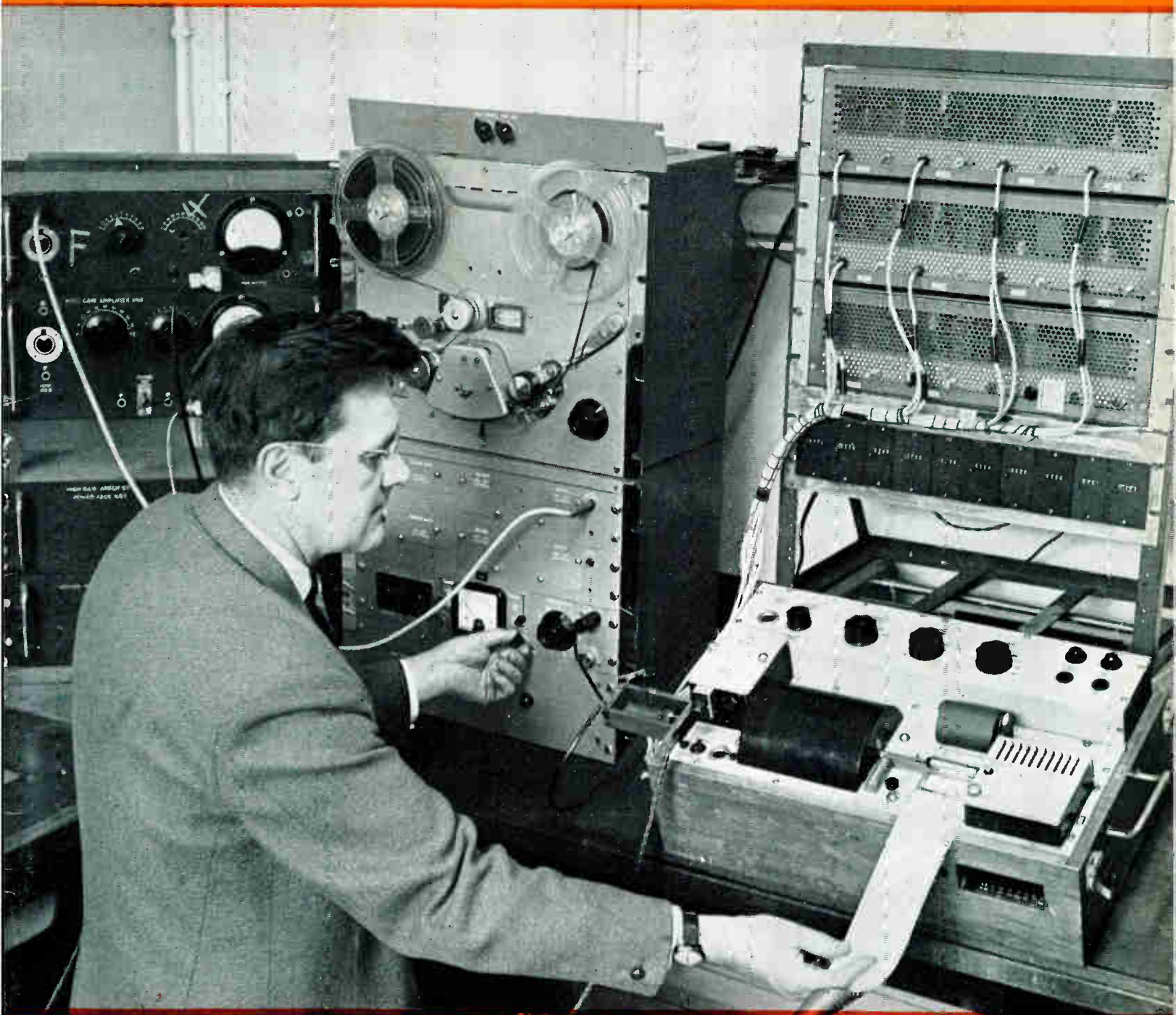


the TAPE RECORDER

PRICE 1/6

SEPTEMBER 1962
Vol. 4 No. 8

INCORPORATING "SOUND AND CINE"



IN THIS NUMBER

- Tape Recorder Service
- Details of New Products
- Peak Programme Meters for Tape Recorders
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- Sound and Cine
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- News and Pictures from the Clubs



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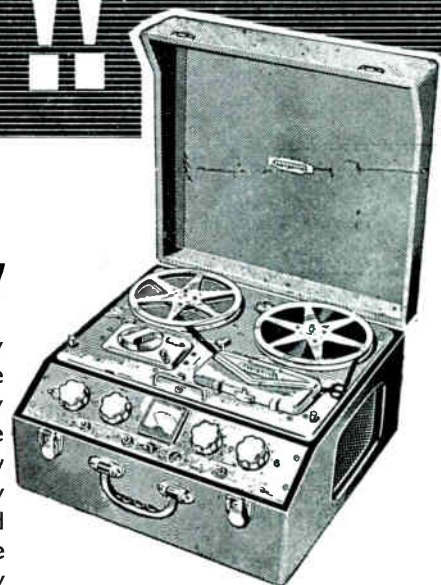
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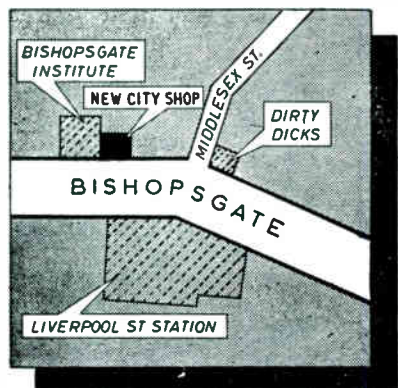
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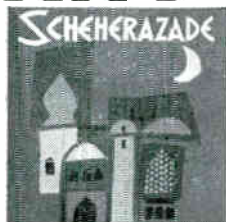
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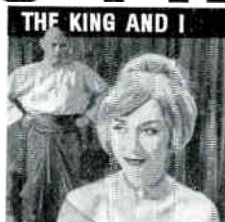
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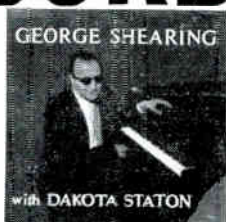
31. Rimsky-Korsakov: Scheherazade, Sir Eugene Goossens conducts the LSO in a breathtaking performance of this rich and exotic masterpiece. Also on disc: mono/stereo



32. Star cast and orchestra stage all the famous songs: Getting to Know You, Hello Young Lovers, I Whistle a Happy Tune, Shall We Dance, etc. Also on disc: mono/stereo



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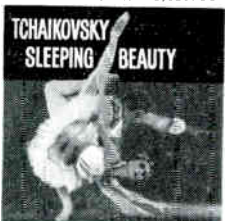
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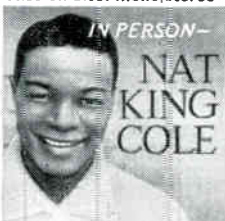
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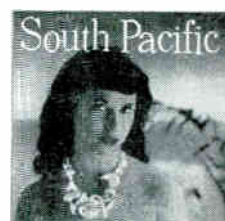
59 The silken voice of Nat King Cole in 'Walkie', 'Because You're Mine', 'You'll Never Grow Old', 'Baby Won't You Say You Love Me' and 8 more. Also on disc: mono only



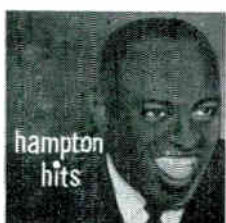
40. Superb singing by Bruna Rizzoli and Giuseppe Savio with the chorus of the Teatro Nuovo di Milano and orchestra conducted by Napoleone Annovazzi. Also on disc: mono only



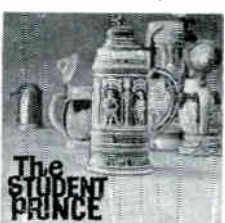
52 Gracie Fields sings her favourite songs for you, including In My Little Bottom Drawer, Sally, Song of the Mountain and ten others. Also on disc: mono only



25. Ian Wallace, Joyce Blair and chorus. Some Enchanted Evening, I'm In Love With a Wonderful Guy, and all the unforgettable songs from this great musical. Also on disc: mono/stereo



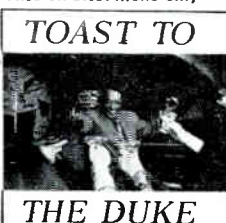
34. Stardust, How High the Moon, Nearness of You, 'Round Midnight, King David—eight numbers by the vibraphone genius, Lionel Hampton. Also on disc: mono/stereo



48. Deep in My Heart, Drinking Song, Serenade—all the old favourites fresher than ever with Marion Grimaldi, Linden Singers and Orchestra. Also on disc: mono/stereo



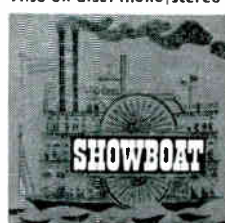
10 Tchaikovsky Violin Concerto, Tossy Spivakovsky with Walter Goehr and London Symphony Orchestra in a superb performance of this melodious work. Also on disc: mono/stereo



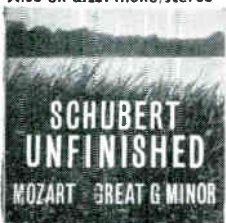
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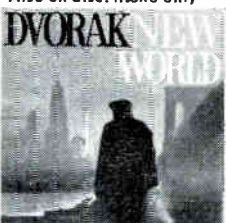
44. Leopold Ludwig and LSO combine brilliantly in an exciting 'double': two of the world's greatest symphonies receive vivid new interpretations. Also on disc: mono/stereo



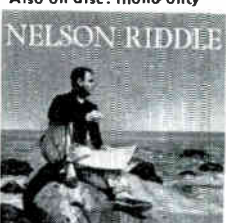
62 The best of Irving Berlin, Easter Parade, The Girl that I Marry, How Deep is the Ocean, What'll I do, 8 more. Raoul Poliakin, his orchestra and chorus. Also on disc: mono/stereo



38. Hervey Alan, Ian Wallace, Marion Grimaldi and chorus sing the immortal favourites: Cobbler's Song, Robbers' Chorus, Chu Chin Chow, etc. Also on disc: mono/stereo



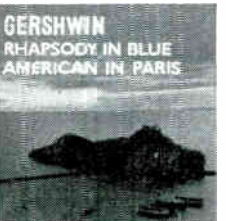
11 Dvorak Symphony No. 5—From The New World. Leopold Ludwig conducts the London Symphony Orchestra in a dramatic and moving performance. Also on disc: mono/stereo



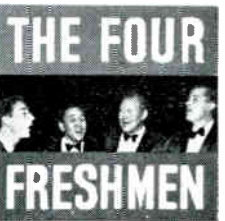
71 The smooth sound of the Nelson Riddle Orchestra in Touch of Your Lips, Body and Soul, The Tender Touch, As You Desire Me—11 favourites in all. Also on disc: mono only



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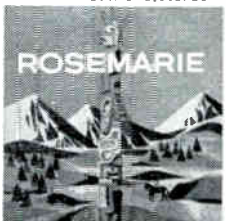
13 Gershwin's Rhapsody in Blue and American in Paris, Pittsburgh Symphony Orchestra conducted by William Steinberg, Jesus Maria Sanroma, piano. Also on disc: mono/stereo



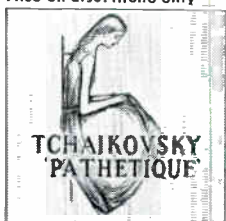
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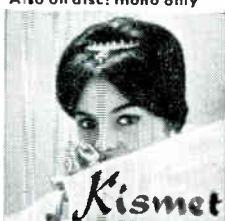
61 The world's 3 greatest sonatas—Beethoven's Moonlight, Pathetique and Appassionata — superbly played by famous T.V. pianist Joseph Cooper. Also on disc: mono only



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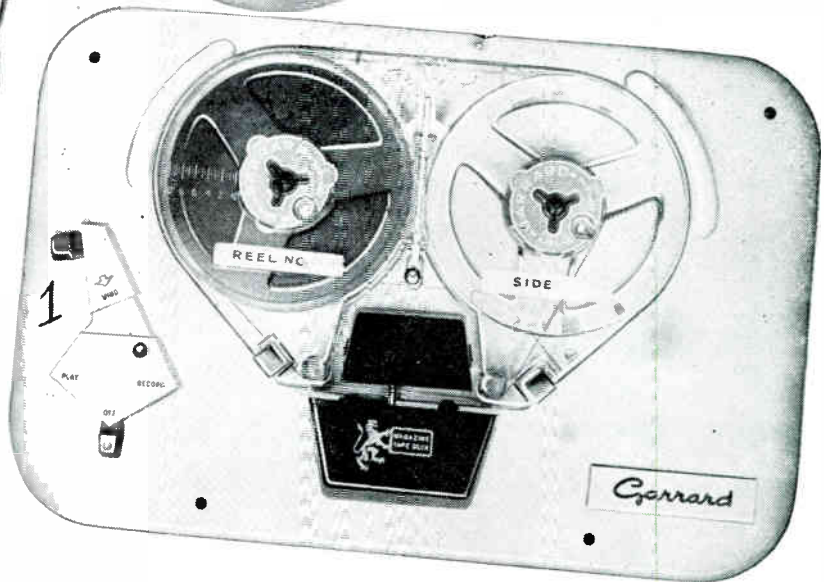
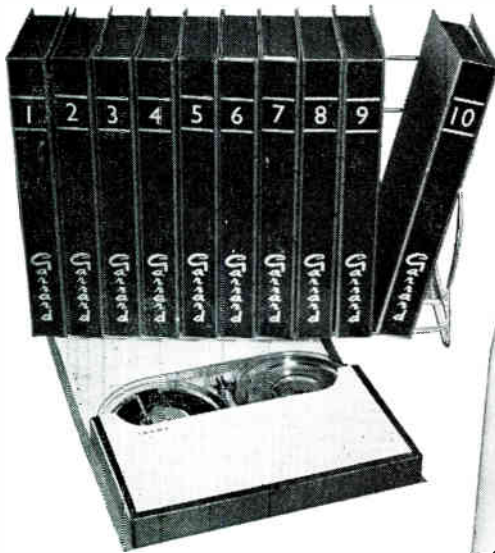
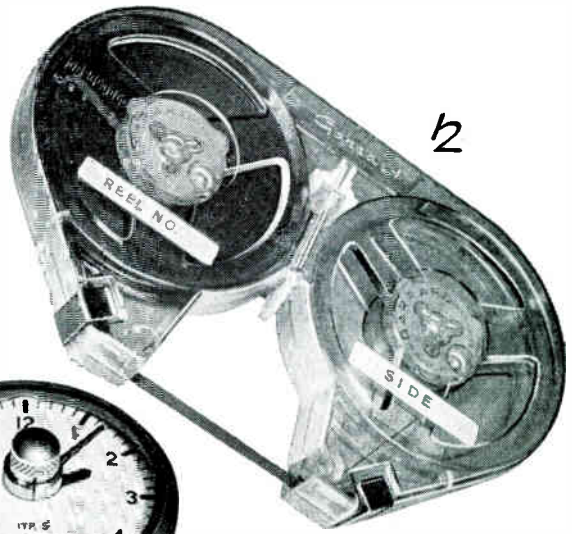
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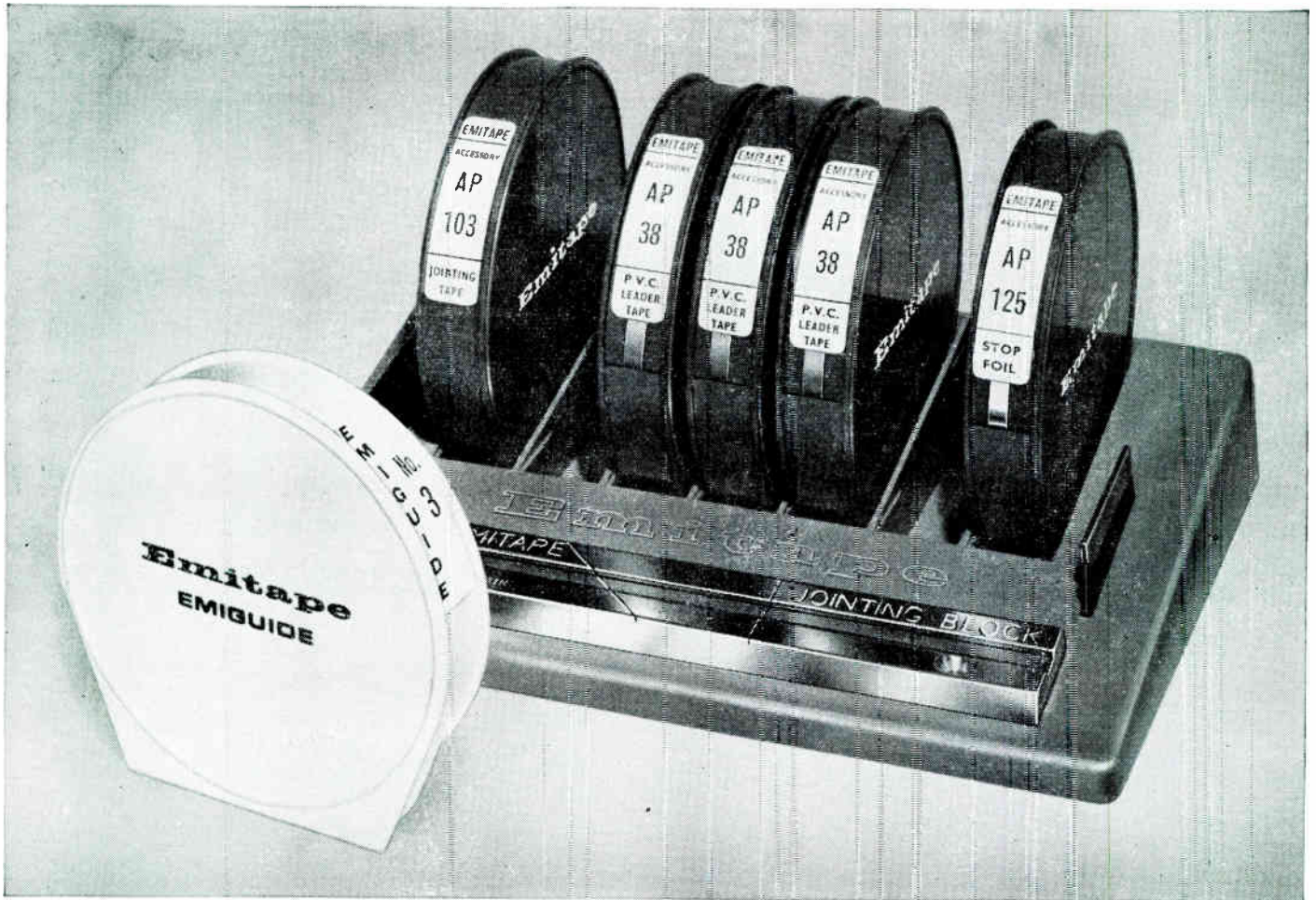


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the TAPE RECORDER

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 Editorial Offices --- 99 Mortimer Street, London, W.1
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★
EDITORIAL

MEMBER OF THE
AUDIT BUREAU
OF CIRCULATIONS

THE month of September is generally regarded as a time of great importance for the radio, tape and hi-fi enthusiast, and certainly for all branches of the trades that cater for such enthusiasts. We have never properly understood why this should be, but until someone explains to us that it is not so, we shall continue to accept that fact that there must be something in it. There is the annual radio show, of course, which sees August out and ushers in September: and we must assume that a large number of very interested people would not have approved this (to us) rather odd timing for so many years, had it not been important. We have, it appears, a season: and it begins in September. Sun-tanned customers besiege sun-tanned dealers and try, test and buy all the things they have been thinking about during the odd minutes between sun-tanning. But, thank heaven, there are still quite a number of weeks of potential good weather (even in the British Isles) before the Summer is forgotten, and before the longer evenings of Autumn and Winter provide the time for full enjoyment of our new electronic gadgets—and the sounds that they produce for us.

Nevertheless, since this number marks the beginning of "the season", we think it is as good a time as any for talking about some of the things that we (editorially) have in mind for this magazine during the next six months or so. First of all, then, we have in our files a number of very interesting constructional articles, which we hope will answer at least some of the many requests we have been receiving from our readers with do-it-yourself hands. Next, we are working on a series of surveys which will cover quite a lot of new ground in the tape and tape recorder world and which, we think and hope, will provide some particularly informative and interesting reading. More on this score we cannot say at this stage, for very obvious reasons!

We hope to bring you more on the subject of tape recorder service, too, both for amateur service people, and for dealers: and our "Tape Recorder Workbench" series will tie-in with this.

A feature that we hope to develop, but one which depends almost entirely upon the co-operation of our readers, is the "How others use tape" title which we started some two years ago, but which we were forced to drop because of lack of

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).

SEPTEMBER - - - - - 1962
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support. "Letters from Readers", too, is far more of a lame duck than it should be in a magazine of this nature, with so many readers (Our latest, official circulation figure, "ABC", has just reached this office, and is 22,476).

When we first applied for ABC membership, a little more than two years ago, we announced that we would keep our readers posted about the results—good or not-so-good—remarking that such results would be a barometer of progress and a prod to our own efforts, as well as doing their primary job of providing our supporters with official, reliable information. In the first six months of our ABC membership our average monthly sales were 17,173. The latest figure quoted above is for the same period, two years later, and it tells us that we have added 5,303 new readers to our total—an average of about 220 each month. Whether you are one of the new readers of *The Tape Recorder*, or whether you have been with us since Vol 1 No. 1, we thank you sincerely for your support, and we hope with equal sincerity that you enjoy the editorial features that we have planned for the months ahead.

COVER PICTURE

LONDON is the first city in the world to be systematically surveyed for noise. The information obtained will be useful for town planning generally, and especially to architects when making provision for insulation in new buildings of all kinds in the central area.

Information about noise levels at selected sites throughout central London is also being recorded for use in particular town planning problems, such as assessing the noise effects of elevated motorways and heliports, and for siting hospitals and other buildings where noise may be detrimental to their use.

The London Noise Survey is being conducted by the Building Research Station, of the Department of Scientific and Industrial Research, and the London County Council. Two vans, with equipment which includes EMI TR52/2 professional tape recorders are sampling noise levels for 100 seconds once an hour over a 24-hour period at each of 540 points. The work has continued since early in 1961 and more than 350 sites have already been monitored. The cover photo shows a research worker studying a pen recording of the noise levels.

HERE AND THERE AND



Music, Movement and Mime Classes are now being held in a number of schools throughout the country. Here the headmaster of a London school briefs his class. The tape recorder, a Grundig TK.830 is used for preparing programmes.

STC at Wimbledon

FOR over 30 years the sound amplification and distribution for the Wimbledon Lawn Tennis Championships has been the responsibility of the Public Address Department of Standard Telephone and Cables Limited.

STC equipment feeds all sound, except commentaries, from the Centre Court and Courts Nos. 1, 2 and 3 to the BBC and into the Wimbledon distribution system generally. It feeds a ring of monitoring loudspeakers from which the electric scoreboards are operated; it provides facilities for car park calling, turnstile control, emergency police control, and an overriding call system under the control of Col. A. D. C. Macaulay, the Secretary of the All England Lawn Tennis Club.

An elaborate telephone system is also installed by STC to link each umpire with the chief umpire and the referees' room, and also to link the pay-boxes and turnstiles.

E.M.I. Form New Company

ELECTRIC AND MUSICAL INDUSTRIES LIMITED announce that they have formed a new company, E.M.I. Sound Products Limited operating from Hayes, Middlesex.

The Domestic Sound Division of the company will be marketing a new range of quality sound equipment under the E.M.I. trade mark. This will include a series of portable record reproducers, tape recorders, stereo reproducers and specialised "packaged" units. The products will be marketed through a limited number of Wholesale Distributors now being appointed.

The new company will include a reconstituted Component Division which will continue to market loudspeaker units, motors, playing decks, etc., mainly for manufacturers and the export market.

1963 Audio Festival Dates

MR. REX HASSEN, the Festival Director, stated that "A very high interest was being maintained in the London Audio Festival and Fair, some 39,600 people visited the 1962 exhibition of which some 1,400 were overseas visitors and 2,000 British Trade Representatives." This information was given to the exhibitors at the Annual General Luncheon held recently at the Hotel Russell, London.

The meeting, presided over by Mr. R. W. Merrick, British Ferrograph, decided that the question of holding a Northern Audio Fair in 1963 would be left to a postal vote. It was also

decided that the policy of holding the show in a hotel would continue. The next London Audio Festival will be at the Hotel Russell from April 18th to 21st, 1963, and would close an hour earlier at 7 p.m. instead of 8 p.m. on the last day.

A ballot was held to elect a new committee and the following firms filled the nine places: Acoustical, Armstrong, E.M.I., Ferrograph, Goodmans, Leak, Lowther, Rogers and Tannoy. Representatives of British Ferrograph and Tannoy acting as chairman and vice-chairman respectively.

Grundig Talent Competition

IN conjunction with ABC Cinemas, Grundig (Great Britain) Limited announce a mammoth nation wide tie-up with the new musical film "The Music Man".

A Grundig "Music Man" Talent Contest to find the best amateur musician in the country is open to all music loving youngsters under the age of 20. Auditions will be held in 250 leading ABC theatres throughout the country and the winning soloist or group will be recorded and the tape entered for one of the eight Regional Finals. The eight regional finalists will come forward for the National Finals and an audition by ABC Television.

Prizes include eight Grundig tape recorders to the value of £450 plus a substantial cash prize.

A.P. Films Studio

SOUND recording for "Supercar"—the popular children's television programme being shown in this country and the United States of America—has been carried out on tape recorders manufactured by EMI Electronics Ltd. This puppet programme is produced by A.P. Films Ltd., of Slough, who run one of the busiest studios in England. A special electronic synchronisation for character voices—super marionation—is achieved by using EMI TR90 tape recorders and special electronic lip movement equipment.

The picture, (Page 335), shows one of the same recorders currently being used by A.P. Films in the production of their new children's television series—"Fireball XL5". It is anticipated that this series will be an even greater success than "Supercar".

Two TR90 tape recorders are used for the purpose of recording all the characters' voices. The same machines are then used for playing back the voices in conjunction with the electronic mouth movement, when the voices are transferred to 35 mm film, the tapes are again replayed from a TR90 in order to maintain the quality and avoid any variation in sound.

New Premises for Francis of Streatham

IT was not long after the establishment of their Tape Recorder shop at 169/171 Streatham High Road, S.W.16, that Francis of Streatham found it necessary to take further premises for a much demanded Hi-Fi department. This was at 181 Streatham High Road, but it quickly became apparent that the premises were not sufficiently large to cope with business.

Francis of Streatham now announce that they have taken far larger premises immediately next door to their Tape Recorder shop for their Hi-Fi department and that the company's address is now 169/171/173 Streatham High Road (telephone no. STR 0466/0192). In charge of Tape Recorders is Mr. Douglas Francis with Mr. Barry Francis in charge of Hi-Fi.

R.S.G.B. Exhibition

THE Radio Society of Great Britain's Exhibition in future will be called International Radio Communications Exhibition and will be transferred to the Seymour Hall, Seymour Place, Marble

EVERYWHERE

Arch, London, W.1. It will be held earlier this year, and for a period of four days, from Wednesday, October 31, to Saturday, November 3rd.

A special display of home-built equipment will be shown and as in other years, Silver Plaques will be presented for the most outstanding home-constructed radio equipment and for a manufacturer's outstanding equipment contribution to the radio world.

The Armed Services, and it is expected Government Services, will again show latest developments and offer educational and recruiting services to all visitors. Exhibitors will be requested to feature latest developments to members and the public in communications, components and latest low noise U.H.F. valves, transistors, aerials, Hi-Fi and television, also test gear.

High Fidelity in Germany

WITH the object of improving the quality standards of the high-fidelity reproduction of gramophone records, magnetic tapes and radio broadcasts, the dhfi, Deutsches High-Fidelity Institut e.V., an incorporated association, has been formed at Frankfurt (Main). Germany has thus followed the lead set by the United States, where the establishment of an Institute of High-Fidelity Manufacturers has provided considerable stimulation to transcription techniques and to the encouragement of music in general.

The dhfi is a non-profit-making organisation, and its terms of reference include the maintenance of quality specifications and standards of measurement to protect the concept of High-Fidelity from debasement and falsification, and to stimulate the efforts of engineers, designers and manufacturers to enhance the quality of sound production.

Public demonstrations of high-fidelity sound are to be arranged, critical listening encouraged, and a forum provided for music lovers and professional musicians to discuss their technical problems with experienced sound engineers. The Institute is to publish bulletins at regular intervals, for the information of members, the trade, Press and the listening public.

All activities to further the development of high-fidelity sound techniques, and to bring them within reach of the general public, are to be fostered.

Heathkit at D.I.Y. Exhibition

HEATHKIT announce that they will be demonstrating their Hi-Fi equipment at the Do-It-Yourself Exhibition at Olympia, London, September 7th-22nd.

Garrard Sales Manager Resigns

THE Garrard Engineering and Manufacturing Co. Ltd. announce that Mr. G. Spark has resigned his position as Sales Manager of their Tape Deck Division. This will take effect from August 31st. Mr. E. W. Mortimer, who is of course very well known in the industry, will from that date be responsible for this division.

London Studio has World Radio Programmes Taped

NEWS flashed across Europe to London before breakfast is edited, recorded and transmitted by direct line to New York. A commentator can speak to any part of the world using G.P.O. cables or short-wave transmitters at Berne.

The organisation behind this network is Stagesound Ltd., whose well-equipped studios overlook London's Covent Garden. Following a recent delivery, by EMI Electronics Ltd., of 15 RE.301 tape recorders, over 50 EMI machines are now involved in these operations, which consume three-quarters of a million feet of Emitape every week.

Originally supplying London theatres with tailored sound effects, Stagesound now record radio programmes in 63 languages for transmission throughout the world. Many of the programmes are transmitted direct from the studios by G.P.O. private lines or



The picture shows an operator at Stagesound Ltd., London, checking the recording before transmission overseas. The recorder is an EMI, TR.90.

short-wave radio to overseas networks. In other instances edited tapes are delivered to radio stations at home and abroad.

Broadcasts of important events like royal weddings and major sporting fixtures are often transmitted live to the United States, France and Belgium. Stagesound supplies a regular programme service to New York for the R.K.O. Network and Mutual Broadcasting Service, and for some 2½ years has been responsible for all news sent over the air from Europe direct to these two stations.

A multi-tape copying channel that uses 17 EMI tape recorders makes copies of either monaural or stereo tapes at any speed and produces up to 500 copy tapes per day. The two master machines are EMI type TR.90 recorders having various head set-ups so that they are capable of replaying tapes of full track, top track, bottom track or stereo recordings. Two machines are used so that two tracks of unrelated recordings can be transferred to the copy tapes.

A control unit is provided to control the level and frequency characteristics of the copy tapes. The desk feeds 15 EMI RE.301 tape recorders for copying purposes. These are often kept running for weeks without respite.



SEPTEMBER NUMBER

★

Contents include:
A New High-Fidelity
Amplifier

The Weather and your F.M.
Readers' Letters

★

NOW ON SALE

NEWS AND PICTURES FROM



The Tricolumn speaker was used recently at the Northampton Tape and Cine Club. The secretary, R. C. Foster (left), and the chairman, C. W. Percy (centre), decided that a closer examination was called for.

TEAMS—each with a car and a portable tape recorder—consisting of members of the North London Tape and Hi-Fi Club got out and about at a June meeting, when the club held its first sound hunt.

A time limit of one hour was set for members to bring back 10 varied sound effects which included a bus starting bell, the chirping of birds, the revving of a motor-cycle, shop-doorway bell, engaged tone on a telephone, an electric train and the voice of someone—not a member of the club—giving the winner of the Derby. And everyone who took part in the event had a good laugh at how some of the sound effects were obtained!

The tape of interviews and sound effects made at one of Enfield's largest fetes, Forty Hill Rose Fayre, has since been played back at a meeting of all those who helped at the event, stallholders and organisers. About 60 of them attended the tape playback.

Having learned a great amount about how to exhibit a stand at a large local show, the club is testing its resources further at the Enfield Show on Friday and Saturday, September 14th and 15th, this year. The club meets every Wednesday evening (7.45 p.m. to 10 p.m.) at Bush Hill Park School, Main Avenue, Enfield, Middlesex. Details from R. Collinson, 30 Ridler Road, Forty Hill, Enfield, Middlesex.

SOME time ago the Cotswold Tape Recording Society was approached by the Gloucestershire Red Cross with a view to establishing a message service for patients in hospital and residents in old people's homes. The society was, of course, delighted to co-operate, and one of the first assignments was a session with some sixteen of the residents at Orchard House—a new and very delightful home at Bishop's Cleeve, near Cheltenham. Several replies having been received to these tapes, Orchard House was again visited on July 17th to continue the exchange. Peter Duddridge interviewed Miss J. Munden, Welfare Officer to the Red Cross, and also several of the old folks who had received messages.

Saturday, July 21st, saw the twenty-fifth Stroud Show, and the society was asked by the Show Society to produce a picture in sound of the Jubilee Show, partly for local archives, and partly for transmission to Stroud, Oklahoma—one of the four Strouds participating in the annual brick-throwing contest: the others being in Australia and New Zealand. The C.T.R.S. therefore literally went to town. Peter Turner ensconced himself in

a window overlooking the route of the Carnival procession to the show ground and, using a Simon SP4 with a Beyer 119 mike, made a commentary on the procession. The Carnival Queen was drawn to the show by two of the famous Whitbread Greys—*Crown* and *Anchor*—who take part in the Lord Mayor's Show.

On the show ground, the recording party consisted of June Turner, Peter Duddridge, John Yeates, John Ticker, Harry Foleder and Reg Watkins. Recorders in use were two Philips 3585's, two Stella equivalents, two Fi-Cord 1A's and a Stuzzi with microphones by Philips, Gramplan, STC and AKG. Interviews with the Carnival Queen and her mother; the driver of "Firefly"—a sixty-year-old traction engine; a former Stroud resident who had come from Stroud, Australia, to present the prizes to the champion brick-thrower; "barkers" at the side-shows and many others were recorded, together with the noises of the fairground, marching bands, Punch and Judy and all the fun of the fair. Special efforts were made at the brick-throwing contest, the team being interviewed before and after the event, and the commentary on the P.A. system taken down.

Later, these recordings and others made before and after the Show will be edited into a feature, using tape of the highest quality to preserve for all time the atmosphere and personalities of the Stroud Jubilee Show.

Details from P. D. Turner, Cave Cottage, Oakridge Lynch, Stroud, Glos.

* * *

THE Soundhunters though not a club as such, are probably busier than any tape club. Present meetings are at least twice a week. Four old-folks' homes are visited regularly with a pre-recorded programme. This programme takes the form of about 90 minutes of old-time records, out-and-about recordings made on battery recorders, documentary material, etc. Several nights each month are devoted to scripting, compiling and editing the programmes which include much requested material asked for by the people at the homes visited.

Another activity taking up much time is the building of a recording studio so as to further improve the quality and slick-running of the programmes for presentation. Much time—and up to four evenings a week have been put in by the Soundhunters in converting a room above a Wakefield shop which has not been used for over 30 years—into a sound-proofed, acoustically improved recording room. The walls and ceiling have been completely covered with cardboard egg trays. Together with specially-fitted shelving, fluorescent lighting, fitted carpet, and so on the studio takes on a most professional appearance. This will be in use shortly.

Once the studio is being used—further programme material will be compiled. The group have been invited by the Wakefield Broadcast to Hospitals Service to compile several hours programmes for transmitting on close-circuit. The programmes will be made at the discretion of the group and when completed considered for the Hospitals Service. No doubt if they are considered suitable, further programmes will be compiled. Already much recorded material has been compiled including recordings made at a Yorkshire zoo, and a circus. The group have a very large collection of old recordings. These were obtained when the local newspaper recently published a letter pleading for old records, which could be used in the old folks' homes programmes. About 500 of these were donated, and together with an already well-stocked library of tapes and records of music, documentary items, and material recorded by the Soundhunters locally—many hours of programmes can be compiled, and a steady flow of entertainment can be provided both for playing at the homes, and for transmitting to the hospitals. Further details can be obtained from M. Storey, 331 Horbury Road, Wakefield, Yorks.

THE CLUBS

MEMBERSHIP of the **South Birmingham Tape Club** is now growing rapidly and it has been decided to hold future meetings at new premises. The opening night at the Breendon Cross Hotel, Pershore Road, Birmingham 30, will be marked by a stereo demonstration given under very much better acoustic conditions.

The club has recently held a Garden Party at the home of the secretary when they were able to meet members of the Warwick and Leamington club.

Providing hospital programmes has become a major activity and local places of interest have been covered including a trip up the Lickey incline. Go-Kart racing and the opening of the M5 motorway. A visit is shortly to be made to a gliding school.

Further details are available from *J. T. Gilbert, "Woodcote," Box Trees Road, Dorridge, Solihull, Warwickshire.*

* * *

THE **Rugby Amateur Tape Recording Society** has been notified of a tape recording enthusiast in Evreux, France, which is twinned with Rugby. This person, M. Jacques Maupas, is coming to Rugby in August and it is hoped that his visit will coincide with one of the August meetings so that members can present a slide show about Evreux complete with tape recorded commentary, which has been prepared. If this is arranged, an invitation will be sent to members of the Twinning Committee to attend the meeting.

The society now has another overseas member, having accepted an application for membership from Mr. John-Kenneth Kristoffersen, of Oslo, Norway. Kenneth, only 18, has already in the space of under a year formed 18 tapesponding contacts all over the world, one in each country only, and has joined three tape recording organisations. He has already sent a 3 in. tape which will be played back at a club meeting as soon as time permits.

The Committee have decided that the second tape recording course will start on September 27th and cover the normal fortnightly meeting dates during October and November, thus ending on December 6th. There will be a charge of five shillings for the course to non-members. Meetings commence at 8 p.m. at the Red Lion, Sheep Street.

Final details have yet to be announced but the first session will be a talk on the history and development of tape recording, and other sessions will deal with correcting recording difficulties, how a tape recorder works, the manufacture of tape, programme construction and editing; and interviewing technique.

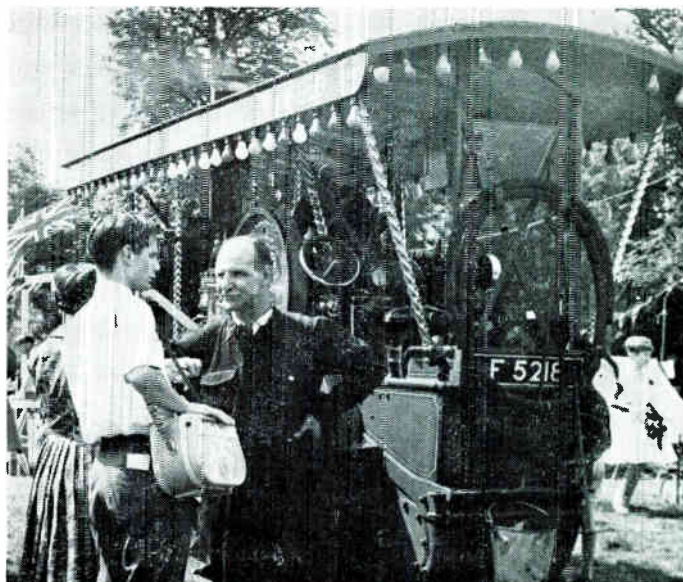
The names of the persons to present the sessions will be released shortly together with confirmation of the order of sessions and the dates respectively. This is intended to provide a basic knowledge of tape recording, and as before, a glossary of common terms will be prepared for reference of those taking the course.

At the meeting of the management committee on July 26th, the resignation of the treasurer, Mr. A. W. Lovett, was reported. Mr. Lovett was responsible with the present secretary for the initial moves in getting together a nucleus of tape recording enthusiasts from which resulted the formation, in May 1958, of this society. At that time, Mr. Lovett was elected to the committee and shortly afterwards he became treasurer. Pressure of other commitments has forced Alec Lovett to relinquish this office although he will remain a member of the society. Mr. C. E. Crane has been appointed treasurer.

Further details available from *M. Brown, 219 Clifton Road, Rugby.*

* * *

THE **Phoenix Drama and Tape Recording Society** held its second annual general meeting on Tuesday, July 10th, 1962, at the Guildhall, in Windsor. One of the decisions made was that the name of the Society should be changed to the Windsor and District Tape Recording Society. This was done to give the organisation a location, not present in the original title.



A member of the North London Tape and Hi-Fi Club recording an interview with the owner of a traction engine.

The society welcomed two new full members to its meeting, Mr. L. Doran and Mr. T. Pywell, secretary of the Canadian Red Cross Memorial Hospital, Taplow. Mr. Pywell will be a particularly valuable member in so far as the society's fortnightly service to his hospital is concerned. This service is quite new, and it is intended to increase its scope and the frequency of visits as soon as possible.

Further details can be obtained from *W. A. C. C. Smith, 73 King's Road, Windsor, Berkshire.*

* * *

DETAILS of the first National Tape, Cine and Audio Rally to be held in this country is announced by the **Northampton Tape and Cine Club**. The event will be held on October 6th at the Central Methodist Rooms, Regent Square, Northampton. A Traders and Manufacturers Exhibition will be open from 10.30 a.m. to 9 p.m. The rally will be held in the adjoining hall from 2.30 p.m. to 9 p.m.

Demonstrations will be given by various tape recorder manufacturers. Periods of 15 to 30 minutes will be allocated for lectures and separate rooms will be available for cine demonstration.

Programmes for this interesting event will be available by mid-September, but further information can be obtained by contacting the secretary, *R. C. Foster, 17 Shakespeare Road, Northampton.*

* * *

A DEMONSTRATION of the Philips Starmaker and the Grundig TK1 was given by Hugh Lanes, a club member, to members of the **Middleton Tape Recording Club**.

This was followed by the replaying of two tapes received from the Jersey and the West Herts Clubs. The members are very interested in exchanging tapes with any other clubs throughout the country. These should be sent to *G. E. West, 187 Oldham Road, Middleton, Lancs.*

New Clubs

* * *

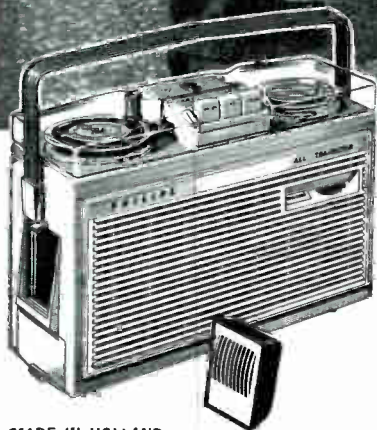
A NEW tape recording club has been announced in the Ashford, Middlesex, district. Any reader interested in joining should contact *P. Nash, 35 Linkscroft Avenue, Ashford, Middlesex.*

* * *

A NEW club has recently been formed under the title, **B.I.C.C. Ltd., (Helsby) Tape Recording Society**. Future plans include the recording of a wedding and it is also hoped to stage a demonstration stand at the local Horticultural Show. Further information can be obtained from: *M. Sutton, 5 Sandringham Avenue, Helsby, Warrington, Lancs.*



CAPTURE
A SUMMERFUL
OF
SOUND



MADE IN HOLLAND

Capture a moment of delight on holiday . . . capture happy times anywhere, any time, exactly as they happen. With Philips Battery Tape Recorder you can take instant, lifelike snapshots in sound all summer long. Come October, you'll own an album of sounds you'll keep playing for years to come. See your Philips dealer about this fine recorder today.

24 GNS (excluding batteries) Supplied complete with microphone, 3" reel of DP tape and empty 3" spool. Optional extra: carrying case and strap 45/- complete.



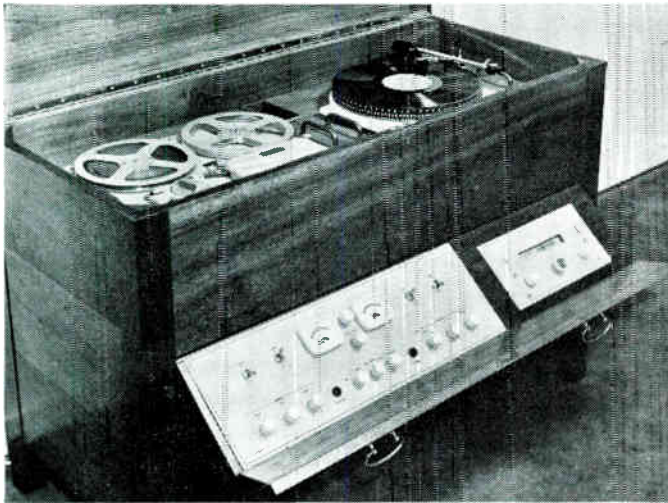
PHILIPS Battery Portable Tape Recorder

RECORDS AND PLAYS BACK ANYWHERE ANY TIME

(PTR4089)

our readers write

. . . about reader's equipment



From: E. W. Stober, 13 Park Lane, Duston, Northampton.

Dear Sir:—I am enclosing a picture of my equipment which I hope will be of interest to some of your readers.

The cabinet houses a Shirley Laboratories TWA 1515 tape amplifier (as described in your series of articles by Mr. A. W. Wayne), Shirley Laboratories F.M. Tuner, Wearite 4S tapedeck, Garrard 301 turntable and Decca ffs pickup. A small amount of spare room would permit the inclusion of a TV sound tuner.

It is quite easy to lower the hinged tray to permit complete access for disconnection and removal of amplifier, power pack and tapedeck for outside recording purposes. The tapedeck and gramophone motor boards are fitted with carrying handles for easy removal and placing into waxed ply frames fitted with wooden bearers on the inside. When recording or playing back away from home I carry the amplifier in a waxed ply carrying box with sliding panels front and back to permit access whilst the amplifier is in use.

Although the speakers are not included in either picture I would mention that they are Goodmans 3 stage systems housed in the Capriol enclosure of Record Housing and the sound of the complete system is very satisfactory and I think pleasing to the eye in so far as appearance is concerned. Yours faithfully.

* * *

. . . about recording standards

From: K. Johns, 21 The Avenue, Wanstead, London, E.11.

Dear Sir:—Over the years a considerable amount of space has been given in *The Tape Recorder* on the subject of two-track and four-track tape recorders. With one or two exceptions it appears that four-track machines are favoured by the manufacturers in the lower price range. This for a start is completely the wrong way to approach the subject. The most important thing in four-track recording is to have an efficient tape transport system that moves the tape past the heads at a very constant speed and also accurate tape guides and pressure pads (if used). To produce an efficient deck with these features alone would cost up to £40 to £50.

Working on these principles, tape recorders in the region of £150 could be produced using four tracks if required. Machines priced from £50 to £100 should be two-track and machines under £50 should be full-track.

This will, of course, bring correspondence on the subject of tape costs. The answer to this would be that people would then use more tape and the prices *should* come down!

The solution to all the problems of tape recording could best be solved by forming a standards committee. Problems such as

head impedance, tape speeds, microphone impedance, etc., could then be discussed. Then, perhaps, heads could be manufactured so that full or quarter track versions could be fitted simply by plugging in the different types depending on the recording required. This would greatly assist most amateur recording enthusiasts!

Yours faithfully.

* * *

. . . about a tape exchange

From:—K. Haughton, 15 Kensington Park Gardens, London, W.11.

Dear Sir:—I have a small tape recorder, which takes a 3½ in. spool. My chief interest is foreign languages. I would be very happy if I could exchange tapes with a person in France, Germany and Spain. May I ask if you know of an address in these countries which I could approach? Thank you for any assistance you may be able to give me.

Yours faithfully.

Can any reader help? (Editor).

* * *

. . . about this magazine

From:—D. G. Bishop, 10 Elmhurst Drive, Hornchurch, Essex.

Dear Sir:—There are three times as many useful pages worth keeping in *Tape Recorder* than in any other British tape recording magazine. This is the result of having to throw out the surplus pages to give more room. Excellent value for 1s. 6d!

Yours faithfully.

* * *

. . . about 2- and 4-track

From:—A. Ferguson, 2 Crown Street, Eastbourne, Sussex.

Dear Sir:—With reference to Mr. Casburn's letter in the August issue of your magazine, it would seem that, if he is satisfied with 4-track recording and considers it Hi-Fi, then he must be a pretty non-technical lay listener, and I thereby endorse the views of Mr. Jefferson. I do not see that with the use of adequate amounts of tape one need lose, as Mr. Warner Allen puts it, silly high frequencies or part of Wagner's Ring. I might add that I am constructing a 2-track stereo recorder and would not dream of making it 4-track.

I might add also that if there were not "abnormal" people who listen with their ears two inches from the speaker and have ambition to strive for the impossible, then we would still be placing a half ton pickup on a varnished cardboard record.

Yours faithfully.

* * *

. . . about scripts

From:—C. B. Jones, 79 Ashley Road, Epsom, Surrey.

Dear Sir:—In using my tape recorder for party gatherings I have found that considerable interest and amusement is created in the recording of a short play for four to six persons and lasting about 20 minutes. I have some difficulty in thinking up and preparing such a play and should like to know how other readers have solved this problem and are there any such scripts available in book form?

Yours faithfully.

THE WAL D-MAG. head demagnetiser, long nylon covered probes. £2.10.0

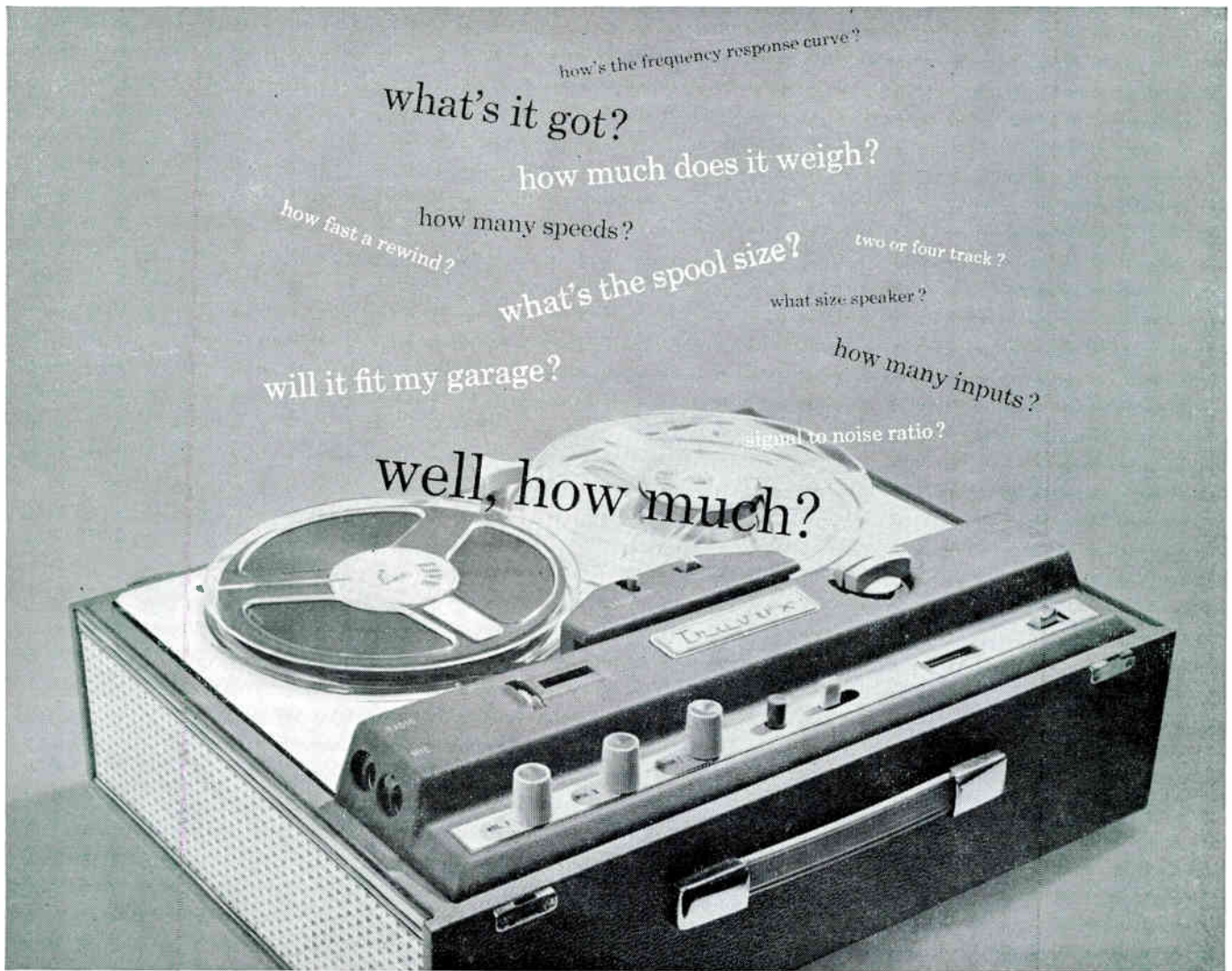
WAL GAIN transistorised pre-amplifiers, Mono £5, Stereo £7.10.0 and Hi-Gain (latter CCIR equalised). £7.16.0

THE WAL BULK ERASER. £7.18.6

Available from all leading dealers. (Wholesale include T.D. & B., London, and A. C. Farnell, Leeds).

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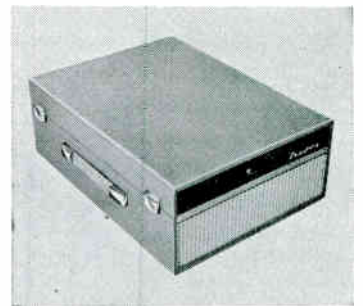




how's the frequency response curve?
 what's it got?
 how much does it weigh?
 how many speeds?
 how fast a rewind?
 what's the spool size?
 two or four track?
 what size speaker?
 will it fit my garage?
 how many inputs?
 signal to noise ratio?
 well, how much?

look! a NEWvox!

Meet the Truvox 60—an excitingly styled new portable, replete with the features and performance of the best top-price recorders . . . yet this custom-built Truvox sells for only 39 guineas! ■ There are two versions of the new Truvox: the R62 (twin-track) with speeds of 3½ and 1½ ips. and the R64 (four-track) with speeds of 7½ and 3½ ips. The frequency response at 7½ ips. is 40-14,000, signal to noise—40dB and wow and flutter better than .25%. ■ The Truvox 60 offers full Mixing, Monitoring and Superimposing facilities, 4-digit footage Indicator, Auto-stop (no foil required!), Pause Control—and operates with 7" reels. There is a roomy storage compartment in the lid, too, for two extra reels. ■ But no description can convey to you the fine *sound* of the 60. No photograph can properly demonstrate the clean, well-proportioned lines of its styling. These subjective factors, beyond the specification, we call *The Truvox Touch*. It's the extra quality engineered into every Truvox tape recorder. It's something you must see, hear and feel for yourself.



THE TRUVOX TOUCH

R62 twin-track (3½ and 1½ ips)
 R64 four-track (7½ and 3½ ips)

39 gns

complete with microphone, 7" reel of tape and recording lead.

Send now for leaflets showing *all* the tape recording equipment with The Truvox Touch:—

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—starts where the specification leaves off

SOUND and CINE

GREAT things are happening in the world of 8 mm. Optical sound on this gauge has been established at last, and it now threatens to change completely the set and prevailing pattern of only separate-tape sound or magnetic stripe sound for the home user.

In April of last year, I reported that Doctor John Maurer of New York had successfully recorded an optical track, 25 thousandths of an inch wide, in the area between the perforations and the outer edge of 8 mm filmstock. The listening results were said to be clear and satisfactory at 24 fps, but the whole operation was to be regarded simply as an experiment. Not much more was heard from the *Maurer* organisation about this until the other week, when indications were given that an 8 mm optical sound projector with new type sprockets and modified picture size would be launched on the American market shortly.

Meanwhile, in Japan (and this may have motivated the above) the 8 mm optical sound projector has actually been produced and is available on certain markets at a price around £50. The National Council of Churches' Audio-Visual Centre in Tokyo was one of the first bodies to take advantage of this and has arranged the purchase of a number of machines together with a good supply of religious sound films for use in African church communities.

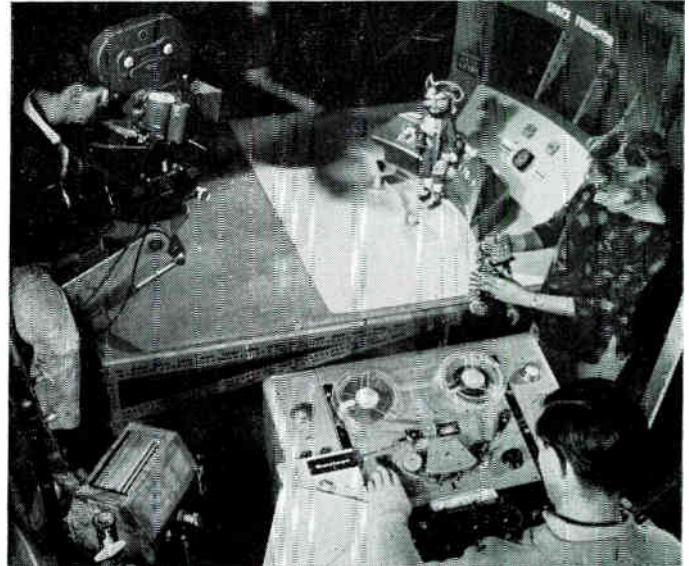
The machine is the *Toie Talkie 8*, made by the Toie Motion Picture Co. of Tokyo, and it has a photo-transistor in place of the usual P.E. cell, a 21.5 v, 150 w *Tru-flector* lamp, and a 6 watt amplifier consisting of one transistor, 2 normal type valves and 2 silicon diodes. The weight is about 20 lbs. A magnetic stripe attachment and a dual speed control is designed for future models.

Optical Sound Track Problems

Laboratory and Library circles in this country are not really very excited about this prospect at the moment, preferring to wait and see how the Japanese and Americans have solved the problems inherent with optical sound on this gauge.

It has always been considered that the low velocity of 8 mm film running at 24 fps, with only a speed of 3.6 i/s and the loss of peak sharpness on the photographed track, does not allow even reasonable quality of sound to be obtained. A comparison may be made in this respect when we consider those 16 mm films, with optical tracks recorded at 16 fps, in this year's *Ten Best* show. The linear speed of these was 4.8 i/s and the sound quality was hardly first class even though the optical track printing was up to standard. Added to this problem of counteracting low linear speed is the fact that, as the track is recorded adjacent to the perforations, a series of flats—rather than the perfect arc needed—is bound to result as 8 mm film, slimmer and with twice as many punched out holes as 16 mm, passes over the sound-head.

The Japanese photo-transistor may have helped to ease the problems of obtaining a high frequency from a very narrow slit-width and may be effective in cutting down light-scatter in 8 mm emulsion. The *Maurer* development of track placement (whether the modified picture size indicates that an entirely new position for track placement has been found or not) together with a highly efficient sound-head may have solved some problems of wow and flutter. The flats may have been overcome by scanning slightly off the sound-head rather than on it. It will be interesting, at least, to find out how they have beaten the speed problem. An assumption, for there are no specifications apart from the ones I have given above, is that some new method of driving the film through the sound-head may have been introduced into the system—possibly by friction from a capstan



The photo shows the set for the new series of children's television programmes "Fireball XL5". Further details can be found on page 328.

powered by a separate motor from that driving the rest of the mechanism plus, additional, loosely sprung sprockets to ease film strain.

Home-Movie Benefits

Assuming that 8 mm optical sound has indeed arrived, we should now consider what advantages there are to the home-movie sound enthusiast. One obvious advantage is that prices of the availing systems must drop considerably, from competition at least. It could be argued that if an optical projector can be produced for as low as £50 then the £150 plus of the mag/stripe projector does seem rather high; but that argument does not really count for much, because (1) the £50 figure is not realistic for the U.K. for it does not take into account the cost of freight or distribution and, (2) the basic mechanism of the optical projector is much more simple than that of the magnetic stripe projector.

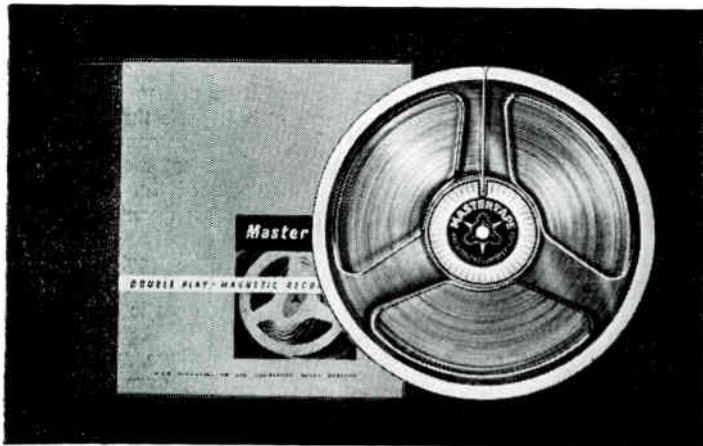
In the past, 8 mm has had to struggle on alone, unaided by the vast resources of Industry and Education, except perhaps where experience with 16 mm equipment has shown the way to be followed. The important fact now is that 8 mm is being recognised as a serious gauge, and that is calling for more development by A-V authorities all over the world. Leading manufacturers in Europe, such as *Technicolor* of London (desk-top projectors for education) and *Ercsam* of France (medical research) have already shown great confidence in 8 mm. In the U.S., 1,200 desk-top 8 mm projectors were recently ordered by the Ford Motor Co alone, and 85 individual American sponsors have promised to supply 8 mm magnetic sound prints for use by U.S. commercial attachés abroad.

U.S. Government Invest Dollars

In America in 1961, industry, Government and other bodies invested 415 million dollars in A-V aids generally. The total amount spent on 8 mm sound equipment and striped films during that year, however, was under 1 million dollars. By the begin-



as perfect as human skill can achieve



For almost a thousand years before our calendar began the Celts grew to be one of the greatest races of all time. Yet a mystery surrounds their culture and is evident in their art, of which this silver brooch is a typical example. The wonderful intricacy of design seems filled with some profound but inscrutable meaning. The great quality of skill and craftsmanship are, however, unmistakable.

In Mastertape also the qualities which outstanding craftsmanship and skill alone can produce are evident to the most discriminating connoisseur of fine sound recording and reproduction. In fact Mastertape is the end product of nearly thirty years research and development by a British pioneer company in recording techniques. Mastertape is specially approved by Grundig (Gt. Britain) Ltd. for use on their machines, as well as by many other leading tape recorder manufacturers. Those who really care for fine recording always insist on Mastertape.

Obtainable from your local dealer or, in case of difficulty write to the address below for your nearest stockist.

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Send for free full colour brochure of useful hints and list of tape prices.

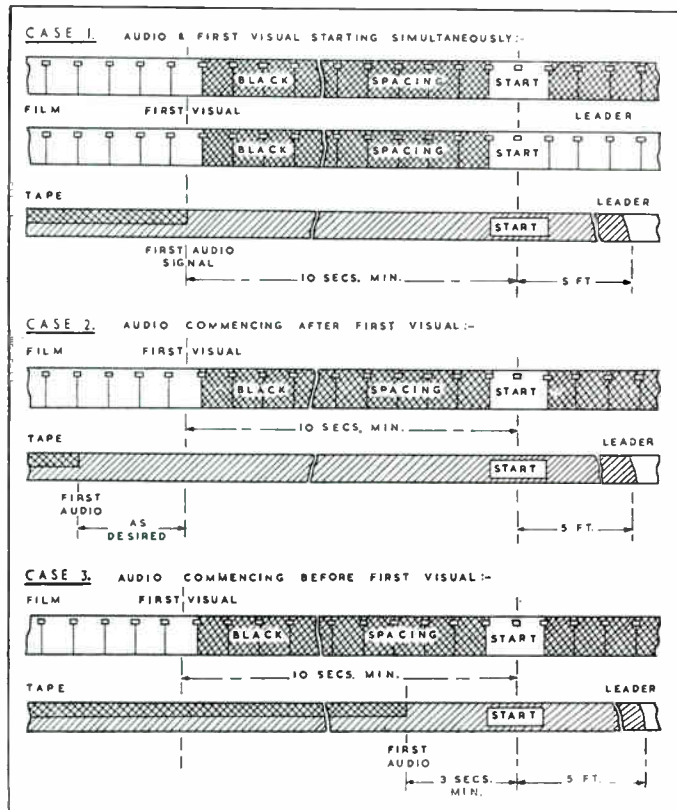
SOUND & CINE—(continued)

ning of 1962, however, the number of non-theatrical films available on magnetic stripe was rising above the 150 figure and the number of entertainment titles was over 60.

Once 8 mm optical is an established fact and accepted, at least by Education, the Labs may be suddenly inundated with orders for several million copies of films (their problem, of course, will be in a clear track transfer). A factor to be considered in this demand will be the public library service.

Increasing Interest by Libraries

Public libraries the world over are becoming increasingly aware of the importance of A-V teaching; in Denmark, the Statefilm Bureau provides all central libraries with 16 mm projectors for the use of film study circles; in the U.S., the Motion Picture Association of America makes films available to library authorities so that they can be loaned to organised groups. In



this country, the cheapness of the 8 mm optical projector together with the low price of 8 mm optical sound prints could enable most public libraries to augment their services to local organisations by having a supply of readily accessible information on sound films.

Advertising, too, may be a great factor in the increased use of 8 mm sound. Whereas, the Heath de Rochefort Corporation in America have found it possible to give away free an 8 mm mag/stripe projector with each set of "Parlons Français", a complete course of 8 mm striped sound films for French instruction in schools, so advertising might find it possible to present free copies of 8 mm optical sound films to home users possessing the appropriate apparatus for screening.

Present 8 mm Equipment

The possibilities seem limitless, but despite the revolution that it must make throughout 8 mm cine, owners of separate-tape or mag/stripe systems should not worry unduly about obsolescence for a long time to come. Separate tape must have the

edge as far as quality sound reproduction goes, and it is with pleasure and some relief that I welcome the recent I.A.C. findings on a code of practice for this system.

The I.A.C. Code of Practice

Because of the increasing use, particularly by amateurs, of magnetic-sound tapes as a medium for adding sound to narrow-gauge films, the Institute of Amateur Cinematographers considers it desirable that methods of synchronising be laid down in order to ensure interchangeability from one set of equipment to another.

Various methods of sound track assembly may call for differing methods of obtaining synchronisation, and the intention of this code of practice is to ensure a common method of identification, coupled with a standard method of reproduction in synchronism with the film during projection. Observance of the rules the code lays down for leaders, start marks etc., will be of great help in preparing films for competition entry and I summarise some of the most important points below.

Definitions: Perforated-tape is standard-play magnetic tape perforated towards its lower edge with sprocket holes spaced at 16 perfs per 3½ inches. **Start Marks** should be points on the film equal to an interval of not less than ten seconds in advance of the first visual and points on tape equal to an interval of not less than three seconds in advance of the first audio signal.

Leaders and Run-Outs: Film Leader. Every film shall have a black spacing between the start mark and the first visual. In advance of the start mark there shall be 6 feet (for 9.5 mm and 16 mm) of 3 feet (for 8 mm) of leader. Preferably this should be white or transparent with the title of the film marked clearly at the beginning. Where this leader is black or opaque, white lettering should be used for legibility. **Film Run-out.** Every film shall have at least 4 feet (for 9.5 mm and 16 mm) or 2 feet (for 8 mm) of black run-out following the "end" title.

Tape Leader. Every tape shall have at least 5 feet of leader in advance of the tape proper. The title of the film with which it is to be used and the tape speed shall be clearly marked at the beginning. **Tape Run-out.** Every tape shall have at least 3 feet of run-out at the end of the last wanted audio signal. **Film Marking.** Every film shall be clearly marked with a start mark. This shall consist of black lettering on clear film covering two frames and at least ten seconds in advance of the first visual.

Tape Marking. Every tape shall be clearly marked with a start mark at least 3 seconds in advance of the first audio signal. This shall consist of black lettering on a white insert at least ¼ inch in length and approximately 5 feet from the end of the leader. The full code can be obtained free (3d. stamp for postage) from the Hon. Secretary, I.A.C., 8 West Street, Epsom, Surrey.

Lectures and Courses outside London

The following lectures and courses arranged by the British Film Institute for September will be of interest to Sound and Cine readers living outside London.

September 8th. One-day Film Festival, subject: "The Critic". Lecturer—Alan Lovell. Organised by Bournemouth Film Society at Cranford School, Wimborne, Dorset.

September 12th. 7.30 p.m. Subject: "The Film of the Book" given by Matthew Turner. Organised by the Newbury Film Society.

September 13th. 8.30 p.m. Subject: "Production of a Film" by Bill Everett. Organised by Bishop's Stortford Townswomen's Guild.

September 25th. 7 p.m. (commencement of a course of 12 evening sessions). Subject: "The Art of the Cinema". Tutor—Derek Eastaway. Organised by Watford Technical College.

September 29/30th. Weekend course on World Cinema. Lecturer—John Huntley. Organised by the County Borough of East Ham Education Committee at Debden House, Loughton, Essex.

TAPE RECORDER SERVICE

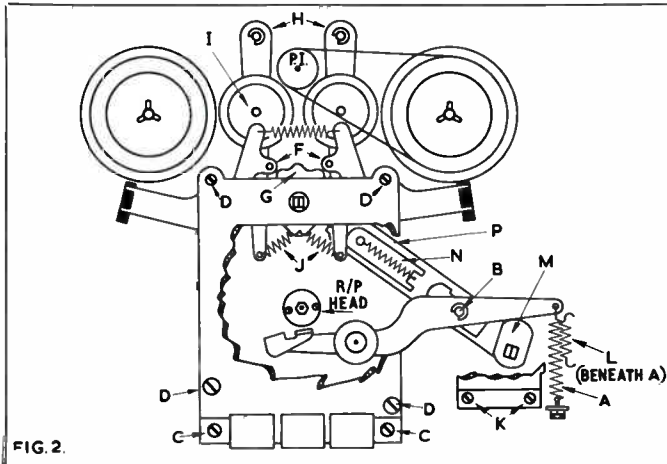
GRUNDIG MODELS, PART 2

By H. W. HELLYER

WITHOUT a doubt, the fault that is most vexing to amateur and professional alike is the broken, relaxed or misshapen belt. Readers may recall an amusing photograph on Page 473 of the November 1961 issue of *The Tape Recorder*. This showed the Grundig "black museum" of repairs, and included broken belts joined by thread, and improvised belts that once graced the innards of a vacuum cleaner and the top of a preserve bottle! It is hoped that present company, however vexed, are more concerned with doing things properly.

To this end, it is necessary to know how the various drive systems are arranged. Fig. 1 shows a selection of the popular drive belt systems used by Messrs. Grundig, with a key to the symbols, including cross-sectional shape of the important belts.

In the last article of this series, fig. 2 showed the motive system of the TK20 and 25 range, and was followed by a few words on belt care and maintenance. But it has been pointed out that replacement of belts—or even their removal for cleaning, heating, etc.—needs more than a layout diagram.



There are a number of parts overlaying the belts, and often a sequence of stripping operations that should be followed. A case in point is the changing of the clutch and fast wind belt on the TK5 and TK8 models. This range seems to have given the most trouble to readers, mainly because they are reluctant to remove the cams and levers and disconnect springs, and unsure of the order in which this dismantling should occur. Referring to fig. 2, the following procedure can be adopted. (Fig. 2 is a "skeleton layout" diagram, not necessarily to scale, drawn to show the essential parts, with extraneous details omitted.)

First, set the selector switch to "Off", unhook spring A, remove circlip B and lift the pressure roller arm away. The latter also bears the R/P head pressure pad.

Next, remove screws C and move the switch unit with its press buttons sufficiently to clear the baseplate, and unscrew the fixing screw D. Ease both brake levers back at their outer end to release cam followers F from cam G. The whole centre mounting plate may now be swung over to the right. Take care, when doing this, not to fracture the head connections or to damage the fast wind indicator lamp.

Take off the position indicator belt and remove the circlips H that hold the two fast wind levers. If the levers and the brake cam are lifted slightly, the fast wind belt can be slipped from its pulley, which lies beneath the rubber-tyred pulley, I.

To continue the complete belt-changing operation, it is now necessary to remove the fast wind levers and the cam G. You

may find it easier, when doing this, to release the end-springs J, but as these are held by two spring clips, easily broken by clumsy removal, it may be advisable to juggle with the three items simultaneously. A word of warning here—lay the loose assembly on bench or table in its correct, i.e. working, position, or you may find yourself attempting to solve a Chinese puzzle when it comes to reassembly. Anyone who has tried this operation will know exactly what I mean! We learn by experience.

Undo the two fixing screws K, which secure the selector switch bracket, unhook spring L from the tape stop lever and remove the bracket. Note the position of the cam M relative to the switch spindle, and remove it. This is most important.

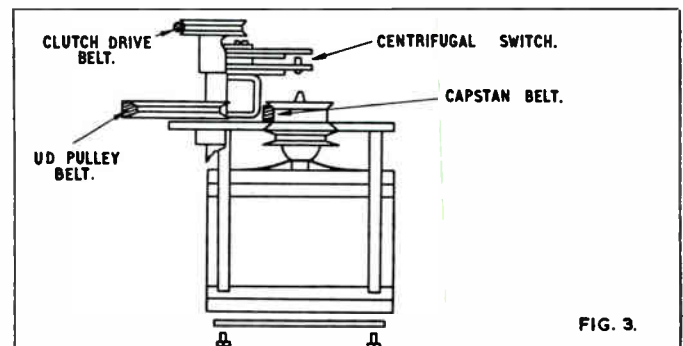
Unhook the tension spring N from the interlocking bar (or from the pillar). It is easier here to unscrew and remove the spring pillar completely. Withdraw the interlocking bar P. Release the tape stop lever by removing its circlip, and both the belts can now be changed easily. Remember to reassemble in reverse order and check functions of cams and levers in the various switch positions before reconnecting to the mains.

Other models, such as the TK25, have a less complicated sequence, but also require that the plate be lifted and swung out of the way to enable the belts to be reached.

Grundig TK9 and 12

A pair of machines that have not yet been mentioned, but are worthy of our attention, are the TK9 and 12, which have the facility of recording and playing back in both directions. These are half-track machines, employing two R/P heads and two erase heads, recording top track, left to right, and bottom track, right to left. The directional changeover is electronic, as is the speed change from $7\frac{1}{2}$ i/s to $3\frac{1}{2}$ i/s on the latter machine, by selection of the appropriate motor windings.

To facilitate this dual-direction working, the pulley arrangement, as can be seen in fig. 1, is quite interesting. The uni-directional drive pulleys are made in such a way that the upper section of each will only rotate in one direction by locking to the lower section. They are coupled individually to the lower halves of the spool carrier clutches, but the lower



pulleys of the U-D assemblies are mutually coupled with a belt that is driven by the motor spindle, via flywheel and coupling pulley.

To break down the sequence, when recording, left to right, a braking action of the left-hand spool is obtained by the appropriate U-D pulley refusing to rotate anti-clockwise. This

holds the lower clutch pulley of the left-hand assembly static and the weight of the tape on its spool causes friction of the felt beneath the upper half of the clutch assembly with the clutching plate of the lower half. The take-up spool, however, has torque applied; the U-D pulley rotates anti-clockwise and drives the lower clutch pulley. At $7\frac{1}{2}$ i/s, the speed is approximately 650 r.p.m. but slipping friction takes place, proportional to the weight of the tape, keeping the pull reasonably uniform. Thus, if take-up is sluggish, the felt in the upper section of the clutch should be checked. A similar braking action is obtained during *Fast Wind*, but take-up is assisted, as will be explained.

For transport in the opposite sense, right to left, the action is clockwise, lower clutch static on the right-hand spool, now the supply spool, and free on the left-hand spool.

Fast Wind operation is obtained by the appropriate take-up spool being locked in a solid assembly. This is accomplished by a solenoid built into the lower clutch, which energises during fast wind, lifting the clutching disc and virtually binding it to the plastic insert of the clutch spindle. During fast wind the motor is fed from the 260 volt winding of the mains transformer, whereas it normally receives 165 volts, from a lower tapping. A braking voltage is applied to the solenoid during "temporary stop" operation.

Centrifugal Switch

There is one interesting departure from this. When the Record or Playback function is first selected at $7\frac{1}{2}$ i/s, the motor starts on the higher voltage tapping. But a centrifugal switch, actuated by the motor spindle, opens as the motor picks up speed and operates to release a relay, which selects the lower voltage tapping.

Mention of this centrifugal switch brings us back to our main theme of belt replacement, for the procedure of changing the capstan belt on these machines can result in damage to the switch unless carefully carried out.

Referring to fig. 3, it can be seen that the flat belt to the capstan assembly cannot be lifted over its pulley without damaging the switch vanes. But removal of the switch will be more difficult than the following method of operation.

Take the motor from the machine. Unscrew the capstan plate, noting the positions of the spacing washers for *exact* reassembly. Unscrew the stator plate and lower the stator about

$\frac{1}{4}$ inch. Then take out the flat belt complete with capstan plate. Unscrew the capstan bearing. It is now possible to replace the flat belt and assemble the motor, taking great care to ensure the belt is running in the centre of the capstan. Note that the position of the washers will affect this. Check that the centrifugal switch is closed with the motor at rest, and opens when the motor runs up to speed.

On another range of machines, the 819, 820, 830 group, the centrifugal switch is even more important, performing several relay-switching operations. It is most important that the contacts be clean and making correctly, and if intermittent faults are reported on these tape recorders, always ensure that the centrifugal switch is performing properly.

Grundig TK14

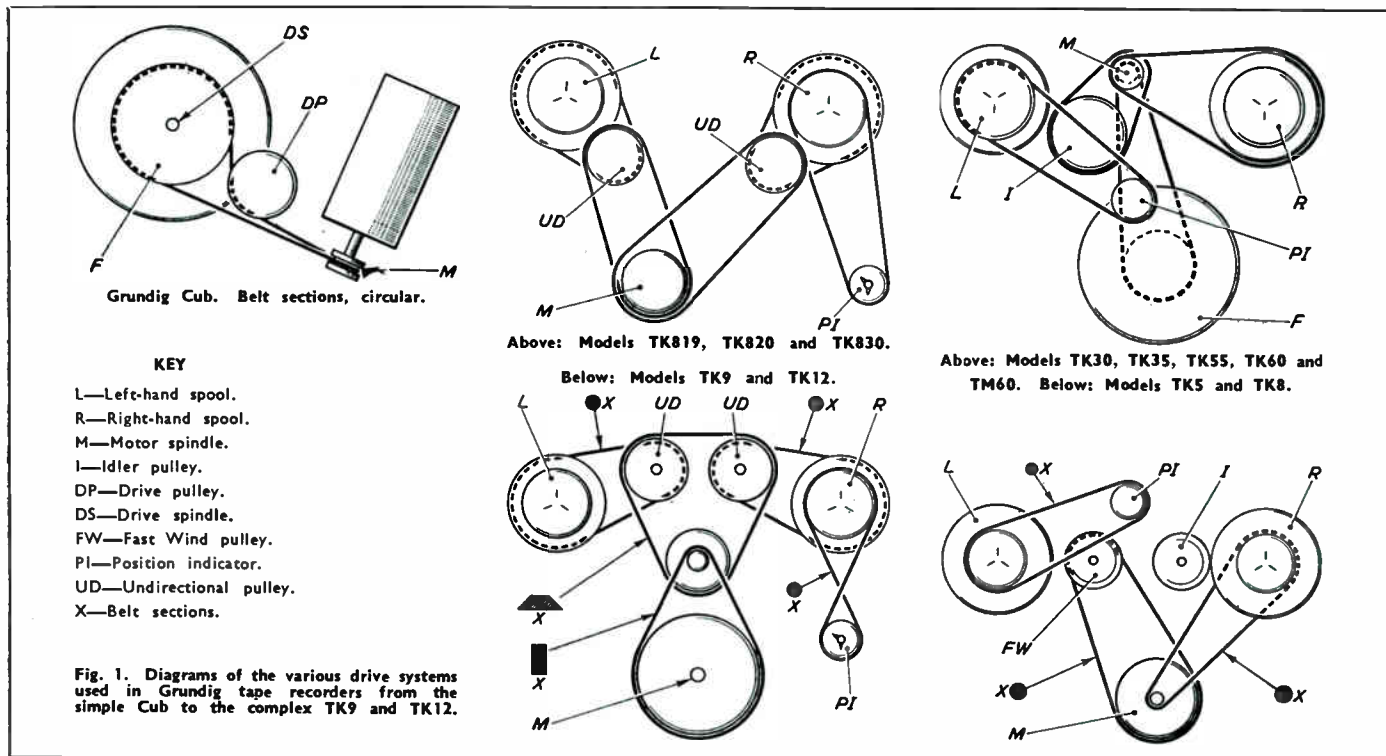
Queries about the slackness of the TK14 drive belt may be simply because of familiarity with "normal" tensed belts. This machine used a triangular section drive belt in the earlier production runs. This has since been superseded by a circular section belt, not so likely to become twisted and cause wow and flutter. Any Grundig agent should be able to obtain and fit the new-type belt.

The TK14 drive system demands that as little pressure as possible is exerted on the motor pulley, thus a slack drive belt is used, and it is vital that alignment of pulleys be accurate. Centre line of the flywheel and motor pulley grooves above the chassis should be 14.5 ± 1 mm.

To make sure of the motor pulley level, first measure the flywheel groove distance and get it accurate. Then, with the machine disconnected, of course, wedge the rotor and grip the motor pulley. Pull the pulley upwards on its spindle with an anti-clockwise twisting action, then carefully screw-push it down with a clockwise motion until it is at the right level. This up-and-down action is the only way of ensuring that, when the motor commences to run, the pulley level will remain true.

Finally, complaints about static interference from belts in the TK30, 35, 55 and 60 range usually prove to be caused by the flywheel belt, and can often be cured by application of a little graphite to the belt. But the manufacturers have gone one better, supplying an anti-static shield, which can be screwed to the top of the deck chassis, just behind the head connections (i.e., in front of the left-hand spool). A Grundig agent will be able to obtain and fit this modification.

H. W. Hellyer



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Three tape speeds

1½, 3¾, 7½ i.p.s.

Frequency response

60 to 10 Kc/s at 1½ i.p.s.
60 to 15 Kc/s at 3¾ i.p.s.
60 to 18 Kc/s at 7½ i.p.s.

Wow/Flutter

± 0.1% at 7½ i.p.s.
± 0.12% at 3¾ i.p.s.
± 0.2% at 1½ i.p.s.

Four-tracks

Selected by positive piano-type keys.

Signal to noise ratio

Better than 50 db at 7½ i.p.s.
Better than 45 db at 3¾ and 1½ i.p.s.

Pressure sling

This, unlike the conventional pad, is flexible and maintains even pressure over the whole surface of the head. It gives better H.F. response and minimises "drop-out" effects.

Multi-disc clutches

In addition to the normal slipping clutches the TK.40 embodies additional multi-disc clutches to remove excessive tape strain. Using *double-play* tape you can switch immediately from fast-forward to fast rewind or vice versa without tape breakage or stretch.

Inching

Fast-forward and rewind are controlled by a slider actuating a progressive clutch. Inching is thus unusually easy and accurate. A lock position is also provided.

Cine-socket

To connect magnetic heads from a cine projector to the TK.40 to record sound films or play back from them.

Built-in tape cleaner

Retractable, and press-button operated.

Indicator re-set

The digital indicator is provided with a button for immediate zero re-set.

Automatic stop

At the end of the tape.

Remote control

An adaptor is available.

Mixing facilities

For microphone/pickup and microphone/diode.

Monitoring

Through loudspeaker when required.

Synchronous recordings

Output for monitor amplifier provided.

Superimposition

Push-button provided for adding effects or commentary to existing recordings at will.

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(*Electronics Division, Gas Purification & Chemical Company Ltd.*)

GS. 301/2

A CROSS-SECTION OF SERVICE PROBLEMS

* The current series of articles on Tape Recorder Servicing are proving of great help to dealers and keen amateurs alike. They have also brought a big crop of letters. From time to time we propose to publish a selection, plus Mr. Hellyer's replies, in the hope that they will be of help to other readers.

Baird Recorder

Dear Sir:—Could you please supply me with an instruction booklet and a valve line up, for the Baird tape recorder, upright model, Serial No. 7633?

I am having some difficulty obtaining a new valve, as the numbers on the old valve have worn off.

I have written to three other companies, to do with Baird, and they suggested I tried a trade magazine.

Yours faithfully, K.A., Hyde.

I regret that I am unable to supply instruction books or service manuals, as these are only issued by the manufacturers, and often limited to accredited agents. And, in the case of the tape recorder you mention, these have been long out of print. I would suggest that the best way of obtaining them would be a short advertisement in the classified columns of this magazine, in the hope that some other reader may be able to lend them to you.

In the meantime, however, I may be able to help you with information compiled from workshop notes. I presume the machine you describe as the "Baird upright model" is the Soundmaster. This used the following valve line-up: EF40 first amplifier; EF40, second amplifier; EL41, output stage; EL41, oscillator; EZ40, rectifier.

This was a single speed, $7\frac{1}{2}$ i/s, machine, with two motors. The motors are 4-pole induction type and the rewind motor has coils parallel connected for high starting torque and the reservoir spool is mounted on a direct shaft extension.

The forward drive motor runs at 1,400 rpm and reduction drive to the flywheel is via a 1 in. rubber drive wheel on the motor shaft, reducing to 480 rpm. (The flywheel has a rubber tyre.) The take-up is via a belt drive from the pinch roller, with a slipping clutch and light friction braking to prevent overspill.

The head assembly is in one unit and both R/P and Erase heads are aligned together. Bias frequency is 50 Kc/s.

Bias current is 20mA, Erase current is 70mA, Bias voltage is 7 volts and Erase voltage 30 volts.

The recording level indicator is a neon lamp in the secondary circuit of the output transformer.

* * *

Sobell 601 Recorder

Dear Sir:—I have a problem with a Sobell Festival tape recorder model 601 TR. How do you get it out of its case? I have removed three screws and the knobs, also the two screws which hold the recorder in the case, but still it will not move. Would you please assist me? Yours faithfully, R.M., Co. Down.

I am sorry to hear that you are having trouble in dismantling your Sobell 601 tape recorder—but, I confess, not surprised. We all have these occasional brick walls, apparently impossible jobs, and it was not until one of my engineers had tried to dismantle one of these and succeeded only in breaking the decorative front plate that I discovered the way myself. Luckily, that was a while ago, and I've had several to service since.

Having tantalised you so far, I'd better tell you the secret. Put the machine on the table with the lower end toward you, as for operating. Note that there are two gilt pieces at the ends of the handle. Get a fine-bladed screwdriver under the slight gap that you'll see if you look closely at each end, and gently prise these caps off. The handle itself is held by two screws at each end. Remove the inner of each pair. All that is needed, apart from this, is to remove the two main fixing screws of the BSR deck, and the whole machine comes from the cabinet. A very

neat assembly—but I wonder how many others have been caught? I have not seen the Sobell instruction book, and can only hope that they remembered to mention the screws hidden under the handle caps—or they are going to have to replace a few damaged front covers.

Philips EL.3541

Dear Sir:—May I ask if you have a Service Report Section for the Philips No. EL.3541. I have read your June article in *The Tape Recorder* on the Nos. 3536-14-85 and found it most interesting, also your views on the recommended standards for the future 4-track heads. What a pity recorder heads are not made with plug-in connections and a clamp so that any variation like a valve can be used!

My own set, EL.3541 four-track, from new would not take a 7 in. reel without judder on the clutch arrangement, yet a 3 in. recorded and played perfectly.

I stripped it and added another ten thou. washer to the spindle under the friction disc. This cured it, but I would like to know the correct clearances and which side the square spindle drive should be, and how to centre the tape control when rewinding, also the correct position of tape on the recorded head.

Yours sincerely, T.A.H., London.

I should point out that the EL.3541 machine was described in my article in the May 1962 issue of "The Tape Recorder", pages 162-3-4. You may not have seen this, and it would probably be of interest; some of the questions asked in your letter are dealt with in the article. I am sure the back numbers department could oblige you with a spare copy if you would care to drop them a line.

The clutch friction is adjusted to take a 5 in. reel, and it is possible that you were imposing too great a load with a 7 in. reel. The small tension wheel (to be seen at the RH side of the upper portion of the deck) should be checked, to ensure that the drive belt is correctly driving the clutch drum for take-up. Its mounting bracket can be positioned to increase tension. The drive belt tension is normally between 500 and 600 grams and the tension wheel should move 10 mm before coming up against the stop cam. This can be seen more clearly in fig. 2 of the aforementioned article.

Clutch clearance is adjusted by adding or subtracting washers, as you have done. First, the height of the turntables may be adjusted by adding washers so that the tape runs centrally between the spool flanges and guide post channels. (The code number of these washers is A.9.868.66.) Then, the turntable should be 0.8 to 1.2 mm above the Vulcanan plugs of the coupling wheel. This is then adjusted by adding the small washers beneath the clutch (code no. A.9.868.65).

Tape guides must be adjusted for the following clearances between the lower side of the guide bracket and the mounting plate: left-hand 16.3 mm, right-hand 16.5 mm. If this is correct, tape should also be central when rewinding.

Correct position of the tape on the heads can now be checked. This is best done with a test tape, but a rough check can be made by observing that the tape runs freely through the head guide plate of the R/P head, and that the core of the erase head protrudes 0.5 mm above the tape. It is advisable not to make indiscriminate adjustments to head settings unless the whole four-track setting-up procedure is followed. This also was covered in detail in the final part of the May article. If the top edge of the tape is running straight across the top limit of the upper gap, and both outer tracks of a pre-recorded tape play back correctly, your machine should be in order.

The square spindle drive is fitted to the left-hand feed spool-carrier. The friction disc with the locating pin in on the right-hand take-up spool carrier.

PEAK PROGRAMME

CONSTRUCTION — SETTING-UP AND TESTING

ALTHOUGH the peak-programme meter circuits described last month can be used to measure the signal at any suitable point of interest in an audio system, the main application will be as an addition or a supplement to good-quality tape recorders, as recording modulation indicators. Where the circuit can be built into the recorder itself, the components must be fitted in as best they can in the space available, but their layout is not critical and no guidance is necessary, save to recommend avoiding placing them near low-level circuitry.

The meter itself need neither be near the other components nor be even in the same box, although the leads to it should certainly be twisted together and may also need screening. The makers of the recorder should be consulted about the availability of supply power (at least 200 V. D.C. at 20 mA, and 6.3 V. A.C. at 1 A) and the best point to take it from. However, the circuit will usually have to be in a separate unit and may have to draw its supply either from another amplifier or from a small separate power unit such as that shown in fig. 5.

Initial Tests

Once built, the circuit has still to be tested and adjusted before it can be put into service. Readers who have access to a test meter may like to check the voltages at the valve electrodes and elsewhere (see fig. 4 in pt. 1) as follows: V1a—anode 120 V., cathode 1.4 V.; V1b—anode 120 V., cathode 30 V.; V4—anode 150 V.; RV3—H.T. end 110 V., cathode end 70 V.

The controls RV2 and RV3 should be set at about their mid-range positions during these tests, or as near these as brings the meter to the left-hand (electrical) zero point. Since

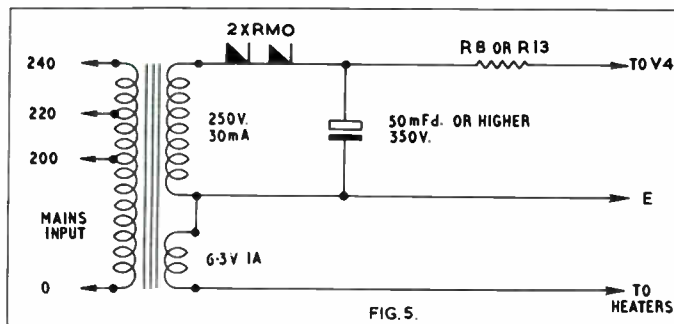


Fig. 5—Circuit of power unit suitable for peak-programme meter circuits shown in figs. 1 and 4 of Pt. 1 last month. R8 (fig. 1) = 5 K ohm, 7 watt; R13 (fig. 4) = 7.5 K ohm, 5 watt. Mains transformer Radio-spares "Midget" type, etc.

the burning voltage across V4 may differ by ± 10 V. from the nominal 150 V. according to the particular tube used, and the characteristics of V1 similarly, some variation from the figures given above can be expected: say ± 15 V. at V1 anodes and ± 0.2 V. or so at V1a cathode. The voltage across R4 must be closely similar to that across R5, however. The screen and cathode voltages of V3 may be almost anything from 110-70 V. and 0.5-3 V. respectively at this stage, but after the law and zero have been finally adjusted, expect about 90-100 V. and 1-1.5 V. respectively.

Check the Stabiliser

Readers without meters can assume that all is reasonably well if V4 strikes and glows brightly immediately the mains supply

is connected and then dims somewhat as the other valves warm up and the ppm pointer moves to the left. Should the stabiliser tube extinguish or not dim at all on warming up, or fail to strike at first, all is *not* well and the wiring and components should be checked. But note that this *correct* sequence will only apply when a metal h.t. rectifier is used in the power supply. With a valve rectifier, perform this check as follows: connect the earthy (h.t.—) line, switch on the power unit and allow a half-minute to warm up; connect h.t.+, through a switch for safety, and observe V4 striking; connect heater supply and observe V4 dim slightly and the ppm pointer move to the left within a half-minute. Lastly, check that the pointer can be set to its electrical zero point by adjustment of RV2 and 3 somewhere near their mid-ranges after a few minutes warming up.

Setting the Law

If you can obtain a variable audio-frequency oscillator and a dB-step attenuator for adjusting the current response characteristic of V3, so much the better since the oscillator can be used later to check the frequency response of the circuit. Even a single frequency source of between 50 c/s and 10 Kc/s will serve the immediate purpose, the waveform being unimportant so long as it is symmetrical. Failing that, one can conveniently use the 50 c/s signal provided by the Electricity Authority which appears at a convenient level across the valve heaters. In the absence of a step attenuator the circuit of fig. 6, which gives two 4 dB steps, can be connected across the heater supply or across the output of most other signal generators. (Remember that most heater supplies are earthed either on one side or at a centre-tap; connect earth to earth only (or you will damage the supply) and the live end of the attenuator to the other side in the former case or to either side in the latter.)

The law-setting procedure is as follows, using the heater voltage and 2 step attenuator (the procedure with other means is the same, of course, but requires less manipulation if a wide-range attenuator is used):

(1) First, with no input, adjust the ppm zero control RV2 to bring the pointer to the electrical zero mark.

(2) With connections as in fig. 6, adjust the ppm gain control RV2 to give a deflection to "4" on the scale.

(3) Step input up and down by 4 dB by moving attenuator connection to A and C respectively, whereupon the pointer should move to deflections of "5" and "3".

(4) If the circuit is out of adjustment the ppm will move either more or less far than it should in each direction. This can be corrected by control RV3.

(5) Return the attenuator to step B. and adjust RV3 to move the pointer by about 2 dB from "4": move the pointer to the left to expand its movement and to the right to contract it.

(6) Remove input signal and start again at (1). When the 3-5 range appears satisfactory, check the 5-7 range by setting the attenuator at A, increasing the gain control RV1 to give "5" and working upwards, and the 3-1 range inversely by setting the attenuator at C, reducing RV1 and working downwards (remember "2", "1" is 6 dB, not 4).

This may call for slight readjustment of the condition reached at (6) above and possibly a compromise in the accuracy of various parts of the scale. Bear in mind here that the accuracy of the upper half of the scale is more important than that of the lower half, although with care it should be possible to achieve an accuracy of within $\pm \frac{1}{2}$ dB over the whole scale. The control RV3 should now be left alone, and preferably locked, and RV2 used for slight day-to-day zero adjustments. If it later becomes necessary

METERS

by GRAHAM BALMAIN

to change V2, V3 or V4, the whole procedure will, unfortunately, have to be repeated; the necessity will usually be shown by one's having to make repeated one-sided zero adjustments rather larger than those normally encountered. However, the valves are used very conservatively here and should last for years.

Checking Response Times

If the circuit of fig. 4 is working correctly, the response times are set by the component values and do not depend on valve characteristics, so these checks are really a matter of form to confirm circuit accuracy. As such, they should ideally appear earlier in the schedule, but unfortunately they cannot be performed satisfactorily until the law adjustment is correct. You may, nevertheless, like to try them for interest.

To check the fall-time, produce a steady deflection of "7" from the calibrating signal by adjusting RV1; then remove the signal and observe the time taken by the pointer to reach "1". With a rapid meter and a nominal 1 second fall time-constant this should amount to 2.5-3.5 seconds, which can be read easily enough on any watch or clock having a sweep second hand. If a "medium" meter and a longer fall time-constant is in use (see Pt. 1) the fall-time can be up to 12 seconds. Should the time differ much from that expected, suspect R9, CH, V2 and V3 in that order.

The check on rise-time is a shade more subtle, in that one must feed an accurately known pulse into the circuit at its input to check both the low-frequency response of the amplifier stages and the charging time-constants of the two phase-splitter outputs into C4. Once again, produce a deflection of "7", then disconnect the input but leave the signal generator output and the gain control RV1 as they are.

The procedure now is to charge a capacitor up to a voltage equal to the peak value of that signal input and to discharge it through a resistor across the circuit input. The values of the capacitor and resistor can be whatever is to hand (although they should be known accurately to within 5 per cent.), provided only that their time-constant, their product in megohms x microfarads is 0.003 seconds. Thus, one can use 5 mfd and 600 ohms, or

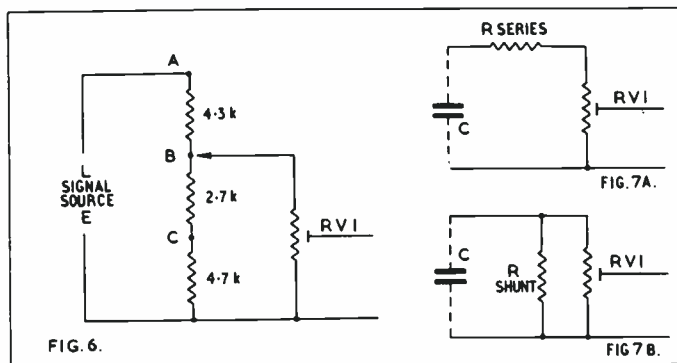
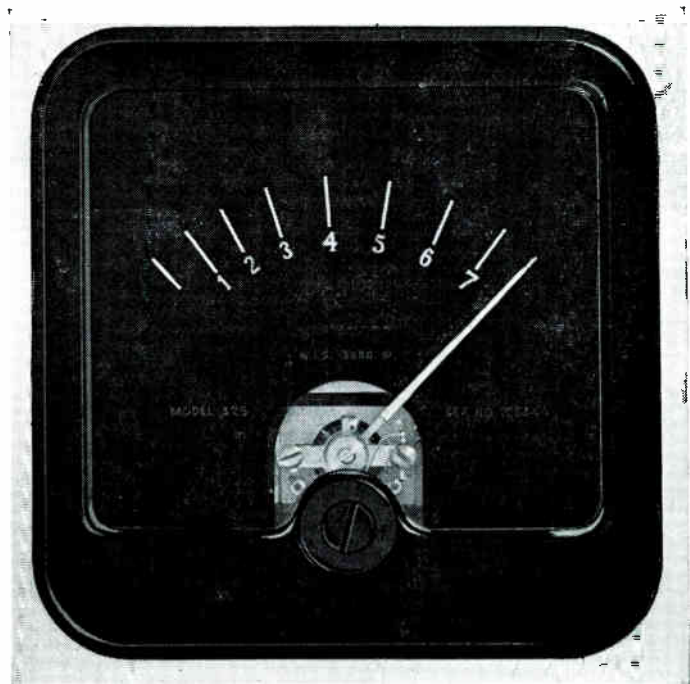


Fig. 6—Two-step attenuator to help in setting the current response of V4. Resistors ± 1 or 2 per cent. Values shown for audio oscillator; divide by 10 when using heater supply, if preferred. Make RV1 at least ten times total resistance. Fig. 7—Two forms of discharge resistor for feeding known pulse into ppm circuit: (a) higher than RV1 ($R_{total} = R_{series} + RV1$) and (b) lower than RV1.

2 mfd and 1.5 K ohm, or 0.1 mfd and 30 K ohm, and so on. It may be convenient to use RV1 as the resistor; otherwise it



B.B.C. peak programme meter (Photo Ernest Turner Instruments Ltd.)

can be padded out to increase the total resistance ($R_{total} = R_{series} + RV1$) or shunted to reduce it when

$$(R_{total} = \frac{R_{shunt} \times RV1}{R_{shunt} + RV1})$$

If a shunt resistor has a value less than 1/20 of RV1, R_{total} is practically equal to R_{shunt} . Fig. 7 (a) and (b) show the alternatives.

There are two ways of producing the correct charge voltage on the capacitor. The first can be used only when the waveform of the input signal and its *r.m.s.* or average value is known (see "Soft—For Art's Sake" *The Tape Recorder*, March 1962) as it is when it is derived from the heater supply or from an audio oscillator. These latter are "sinusoidal" waveforms whose peak/average ratio is 1.57 and peak *r.m.s.* is 1.41. The other likely waveform, which readers who have knocked up a simple multi-vibrator will be using, is "square" and this is even easier because the peak *r.m.s.* and average values are all equal. Taking the case of a 6.3 V. *r.m.s.* (or 3.15 V.) heater supply source—check the exact voltage if you can—we need 6.3 (or 3.15) $\times 1.41 = 8.9$ (or 4.45) V. D.C. across the capacitor. This can be derived via a potentiometer either from a battery or, more conveniently, from the 150 V. *h.t.* supply. If you have a D.C. voltmeter, a 100 K ohm or higher logarithmic potentiometer across the supply will suffice (fig. 8a); otherwise use the arrangement in fig. 8b.

Charging the Capacitor

Now hold the capacitor leads across resistor R_e for a few moments to allow it to charge up to the required voltage and, without shunting the leads with your fingers, transfer them to the input terminals (fig. 7) and allow the capacitor to discharge through R_{total} . All being well, the ppm pointer should kick to a deflection within a dB on either side of "5". It is easier to see how far the pointer kicks if you view the meter from above, by the way. Repeat the process of charging up and discharging two or three times to make sure of the deflection, keeping the capacitor the same way round each time, and then again with it charged the same way round but discharged in reverse. The two kicks may be slightly different but both should fall within ± 1 dB of "5". Referring to fig. 4, when the voltage applied to the input is *positive* with respect to earth, it is the *cathode* output of V1b which is operative (the anode

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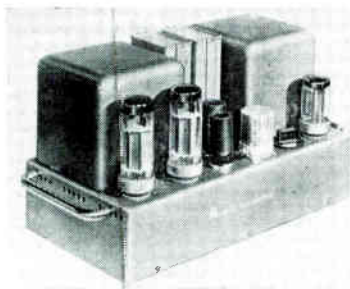
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PEAK PROGRAMME METERS—(continued)

output contributing practically nothing) and the anode output when the input is negative *w.r.t.* earth, the cathode output then being inactive.

The other way of producing the correct voltage across the capacitor is to charge it up directly from the signal source through a ½-wave rectifier (fig. 8c), but, although much simpler,

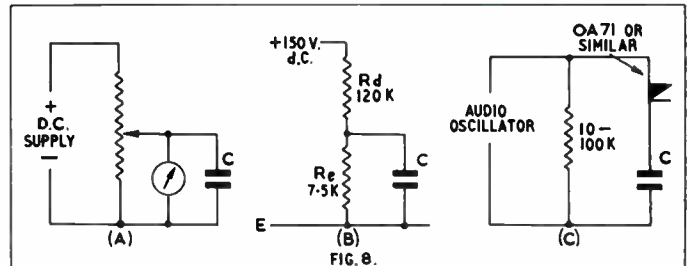


Fig. 8—Deriving capacitor charging voltage for pulse testing: (a) using D.C. voltmeter; (b) using stabilised h.t. supply; (c) using peak-charging circuit. Potentiometer in (a) should be 50-100 K ohm for 150 V. supply, correspondingly less for lower-voltage sources. Resistors in (b) ±1 or 2 per cent. values given for 8.9 V. D.C. otherwise

$$\frac{R_e}{R_d} = \frac{\text{D.C. volts required}}{150 \text{ V.} - \text{D.C. volts required}}$$

this method is liable to unconsidered errors unless one can work out what is happening in each particular case. Try it only if you can do so, or if the generator output source impedance is definitely known to be 100 ohms or less (the heater supply fulfills this condition). Readers who have built a circuit to fig. 1 should set RV2 to give the correct deflection during these tests.

Next Month

You will doubtless be relieved to hear that your *ppm* is now ready for use, though discussion of its connection into the recorder circuit and setting its gain control suitably must wait until part 3 next month. I shall also describe there some simpler peak-reading circuits needing fewer valves or none.

TABLE OF METERS FOR PPM CIRCUIT

Manufacturer	Model	Size of face	Speed	Price	Delivery
Taylor Electrical Instruments, Ltd., Montrose Avenue, Slough, Bucks.	50	5" × 4"	Rapid	£ 6 0 0	8 weeks (approx.)
	30	2½" × 2¼"	Rapid	5 0 0	8 weeks (approx.)
	220	3½" × ½" (edgewise)	Rapid*	2 5 0	8 weeks (approx.)
	30	2½" × 2¼"	Medium	3 0 0	8 weeks (approx.)
Measuring Instruments (Pullin) Ltd., Winchester Street, Acton, London, W.3.	35	3½" square	Rapid	5 11 6	6 weeks
	20	2" round or square	Rapid	3 18 0	6 weeks
	35	3½" square	Medium	4 18 6	6 weeks
Ernest Turner Electrical Instruments, Ltd., High Wycombe, Bucks.	325	3½" square	Rapid	6 6 0	12 weeks (max.)
	505	2½" round	Rapid	5 16 6	12 weeks (max.)
	W15	1½" square	Rapid	5 15 0	12 weeks (max.)
	W15	1½" square	Medium	3 11 6	12 weeks (max.)

* The Taylor edgewise meter has a satisfactorily short rise time but overshoots by 1-2 dB and thus takes longer to come to rest.

BUILDING ROUND THE HARTING DECK

PART 3 — LINING-UP AND TESTING

THE ways and means of testing and lining-up tape recorders have been discussed so many times in this magazine that readers will probably have become experts by now. If so, pass on; but the methods employed here work well on this particular circuit design, so I will try to make it a "handbook" type of article rather than one of general theory.

Requirements: A test tape to C.C.I.R. limits at $7\frac{1}{2}$ i/s, with an 8 Kc/s recorded tone on the other track. An oscillator covering 40-15,000 c/s, or a frequency test record with a good pickup and amplifier. A meter capable of measuring up to 400 or so volts, of as high an ohms/volt category as you can afford (ideally a valve voltmeter).

As some of you know, I favour using a general purpose oscilloscope in the setting-up procedure, if only because it does show you what is going on. As for detecting instability, analysing hum and noise and tracking down cross-talk, well, it is nearly indispensable. However, if you cannot beg, borrow or steal you must be prepared to take some of the measurements on face value and exercise a little more faith in the circuits than would otherwise be needed!

Testing: An overall wiring check is customary before applying any volts, with a specific check of mains wiring, heater continuity and correct polarity of electrolytics. If you have another recorder handy, dictate into it the points you wish to check by reading from the wiring diagram "Input socket to tag 9 of V1, one meg. resistor to screen and earth bar . . . etc". By playing this back you have a good bloke checking and a good bloke telling him what to check—try it sometime!

Check for Overheating

Switching on with bated breath, keep a wary eye for overheating anywhere in the circuit which may denote a fault and then take a few voltmeter readings on your predetermined test points for H.T. Check the operation of the microswitches, and note that the neon pilot for *Record* comes on correctly when the

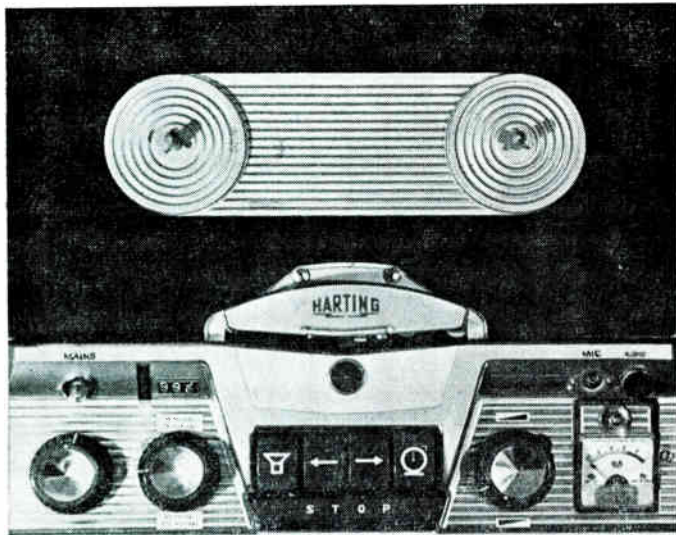


Fig. 1: The layout of the Harting Deck allows the constructor to fit level meter, microphone input and neon indicator.

button is pressed and dies slowly when the button is released (due to the charge on C4A holding the H.T. temporarily on the oscillator).

The meter may register in either direction, and the cathode preset resistor should be adjusted to give zero reading with the gain controls all turned down. With the *Record* button pressed there will be a small deflection—but more of that later. A large deflection should be obtained by turning up each gain control

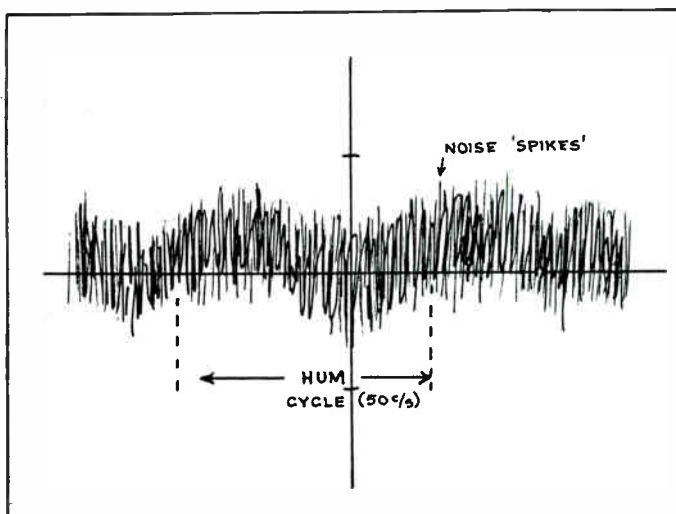


Fig. 2: Waveform of hum and noise.

in turn and quickly tapping the "Signal" tag of the relative input jack. If you have the aforementioned oscilloscope, put it across the output of V2 and this will give you some idea of the gain present there, too,—the mere proximity of a hand to the input tag will give a good indication.

Lining-up Procedure

(a) *Playback.* First, demagnetise the head. Then use the test tape on the continuous 8 Kc/s tone to adjust the head azimuth. Watch the amplitude of the output waveform on the oscilloscope or use a power amplifier and an ordinary voltmeter to find the maximum point while rocking the head "platform".

Now use the C.C.I.R. side of the tape and start on the real equalisation. With the components as shown the response will be reasonably level from 40 c/s to 2 Kc/s. The series 3K preset will adjust the 2 Kc/s—4 Kc/s level. Pressing on up the scale, the 10 Kc/s point is brought to the 2 Kc/s level by adjusting the preset across the boost coil; at this point you may allow a 1.5 dB rise to give you a little more in hand at the extreme top, but this level should not be exceeded. Re-scanning the range again will probably show that the 2 Kc/s level can be readjusted slightly and the 40 c/s level raised or lowered by slight "padding" of the .05 capacitor ($\pm .005$ is a good start).

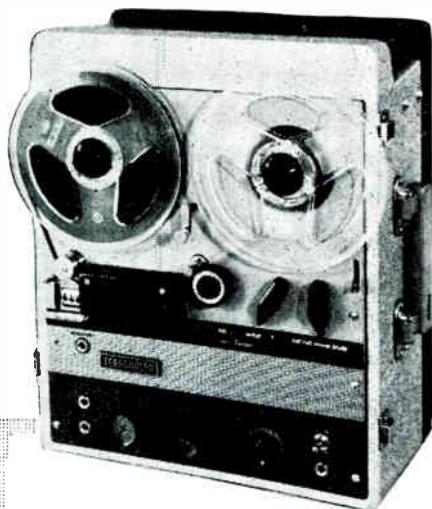
Hum and Noise

At this point you can check for residual hum and noise. The 50 c/s hum can be mostly affected by the position of the mains transformer which can now be tilted back till the hum is a

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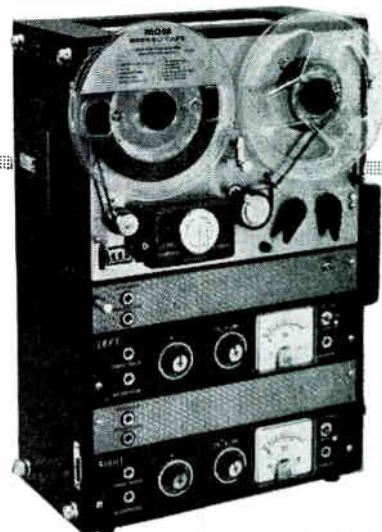
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BUILDING ROUND THE HARTING DECK— cont.

minimum. On the oscilloscope the relationship of hum to high frequency hiss (fully equalised circuit) should give a trace similar to fig. 2, and with the output driving 1 watt of test tone from a power amplifier to a moving coil speaker the background should be quite inaudible in a quiet room. (One watt of test tone is very loud!) There is no point in trying to improve on this performance. Tape noise will be much more evident than amplifier noise.

(b) *Record*: First check the oscillator waveform and correct "dying-away" on switch-off. Check the meter zero adjustment. Apply a 1 Kc/s test tone to the auxiliary input at 100 mv and increase the gain control till there is 15 volts *r.m.s.* of AC signal at the anode of the recording output valve (valve side of the bias filter). Check the waveform here if possible. At this level increase the meter input preset till the needle gives two-thirds deflection and mark the scale in red from that point on (see photo).

Adjusting the Bias Voltage

Reduce the signal gain to give one-third full scale reading and commence recording tests. At this point the bias voltage across the head should be roughly adjusted to 100 volts *r.m.s.*, and the bias blocking filter adjusted to give a minimum reading on V5 anode. Record short passages of 1 Kc/s tone at bias voltages above and below this value and settle on one which is just *above* the value that gives maximum playback. You will now notice that

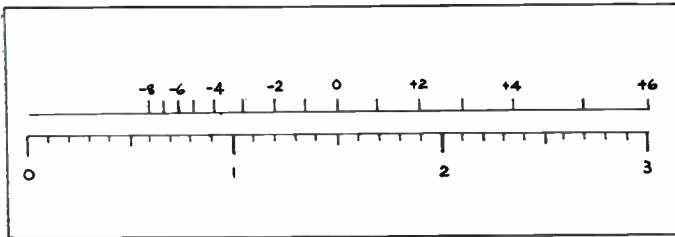


Fig. 3: Volts decibel scale

with the signal taken off and gain turned down there is still a small deflection of the meter due to "pickup" of the bias voltage. This can be marked on the scale to give an indication that the bias is indeed there and reasonably correct.

Frequency Response

A full frequency run can now be undertaken (at the same level) and on playback this should give a fairly level output. Any adjustments needed must now be made to the *record* equalisation only. If 12 Kc/s response is not satisfactory check the boost inductor tuning—it should resonate about 15 Kc/s. If no snags arise the overall response should be ± 2 dB from 40 c/s to well over 12 Kc/s.

The recording and playback at $3\frac{1}{4}$ i/s can be similarly checked if a test tape at that speed is available, but the components shown will give a reasonable compromise between response at 7 Kc/s and treble distortion. If you *must* have 10 Kc/s response at that speed and can put up with the resulting comb-and-paper reproduction, then good luck!

A Useful Scale

The continual conversion of voltage readings to decibels is a tedious business, and a useful scale is reproduced in fig. 3. This assumes a zero of 1.5 volts, which is an easily-attainable figure across the output of a power amplifier used as a valve voltmeter. On an oscilloscope face the graticule can be marked at 1.5 on the vertical scale, and amplitude variations read off directly against this arbitrary zero.

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by RALPH WEST

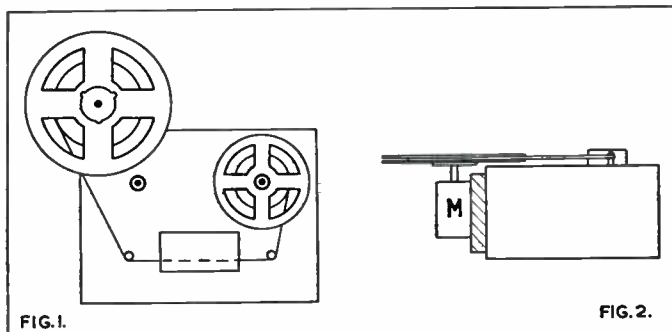
USING N.A.R.T.B. SPOOLS

GOOD magnetic tape is not cheap and one seldom finds a recording that just fits a standard reel of tape. Anyway, it is too risky with a live recording! Though the writer's machine will take 8½ in. reels, which provides just over one hour's stereo at 7½ i/s on long play tape, it did not prove any less wasteful of tape. The odd bits can, of course, be joined and used, but one always hesitates to use such odd lengths on a good recording, even if one has the time to check whether the tape characteristics are the same each side of a join.

Negligible Wastage

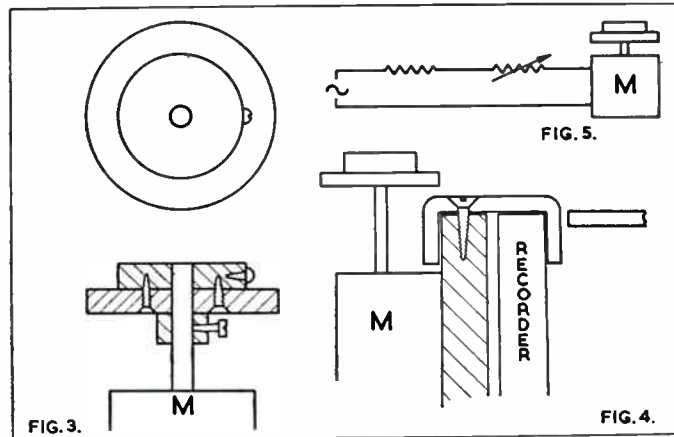
Surely the right way to do it, is to use the largest possible feed spool and run each item—symphony, concerto, solo, etc. on to a separate reel. With very little arranging, the wastage can be negligible. It also gives a greater freedom in the choice of tape and storage reels, i.e.—one's favourite tape and one's favourite reels. The writer prefers reels with holes in the centre! The 10½ in. NARTB reel with the 3 in. centre hole carries 3,600 feet of long play tape, enough for just over 1½ hours' playing. This is probably the better proposition since it is a proper double-sided reel. The 11½ in. European reel holds a bit more, but being open one side, it is a somewhat risky proposition. It also needs a more complicated boss to carry it.

While this scheme was originally designed for use with an EMI TR52, there is no reason why it cannot be used with any other machine, professional or the humblest domestic model.



Figs. 1 and 2 show the general idea. *M* was actually a spooling motor from an old machine, but almost any induction motor that rotates the right way would do. Even if the motor will only run the other way, it can still be used. The tape will have to be put on the other way up and a twist put in it to bring the oxide face next the heads. With this increased length between reel and guide, one twist will cause no embarrassment or in any way damage the tape. A very rough boss was made from bits found in the junk box and the coal-cellar. The lower part was an old pulley bored out to fit the motor spindle. The upper part was a block of wood screwed to this and turned down in the lathe. One small wood screw run into the side of this engaged one of the slots in the centre of the reel hub. (Fig. 3).

A very simple wooden base for the motor was literally hung on the edge of the tape recorder case by two suitably bent pieces of brass curtain rail (fig. 4). It was of course very carefully squared up and levelled so that the tape was in line with the guides and heads. Back tension was provided by energising the motor via a variable resistance (fig. 5). Only enough current was used to take up tape slackness, as with this machine, constant tape tension is provided by a special pressure pad. Many machines tension the tape with the feed spool motor. Had this been the case, a little more reverse pull would have been used.

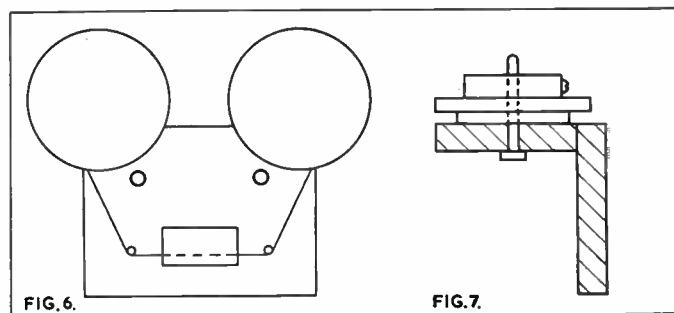


This idea could, of course, be extended, if necessary, and a second outrigger spool added as in fig. 6. With a little bit of patience it is possible to persuade the tape back on to the left hand big reel without mishap, with both the single and the double outrigger design. To attempt fast spooling with these would, of course, necessitate accurate turning and very careful alignment of both motors. This really puts the whole job into another category, whereas just using one motor for the feed spool, does not necessitate much more than "kitchen table" engineering.

Further Simplifications

The idea could be further simplified if the emergency rewind is not needed. The home-made hub could merely rotate about a fixed pin and sit on a small friction pad to provide tape tension (fig. 7). The hub should rotate smoothly and accurately about its pin and be aligned as carefully as before. A small circle of felt can provide the friction which will tend to produce an even tape tension throughout the reel. As the load of tape diminishes, the friction falls and offsets the fact that the tape is being pulled from a circle of smaller diameter. The circle of felt should be accurately cut and of even thickness and texture. The diameter should be between 2 and 3 inches—small, yet wide enough to give some stability to the reel. The two surfaces bounding the felt should be very flat, smooth, and accurately perpendicular to the pin. The felt should be stuck to one of them, not left floating, and the sliding surface could with advantage be metal. At first sight, a fully floating felt washer may seem a better proposition, but in practice it sooner or later misbehaves and slips sometimes on one surface, sometimes on the other. Whenever it "changes hands," the tape receives quite a jerk, since the frictional force to start something moving ("stiction") is always greater than the force to keep it moving. The old custom of using a loose thrust washer isn't so sound after all, though one gets away with it in crude machinery.

There are many parts of a tape machine that cannot be made outside of a precision engineering works, but this little hookup



can be made with simple tools. Even a lathe is not essential, and with a little patience and care, its performance will not disgrace any tape machine.

Using the motor supported hub, as described first, the writer had such success with a pianoforte concerto recording, that he is tempted to think it is better than doing it the normal way!



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... tape recorder workbench

No. 38. GENERAL ADVICE

by A. Bartlett Still

IT is several years ago that I first came up, in a practical way, against a problem of which I have been recently reminded a couple of times by readers' letters. It is only likely to apply to the owners of some Grundig tape recorders, but in view of the large number of these very popular machines that have been sold, I believe it is worth mentioning here.

Condenser Microphones

The microphone normally supplied with a high proportion of the models produced is the condenser microphone type G.C.M. For its price I have always considered this a successful device, but many owners will, quite naturally, want to use a different microphone on occasion. A condenser microphone requires a polarising voltage and in consequence, something like 80-100



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CONDENSER
MICROPHONE
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V.D.C. appears at the mic socket. It is drawn from an extremely high impedance source, and is, of course, completely safe. It also collapses as soon as any device with a low D.C. resistance, such as a mic transformer, is connected.

A popular form of alternative microphone, however, is the crystal type. There are a number of very interesting-looking Japanese models on the market now at reasonable prices, though I have no idea of their real worth. In this context we have to remember that the crystal microphone does not allow the D.C. voltage to collapse and so might, in fact, be damaged by it, though I hardly think this likely. What is likely is a leakage current through the microphone and its lead insulation. Although this will be only of the order of a few microamperes, it will nevertheless be sufficient to produce quite a loud noise signal, a sort of rushing, tearing, hissing sound.

This same noise can be produced when using the correct microphone if a different sort of connecting cable is used. The insulation resistance of the cable has to be of a very high order indeed, and you would be well advised to let the makers supply it and take responsibility. If the microphone itself has got damp in it, noise will arise. If you are going to dry it off in the oven, for goodness sake do it *some time* after the gas has been turned out!

Head Alignment

The question of head alignment has also cropped up again. A reader cites a case of two identical machines where he is not able to transfer a tape without loss of the treble frequencies. As tape speeds drop lower and lower, and head gaps are reduced in width to push the frequency response higher and higher, the correct azimuth adjustment of the head becomes more and more critical—it will soon be impossible to achieve by present methods.

Certainly mass production costing will not allow setting by the maker to an accuracy that is desirable.

A good make of tape record should be an acceptable standard for the amateur, I have found it quite satisfactory to set a head to produce the maximum treble from such a tape, particularly if the same tape is used for setting the heads on two or more machines that are to be regularly used for the exchange of recorded material.

Bias Adjustment

Many of my readers realise that the bias adjustment of a recorder is another critical setting, and are satisfied to give the maker best in this respect, acknowledging that he has better equipment available to trim as required. What if you have built the machine yourself? I have dealt with this more fully in the past—suffice it for the present to say that the circuit should be built as published. If the treble seems harsh, with sibilants predominating, then the bias should be increased. The opposite variation should be tried if bass predominates, treble is lacking and general tape sensitivity is low.

We all know what happens to "best laid plans", but I hope to be able to introduce a couple of practical ideas during the winter that I hope will be of interest. I have recently built a very interesting and useful little Audio Oscillator. It uses three transistors and is based on a Mullard design. I hope to obtain permission to reproduce their circuit, as I think a number of my readers would find it a useful item of test gear. The second is a little more ambitious. Over the last 18 months or so I have given my ideas on replay and record amplifier circuits. Some while ago I combined these to make a complete recorder circuit for a friend. It seemed to be satisfactory and now a second machine is being built. If it is as successful as the first appeared to be I hope to give the circuit, details of components etc., and a few helpful drawings in case any of my readers would like to have a shot at it. In any event I think it should prove to be of interest.

Maintenance

Finally this month, a reminder that before the evenings draw in, with an increase of tape recording activity, an hour or two spent on maintenance is well worth the effort. In previous years, about this time, I've devoted a column to this subject. Readers will agree, I am sure, that my colleague, H. W. Hellyer, is covering tape recorder service in such detail that any words of mine would only be superfluous.

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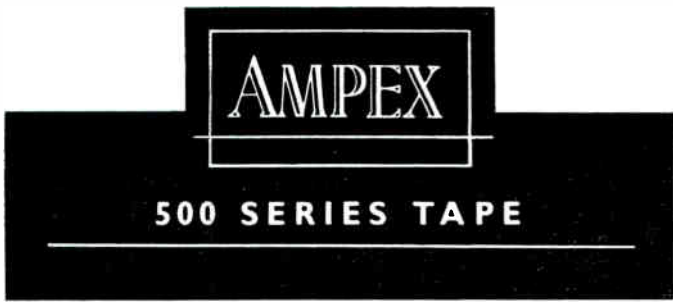
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TAPE, RECORDERS & ACCESSORIES

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.



★
DANSETTE
CONSORT
TWO-TRACK
RECORDER
★

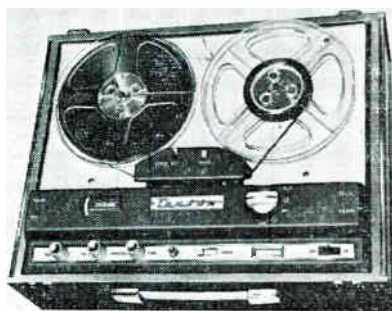
AT the 1962 Radio Show, Dansette Products entered the tape recorder field with their Consort recorder, which has been designed to meet the needs of both the home and office user.

The controls consist of: a combined playback, volume and recording level control, combined on-off and tone control, record switch mechanically interlocked with record-replay-rewind control, which prevents accidental erasure. The tape deck has a single speed of $3\frac{1}{2}$ i/s and uses International Standard half-track heads recording top track left to right. Maximum spool size usable with the new model is $5\frac{1}{2}$ in. Rewind, using $5\frac{1}{2}$ in. standard play tape, takes $2\frac{1}{2}$ min. (fast forward $3\frac{1}{2}$ min.).

Other features include: high impedance input for use when recording, from microphone or radio tuner unit, medium impedance for recording from a gramophone pickup or radio extension speaker socket, output socket for 3 ohm external speaker and magic eye recording level indicator. The weight is $16\frac{1}{2}$ lb. The power output of the unit is $2\frac{1}{2}$ watts.

Storage space is provided in the lid of the unit for microphone and spare tape. The price is £23 2s. which includes a crystal microphone, 850 ft. tape and a spare $5\frac{1}{2}$ in. spool.

Manufacturers: J. & A. Margolin Ltd., 112-116 Old Street, London, E.C.1.



★
TWO
TRUVOX
RECORDERS
★

TWO new recorders have joined the Truvox range. The model R.62, a two-track machine with speeds of $3\frac{1}{2}$ and $1\frac{1}{2}$ i/s and the R.64 a four-track recorder with speeds of $7\frac{1}{2}$ and $3\frac{1}{2}$ i/s.

Features include: monitoring, pause control, automatic stop, magic eye level indicator, tone control and recording interlock button. The claimed frequency response of the R.62 is 40-10,000 c/s at $3\frac{1}{2}$ i/s and 60-6,000 c/s at $1\frac{1}{2}$ i/s. With the R.64, the response is quoted as 40-14,000 c/s at $7\frac{1}{2}$ i/s and 40-10,000 c/s at $3\frac{1}{2}$ i/s. Wow and flutter is better than 0.25 per cent. at $7\frac{1}{2}$ i/s. Seven inch spools are fitted. Both of the recorders have an output

of four watts with extension speaker sockets for 3 or 15 ohms.

The machines are supplied complete with microphone, reel of tape and spare spool and a recording lead. The dimensions are $17 \times 13 \times 7$ in. Weight: 27 lb. Price £40 19s. each model. Manufacturers: Truvox Ltd., Neasden Lane, London, N.W.10.



★
GARRARD
BATTERY
OPERATED
DECK
★

GARRARD announce the introduction into their range of a Battery Tape Deck

The deck has been designed to accommodate both open spools up to 4 in. in diameter as well as the well-known Garrard Magazine which has the advantage of instant loading in outdoor and mobile conditions. It is a two-speed model with low battery consumption and features fast-wind in both directions. The price is £10 15s. Manufacturers: Garrard Engineering and Manufacturing Co., Ltd., Swindon, Wilts.



★
SOUND
SLIMLINE
THREE-TWO
RECORDER
★

THE Sound Three-Two is a two-track three speed recorder, push button operated with facilities for superimposing, monitoring, mixing and using as a straight through amplifier. The speeds used are $7\frac{1}{2}$, $3\frac{1}{2}$ and $1\frac{1}{2}$ i/s. The output is $3\frac{1}{2}$ watts.

The specification supplied, claims a frequency response of 80 to 14,000 c/s ± 3 dB at $7\frac{1}{2}$ i/s, with a signal to noise ratio of 40 dB. Wow and flutter is quoted at 0.2 per cent. The price is £42 complete with microphone, tape and spare spool. A four-track version is available for £47 5s. Manufacturers: Tape Recorders (Electronics) Ltd., 784-788 High Road, Tottenham, London, N.17.

● In one of London's most fastidious boroughs, home of theatre and television personalities, playwrights, novelists and politicians, the PLANET U-1 tape deck (£39.10.0) is causing a lot of excitement. For months now we have been steadily booking orders for this semi-pro model. We also stock the well-known Tandberg, together with all kinds of audio equipment. We are open up to 10 p.m.—closed Thursday.

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EQUIPMENT REVIEWED



★
UHER
"4000 REPORT"
BATTERY
RECORDER
 ★

Manufacturer's Specification: Recording sense: two tracks to international standard. Tape speeds: 15/16 i/s, 1 7/8 i/s, 3 3/4 i/s and 7 1/2 i/s. Reel size: up to 5 in. Playing time (double play tape): 2 times 4 hours at 15/16 i/s, 2 times 2 hours at 1 7/8 i/s, 2 times 1 hour at 3 3/4 i/s, 2 times 1/2 hour at 7 1/2 i/s. Frequency response: 70-5,000 c/s at 15/16 i/s, 50-11,000 c/s at 1 7/8 i/s, 50-18,000 c/s at 3 3/4 i/s, 50-22,000 c/s at 7 1/2 i/s. Signal noise ratio: 50 dB or better. Wow and flutter: plus or minus 0.15 per cent. or better at 7 1/2 i/s (audible frequencies only). Power output: 1 watt (push-pull power stage). Power supplies: 4 flashlight cells (1.5 V. each) or "dryfit" storage battery or Model 880 mains operated power unit or automobile battery of 6-24 volts. Transistor complement: 5 TF65's, 2 TF66's, 3 AC117's, 1 AC120. Controls: "piano key" push buttons, electric remote control. Inputs and outputs: microphone, radio, phono, external loudspeaker, earphones, remote control, power unit and battery charger, Model 817 Akustomat. Dimensions: approx. 10 1/2 in. x 8 1/2 in. x 3 1/2 in. Weight: (less batteries or power unit) approx. 7 lb. Price: £97 13s. Distributors: Bosch Limited, Domestic Appliance Division, 205 Great Portland Street, London, W.1.

THE Uher "4000 Report" has been designed to suit the advanced amateur and professional recordist. A novel drive system allows it to operate in any position and it is not affected by sudden movements. It can be run from readily available flashlight cells, a "dryfit" storage battery which combines the advantages of a dry battery with the rechargability of an accu-

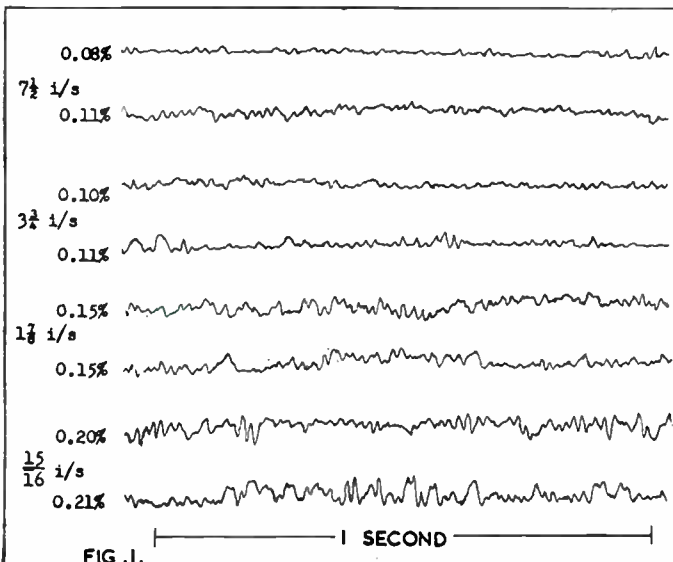


FIG. 1.

mulator, a car battery of 6-24 volts or a mains operated power unit, so that it is possible to select the most economical and best suited power supply for any kind of use.

The very wide range of tape speeds is also useful to meet the needs of any given job. For professional or broadcast quality recordings the top speed of 7 1/2 i/s would be used; for slightly less stringent requirements the lower speed of 3 3/4 i/s would suffice; and for speech quality or for very extended recording time the lowest speed of 1 7/8 i/s or 15/16 i/s would be used.

Tape loading is simple and straightforward and the reels are attached to the supply and take-up spindles by spring loaded turnbuckles which cannot be lost or mislaid. The hinged lid is fitted with a window which bears an engraved dual scale which is useful for calculating elapsed playing time as well as the remaining playing time.

Piano key controls provide wind, rewind, stop, record and play facilities, but the on-off switch is combined with the speed control "gear change" control.

A meter type record level indicator is fitted and this can also be used to check the battery voltage.

Speed Wow and Flutter

An intermittent fault in the motor governor or governor control transistor made exact measurement of tape speed difficult

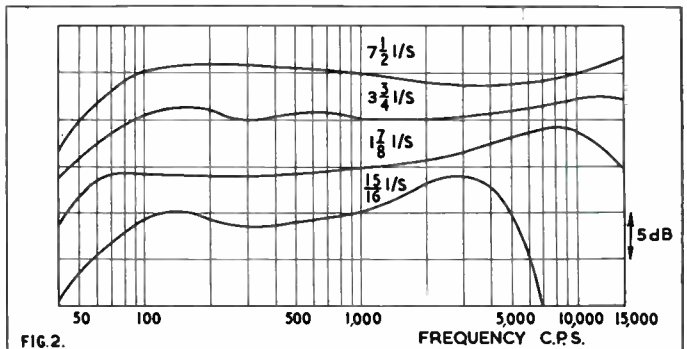


FIG. 2.

but I think I am safe in saying that the actual tape speeds were within 1 per cent. of the nominal speeds when the governor was operating properly.

Short term speed fluctuations, within my one-second wow and flutter measurement periods, would not be affected by the governor fault and the mean r.m.s. readings were 0.1 per cent. at 7 1/2 and 3 3/4 i/s, 0.15 per cent. at 1 7/8 i/s and 0.2 per cent. at 15/16 i/s. Fig. 1 shows the fluttergrams, or pen recordings of the output of my flutter bridge at the various speeds, and it will be seen that there is no cyclical speed disturbance at any speed which might add or cancel to give variations in overall recorded and playback wow and flutter.

The drive system deserves special mention as it has been carefully designed to minimise speed changes due to sudden movements of the recorder during normal portable use. The governed motor drives a 1 in. diameter drum at approximately the same speed as the motor (3,000 r.p.m.) by means of a flexible rubber belt and this drum, which is stepped at one end, is moved bodily by the speed change lever so that the various steps bear on a V-shaped tyre on the underside of a relatively light 3 in. diameter flywheel on the capstan shaft. Most of the smoothing is done by the high speed drum, and the flywheel is used as a speed reduction device rather than a filter element. A heavy large diameter flywheel would be very sensitive to small movements of the recorder—try moving your gramophone turntable when playing a record and you will see what I mean!

CCIR test tapes were played at the various speeds and they all showed a 6 dB step in the high frequency response indicating that

the playback responses were matched to NARTB 50, 100, 200 and 400 microsecond characteristics in line with the normal practice of Continental manufacturers. System noise, from transistors and motor, was better than 40 dB below test tape level at all speeds and bulk erased tape was within 1 dB of this level on playback. But tape erased and recorded on the machine with the gain control at zero was 7 dB above bulk erased tape noise. This shows that the bias waveform is not symmetrical and that

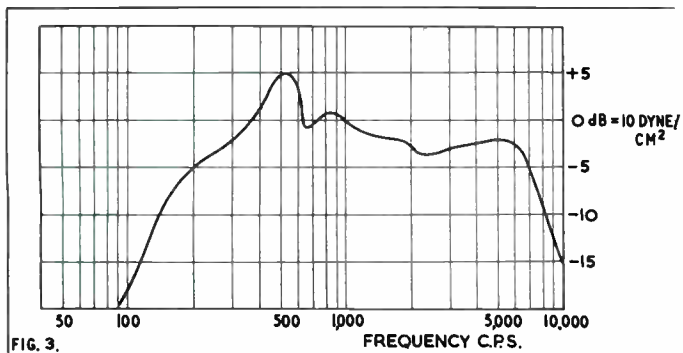


FIG. 3.

there is a small out of balance D.C. component which is causing this noise. Peak recording level of 12 dB above test tape level could be recorded without distortion, indicating that the bias was optimum for highest recorded level and low distortion.

Signal Noise Ratio

The measured signal noise ratio, from peak recording level down to recorded tape noise, ranged from 44 dB at 7½ i/s to 37 dB at 15/16 i/s. The ratio at 3¼ i/s was 42 dB. The slight tape hiss was completely lost in ambient acoustic noise picked up on the microphone under outdoor recording conditions, but, nevertheless, attention to the bias oscillator waveform is needed to bring this recorder up to full professional standards at 7½ i/s.

Record Play Responses

Fig. 2 shows the overall record replay responses from microphone input to line output at all tape speeds and these electrical responses are eminently satisfactory. The slight bass cut at 15/16 i/s is required to balance the top cut caused by the very short recorded wavelengths, and both speech and music quality is highly satisfactory even at the lowest speed.

Acoustic Responses

White noise measurements at 7½ i/s gave the overall response, from electrical mic input to acoustic sound output on the speaker axis, shown by fig. 3. Slight cabinet boxiness is evident at 500 c/s, and this was confirmed by listening tests, but sound reproduction is adequate for judging the content of a tape in the field. Recordings would normally be played or re-recorded from line output, or the tape played on a home based machine for final quality assessment.

The microphone response is shown in fig. 4. The fall in bass response is useful for speech or outdoor sound effect recording

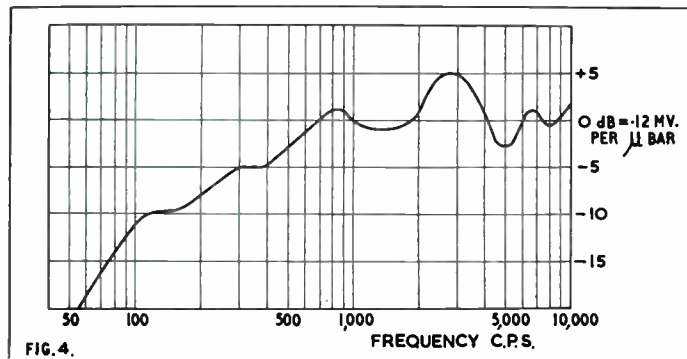


FIG. 4.

but it may sound a trifle "thin" on musical items. The cardioid microphone is also rather sensitive to wind noise, and an adequate windshield will have to be used for most outside recordings.

Comment

Good and bad features are almost equally balanced on this recorder. Plus points: excellent record-play response; good wow and flutter performance and freedom from movement effects; wide range of speeds, making it very adaptable for various uses; compact, and ideal for really portable applications. Minus points: high bias noise; flimsy case—the lid and back cover are of very thin aluminium and could be easily dented or bent; knobs are rather small and it is difficult to get an adequate grip on the ones that have to be pulled out for switching functions (panel light on-off, L.S. on-off, etc.). Some of these latter points are compromises towards extreme portability and lightness and do not really affect the electrical performance. Bias noise is the only really serious criticism and it is difficult to guess whether this is a fault in this particular machine or not. The governor fault is certainly not "built in", but it should be looked for in case it is a design weakness.

A. Tutchings.



★
SONY
521
STEREO
RECORDER
★

Manufacturer's Specification: Power requirements: 95 watts, 110, 117, 220 volts A.C., 50 or 60 cycles. **Tape speeds:** instantaneous selection 7½ i/s or 3¼ i/s. **Frequency response:** 30-18,000 c/s at 7½ i/s, dynamic range ± 2 dB 50-15,000 c/s; 30-13,000 c/s at 3¼ i/s, dynamic range ± 2 dB 50-10,000 c/s. **Signal to noise ratio:** 50 dB or more across line output (measured by NARTB standards). **Flutter and wow:** less than 0.15 per cent. at 7½ i/s; less than 0.25 per cent. at 3¼ i/s. **Harmonic distortion:** less than 2 per cent. at 3 dB below rated output. **Erase head:** in line (stacked) quarter track. **Record-playback heads:** in line (stacked) quarter track. **Bias frequency:** 65 Kc/s. **Level indication:** two V.U. meters (calibrated to read zero dB at 12 dB below tape saturation). **Level controls:** individual controls on each channel for playback, microphone and auxiliary inputs; provides professional mixing facilities for recording sound with sound. **Tone controls:** two position switch selects either flat response or 8 dB bass boost for monitoring speakers or low level listening. **Editing facilities:** instant stop lever, automatic tape lifters, fast forward and rewind, manual cueing and digital footage indicator. **Mode selection:** instantaneous push button switching from stereophonic recording and playback, also instantaneous selection of either 4-track or 2-track stereophonic or monophonic recording and playback. **Input impedance** (per channel): high impedance microphone inputs, high impedance auxiliary inputs. **Output impedance** (per channel): 8 ohms monitor speaker or earphone outputs, 600 ohm 0 dB line outputs. **Output level:** 6 watts combined monitor speaker outputs. **Tube complement:** 2 12AD7, 2 6AU6, 2 6AQ5, 1 12BH7, 1 6CA4. **Weight:** 42 lb. **Dimensions:** 16½ in. × 12¼ in. × 7¼ in. **Price:** £130 4s. **Distributors:** Tellux Ltd., 44 Brunel Road, Acton, London, W.3.

THIS is a completely self-contained stereo recording and playback system with two dynamic microphones, two recording channels, with inbuilt power output stages, and two monitor loudspeakers built into the sides of the case with hinged reflector flaps so that the operator, sitting fairly close to the front of the machine, can monitor the stereo balance while recording or during a playback check. Provision is also made for plugging in a pair

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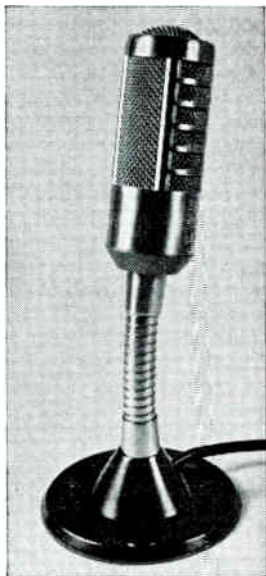
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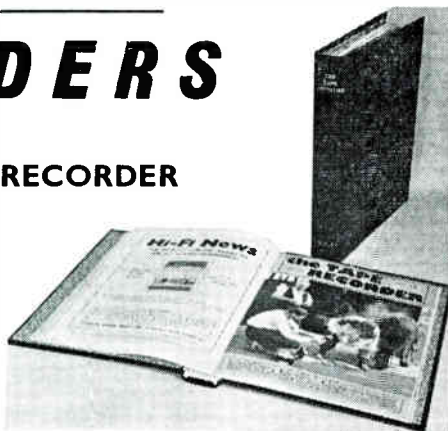
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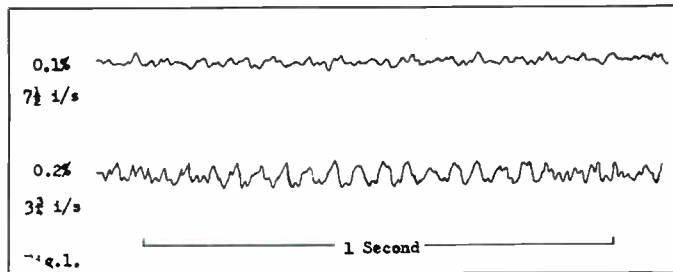
In/Output and freq. required:

EQUIPMENT REVIEWED — (continued)

of stereo headphones. For full stereo playback, wide range speakers may be plugged directly into the output jacks, or the line outputs may feed separate power amplifiers and speakers. Auxiliary inputs, such as the output from a stereo pickup, may be mixed with the microphone input.

For monophonic recording, channel 2 is disconnected so that two separate tracks may be recorded by turning over the reels in the normal way.

The head block can be moved bodily by the 2-track—4-track shift lever so that the top heads scan the upper edge of the tape

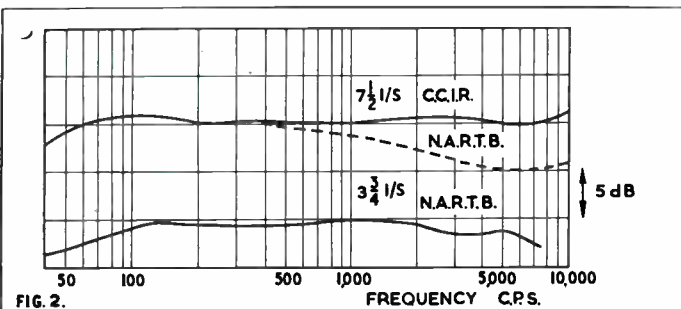


or the centre of the normal two channel track. Note that 43 thou' tracks are used at all times, there is no switching from wide to narrow tracks, only the position is changed.

Wow and Flutter

The wow and flutter was measured in the usual way by recording a steady 3 Kc/s tone at each speed and playing the output into a limiter-F.M. discriminator circuit (flutter bridge) to change the frequency (speed) variations into amplitude fluctuations which were recorded on a high speed pen recorder to give my standard "fluttergrams" (see fig. 1). At the same time the output was integrated to give a Root Mean Square (*r.m.s.*) reading which is shown adjacent to each pen recording.

The *r.m.s.* readings were well within the specification, and wow, or slow speed changes, were shown to be completely negligible.

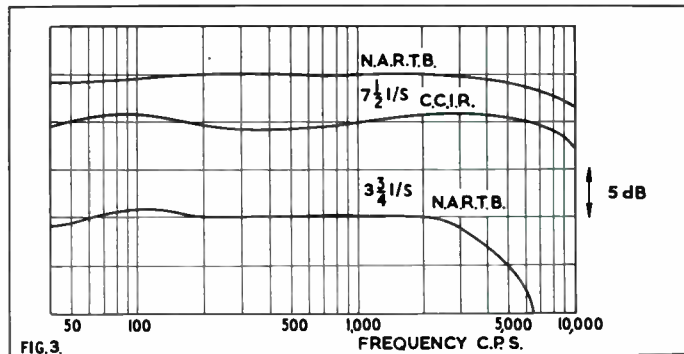


A very slight flutter can be detected at 36 c/s at the high speed, and 18 c/s at the lower speed. This corresponds to the rotational frequency of the idler wheel which couples the motor pulley to the flywheel. The flutter can just be detected on a pure tone at 3 3/4 i/s, but is not noticeable on a musical recording—even sensitive slow piano music.

Playback Only Responses

To find the responses from pre-recorded tapes, 100 and 200 microsecond test tapes were played at 7 1/2 and 3 3/4 i/s respectively. At 7 1/2 i/s the responses were as expected: level on the CCIR (100 microsecond) equalisation, and with a stepped response falling approximately 6 dB at high frequencies with NARTB (50 microsecond) equalisation.

At 3 3/4 i/s only the NARTB equalisation could be checked as motor boating and high frequency oscillation occurred on the top and bottom channels respectively when the equalisation button was set for CCIR response. According to the instruction book this equalisation button is a new addition to the machine—it looks



as if "bugs" are present so far, and further development of this facility is required! In fact, the CCIR tape played back perfectly level with the American equalisation and so no harm was done.

Record Play Responses

Fig. 3 shows the overall record-play responses which are satisfactory at 7 1/2 i/s, but rather lacking in high note response at 3 3/4 i/s—this lack of top response may be another aspect of the fault mentioned in the preceding section—or it may be slight over biasing for the lower speed.

Test tape level! was recorded at either speed with the V.U. meter reading -6 dB, and a level 15 dB above test tape level could be recorded with no visible waveform distortion; for this peak level recording the meter needle was well off scale, but this is in order as the dynamics of the meter movement have to be taken into account and, on transients, such instantaneous peaks would only just kick the meter needle into the red region. Distortion and under signal noise was extremely low and this demonstrates once again that it is much more important to set the bias for lowest distortion rather than for the widest possible frequency response.

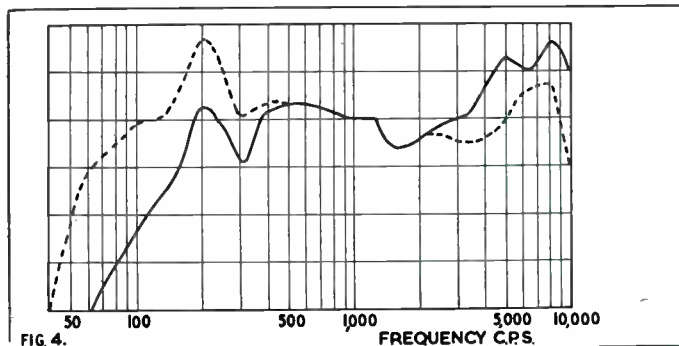
Signal Noise Ratio

System noise was 37 dB below test tape level, and playing bulk erased tape did not alter this reading. Tape erased and recorded on the machine, with the gain controls at zero, showed a noise only 2 dB above system noise which indicates that the push-pull erase-bias oscillator has a clean balanced waveform. Total dynamic range to peak recording level is thus 52 dB, which more than meets the specification.

Acoustic Response

A white noise test tape was played, using the CCIR playback response, and the sound output measured on the axis of one of the speakers giving the solid curve of fig. 4. As the sound is not heard directly on the speaker axis during stereo monitoring the high note response was again measured with the reflector flap set to 45°, giving the R.H. dotted curve of fig. 5.

A bass boost switch is provided to compensate for the low note losses of small speakers, and the L.H. dotted curve shows the response with the switch set to the "Bass" position. It will be seen that the response is now maintained level to below



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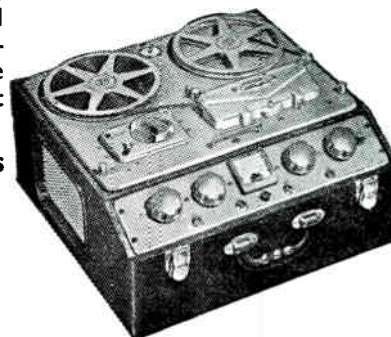
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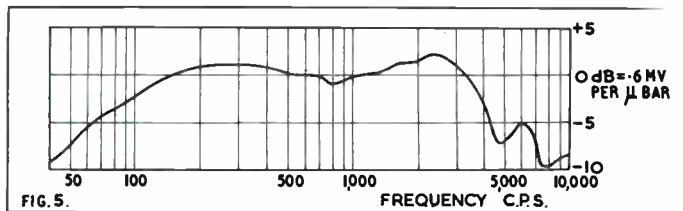
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100 c/s, but that on the internal speakers a cabinet resonance at 200 c/s is brought into prominence, giving slight boxiness.

F7 Microphone

The dynamic microphones supplied with the 521 recorder are pressure units with non-directional polar response and a high impedance output. The response of one unit was measured and is shown in fig. 5. A slightly better high note response would have been useful, but the curve is smooth and free of peaks and



the polar response is fairly broad at high frequencies (due to the relatively small diaphragm) which makes it a good choice for this stereo application.

Comment

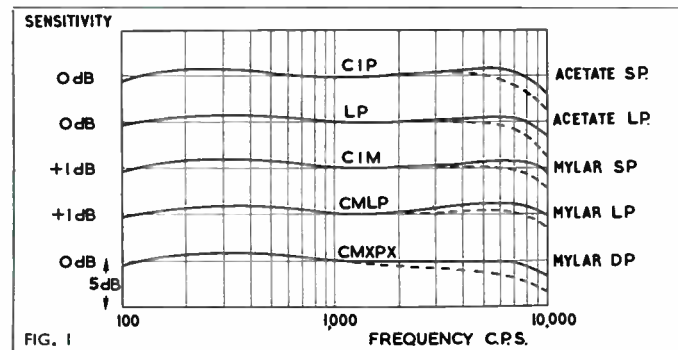
This is a lovely machine to handle; it has that indefinable "professional" feel, where all the controls are "just right" and one is never in any doubt as to the operation or function of each knob or lever. It also has that professional feel of being nailed to the floor! But if you can afford this machine you will probably own a big car to carry it around! Plus points: low wow and flutter and properly equalised response at 7½ i/s; good signal noise ratio; full portable stereo recording and playback facilities; excellent controls and facilities. Minus points: 3½ i/s flutter and record replay response below the best modern standards. It is fundamentally a four-track recorder (43 thou' track width) and as such it must be slightly inferior to the best two-track (90 thou' track width) machines in sensitivity to "drop outs" or tape faults, and subjective signal noise ratio.

A. Tutchings.

C.B.S. TAPE REVIEWED

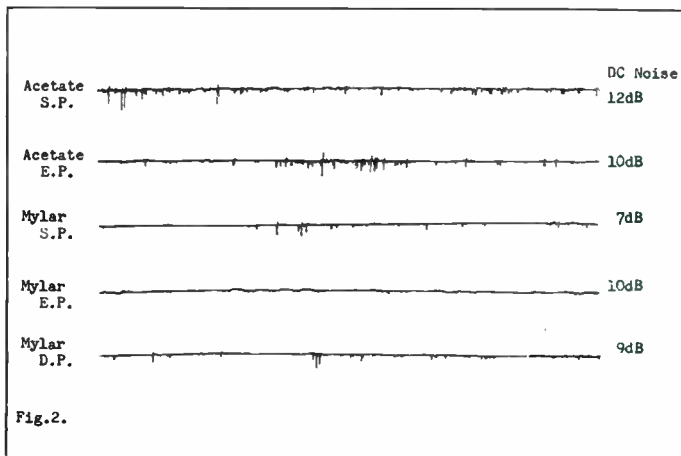
C.B.S. make six grades of tape: standard, extended play and double play on acetate base, and the same again on Mylar polyester base. I can only trace five samples in my review batch, the double play acetate seems to be missing. If this is my fault I hope the manufacturer will accept my apologies! Fig. 1 shows the responses and sensitivity figures.

The dotted curves show that there is some directional effect (see December 1961 review for explanation). The direction for best frequency response was quite random, on some reels it was track 1, on others it was track 2. The sensitivity figures for these tapes was very consistent, and the responses shown are



all for standard bias. The uniformity was such that random samples could be interspliced and recorded with no audible difference in response or playback level.

The drop out charts and D.C. noise factor figures are shown in fig. 2. Here again there is little to choose between the tapes in practical use. The slightly stiffer base of the acetate tapes tends to increase the drop out count, and the Mylar base standard play tape has few drop outs and a lower D.C. noise



than the others which makes it eminently suitable for its intended use as a Master tape for important recordings and for archive use where good storage properties are needed.

Comment

It is very easy when carrying out tests (as described in the June 1961 issue) to soar away on the clouds of pure theory without ever listening to the tapes at all! I hasten to add that I have listened to the tapes most carefully and have used the above tests as a guide to tell me what to listen for. On good equipment and good tapes it is possible to drop the recording level by 20 dB so as to bring up the tape noise relative to the signal on playback, and it is also possible to increase the recording level at least 6 dB above optimum without disastrous distortion. The C.B.S. tapes stood up to these tests very well; the Mylar standard play tape was just perceptibly quieter on the first test, and all tapes showed a gentle overload characteristic with a slight advantage again to the standard play tapes, both Acetate and Mylar base.

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READERS' PROBLEMS

★ Readers who encounter snags, or who run into trouble with their tape recording equipment, are invited to write to this editorial office for advice, marking the envelopes "Readers' Problems—Tape". Replies will either be sent direct by post, or published in this column if the subject is of general interest. However, we must emphasise that this advisory service cannot include requests for information about manufacturers' products when such information is obviously obtainable from the makers themselves. It is also essential to keep the queries reasonably short and to the point, and to limit them to one specific subject if at all possible. And, please, in no circumstances confuse such letters with references to other matters which may have to be dealt with by other departments in our office.

Television Sound Breakthrough

Dear Sir,—I have a Grundig 700L tape recorder. Recently I have found that when I play back a recording, I have also recorded the B.B.C. T.V. sound programme. By running the machine on recording without any inputs I can make quite a good recording of the current B.B.C. T.V. sound programme. With a Grundig low impedance microphone it is even stronger. I can record with Acos high impedance microphone fairly well but the B.B.C. is still faintly in the background. I live one-third of a mile from a B.B.C. T.V. transmitter. After the B.B.C. has closed down recordings are perfect. I am told that the erase head may be in tune with B.B.C. frequency—how can I rectify it?

Yours faithfully, F.H.T., Sutton Coldfield.

You are in a difficult situation, in which it is almost possible to pick up the T.V. signal on a piece of string, and it is very difficult to know just whereabouts in your equipment it is coming in. I think you will have to experiment with small chokes, made by taking about 10 turns of 16 s.w.g. enamelled copper wire round your little finger or a pencil close to your erase head, and, if this does not clear the trouble, in the grid circuit of the first valve as well. It will be a case of trial and error, or "if at first you don't succeed, try again" but I hope it will be successful in the end. This has certainly been the case in other similar instances in my experience.

Linking Equipment

Dear Sir:—I have an H.M.V. tape recorder, model D.S.R.1., which I am using in conjunction with an Armstrong Stereo 44. As the unit has "Tape Record" and "Tape Replay" sockets there is no difficulty in connecting up to the appropriate sockets of the recorder, using screen leads.

In practice, however, it is impossible to get adequate volume for either purpose. The strongest radio signal will not close the magic eye for recording and on replay it is necessary to use maximum volume to obtain any results. This is on an 8 watt amplifier!

The reason for this appears to be in the differing sensitivities and impedances of the two instruments. The recording output of the Armstrong is given as 150/200 mV at 1 M ohm. The high impedance output of the recorder is 100 mV at 200 K ohm, whilst the replay input of the Armstrong is 500 mV at 54 K ohm.

I have been advised to incorporate a suitable resistor and condenser in the leads, but I find this difficult to do with a screened lead with a rather complicated plug at each end.

Yours faithfully, F.H.C., Cranwell.

The main difficulty that you are experiencing lies not so much in the variations between input and output impedances as in the differences between the signals available and those required. No incorporation of resistors or capacitors in the connecting lead is going to increase the signal voltage available, so we must look elsewhere for the answer.

The discrepancy between the output of the Armstrong and the recorder input requirement can virtually be ignored, the culprit is the 100mV of replay signal when five times that amount is required to load the amplifier at full gain.

A much higher signal voltage than this must be available in the tape recorder and so I would suggest that you write to H.M.V. explaining the problem.

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