

the TAPE

PRICE 1/6

NOVEMBER 1961
Vol. 3 No. 10

RECORDER

INCORPORATING "Sound & Cine"



IN THIS NUMBER

Facts about 4-track recording ● A tour in Europe with a Tape Recorder and Camera. ● Readers' Letters ● Tape Recorder Workbench ● Equipment Reviewed ● Details of New Products ● Readers' Problems ● Sound and Cine' ● Here and There and Everywhere ● News and Pictures from the Clubs

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★
EDITORIAL

MEMBER OF THE
AUDIT BUREAU
OF CIRCULATIONS

Slightly over three years ago—almost coincidentally with our preparatory planning for the launching of this magazine, *The Tape Recorder*, we put forward a very detailed proposal for the formation of a tape club—a real club, in the fullest sense of the term—with well-equipped premises for its members. Various things occurred during the following eighteen months which made it doubtful whether such a venture would be worthwhile; and, as the potential organisers had other commitments and time-consuming responsibilities, we did not push our proposals any further. Nevertheless, it has often occurred to us since, that such a headquarters for serious tape enthusiasts would be a very desirable thing, and we have recently approached the organisers that we originally had in mind, again suggesting to them that the idea deserved serious consideration.

The type of club that we envisaged would have to offer its members very worthwhile facilities, and would have to be specially tailored to tape alone. It would, of course, have no connection (financial or otherwise) whatsoever with this magazine or this publishing house, though we should naturally do all that we could to assist and support the venture. The facilities that we have suggested include studios, properly wired and arranged, for experimental recording; the engagements of musicians for regular recording sessions; the attendance of technical instructors for elementary servicing and engineering; the services of lecturers on useful, practical subjects; and so on. Above all, it was stressed, membership fees for Town and Country members should be reasonably and realistically based.

We await the deliberation of the organisers, and we hope that they may be favourable. If such be the case, we will return to the subject at the earliest possible moment. It must be understood, however, that we have no "finger in this pie", and that we only raise the subject at this stage because increasing correspondence has shown us that a need exists—and because, with such a possibility on the agenda, it can do no harm to announce that serious-minded people are studying the need.

* * *

Another subject of great importance this month, is that of *Tape Recorder Servicing*. We have, on the one hand, been approached independently by several dealers with suggestions that some form of special recognition be given to reputable, live and responsible tape recorder dealers, who back their sales with competent and reliable service facilities. We ourselves, on the other hand, have approached other dealers who we know from experience and recommendation to have such facilities, asking them whether they would like to co-operate in the establishment of some such recognised group.

In the past there has been considerable frustration and disappointment as a result of haphazard purchasing—often from

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furniture stores and similar retail outlets, where (as a moment's thought should have warned) no servicing facilities could possibly exist—and also through the purchase of recorders which, after a short blaze of publicity, vanished from the scene. A good dealer either has first-class servicing facilities under his own control, or he has access to them. Our aim, with the co-operation of dealers and makers, is to ensure that our readers shall know of these services, so that they can buy with greater confidence. On this subject, too we hope to be able to report more fully very soon.

— NEXT MONTH —

APART from all the regular monthly features, which include *Workbench*, *Readers' letters and Problems*, *Details of New Tape Products*, *Sound and Cine*, etc., we have two articles of special interest scheduled—the second in the series by Graham Balmain, and another by our contributor, Frank K. Rawson, who writes about the odd problems encountered by him (and undoubtedly many readers, too) during his work with recorders, and his suggested cures for the troubles. There will be several pages of News and Pictures, and the Equipment Reviewed section will cover the new Grundig TK 14 and Gevaert tape.

— COVER PICTURE —

OUR front cover picture was taken by Eric Hosking during the recent 1961 British Ornithological Expedition to Hungary. And although there is no bird visible (and this is not a "spot the bird" contest!), there is the sound of one in the parabolic embrace of the Grampian reflector—the rare River Warbler. The setting is the Osca Forest, in Hungary, and the very pre-occupied operator is Andrew Burnett.

SUBSCRIPTION RATES

The subscription rate to *The Tape Recorder* is 21/- per annum (U.S.A. \$3.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription + Index, 24/- (U.S.A. \$3.25).

HOW OTHERS USE TAPE



Mr. Chambers sorting through his library of tape programmes for the blind. The Philips portable recorder is for loan to blind people without equipment of their own.

(Photo: The Birmingham Mail)

MR. MAURICE CHAMBERS, a Birmingham tape recorder enthusiast whose hobby is producing programmes for the blind, has just heard that his one-man organisation has been recognised as an official charity.

The scheme first started in 1957 and membership to "Tape Programmes for the Blind" has grown every year until today there are 35 blind people in Britain, Holland, Germany and the U.S.A. receiving tapes regularly from Mr. Chambers. The programmes consists of music, stories and "sound pictures" and willing friends help by reading some of the stories. A library has been built up and already 80 different tapes are in stock.

One of the most famous contributors is Frankie Vaughan, who, when he heard of this service offered to add his personal greeting to a tape. The recording was made at a Brighton Theatre, between the acts. Taped messages have been exchanged between a former Mayor of Solihull, Alderman E. N. Hiley and Herr Kurt Exner the Blind Deputy Burgomaster of Neukollen in West Berlin.

One of the most popular features is a "round robin" tape which is circulated to about 15 blind people for each to record a message. "It makes them a closely knit community who feel that they know each other well, although they have never met" says Mr. Chambers. One of his keenest listeners is Herr Helmut Hartwig, a German dentist, blinded on the Russian front during the war. Somehow he heard of "Tape Programmes for the Blind" and wrote asking for a tape. His English has greatly improved since he has received these programmes and he has made many new friends in this country and abroad.

Publicity has brought help from Nigeria and other countries scattered throughout the world, but Mr. Chambers has up to now

been limited by finance. His latest venture is a "Sound Picture" of everyday life in Birmingham, his next programme will be entitled "Spotlight on Stratford-upon-Avon" and already the sound effects have been recorded.

Mr. Chambers, one of the first enthusiasts in this country has certainly found a constructive use for a tape recorder. Due to his untiring efforts to assist the blind, the Post Office has granted permission for him to send tapes under the "blind label" to any place in the world for a halfpenny, but only those with tape recorders can benefit.

Piano Improvising Using a Tape Recorder

BY now there is nothing new about piano playing being recorded on tape, even in the home circle. No doubt these days many a Dad gets out the tape recorder to capture young Susan's spirited rendering of her party piece for distant members of the family. On another level, pianists can use tape when practising to pinpoint and remedy weaknesses which any microphone will show up relentlessly.

One of our readers carries the domestic application of tape recording a little further. It seems that for very many years Mr. P. W. F. Mills, of Dore, Sheffield, has been able to either improvise or extemporise on a piano. He himself distinguishes between three forms of "off-the-cuff" piano playing. With the first, strumming (or doodling), we are most of us familiar. The second, improvisation upon a set theme (or, shall we say, playing about with somebody else's tune), is common enough. The third, extemporisation (or genuinely impromptu playing of an original piece with an acceptable shape, i.e. with a beginning, a middle and an ending), must be comparatively rare. It is a facility for extemporisation proper, which we gather has developed with time, that prompted our reader, following retirement from business recently, to invest in a tape recorder.

In so far as such extemporisation proper is a manner of composing at a keyboard some musical know-how is obviously called for, apart from some degree of creative talent.

His recorder has three motors and two speeds. All recording has been at $7\frac{1}{2}$ i.p.s., and playback is usually through the speaker of a cabinet radiogram. Mr. Mills tells us that he ordinarily plays with the lid of his piano closed, and rather softly. Perhaps because of this a good crystal microphone, placed at about keyboard level a few feet away to the left and slightly rearwards, seems to have proved adequate with a moderate recording volume which necessarily has to be preset and left unwatched.

Playback is normally at low volume (apparently at a control setting round about a ninth of the full range), and this again, besides being in keeping with our reader's natural playing style, may assist in obviating distortion when the lowest and highest piano registers are invaded from time to time, which a specimen tape kindly loaned to us by Mr. Mills shows is likely to happen with this class of sophisticated extemporisation.

Unpredictable Results

Apparently a feature of keyboard extemporisation proper is a certain unpredictability as to result, and when a memory block operates, as in this case, it seems that the first playback from tape is definitely exciting.

The position to date appears to be that since acquiring his recorder Mr. Mills has provided himself with six dual-track 7 in. tapes, carrying nothing but 73 piano extemporisations, varying in playing time from 2 to 8 minutes. He recognises that if transferred to commercial L.P. discs these individual extemporisations would probably require to be described as Nocturnes, Preludes, Studies, Meditations or Rhapsodies, according to mood and texture. But as yet no attempt has been made to label them, and indexing is simply by tape-location numerals. The value of the tapes to the composer, and his friends, lies in their permitting whole half-hours of continuous listening to piano music which, if not composed direct on to tape, could be heard only once from the keyboard, without any hope of repetition.

NEWS AND PICTURES FROM THE CLUBS



(Left to right.) The treasurer, V. McIlveen, secretary, Mrs. Hazel Jordan and chairman Mr. C. J. Jordan, of the Ulster Tape Recording Society at the society's Exhibition Stand.

A UNIQUE situation occurred at the fourth annual general meeting of the Ulster Tape Recording Society held at their studio, 44 Dublin Road, Belfast, 9, on September the 14th. The husband and wife team of Mr. and Mrs. Jordan were elected to combine once again. This time in the offices of Chairman and Hon. Secretary. Mrs. Hazel Jordan who occupies the Hon. Sec. position has been a member of the society, along with her husband, since its inception. Keen tape recording fans, they have taken part in many of the society's outside recordings.

Such programmes were referred to in the retiring secretary's, C. J. Monaghan, annual retrospection of activities. He thanked all concerned for their loyal support and concluded by saying that he hoped that the future secretary would receive the same loyalty. Mr. Monaghan was unfortunately compelled, through business reasons, to withdraw his name from the election list.

During the evening's business the members unanimously agreed to elect the founder members of the society to a honorary membership. A distinction which, it was felt, would show the society's gratitude to those who laid the foundations of its beginnings. Meetings of the U.T.R.S. are held weekly and they will be pleased to hear from other tape clubs in the world. Correspondence should be sent to Mrs. H. Jordan, 36 Sandymount Street, Stranmillis Road, Belfast 9.

THE Brixton Tape Recording Club are now in the final stages of editing over 15 hours of recorded material for the tape of the local "Lambeth Festival" which has been a mammoth task for this small but lively Club. The club secretary, Mr. R. G. Garrett, now on holiday in Italy, has promised to send a tape to the club which members hope will be even more interesting than the tape Mr. Garrett sent from France when he was on holiday earlier this year. Tape exchanging is enjoyed by many club members, tapes have been sent to Baghdad (Iraq) and Iowa and Colorado Springs (U.S.A.) and a tape has been received from New Zealand. This is only one of the many activities that members take part in.

New members will be welcome at meetings held each Tuesday evening 8.0-10.30 p.m., in a room over The White Horse Hotel, 94 Brixton Hill, London, S.W.2. For further details contact R. G. Garrett, 56 Ratray Road, Brixton, London, S.W.2.

MR. Yardley from the Teddington Theatre Club visited the West Middlesex Tape Recording Club on Thursday, September 14th, and gave members an outline of the many ways

in which they can help in putting on their future plays. In practice, it would appear that they can best help by recording the sound effects for the various shows and man the replay and amplifier equipment at the performances. Five members volunteered to give active support at show times, but many more have offered to assist in obtaining the actual sound effects.

The club has been presented with half-a-dozen tickets for Teddington's next play, so that members can make an appraisal of the problems and wander round backstage afterwards to meet the hard-working folk who have put the play on. Details of future meetings can be obtained from H. E. Saunders, 20 Nightingale Road, Hampton, Middlesex.

MEMBERS of the Catford Tape Recording Club were given a talk on various splicers, splicing and editing at a recent meeting by the chairman Brian Blakeney who, showing examples of good and bad splicers, soon told them what and what not to do, with the result that in no time at all the whole club was busily engaged in cutting tape.

Other future programmes consist of a Tape Recorder Comparison night when members will all record the same subject, then the machines will be compared on playback, a participation studio night and a dubbing session.

The club can now boast a library of books on tape recording and a library of tapes recorded by the members of the club, one tape will eventually be completely filled with sound effects. Both the books and tapes are on free loan to members. Details can be obtained from C. Harker, 62 Barmeston Road, Catford, London, S.E.6.

FINAL arrangements have been made for the Friern Barnet & District Tape Recording Club car rally, crews have been selected and briefed and all instructions will be given on tape and full use made of portable equipment.

Recently Mr. J. Neal has given a demonstration of the various methods of splicing and Mr. F. Inman has continued his lectures on tape recording and recorders.

The club had a stand at the Friern Barnet Summer Show, and members were present for two days to demonstrate their equipment. An "endless loop" was used to record interviews. This gave sufficient delay to enable those interviewed to hear themselves when they approached the stand. Mr. J. Fulton has now handed to the Secretary the Cup which he is presenting for the best 5-minute tape, to be judged at Christmas. Readers interested in joining this club should contact A. S. Andrews, 13 Hartland Road, Friern Barnet, London.

THE meeting of the Cotswold Tape Recording Society on September 7th was devoted to a live recording exercise. The special object of this was to examine the effect of microphone placement on the overall balance of the recording; and for this purpose the Society was fortunate in having the services of a dance band which is run by one of its members—Ray Tingley—who is well versed in the art of recording, and knew exactly what was required. Four instrumentalists were present, doubling between them piano, drums, tenor saxophone, banjo, piano accordion and electronic organ, thus providing a wide range of tone-colour and dynamic.

The pianist of the band, Andy Clyne, is also a composer, and it was his tune "Passing Cloud" which was recorded—played straight, as a waltz and as a cha-cha-cha. Upwards of a dozen recorders, representative of the whole price range, were in use; and after each short musical performance, each tape was played back and discussed. It was fascinating and instructive to observe the difference produced by moving a microphone only a few inches; and also to hear the difference between recordings made by identical microphones into different machines, and different microphones into identical machines. This inevitable variation

NEWS AND PICTURES FROM THE CLUBS

is one of the major components of the art of recording. One member tried the effect of recording mainly sound reflected from different surfaces such as walls and screens—and produced some remarkably good results. Eric Jones was again in action with his home-made multi-channel mixer and three microphones. It was very enjoyable to compare his more ambitious efforts with those using simpler equipment. Further details available from P. D. Turner, *Cave Cottage, Oakridge Lynch, Stroud.*

DURING the summer months the **Harrow Tape Recording Club** held a number of very interesting meetings when the opportunity was taken of the fine weather to record outside sounds for future effects in connection with the winter programmes. The club now meets on the first and third Thursday in each month at St. George's Hall, Pinner View, North Harrow, when new members will receive a hearty welcome, if they will call on any of these evenings about 8 p.m. Secretary: L. M. Bouldstridge, 10 Towers Road, Hatch End, Middlesex, will supply further information on request.

FIRST item on the agenda of the **Ilford and District Tape Recording Society** at a recent meeting, was the election of a new committee. Mr. Jimmy Hunter was re-elected as chairman and the secretary also voted in for another year. Dave Bolton had requested that the club should have a treasurer this year instead of the post being included in the secretaryship. This was agreed and Bill Paine, a relatively new but extremely enthusiastic member took the position.

Business compelled Alan Gentle to stand down from the committee and Fred Faulkner took his place as a committee member. Recently each member received a comprehensive questionnaire and a summary of the individual views of members was debated. The resulting answers sent back proved informative and some of the general preferences of members may be useful to other clubs. Details can be obtained from D. Bolton, 13 Gloucester Road, Manor Park, London, E.12

YET another busy and interesting month has passed and after six months, the membership of the **Cambridge Amateur Tape Recording Society** has now risen to 30.

Members were very impressed with the Acos Hi-Light stereo pick up arm, when Mr. Wells and Mr. Adams of Cosmocord Ltd. gave a lecture and demonstration. Mr. Wells began by giving a very amusing account of how the crystals were "grown", processed and finally assembled into Acos microphones and pickups. A questions and answers session followed, and Mr. Adams was kept busy answering the many questions posed by members. A demonstration of stereo records concluded the evening.

The Society's Technical Sub-Committee plan to give a series of six lectures and demonstrations on various topics concerned with recording. Sessions will be devoted to: microphones, speaker enclosures, portable recorders, dubbing and editing, stereo and electronic music. Further details of club activities can be obtained from M. E. Renshaw, 6 St. Vincent's Close, Girton, Cambridge.

AT the Watford meeting of the **West Herts Tape Recording Society** members were invited to bring along sounds which they would like to have with them should they be cast away on a desert island. The conditions being that they may have as few or as many sounds as they wished but they must be confined to 45 feet of tape at 3½ i/s. That was not all, for the tape was to be presented in the form of an endless loop for this was a desert island without spools. Most of the entries consisted of sounds which would be left behind at home such as the children and traffic etc., but the judge, James Boyland,



Members of the Pietermaritzburg Tape Recording Club, photographed during a recent club night.

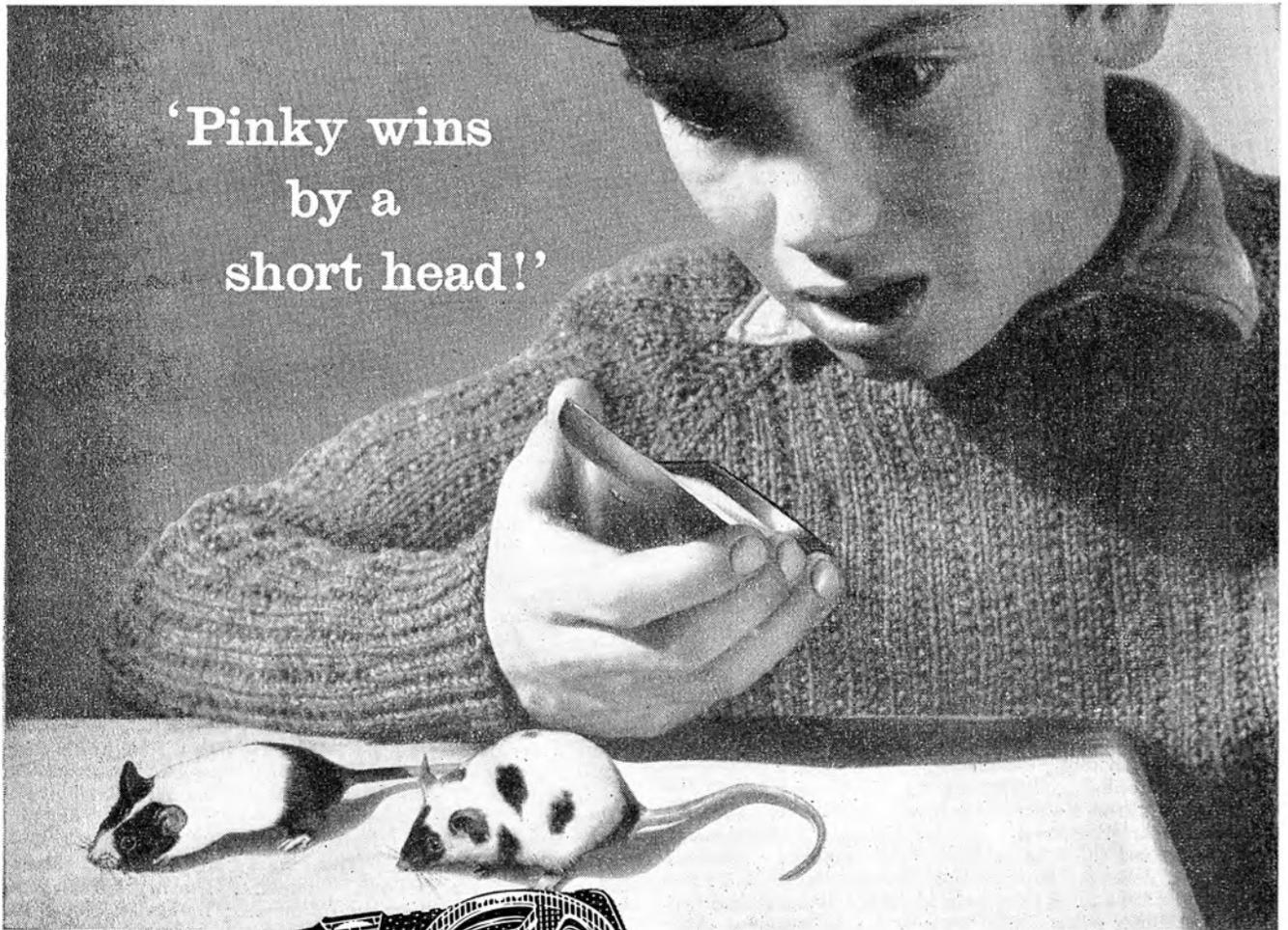
awarded most points to Vera Jackson for her unusual composition. Mainly it was compiled of cries of "Help" and "I'm over here" although there was a description of a cricket match too. Her prize was a book on tape editing.

At a later meeting tapes were brought for editing the sounds recorded during the summer activities. Under the guidance of Jack Hill, librarian, the buses, fairground and water sounds were dubbed along with a very useful recording of various train and station sounds recorded by Michael Coates at Bushey station. In another part of the building John Grainger and a few more were busy concocting some "space" sounds for use in the science fiction programme. Future meeting dates are available from P. Holloway, 29 Fishery Road, Boxmoor, Hemel Hempstead, Herts.

THE Pietermaritzburg Tape Recording Club has been in existence for just over 12 months. The September meeting was held at a new venue for the first time, one of the local hotels in the City. Up until then members have had the use of a church hall. This proved well for a certain time but as the club progressed, as it has done, another venue was sought. Now the club is in a very comfortable place. The club is one of five clubs now in existence in South Africa. Tape recording in the last few years has become very popular in that country. The club now has a membership of 35.

At the September meeting Mr. Goldsmith gave a very interesting talk together with a demonstration of how to keep the recorder in good working order. He "pulled" his own machine to pieces showing how to oil and clean the parts on the recorder. Tony Hofmeyr, the genial secretary/treasurer, also gave members a tape-slide show of Sani Pass. So all in all a very successful meeting at the new venue. The club's address is as follows: *The Pietermaritzburg Tape Recording Club, P.O. Box 40, Pietermaritzburg, Natal, South Africa.*

THE inaugural meeting of **Leyton Tape and Audio Club** was held at the Harrow Green branch library and was attended by sixteen persons. The first item on the agenda was the election of a chairman for the evening, this job was voted on by Mr. G. H. Saddington, a very well-known active member of the Leyton Music Society. Mr. Saddington then called on members to name the club. After a second reading of those names that appeared suitable, the name **Leyton Tape and Audio Club** was voted for unanimously. The chairman then called for selection of the officers of this club, Mr. Terry was nominated as chairman, and elected. Mr. Turner was nominated as secretary this was also passed and Mr. Roberts by virtue of the fact that he had kept his own books in order for the past thirty years with a local company was elected treasurer. Further details can be obtained from J. Turner, 1A Frith Road, Leytonstone, London, E.11.



'Pinky wins
by a
short head!'



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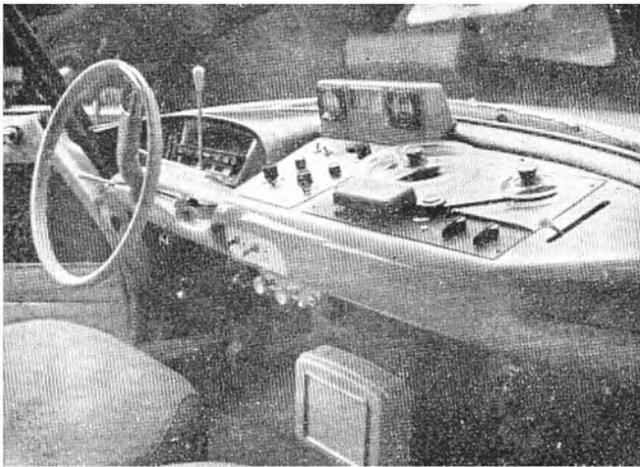
In fact, the whole family's agreed about one thing: no other instrument in its class gives you such faithful reproduction and such simple, efficient operation as Philips Family Tape Recorder. Not to mention four-track recording that provides up to eight hours' sound from a single 7" reel of D.P. tape—Philips tape, of course!

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- Practising public speaking.
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- Spoken letters to relatives overseas.

NEWS FROM THE WORLD OF TAPE



RADIO Monte Carlo have, for some time, been using an Ampex 601 recorder/reproducer built into the dash board of the French car, Citroen DS-19.

This unusual mobile installation has been used by Radio Monte Carlo, according to the station's chief engineer, M. Auvray, to simplify problems of remote recording for broadcasting. The electronics of the Model 601 were modified to suit the special operational requirements for recording in the automobile.

Two switchable inputs were designed so that playback signal from the tape could be mixed with a microphone signal or two microphones could be mixed for simultaneous recording. The meter panel in the centre of the dash contains the regular VU meter with the addition of a voltmeter and a frequency meter. Power is supplied through a 50-cycle converter by the 6-volt battery of the Citroen. All cables and accessories are carried in the car's trunk so that the interior remains free for passenger seating.

Tape Recording Course for Teachers

A ONE-DAY tape recording course has been organised for ministers, Sunday school and youth club leaders, by World Council of Christian Education. The aim is to stimulate the use of this exciting and challenging aid to teaching, to offer technical instruction at whatever levels may be required and to encourage interchange of ideas and experience among participants. The main lecturer at the course will be John Weston. He has won the educational section of the British Tape Recording Contest since its inception, and last year was awarded the Grand Prix as the outright winner of the International Tape Recording Contest as well. The course will be limited to 16 applicants. It is therefore essential to register well in advance, enclosing the course fee of ten shillings. Registrations should be sent to *The Rev. Cyril Thomas (Secretary), Churches' Television Training Centre, Central Hall, Tooting Broadway, London, S.W.17.*

Students to Make Tapes For Blind

TAPE recording fans in South London will be invited to take part in a project to establish a regular service of news and entertainment on tape for blind and other disabled people. The project is likely to stem from a new L.C.C. evening class in tape recording technique which is being started at the Henry Thornton School, Elms-road, Clapham, a branch of the Clapham and Balham Institute. "This is an entirely new departure," said the Principal, Mr. E. Auerbach. "The class is intended to benefit those who want to learn the art and technique of

tape recording, and how to make the best use of their equipment and their own special aptitudes. We think it may develop into something quite interesting."

In charge of the class is Mr. Walter Gillings, of Ilford (Essex), a former newspaper editor who is well-known in the tape recording field for his production of sound news bulletins for the blind. "There's a great deal of useful work to be done along these lines by people who realise the true potentialities of the tape recorder," said Mr. Gillings. "We hope to show them how to go about it, and to enlist local talent in making recordings for presentation to old folk's clubs, the blind and disabled. Local entertainers, amateur actors and writers who want an outlet for their energies will be able to render valuable service to the community in this way."

The new class meets Monday evenings at 7.30, at the Henry Thornton School.

Home Repairs to Recorders

MANY problems confront the long-suffering tape recorder service engineer, not the least of which is the number of foreign bodies that find their way into the machine, sometimes by accident, more often by design.

The "museum pieces" shown in the photograph have been extracted from Grundig machines returned for service.

Top line (left to right).

1. This screw was fitted in place of a fuse with disastrous results.

2. The rating of this fuse was 100 times too high.

3 and 4. Gadgets manufactured by some person or persons unknown to connect knobs to the spindle.

5. This record and erase head was so badly worn that it had gone right through to the plastic behind.

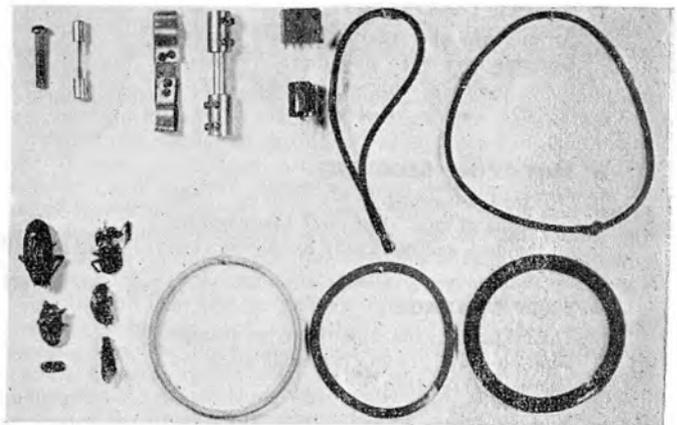
6. Broken belts joined together by thread!

Bottom line (left to right).

7. The charred remains of a family of cockroaches.

8. Three improvised drive belts. The first of unknown origin, the second a bottle closure, the third a belt taken from a vacuum cleaner.

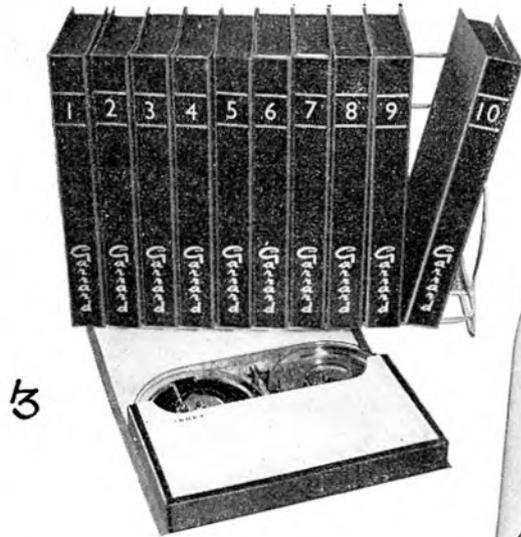
Grundig beg customers to contact their dealers for any replacement parts that may be required. A letter or telephone



call from the dealer to Grundig Spares Department can save time, energy, money and frequently expensive damage to the machine.

THE price of the Grampian DP4/L (low impedance) microphone complete with connector and 18ft. screened lead is £8, and that of the medium and high impedance model is £9—not as stated in the October issue.

4 REASONS THAT MAKE THE **Garrard** TAPE SYSTEM SO SIMPLE



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1 SIMPLE TO OPERATE

Anyone can operate the Garrard system. Controls have been simplified. There are three positions only—PLAY—RECORD—WIND.

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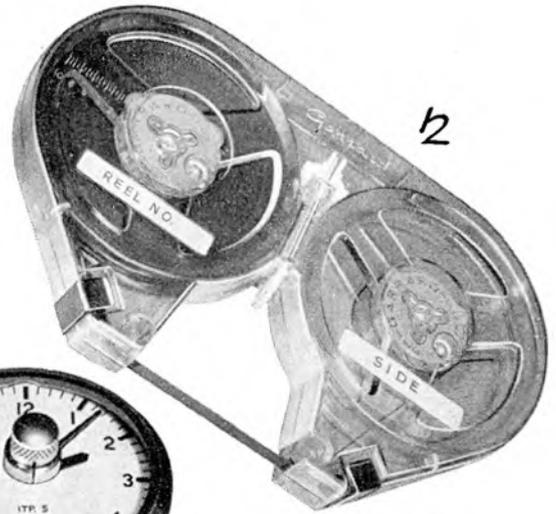
No tape threading. No spilling. No anchoring of tape. Just place the magazine on the deck and it is ready to operate.

3 EASY STORAGE

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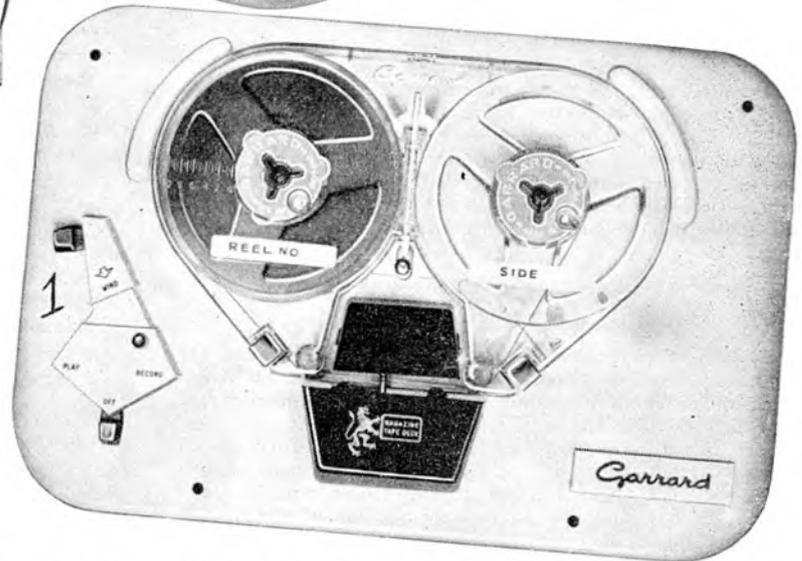
Gives precise and accurate indication of recordings on the tape.



2



4



CONTINUOUS-EASY TAPE RECORDING & PLAYBACK WITH THE GARRARD MAGAZINE METHOD

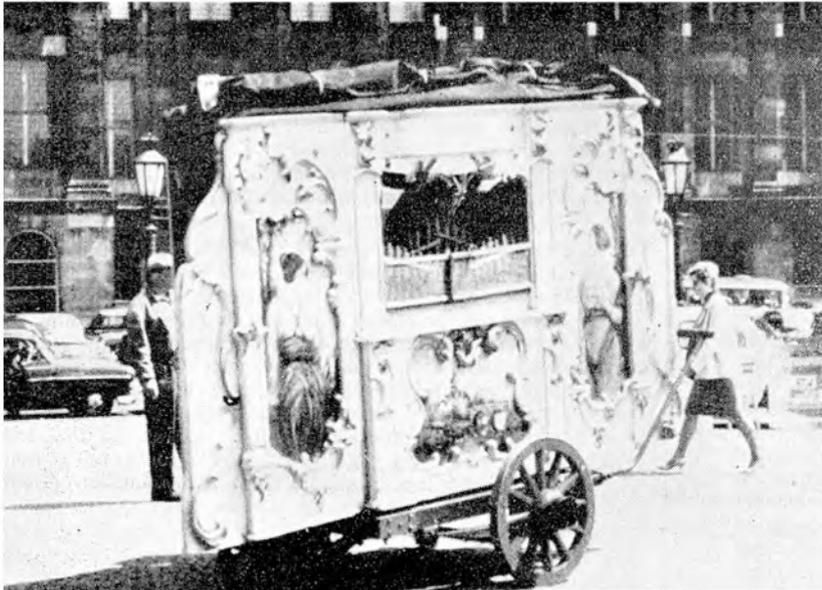
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Magazine containing 650 ft. Double Play Tape in container ...	1	13	4
Magazine only with one empty spool	8 0
Reel of 650 ft. Double Play Tape ...	1	4	0
Garrard Spool only	3 3
Library Storage Magazine Container	3 6
Tape Position Indicator ...	1	19	6

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A TOUR IN EUROPE WITH TAPE RECORDER AND CAMERA

by CLIFFORD A. BENN

TWO years ago I took my holiday on a coach tour to Switzerland. Although I had my camera with me and took about ninety colour pictures, I wished that I had had a portable recorder as well, for the Courier was most informative about the places we visited and I felt it would have been more interesting, when showing my colour slides afterwards, to have had the actual sounds which accompanied the scenes shown.

This year, I determined to do better and, before setting off on a similar tour to Paris, Brussels and Amsterdam, I armed myself not only with a camera but also with a Fi-cord, eight reels of tape, a spare set of batteries, a battery charger and spare fuses, and of course a Gramian microphone. Quite a formidable array when gathered together, so I decided to use an ordinary brief case as "hand luggage" which is permitted on the coach. One pocket of this was loaded with the usual paraphernalia of passport, map, itinerary, etc. The Fi-cord fitted beautifully in another pocket, with the controls easily accessible just under the flap of the brief case, and there was still ample room for the microphone, camera, and a few spare reels of tape. All other items were packed in the large suitcase, as they would only be required at night.

Inconspicuous Recording

The first opportunity of making actuality recordings occurred at Southend Airport; and I recorded the public address loud-speaker requesting various parties, including our own, to assemble at the departure bays when the planes were due to leave. It was there that I hit upon the technique of making recordings inconspicuously, which I used throughout the holiday. With the brief case on my knee, flap towards me, I could operate the Fi-cord on-off switch with my fingers, whilst the flap of the brief case concealed what I was doing. At the same time the tip of the microphone could be poked out about half an inch from the other end of the flap. If desired even this half-inch could be covered round the edge with the fingers of the other hand without any handling noise being recorded.

Once aboard the plane, I recorded in the same way the noise of the engines warming up, and the welcome, and safety instructions, which were given by the steward.

We were soon at Ostend, where we joined the coach which was to take us on the remainder of our week's tour. The seat which I occupied had a loudspeaker over it, which gave a remarkably clear reproduction of the Courier's voice as he spoke into the microphone at the front of the bus, and it was very simple to make recordings with the brief case and microphone on my knee as already described.

Up to this time I had been recording at $7\frac{1}{2}$ i/s, but as our Courier enlivened the journey, through an otherwise rather

dull countryside, with an interesting account of the people and customs of Belgium, it soon became apparent that I should be forever changing tape; so all subsequent recording in the bus was done at $1\frac{1}{2}$ i/s. This was found to be quite adequate in view of the fact that I was only recording speech which was inevitably mixed up with a certain amount of bus noise in any case. Although I did not make any special effort to eliminate the bus noise, I found that it recorded at an acceptably lower level than the speech signal. As it is primarily a low frequency noise, a certain amount of bass cut helps to hold it back upon replaying the tape.

A Visit to Antwerp Cathedral

On principle, I do not like the idea of recording people unawares, so by the time we reached Paris I felt I knew the Courier sufficiently well to ask him if he minded my taking down his commentary and he did not offer any objection. In fact, he later asked to hear a sample to see what it sounded like! During the week's holiday I recorded pretty well all he said over the microphone, and at $1\frac{1}{2}$ i/s this amounted to about four $3\frac{1}{4}$ in. spools of tape.

Opportunities for actuality recordings were somewhat limited as we did not have very much free time in any one place, and it is necessary to spend some time in a city before one is able to forecast when and where some of the characteristic sounds will occur. It was not difficult, however, to record the sound of the trams and traffic in Brussels and Amsterdam.

I had two particular strokes of luck at Antwerp and Amsterdam. We stopped at Antwerp for a morning coffee break and to look at the Cathedral. When we went into the Cathedral we found that a service was in progress, and the choir was singing most beautifully. I hastily returned to the bus for the Fi-cord and, tucking it under my arm, with the mike in my pocket, I re-entered the Cathedral with the recorder unobserved, as I naturally did not wish to become involved in an argument (in French, Flemish or even in English) with the Verger who was standing near the door. Once inside I was able to lean casually against a pillar, which screened my movements, and captured a few minutes of the choir very satisfactorily at $7\frac{1}{2}$ i/s.

Again, in Amsterdam, whilst having coffee at a street-side table, an itinerant accordion player came along and played a few tunes for the entertainment of the customers and the replenishment of his collecting box. It was the work of a few moments to make a useful "atmosphere" recording. Immediately afterwards I went into the central square and found a very fine specimen of a mechanical pipe organ being played. I gather it is known as "The Pride of Amsterdam". It simply had to be recorded and, of course, some photographs of it were taken at the same time.

Continued overleaf.

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A CONTINENTAL RECORDING TOUR (continued)

When I returned from my holiday I had about five 3½ in. reels of recording. Much of this was the information about the places we visited which the Courier had given to us on the bus, and this was supplemented by actuality recordings made at 7½ i/s. I also had something like a hundred and twenty colour slides of the places which we had visited.

The next step was to make a copy of the original recording on to a single edge of tape at 7½ i/s. This was to be the tape to be edited, so this speed was chosen for ease of cutting. As there was originally something like six hours of recording, making this copy sounds a rather expensive proposition, but by the time the pictures were available it was easy to see that much of the commentary was not relevant to the pictures, and could be omitted. Secondly, the copying was carried out in stages a day or two's recordings at a time. Each stage was then edited before commencing the next section, so that tape which was wasted from the first "stage" could be re-used. Thirdly, the cheap tape available from many London dealers was used.

Editing

Editing was done the only really satisfactory way, but cutting out unwanted portions of tape with scissors or razor blade and joining with splicing tape. Splices joined with tape will not come apart accidentally but can be separated on purpose if it is found later on that some change in order, or further deletion or addition, would effect an improvement. A rough editing was carried out first to eliminate obviously unwanted material. Several more "runs" were then required to suit the length of tape to the number of pictures which I had available.

Experience shows that an audience requires 10 to 20 seconds to "take in" each slide, and this factor should be allowed for when editing the commentary. It was sometimes necessary to separate statements in the commentary to allow extra time for viewing the slides. Now, the commentary was necessarily recorded in the moving coach so there was always a background of "bus noise" with it. Consequently, a section of original tape was found which had recorded on it only "bus noise" and no commentary. This section did not have to be very long as it was made into a tape loop, the "far side" of which was kept taut by a pencil held in the hand whilst it was copied for several minutes on to a length of the "copy tape". This piece of copy tape could then be cut up into lengths as required, and spliced in between comments which were originally too close together to allow enough viewing time for the slides which were to go with them. Had blank tape been used for this purpose, the sound heard by the audience would suddenly have "gone dead" periodically and would have been distracting.

Comments added later

For a similar reason it was decided not to add to the tape any of my own comments recorded afterwards at home. The insertion of such additions would have drawn attention to the background noise in the other parts of the commentary. If such a noise is continuous, the ear soon ignores it, but this natural filtering cannot operate so effectively if the noise is intermittent. Where discontinuities such as a new day's journey had to be explained to avoid confusion, this was done by inserting a "title slide" amongst the picture slides.

In Antwerp a number of pictures were taken of the Cathedral in order to go with the recording of the choir. Similarly, in Amsterdam, several pictures were taken of the mechanical organ to show whilst part of that recording was being played. The recordings of street noises and trams of Brussels and Amsterdam were used to accompany pictures of these towns by night, showing the neon lights and shop windows, some of which are triumphs of window dressing.

Finally, the recording of the street accordionist in Amsterdam makes authentic opening and closing music for the whole programme. In the final form there are about a hundred and ten slides and the commentary lasts about forty minutes.

... tape recorder workbench

No. 28. MIXER UNITS

by A. Bartlett Still

A NUMBER of the domestic tape recorders that are (or have been) available incorporate provision for input mixing to increase their flexibility. In the simplest cases this consists of a "passive" mixing network built on to the front end of the normal amplifier system. By "passive", in this sense, is meant that there are no valves or amplifying devices, solely resistive networks are used.

One of my readers has already seen the possibility of building such a unit as an extra, to be used with a standard tape recorder, and, since I think others may well be interested, I am devoting my space this month to the subject.

The Requirements

The requirement put to me was for a four-channel unit: Channel 1, low impedance microphone; Channel 2, high impedance microphone; Channel 3, VHF tuner; Channel 4, P.U. (high impedance). The output was to be suitable for feeding to a high impedance ($2\frac{1}{2}$ M ohm) microphone input socket on the tape recorder. An added proviso was for one of the microphone inputs to be capable of phase reversal, so as to enable two microphones to be correctly used together.

Ideally, on any mixer, a signal can be altered in amplitude only (no frequency effects), and alteration of the level of one channel should not vary another (no interaction). With a passive type of mixer it becomes even more important, however, to reduce the insertion loss on the low level channels. In consequence interaction on the other channels becomes inevitable. The effect is to reduce the signal output from, say, the Tuner unit as one of the microphone channels is brought in. In practice this need not cause any concern and may even be desirable. As there is plenty of signal voltage in reserve on the other two channels large value resistors (R1 and R2 on my diagram) can be used to avoid the same effect the other way round.

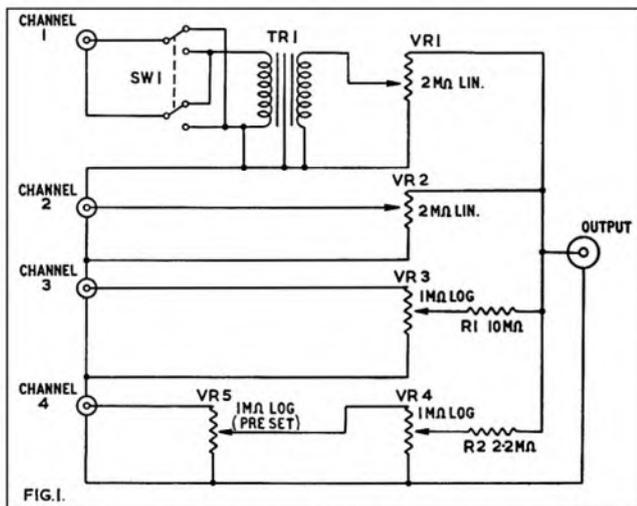


Fig. 1. Circuit diagram of a four channel passive mixer unit.

Turning to the circuit I have drawn, let us look at each channel in turn. Channel 1, for microphones of low impedance, has the phase reversing switch, which can be either rotary wafer or toggle type, inserted in the low impedance input side. Where balanced microphone lines are used, the connection to the common earth will go, not to one side, but to a centre tap of the transformer primary. The transformer will be a normal micro-

phone input transformer, preferably mu-metal shielded. The output of the transformer is taken to a potentiometer connected "the wrong way round," since in this way the interaction on other channels is reduced, at the expense of a slight variation in frequency response, without the use of an isolating resistor and consequent insertion loss. For a high Z microphone, channel 2 operates in the same manner, but without the impedance transfer. Because microphones of this type normally use single-screened cable, phase inversion should not be attempted. If two high Z mic. channels are required, they would both be as channel 2. It should be remembered that the control circuits on both these channels are operating with a low signal voltage and at high impedance. This means that care must be taken to keep the "live" lines as short and direct as possible and screening is advisable.

To meet the requirements outlined above, Channels 3 and 4 can be identical, but I have shown alternative circuits which may be used as desired. For Channel 3 a conventionally wired potentiometer is used with an isolating resistor of a high value. This resistor (R1), serves the purpose of isolating this channel from the others and also itself forms a potential divider with the load resistance to be connected to the output socket, thus reducing the signal level to the same order as the microphone channels. It will be noted that a potentiometer with a logarithmic law is used to give a better fading control. With the reverse connection used in Channels 1 and 2, linear law controls give a better effect.

Fader Control

In the alternative arrangement, shown for Channel 4 in my diagram, two potentiometers are used. One of these (VR4), provides the main fading control while the other is intended to preset the signal level. This device is useful since it allows the correct signal level for good recording to be produced with the fader control at maximum, and prevents working solely over a small part of the travel. As a result the value of the isolating resistor (R2) can be reduced to a value where it is less likely to introduce noise into the circuit.

From the constructional point of view there is not a great deal that needs to be said. All the components should be housed in a completely enclosed metal box or case for screening purposes, and the screens of internal connecting wiring should be well bonded to the earthy side of the output socket. The connecting sockets used should be of good design since a poor contact would result in a noisy signal, introducing plops and crackles every time a wire is moved. The potentiometers used for the fader controls can be of standard size, but it is suggested that the largest knobs available should be fitted to facilitate easy and smooth operation.

Screen it—and keep it Short!

One final point: the cable used to connect the mixer unit to the tape recorder should be kept as short as possible, and particular care should be taken to use wire with a screening braid of very close mesh.

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FACTS ABOUT 4-TRACK RECORDING

By Graham Balmain

FAULTS THAT MAY BE ENCOUNTERED, AND ADVICE FOR CORRECTING THEM

MOST domestic tape decks—let's face it—were born with half-track minds. To see what this implies, look at **fig. 1**, which presents some of the vital statistics of an average (*but imaginary*) deck as they affect the tape; and if you have previously assumed that the tape moves in a straight and narrow path across the heads, prepare to think again! A "quarter-inch" tape may actually measure anything from 0.244 in. to 0.248 in. wide (see *BS1568: 1960*) so that, if the tape has a mind to wander about, it has 12-16 thou' of leeway available; say about 14 thou'.

Assume now that we have a perfectly straight half-track, recorded in the right place on a good piece of tape, which we wish to play on this deck. For some reason—a crooked spool, perhaps—the tape weaves up and down slowly against the heads, and obviously a half-track playback head will miss some of the recorded track most of the time. How severe the consequent output variations are depends on where the playback track is to start with. If it is placed centrally in the total width occupied by the weaving track, as in **fig. 2 (a)**, the maximum possible track loss is 7 thou', or 7 per cent. of the total, giving output variations of 0.65 dB. These will generally be inaudible.

Loss that sounds like wow

With a playback track at one edge of the recorded track's travel (**fig. 2b**), up to 14 per cent. of the track can be lost, with output variations of 1.3 dB. This is just becoming audible, although it could be mistaken for slight "wow". If the track is adjusted so that its edge just appears at the edge of the tape when the latter is against the upper guide flanges—a practice which is not uncommon—we get the condition shown in **fig. 2(c)**, where some of the recorded track is never scanned, and the possible output variation is rather more, about 1.5 dB, but still

not objectionable. Any further misadjustment causes the possible variations to increase rather rapidly, however.

So far, so good. Despite some rather imprecise tape guiding, our half-track mechanism will give little hint that this exists, by simple track loss anyway, provided that the playback track is in the right place. And this will hold good even if the recorded track, having been recorded in the same conditions, itself weaves on the tape, for all *that* does in general is to make the output variations more rapid and irregular.

What happens if we now fit quarter-track heads to the same deck? (This practice also is not uncommon). **Fig. 3** gives the clue for the two conditions corresponding to **fig. 2 (a)** and **(b)**. The possible output variations amount respectively to 1.55 dB and 3.4 dB, i.e., appreciable and disconcerting. (The outer tracks are already at the tape edge anyway, so 2(c) is covered by (b) in the $\frac{1}{4}$ -track case).

Uneven Winding

The tape need not only move bodily up and down, of course. If the winding on the supply spool is irregular, the tape may well weave off the spool faster than it can do so at the capstan, so that it moves at an angle across the heads rather than horizontally, the angle varying more or less irregularly. The maximum possible skew is shown, *much exaggerated*, in **fig. 4**, where the tape is lying at an angle of about 15 minutes of arc to its proper direction. This leads to the usual loss due to azimuth misalignment, which amounts in this case to about 2 dB of a 10 Kc/s signal recorded on a $\frac{1}{2}$ -track at $7\frac{1}{2}$ in/sec (or on a $\frac{1}{4}$ -track at $3\frac{1}{2}$ in/sec) when the head alignment is correct. If the head alignment is also off by 15 minutes the possible variations of the 10 Kc/s signal are over 6 dB. And, as before with the track loss, further misalignment increases the output variations

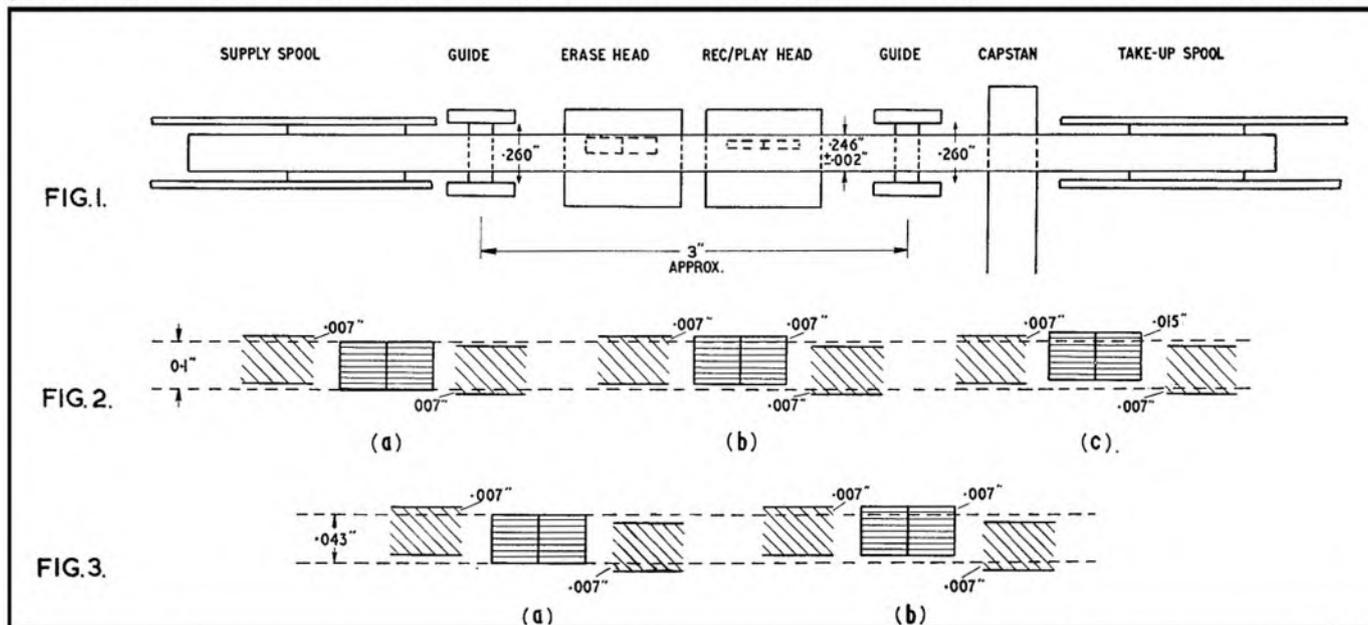
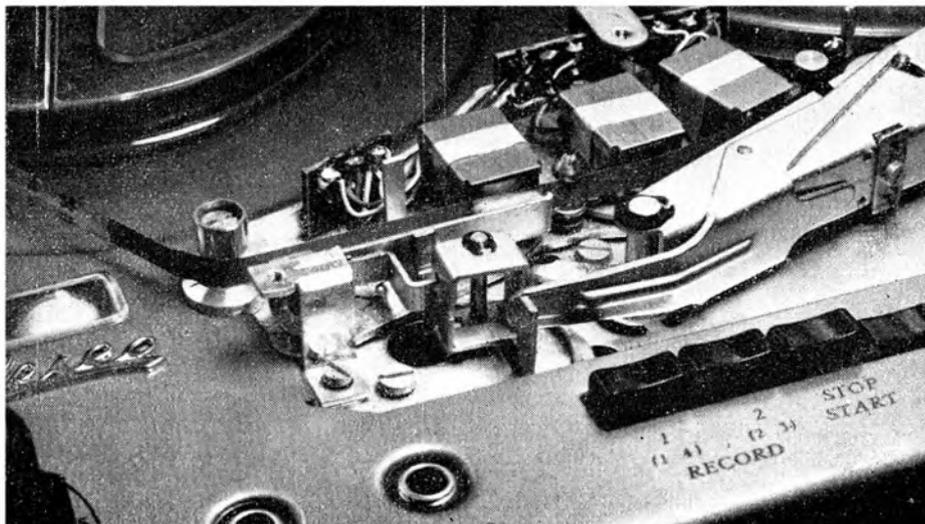


Fig. 1. Guiding arrangements of average domestic deck, definitely imaginary, definitely not to scale. **Fig. 2.** Track loss due to tape weave on $\frac{1}{2}$ track recording. Dotted lines show correct position of recorded track, shaded areas show extreme positions (a) Head track at correct height (b) 7 thou. high (c) 15 thou. high. **Fig. 3.** Track loss due to weave on $\frac{1}{4}$ track recording. (a) Head track at correct height (b) 7 thou. high.

FACTS ABOUT 4-TRACK

● Four-track recorders can be very good indeed, and the photograph on the right illustrates the head assembly and guide path of one of the best—the Tandberg Series 6. Needless to say, warped spools and faulty tapes should be avoided with this machine, as with all others, but the careful design of the Tandberg controls much of the potential trouble.



even more, because of the increasing slope of the output/misalignment curve (fig. 5) away from its peak.

Note here that the effect of azimuth misalignment *decreases* with a decrease of track width, but *increases* with a decrease of speed, for a given signal frequency.

Now this is a gloomy picture indeed. How can you ever enjoy music from a tape, if this kind of thing happens? The answer is that it doesn't, necessarily; I say only that it *could* happen in extreme cases. But there will always be some variations of this kind on our average machine. To convince you of the possibility, I have "mocked-up" such a machine and played on it a tape, recorded on a known good recorder with a steady h.f. signal to produce the chart of fig. 6. The caption gives details but, roughly, it shows the difference between a smooth, straight tape travel and one which has all the faults we have discussed so far, except the crooked spool.

Throw away the duds!

Have you ever noticed a slight roughness or wavering in tape reproduction—hard to pin down; might be bad tape, might be slight machine flutter? It could be this! Something can evidently be done about it, otherwise the one half of my chart would not be so even. There are in fact one or two quite simple precautions which you can take to get over the worst of the trouble without even lifting a screwdriver. If you are prepared to do this also, then matters can be improved even more.

The simplest precautions concern even winding, and the first thing you should do here is to examine all your spools and ruthlessly scrap any which are obviously untrue. Slightly-warped flanges do not matter unless they actually scrape the tape; it is the centre hubs which cause trouble, when they are lumpy, conical or markedly eccentric. Spools which sit crookedly on the carriers because the centre holes in the two flanges are offset should also go, unless they are the metal screw-together type which can be reset.

Check crazy rewinds!

Once you are sure of the spools, you can take the next step. If your machine is one which whips the spools round at ridiculously high speeds during winding back, try restraining the free spool with a light thumb pressure before it gets up steam. This should improve the wind considerably, and it is worth taking two or three times the normal winding time to do it.

With a little practice, you should be able to achieve a smooth pad of tape which is just tight enough to support itself clear of both spool flanges—but don't overdo the tightness, or an impression of the loading slots in the hub will be embossed on many successive layers of tape. Such a pad is obviously spooled at a convenient fixed height (provided other things are correct),

and the tape will therefore enter the guides again at the same constant height during a subsequent record or playback operation. It is well worth re-spooling each tape in this way before each use, although, if you can be certain that the pad will not shift on the spool during storage or handling, it may be enough to rely on the goodness of its last rewind. It helps in this case to mark the spool, and to load it to correspond with a mark on the supply carrier each time, for few spools or carriers are absolutely true even if they seem so to the eye.

All this will be impossible unless the carriers themselves, and the spindles on which they run, are also reasonably true, although there is not much that the non-technical amateur can do if they are not. The best cure for a crooked carrier is to change it for a new one. Exchanging the two carriers (on the assumption that the take-up side is less important than the supply side) is not really satisfactory, for with two- or four-track tapes the spools themselves have to be exchanged at the end of each track, and the take-up wind should, therefore, be as accurate as the supply rewind. Bent carrier spindles are even less amenable, and should be tackled by an experienced engineer, especially if they belong to spool motors.

However, you can at least make sure that the spindles are vertical. If they are not, then take up your screw-driver and make them so. The manufacturer's service manual usually describes this simple operation; if not, a little examination of the

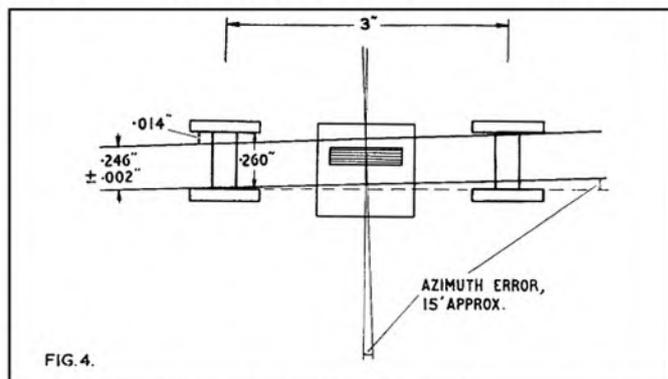


Fig. 4. Azimuth error due to tape skew, heads correctly adjusted.

motor or spindle-bearing mounting will make the method of adjustment obvious. (I hope it is not necessary to warn you to **Disconnect the Mains** before you adjust anything inside the recorder.) At the same time, adjust the height of the carriers, if necessary, to ensure that the tape pads are wound midway between the spool flanges.

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FACTS ABOUT 4-TRACK RECORDING—continued

Look at the Guide Path

Last among the simpler measures you can take is to check the run of the tape along the guide path. There may be other guides between the two shown in fig. 1, and your aim here is to ensure that they are all at the same height, so that the tape travels smoothly and straight along its path without being forced out of its natural vertical position at any point.

You may be tempted here to try restricting tape weave by arranging that, for example, the upper edge of the tape runs against the upper flanges of the two outer guides and its lower edge against the lower flange(s) of the other(s). This is satisfactory up to a point, but do not try to eliminate weave altogether in this way. For one thing, tape varies in width, for another, of

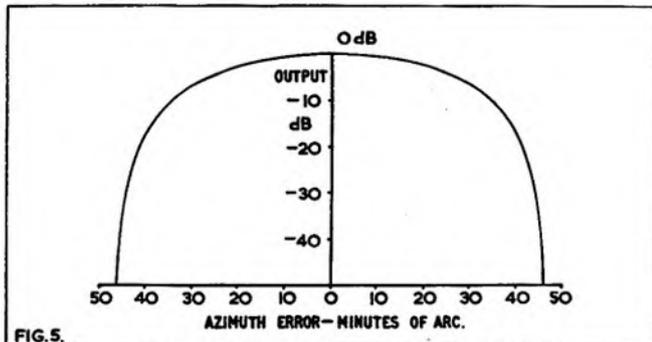


Fig. 5. Output loss due to azimuth error, for 10 Kc/s recorded on a $\frac{1}{2}$ track at $7\frac{1}{2}$ i/s or on a $\frac{1}{4}$ track at $3\frac{1}{2}$ i/s. Approximate only.

all parts of a tape, the edges are most susceptible to damage, and the present outer $\frac{1}{4}$ -tracks either are very near or may even include the edges (see Footnote). On balance, it is wiser—with most designs of guide at least—to let the tape weave a shade rather than attempt to guide it too firmly.

Cleanliness most important

Cleanliness is also of great importance here; any oxide deposits *must* be removed from guides (from the corners especially) and heads, as they are very abrasive. But do this with care, to avoid scratching surfaces which contact the tape; use ordinary petrol lighter fuel (or carbon tetrachloride provided it

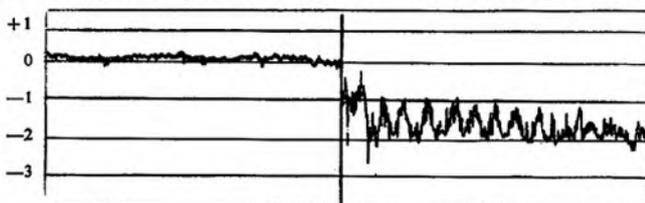


Fig. 6. Chart recording of a 5 Kc/s steady tone, recorded at correct azimuth on a straight $\frac{1}{2}$ track at $3\frac{1}{2}$ i/s and replayed on a "mock-up" of Fig. 1. (a) Well-wound, azimuth and track height correct. (b) Badly wound, azimuth error about 15 min. of arc, track set about 5 thou. low.

is kept away from any plastic on the recorder casing) applied with a camel-hair pencil brush to heads and with a rag or matchstick, if necessary, to other parts.

Further adjustments

The other measures to be taken will now be obvious to you from the first part of this article, but inexperienced users should not attempt to adjust head height or azimuth without the help of a test-tape and an experienced friend or service engineer who is familiar with such adjustments. Similarly, if you want to try fitting narrower guides (some dimensions are suggested in fig. 7), you need the assistance of an instrument engineer.

If you feel capable of tackling these adjustments and modifications yourself, you do not need me to tell you how to set about them. What I am trying to do is to persuade you that

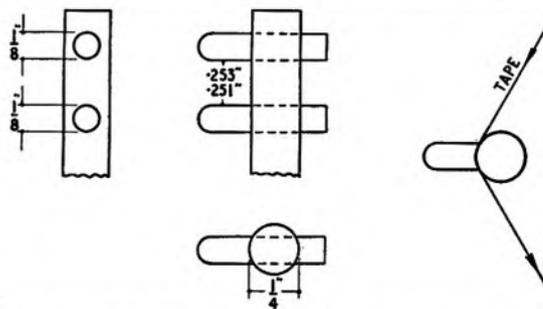


FIG. 7.

Fig. 7. Suggested design for tape guides. Material: brass, phosphor-bronze or non-magnetic stainless steel, smooth (or ground) and polished. Pins may be sapphire roundels with advantage (if expense no object). Dimensions in fractions not critical. The pin should be a light hammer fit in the stems, and there must be a square clean corner at the joint where the tape edge runs. This guide is probably the best simple design, as it ensures that the tape is cupped round the stem (and therefore at its most rigid) when the actual guiding takes place.

your quarter-track recorder—or indeed any recorder—may benefit from their being done. This is one case where it pays to be narrow-minded!

Footnote. The Magnetic Recording Industries Association of America has lately proposed a track layout based on 31 thou' tracks, positioned so that (a) there is a 4-5 thou' safety lane at each tape edge (b) each track falls within one or other of the present standard $\frac{1}{2}$ -tracks. I have myself proposed re-positioning the present $\frac{1}{2}$ -track heads to achieve similar benefits.

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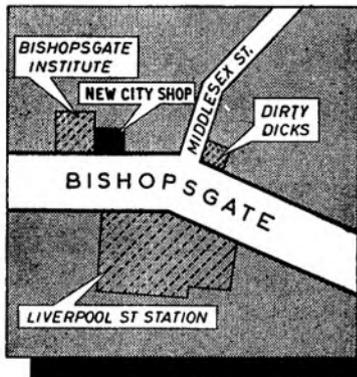


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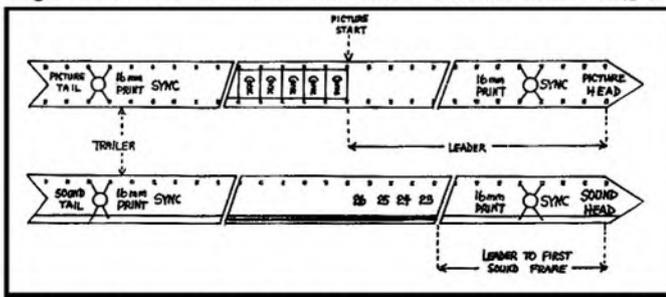
SOUND AND CINE

OPTICAL AND MAGNETIC TRACKS

By Richard Golding

I AM often asked why a final optical sound track is desirable for 16mm sound films although it may have less fidelity than magnetic stripe. The answer, of course, is that the optical track, whether variable density or variable area, can be handled by all 16mm sound projectors; the photographed image is permanent and cannot be affected by accidental erasure or adverse atmospheric conditions. It is also cheaper to produce where a number of copies are required, in other words, picture and sound may be duplicated together whereas mag/stripe must have the sound magnetically transferred after the photographic process is completed.

In the studios or on location original sound for final reproduction as optical track is usually recorded by a double film system with sound in interlock with the picture film in the camera. After processing and editing, sound and picture are printed on the one strip of film which is single perforated stock. The track occupies an area of about 0.065 in. in width on the unperforated edge and can be in one or two forms—variable area which is



Preparing the master sound and picture films for a married print.

composed of a moving line which widens or narrows according to the volume, the wider the line the louder the sound, and variable density which is composed of a number of tiny lines packed on top of each other across the width of the track, the lightest line being the loudest.

Both types of track reproduce equally well on the standard sound projector, the sound is always 26 frames ahead of the picture and both tracks reproduce sound in the same manner. A light in the projector sound head shines through the moving track on to a photo-electric cell where the variations in light are converted into electrical variations capable of the amplification and reproduction of the original sound.

When optical sound is applied to amateur films, the mechanics of the sound track should be handled by the commercial labs. Some amateurs, of course, do construct their own optical recorders, but these are exceptions and it is beyond the scope of this article to discuss this here.

Visual Modulations

With optical sound the modulations can be seen and, with experience, read with the naked eye just as a sound engineer can read the grooves in a disc. When you hold a piece of optical film with the image upright, if it is a positive print taken from a master negative, then the emulsion of both picture and sound track will be towards you, with the sound track on the right hand side. If the film was shot on reversal stock and/or the print made from an intermediate dupe negative the emulsion will be on the side away from you with also the track on your right hand side. When sending off for an optical print the labs should be informed whether the camera original was negative or reversal.

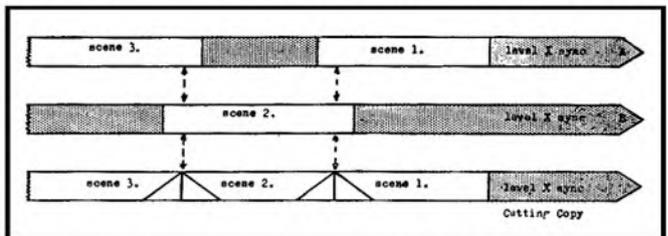
Modulated track is any track with recording on it, dialogue, music and sound effects etc., unmod track is free from sound. Over modulated track is distortion caused by too high volume.

The stages in preparing for the final transfer to sound-on-film are as follows: 1. The music and effects are prepared on a separate tape. 2. Commentary, music and effects are mixed into the master tape. 3. This master tape is sent to the labs for transfer to film. If the budget allows it is wise to have a cutting copy made at the same time. 4. The optical track is matched to the picture track by track reading on a sound editing machine or by running double-headed through a sound projector. 5. The picture and sound master prints are matched to the cutting copy, marked up and sent to the labs for the married print.

Track Reading

Of these stages perhaps the most difficult for the amateur is track reading. The professional, of course, has his Moviola type editing machine which normally consists of a small screen, a speaker mounted on a platform which contains a splicer, rewind arms and a two-way synchroniser. The mechanical functions giving a continuous movement for negative and positive film viewing with a clutch for taking out the film paths, with press-button and foot-control for instant stop in either direction. Other features which make the editor's life more interesting are variable speeds, fast rewind and mag/opt heads. A machine such as this is a must for the professional film editor who has a difficult and involved task. In a feature film he may be required to deal with over 2,000 takes from some 800 camera positions.

Unless he is making a sponsored film, and here the hire of cutting rooms should be included in production costs, the amateur's requirements are usually much simpler. His films are short and easier to control in the editing stages, his lip-sync usually in the form of short inserts, and his music and effects tape tracks less complicated. Even so some means of reading the track is essential so that each sound can be matched frame for frame to its appropriate action. The easiest way out is to run the film through a sound projector in the normal manner and tap the frame area with a grease pencil each time the required sound is heard. The marks should be made as close to the sound head as possible and can be adjusted later by visual examination of the mod track. It may be possible, however, in critical cases,

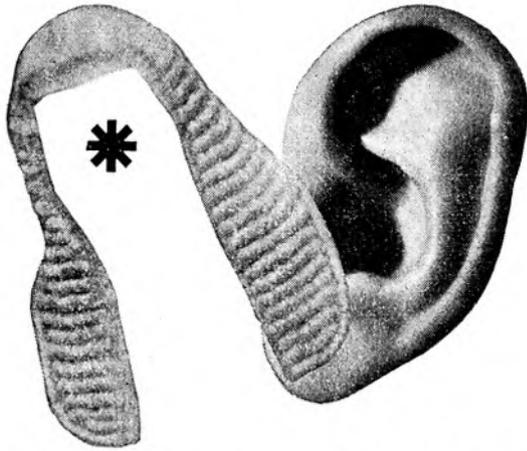


Assembling original 16mm A and B Rolls for dissolve.

to read portions of the track by pulling the film manually over the sound head but this method is tiresome and should be restricted to short sequences.

Separate soundheads with photo-electric cell and amplifier can be mounted on to the editing board and used in conjunction with a viewer. A two-way synchroniser is essential to keep sound and picture in step. These small units are very useful and cost, complete with footage counter, about £10. The separate sound-head system is most efficient for cartoon track reading, and exact registration is possible by winding the films through viewer and soundhead, marking each point that the grunt or groan occurs.

Before the master sound and picture films can be sent off for final transfer they must be given sync marks on leaders and



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trailers respectively. The leaders and trailers should be not less than 4 ft. in length. It is usual to punch a hole through a frame area and scratch two diagonal lines across it for head and tail sync marks. There are two ways to mark up the film and these are, Level Sync, i.e. when sound and visuals are placed side by side and where the labs make the necessary advancement of 26 frames, and Print Sync, i.e. where the editor advances the track himself before sending it off.

With Print Sync the leader from the punched hole in the picture film head must match frame for frame the length of the leader from the punched hole in the sound film head plus the first 26 sound frames. With Level Sync, both leaders are exactly the same length. The markings can be scratched on or made with the grease pencil, and the two films sent off to the labs for a married print.

Blooping

When matching the masters to the cutting copy it may be necessary to paint each splice with blooping ink, although theoretically a really accurate splice on a well modulated track should pass unnoticed through the sound head with the sound volume deadening any click. However, some quiet passages will invariably contain splices and these will have to be painted. The function of blooping is to cover the splice area on the sound track with a frequency lower than that of which the amplifier is capable of reproducing and which will pass silently over the soundhead. Reversal tracks should be blacked out and negative tracks cut with a special wedge or round shaped instrument.

A and B Roll Printing

A and B Roll printing gives greater freedom to the editor by allowing him to separate the print into two rolls. *A Roll* will have scene one and then black spacing followed by scene three and so on. *B Roll* will start with a length of black spacing equivalent to the length of scene one followed by scene two and so on. Both rolls can be marked up for opticals, i.e. fades, mixes etc. The spacing opposite the picture on any roll can support titles for superimposing. When sending A and B rolls to the labs for printing, it is advisable to send the cutting copy marked up for the effects required.

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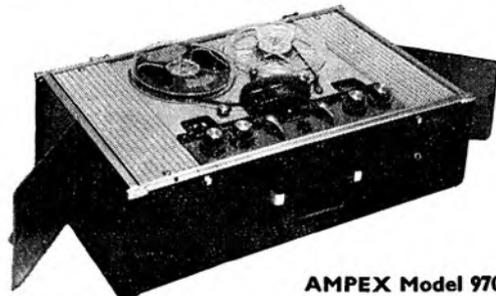
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Readers' Problems

Dear Sir:—With regard to your remarks about the "Countess" tape recorder in the October issue of your magazine. Who's kidding who? May I point out that the machine being sold under the name of the "Countess" at 30 gns. is not the same machine which sold for £90 under the name of "Timbra". If you will refer to *Tape Recorder* (December 1959, P. 491) the specification will show two speeds of $3\frac{1}{2}$ and $1\frac{1}{2}$. Frequency response 30-18,000 and 30-12,500 c/s. Wow and flutter is given as 0.075%. Your note goes on to add that separate amplifier is used for monitoring via the replay head. Size is given as $11\frac{1}{2} \times 12\frac{1}{2} \times 6\frac{1}{2}$ ins. Weight, 39 lbs. A slightly more detailed report was also given in *Tape Recording Fortnightly* dated 16th December 1959, but the specification is roughly the same except for frequency response with external amplifiers.

Now let us turn to the "Countess". The photograph which you depict on P. 449 is not of the Countess but is the original "Timbra" as, too, was that which appeared with H. Burrell Haddens article on the "Countess" in *Tape Recording Fortnightly* 12th July 1961.

Can you now explain why the "Timbra", now being offered at the wonderful bargain price of 30 gns. under the name "Countess" is contained in a cabinet made in England and has electronics of English manufacture and Plessey condensers etc. and has suddenly lost 9 lbs. in weight and now runs at $3\frac{1}{2}$ and $7\frac{1}{2}$ i/s with a lower frequency response than it had at $1\frac{1}{2}$ i/s? With wow and flutter up to 0.25%? For a bargain offer whilst supplies last, it has run rather a long time—3 months! and still they are available in plenty.

To quote your article... "It could not possibly be made and sold at this price today in this country..." Couldn't it? I was informed by Messrs. Radio Clearance Ltd., that it was being made in this country and that production was still going on. This ties up with the facts stated above, that it is despatched in corrugated cases manufactured in England by Messrs Cooks of Hatfield.

All the reviews, test reports, etc., have failed to mention one useful point. If left running for an hour or so, eggs may be fried on the deck over the capstan motor. Let's hope that the suppliers will have spare motors available! The hum level is higher than average. Strange noises come from the lower bearing of the capstan/fly-wheel assembly. The claim that superimposing facilities are available is hardly just since this entails placing a piece of card over the erase head. Monitoring via the speaker, is, I suppose possible if you can get your ear close to the speaker! There is no separate monitoring amplifier.

May I request, Sir, that you publish this letter in order that readers may draw their own conclusions? Further, that you should investigate this "mystery" and give a full report in your excellent journal.

In conclusion I would point out that my remarks are based on three machines purchased direct from the suppliers and which were tested by myself before being used by the owners.

Yours faithfully, R.V.A., Chesham.

Note: We never received for review, or even saw, an original "Timbra". We were informed that the currently available "Countess" was in fact the same machine under another name. The fact that the two specifications differ, as the writer points out, proves us to have been unobservant; and in this conviction we apologise to any readers who may have been misled by our carelessness. However, we must emphasise that no misrepresentation of these facts in our editorial is attributable to the present suppliers. We merely asked them (a) were sufficient supplies available to merit a write-up, so as to save our readers from the annoyance of planning for something which would not be obtainable, and (b) were there adequate spare parts and servicing facilities? These points established, we published the short review. The model tested has since been used quite considerably,

and has so far worked well and without trouble. As for the "mystery" of its origin, we are still in the dark. The fact that such a robust and well-built recorder can be "produced" for such a low figure suggests that its basic parts may have been bought up at a keen price. They may indeed be of Continental origin and of English assembly. The fact remains that the "Countess" still appears to us to be good value for money, and several readers have written to us, saying that they were very pleased with it. We repeat our apology for missing the points made by Mr. Aldridge. Editor.

Microphone Positioning

Dear Sir:—Since last fall, I have had opportunities to record amateur operatic performances with varying degrees of success. The singers are conditioned by modern disc recordings and seem to prefer "presence". I started from balcony locations 45 feet away and have since moved to overhead positions on stage in front of the curtains. The halls available hardly meet the ideals of the B.B.C. The microphones are seldom more than 15 feet from the floor. Should I expect standing waves beginning at 75 cycles? Recording equipment consists of Ampex 2 channel "portable" 350 coupled to 2 Philips EL 6040 50-ohm microphones feeding through a maximum cable length of 175 feet. The wide pickup pattern of the EL 6040 is an asset for close stereo work giving the performer an almost equal chance to be heard. Spacing by "thirds" across the stage gives adequate centre "fill". The overhead suspension seems to provide the most satisfactory solution for this type of recording. The orchestra is in the pit, and it usually gives a balance problem.

Equipment noise is an ever present problem. Most Los Angeles recording studios have mixing consoles with amplifiers separate from and bypassing into their Ampex machines. Low noise amplifiers are commercially available from Longevin in Santa Ana, California and claim minus 123 dBm! The circuit is 600-ohm transformers in and out with a 2-stage push pull 12AX7 and 12 BH7 in between. Maximum gain is 46 dB with $\frac{1}{2}$ % harmonics and 1% intermodulation. Priced for a quick sale at \$105 plus power supply at \$110 (will power 5 amplifiers) using oil filled filter condenser. The Ampex is -80dB for its microphone amplifier.

The current Ampex 351 electronics provided trouble in the early deliveries because of the small 12-volt tubes. This has been corrected. The studios are not in sympathy with the etched circuit because it is more difficult to alter the recording pre-emphasis to their own satisfaction.

At the present time I use the 350-microphone amplifiers and bypass the erase head with a dummy load on the electronics. I have to put my ear on the cone to hear much tape hiss.

Yours faithfully, J.M.G., Los Angeles.

The only people who really know how to use microphones are the recording and broadcasting engineers, and they are not likely to tell us! I sympathise with you over the preference for "presence". A little of it may be exhilarating, but I think we shall get tired of it. Even so, I think moving the microphones farther in was a wise move because of the big improvement in signal/noise ratio this will have given you—also a substantial reduction in reverberation.

Standing wave trouble? It depends on microphone polar characteristics and the ceilings, etc. I think that is a matter for experiment. I haven't experimented with spaced microphone stereo as I prefer the coincident variety—this is for home listening in well damped surroundings. The spaced microphone variety seems to be o.k. when played in a large hall, say, to a large audience. I have used the Lustraphone Stereomic—two ribbons, one above the other in a single case. I think ribbons can give less colouration for a given price than any other type. I have to work much farther away with this "single" mike, so I doubt whether my signal to noise ratio is as good as yours.

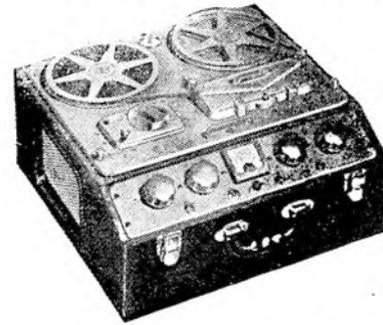
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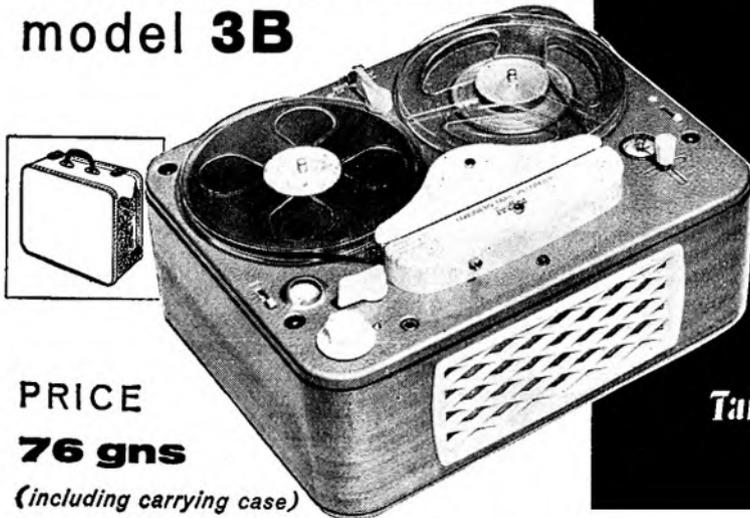
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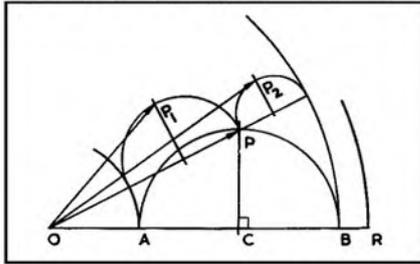
our readers write

. . . about tape calculating

From S. G. Caspard, 27 Burnside Road, Gosforth, Newcastle-upon-Tyne, 3.

Dear Sir:—On many occasions it is useful to know the halfway point on a reel of recording tape on a spool not marked off for this purpose. Below is a simple means of calculating this halfway point P.

Represent to scale the radius of the tape spool by OR and the part occupied by the tape by AB. Then bisect AB at right-



angles and on the point of intersection at C draw a semicircle of radius CB. Where the bisector of AB cuts the semicircle at P the halfway point is given. The distance of the halfway point P from the centre of the spool being clearly represented by OP. By repeating the process either way from point P it is quite easy to obtain divisions P1 and P2 respectively, and so on for further divisions of the tape if required.

Each loaded spool of tape can thus be marked off quite accurately to show at a glance the length of tape used or unused as a fraction of the total length. It avoids the laborious running through of a tape, which in some cases may not be possible in the time available—for example—borrowed tapes for reproduction by Dramatic Societies, etc. *Your faithfully.*

. . . about comparing machines

From:—C. H. Henderson, "Pinewood", Carne Close, Chandlersford, Hants.

Dear Sir:—I have just managed to acquire the specification for the new GRUNDIG TK. 14. On comparing my TK 20 with the TK 14 I find that the latter has somewhat finer points, e.g. the frequency response. This is just on that comes to my notice without checking the rest of the specification.

This means the TK 20 will lose its value in the second hand and part exchange market. Many TK 20 owners are still complaining about the drop in price a few months back, 52 guineas to 42 guineas. This puts my machine down to some £25-28, part exchange and £20-25 selling price (with luck).

For many years Grundig have led the field in Tape Recorders with a better class machine, why have they suddenly decided to change to a cheaper machine? They say to allow everyone to own a Grundig. I feel sure that price has second importance, the name, make and construction come first. *Yours faithfully.*

This letter was shown to Mr. Cole, the Chief Engineer of Grundig (Great Britain) Ltd. His answer is printed below.

Mr. Henderson quotes that the TK 14 is a better machine than the TK 20—this does not follow, although the specification which is the only point he makes does differ in its declaration. First he must not lose sight of the development and progress in all electronic matters. As far as the TK 20 is concerned, although the frequency response was originally quoted to be 60-10,000 c/s, + 4, -5dB, it must not be overlooked that during the manufacturing period of this model it became progressively easier for the TK 20 to meet this response, and in most cases to surpass its minimum performance.

There are of course differences between the TK 20 and the TK 14 To quote one, the TK 20 can monitor its own recordings, either through headphones or through its built-in loudspeaker,

while the TK 14 cannot. This is but one fact that enables us to hold the price of the TK 14 lower than that of the TK 20. And there are a number of other features.

Mr. Henderson must, I think, realise that every reputable manufacturer aims to produce goods to the highest possible quality and the lowest possible price. This has been done in the case of both these models. He should also be reminded that Grundig were certainly first in the field, and built the tape recorder market. During the last two or three years they have been followed by a number of other manufacturers, some producing very cheap machines which not only expanded the tape recorder market but tended to encroach on our cheapest tape recorder, which at that time was the TK 20 selling at 52 guineas. consequently bringing it into the middle class price.

. . . about four track recording

From:—A. Bartlett Still, 105 Lee Road, Blackheath, London, S.E.3.

Dear Sir:—I was naturally pleased to read the letter from Mr. R. G. Woods (September issue) in which he endorsed some remarks of mine in the July "Workbench" column. In view of the fact that Mr. Woods is equally emphatic in his disagreement with my condemnation of four-track working, I wonder whether you might allow me some space to substantiate my remarks.

I recall that, in the beginning of domestic tape recording, a typical machine operated at $7\frac{1}{2}$ i/s, full track, offered 50-10,000 c/s, with wow and flutter at approximately 0.3% and a signal/noise ratio about 40dB. Using standard tape, this would play for 32 minutes per 1,200ft. spool. Today, in spite of all technical advances, the average domestic machine offers the same electrical performance, except that we can record for 256 minutes on the same tape, provided that we do not wish to edit. Every technological advance has been withdrawn by a reduction in tape speed or track width—and this during a period when High Fidelity has come into its own, and set standards of performance that magazines such as yours, Sir, attempt to maintain.

On the basis that one has to call for an extreme in order to obtain a reasonable compromise, I would like to see a present-day machine on $7\frac{1}{2}$ i/s, full track. This would, by my calculation, offer 40-15,000 c/s \pm 2dB with respect to 1 kc/s, wow and flutter 0.1% r.m.s. with a signal/noise ratio of 55 dB below 2% third harmonic distortion. One would still have the availability of long- and double-play tapes, and the use of a double half-track head would allow conversion to stereo, which could be reproduced in the meantime as a compatible mono signal. All the figures I have quoted are intended to relate to real performance, maintained over a period, and need not necessarily relate to any manufacturers claims.

My point is, that if we would get away from this fetish of playing time, and use the great technical strides that have been made in the right direction, we would be able to purchase, for under £50, a machine whose performance would do justice to other Hi-Fi equipment of today. That, Sir would be a step forward! *Yours faithfully.*

about a Truvox deck

From: Frank Croxson, 37 Canterbury Avenue, Ilford.

Dear Sir,—Can any of your readers suggest a circuit for use with my spare Truvox tape deck merely to operate the electronic brake? The deck is used for dubbing and copying in conjunction with my Wearite deck, but it would be much more convenient if the brake could be brought into use. I have in mind perhaps a transformer + metal rectifier to supply the necessary D.C. Any ideas please? *Your faithfully.*

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TAPE, RECORDERS & ACCESSORIES

FIRST DETAILS OF NEW PRODUCTS

● We remind our readers that notices of equipment listed and illustrated in this monthly feature are in no sense reviews. When figures, specifications and diagrams are published, these data are extractions from manufacturers' lists. When samples of this equipment are submitted for test, they are passed to our technical contributors, whose reports are published in a separate section.

★
STELLA
ST 470
BATTERY
PORTABLE



STELLA RADIO AND TELEVISION CO. LTD. have recently announced a portable battery recorder Model ST470. The machine is supplied complete with a sensitive moving-coil microphone, 3-inch reel of double-play tape, empty take-up spool, and screened connecting lead for recording direct from radio or replaying through an external amplifier.

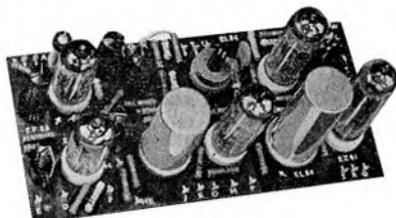
All the operating controls and the tape deck are on top of the machine, thus making it easy to operate while carrying. The handle is detachable and an imitation pig-skin carrying case and shoulder strap are optional extras, which make for easy transportation. The controls are as simple as could be devised with push buttons for start, fast wind and fast rewind, and a safety lock switch to prevent accidental erasure. On the front of the machine is a combined recording level and battery voltage indicator, and a volume control for recording and playback.

Styled similar to a portable radio the casing is in light beige polystyrene with an ivory-coloured plastic speaker grille. The microphone can be stored away in a special compartment at the side of the machine. A plastic cover protects the reels and recording mechanism when the recorder is out of doors, but leaves the controls free. With this plastic cover off the machine will take 4-inch reels, which doubles the playing time.

Specification is as follows: Tape speed: $1\frac{7}{8}$ i.p.s. Twin-track recording. Frequency response: 120-5,500 c/s \pm 3 dB. Signal-to-noise ratio: Better than -40 dB. Power supply: Six $1\frac{1}{2}$ -volt batteries. Battery life: About 20 hours. Output: 250 mW. Loudspeaker: 4 in. diameter. Dimensions: $11\frac{1}{2} \times 4\frac{1}{4} \times 7\frac{1}{2}$ in. Weight: 8 lb.

The ST 470 is priced at £26 5s., the carrying case and shoulder strap £2 5s. and the power supply unit, to operate from A.C. mains, costs £5. Manufacturers Stella Radio and Television Co. Ltd., Astra House, 121-123 Shaftesbury Avenue, London, W.C.2.

★
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RECORDAKITS

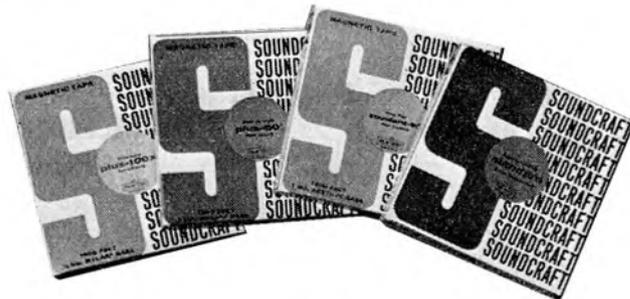


MARTIN ELECTRONICS LIMITED announce a series of new kits to enable the non-technical home constructor to build his own tape recorder. Whilst the idea of such kits in other fields is far from new, the technical problems associated with tape reproduction are such that considerable thought and care has been required in order to make it possible for a recorder

to be built at home. There are basically three types of constructional kits offered and these are based upon a well-developed "Brick-by-Brick" system.

This means that by designing to the availability of well-known decks which can easily be bought anywhere, the constructor is able to build a recorder to professional standards of performance and appearance. Martin Recordakits are centred upon the printed circuit amplifiers developed by Martin Electronics. They come assembled with valves and each is individually tested before leaving the factory. To help the constructor, wires are cut to length and attached by one end to the relevant component part. Detailed instructions are included with each kit and as an added facility there are case and loud speaker assemblies offered, with or without the appropriate deck.

In this way the would-be constructor can build a 3-speed 2-track recorder using a Collaro Studio deck, or a 4-track or 2-track recorder using a BSR Monardeck. Prices for these presented Amplifier Kits are most reasonable, starting at £8 8s. for Type 8312-M (for BSR 2-track deck) to £11 11s. for Type 8311-V (for Collaro deck). Everything is complete, to labelled knobs, indicator plates, nuts, bolts, wire, etc., and all equipment is guaranteed. Details can be obtained from Martin Electronics Ltd., 155 High Street, Brentford, Middlesex.



SOUNDCRAFT Recording Tape manufactured in America has now been introduced to this country by Soundcraft Magnetics Limited, of Haddenham. Its makers were awarded the Academy of Motion Pictures Award of Merit for work in applying strips of magnetic oxides to film. Subsequently, Soundcraft products have been used by leading T.V. production companies for films such as "Ben Hur," "Porgy and Bess," and for T.V. features such as "Wagon Train," "Rawhide," and "Highway Patrol." Another result of Soundcraft's technology was the use by the U.S. Government of tape in their Tyros I and II space satellites.

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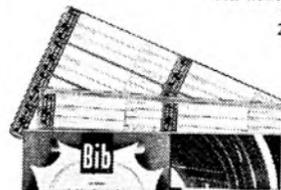


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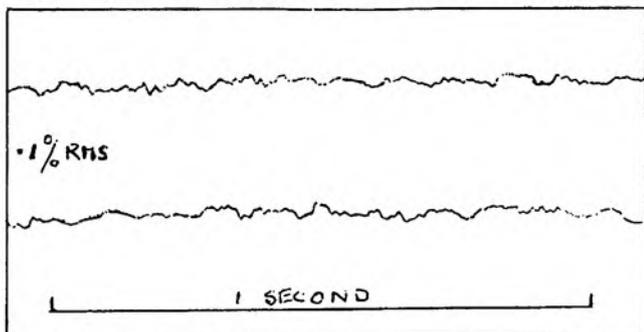


*
**THE E.M.I.
 RE 321
 TRANSISTORISED
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 *

Manufacturer's Specification: Recorded frequency response: 60 c/s-10 Kc/s to C.C.I.R. recommendation. Signal to noise ratio (at 1,000 c/s unweighted) -44 dB, internal replay facilities with record gain at mid position, and -49 dB when replayed on E.M.I. studio recorder. Wow: better than 0.2% R.M.S. Input: For high impedance microphone 7,000 ohms. Low impedance version: 30 ohms. Output: Phones/line out 600 ohms impedance. Weight 16½ lbs. Batteries 8 1.5 cells. Tape speed: 7½ i/s—15 mins. Price: £124. Manufactured by: E.M.I. Electronics Ltd., Hayes, Middlesex.

THIS recorder is a transistorized version of the older Model L2, and is designed for application where extreme portability is required, such as mobile commentating, interview work, etc. No erase head is fitted and bulk erased tape must be used. Separate record and replay heads and amplifiers are provided so that the recorded signal can be monitored directly from the tape a fraction of a second after being recorded. Visual monitoring on the volume indicator meter is recommended for most purposes, as any effort to monitor one's own voice on headphones will quickly lead to a nervous breakdown; the slight time delay between record and play is guaranteed to turn the most hardened commentator into a gibbering idiot within a very few sentences. When switched to replay, the gain to the internal speaker is fixed so that a simple listening test will soon show if the recording is at the right level. Tape overload occurs about 3 dB below that of the output stage feeding the speaker, and any distortion heard is almost certainly a result of over recording. Rewind is manual and a highly geared rewind handle is coupled to the supply reel by depressing a button on the lid.

Wow and flutter: The instantaneous short term speed variations did not exceed 0.1% r.m.s. at any time, even when the tape was played on the portable recorder. This is considerably

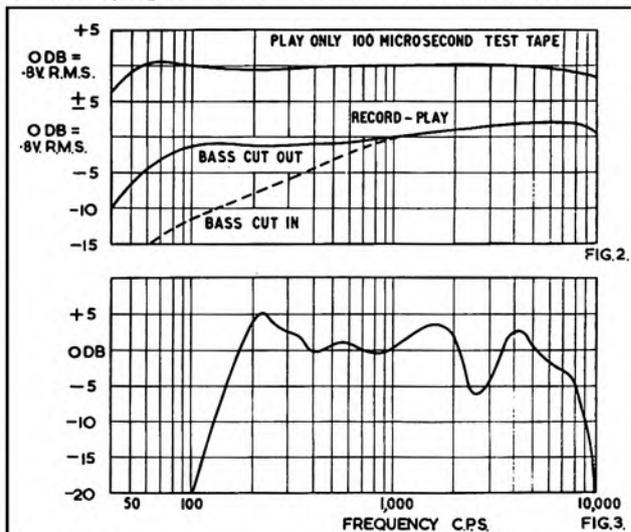


better than the specification figure of 0.2% max, which is probably only obtained when all tolerances combine to give the worst possible performance. Fig. 1 shows that tape flutter is

very low indeed and that a slight wow at capstan rotation frequency of about 10 c/s is just discernable when the record and replay speed variations happen to be in phase. Slow piano music was recorded and listened to most critically and no audible wow could be detected.

Play only response: A full track C.C.I.R. 7½ i/s test tape with a surface induction characteristic corresponding to a 100 microsecond time constant was placed on the machine, and the response at the output jack is indicated by the top curve of fig. 2. This shows that the playback response is within 1 dB from 50 c/s to 10 Kc/s, and that the line level corresponds very closely to the standard 0 dB level of .775v R.M.S. for a 600 ohm line.

Record-play response: The lower solid curve of fig. 2 shows the combined record-play response, with the test signal injected from a low impedance source in series with a 30 ohm resistor to simulate the output from a low impedance microphone. The input level for 0 dB line level was 50 microvolts with the recording gain control at maximum. The response is within plus or minus 2 dB over the range 100 c/s to 10 Kc/s with a fall of 10 dB at 40 c/s. A further bass cut can be obtained by operating the "bass cut" switch so that a smooth



roll off of 12 dB at 100 c/s and 20 dB at 40 c/s is available to compensate for close speech or difficult acoustic environment.

Signal/Noise ratio: At this point we have to throw overboard all preconceived ideas about signal/noise ratios as applied to domestic recorders, where a total range of 40 dB from tape overload to recorded noise and playback hum is considered tolerable. In this machine the transistor noise and induced motor noise is 48 dB below test tape or 0 dB line level, and overload recording tests show that distortion is only 3% at peak recording, or plus 12 dB line level. So that, neglecting tape noise, a potential dynamic range of 60 dB is available.

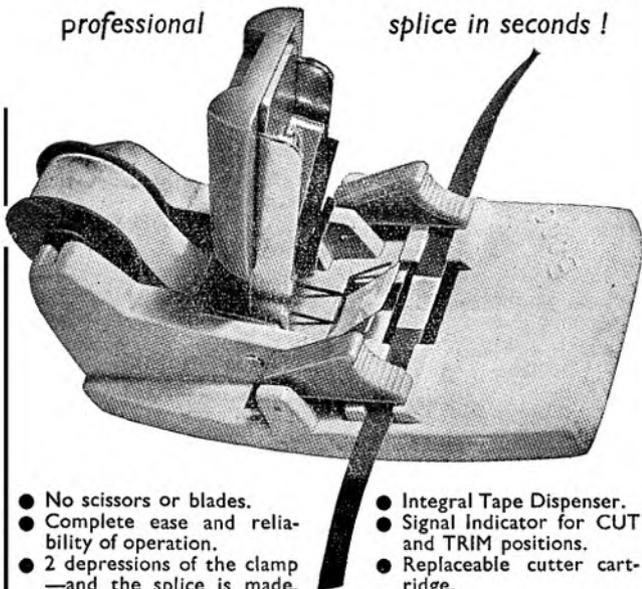
Further tests with tape running show that bulk erased tape increases the noise by only 1 dB, and that tape recorded on the machine with the recording gain control at minimum is 2 dB up on system noise. Finally, with a dummy source resistor of 30 ohms, and the recording gain full on, the recorded noise, mainly from the first transistor, is 42 dB below 0 dB line level or 54 dB below peak recording level. The use of full track accounts for some of this improvement, but very careful bias oscillator design for low even harmonic distortion and proper balancing of the noise contribution of the various amplifier stages does the rest.

Acoustic response: The response from tape to monitor speaker

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EQUIPMENT REVIEWED—(continued)

acoustic output was measured by loading the machine with a White Noise Test Tape and measuring the sound output at one foot from the monitor speaker fret. The response of fig. 3 indicates that the overall response is within plus or minus 5 dB over the range 150 c/s to 8 Kc/s. This is perfectly adequate for judging voice and background effects balance and, as mentioned earlier, the fixed gain also allows some assessment of recorded level and overload. 0 dB level on the tape at 1 Kc/s gives an acoustic output of 79 phons, or 79 dB above hearing threshold. Peak recording level thus results in a peak sound output of 91 phons. The average domestic recorder acoustic peak output level is about 108 phons so that it will be appreciated that the monitor sound output of this machine is quite low and is only meant to give the operator some idea of the recorded quality and balance when listening about one foot from the speaker.

Comment: As would be expected of a recorder with this pedigree, the design and performance is immaculate and there are a number of interesting circuit design features which are worth noting. For instance a transistor smoothing circuit is used to isolate the sensitive amplifier circuits from any H.T. disturbances caused by the heavy current drain of the motor. Another transistor isolates the record level meter from the record amplifier output, to avoid any slight distortion caused by the meter rectifier. A push-pull bias oscillator is used to ensure a truly balanced waveform and so reduce recorded noise to the absolute minimum. Three transistors are used in the recording amplifier: a pre-amplifier with slight degeneration in the emitter circuit to cut the extreme bass response, and a two stage amplifier following the gain control with negative feedback from output collector to input emitter, to reduce distortion and to provide pre-emphasis top rise for recording.

Transistors Playback Amplifier

The main playback amplifier consists of four transistors in cascade, with feedback loops around each pair; the first loop modifies the response to give the necessary bass and top boost to correct for tape and head losses, and the second loop reduces distortion in the driver or line output stage and also provides a slight extra bass lift at frequencies below 100 c/s to compensate for deviations from a true C.C.I.R. equalisation characteristic in the first equaliser. The internal loudspeaker output stage is brought into operation on playback when the line jack is withdrawn from its socket; it consists of a push-pull pair of small power transistors, working in class AB with a centre-tapped speaker voice coil to eliminate output transformer losses.

I did notice that on record a very faint delayed reproduction is heard on the loudspeaker, even though the H.T. on the power amplifier is disconnected. This is probably due to signals from the driver stage passing through the capacity of the output transistors directly to the speaker voice coil. If the microphone is being used very near to the recorder this sound can be picked up and recorded as a faint echo. The effect is much reduced when the line jack is removed but it is just there, and it is indeed a tribute to the extremely good signal/noise ratio of the recordings that the signal can be heard at all on replay.

Mechanical noise from the capstan drive motor, although barely audible directly, is recorded at very low level if the microphone is brought within a yard or so of the case, particularly if the recorder is standing on a table or surface which can act as a sounding board. When the recorder is slung from the shoulder in the normal interviewing position the radiated acoustic noise is much reduced and is masked by any slight ambient background sounds.

Alternative input circuits for low impedance microphone, medium impedance microphone, or line can be fitted to order, and a rechargeable power pack to replace the 1.5V battery container will be available shortly.

This machine is a studio recorder in miniature, with no relaxing of the specification on the essential recording functions. Only on non-essentials, such as erase, power rewind and monitor power output, have sacrifices been made in the interests of reasonable portability.

A. Tutchings.



RESLO
TYPE RB
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PHONE

THIS is a cheaper and mechanically simplified version of the standard Reslo type RB and is directed to the home recorder and public address field. The frequency response is slightly restricted with a broad peak in the mid upper range and a cut off below 100 c/s to reduce handling noise and any tendency to heaviness in speech. A new form of acoustic damping is used at the rear of the ribbon consisting of plastic foam pads placed between the magnets which cup the back of the ribbon pole piece assembly. The effect of this extra damping is twofold; it increases the high note response on the front axis of the microphone by a standing wave effect between the pads and the ribbon; and it also provides heavy acoustic damping of the main ribbon resonance.

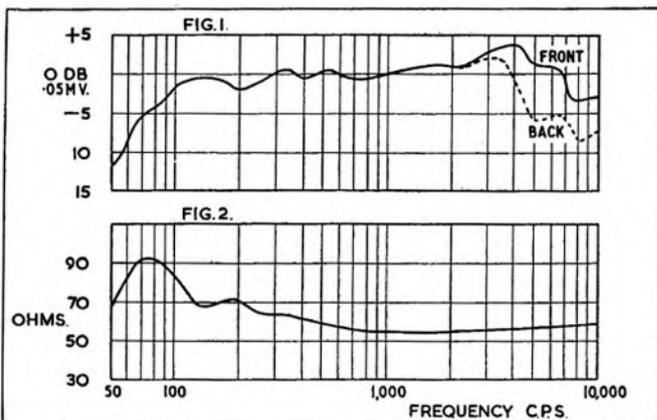


Fig. 1. shows the plane wave free air response; the solid line curve is the response on the front axis of the microphone and the dotted curve is the rear response. The frontal response is seen to be sensibly level from 80 c/s to 10,000 c/s within plus or minus 4 dB. The rear response drops above 4,000 c/s. The basic polar response is still cosine or figure of eight at medium and low frequencies; it is only above about 3 Kc/s that a semi-cardioid directional response is obtained due to phase delay in the rear damping.

Sensitivity

The model submitted for review was the PRL 30/50 ohm model and the sensitivity was 86 dB below 1 volt/dyne/cm². This corresponds to .05 millivolts per microbar. With a 50 to 1 transformer the voltage at the grid of a valve would be 2.5 millivolts. This sensitivity is high for a ribbon microphone and compares favourably with that of many moving coil units.

The impedance was measured over the frequency range and the results are plotted in Fig. 2. This indicates that the main ribbon resonance is at 70 c/s and that the low frequency cut is due to critical damping of the ribbon resonance rather than a higher resonant frequency.

Comment: The clipping of the extreme ends of the frequency response is a small price to pay for the sturdy construction and high sensitivity of this unit and the design objective of a microphone well suited to public address work and home recording has been achieved in a simple and elegant manner. A. Tutchings

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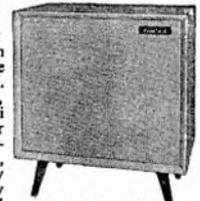
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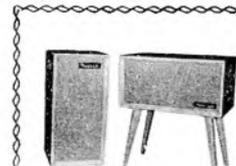


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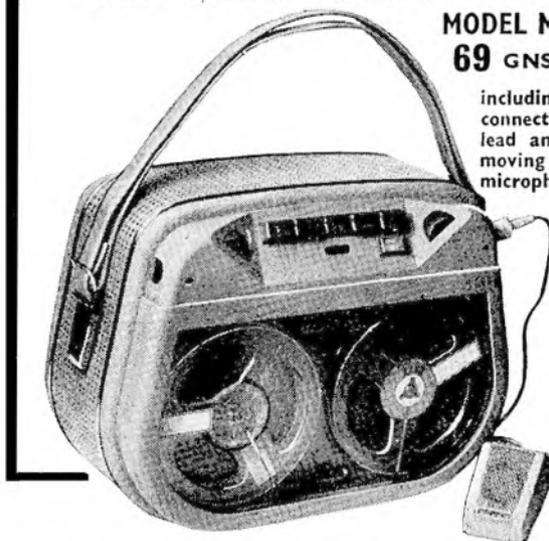
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9 Months to Pay

	Deposit		9 Monthly Payments		Cash		
	£	s. d.	£	s. d.	Gns.		
MAINS TWIN-TRACK							
Argyll Minor ...	2	6	3	2	6	3	22
Wyndor Heron ...	2	15	0	2	12	3	25
Grundig TK14 ...	3	13	6	3	13	6	35
Robuk RK3 ...	3	15	0	3	15	8	36
Elizabethan TT3 ...	4	2	0	4	1	11	39
Victor ...	4	2	0	4	1	11	39
Allegro ...	4	8	6	4	8	2	42
Grundig TK20 ...	4	8	6	4	8	2	42
Spectone "161" ...	5	2	11	5	2	11	49
Telefunken 95 ...	6	3	11	6	3	11	59

4-TRACK							
Stuzzi ...	2	16	6	2	14	6	26
Argyll 4-T ...	3	4	0	3	4	0	29½
Elizabethan FT1 ...	3	11	5	3	11	5	34
Philips EL3541 ...	3	11	5	3	11	5	34
Stella ST 454 ...	3	17	9	3	17	9	37
Sound ...	4	15	0	4	14	6	45
Elizabethan FT3 ...	4	15	0	4	14	6	45

BATTERY							
Clarion Mk. 1 ...	1	19	11	1	19	11	19
Philips EL3585 ...	2	10	5	2	10	5	24
Clarion Mk. 2 ...	2	16	9	2	16	9	27
Grundig TK1 ...	3	1	0	3	0	11	29
Minivox "C" ...	3	3	0	3	3	0	30
Ficord IA ...	6	3	11	6	3	11	59
Stuzzi Magnette ...	6	3	11	6	3	11	59

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MAINS 2-TRACK							
Telefunken 75/15 ...	9	18	0	2	5	6	47
Truvox R6 ...	11	15	0	2	11	2	55
Brenell 3 Star ...	12	4	0	2	14	0	58
Brenell Mk. 5 ...	14	4	0	2	18	11	64
Elizabethan Major ...	14	5	0	3	0	0	65
Grundig TK35 ...	15	15	0	3	10	0	75
Truvox R7 ...	15	15	0	3	10	0	75
Telefunken 85KL ...	17	19	0	3	12	3	79
Ferrograph 4A/N ...	18	1	0	3	14	6	81
Brenell 5 Type "M" ...	18	10	0	4	2	2	88
Simon SP4 ...	20	0	0	4	8	8	95
Reflectograph "A" ...	22	5	0	4	17	6	105

4-TRACK MONAURAL							
Wyndor Victor ...	10	9	0	2	5	7	49
Grundig TK24 ...	11	11	0	2	11	4	55
Telefunken 76 ...	12	7	0	2	12	10	57
Brenell 3 Star ...	12	4	0	2	14	2	58
Philips EL3542 ...	12	8	0	2	15	1	59
Stella ST455 ...	12	8	0	2	15	1	59

4-TRACK STEREO/MONAURAL							
Korting MT 157 ...	17	17	0	3	19	4	85
Telefunken 77K ...	17	17	0	3	19	4	85
Harting H.M.8 ...	18	6	0	4	0	0	86
Philips EL3536 ...	19	12	0	4	5	7	92

Open all day Saturday—
Friday 6.30 p.m.

THE RECORDER CO.

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*Grundig TK35 ...	75 gns.	Clarion ...	25 gns.
*Grundig TK60 Stereo ...	128 gns.	Clarion Twin Set ...	8 gns.
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Philips 4 Tr. Stereo 3536 ...	92 gns.	Walter Metropolitan ...	55 gns.
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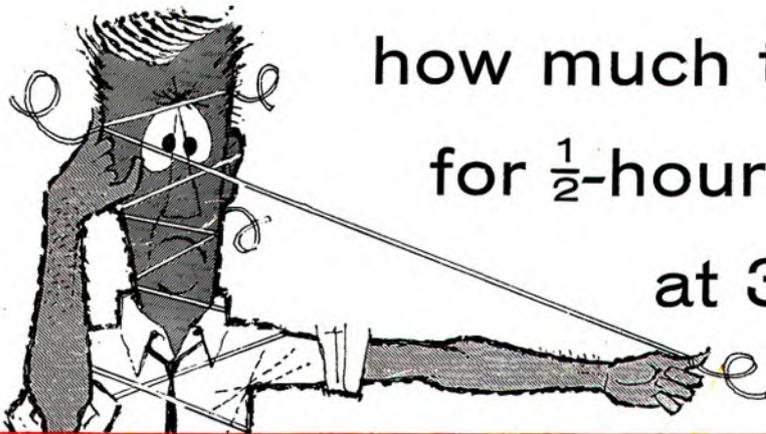
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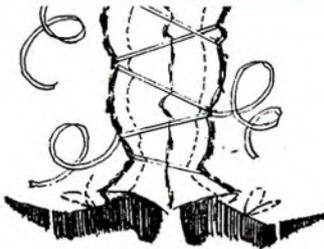
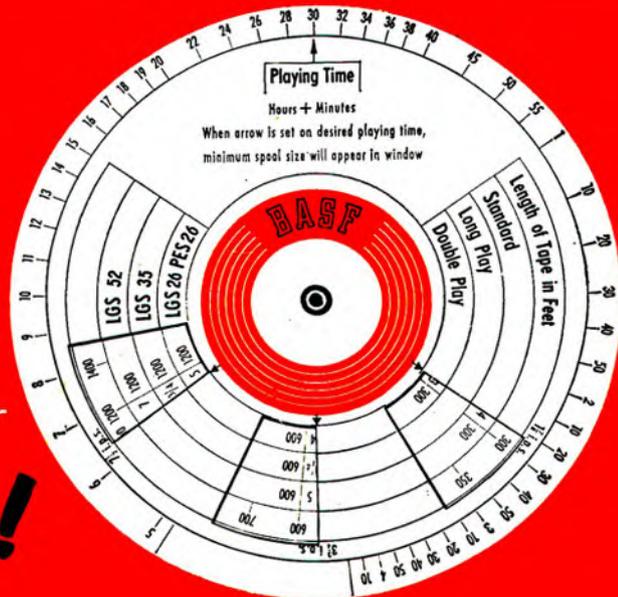
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