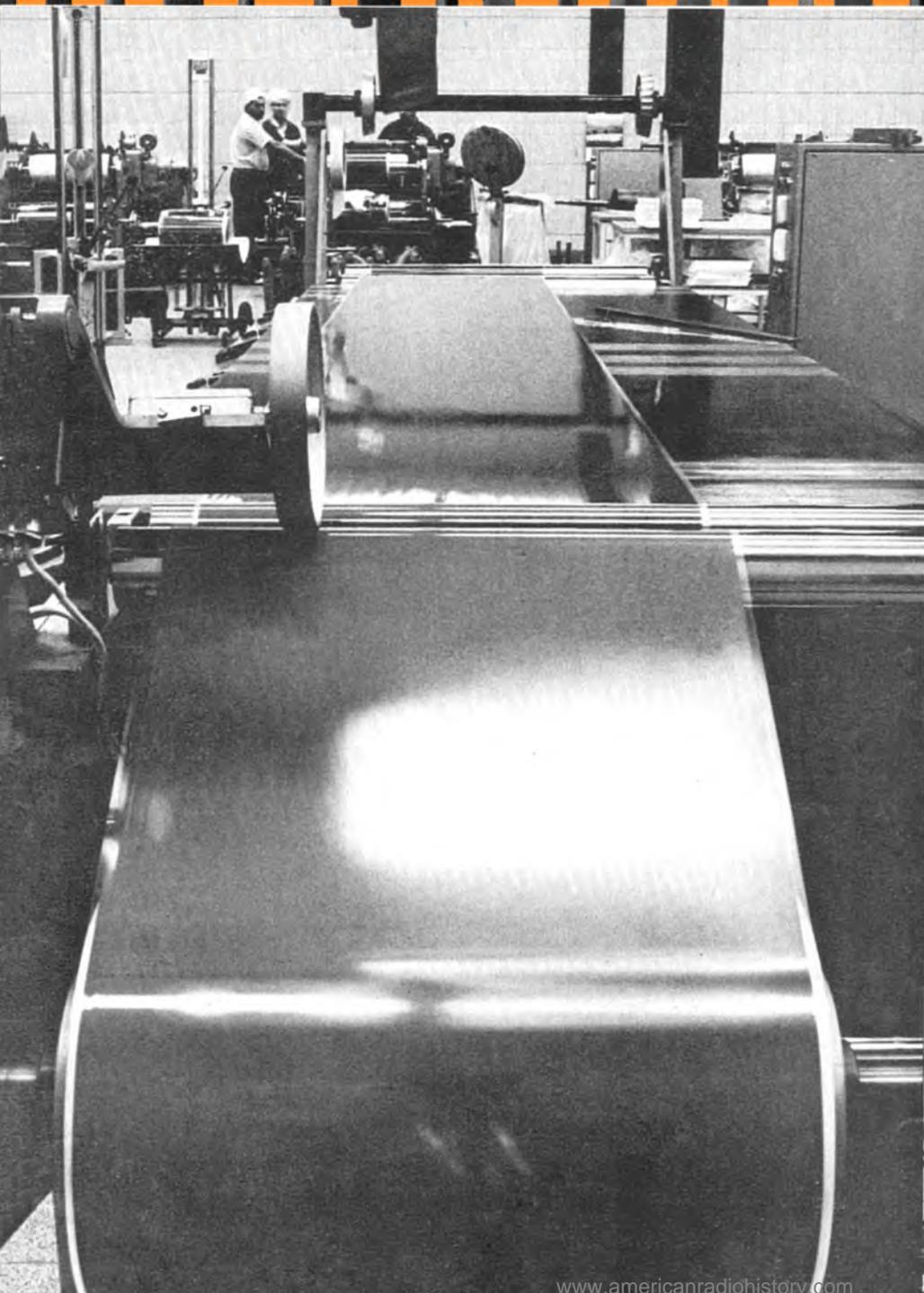


OCTOBER 1967

# TAPE

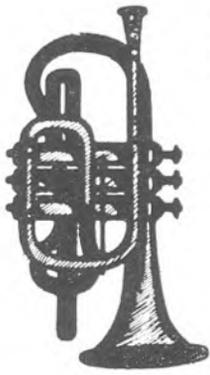
RECORDING MAGAZINE

2<sup>1</sup>/<sub>2</sub>



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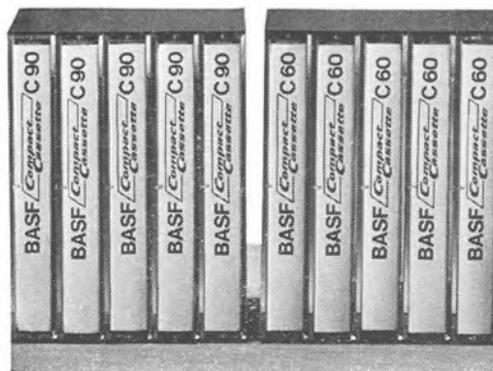
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The Series 8 features:

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- \* Sockets for radio recording and playback through radio or external speaker.
- \* Loudspeaker selector switch provides choice of playback through internal or external speakers or both simultaneously.
- \* Illuminated digital counter (in feet) makes it

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\* Electronic beam recording level indicator permits precise control of recording level.

\* 4 track models have a 'dual position' allowing 2 programmes to be played back simultaneously.

\* Both 2 and 4 track models are available in either teak cabinets or portable 'Aero' cases. (Cabinet models can be fitted with remote control for starting, stopping and rewind).

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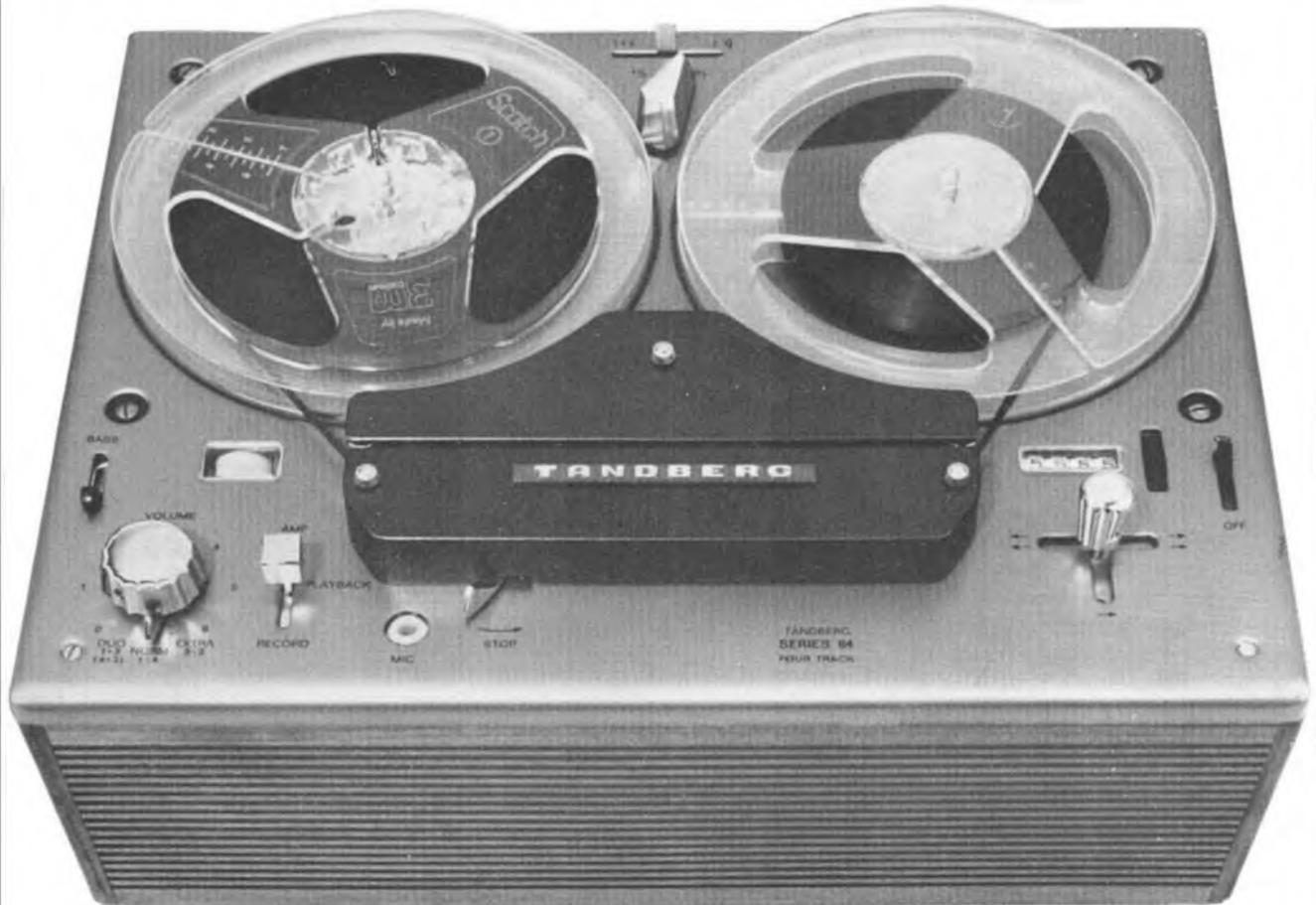
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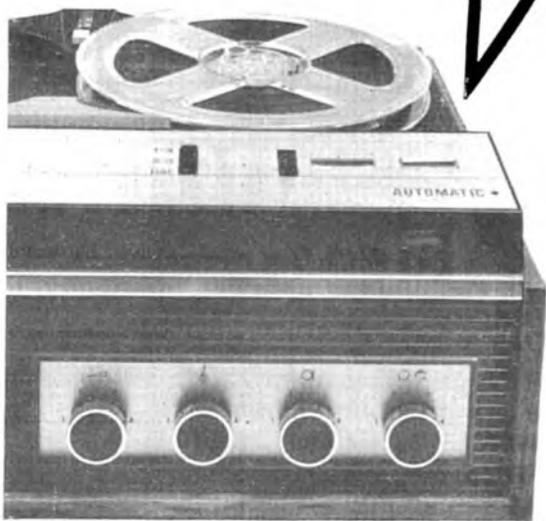
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3. Four independent heads—erase, record, monitor, Akai Crossfield.
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for reel and cassette tape recorders and dictating machines

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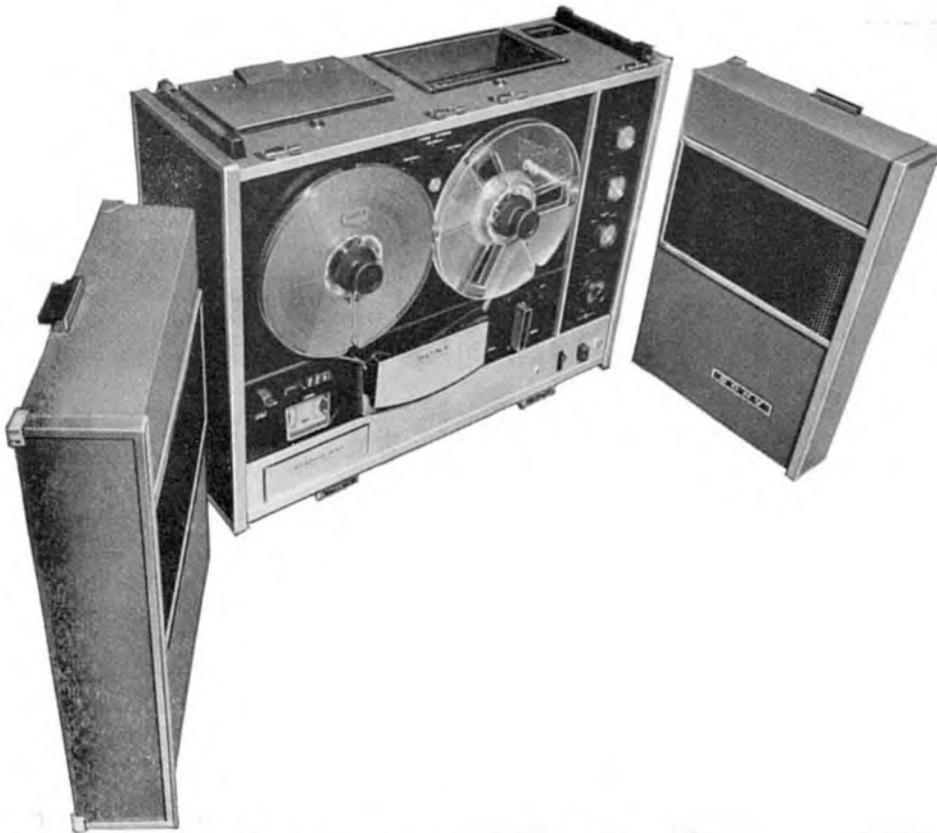
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**Specifications:**  
**Power requirements:** 65W, 100-125V and 220-240V AC. 50/60 c/s.

**Tape speed:** 7½ ips., 3¾ ips. and 1½ ips. instantaneous switching with automatic equalization change.

**Reels:** 7" diameter or smaller.

**Recording system:** 4-track stereophonic or monophonic.

**Frequency response:** 30-20,000 cps. at 7½ ips. ( $\pm$  3dB 50-15,000 cps. at 7½ ips.)  
30-13,000 cps. at 3¾ ips.  
30-10,000 cps. at 1½ ips.

**Wow and flutter:** Less than 0.17% at

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**Power output:** 5W R.M.S. per channel.

**Signal-to-noise ratio:** Better than 48 dB (at peak record level).

**Harmonic distortion:** Less than 3% at 0 dB line output.

**Level indication:** Calibrated VU meter x 2.  
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**Outputs:** Line outputs: 0 dB (0.775V), load impedance 100K ohms.

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Integrated record/playback connector.

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Impedance 10K ohms.

**Output:** Sensitivity 0dB (0.775V)  
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**Dimensions:** 19½" wide x 9½" high x 15½" deep.

**Weight:** 41 lbs. 10 ozs.

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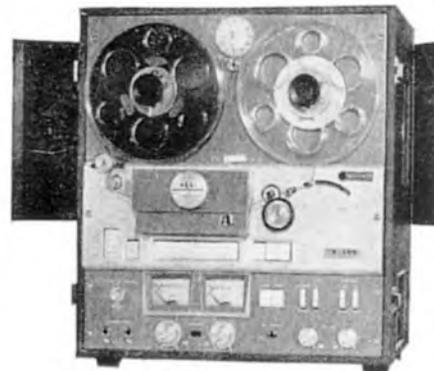
**AKAI 910**  
A mono recorder, available in 4 or 2-track form. Clean practical styling; 2 speeds; 3.2 watts output. Built in P.A. system and mixing facilities. **67 gns.** Deposit £22 2s. 0d., 12 monthly payments of £3 11s. 8d.



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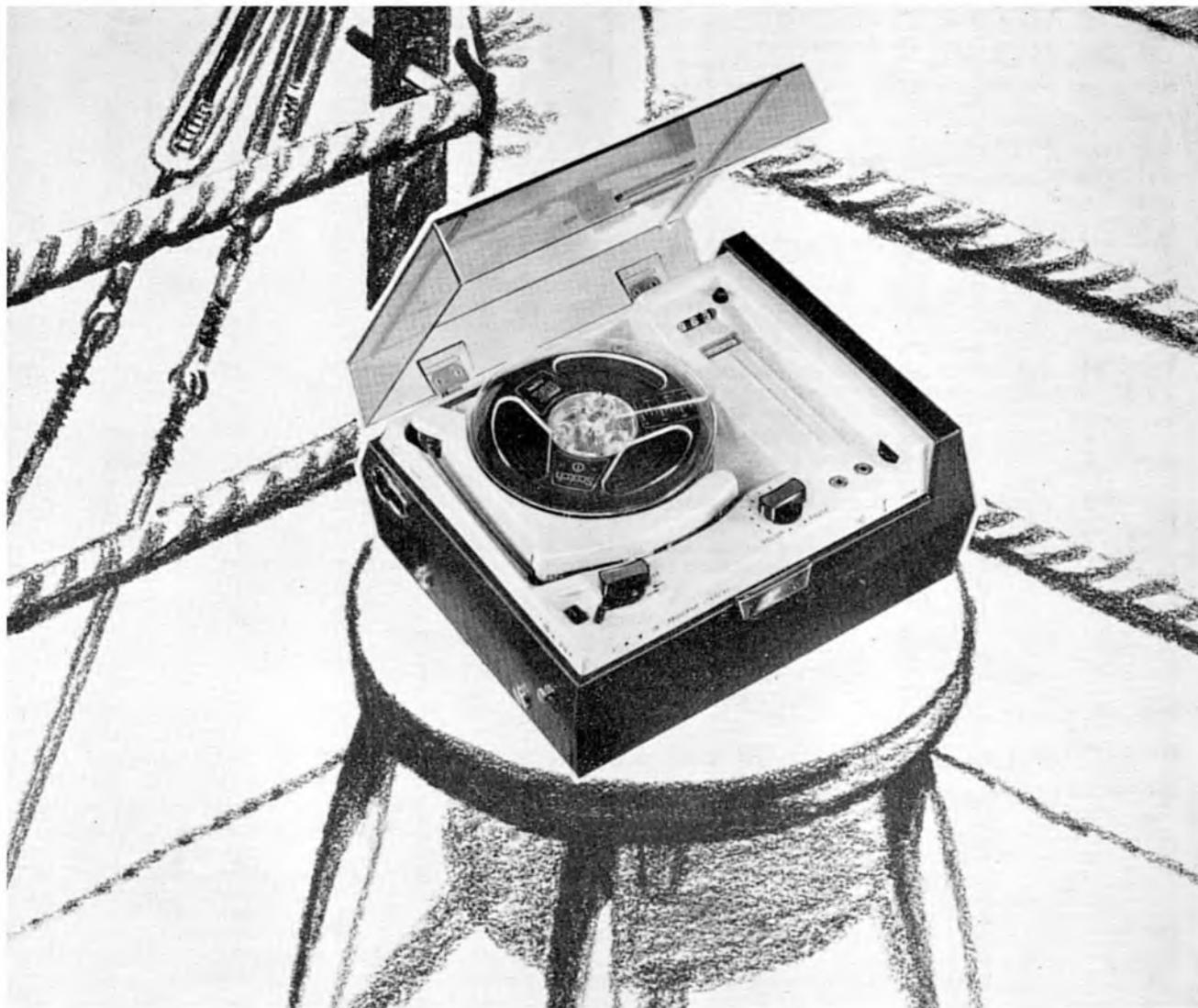
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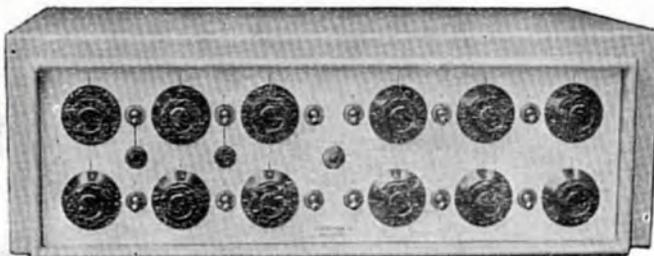
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12-WAY ELECTRONIC MIXER

## quality equipment

The 12-way electronic mixer has facilities for mixing 12 balanced line microphones. Each of the 12 lines has its own potted metal shielded microphone transformer and input valve, each control is hermetically sealed. Muting switches are normally fitted on each channel and the unit is fed from its own metal shielded mains transformer and metal rectifier.



### FOUR-WAY ELECTRONIC MIXER

This unit provides for 4 independent channels electronically mixed without "spurious break through," microphone hum and background noise have been reduced to a minimum by careful selection of components. The standard 15-50 ohm shielded transformers on each input are arranged for balanced line, and have screened primaries to prevent H.F. transfer when used on long lines.

The standard 5 valve unit only consumes 18.5 watts. H.T. is provided by a selenium rectifier fed by a low loss, low-field transformer in a screening box. The ventilated case gives negligible temperature rise with this low consumption assuring continuance of low noise figures.

20,000 ohms is the standard output impedance, but the noise pick-up on the output lines is equivalent to approximately 2,000 ohms due to the large amount of negative feedback used.

For any output impedance between 20,000 ohms and infinity half a volt output is available. Special models can be supplied for 600 ohms at equivalent voltage by an additional transformer or 1 milliwatt 600 ohms by additional transformer and valve.

The white engraved front panel permits of temporary pencil notes being made, and these may be easily erased when required. The standard input is balanced line by means of 2 point jack sockets at the front, but alternative 3 point connectors may be obtained to order at the rear.

Mixer for 200-250 V AC Mains	...	...	...	£40 8 6
Extra for 600 ohm output model	...	...	...	£1 18 6
Extra for 600 ohm 1 milliwatt output	...	...	...	£3 0 6
Size 18½ in. wide × 11½ in. front to back (excluding plugs) × 6½ in. high. Weight 22 lb.				

### THREE-WAY MIXER and peak programme meter for recording and large sound installations etc.

This is similar in dimension to the 4-Way Mixer but has an output meter indicating transient peaks by means of a valve voltmeter with a 1 second time constant in its grid circuit.

The meter is calibrated in dB's, zero dB being 1 milliwatt-600 ohm (.775 V) and markings are provided for +10 dB and -26 dB. A switch is provided for checking the calibration. A valve is used for stabilising the gain of this unit. The output is 1 milliwatt on 600 ohms for zero level up to +12 dB maximum. An internal switch connects the output for balance, unbalance, or float. This output is given for input for 40 microvolts on 15 ohm.

An additional input marked "Ext. Mxr." will accept the output of the 4-Way Mixer converting the unit into a 7-Way controlled unit. This input will also accept the output of a crystal pick-up but no control of volume is available.

The standard input is balanced line by means of 3 point jack sockets at rear but alternative 2 point connectors may be obtained to order at the front or rear as desired.

The 8 valves and selenium rectifier draw a total of 25 watts.

P.P.M. for 200-250 V AC Mains	...	...	Price on application
Size 18½ in. wide × 11½ in. front to back (excluding plugs) × 6½ in. high. Weight 23 lb.			
10/15 watt Amplifier with built-in mixers.			
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# TAPE

RECORDING  
MAGAZINE

Vol. 11 No. 10 October 1967

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**COVER PHOTOGRAPH:** There is a very definite connection between the two photographs that appear on this month's cover. On the left we see one stage in the complex manufacturing processes at the new B.A.S.F. tape factory in Germany. This outside sheet of gleaming magnetic film is being wound on to great drums before passing to the slitting machine for cutting into the familiar, quarter-inch width used on tape recorders. And on the right we have a very different view of the same tape. Magnified very many times we show just a few of the 150 million or more oxide particles that are concentrated in every square millimeter of standard audio tape. Read the dramatic story of tape manufacture on page 380 of this issue.

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# Tape trends and tape talk

By Douglas Brown

THE COURSE of the "tape revolution" in North America has been quite different to our own, and public evidence of tape recording as a popular hobby is not easy to find as one strolls the streets of U.S. and Canadian cities. During recent weeks I have been in New York, Washington, San Francisco, Boston, Vancouver, Ottawa and Montreal and I have not noticed a single shop offering the range of products and variety of service of any average English hi-fi dealer.

Had I been a serious customer, of course, I could have found almost anything I required. The specialist dealers *are* there. I have heard "commercials" for tape recording on local radio stations (most of which make a point of stressing that they are transmitting stereophonically).

What I *have* seen in most cities are the tape cartridge centres, with dozens of titles attractively arranged in racks and every evidence of brisk trade.

On the bookstands (which I have studied with greatest care) I have only once seen a copy of a specifically tape recording magazine.

The American accent is most definitely on tape as a means of musical reproduction rather than as a creative hobby. Curiously, to an English visitor, the motor manufacturers seem to have been principally responsible for this state of affairs.

The big breakthrough in the USA came with the development of tape cartridges for use in cars. Early last year the Ford Motor Company began offering as optional equipment on their new models a cartridge-tape player reproducing through a four-speaker system music from the RCA repertoire. The idea was quickly taken up by other car manufacturers and only then spread to home appliance dealers.

So most of the two and a half million cartridge-tape players so far sold in the USA are almost certainly in cars.

It was the car-makers, too, who were responsible for the drive towards 8-track continuous-loop cartridges, giving the maximum programme time and making it unnecessary to touch the machine once it had been started.

Just as the cartridge revolution was developing dramatically on these lines, along came Philips' American Partners with the new cassette, which is already so well known in Europe. Battle has been joined between the giants. Even the *Wall Street Journal*, staid journal of American big business, has sat up and taken notice.

According to the *WSJ*, Philips sold about half a million of their cassettes in America in the first year. The *Journal* quoted a forecast by a Philips' spokes-

man that "cassette recorders will account for 25 per cent of the 5.5 million tape recorders to be sold in the U.S. this year."

The big advantages of the cassette (meaning the Philips-type spool-to-spool product) over the cartridge (meaning the American continuous-loop product) are, firstly, that it can be used for recording as well as playback and, secondly, that fast wind and rewind makes it possible to find any desired place on the tape. Incidentally, the cassette is also significantly smaller in size.

Efforts are now being made, however, to produce a cartridge with recording as well as playback facilities.

The attitude of Ampex is seen in America as significant for the future. Until last June this company manufactured and marketed only top-quality, high-priced equipment. Its cheapest model cost 250 dollars (nearly £90). In June Ampex introduced three new models, with a price range from 99.95 to 199.95 dollars (about £36 to £71)—and all incorporating the Philips' cassette.

The drawback for cassette users at present is the limited repertoire of recordings available. Ampex have promised to issue at least 500 new selections in cassette form by the end of 1967, and another firm, Mercury, is currently producing a dozen new issues each month. These are significant figures, for until now only about 130 music cassettes have been on sale.

Ampex obviously assessed the market optimistically. Its estimate is that about £7.5 million worth of prerecorded stereo tape was sold in America in 1965, well over £16 million worth in 1966, and that this year sales should hit £35.7 million. Ampex thinks that the motor industry will remain the biggest customer this year, with 65 per cent of total sales in cartridge form.

The latest news is that the record division of Metro-Goldwyn-Mayer is now building up sales of a 19.95 dollar (£7) "Playtape" machine to teenagers and that soon it will offer two pop numbers on a five-minute cartridge tape for 99 cents (just over 7s.).

Big Business has moved into American tape recording with a vengeance. Out of all this activity there is bound to come, I suppose, a build-up of the type of tape recording activity with which we are more familiar in Europe.

But I doubt if it will develop to the same extent on the other side of the Atlantic. Most Americans seem to me more restless and impatient than Europeans, and I think creative tape recording may prove too painstaking and time-consuming an activity for those who seek "instant" pleasure.



TECHNIQUES . . .

# THE ART OF INTERVIEWING

BY DENYS KILLICK

**I**N choosing the title of this series, "Tape Recording Techniques," I was only too well aware that such a generalisation embraces an almost limitless field of activity. One of the many exciting features of recorded sound as a medium of expression is its extreme versatility. Recently we have been dealing with recording music, an activity which requires not only the very best equipment and a degree of skill on the part of the operator, but also the very highest standard of performance by the musicians.

The amateur can often fulfil these first two requirements without very much difficulty, but he finds all too often that in spite of his efforts recordings are disappointing because performance falls short of expectation. At the risk of repeating myself to the point of boredom I should like to once again point out that churches, with their choirs and organs, provide the very finest training ground for this class of work. Church authorities are unlikely to approach you—the initiative is in your hands to approach them. If a first request is met with a dubious acceptance then at least you have the chance to win them over by producing some really good quality sound. I never fail to marvel at the readiness of all musicians, both amateur and professional, to change from guarded scepticism to sincere enthusiasm when

they hear for themselves the results we can achieve.

But recording music is only one application of the medium. Let us now turn to something quite different. The art of the recorded interview requires a particular kind of temperament on the part of the operator. Unlike the music enthusiast, the interviewer is not severely limited by equipment—almost anything will do. Neither is he limited by the performance skills of his subjects; the world is his oyster and his success or failure will depend solely upon his own ability to crack it open.

If half a dozen would-be interviewers, all equipped with identical recorders and microphones, were to be sent out on identical assignments they would all come back with very different results. A good interviewer with relatively poor recording equipment will consistently return good results; a poor interviewer with the very best equipment in the world will always fail. Of all recording applications equipment matters less in interviewing than in any other. One can work satisfactorily with mains or battery equipment, the difference between the two requiring only a modification in the interviewer's technique. There is really no excuse for anyone who does not attempt this most fascinating of all recording jobs. Apart from which it is one of the few possible avenues for actually making money out of our hobby.

What does it take to make a good interviewer, and how does one go about it? The answer to the first part is that it requires a very unusual, persistent, and sharp mentality, combined with grit and determination to succeed at all costs. If you feel you have these attributes it is just possible that you

might also be endowed with that touch of half-genius, half-eccentricity, that will make you one of the very few really great interviewers. If this should be so then the rewards will be great indeed. But we shall never find out what we can do if we don't try, so let's consider how to set about it.

For convenience we will consider two quite distinct kinds of interviews. Firstly, there is the pre-arranged interview. This often, though not always, takes place in the studio. The interviewee is consulted in advance through the invitation extended to him to attend the recording session, and he is usually well aware of the topic to be discussed. Both he and the interviewer have plenty of time to marshal their facts and the recording usually takes place in a relaxed, informal, atmosphere. In contradistinction we have the speculative interview where the interviewer approaches a complete stranger, perhaps on a street corner, perhaps in some other public place, and asks questions of which the interviewee had no previous knowledge at all.

Standard equipment for the studio interview is a simple mains recorder and single microphone, which could be either handheld or mounted on a stand. For outdoor work a battery portable machine and handheld microphone is indicated. If the enthusiast should not own battery equipment this does not mean that he is prevented from investigating the possibilities of interviewing—it only means that all his interviews will have to be conducted under "studio" conditions.

Recorded interviews can offer a very worthwhile means of providing an additional income. Much of the work transmitted by both the British Broadcasting Corporation and foreign broadcasting stations has been undertaken on a freelance basis. This does not mean that any broadcasting authority

*(Continued overleaf)*

will accept and pay for an interview just because you personally have recorded it and offered it to them. Freelance work of this kind is rather specialised, and it is essential that the market be studied carefully beforehand.

The right kind of interview, properly conducted and recorded, offered to the right producer at the right time, may very well result in a surprisingly large cheque. I mention this possibility before talking about the mechanics of interviewing because the knowledge that such opportunities exist may well influence the choice of the subject to be discussed. Before anyone can interview anyone the interviewer must know what he is going to talk about—so beyond all else that is the very first requirement.

Selection of a subject is not easy. It always helps to work with a definite plan, or project, in mind—preferably with a possible sales outlet also in view. This will provide what the psychologists call “motivation,” or sense of purpose, which I personally find essential. Never wander aimlessly with no definite plan in mind. This will result only in frustration and wasted time. Take the opposite course by making up your mind what you are going to do and then go out and do it.

One last word on the choice of subject. This is going to materially influence the kind of people you will want to talk to, and also the places you visit to find those persons. If you want to talk to Billingsgate fish porters then you must obviously go to Billingsgate; it's no use looking for office cleaners at 10 o'clock in the morning; neither will you get profound comments on the complexities of the International Monetary Fund from passers-by in the City of London if you are looking for your “victims” either before 9 o'clock in the morning or after 5 o'clock in the afternoon. The subject determines the location and type of person to whom you should speak.

Is it possible to conduct an interview on a subject about which you yourself might perhaps know very little? The answer to that one is a very definite “yes.” In fact I consider it an advantage to be relatively ignorant of the topic under discussion. A certain amount of background knowledge is desirable, but if my interview were for subsequent broadcast I should have to get the interviewee to answer my questions in such a way as to impart meaningful information which will enlighten me. If I know too much there is a grave danger that my interview will degenerate into a technical discussion between experts. Which brings me to my next point; the interviewer must know in advance the kind of audience for which his interview is being recorded.

Now I have assumed so far that our recorded interview is to be heard by ordinary people, men in the street, a typical cross-section of the community such as is formed by any average radio audience. But sometimes interviews are conducted for the benefit of highly specialised audiences. In these cases the interviewer must have an expert knowledge of his subject, otherwise he will draw nothing but basic fundamentals from his interviewees and will bore his audience to tears. Similarly, the kind of question and answer repartee required for a child audience is different to that required for an adult audience. A sophisticated adult audience would favour a differentiated treatment to that which would be successful for less cultured people. Everything revolves around the original plan of action. That is why the formulation of such a plan is essential to successful interviewing.

Having come so far we appear to have jumped quite a few hurdles without actually starting the race. But as with so many things success lies as much in the pre-arrangement as in the execution of the task. I hate to mention it yet again, but pre-planning requires no equipment and costs no money; all it needs is mental effort. How much more we would all achieve if we were not as lazy as a nagging little voice tells us we really are.

Just one more word on pre-planning. It's not really such a deadly chore as it might at first seem to be. In fact the contrary is the case. Proper planning results in one becoming more and more involved with the subject; interest increases and excitement rises to fever pitch until one literally has to go and take the actual recordings. It becomes a compulsive thing about which one has no option. When you feel like this then you know you are going about the job in exactly the right way.

Now to get on with the business of actually recording. For outdoor work one needs a battery machine, tape, a supply of spare batteries and, of course, a microphone. Although a cardioid microphone has much in its favour, I personally prefer to use an omni-directional model for interviewing. It is often an advantage to pick up authentic background sound to convince the listener that the interview is really taking place where you say it is. If we are recording in a pub we would expect to have a background of general chatter, chinking glasses, etc. The important thing is always to keep ambient noise well below voice level so as not to impair intelligibility. The two standards by which your interview will be judged will be, firstly, the intelligibility of the speech, and, secondly, the interest value of the recorded material. Please note: *intelligibility always comes first*. If you are working by yourself never have more than about four or five feet of lead on the microphone. This is sufficient to enable it to be handled conveniently without dragging on the machine, but not enough to fall around the feet and trip one up.

Full of optimism, we set out on our first venture. The portable is slung on its carrying strap on our shoulder, the microphone is carefully protected in a polythene bag in a pocket; in the other pocket lies spare tape and spare batteries for the machine. Our subject is firmly fixed in our minds and we have a pretty good idea of both the kind of questions we want to ask and also the sort of answers we anticipate getting. Having arrived at the recording location we select an intelligent looking person and in a surprisingly thin, unnatural, voice beg their pardon as we ask if they would mind if we recorded their comments on “holidays at the seaside” or whatever else we are talking about.

This must always be the opening gambit. One must always ask permission to record someone's remarks. Without fail this will always draw a counter question in reply. If you are not prepared with a ready answer for this question you, the interviewer, will be in the ignominious position of being flayed by your own interviewee. The very first, and very natural, question that any stranger will ask you, is: “What are you conducting this interview for?”

You must have the answer ready, and it must be an answer that will satisfy the interviewee and convince him that you are not wasting his time and that your purpose is worthy of his co-operation. Provided you satisfy him on these points I can guarantee that a refusal to speak is a very rare thing indeed.

I am not going to suggest precisely how you should counter this one. If you cannot think out for yourself a satisfactory explanation for what you are doing, then you may be quite sure you will not be able to succeed in the job of interviewing itself, since this calls for a very agile mind and sharp intelligence.

The kind of answers you are subsequently going to get will depend entirely upon the kind of questions you ask. There are several ways of asking questions; some will draw nothing but monosyllables in reply. A succession of “yeses” and “noes” from an interviewee does not constitute an interview. Your job is to get this person talking about the subject you want him to discuss. There are certain key words which you should keep firmly in your mind. Try this one out on your friends. Ask them a question, any question you like, but use as the first word of your question one of the following key interrogatives:

How	Where
What	When
Why	

No one can possibly answer a question phrased in such a way in a monosyllable. They can only be answered by imparting factual information and that is what you are there to record. Of course there is always one reaction for which you must be prepared, but against which you can do nothing. Any question phrased in the manner suggested can be answered by the all too familiar cliché, “I dunno.” A string of answers like that means just one thing; you chose the wrong interviewee! Change your victim and you will surely fare better.

Next give a little thought to the microphone. When starting your interview it is natural for you to hold the microphone out to the person you are speaking to. It would not be unnatural for him to reach out his hand and take the microphone out of yours. If that should happen you are completely done for. Once you lose possession of the microphone you lose control; the interview from thence on will be conducted as the interviewee wants, not as you want.

Never under any circumstances part with your microphone. If your interviewee should go to take it out of your hand merely withdraw it a few inches, raise your left hand in a cautionary gesture and then re-present the microphone. Be very firm indeed about it and you will find that no one will ever attempt to take it from you a second time.

When working as a lone wolf you will find you have a great many things to think about at one and the same time. You have to control the machine, to set the right recording level, to make sure you have sufficient tape available and that the batteries are not nearly exhausted. You have to carefully control the microphone-to-face distance when both you and your interviewee are speaking. And while all this is going on your brain is working furiously as you both listen to your interviewee's answers and at the same time begin to phrase your next question. Take it from me it is not easy.

The most important single piece of advice I can give to any amateur—or professional for that matter—is to always wait for a full and complete answer to each question. If the person to whom you are speaking should pause in his reply you will find a natural tendency, as a conscientious interviewer, to “jump down his throat” with the next clever question that you have just worked out. This is a very bad fault, one of which I am guilty myself. Every interviewer feels a degree of nervous tension when he starts to work. Even the most hardened profes-

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# THE 1967 RADIO SHOWS

A SURVEY BY TRM STAFF

AS there was no centrally organised Radio Show in London this year many manufacturers arranged to display their latest products in their own London showrooms or in hotels. These exhibitions were open to the trade and the press, and in some cases to the public as well. Members of *Tape Recording Magazine* staff visited as many of these displays as possible to bring you news of the latest developments; unfortunately complete coverage was not possible as the individual shows were widely scattered over a large area, ranging from Clapham in South-West London to Finsbury Park in the North. We cannot help feeling that a joint exhibition under a single roof has many advantages from the visitors' point of view; many dealers must have been able to see only a fraction of the items that would have interested them this year.

Our first call was to B. Adler & Sons (Radio) Ltd., distributors of Eagle Products. A glance around their showrooms revealed a veritable Aladdin's cave of fascinating items. The Eagle range of plugs and connectors is vast, and caters for almost every requirement. New items of great interest include the TC450 4-track stereo record and playback tape deck. Selling at a suggested retail price of £51 9s., the equipment has two speeds,  $3\frac{1}{2}$  and  $7\frac{1}{2}$  ips, and a claimed frequency response of 30 to 17,000 Hertz at  $7\frac{1}{2}$  and 30 to 12,000 Hertz at  $3\frac{1}{2}$  ips, both plus or minus 3 dB. Fully equalised to CCIR recording characteristics, the equipment has an impressive specification and is designed to be used in conjunction with existing amplifiers and speakers. Another new item is the CP1004 cassette mains/battery stereo portable machine. Offering full stereo record and playback facilities, the equipment includes a pair of large detachable speakers which can be suitably positioned to give a good stereophonic image. Independent volume and tone controls are featured together with vu meters for each channel. The recommended retail price is £46 4s. An interesting and comprehensive range of tuners, amplifiers and pre-amp modules is offered, including what is described as "the world's most compact transistor FM tuner," model VFM40, at a recommended price of £12 19s. 6d., and a complete 2-channel stereo amplifier, power output 5 watts RMS per channel, reference TSA10, at a recommended price of £13 19s. 6d. Eagle Products catalogue, price 5s., is available from the distributors and is strongly recommended as an invaluable "inquire within."

Calling next at the Grundig showrooms in Orchard Street we were ushered into a



The new Eagle 4-track stereo tape deck and pre-amp. is for use with existing Hi-Fi equipment



A mains/battery cassette machine complete with a pair of detachable speakers by Eagle

delightful grotto in which the equipment was set like jewels. This was certainly the most tasteful and imaginative display we saw.

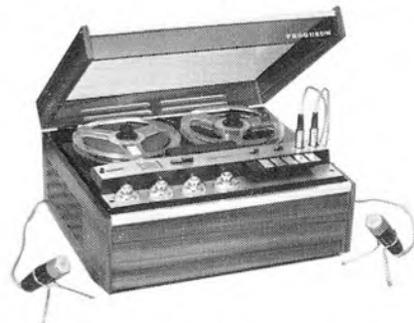
We have been saying for a long time that it is no longer possible to separate tape recording from so-called high fidelity—which, after all, is only a more convenient way of saying "good sound reproduction." Emphasis by Grundig was strongly on their high fidelity amplifiers, tuners, and loudspeakers, all of which were being demonstrated by the Grundig hi-fi advisor, Mr. A. M. Camisotti. We were, as usual, very impressed with the high standard of the equipment, but we would particularly like to pay tribute to Mr. Camisotti. Not only is he a real enthusiast, but he really does know about both music and recording. Of all the people we met at the various shows we found Mr. Camisotti to be one of the most interesting to talk to, and we would strongly recommend readers to look into this showroom and to listen to his demonstrations. The impressive decor will remain until

Christmas, and the showroom will be open from 9 a.m. until 5.30 p.m., 6 p.m. Thursday and 1 p.m. Saturdays.

Looking for a consistent trend throughout all the exhibitions we found two hand-in-hand. An overall interest in good quality sound reproduction is running parallel to the introduction of ever wider ranges of low cost equipment in all classes. Now it might be said that "hi-fi" and low cost are incompatible. From the purist point of view this may well be so, but much of the equipment we saw and heard was displaying remarkable quality standards with reasonable price tickets. As such it will help to bring better quality sound to more and more people—this will not prevent the dedicated enthusiast from enjoying his superlative but expensive equipment as he has always done.

As an example of this trend, how about a 3-speed,  $\frac{1}{4}$ -track, 7 in. reel, stereo tape recorder beautifully styled in teak or walnut cabinet with neutral tinted acrylic lid at a recommended retail price of 69 gns.? This is a new entry from Ferguson, Model 3232, and it quotes a most impressive specification, including frequency response from 40 to 18,000 Hz. at  $7\frac{1}{2}$  ips. Complete with built-in speakers, one per channel, an outlet for external speakers (5 watts at 8 ohms) this machine really does seem to offer outstanding value for money. Only now going into production we have arranged to review this tape recorder as soon as one is available. In common with many other manufacturers Ferguson are also producing a battery-operated cassette portable with key type controls. This is Model 326 and it is offered complete with cassette, radio connecting lead, muting plug and dynamic microphone at a recommended price of 21 gns.

The name of Van Der Molen has always been coupled with bright ideas, and one of his best—and least expensive—was on show for the first time. The equipment comprises a stereophonic cassette playback unit. This



Latest model in the Ferguson range; full stereo at 69 gns.

(Continued overleaf)

## RADIO SHOW from page 373

has been designed for use by the person who wishes to take advantage of the excellent quality sound available in musicassette form, but who already owns an existing audio set-up. The little Van Der Molen cassette playback unit, the Sonic-5, will plug into a hi-fi amplifier, stereo recorder or radiogram, in fact any equipment where the load impedance is greater than 5 K ohms. Frequency response is quoted as from 70 to 12,000 Hz. and the recommended selling price of this very neat and useful piece of equipment is 17 gns. Another change in the Van Der Molen range is an improved teak cabinet to the VR7.



The Van Der Molen Sonic-5 reproduces Musicassettes in stereo when used with external amplifiers and speakers

The Wyndor Recording Company was showing a miniature tape pre-amp unit which has been designed for use mainly as a link between the stereo outlet of a 4-track mono tape recorder and an amplifier. Costing only 6 gns., and incorporating switched equalisation for tape speeds of  $3\frac{1}{4}$  and  $7\frac{1}{2}$  ips, it will enable stereo pre-recorded tapes to be reproduced on 4-track mono equipment which includes a stereo outlet socket. A highly original item also displayed by Wyndor is a tall, slimline speaker unit. Place the hand at the rear and down drops a gramophone transcription turntable and amplifier. This equipment is full stereo and costs only 24 gns., but for stereo reproduction a second matching speaker would be required and this is also available at 14 gns. We listened to the sound quality here and were impressed with what can be achieved at such low cost.

In Denham & Morleys showroom we saw the Multicorder in use and looked at two new Standard tape recorders. These are the Standard SR500 and SR550, the latter offering automatic track reversal. This is a most unusual feature since the machine is mains/battery, running at  $3\frac{1}{4}$  and  $1\frac{7}{8}$  ips and costing 47 gns.

For real low cost (not claimed by anyone to be high fidelity!) we really must quote



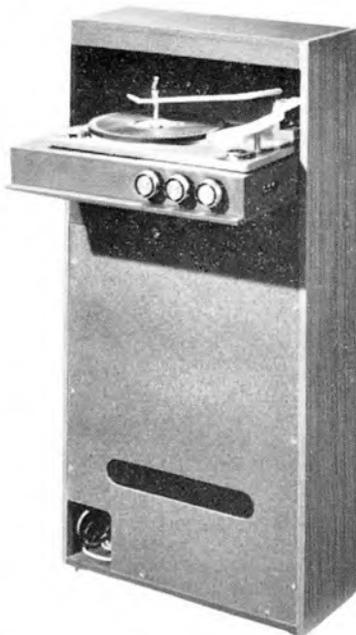
Automatic track reversal is a feature of this Standard mains/battery portable

a record player being introduced by Lee Products (Gt. Britain) Ltd. Fitted with a wrist-sling carrying strap, the case is neatly made in gaily coloured plastic. Beneath the lid is a turntable and tone arm complete with loudspeaker and volume control. Reproducing only 45 rpm discs this equipment is obviously intended for the younger market and it has been priced accordingly at a retail cost of £4 10s. Investigation shows a startling absence of physical means of amplification, but we were told that this takes the form of an Integrated Circuit mounted within the pickup head!

Under the Elpico label Lee Products are introducing a number of very low priced portable transistor radios featuring VHF reception from as little as 9 gns. At 12½ gns. the Elpico 92 offers mains or battery operation over three wave bands, long, medium and VHF.

Continuing the theme of low cost, Elizabeth Electronics Ltd. are about to market the Dulci 207 stereo amplifier and the Dulci FMT 7 VHF tuner. Both items have a recommended retail price tag of 19 gns. each. Alternatively, there is the Dulci 220 integrated stereo amplifier offering 10 watts output per channel and all usual facilities at 39 gns.

Stereo is certainly here to stay, and so we find two new versions of the well-known Uher 4000L Report tape recorder. These are models 4200 and 4400, which are  $\frac{1}{2}$ -track and  $\frac{3}{4}$ -track respectively, with full stereophonic record and playback facilities. Both models will be available at 115 gns.



Rear view of the Wyndor speaker unit showing the concealed turn-table and amplifier. From the front it looks like a conventional, slim-line speaker

A delightful range of electronic novelties are offered by Goodman (Radio 1950) Ltd. of 3/5 Eden Grove, London, N.7. Not only do they handle speakers, amplifiers, tuners and a workmanlike range of test equipment, but their catalogue includes some fascinating gimmicks. If you really want to buy a poodle radio, blue for boys or pink for girls, this is the one place you can purchase it for £4 12s. 6d.

In direct contrast the Bang & Olufsen display at their Welbeck St. showroom

featured top quality tape recorders and high fidelity equipment. One little item that particularly caught our eye was their new fixed station, transistorised FM receiver, which by the addition of an extra loudspeaker can be used as an efficient intercom system. It occurs to us that this could perform a most useful service for enthusiasts in providing "talk back" studio facilities which are so often absent in amateur set-ups. Full details of this equipment are published in our New Products section on page 397 of this issue.

Before we forget we must mention that the Philips exhibition was held in Harrogate, but a one day show will be held in their London showrooms later in September. Advance information indicates that they will be offering a completely new prestige spool-to-spool tape recorder, with a number of unique features selling at 95 gns. Other items in their range will have been restyled to conform to the "black and silver look" that has now become standard Philips' styling. Not only will we see new cassette equipment, but prices of the Philips EL3310 and Stella ST911A mono/mains cassette recorders will be 30 gns., while the stereo versions, EL3312 (Philips) and ST9114A (Stella) will now be sold complete with two matching speakers at an inclusive price of 55 gns. Further details will be published in New Products next month.

Value for money has always been one of our guiding principles, so we were impressed with Sharp Tape Recorders of 1, Robert Adam Street, London W.1., simply because they are publicising a guarantee period of no less than five years. When coupled to a retail price of as little as 26 gns., then a five year guarantee must surely mean unbounded faith in the product. We do not expect a very impressive specification for a spool-to-spool recorder at this price level. In fact the styling is excellent, the sound quality appeared to be surprisingly good in relation to cost, and we were just mesmerized by those magic words "five year guarantee." Well worth investigating, so we enquired of the distributors precisely what they really meant. To our surprise we were told that for the first year it covers both replacement of parts and all labour costs; for the next four years it covers replacement of faulty parts only (not including labour) and quite reasonably they have had to exclude all rotating parts from this extra period. To us this seemed fair to the point of extreme generosity, particularly when the distributor added that his interpretation of rotating parts is "very liberal."

On the pure hi-fi side we examined the LL 4000 system designed by LL Electronics Ltd. of 5, Shakespeare Road, Finchley, London, N.3. This comprises an integrated amplifier/record player, with matching loud-speakers. The turntable is the Garrard 3000 auto changer, and the output is 10 watts RMS. Price, complete with two bookshelf speakers, is 75 gns., or with very impressive, full range LL dynastatic speakers, 149 gns.

The Sanyo distributors have created an entirely new and completely separate hi-fi division which will handle all top quality Sanyo equipment. This was unfortunately not on show. In the lower price bracket we were very impressed with a delightful little VHF portable radio selling at £14 7s. 5d. complete with earphone for optional personal listening or a similar but larger model at 22½ gns. Their most luxurious mains/battery portable radio offers just about every facility one could think of, and costs

(Please turn to page 392)

# What have the happiest Hi-Fi enthusiasts in common with the Fire, Police and Defence services...with theatrical producers and concert impresarios?



## The Ferrograph

Ferrographs are unique in their combination of reliability, rugged construction and *fidelity of recording* . . . not for the first exciting months of ownership, but for year after year of faultless performance. Even so, we do not claim perfection, although we do believe that we have come nearest of all to the ideal. And the vast majority of Ferrograph users agree.

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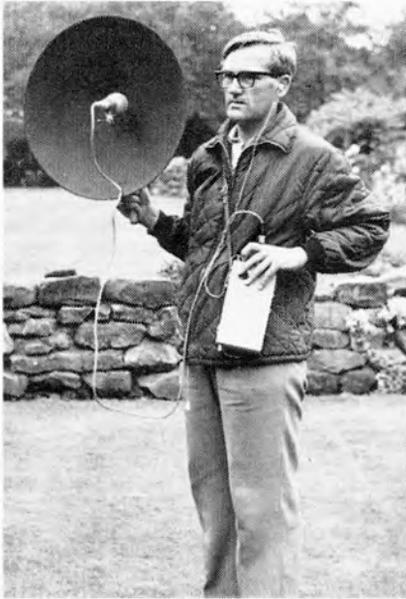
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THE INCOMPARABLE TAPE RECORDER



RICHARD MARGOSCHIS  
DESCRIBES

## MAKING A FIBREGLASS REFLECTOR

chunks of clay and disgoring it in a smooth even mass, he said, "That's just the job for you. It's been puddled extra wet for our hand-made specials."

Puddling is the process to which raw clay is subjected to prepare it for use in moulding machinery. Where it is to be used for hand moulded articles extra water is added to make it more pliable. I returned home with the back of my car loaded down with a hundredweight of clay. Art schools usually have large quantities of modelling clay available; tactful inquiry is sure to produce the offer of a supply. As it is only used for the former it could be returned after use.

The characteristics of a reflector which chiefly interest us are its diameter and its focal length. The latter is the point at which sound falling on the surface of the reflector is focussed, and therefore it is at that point at which the microphone will have to be mounted. Increases in diameter result in the reflector being capable of both collecting more sound and handling a wider range of frequencies, the improvement in the frequency range being at the lower end of the audio spectrum. A decrease in focal length results in a reduction of the area from which sound will be collected; in other words it makes a reflector more directional.

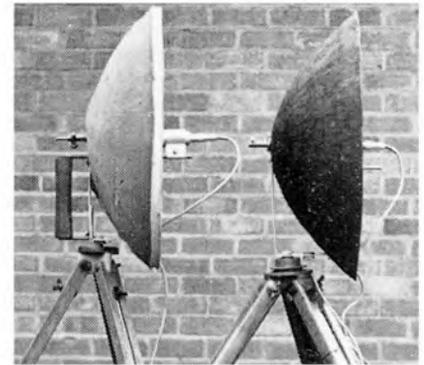
The parabolic curve is a very precise geometric shape, and is given by the formula  $y^2 = 4ax$  where:

$y$  = the vertical axis  
 $x$  = the horizontal axis  
 $a$  = the distance of the focal point from where the axes meet.

Details about suitable curves can be obtained by reference to my previous articles, and measurements for drawing five different curves are worked out and given in Table I on page 90 of the March 1966 issue. My own proposed fibreglass reflector was to have a diameter of 24 inches and a focal length of four inches. So the next step was to produce a template which would be suitable for shaping the clay into the former.

The appropriate curve was drawn on a piece of hardboard and a fretsaw used to remove the unwanted piece. This left a shape looking rather like the arch of a bridge. The top of the arch had to be strong to stand up to the work it had to do, and so it was strengthened by sandwiching it between two lengths of 2 in. x 1 in. battening screwed together. In the middle of these two battens, and exactly in the centre of the curve, a quarter-inch hole was drilled vertically downwards. This had the effect of cutting the hardboard into two separate pieces which were firmly held together between the two battens.

When clay is being shaped it is usual to spin it on a wheel. Having no means of making the dead weight of about 112 lb. revolve, the alternative was for the clay to remain stationary and for the template to turn about a central axis. An old table was called in service and covered with another oddment of hardboard. In the centre of this a hole was drilled to receive the end of a 12 in.



The 20 in. x 4 in. fibreglass reflector on the right with a 20 in. x 5 in. model in spun aluminium on the left

length of quarter-inch steel rod which was held in a vertical position by building around it with clay. This metal upright was constantly checked with a spirit level to ensure that it did not lean out of plumb. Any angle other than a dead 90° would produce the wrong shape when the template began to revolve.

Gradually the clay was built up around the central vertical spindle, making quite sure that it was packed well down. The template was lowered down the spindle, using the hole drilled at its centre as described. By walking around the table whilst holding each end of the template it could be worked around and around, and so gradually brought to the desired shape. Adding clay at the centre first to give the necessary height, the sides were gradually worked in. Extra clay was added at the spots where the template did not touch the surface of the former, and where there was too much the template itself scraped it off as it was turned around.

Although perhaps crude, this method produced a surprisingly good shape. The surface was quite good too, but it could be improved by carefully smoothing over with wet hands, taking care not to lose the outline. It might be possible to reduce the amount of clay if one was to use some more readily available material as a "filler" for the centre of the former, although this thought did not occur to me until after completing the job.

The shaped former was now put on one side to dry, a stage which was judged to be complete in about two days. To my consternation considerable shrinkage had taken place, and I was now faced with the problem of preventing the fibreglass from sticking to the dry surface of the clay. An application of wax was attempted as a means of overcoming this problem, but it was a failure. These difficulties were avoided when a second reflector was made by applying the fibreglass very much earlier. This not only made the application of wax unnecessary, but avoided shrinkage together with its inevitable change in shape. It was soon established that so long as one is careful the application of fibreglass can begin as soon as the surface of the clay is touch dry. This will probably take about twelve hours.

As its name implies, fibreglass is a material loosely woven from glass fibre. It can vary in its coarseness. The finer material is very thin, and will produce a smooth surface, whilst the coarser grades tend to produce a rough finish. The function of the fibrous material is to act as a carrier for the resin binder which is applied as the article is built up, layer by layer. The combination of fibre and resin together produce great strength,

(Please turn to page 379)

IN articles on recording sounds of nature published in the February, March and April 1966 issues of *TAPE Recording Magazine* I described a parabolic reflector spun from sheet aluminium. The possibility of making a reflector from fibreglass was also suggested. Wanting to try a reflector of a different curve from the two already in use I decided to attempt to put my own suggestion into practice.

It must at once be admitted that I had no previous experience of fibreglass; in fact I had never even seen the stuff. When it came to the point it was certainly found to be a little messy, although proficiency and cleanliness is soon acquired with experience. But the techniques of handling fibreglass can soon be mastered with a little patience.

The first problem was obviously going to be to find a suitable material to act as a mould, or former. Would it be better to use a former on which the fibreglass could be laid, rather than attempting to lay it in a mould? Deciding to experiment with a former it was soon evident that this was the correct choice. Not only was it easier to make a former than a mould, but as the surface which matters most is the inner one, not the outer, and this would be in direct contact with the former, shape was bound to be more accurate working in this way.

So far so good, but what material could be used to make the former itself? It had to be something malleable and yet sufficiently cohesive to enable me to spread the fibreglass without altering the shape. My wife gave me a vital clue when she mentioned clay models the children had been making at school. Why not try ordinary clay? The solution seemed almost too simple.

Not far from my home is a local factory which makes clay products. I called and explained my problem to the manager. Taking me through the hot drying rooms to a shed where a huge machine was gobbling up

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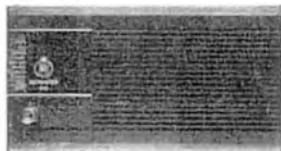


# Bang & Olufsen

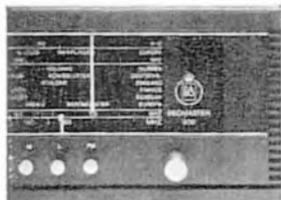
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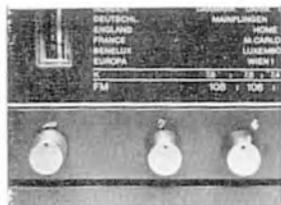
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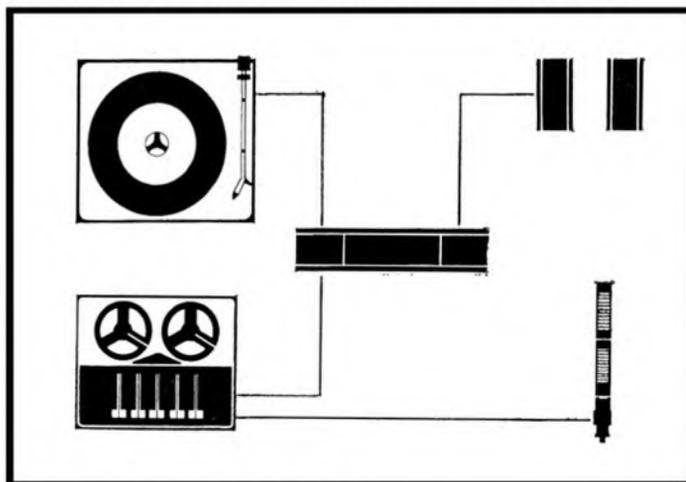


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## REFLECTOR from page 376

which is increased by the laminated structure of the finished product.

Small quantities of fibreglass intended for motorcar body repair work can be purchased in kit form from motor accessory shops. This would be a most expensive way of acquiring it. However, a great many manufacturing processes now use this material, and it should not be too difficult to locate an adequate source of supply at reasonable cost. Boat builders in particular use fibreglass, as do firms making such diverse products as furniture, special motorcar bodies, industrial sinks and a host of other items. Many of the "do-it-yourself" magazines carry advertisements for the sale of fibreglass together with its resin binders in reasonable quantities.

The first layer of fibreglass must be cut into shape and laid on the former. It is very pliable, and will be found to follow the contour easily. Triangular shaped pieces with their apexes at the point where the vertical spindle projects can have their edges overlapped, but must alternate with edges of succeeding layers to prevent ridges forming. With the first layer complete the resin has to be prepared. This is a clear, thick, liquid of the consistency of syrup, to which a special hardener must be added. Directions are given with the hardener indicating how much should be used, but the amount varies according to ambient temperature. As it "goes off" very quickly the mixture must be prepared in small quantities, and this does call for a little experimenting.

Application of the resin to the fibre is rather tricky until one is used to it. Working from a jam jar I first attempted to paint it on with a one-inch brush, but soon found this to be hopeless. The only workable method is to stipple it on. Take it from the jar by the brushful and dab it all over the surface of the fibre, starting at the top and working downwards. As the resin fills the spaces between the fibres of the glass the whole takes the shape of the former quite easily, but care must be taken to work out any air bubbles. Layer can follow layer without waiting for the preceding one to harden, although if it does set off this does not in any way affect the next lamination being applied. A supply of special thinners is essential to keep hands clean, but do please remember it is highly inflammable.

To produce as smooth a finish as possible two grades of fibre were used. I started and finished with a layer of fine fibre and used three layers of coarse between them. All the work was carried out one evening, and by the following morning it was quite hard and ready to be removed from the former.

This proved to be far more difficult than I had anticipated. Because of the failure of the wax to form an efficiently lubricating film, the two were stuck firmly together and drastic measures were necessary. By placing the whole thing upside down on the garage floor, the baseboard was easily removed after easing around the edge with a knife and knocking the central spindle out. The clay had to be extracted little by little, using a small trowel and taking care not to damage the surface of the reflector with the point. Residual clay was finally washed away with water, and the internal surface was revealed.

The rim of the reflector looked rather rough, due to liquid resin running down on to the baseboard. The application of a good rough rasp, followed by a fairly fine file, quickly cleaned up the rim, and I was not too worried by the fact that the outer surface was not as smooth as I would have wished. But something had to be done about the few imperfections inside. These had been caused by air being trapped between the clay and

the first layer of glass, and by small inequalities in the surface of the clay.

Turning to the car body repair trade, use was made of what is known as "filler" followed by "wet and dry." Filler is a kind of plastic metal to which a hardener has to be added before use. Only small quantities are prepared at a time. Using a small piece of pliable plastic, the filler was scraped over the surface in such a way as to effectively stop up any small holes and imperfections. It becomes as hard as the fibreglass when it has set off, and the second part of the treatment can then be started.

Wet and dry is a type of emery paper which can be used with or without water. By constant rubbing with plenty of elbow grease the surface can be brought to a very fine finish. Using a coarse paper to start with, and then following up with a fine one, an hour's hard rubbing produced a very fine smooth and even finish to the internal surface. As this is the reflecting face of the instrument it is very important. If a coarse glass fibre had been used for the initial layer there would have been a lot more hard work to do with additional filling and rubbing down.

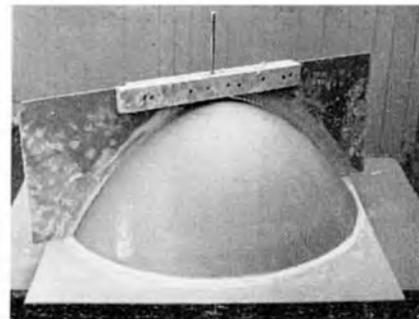
A couple of coats of matt black paint made the reflector look quite respectable and it was then ready for fixing the necessary fittings. These are quite simple, and comprise the mounting for the microphone which must hold its face at the focal point, and a bracket by which the reflector can be fitted to a camera tripod. Alternatively a handle could be fitted instead. Reference to page 91 of the March 1966 issue will reveal in Figures 3 and 4 the type of fittings used. The owner can design these to suit his own particular requirements.

The result of my experiment was interesting, and a number of points arose out of it. The 24-inch reflector turned out to be rather heavier than I had expected. Although it is sufficiently rigid for its purpose, the number of layers of fibreglass could certainly not have been reduced with safety. The amount of resin stippled on to each layer does have a direct bearing on both the weight and the strength. Quite apart from weight it was discovered that the 24 in. x 4 in. reflector was rather cumbersome, mainly due to its depth. In fact the Gram-phon reflector of the same diameter and weight is easier to carry.

A second reflector was made using the same process, but with a diameter of only 20 inches. In this model four layers of fibre were employed, two fine for the inner and outer and two coarse sandwiched between. From previous experience the resin was used more sparingly. This resulted in a reflector which is both comfortable to carry and easy to use when held in the hand.

If these homemade fibreglass reflectors were to be tested with instruments it might be found they were more resonant than their commercial counterparts. However, after listening to the results obtained I am very pleased indeed with their performance. The curve used not only makes them very directional, but it also helps to protect the microphone from wind effects—a very important consideration in any outdoor recording.

Working with clay and fibreglass can be a messy job. If you want a reflector to your own specification you will only get it by making it yourself, and this I found to be a practical way of going about the job. It is always satisfying to obtain difficult recordings of the sounds of nature, but how much more satisfying if this has been done with the aid of a piece of homemade equipment.



The construction of the template with its central pivot can be clearly seen from this picture which was taken at the end of the building-up process. The author does not exaggerate when he warns that it's a messy business!



In all forms of nature recording one often has to overcome the apparently insurmountable obstacle of the distance between sound source and microphone. Many devices have been evolved to focus the desired sound on the point where the microphone is placed. The most common of these is the parabolic reflector which Richard Margoschis describes making on this page.

The reflector is popular because of its very low cost and extreme versatility. Another approach would be to use a "gun" microphone. Our illustration shows a Sennheiser gun microphone, complete with its zeppelin-like wind shield, being used in conjunction with an E.M.I. L4 battery portable recorder. The microphone itself is fitted with a long barrel (hence the term gun) and costs £89 17s. 6d. Its size might be gauged from the wind shield enclosure, which costs another £25 10s. A specially designed grip at £15 and the floor stand at 8 gns. completes the microphone assembly. There are a number of models available in the E.M.I. L4 range but typical is the L4A ½-track machine at £120.

Whether one uses such high class equipment or whether one uses a home-made, fibre-glass, reflector, makes no difference at all to the first requirement for all natural history work—the operator must have patience, more patience, and yet still more patience. Without that he will be wasting his time.

# THE WORLD'S NEWEST TAPE FACTORY

AN ACCOUNT OF A VISIT BY YOUR EDITOR

**T**HE workers at the machines were dressed in specially-designed, lightweight dungarees. From the observation gallery one could look down through glass inspection windows and watch them. No sound could be heard. Most of them were girls; none wore any make-up—not even lipstick or nail varnish. Their blue overall suits had a silk-like sheen. As we watched their deft movements one would glance up and return our frankly curious stare. Then, with just a trace of a smile, she would turn back to her work.

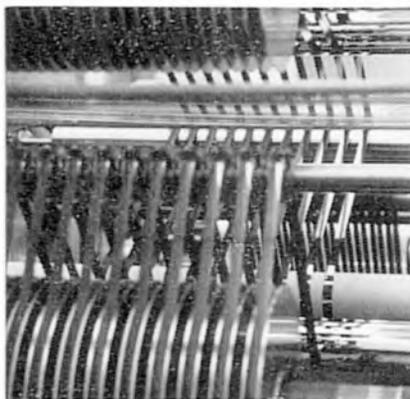
Outside the main works building was a complex array of metal structures. Polished domes of burnished aluminium glittered in the hard light of the mid-day sun. Great storage cylinders sparkled to dazzle the eye as one tried to trace the convolutions of massive, gleaming pipes that ran in ordered confusion from here to there.

From an outbuilding comes the tick and whirr of a computer; every inch of interior wall-space is occupied with dials, gauges and controls. Over the whole scene the sun burns relentlessly and the hot air is heavy with the fragrance of the Black Forest pines.

No, we have not stepped out of the twentieth century into the twenty-first—this was the scene that met a party of British journalists when we visited the newest, and most up-to-date, magnetic tape factory in the world, owned by BASF, at Willstätt. The party included Donald Aldous of *Audio Record Review*, Bob Danvers-Walker, BBC and TV commentator, Fred Judd of *Amateur Tape Recording*, David Kirk of *The Tape Recorder* and Denys Killick of *TAPE Recording Magazine*. We were there at

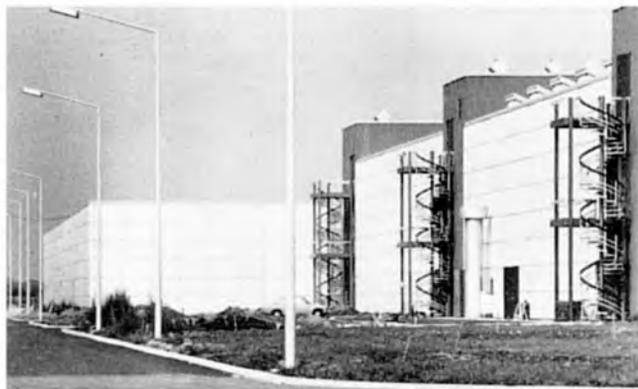
the kind invitation of BASF Germany, and the trip had been arranged through the good offices of Mr. Bruce Nicolls, of BASF United Kingdom Limited. We were in Germany to examine for ourselves the most up-to-date methods of manufacturing magnetic recording tape, and also to discuss matters of common interest with company officials. But before even thinking about tape we had a quick look around the main BASF works at Ludwigshafen.

Here is no gleaming factory of the future, but a vast metropolis of industrial activity. Within the works area is a network of pri-



High precision machines cut the magnetic film into individual tapes to an accuracy of hundredths of a millimetre. This is the cutter unit for computer tapes

vate roads, railway lines and even railway stations. The internal road service alone covers more than fifty miles. The electrical energy generated is the equivalent to the consumption of a city of 2,000,000 inhabitants. Sited on the bank of the river Rhine the factory uses 200,000,000,000 gallons of water annually. And, as a lesson for us in this country, they are proud of the fact that



A view of the new BASF tape factory at Willstätt, Southern Germany.

Built in the heart of the German countryside one first notices the lack of windows. Every-thing here is precisely controlled—even the atmosphere itself. Air is specially filtered and conditioned before being admitted to these “clean area” buildings

this water is returned to the river in a purer condition than when they drew it off.

The name BASF is always associated in Great Britain with the production of magnetic recording tape. In fact this activity is no more than a very tiny fraction of the Company's business. Founded in 1865, it is one of the *élite* few regarded as leading members of the international “heavy chemical” industry, manufacturing and trading on a world-wide scale. The great bulk of the firm's products are not sold direct to the consumer but are used by other industries as basic raw materials.

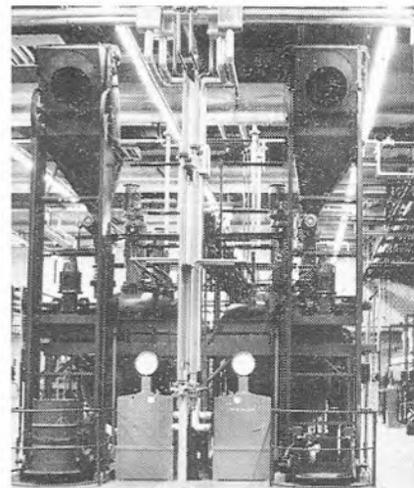
The Ludwigshafen plant has been aptly described as “The City of Chemistry.” Of the 47,000 employees nearly 8,000 are engaged in research, and of these nearly 1,000 are qualified chemists, physicists, engineers and biologists.

To me, as a layman, the word ammonia means just one thing—a rather nasty smell. To the industrial chemist ammonia is one of the most important basic chemicals he has at his disposal. More than fifty years ago the first commercial plant in the world for the production of ammonia from nitrogen in the air and hydrogen in water was put into operation at this West German factory. It still stands and it still produces ammonia, although elsewhere in the works are other plants producing larger quantities more efficiently with less labour.

As our conducted tour proceeded we were assailed by the odours of the school laboratory. Great black tanks of sulphuric acid, silos of nitrogenous fertilisers looking for all the world like alpine landscapes of peaks and valleys with thousands upon thousands of tons of fertilisers to increase the international production of food. On every hand could be seen the strange and incomprehen-



The face of modern industry reveals few people but a vast array of automatic equipment. In this plant enormous quantities of PVC are processed daily to produce miles and miles of wafer-thin "Luvitherm," the carrier film for BASF magnetic recording tape



This plant produces the "dispersion," a fluid compound of brown, magnetisable, iron oxide lacquer and solvents that will ultimately form the active coating to audio tape

## THE WORLD'S NEWEST TAPE FACTORY

sible activity of the 47,000 employees as they went about their daily work.

Mankind needs chemicals; without them the everyday things of life which we take for granted would not exist. Chemicals go into the food we eat, the clothes we wear, the houses we live in, the papers we read. Modern living revolves around the central pivot of the chemical industry. Here, in Ludwigshafen, one of that industries' main arteries was laid bare for us to see.

But our primary interest was in magnetic tape. Apart from research the Company now confines its manufacturing processes at Ludwigshafen mainly to the production of the plastic tape base. This plant is confined to a single floor of a single building located in the sprawling City of Chemistry. Here the raw plastic in dough-like lumps is fed into the calendar machines. Treated simultaneously to both heat and pressure, a plastic film emerges on tightly wound drums about twenty inches wide.

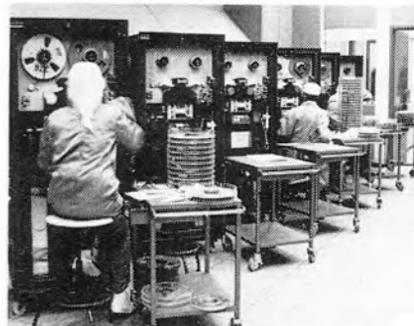
As at all stages of tape manufacture the processing procedures are critical. When the raw plastic has been converted into sheet it then runs between yet more heavy, heated, rollers to be stretched to up to 300 per cent of its original length. This pre-stretching ensures the very minimum of elongation when subjected to user conditions. The finished thickness of the film is so critical it is checked by a radioactive gauge which ensures accuracy to a fraction of a micron. Before pre-stretching and heat-treatment the plastic sheet is brittle and easily torn; the finished product, which looks very similar to the plastic polythene that is commonly used for a hundred and one different purposes, is actually a highly sophisticated material that has been produced to the most rigid specification.

Dirt and dust are inevitable where industrial work is going on. The plastic base room at Ludwigshafen is unusually clean and free from contamination. But these are not the best conditions for coating the tape. The magnetic "porridge" of oxide must be uniformly applied to the surface of the plastic under the kind of clean and dust-free conditions that one normally associates with a hospital operating theatre. Although this work was done at Ludwigshafen in the past it was wisely decided that the air was too polluted to satisfactorily continue coating operations on an economic scale. So about one hundred miles away on the fringe of the Black Forest the new tape factory at Willstätt was built.

This site was not chosen merely to give BASF the prestige value of a "factory amongst the pines." Although a clean, dust-free, atmosphere is essential even for the manufacture of audio tape, it must be remembered that much of the plant's production is of computer and instrumentation tape where the tiniest imperfection is inadmissible. So the Company built their new tape factory at Willstätt, in the heart of the South German countryside. The buildings themselves, and all the equipment, were specially designed. Because the air is so clean and so free from pollution the factory takes on the brilliant guise of a twenty-first century installation from the pages of science fiction. Everything is new and bright and sparkling—truly an industrial gem in a setting of green fields with mountain ranges beyond.

Discussing the business of tape manufacture with Herr Cabus, the genial executive who conducted our tour, he admitted to me that the principles of tape manufacture are well known and by today's standards not particularly difficult to accomplish. In fact he was able to reduce the process to such simple terms that I began to think that any enterprising Briton could start his own tape factory in the back kitchen at home. But the mere ability to make tape is nothing. The secrets, and jealously guarded secrets they are too, lie in the highly specialised processes which enable tape to be manufactured to superlative standards of high quality with an industrial efficiency that will enable the finished product to be marketed at competitive prices. These are the guiding factors

underlying both the design and the operation of the new works. "Quality and reliability" are two familiar words to us. To BASF they are linked to the word "productivity" and together the three are tantamount to a religion.



In this department the entire surface of each new computer tape is inspected to ensure the strictest quality control

It was not sufficient to accept the benefits of the clean country air in which the works were situated. The critical coating, splitting, testing and spooling departments have together been designated "clean areas." Only the employees working in these sections are allowed admittance. They must all be specially cleaned and must wear the special clothing provided. Access to the clean area from the so-called black, or dirty, area is only possible through a specially designed airlock. Standing in the airlock the operative is subjected to angled jets of air that will effectively spray off any loose dust he might have about either his person or his clothes. Only after this treatment can he enter the clean section. That is why we, the visiting journalists, were permitted only to watch operations from the observation gallery. None of us was allowed even to enter the airlock itself. Such is the strictness of the precautions.

From the glass windows we could see the rolls of plastic film which we had watched being made in Ludwigshafen loaded into

(Continued overleaf)

## *TAPE from page 381*

the coating machines. The coating itself, a porridge of specially prepared oxides, solvents and binders, is mixed in a series of giant vessels containing a system of revolving blades. The finished coating material is pumped into the clean area through a pipeline.

There is not a great deal to see in a coating machine. At one end we have the drum of transparent plastic film; at the other end the brown, oxide coated, film is wound off. One can see nothing of the actual spreading, heating, drying, thickness testing and other processes through which it passes in its travel from one end of the machine to the other. Sufficient to say that by some miracle of ingenuity it emerges as outsize, but perfect, recording tape, complete with its oxide coating of controlled thickness and uniformity. Faced with the need to install machinery which cannot, of course, be bought off-the-peg, the resources of the Company's design and research departments were employed to produce what, in their description, is the best tool for the job. And a mighty complex tool it is, too! Raw film at one end, magnetic tape at the other. And in between about twenty feet of gleaming machinery and a thousand and one bright ideas.

And that's really about all there is to it. All that remains is for the large drums of tape to be split into either conventional, quarter-inch, audio tape, or perhaps half-inch computer tape, to be spooled off, tested, wound into the various commercial reel sizes, packed and sent into the store. We watched them spooling and testing instrumentation tape. Both these operations



The end of the tape production processes. Finished spools travelling along an endless conveyor into the packing department. Note the glass partition separating the "clean" area from the packaging room

are done at the same time. As the feed spool is unwound on to the take-up reel it passes over a test head. This head is so designed that it will detect the tiniest flaw in the tape. When this happens the spooling process automatically stops. The girl operator then cuts the tape and lays the faulty length on one side and starts spooling another reel. Final packaging is done outside the clean area. An endless belt conveyor passes through a glass partition and delivers the wound spools to the packing staff. There they are inserted in boxes, packed in cartons and moved into the warehouse to await shipment.

Much of what I saw was frankly beyond my comprehension. Unfortunately, I can do no more than convey to you, the reader, the general impression with which I was left after this most interesting experience. BASF Ludwigshafen left me with a feeling of modern industry on a scale of such vast-

ness that I had not previously thought possible. By comparison the Willstätt factory is tiny, but no less significant for the deep thought and planning to which it owes its origin.

Like any commercial enterprise BASF functions to make a profit for its shareholders. In fact some of the plants at Ludwigshafen operate under what is known as "optimised" conditions. These plants are wholly controlled by a computer. All relevant facts and circumstances are fed to the computer which then controls the plant to operate at the highest possible degree of profitability for the Company.

However easy it might be to use mere profit as a standard of measurement of the success of an enterprise, the creation of profit in a capitalist society is merely a by-product of the less obvious social services which derive from the organisation. As an example, the firm employs no fewer than twenty qualified doctors to look after the health of its workers—it even has its own operating theatre for emergency operations if there should be a serious accident. The Company owns or has assisted in the purchase of more than 17,000 dwellings for staff members, and the works canteen provides 5,000,000 meals a year. All over the world the ordinary consumer has his life made easier and more pleasant by the use of BASF products, although he is probably not aware of it. And we in the recording world can pick up a box of tape bearing the familiar BASF design with every confidence that the product we are about to use is backed by some of the best brains and the most modern technology available today.

Our German hosts were determined to make our visit to their country a memorable experience, and they treated us all with such kind hospitality that I am sure none of us will ever forget it. Apart from the business interest of our visit a full social and recreational programme had been organised, including a visit to Heidelberg to see the castle and one of the traditional student pubs. Like all good recording enthusiasts we took with us a battery portable tape recorder, a Uher 4200 stereo model, and a pair of microphones.

As we travelled by coach from the airport at Frankfurt to our hotel in Mannheim we were told that the local police band would be giving an open-air recital at the foot of the famous Mannheim Water Tower that very evening. With one accord we at once decided that this was a recording we should have to take home with us.

Craving the indulgence of our long suffering host we accordingly removed ourselves from the dinner table immediately after the main course had been served, and made our way the few hundred yards from the hotel to the Water Tower. The grounds around the tower are laid out in charming formal gardens with a group of fountains at the centre. The flying jets of water were brilliantly lit by changing coloured lights as the local population strolled around in shirt-sleeves or thin summer dresses. The day had been overpoweringly hot, and this, the cool of the evening, was being enjoyed to the full. The atmosphere was one of light-hearted continental pleasure with the strains of the music from the police band drifting lazily over the warm night air.

We certainly succeeded in taking our recording, although none of us would claim that it will find a place amongst the great sounds of our times. But like all amateur recording it was fun to do and the tape will always remind us of that delightful first evening in Germany. As we returned to the



Relaxing in Mannheim. Bob Danvers-Walker is using a Uher stereo portable machine, Model 4200, with Denys Killick holding the microphones as they record the local police band in the Water Tower Gardens on their first evening in Germany. Donald Aldous stands by in the background ready to offer good advice. This recording was adopted as the party's signature tune and was played back by Bob Danvers-Walker at every opportune (and inopportune!) moment. With all this weight of experience they should have achieved excellent quality, but good or bad it didn't matter because they were just having fun

hotel to complete our meal I wondered what our German hosts really thought of the incomprehensible actions of their mad English guests.

The ancient castle of Heidelberg, perched high up on the hills overlooking a delightful tributary of the Rhine, is one of the classic beauty spots of the world. Bristling with cameras and with the tape recorder in constant use we gazed and were impressed in the very best tourist tradition. There is a feeling about this town that I find difficult to put into words. Romantic? Yes, but very much more. One is constantly aware of both the beauty of the town and the overpowering presence of historical association. Here the great names of German culture attended the University and drank in the pubs. In Heidelberg the past comes to life; time past becomes time present. It was disappointing not to actually bump into Brahms or Goethe in the flesh.

To remedy the situation we repaired after dinner to The Seppl, a student pub dating back to the early 17th century. Seated at a long bench with convivial company around us our host produced an enormous three litre stein filled with beer which was passed in the traditional fashion around the table. At last we were really one with the heart of Heidelberg.

Sufficient to say that we maintained the good name of our country and our respective publications to the very best of our ability. All were agreed that the town of Heidelberg, coupled with the name of Herr Cabus, will have a very special place in our personal recollections of delightful occasions.

Our visit came to an end all too soon. In fact I remained in Mannheim for an extra night after the rest of the party had left for London. But when it was my turn to leave I found myself experiencing the strangest feeling of sadness and regret. I had seen many wonderful things and had enjoyed the pleasure of the very best company a man could ask for. As the aircraft took off from Frankfurt Airport I knew that I was leaving behind me in Germany three of the happiest and most instructive days of my life.

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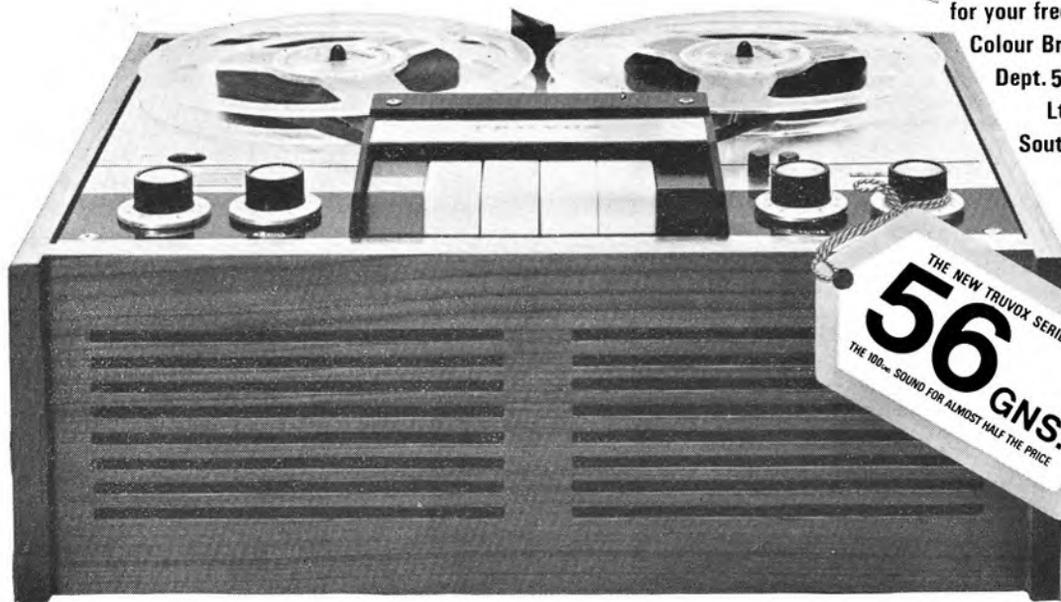
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# CROSS TALK

## By Audios

**T**HE world of economics and international finance is a mystery to me. I don't pretend to understand it. All I know is what I am told, and much of that doesn't make much sense to my simple mind.

If I go on holiday abroad I am allowed no more than £50 in foreign currency. But if I were to be sufficiently wealthy I could freely purchase in London thousands of pounds worth of expensive imported goods. Say a Mercedes Benz motor car from Germany, the latest style of furniture from Scandinavia, cameras from Japan, foodstuffs from the four corners of the globe. There is just no limit to the amount of sterling that can be sent out of the country—provided I don't take it out personally.

Within the pages of this magazine you will find advertised all kinds of products manufactured abroad. Although we pay for them in pounds, shillings and pence across the counter of a British shop they must ultimately be paid for in sterling abroad. Why can't we do without them? Because in many cases a satisfactory British equivalent to the imported goods just does not exist.

The situation is far worse in the field of photography. How many really good cameras are made in this country? I can think of one or two, but they are specialised professional tools. In the manufacture of cameras the small British industry that at one time existed is now virtually dead. It is in the interests of every citizen to ensure that our tape recorder industry does not go the same way.

Having recently been abroad I was keenly interested to see how much British recording and hi-fi equipment I would find displayed in Continental shops. The answer, practically none. After a long search I did locate a Goodmans Maxamp amplifier, but I did not find a single British tape recorder. Yet our shops here are loaded with Continental imports. This is surely a situation about which manufacturers should be worrying themselves silly at this moment. In this country we have the ability to both make top quality products and to sell them overseas. But, so far as I could see, it just isn't happening.

Certainly I only looked in half a dozen small provincial shops, but could you name to me an equally random half-dozen British shops in which you could see not a single Continental tape recorder? That is a measure of the seriousness of the situation.

**A**NYONE who imagines that tape recording contests do not provoke interest is sadly misinformed. I am advised that more than 1,000 enthusiasts have already sent for the rules of this year's BBC contest organised by the North Region from Manchester. The theme of the competition is, "On the Move" and closing date is September 30, 1967. If your entry has not yet been posted it should be despatched without delay. Allow plenty of time in case of hold-ups in the post, so get that tape away right now.

\* \* \*

**T**HE International Radio Engineering and Communications Exhibition will be held at the Royal Horticultural New Hall, Victoria, London, S.W.1, from September 27 to 30. One of the central features will be the Radio and Space Research Display by the Science Research Council. This exhibition will demonstrate studies of the atmosphere in relation to radio communications, and the effect of the low atmosphere will be illustrated by a working model of a microwave refractometer. Also on show will be a model of the new, 82-foot steerable aerial recently commissioned at Chilbolton in Hampshire. This is being used to study radio propagation of radio waves through space and the earth's atmosphere.

All this sounds very exciting. But the main exhibits will, as usual, comprise communications equipment of all kinds with special emphasis on amateur stations. The exhibition will be open from 10 a.m. to 9 p.m., and the admission charge is 3s. As usual, it will be well worth a visit.

\* \* \*

**A**S you know, EMI Records announced a month or two ago the discontinuance of mono releases of new classical records. Now Philips Records announce that as from 1st September this year they too will be manufacturing stereo versions only of classical recordings.

\* \* \*

**Y**ET another new tape cartridge system is about to be introduced in this country. Using tape one-eighth of an inch wide in a single hub, re-entrant type of cartridge, measuring  $3\frac{3}{4}$  in. x  $3\frac{3}{8}$  in. x  $\frac{1}{2}$  in., it is a 2-track system running at  $3\frac{3}{4}$  ips. Known as the Playtape cartridge it can only be used in Playtape machines designed to accept it.

This system does not offer any record facilities, only the playback of pre-recorded programme material. There will be an extensive repertoire of musical items available with a maximum playing time of 24 minutes at a cost of 25s. per cartridge. In addition, there will be children's cartridges featuring fairy stories at about 8s. or 9s. each, single tune cartridges at about 8s. and educational series with the full playing time of 24 minutes.

Playback machines will be imported in the first instance and will cost from approximately 12 to 18½ gns. each. Some will include radio receiving circuits. Later we shall see British made equipment, including the very first machine designed to reproduce from both gramophone disc and from tape cartridge. Distributors are Discatron Ltd. of Bleward Works, Blews St., Birmingham 6, and they state that both equipment and cartridges will be available from October of this year.

**S**OMETIMES one reads a news item that really turns the stomach over. The cutting in front of me at the moment had just that effect. It is taken from the London "Daily Telegraph," and refers to a speech made by Stokely Carmichael, the American "Black Power" advocate.

This gentleman has been banned from entering Britain by Mr. Jenkins, our Home Secretary. So tape recordings of one of his speeches are to go on sale to the general public. The tapes are said to have been made at an International Congress organised by the Institute of Phenomenological Studies. These people claim to have a long waiting list of people asking for a copy of the tape.

This is a free country and I have not personally heard either the speech or the recording; I should therefore condemn neither. If the tapes contain nothing but sweetness and light, messages of love and goodwill to all men, then all the parties concerned will have earned my sincerest apologies. But if those tapes are spreading a message of hatred and racial violence then I shall express my feelings silently by retiring to a suitable place where I can heave my heart up in peace. And I shall not offend the populus in general by offering for sale recordings of the sounds of my vomiting.

\* \* \*

**O**NE or two magazines have recently made scathing comments about the quality of sound we get from ordinary television sets. Without exception it is pathetic when compared to present-day standards of high fidelity reproduction. This doesn't worry me greatly. If I want to listen to music, give me good old steam radio every time. Although television producers are better than they were, they still delight in distracting the mind by panning the camera wildly around the orchestra to give a confusing series of visual images. In my humble opinion television is not the medium for music. However, improved sound quality in commercial equipment is something always earnestly desired, so I was interested to note that the new Philips colour television receivers will not only give almost double the sound output of the conventional black and white sets but—and this really is staggering—they will actually be fitted with a tone control!

This is a move in the right direction that could well be emulated by other manufacturers, but I fail to see why better sound should be considered necessary for colour and yet unnecessary for black and white. The logic defeats me; unless, of course, the manufacturer feels guilty at having to ask about £300 for a television set and feels that he must incorporate another extra in an attempt to justify the price. Like a great many people I shall be watching with interest to see if the price of colour television really does come down as has been forecast by a number of authorities. In the meantime just supposing I had £300 to spend I am quite sure it would be better invested in hi-fi equipment than in a coloured screen.

\* \* \*

**T**APE recorders are about to invade that most sacred of all-hallowed ground, the House of Commons. Instead of shorthand writers reporting for "Hansard," tape recorders will be used during morning sessions. The recorded tapes will then be transcribed into typescript. There is absolutely no truth in the rumour that strong Government pressure is being exerted to prevent publication of next month's "Techniques" feature on editing and splicing. . . .!

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It's the very latest 'Scotch' magnetic tape development and it means that hi-fi enthusiasts will want to take another look at cassette recorders. Now, for the first time ever, you can get cassettes containing the brilliant 'Scotch' magnetic tape with 'Superlife' coating. This tape has a flawless mirror-smooth coating that gives improved frequency response and less wear on the delicate recording heads—so it keeps its high quality far longer. With 'Scotch' magnetic tape the cassette recorder becomes a serious possibility as a second, portable machine—and with these new cassettes, the recordings you make will merit playing on your full-scale home set-up.

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**MANUFACTURER'S SPECIFICATION**

**Telefunken M204**

Mains Supply: 110/127/220/240 volts 50 Hz AC. Can be switched over for 60 Hz AC supply.

Power Consumption: Approx. 60 Watts.

Magnetic Heads: 1 Record/Playback and 1 Erase.

Equalisation: According to DIN (German Industrial Standards Specifications).

Tape Speeds: 7½ and 3¾ ips.

Tape Spool Size: 7 inch (18 cm) diameter Maximum.

Rewind Time: Approx. 4 minutes for 1,800 feet on 7-inch spool.

Track Location: Four-track system to international standard.

Frequency Range:

40 to 18,000 Hz at 7½ ips;

40 to 15,000 Hz at 3¾ ips.

Dynamic Range: Background Noise 50 dB below full drive.

Wow and Flutter: ± 0.2 per cent at 7½ ips; ± 0.3 per cent at 3¾ ips.

Input Sensitivities: Microphone, 2 x 0.15 mV across 2 kOhms; Radio 2 x 0.15 mV across 2 kOhm; Phono (Tape), 2 x 150 mV across 2.2 MOhm.

Outputs: Radio, 2 x 1.5 V across 8 kOhms; Mono Earphones, 1.5 V across 15 kOhm; Stereo Earphones, 2 x 1.5 V across 15 kOhms; External Speakers, 2 x 10 Ohms (greater than or equal to 4 Ohm load impedance), switched sockets.

End Switch-off: Automatic with stop foil.

Controls: 2 Record Drive controls, 2 Volume controls and 2 Tone controls.

Function Selector Switch: 6 Positions. STEREO, Transcription 2 to 1, Mono Track 1, Mono Track 2, Transcription 1 to 2 and Parallel.

Output Power: Two push-pull output stages each delivering 6 Watts on Music.

Distortion Factor of Output Stages: Less than or equal to 5 per cent.

Dimensions: Length x Height x Depth 470 x 355 x 225 mm.

Weight: Approx. 14.5 kg.

Cost: 106 guineas, excluding microphones.

Distributors: A.E.G. (Great Britain) Ltd., 27, Chancery Lane, London, W.C.2.

**TEST BENCH**

**TELEFUNKEN  
M204**

INVESTIGATED  
BY  
**R. HIRST AND D. KILLICK**



**TELEFUNKEN M204 TEST CHART**

**Frequency Hz**

40.....	-3
50.....	-1
60.....	+0.5
100.....	+2
250.....	+2
500.....	-1.5
1000.....	0
2000.....	+1
4000.....	+1.5
6000.....	+1
8000.....	+1.5
10000.....	+2
12000.....	+2.5
14000.....	+2.5
16000.....	+3
18000.....	0

Wow and Flutter .....

Signal/Noise.....

Power Output .....

Overall Response dB		Playback Only dB	Crosstalk dB
7½ ips	3¾ ips	7½ ips	7½ ips
-3	-5	-2	
-1	-4	0	
+0.5	+0.5	0	
+2	+2.5	+2	
+2	+1	+2	
-1.5	0	-1	
0	0	0	51
+1	+1	+1	
+1.5	+2	+1	
+1	+2.5	+1	
+1.5	+2.5	+1.5	
+2	+2	+2	
+2.5	-1	+2.5	
+2.5	-5	+3	
+3		+3	
0		-1	
0.16%		0.28%	
54 dB		51 dB	
5.8 Watts into 10 Ohms (per channel) with 4.2% RMS distortion at 1 k Hz.			

**Notes.**—The Overall Response figures relate to record and playback. Playback Only relates to the reproduction of a 70 microsecond test tape at 7½ ips (CCIR) but see text for further comment. For Signal to Noise Ratio the tape was recorded at peak level and then the input signal was removed from the record amplifier. By reference to the signal level recorded and the resultant tape noise, the noise voltage was read off, with the tape still in motion. Distortion is quoted against a 1,000 Hz signal recorded at the correct maximum level as indicated by the manufacturers, and the figure is an RMS value. Wow and Flutter is also RMS, the test frequency being 3,000 Hz. Test equipment used includes: Bruel and Kjaer Signal Generator, B & K Frequency Analyser Type 2107, B & K Level Recorder Type 2305, Marconi Distortion Factor Analyser and Gaumont-Kaylee Wow and Flutter Meter.

**I**t is appropriate that this review should appear in the same issue in which we report on the new BASF tape factory in Germany. Both companies have been responsible for much pioneering work in the tape recording field. Just as the very first magnetic tape was produced by BASF as a result of their collaboration with Telefunken, so Telefunken were themselves concerned with the development of the very first magnetic recording devices many years earlier. Your reviewers would therefore like to open this review by acknowledging with gratitude the debt that we all owe to the Telefunken organisation.

The model under consideration is the Telefunken M204, 4-track, mains stereo record playback machine. It is of unusual design, since although only employing a single record/playback head it offers a wide range of facilities normally found only on equipment incorporating separate record and playback heads and amplifiers. Our laboratory investigation was carried

out in the usual manner, and the results are shown in the accompanying tables. It will be noted that both the overall record/playback figures and also the response obtained from the reproduction of a CCIR standard test tape reveal an excellent response at 7½ ips within the range 40 to 18,000 Hz., which is shown to be within the normally accepted tolerance limits of plus or minus 3 dB. Even at the lower speed of 3¾ ips the same tolerances are observed from 100 to 12,000 Hz. As is customary, these readings were taken at the "line out" socket, but we would particularly draw readers' attention to further comments on frequency response later in this review.

The wow and flutter figures, together with signal-to-noise ratio, were found to be marginally better than specification, and total harmonic distortion of 3 per cent at the line out sockets can be regarded as excellent. Power output from the two external speaker sockets was rather less than 6 watts R.M.S.; the wording of the specification which quotes, "6 watts on music," is rather ambiguous. Further measurements indicated a record/playback accuracy of plus

or minus 2 dB between tracks and a crosstalk figure of 51 dB at 1,000 Hz.

From these investigations we proceeded with some curiosity to investigate the practical use of this machine, and noted the clean line of the design. Styled as a compromise between the "laboratory look" and domestic appearance, it would fit unobtrusively into any modern decor. Operation is possible in either the horizontal or vertical planes. In the latter position the very sensible and substantial carrying handle becomes an extended frontal support, and the spools are retained in place by means of push-on rubber caps.

All the input and output sockets (other than microphone) have been ranged in a single line on the front deck plate. This certainly makes for ease of connections, but it could lead to an untidy effect in a permanent installation. Connecting cables should, under domestic conditions, be unobtrusive, but with the M204 they will always be visible. The sockets themselves are to DIN standard and they comprise: mono/stereo radio in/out, connection for

(Continued overleaf)

## TELEFUNKEN M204 from page 387

mono/stereo pickup or record player with equalisation, separate sockets for monophonic and stereophonic monitoring and a pair of DIN extension speaker sockets. A pair of 5-pin DIN microphone sockets are positioned centrally in the front control panel, together with a pair of separate volume controls on the extreme left and a similar pair of record level controls on the extreme right. Also on this panel are a pair of single tone controls, separate slide switches (one for each channel) to switch from microphone to radio/phono inputs, and the on/off power switch. Tape transport controls are in the form of very substantial push keys on the left, giving fast forward, rewind and run facilities together with a record safety lock key. Parallel with these runs the stop bar. Other controls are a very neat speed change switch, a locking pause control and a three digit rev. counter.

Mounted on the sound channel cover is a large rotating control wheel inscribed "STEREO," "2/1," "1," "2," "1/2" and "P." This single function control enables the user to command a versatile range of facilities by merely operating a single knob. Before investigating this we proceeded with conventional record and playback tests.

Operation of all deck controls was found to be precise and the motor noise was unobtrusive. The record interlock system is well designed and could not be defeated under any normal conditions. The automatic stop is actuated by metallic foil at the beginning and end of the tape, and we noted with approval that this is a solenoid-operated mechanism which effectively separates the pinchwheel from the capstan. Rewind time at four minutes for 1,800 ft. of tape is rather long, and we did note an obvious slowing down of the takeup spool when heavily loaded. This is a common deficiency of most single motor tape transport systems. When power is switched on pilot lights appear in the two edge type meters in the front panel; these meters were found to operate very efficiently in conjunction with their respective level controls. The two level controls must be set by reference to a single, central, mark on the escutcheon plate instead of the numeric scale which your reviewers always prefer to see. In fact, no numeric references are provided for either volume, record or tone controls. A pair of internal monitor speakers are provided, one for each channel, mounted at the two sides of the cabinet.

Before playing back we referred to the instruction book for guidance on the tone control settings to achieve a flat response at the external speaker sockets. To our surprise no information was given, other than the bald statement that tone can be adjusted by means of the single control knobs, and that treble boost can be obtained by turning the respective control to the right. Engraved marks on the panel clearly indicate a central reference position, and so in the lack of further information we listened at first with this setting using a pair of 4-Ohm Celestion Ditton 15 speakers driven from the external speaker outlets. Sound quality was so deficient in top response that we decided to measure the output at the external speaker sockets against a standard test tape in an attempt to establish the precise setting of the tone controls to give a level response.

The tape used was the Ampex 3123/01 7½ ips CCIR calibration tape, and measurements were taken with a 10-Ohm resistive load across the contacts. With the tone controls in their original central position it was found that frequencies ranging from 2,500 to 15,000 Hz were attenuated by an average

of approximately 20 dB. Accordingly the tone controls were advanced to their maximum settings. Running through the calibration tape once more it was found that the upper frequency range was again attenuated, but this time only by an average of about 5 dB. It will be noted that the manufacturer does not claim a level response at the external speaker sockets, but nevertheless we could not help regarding our findings as rather disappointing. To ensure accuracy of results we checked the azimuth alignment of the head but could not improve on our figures. A second machine was then submitted for examination and in this sample the high frequency attenuation was confined to approximately 3 dB.

From these findings we had established that when using external speakers both tone controls should be in their maximum clockwise setting for the nearest possible approach to a flat response. This in no way invalidates our table of frequency responses published with this review, for those measurements were taken at the line out socket which is not affected by any of the deck controls.

In subsequent listener tests with the revised tone control setting we were disturbed by the level of hum when the volume controls were advanced towards maximum. When the tape is stationary this hum was most objectionable on the first model but better on the second; when the machine is in the "run" mode a screening plate (which carries the pressure pads) is swung upwards parallel to the heads and this does have the effect of considerably reducing the hum level. Nevertheless, we do feel that in equipment at this price audible hum should not occur at all. It was surprising to us that a manufacturer of such high standing should permit such a state of affairs.

Continuing subjective listening tests from good quality sound sources we confirmed our original impressions that the final audio output stages are the weakest feature of this machine. So long as the output was taken from the line out socket and fed into an external amplifier then the overall quality could not be faulted; the same tape reproduced via the external speaker sockets fell short of this high standard, although the second machine we examined did show a marked improvement on the first.

Turning to the function selector control we spent what little time remained to us on investigating its possibilities. The instruction booklet advises that when this control wheel is turned to position "1" a mono recording can be taken on track one (or track three after turning the tape over). When the control is turned to number "2" a mono recording can be taken on track two (or track four after turning the tape over). An identical track selection is of course achieved on playback. When the selector is turned to the "STEREO" setting then conventional 4-track stereo arrangement obtains with the head scanning alternate tracks for either record or playback. Unfortunately the instruction booklet now refers to these as track one for the lefthand channel and track two for the right. This of course should read track one for the left and track three for the right.

The confusion on track numbering is maintained by the markings "1/2" and "2/1." According to the handbook these settings enable monophonic transcription to be carried out from track one to track two in the first place and from track two to track one in the second. If we regard the track sequence as being numbered one, two, three and four across the width of the tape, then the setting "1/2" transcribes from

track one to track three and the setting "2/1" from track three to track one. This inaccuracy is an example of the ambiguities that occur in the wording of the handbook. Similarly when the function control is set to position "P," then according to the handbook we achieve parallel playback of tracks one and two (or tracks three and four after turning the tape over). In fact the tracks that are paralleled are one and three or two and four on the other side.

Once one has overcome this unnecessary, and rather silly, confusion, the facilities afforded can really produce surprising results that could otherwise only be obtained on more expensive and more complex equipment. With the dual playback achieved by the "P" setting in conjunction with the two mono settings ("1" and "2") it is possible to record musical sound effects on one track, to monitor and synchronise speech on the other, and then reproduce both together. For slide or cine work this is not a luxury but a necessity.

The Telefunken M204 is the only two-head machine we have come across which is capable of producing "multiple" recording. The precise technique is too involved to describe in detail but by appropriate use of this ingenious function selector the operator can build up a complex recording by transcribing from one track to another and so—if he wishes—produce a vocal ensemble of twelve voices all of which have originated from his own single voice. Such advanced techniques demand perfect synchronisation which we have previously only found to be possible on a machine employing a separate playback head and amplifier system. In the present case multiple recordings can be done with equal ease in spite of the fact that the machine has only a single combined record/playback head. Very simply, all that happens is that one half of the head is switched to record whilst the other half operates as playback; with a turn of the function control wheel the roles of the two halves of the head are reversed. It is for this reason that there is provision on the main deck plate for monophonic monitoring through headphones, which is essential in carrying out this very interesting process.

The operation of this single control appears to be entirely satisfactory, and it enables all the desired functions to be carried out very simply—once the confusion over track notation has been overcome! We must warn, however, that accurate editing would be difficult owing to the superstructure around the front of the heads.

Summing up our comments on this equipment we would firstly state that the Telefunken M204 is basically an excellent machine of extreme and unusual versatility. Unfortunately this creditable performance is marred by small weaknesses in the final audio output stage, by obtrusive hum and by the inaccuracies and inadequacies of its handbook. The machine can be used in conjunction with an existing audio amplifier when very good quality sound will be assured. If the prospective owner intends to use it with a pair of external speakers then he must be prepared to accept a slightly lower quality standard. We have, as usual, tried to be as fair as possible to both the manufacturer and the prospective user. If our criticisms seem to be severe, then we must add that these have been made only after the most thorough investigation and in the light of the cost of the equipment. It is sincerely hoped that the manufacturers will note our comments and take appropriate action since we have little doubt that this machine could be an outstanding product in a class of its own.

Jerry Keebles: 2nd violin

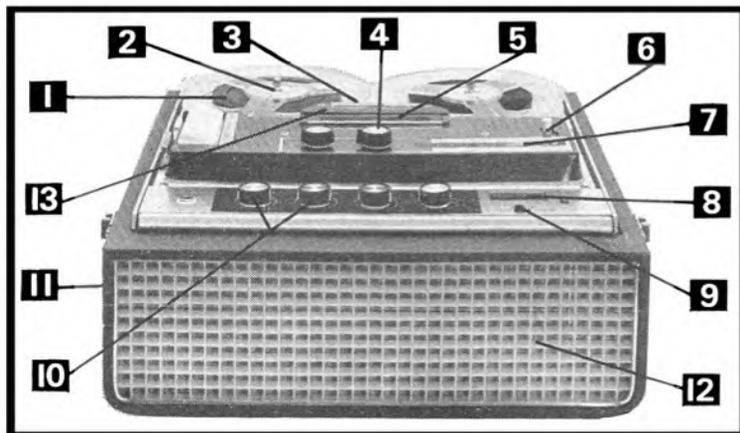
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# A glossary of tape terms—part 17

**TRANSIENT.**—Although correctly used to denote a sound of short duration, the term is often employed more precisely to illustrate the “attack” period at the beginning of many notes—particularly those made by percussive instruments, such as the piano or cymbals. The notes are characteristically complex and of short duration, having a steep wavefront which is produced by a combination of harmonics.

\* \* \*

**TRANSIENT RESPONSE.**—To reproduce transients faithfully, an amplifier must have a wide frequency range—a wide bandwidth—and must be free from supersonic oscillations. These can cause “ringing,” especially in amplifiers which employ a large amount of negative feedback.

When an amplifier has a “peak” in the frequency response curve at the higher end, the result may be that ringing will occur unless the circuits are heavily damped, and the sound will tend to be harsh and edgy. Some quite small, upper-frequency peaks can cause this distortion effect, and the symptoms may be that the harshness only occurs after certain combinations of notes and sound levels. The faults can be extremely difficult to trace and cure.

\* \* \*

**TRANSIENT DISTORTION TESTS.**—

The usual method of testing for this distortion is by injecting a square wave and monitoring the output from the amplifier with an oscilloscope. Fig. 1 shows the typical response curves of three amplifiers and the result of applying square wave tests to them. In (a), the response has a small peak near the upper frequency end, and a square wave may produce an output such as shown inset, with a “blip” just after a reasonably good attack, followed by small variations from the required flat top. The effect may be the triggered ringing we have discussed.

The response of amplifier (b) is much wider, but has a well-defined peak which, though outside the audible range will cause severe ringing and distortion to the square wave as shown, giving the harsh and edgy sound we would expect.

A response curve that tails off too early, a common fault, has quite the opposite effect, as in (c). The high frequency components of the square wave are suppressed, the attack is lost; the resultant sound is dull and muffled.

Phase distortion, though apparently less troublesome than harmonic, intermodulation or transient distortion, can affect the last in some insidious ways. The presence of filters, tone controls, and high values of gain control potentiometers will modify the transient response at different settings. It is therefore advisable to make square wave tests at different gain and filter settings to check whether ringing is set off by any abnormal combination of characteristics. It should also be remembered that a large amount of power is generated by short duration transients—which is one reason

why an amplifier of adequate output rating is necessary to give a wide dynamic range of sound.

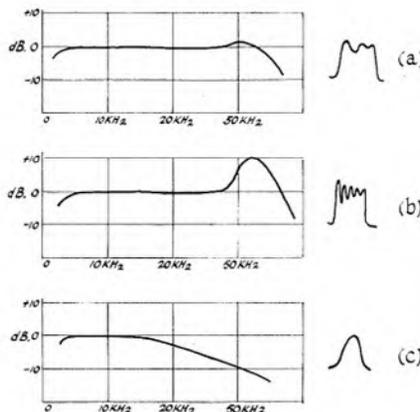


Fig. 1. Comparative response curves from three amplifiers showing the waveform that might be expected from each. Common faults are displayed in all three

**TRANSISTOR.**—A form of semiconductor made by combining crystals with controlled added impurities to provide current carriers. A small change of current in the low resistance section causes a similar small change of current through the high resistance section, giving what is in effect power amplification. The idea of “transferring” a current from a low to a high resistance circuit is the accepted origin of the name transistor—from *transfer resistor*.

Because the transistor needs no heater supply and operates on lower voltages than valves doing a similar job, requiring less power from the main supply, development of transistorised tape recorder circuits has been rapid and widespread. Many different circuits have evolved and new types of semiconductor promote fresh design ideas. The obvious advantage is towards battery operation and portability, but many large, mains-powered machines have now gone over totally to transistors.

**TUNER.**—Tape recorders lend themselves admirably to the addition of accessories, one of the most important being the radio tuner. Many different types are marketed, some self-powered, some requiring an external power supply. Amplitude Modulated (A.M.) or Frequency Modulated (F.M.) broadcasts can be received, many tuners combining both. Later models may also be fitted with, or be adaptable to take, a decoder for the reception of stereo broadcast programmes.

The tuner, as shown in Fig. 2, normally consists of the input circuits, r.f. amplifier, oscillator/mixer stage, one or more stages of amplification at intermediate frequency and the detector circuit. The output from the tuner is at audio frequency, usually from 500 mV to 1 volt and at typical impedances between 47 k and 200 k, suitable to apply to the hi-level input of the average tape recorder. Application will be to the “diode” socket or “tuner” socket, marked as shown at the output end of Fig. 2.

\* \* \*

**TURNOVER FREQUENCY.**—The frequency at which the output from a fully modulated tape when plotted as the typical 6 dB per octave rising curve of the output from a replay head deviates 3 dB from the “ideal” straight line. When a time constant is used to define the curve, this is the frequency at which the reactance of the capacitive component of the C-R combination exactly equals the resistance R. (See also “Standards”).

\* \* \*

**TUTORIAL TAPES.**—Pre-recorded tapes of instruction devised to aid the student. Recordings are made on one track while a parallel track is left available for the student to record his answers, repeat material or make notes. This requires a machine capable of replaying one track while recording on another, a facility that can easily be arranged with a four-track or stacked twin-track tape recorder, and a simple external amplifier with a headphone. There are a number of variations on the theme, including the widening field of “hypno-paedia” or sleep-learning. Companies have been formed especially to market tutorial tapes with a wide range of subjects, from language learning to a course on computer programming.

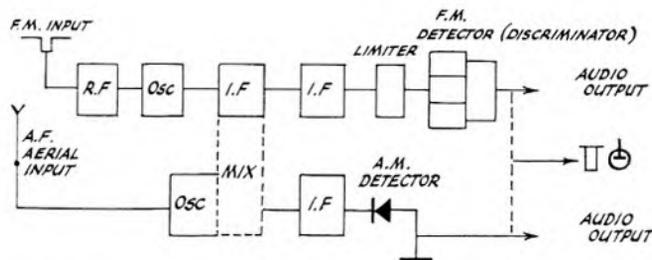


Fig. 2. Schematic diagram of typical AM/FM tuner, showing output to “diode” or “tuner” input on the tape recorder

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## INTERVIEWING from page 372

sionals admit to this. Nervousness will be revealed with embarrassing transparency by the microphone. Often it is evident as a too aggressive approach by the interviewer. He hurls his questions at his poor unfortunate victim like a machine-gun. On playback the listener has the impression of a duel to the death rather than a relaxed and interesting conversation. Always allow time for a full and complete answer—if you jump in too soon with the next question you may well stifle some witty or intelligent remark that could be used as a key to the whole programme. Leave aggressive techniques to those famous, or infamous, television personalities who are well known for conducting an interview after the style of a gladiatorial combat. The popularity of such programmes is indeed the equivalent of the Roman arena with audiences gloating over the decimation of the unfortunate condemned.

There is a whole code of ethics in the business of interviewing. It goes without saying that the interviewer must always be kind, considerate and courteous to the people to whom he is speaking. More difficult, he must always remember that the purpose of his interview is to obtain information and opinions from the person to whom he is speaking, not to interpolate his own. After many years of training potential interviewers I have found that one of the most difficult things for them to grasp is the need to maintain a neutral and unbiased position themselves, and to resist the temptation to throw in gratuitous expressions of their own opinions. If your own opinions on the subject are worth hearing then they should be recorded in the form of a talk and used in that way. Never allow them to intrude upon an interview of the kind we are discussing.

Having successfully started our interview

and got it under way it is surprising how difficult many people find it to bring it to a close. Questions become more and more difficult to think of, answers become more and more laboured and the whole thing tails off into a string of mumbled nothings. You must not only know when to stop but you must also know how to stop.

When you have either all the information you need or, as is more likely, when your intuition tells you that both you and your interviewee are beginning to tire, you must close at once. The very best way to close any interview is with a remark which leaves the interviewee in no doubt that this is the end, but phrased in such a way that it can be made with a smile in the voice and will at the same time produce a smile from him. Complicated? Not really. Try thinking of closures for various subjects. The ingredients are a little wit, a little humour and a great deal of pleasantness.

Although the interviewer should always have a good idea of the questions he intends to ask he should never, on any account, start a session by working from a written list. This is a fatal mistake because the questions will not only sound stilted and false, but you will find that interviews never proceed in quite the manner you had imagined, so that your list of questions will never fit the context of the conversation. It is this need to continually ad lib that makes interviewing such an intellectual strain. And if you should not do quite so well as you had imagined you might then remember that really good interviewers are very rare animals indeed.

Having collected your material you will find that the job is only half done. The next stage, editing, is vital in the compilation of an actual programme. So next month we will discuss the techniques of splicing and editing in some detail.

## RADIO SHOW from page 374

£62 16s. 2d. Tape recorders include a range of low priced spool-to-spool and cassette equipments.

Fidelity were showing their restyled Playtime spool-to-spool tape recorders at the new low price of 23 gns. half track or 25 gns. four track. In addition the Fidelity Studio machine at 35 gns. is a 4-track model offering monitoring and mixing facilities together with an outlet for reproduction of stereo tapes via a separate amplifier.

The scope of this report will indicate what a mass of interesting items we saw. Inevitably we were not able to cover all the shows and we would apologise both to our readers and to exhibitors for those items omitted. With sore feet, but unflagging spirits, our last port of call was to Metro-sound to participate in their 10th birthday celebrations. Besides showing their well-known range of disc and tape accessories, together with Thorens turntables, Sonotone cartridges, etc., they were also introducing for the very first time their own 8-track cartridge system. As in the United States of America, the first application of the equipment will be in motorcars, but we shall see the arrival of playback mechanisms designed for domestic use in the very near future. The catalogue of titles available is impressive. We shall doubtless be reporting on this development in more detail later.

So we came to the end of the 1967 Radio Show. Although the industry has been passing through difficult economic times it is obvious that our manufacturers and distributors are keenly competitive and are determined to offer to the British public an ever wider range of versatile equipment to suit all tastes and pockets. We have no doubt that future prospects are as bright for the consumer as they are for the dealer and manufacturer.

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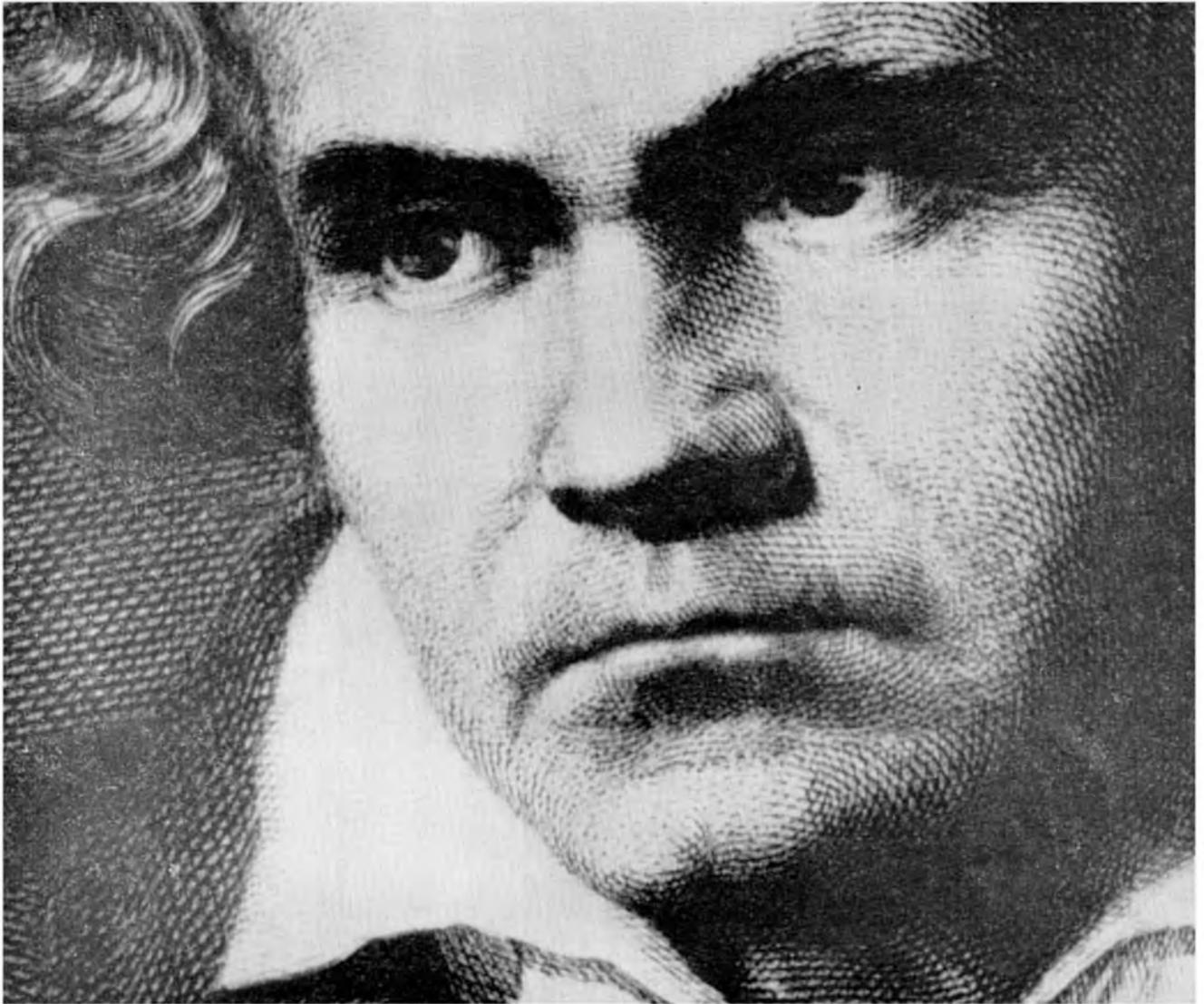


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# MUSICASSETTE

## REVIEWS

A detailed report on a new set of four Musicassettes published by Readers Digest Association

### MOOD MUSIC FOR LISTENING AND RELAXATION. Set of four Musicassettes by "Reader's Digest," 120s.

The Reader's Digest Organisation is well known for its issues of popular and lighter classics in sets of gramophone records, neatly boxed and presented. It was noted with great interest last July that this concern has now entered the Musicassette market with a collection of four complete cassettes under the collective title of, "Mood Music for Listening and Relaxation."

The set arrived in a very smart, slim shaped, container with a suitably relaxing coloured illustration on the front. Inside were four Musicassettes, looking very similar to those produced by other publishers. I was at once impressed with the advantages of presenting four, correlated, cassettes in a single neat container. This is a thoroughly practical idea which might well be followed by the other firms in the business.

The musical content is adequately indicated by the eight titles, one for each of the two sides of every cassette. On side one of Musicassette Number one we have *Stardust* with *Candlelight and Wine* on side two. Number two carries *Moon over Hawaii* and *Softly as in a Serenade*, Number three, *Romantic Piano Melodies* and *Moonlight Piano* with Number four bearing the titles *Vienna Bon-Bons* and *Dancing Strings*. The overall title, "Mood Music for Listening and Relaxation," probably suits the entire collection rather well.

Starting with the first Musicassette we have on side 1 the Voices of Robert MacDonald delivering a soft and soothing assortment of items with an evening theme. Sound quality is good and the coupling with Daniel Michaels and his orchestra offering popular and equally soothing melodies on side two provides a very pleasant collection of background sounds. One might be contemptuous of "wall paper music." On the other hand there are many occasions when gentle background sound will break social ice and encourage the enjoyment of conversation. Used with discretion in this way it can perform a most useful social service to counteract the silent isolation of television watching. The first Musicassette is utterly lacking in drama or outstanding quality of any kind, which is precisely what it is intended to be.

*Moon Over Hawaii*, side one of No. 2, is a collection of standard Hawaiian favourites by Al Caila and his orchestra. Recording and sound quality is really excellent, and this too could be regarded as "musical wall

paper" but for one rather unfortunate thing. Presumably in order to evoke the true atmosphere of the islands a number of sounds which I take to be those of the local animal life have been introduced. These are in the form of rather plaintive cries, and I am quite sure that any fond parent hearing these for the first time would immediately rush into the nursery under the impression that Junior was being harpooned by a safety pin. This is perhaps unfortunate when one considers that this music is intended for Mum and Dad's relaxation in the quiet and peaceful evening hours! Subject to that one caution, I must add that if you are devoted to Hawaiian music then you will be entranced by *Moon over Hawaii*. On side two *Softly as in a Serenade* gives us the John Norman Chorale with the RCA Symphony Orchestra and a selection of delightfully nostalgic sounds. All is sweetness and light on this side. For really pleasant background music I would vote these items for my favourites.

For me there was no relaxation at all in Musicassette No. 3, but plenty of brilliant performance and exciting sound. Side one, *Romantic Piano Melodies* is coupled neatly with side two, *Moonlight Piano*, and the soloists who alternate throughout are Earl Wild and Ralph Votapek. Orchestral accompaniment is provided by the Royal Philharmonic Orchestra under Russel Stanger. I have not named the individual items in the first two cassettes as I feel that as background music they are largely irrelevant. This third Musicassette is quite a different matter, however, and the programme comprises: *Grand Polonaise*, *Nocturne in E Flat* and *Waltz in C Sharp Minor* by Chopin, *Liebesträume*, *Hungarian Fantasy* and *Forgotten Waltz* by Liszt, *Romance* by Rubenstein, an excerpt from *Piano Concerto No. 1* by Tchaikovsky, *1st Movement of the Moonlight Sonata* by Beethoven and *Träumerei* by Schumann. It would irritate me enormously if I had to endure these items at background level. Recorded quality is absolutely excellent; the volume control should be turned well up and the programme can then be thoroughly enjoyed as a brilliant example of piano and orchestral recording.

The fourth and last cassette is again material for listening, rather than relaxation. The items are, on side one: *Vienna Bon-Bons* J. Strauss Jr., *Village Swallows* Josef Strauss, *Schönbrunner Waltz* Lanner, all performed by the Vienna State Opera Orchestra. On side two: *Cossack Dance* by Tchaikovsky, *Coppélia Waltz* Delibes, *Dance from Suite No. 2* Tchaikovsky, *Rosamunde (Selections)* Schubert, *Scarף Dance* Delibes, *Skaters Waltz* Meyerbeer, and "Chopin" from *Carnaval* by Schumann, all performed by the Royal Philharmonic Orchestra. Quality is again consistently good and the programme deserves the listener's undivided attention.

My opinion of this collection is that they are extremely good value for money, saving as they do 40s. on the full retail price of four Musicassettes. But I can't help wondering if the publishers have not fallen between two stools. Personally I would have preferred to see two quite separate collections, one of genuine mood music for relaxation and the other of popular light and classical selections. However, this is only the first Reader's Digest venture into the Musicassette world and it is sincerely hoped that more collections will follow. By the way, these Musicassettes can only be purchased as a complete set through the Reader's Digest Association Ltd. at 7/10, Old Bailey, London, E.C.4, and as usual easy terms are offered.

## MUSIC ON TAPE

### CONTRASTING ORGANS

**BACH.** *The Majesty of the Lüneberg Organ. Toccata and Fugue in D Minor, Toccata and Fugue in F Major and Toccata and Fugue in C Major.* Played by Professor Michael Schneider. Audio Spectrum AST303 4-track stereo 7½ ips. 55s.

A catalogue of tapes under the "Audio Spectrum" label is distributed in this country by Transatlantic Music Tapes (Distributors) Limited of Bristol and West House, 36 High Street, Salisbury, Wiltshire. This album is the first of the series I have reviewed, and in selecting a performance at the Lüneberg Organ we have dived straight into the deep end.

This instrument is as ancient as it is famous. Housed in the 14th century church of St. Johannes, it was constructed in 1551. Only slight modifications have since been carried out, firstly in 1712 and later in 1850. One of its claims to fame is that Bach himself played many times on this very instrument, which he is said to have favoured above all others in Northern Europe.

The works offered in this collection comprise three toccatas and fugues. There has recently been a tendency for recordings to be issued of toccatas divorced from their fugues, thus providing, so to speak, the dramatic jam without the sustenance of the intellectual bread. Happily the works under consideration have not been truncated in this way.

The first item is the ever popular Toccata and Fugue in D Minor. Beloved of organists, musicians, hi-fi enthusiasts and the public in general, this must be one of the best known and loved of all organ compositions. It's not difficult to understand why. The music peals in exultation with vibrant trumpet calls proclaiming a message of hope to all mankind. But the other two fugues, in F Major and C Major are by no means lesser works—in fact some would suggest the contrary to be the case.

The great genius of Bach shone most brilliantly in his keyboard music; of these instruments the organ inspired him more than any other. Of all composers perhaps Bach suffers most at the hands of the performer. The beginning and end of any Bach performance lies in interpretation. In this album we are fortunate to have no less a person than Professor Michael Schneider performing for us. Professor Schneider has devoted a great deal of his life to the study of Bach, and there is no doubt that his interpretation may be regarded as authoritative.

So it only remains to consider the recording itself. I have nothing but praise for the way in which the glories of the sound of Lüneberg have been preserved for posterity in this album. Having worked myself on the recording of various items of organ music, including, by the way, the D Minor Toccata and Fugue, I was naturally listening with a very keen and critical ear. The sound could not be faulted. It really is excellent, requiring plenty of bass response in the speaker for real appreciation.

Listening to this tape I really was taken into the church—perhaps back to the 18th century as the Master's fingers strayed over the keys. Here we have glorious music, glorious sound and an unforgettable experience. This is an album that cannot be too strongly recommended.

**REGAL MEMORIES.** George Blackmore at the organ of the Odeon (Regal) Cinema, Marble Arch. Organ of the Month Club. Four-track, stereo, 7½ ips. 41s. 7d.

Before beginning to consider the content of this album I must try to clear up a small mystery regarding its title. This is quoted as, "Regal Memories," and the very full printed notes enclosed within the box include photographs of the interior of the Regal theatre and also its exterior. Unfortunately on its exterior it clearly bears the name Odeon. My own memory refused to accept the idea of this cinema being known as the Regal, Marble Arch—to me it was always the Odeon. On checking with Ranks I do find that it was originally the Regal, but the name was changed in 1929 or 1930 to Odeon. This building was recently demolished to be replaced with a modern block which includes a contemporary cinema which perpetuates the name Odeon, Marble Arch.

So having tried to sort that one out let's consider the organ itself. Built in 1928 it was specially designed by William Hill, Norman & Beard Limited. Many have claimed this instrument to be one of the world's finest examples of the art. When the cinema was demolished in 1964 it was removed, piece by piece, to safety.

As the largest and most flexible theatre organ ever built it incorporated a bewildering range of facilities, including effects such as crockery smashing, face slap, an eighteen note bird whistle and a full thirty-one note carillon. The record notes inform us that an injunction was served on the theatre restricting the times when the organ and carillon could be played. Apparently the sound could be clearly heard outside where local residents complained. The last time the full carillon was used in earnest must have been just before the last war. When the present recording was made it was found that the electric motor system has long since burnt out. Fortunately the organist persuaded a friend to ring the bells by hand so that we can hear them for the last time in his rendering of *The Bells of St. Mary's*.

The other items in the album are: *Don't Bring Lulu, In a Clock Store, Parade of the Sunbeams, The Carousel Waltz, Moonlight Becomes You, A Stitch in Time, Adios, Around the Marble Arch, Try a Little Tenderness, Finlandia and Memories of You.*

I think I have mentioned before that I am no great admirer of the traditional theatre organ. But I am a lover of good music and good sound. Immediately one begins to play back this tape the listener is conscious of the fact that something really great is going on. The tone of this instrument is not what I associate with theatre organs. It is full-bodied, round and satisfying. Having admitted my prejudice against this class of instrument I can pay this recording no higher compliment than by saying that it has completely won me over. I regard this tape as being not only of historic interest but also as providing intriguing sound coupled with pleasant listening.

A word of explanation about the Organ of the Month Club. Their tapes (and discs) are intended for members only, but no membership fee is charged. A person ordering a record automatically becomes a member. Orders should be sent to the address quoted in their advertisement in *TAPE Recording Magazine*, page 397, but payment should not be included. Delivery takes up to five weeks as tapes are sent from USA; payment to an English bank is against invoice only.

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The manufacturers claim that both the insert and the main case have been strongly built to withstand rough treatment. Sound quality is said not to be affected by very close singing or speaking, but an acoustic resistance cap or windshield is supplied with the microphone for use in the open air. Frequency response is claimed to be smoothly retained over the range 100 to 17,000 Hz.

The EC1 is available in three main impedance values: L 30/50 ohms, M 250 or 600 ohms and H 50 Kohms or 30/50 ohms. Models M and H are dual impedance.

With a weight of only 6 oz. the EC1 microphone measures 8½ in. overall with a head diameter of 15/16 of an inch. It is supplied complete with six yards of screened PVC flexible cable and a hinged plastic and polished chrome holder for attaching to floor, banqueting or table stands.

The cost of the microphone complete is £18.

Reslosound Limited, Spring Gardens,  
London Road, Romford, Essex.

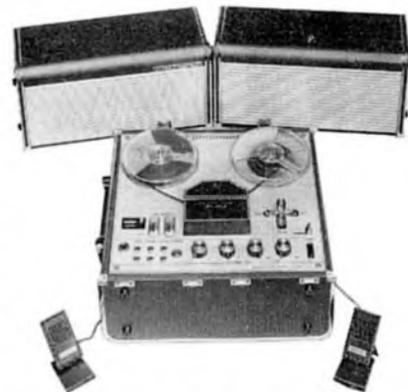
## SANYO OFFER FOUR NEW RECORDERS

OF the six new models in the range of Sanyo high quality audio equipment now to be marketed in this country no fewer than four are complete tape recorders. The other two items are model DC434, a solid state FM/AM tuner amplifier fitted with multiplex decoder and incorporating a high quality transcription unit, pick-up arm and magnetic cartridge at a price of 145 guineas, and model DC60, an integrated FM/AM tuner amplifier with multiplex decoder giving a claimed output of 30 watts per channel at 1 per cent distortion (RMS) and costing 87 guineas.

The tape recorders include the MR151 mains/battery 4-track stereo machine shown below.



Offering three speeds, 3¾, 1½ and 15/16 ips, the claimed frequency responses are 100 to 10,000 Hz, 100 to 5,000 Hz and 100 to 2,500 Hz, plus or minus 3 dB respectively. Maximum spool size is 5 in. and the cost price of 65 guineas includes the usual accessories together with a pair of microphones and stands.



At 72 guineas model MR929 is a mains stereo/mono 4-track machine running at 7½ and 3¾ ips. Power output is quoted as maximum 4 watts per channel (undistorted 3 watts per channel). Dimensions are 14½ x 12¾ x 11 and accessories include two dynamic microphones.

Other machines in this range are the MR910 mains stereo/mono 4-track machine giving a claimed output of 1.6 watts per channel and signal-to-noise ratio better than 46 dB at 69 guineas, and at the same price model MR800 which incorporates two output amplifiers at 6 watts per channel, for which suitable speakers can be purchased as extras.

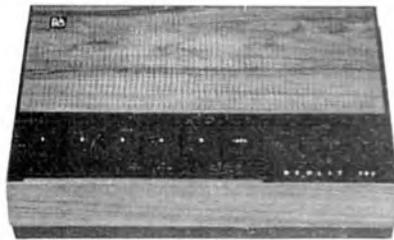
Marubini-Iida Co. Ltd., 164, Clapham  
Park Road, London, S.W.4.

## RADIO OR INTERCOM

**B**ANG & OLUFSEN is a name we associate with elegant styling and brilliant design. Their new Beolit 500 is no exception.

Primarily a battery-operated, solid state, radio, it operates on the FM waveband and features push-button station selection. There is no traditional dial, each individual selector being separately tuned by controls accessible from beneath the cabinet. Reception is immediate on any of the five chosen stations simply by depressing the corresponding push-button.

The set has a relatively large loudspeaker, and sockets are provided for gramophone, pick-up and extension speaker. It also has a telescopic rotatable aerial for use when the set is in either horizontal or vertical positions.



A unique feature of the Beolit 500 is the fact that it can operate not only as a radio but also as an efficient two-way intercom system. All that is needed for this conversion is an extension speaker which can be connected on a lead of up to 450 feet in length. To operate as an intercom two push-buttons are depressed simultaneously cutting out the radio receiver circuits. The extension speaker then operates as a microphone. Direction of communication is reversed by depressing a talk/listen button which converts the internal speaker of the set to a microphone.

The Beolit 500 measures 3 in. x 10 in. x 7½ in. and weighs 9½ lb. including batteries. The recommended retail price is 35 guineas.

*Bang & Olufsen United Kingdom Division, Eastbrook Road, Gloucester.*

## EAGLE PORTABLE

**E**AGLE PRODUCTS announce a mains/battery tape recorder, the TP 730. This machine incorporates a number of sophisticated facilities, including an automatic volume control system which dispenses with the need for conventional modulating. There is also a fast forward operation, a remote control facility, a tone control, two speeds, 3¼ and 1½ ips, and a level meter. (Illustrated top centre.)

Frequency response is claimed to be 50 to 13,000 Hz, and the output is said to be 1 watt. Other features include push-button keyboard, additional input for any high level sound source such as radio or record player, and socket for external speaker. The machine is supplied complete with dynamic microphone, earphone, a five-inch spool of 1.5 mil. tape, batteries and AC lead at a recommended retail price of £27 16s. 6d.

*Eagle Products Limited, 32A, Coptic Street, London, W.C.1.*



## NEW SERVICE FOR TECHNICAL BOOKS

**A** NEW agreement has been reached by Electronic Services—STC with five major publishers of technical and reference books enabling the STC organisation to market selected volumes from their current title lists. Topics covered include basic electronics, electronics maths, circuits and components, computers, electronics hobbies, short wave listening and amateur radio.



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Illustrated details of books available through the new service are given in a 40 page booklet available free from:

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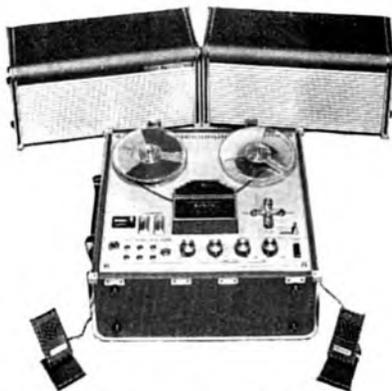
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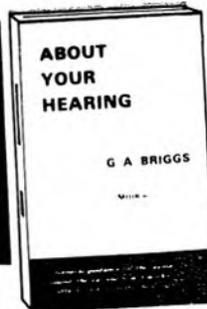
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*Specification:* Mains Stereo/Mono tape recorder, 4 tracks, two speeds, sound on sound, sound with sound facilities. Automatic shut-off. *Accessories:* two microphones, full spool of tape, empty spool—separate speakers. *Reel Size:* 7" dia. *Speeds:* 7½ in/sec (19 cm/sec), 3¾ in/sec (9.5 cm/sec). *Power Output:* Maximum 4W (each channel), Undistorted 3W (each channel). *Line Outputs:* 1K ohms. *Dimensions:* 14¼" wide x 12¾" deep x 11" high (350mm x 330mm x 280mm). *Accessories:* Dynamic microphone x 2, 7" (18cm) full tape and empty reel, patch cord x 2, splicing tape, reel stopper x 2.

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Sound and Hearing—The Ear—Hearing Tests—Forms of Deafness—Hearing Aids—Noise—Reproduced Sound—Surgical Treatment of Deafness—Hospitals and Child Welfare—Questions and Answers—Definitions.

*Tape Recording Magazine* Review concludes:

Quite apart from its technical interest, I have found this book offers a great deal of really fascinating reading. The author is well known for his other works on acoustics, all of which have long been accepted as standard books of reference. The present volume is, in my opinion, the most interesting he has yet produced, and as such is strongly recommended.



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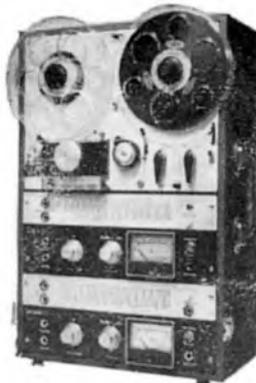
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Ferrograph 631	33 5 0	5 10 10	95	
Ferrograph 633 Connoisseur	42 0 0	7 0 0	120	

<b>STEREO/MONO</b>				
Philips EL3312	16 16 0	2 16 0	48	
Sony TC250A	19 19 0	3 6 6	57	
Philips EL3555	26 5 0	4 7 6	75	
Akai 1710	27 13 0	4 12 2	79	
Sony TC260	33 19 0	5 13 2	97	
Tandberg Series 12	36 15 0	6 2 6	105	
Truvox PD104	36 15 0	6 2 6	105	
Beocord 1500	36 15 0	6 2 6	105	
Beocord 2000K De Luxe	43 15 0	7 5 10	125	
Revox 736	44 9 0	7 8 2	127	
Beocord 2000T De Luxe	45 3 0	7 10 6	129	
Akai X-300	65 5 0	10 15 0	185	
Akai X-355	83 6 4	13 17 9	239	

<b>BATTERY</b>				
Philips EL3302	9 9 0	1 11 6	27	
Telefunken 301 4-Y	18 18 0	3 3 0	54	
Akai X-4 Stereo	34 13 0	5 15 6	99	
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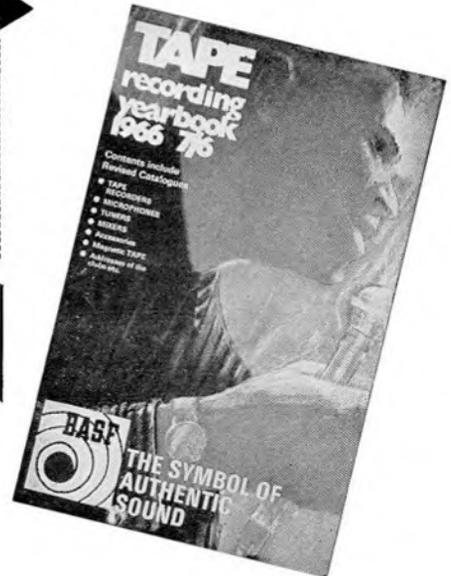
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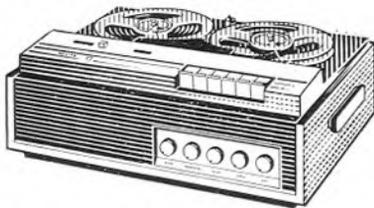


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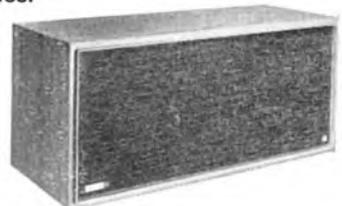
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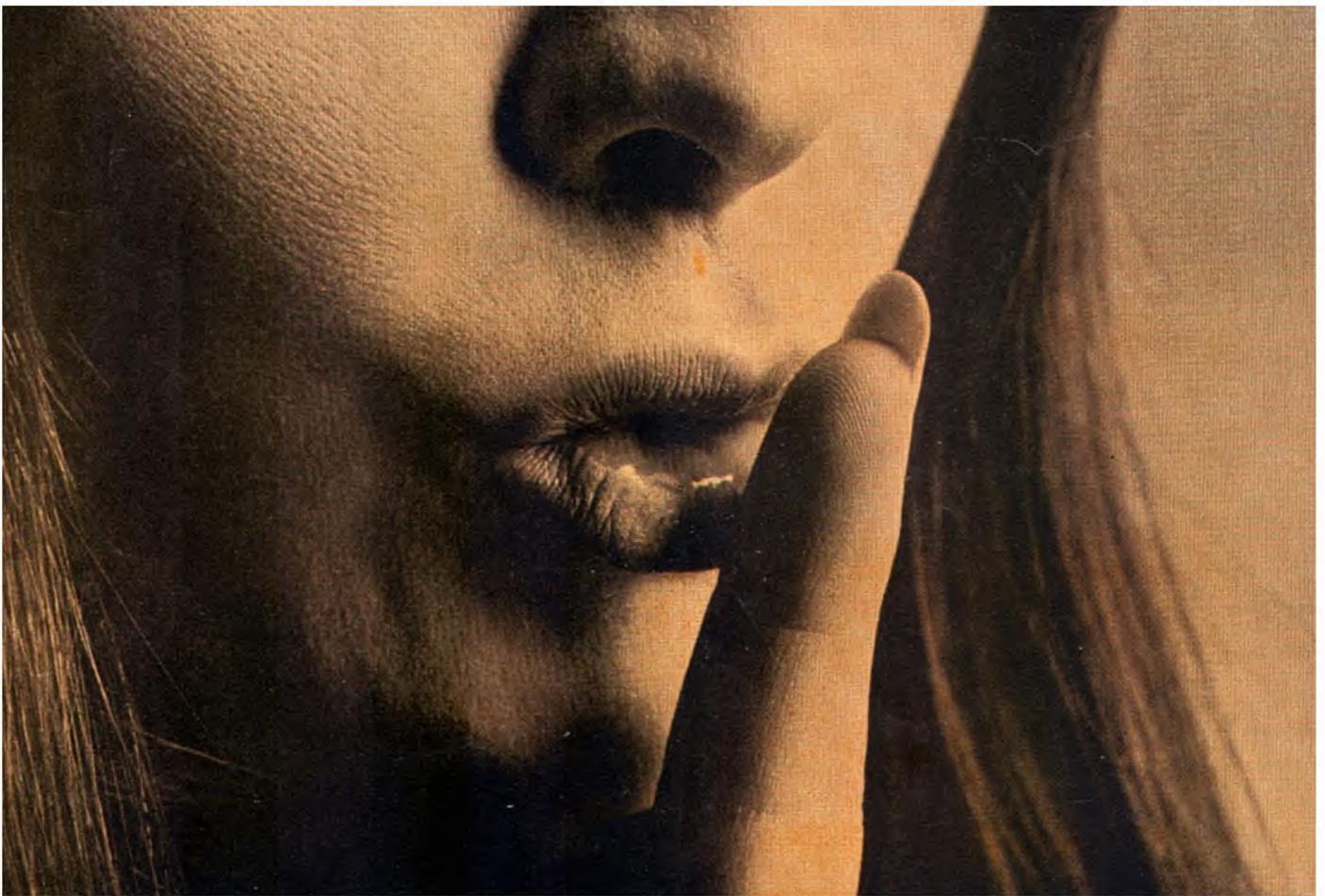


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