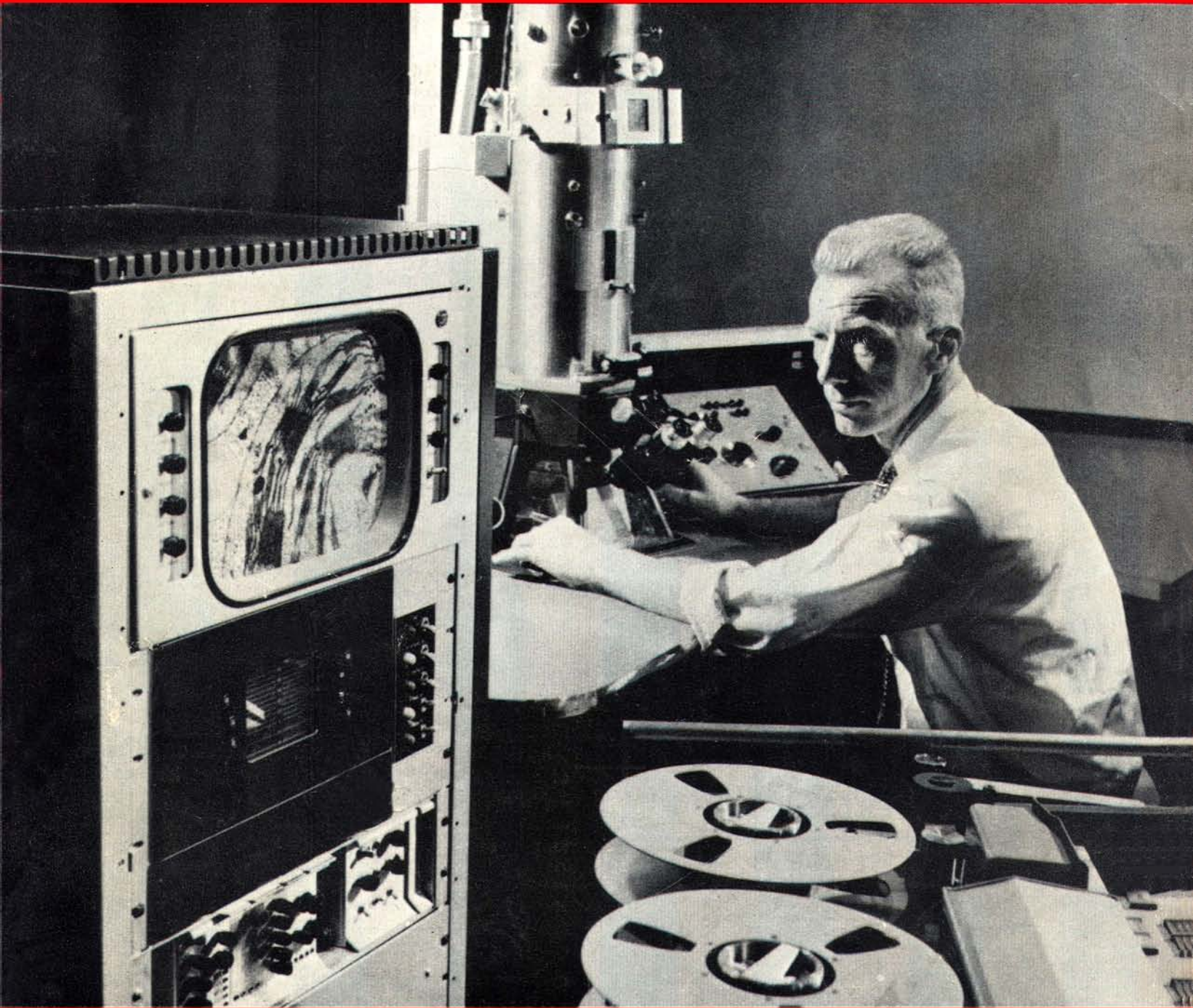


JANUARY 1965 TWO SHILLINGS

tape recorder



A CHRISTMAS TAPE PLAY ■ COMBINING SOUND WITH SLIDES
BUILD A COMPREHENSIVE MIXER ■ THE COPYRIGHT POSITION



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tape recorder

INCORPORATING 'SOUND AND CINE'

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editorial

IN THE COURSE of our comments on the Radio Show in October we deplored a restrictionist attitude which led to the exclusion of imported products. We argued that the customer should be free to decide for himself on the basis of value-for-money rather than have the matter settled over his head by British manufacturers, some of whom might have suspect motives. We were concerned with the quality of tape recording equipment regardless of its country of origin and without reference to the balance of payments situation, but now the matter is raised again by the Government's actions in the financial field.

We appreciate the dilemma set for politicians by the import/export problem in a nation whose economy depends on a rather precarious balance, and we certainly don't intend to take sides on the *political* rights and wrongs of the increased import duty. But there are a few related points to be made in connection with the competitiveness of home produced and imported goods in the tape recording market.

In October we referred to "the typical British recorder comprising some rather unimaginative circuitry housed in a box which is stylistically out of step with the deck". We believe that this type of machine has no future in the mass-market which now exists for tape recorders—its amateurism cannot compete with the integrated Continental designs, as recent sales figures show. However, being a highly technical and industrial nation we are certainly capable of producing attractive, reliable and value-for-money recorders, as was shown in last month's report on the *Thorn* factory. But would the *Thorn* group have tackled this problem—and become a significant exporter into the bargain—if there had been no spur of competition from non-British machines on the home market? It may be necessary, as the Government claims, to restrict imports temporarily, but in the long run the availability of foreign models at untaxed prices is desirable even from a purely national/economic point of view, for in coping with their competitors at home British manufacturers are forced to adopt methods and designs which aid eventual exports.

In fact, it is deplorable that we have lagged so far behind our competitors in an electro-mechanical field where engineering ingenuity could easily have made us one of the leaders. It is true that the Germans invented tape recording and might reasonably be expected to be leading (though they had no patent rights and are a divided nation), but the Dutch, Swiss, Scandinavians and Japanese have all applied their skill with apparently greater results, each in their chosen segments of the tape recording market. Some fine tape recorders are made in this country, but also some of the world's worst; in the battery portable sphere our manufacturers have practically nothing to show. We don't wish to be dogmatic, but we offer the suggestion that the availability of several cheap mass-produced deck mechanisms in the UK has actually *retarded* healthy growth of the tape recorder industry by encouraging the entry of small and inefficient firms with their "unimaginative circuitry" and "out of step" boxes. There are now signs of a trend to original and imaginative design—we hope it continues and prospers.

One possible effect of the import surcharge is slightly disturbing. Many distributors of imported tape equipment have decided either to absorb the tax themselves or pass on to the consumer only a fraction

of the increase. Thus the import duty becomes, in effect, an additional profits tax which raises the distributor's overheads. Of itself, this may or may not be desirable, but we have often heard the argument that a reduced profit margin means poorer servicing facilities, and importers may react in the same way. Generally speaking we have found that servicing and maintenance in the UK are as variable on home-made goods as on those from abroad, and we certainly deplore the implication or suggestion sometimes made that—of necessity—importers are worse than home producers in this respect. Some may be, others aren't— incompetence and unreliability seem fairly evenly distributed. But we are perturbed that a tendency to degrade service facilities may be hidden in the new import restrictions.

In connection with the whole business of good design and reliability, may we remind readers of our request for ideas made on this page in November? Have another look at what we said then and add a letter to the growing pile on our desk; we hope to publish a first selection next month.

Finally, a few words of explanation concerning the publication of yet another article on a home constructed mixer. Unlike David Robinson's elaborate semi-professional project which finished last month, the Foord device is intended for the long suffering amateur whose soldering iron has for the last few months been corroding in a convenient cupboard. We believe this article will fulfil the needs of the constructor wanting a good quality mixer to his own specification. It is relatively cheap and straightforward to build and can be modified, if plug-in module construction is employed, to perform a variety of tasks.

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COVER PICTURE

Tape recorder and electron microscope combine on this month's cover photograph, which was taken during a recent demonstration at the RCA Laboratories in New Jersey, to produce an efficient system for the display and storage of minute images. Replacing the eyepiece, a television screen can be watched by any number of onlookers, eliminating the need for individual observation. Use of a video recorder adds to the flexibility of the microscope which is freed for other uses while the display is in progress.

SUBSCRIPTION RATES

Annual subscription rates to *Tape Recorder* and its associated magazine *Hi-Fi News* are each 30s. in the U.K. and 32s. 6d. overseas (U.S.A. \$4.50) from Link House Publications Ltd., Dingwall Avenue, Croydon, Surrey.

TK40



TK41



TK46



top trio!

To achieve the position of making (and selling) more Tape Recorders than anyone else in the world is something that Grundig can be proud of. And they are! Millions of people have been introduced to the innumerable joys of tape recording through Grundig's policy of reliability and quality at a moderate cost.

For the favoured few, however, (some people call them connoisseurs) Grundig have developed three specialist machines which set the standard by which all others are judged.

The TK.40 at 87 guineas, including microphone, is a remarkable three speed, four track machine with an unrivalled specification. The TK.41 at 83 guineas is a two

track version, packed with ingenious and exclusive refinements.

Tape recording enthusiasts will need no introduction to the fully stereophonic TK.46 at 107 guineas. It is doubtful whether any model in the history of tape recording has been given so fulsome a welcome by the keenest critics and press reviewers.

You will realise that one page in this magazine can do no more than introduce you to the *idea* of such perfection. May we suggest that you ask your local Grundig Dealer to demonstrate these models to you.

Or write to us. We have a leaflet which will put you completely in the picture.

If you will clip the coupon and post it to us, we will rush you your portfolio of information. It's the least we can do!



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world of tape

B.A.T.R.C. PRESENTATIONS

INTRODUCING the prize-giving of the 8th British Amateur Tape Recording Contest at a London hotel on November 6th, Mr. Cyril Rex-Hassan claimed that 1964 had been "the most successful year for quality" though the number of entrants had fallen compared with the previous year's total. The postal strike was blamed for the lessened support.

Several of the cups, shields and tapes donated by *Agfa*, *BASF*, *EMI*, *Kodak*, *MSS*, *3M Philips* and *Zonal* were won by the creator of *Sink Symphony*. This was an amusing and very original collection of watery gurgles, with descriptive commentary, recorded in well-known British hotel bathrooms. A *Philips EL3534* was used to play the winning tape which has also come first in an internationally sponsored contest. The B.A.T.R.C. is an annual event designed to attract creative individuals and groups. Club response was, however, pathetically small, though lack of group entries was made up by contributions from several modern-minded schools.

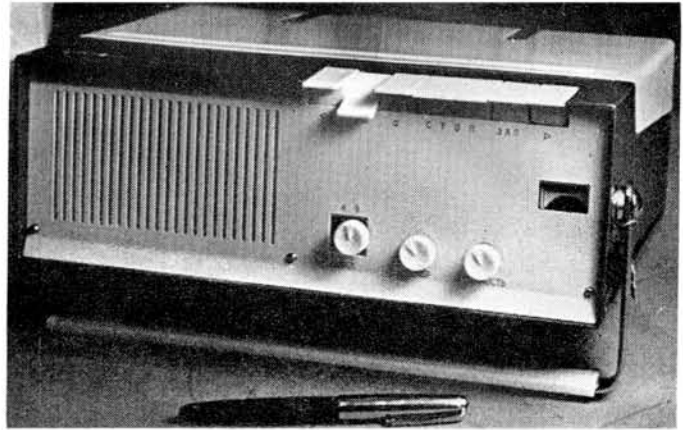
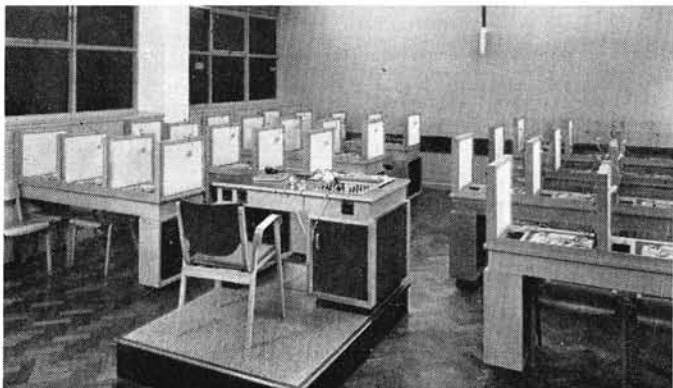
PROTECTING CHERRIES AND WHITE HOUSES

RIPE cherries on the 10,000 cherry trees at *Cherry Heering's* Orchard Distillery at Dalby constitute a great temptation to starlings. Throughout the years there has been a permanent war between these charming thieves and the company. Scarecrows of every shape—stuffed hawks hanging from balloons were fairly successful—firearms and ingenious systems of strings had only a temporary effect and the impression was given that the starlings considered this merely an extra zest to the meal. Today, however, the company has taken the offensive, thanks to ultrasonic warfare. The recipe is simple: a female starling—and it *should* be a *she*—is caught and her warning shrieks recorded on tape. After this the bird is allowed to fly away as an appreciation of her assistance. When a crowd of starlings approaches, the warning cries are broadcast through speakers scattered around the orchards. This method never fails to scare the starlings away; experiments show that the essential part of the cry is ultrasonic and cannot be heard by the human ear.

The system has obtained international recognition and, after correspondence with the White House in Washington, the company is assisting in an attempt to relieve the President of the U.S.A. of the starlings which for years have been a nuisance at his residence.

THORN LANGUAGE LABORATORY

THIRTY Ferguson tape recorders form the basis of a new language laboratory installed recently at St. Bede's school, Bedford. Conventional techniques are used, each machine being wired for single channel recording and double channel playback. From the instructors' console, which is fitted with a *Truvox* deck, the machines can be switched to record tapes from the school library prior to the commencement of a lesson. **Manufacturer: Ferguson Radio Corporation Ltd., Thorn House, Upper Saint Martins Lane, London, W.C.2.**



RUSSIAN PORTABLE

WEIGHING just over 9lb., a new battery recorder (above) has just been placed on the Russian market. The *Yauza-20* operates at $3\frac{1}{2}$ and $1\frac{1}{7}$ i/s with claimed frequency ranges of 50 c/s to 15 Kc/s and 50 c/s to 10 Kc/s respectively. Fourteen transistors and several diodes are incorporated in the printed circuit amplifiers, and inputs for microphone, pickup, radio and television are provided. The power supply may be taken from ten dry cells or a 12V car battery. For home use a 127/220V mains adaptor is available.

SAJA SPARES AND SERVICE

FOLLOWING recent confusion in retail circles, C. Braddock Ltd. have asked us to advise readers and dealers that they are the sole agents for Saja spares. The range of Saja recorders are no longer available in Britain but comprehensive stocks of parts will continue to be held for the foreseeable future. Readers and the trade are asked to note also that service of Saja machines is available from the company: **C. Braddock Ltd., 266 Waterloo Road, Blackpool, Lancs.**

FURTHER DEVELOPMENTS IN DOMESTIC VIDEO RECORDING

SINCE the collapse of the *Nottingham Electronic Valve Co.* a few months ago, two new companies have been formed by ex-members of the *Telcan* team. A video recorder in kit form ("easy to build") will shortly be marketed by *Wesgrove Electrics Ltd.*, with a similar specification to *Telcan*, selling at £97 10s. Three tape speeds of $7\frac{1}{2}$, 120 and 150 i/s permit recording of sound, sound plus 405-line video, and sound plus 625-line video, respectively. Frequency range is from 50 c/s to 2 Mc/s.

Rather more detailed technical information is available of a rotating video head unit which the inventors, *Vale Electronics*, claim will make possible the production of a video recorder to sell at about £300. Like the *Telcan* and *Wesgrove* machines, the *Vale* device uses $\frac{1}{2}$ in. tape but the playing speed is of a much more realistic order: 30 i/s. Basically, the head unit consists of a thin magnetic band, divided into sections by a series of narrow slots positioned around the circumference of a non-magnetic disc. The signals to be recorded are induced into the head by a small coil assembly on the opposite, uncoated, side of the tape. A prototype recorder has been used, employing this system, to record and play signals of up to 2.75 Mc/s at a head rotation speed of 7,000 rpm and linear tape speed of 30 i/s.

NEXT MONTH

OUR February issue, published on January 15th, will contain a second article by Mr. Foord on the construction of a tone-control/filter network, for use with or without his mixer. Readers are advised that no modification to the mixing unit will be involved and they can start work on the latter right away! Also in this issue will be an article by John Gaselee covering aspects of tape recorder hire-purchase.

Here are some of the easy-to-build Heathkit models from our wide range

HI-FI EQUIPMENT CABINETS

A range of over a dozen equipment cabinets is now available to meet the differing needs of enthusiasts. Designed for maximum operating convenience or for where room space is an over-riding consideration, this range includes kits, accurately machined for ease of assembly and "left in the white" for finish to personal taste, ready assembled cabinets or RECORD HOUSING assembled and fully finished cabinets, and has at least one model to meet your requirements. Why not send for full details? Prices from £7 7s. 0d.—£37 16s. 0d.

ALL BRITISH MODELS AVAILABLE ASSEMBLED.
PRICES ON REQUEST
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"Malvern"



MFS

COTSWOLD HI-FI SPEAKER SYSTEM

This is an acoustically designed enclosure 26" x 23" x 14 1/2" housing a 12" bass speaker with 2" speech coil, elliptical middle speaker, together with 2" pressure unit to cover the full frequency range of 30-20,000 c/s. Delivered complete with speakers, cross-over unit, level control, grille cloth, etc. Ralph West ("Hi-Fi News") says: "The reviewer was very impressed and places this design among the top few and unhesitatingly recommends it to the most critical music lover."

"COTSWOLD" MFS SYSTEM

Similar performance to standard "Cotswold" but designed for the smaller room. Size 36" high x 16 1/2" wide x 14 1/2" deep. Either model £23 4s. 0d. kit.



FM TUNER

A Tape recorder requires a quality tuner

HI-FI FM TUNER, Model FM-4U

Available in two units which for your convenience are sold separately: Tuning unit (FMT-4U—£2 15s. 0d., incl. P.T.), despatched wired and tested, and I.F. amplifier (FMA-4U—£13 3s.). Printed circuit for I.F. amplifier and ratio detector. Built-in power supply: 7 valves. Tuning range 88-108 Mc/s. Total price Kit £15 18s. 0d.

Tape Recording and Replay Hi-Fi Amplifiers Models TA-IM (Mono) and TA-IS (Stereo) For use with most tape decks. Thermometer type recording indicators, press-button speed compensation and input selection. 3-position bias level and printed circuit construction.

TA-IM	Kit	£19 18s. 0d.
TA-IM and Collaro "STUDIO"		£31 5s. 6d.
TA-IM and TRUVOX D92/2		£52 18s. 0d.
TA-IM and TRUVOX D93/4		£52 18s. 0d.
TA-IS (Illustration Centre) Kit		£25 10s. 0d.
TA-IS and TRUVOX D93/2		£58 10s. 0d.
TA-IS and TRUVOX D93/4		£58 10s. 0d.

A WHOLE RANGE OF PACKAGED DEALS (INCLUDING "CONNOISSEUR CRAFTSMAN" TURN-TABLE and DECCA fess PICK-UP) NOW AVAILABLE TO SAVE YOU FURTHER MONEY.

Get best possible recordings with a tuner



A.M./F.M. TUNER

HI-FI AM/FM TUNER, Model AFM-1 Also available in two units as above: Tuning heart (AFM-TI—£413s. 6d. incl. P.T.) and I.F. amplifier (AFM-AI—£21 16s. 6d.). Printed circuit board: 8 valves; consecutive FM limiting and ratio detector. Tuning range FM: 88-108 Mc/s; AM: 16-50, 200-550, 900-2,000m. Switched wide and narrow AM bandwidth. Built-in power supply. Total price Kit £26 10s.



Save Money and enjoy yourself building these Heathkit models

They are so easy to build even for an absolute beginner. The manual of instruction is fool-proof—just follow the step-by-step.



S-33

MONO CONTROL UNIT Model UMC-1. Designed to operate with the MA-12 or any amplifier requiring 0.25v or less for full output. Suitable for cabinet mounting or free standing. Size 10" x 7" x 4". Kit £8 12s. 6d. Assembled £13 12s. 6d.

DELUXE 6 WATT STEREO AMPLIFIER Model S-33H. A stereo/mono amplifier with the high sensitivity necessary for lightweight ceramic pickups (e.g. Decca Deram). Deluxe version of the S-33. Kit £15 17s. 6d. Assembled £21 7s. 6d.

HI-FI STEREO 6 WATT AMPLIFIER Model S-33. Attractively styled, completely self-contained. Printed circuit makes it easy to build. Only 0.3% distortion at 21 W/chal. U/I output, ganged controls. Kit £13 7s. 6d. Assembled £18 18s. 0d.

HI-FI MONAURAL AMPLIFIER Model MA-5. An ideal general-purpose reasonably priced mono amplifier, 5 watts output at only 0.5% distortion, has inputs for Gram, Radio. Printed circuit board. Kit £10 19s. 6d. Assembled £15 10s. 0d.

HI-FI SPEAKER SYSTEM Model SSU-1. This kit is easily assembled. It contains speakers and balance control in its direct ducted port reflex cabinet. It is equally suitable for stereo or mono in average room. (Legs 14/6 optional extra.) Kit £10 17s. 6d. Available for vertical or horizontal use.

AUDIO SIGNAL GENERATOR Model AG-9U. Delivers up to 10 volts pure sine-wave (less than 0.1% distortion. 20 c/s to 20 Kc/s). Decade switch-selected frequencies from 10 to 100,000 c/s. Kit £22 10s. 0d. Assembled £30 10s. 0d.

POWER-AMPLIFIER 12-WATT Model MA-12. Single channel, ideal for stereo conversion. Kit £11 18s. 0d. Assembled £15 18s. 0d.

COLLARO "STUDIO" TAPE DECK. Two tracks. "Wow" and "flutter" not greater than 0.15% at 7 1/2" p.s. Long Term Speed Stability better than 0.5%. £17 10s. 0d.

SUGDEN MOTOR UNIT "CONNOISSEUR CRAFTSMAN". Heavy duty motor, operating at 33 1/3 and 45 r.p.m. Very heavy 12" turntable. £17 2s. 11d.



USC-1



TA-IS



TRUVOX D93



STUDIO

HI-FI STEREO 18-WATT AMPLIFIER Model S-99. Within its power rating, this is the finest stereo amplifier available, regardless of price. U/L push-pull output. Printed circuit. Kit £27 19s. 6d. Assembled £37 19s. 6d.

TRANSISTOR INTERCOM. Models XI-1U and XIR-1U. Ideal for office or home. Each Master operates up to five Remotes. Assembled £16 19s. 6d. Remote Kit £4 7s. 6d. Assembled £5 16s. 0d.

STEREO CONTROL UNIT Model USC-1. A deluxe stereo control unit with variable filter, switched rumble filter, printed circuit boards and many other refinements. Operates direct from tape heads. Kit £19 10s. 0d. Assembled £26 10s.

"OXFORD" PORTABLE RADIO Model UXR-2. Superbly styled hide case, with Golden trim and slide-rule tuning scale; this completely self-contained transistor dual-wave set performs brilliantly everywhere, even in a car. Reproduction is exceptionally good. Printed circuit. Kit £14 18s. 0d.

SHORTWAVE TRANSISTOR PORTABLE Model RSW-1. Four wave-band seven transistor portable with telescopic and ferrite aerials, slow-motion tuning. Covers Medium, Trawler and 6-26 Mc/s in four switched bands. Uses printed circuit board and latest circuit technique. Superbly styled leather case. Kit £19 17s. 6d.

TRUVOX D93/2 AND D93/4 TAPE DECKS. High quality mono-stereo Tape Decks. D93/2 4-track for highest fidelity. £36 15s. 0d. D93/4 4-track for most economical use of tape. £36 15s. 0d.

GARRARD AUTO/RECORD PLAYER Model AT-6. A 4-speed stereo-mono unit with manual or fully automatic record selection; adjustable counter-balanced arm. Fitted with Decca Deram ceramic cartridge £14 6s. 1d.

or Ronette 105 mono/stereo cartridge £13 12s. 1d. GOLDRING Lenco TRANSCRIPTION RECORD PLAYER Model GL-58. Fitted with the G.60 pick-up arm and Ronette 105 mono-stereo cartridge, it has infinitely variable speed adjustment between 33 1/3 and 80 r.p.m. and four fixed speeds. 3 1/2lb. turntable to reduce rumble, "wow" and "flutter" £20 1s. 3d.



S-99



RSW-1



UXR-2



AT/6

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THE LARGEST-SELLING ELECTRONIC KITS IN THE WORLD

JUST outside London, to the west of Hounslow, lies a great stretch of land, criss-crossed by runways and taxi-strips. From the centre of this giant geometry rises a group of modern buildings, several stories high, and glass walled. Around the perimeter stand yet more buildings—low sheds, enormous hangars, company offices, stores and maintenance shops. Further out still, across the Bath Road, are the hotels, open day and night to cater for the continual flood of guests from the great airport of London—England's front door.

And from this terminal comes sound—the sound of an airport at work. Twenty-four hours a day, seven days a week you can hear the unceasing roar of aero engines: warming up, taking off, arriving, testing. The grumble of the generators, the cars, trucks, buses, and tankers. The public announcements, and the chatter of voices in many different languages. It is this which goes to make the great Sound of London Airport.

So it was with some feeling of trepidation that my friend and I caught the bus at Hounslow West, *en route* to tape the sounds of the air, which we required for a forthcoming documentary on Means of Transport. We took with us a Stuzzi Magnette battery portable, a Grampian DP/4 microphone, and more than enough tape. I carried also a camera and supply of film.

Our trepidation must have been greater than we imagined, for we caught the wrong bus, and had a good long walk through the tunnel to reach the centre of the airfield. This brought us near the main buildings, and we headed first for *Queens Building*, which gives access to the fine roof garden built especially for visitors. From here, one

and decided to venture indoors. We walked along to the *Reception Building* and, getting permission, went inside.

Inside the *Passenger Buildings* are all the conveniences one can expect nowadays in any large terminal—Snack Bar (to which our footsteps were directed with unerring accuracy), Restaurants, Bars, Banks, Outfitters, Barbers, Airline Offices, and even a 'Waving Base' for friends to bid that last farewell.

We walked around to record general background chatter, and eventually reached a position on the upper level overlooking the lounge itself which we found particularly good for recording public announcements. This was fairly near the speakers and away from the crowds.

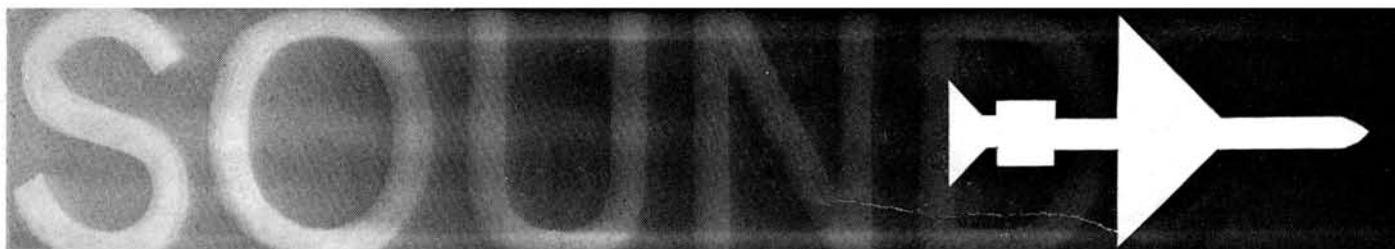
A GOOD COLLECTION

Here we stayed some time, obtaining a very good collection of announcements in all manner of languages, until the session was brought to an end by the noise of workmen sawing wood close by, so making further recording impossible (except, of course, of sawing wood!).

There was one final visit to make before leaving. As we wanted some 'pure' aircraft sounds free from the extraneous noises already mentioned, we strolled across to a point where we could get close to the runway, and well away from other activity.

However, we found that at such close quarters the volume of sound from the aircraft was overwhelming, and however low we modulated, it was impossible to get a recording that was not distorted; and,

THE ROAR OF THE JETS



taping the sounds of an airport

BY DAVID KINGLAKE

has a bird's eye-view of the airport, and in the summer it is crowded with aircraft enthusiasts and tourists.

As there was little activity when we arrived, we were able to stroll around and get our bearings. We found out which runways were in use, and also what we thought to be good recording positions.

Our selected vantages protected us somewhat from the wind, and so cut down too much noise, but unfortunately most of the visitors were crowded there, producing, at times, too much background chatter. We could only hope that the volume of sound produced by the aircraft would drown this out—which it did, except, now and then, for the very penetrating shouts of some small boys whose enthusiasm whenever they sighted planes could not be subdued, even by the noise of the aircraft themselves. Nevertheless we did manage to obtain a number of quite reasonable recordings.

There are usually announcements for visitors on the roof garden regarding the various flights, but we happened to arrive on a day when staff sickness prevented this. Although this would have been enlightening, its absence was perhaps a good thing, as it might have spoiled recording.

As well as aircraft, we recorded the sound of the portable generators, and the overall noise of traffic on the tarmac. A BEA *Viscount* arrived while we were there, and taxied up to the building to discharge visitors. It was fascinating to watch the organisation that goes into every arrival, for as the plane turned in, it was approached by coaches, trucks, maintenance vans etc.—all arriving exactly on cue—unfortunately rather a jumble of noise to record, but interesting to photograph.

By this time we had been standing in the cold for an hour or more,



London Airport seen from the roof gardens.

of course, when we moved further away, we came back among the traffic and visitors. On playback later, the result of these 'close-t' recordings was just an indistinguishable noise, as opposed to specific aircraft engine sounds which could be recognised for what they were.

In fact, when we sorted through our earlier recording the next day, we found one free enough of background for our purposes. It seems likely that the best position for such recording would be the centre of the airfield, away from both general activity and some way from the runway. Obviously this is quite inaccessible to such as we.

Nevertheless the recording we had was very suitable and interesting, and we left with an impression of a most useful and enjoyable trip.

THE combination of recorded sound and pictures is one of the most popular forms of entertainment ever invented—hence the success of the cinema and, more recently, television. Home television recording may one day replace the 8mm cine film, but it is likely to be many years before the 35mm slide is ousted as the least expensive and most satisfying form of colour photography.

The slide has many advantages over other photographic systems. Neither video tape recordings nor pocket snapshots can compare with the magnificence of a well contrasted colour projection. The 8mm movie film is a rather more serious competitor, but the expense and limited duration, not forgetting loud motor noise and unsteady pictures on all but the most expensive projectors, makes this a far from ideal system for the amateur.

expensive projectors: many are susceptible to jamming at inconvenient moments—especially when a hot lamp has caused some moving parts to expand.

The most worthwhile feature of the more expensive projectors is magazine loading. This allows the operator to position his slides in order of projection *before* starting the display; he is then free to concentrate on watching the programme, having merely to move a lever on the projector to change the picture. This feature can be purchased as an 'add-on' unit, for about £3, to fit most of the cheaper models. Another useful attachment, of a similar price, is an electric fan, which can be clipped to the base of a convection-cooled projector. This makes the projector easier to handle and prevents slides 'popping'.

Although not essential, an exposure meter is a worthwhile aid to the

PRODUCING A SOUND/SLIDE SHOW

by
David Kirk



The only drawback to colour slides is the absence of visual motion. But this can be overcome, more or less, by using sound to create in the ears of the audience the movement which the eyes miss. The purpose of this article is to suggest ways of combining sound with slides to produce a lively and interesting programme.

There are three main activities to consider: photography, sound accompaniment and projection. Our first requirements, after a tape recorder, are a versatile camera, a constructive eye and, though not essential, a few gadgets. Cameras range in price from £5 to £120, much of the cost of very expensive models being devoted to the lens, which requires extremely careful polishing to produce a very accurate picture. It is not really necessary to pay more than £14 for a general-purpose (domestic?) 35mm camera and a good model of this price will possess the following features:—

Variable focus—usually from 3ft. to infinity.

Variable Speed: 1/200th, 1/50th, 1/25th second (or thereabouts) and provision for time exposure.

Variable Iris: continuously variable from f/22 (smallest) to f/2.8 (largest) aperture.

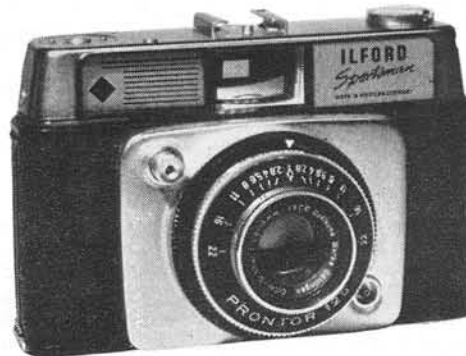
Such facilities as an exposure counter and double-exposure prevention lock are also incorporated on most models.

Another obvious requirement for prospective pursuers of the hobby is a projector. It is worth mentioning for those who are attracted by the battery-powered miniature slide viewer, that the small saving in outlay does not justify the considerable loss of enjoyment compared with projected slides. A viewer gives an often distorted picture measuring about 2in. wide, smaller and just as unreal as an ordinary colour snapshot. Projectors, like cameras, start at about £5, and a simple 150W air-ventilated model can be purchased quite cheaply (though they have limitations—see later). Should there be between £20 and £90 to spare, the world of remote control slide changing and focusing is opened to you. But beware of complicated and highly

bringing new life to 35mm colour

inexperienced owner of a variable exposure camera. The price of this particular gadget ranges from £3 to £12—money well spent when one considers the cost of spoiled exposures. They are all fairly accurate, used correctly, though some models have rotating controls which require fingers the size of pin heads to use.

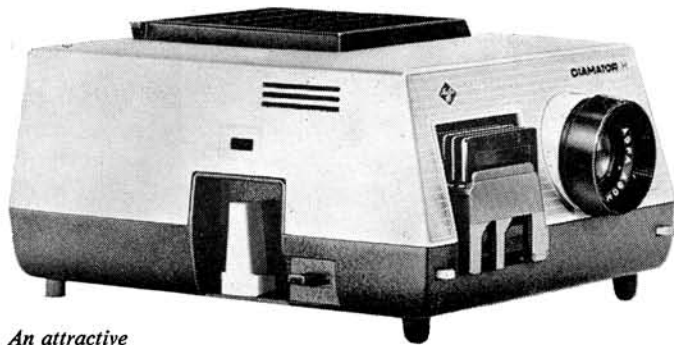
The final requirement—less important than the above—is a tripod; between £3 and £4 will buy a good model. Points to look for are



*A fine
example
of good
value and
low cost
—the
Ilford
Sportsman*

versatility—check that the camera screw-base can be positioned at any angle vertically and horizontally—and steadiness: a tripod which wobbles when fully extended is a complete waste of money.

The first decision to be taken when planning a slide show is the number of pictures to be displayed. Following the principle of bulk



An attractive and inexpensive magazine loading projector—the Agfa Diamator H retails at £17 3s. 6d.

buying, transparencies purchased in spools of thirty-six (usual price : 32s.) are cheaper, per slide, than when bought in twenties (22s.). We must, therefore, decide on the subject, allotting a slide to each local place of interest—or whatever the show is to cover, leaving a few slides spare for unforeseen objects that might warrant inclusion. Now, our camera loaded, we follow an itinerary designed to cover the listed subjects in as low a mileage as possible—that is, if we are really efficient!

Taking good photographs is an acquired art which is generally easier to perfect with colour slides than with black-and-white snaps. I shall never forget my surprise on seeing a shot I had taken of the murky Thames from London Bridge one very dull summer evening. The cold, grey water reproduced in brilliant blue, with a sky that seemed more suited to the Mediterranean. It was certainly not the photographer who was responsible for the well blended, albeit untruthful, colouring. Many transparencies seem to over-emphasise naturally dull colour tones—with very pleasing results. The real art of photography, exposure assessment having been placed in the hands of the light-meter, is that of balancing foreground with background and contrasting one colour with another. The best way to learn subject placing is to examine the work of professional photographers. This is most easily done by browsing through national magazines and newspapers. The recently introduced 'colour supplements', for example, contain many excellent shots. When photographing scenery

Having numbered the slides in order of display—perhaps going from North to South of the county—we shall end up with a logical tour of the area. In this case the preliminary 'warming-up' slides could show the operator's house and garden, view from front upstairs window and the local High Street, etc. Only after these have been shown does the title slide—"A Look at . . ." commence the actual tour. By following this North to South route, the slides will be linked to each other as they pass from 'un-developed land' through a new housing estate, a small industrial area, another group of houses, and finally the river-side docks to the south. After this, the audience will be taken eastwards to a horse show, where several useful sound effects have already been obtained. In the closing slides the equipment used in making the programme will be seen.

The script, in its final form, should contain the commentary—word for word—and some notes on which types of music and effects are required for which slides. Placing the projector on the writing table, slide No. 1 is projected on to a small makeshift screen such as a sheet of white writing paper. Details of the slide which might be missed by simply holding each slide to the light are then visible. A short description of the objects illustrated should then be written and suitable effects or music listed in the margin. This procedure should be followed for the full thirty-six shots, excepting the title slides, which are allotted a loud and impressive, or light and gay, introductory musical sequence. Details of fades and sequence timing need not be included in the script and are best decided during the actual recording. There is no reason why each slide should be given the same length of time ; some shots will obviously be of more interest than others and these should be allowed longer commentaries. On completion, the script should be read aloud and badly worded sections re-written.

ALLOCATION OF EFFECTS

Any sound effects that may have been recorded at the time of taking the photographs should be collected, either on separate 3in. spools or together in a single reel, with sections divided by white leader on which the effect to follow can be written with a ball-pen. Similarly, music should be collected and allotted to suitable slides. In general, it is good practice to use one particular piece of music to link the slides (i.e., to play during slide changing) thus providing a unifying theme. This can be faded on to the following slide commentary or, in some cases, on to further music where a special mood needs to be set. Mood music

transparencies with recorded sound effects and a commentary

it is important to include in the viewfinder a good-sized object such as a tree, which will assume the role of foreground, putting the subject into a natural perspective. The camera should be focused on the background and positioned sufficiently away from the tree to include it within the depth of field.

But now I am digressing into a subject which has been more than adequately covered elsewhere. Let us assume that the pictures have been taken, together with title slides to open and close the programme, and that the processed slides have been returned from the manufacturer.

Preparation of sound accompaniment begins with the concoction of a script. By writing every word to be included in the commentary, sufficient time for thought is given to ensure that any questions liable to occur in the minds of the audience will be answered by the tape. How many recordists, I wonder, have been forced to resort to turning up the volume to counteract bursts of questioning and general audience hubbub ?

FROM START TO FINISH

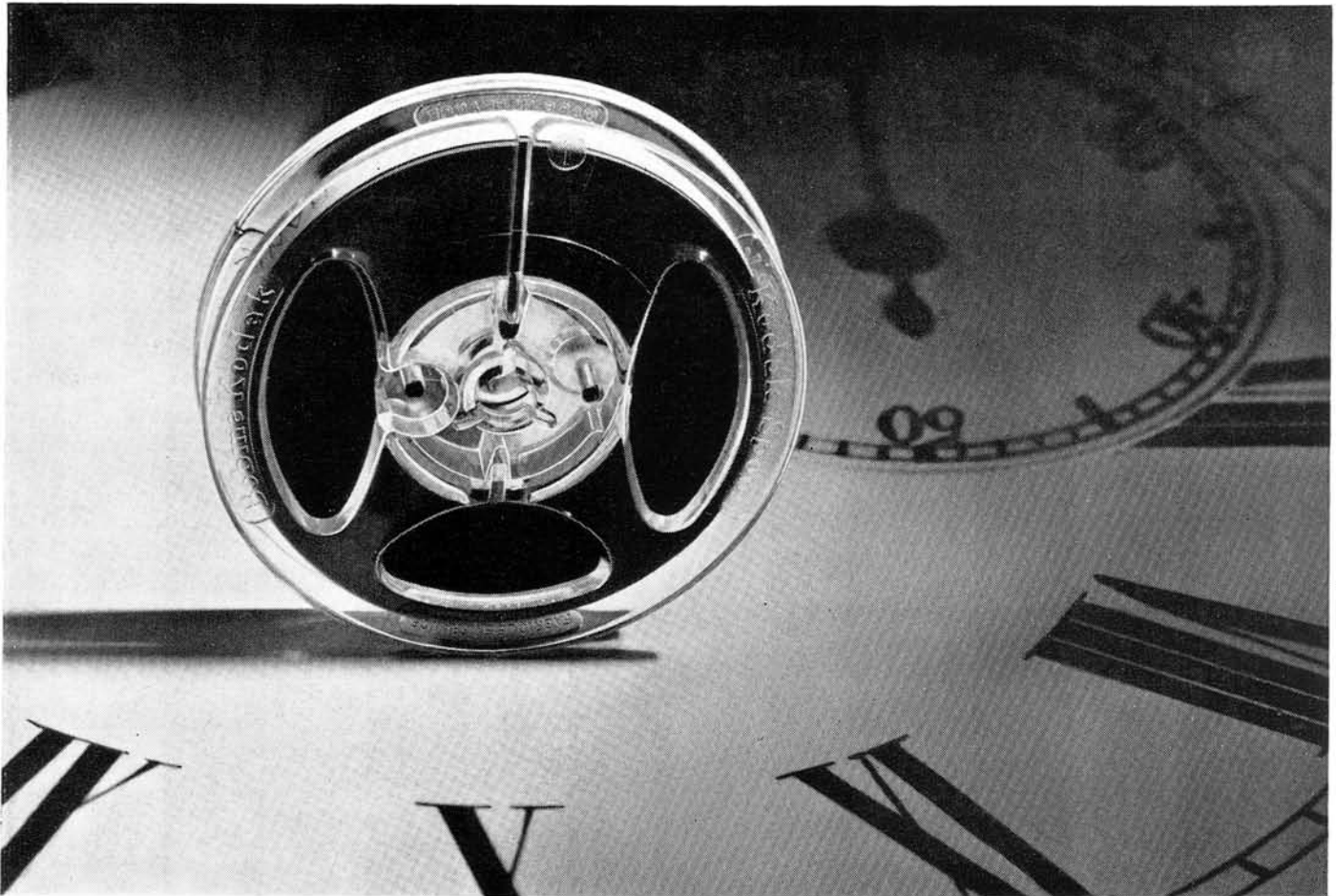
Let us follow the production of a sound commentary from start to finish. The slides have just returned from the processor and are laid out before us on a sheet of thin paper or glass, with the transparencies illuminated from behind. The subject is a documentary on local scenery and places of interest ; we may, however, be obliged to include at least *some* shots of the garden rose-bushes, but do not be afraid to reject the less suitable pictures—the daughter's cat is unlikely to object ! Incidentally, it is surprising how interesting an apparently dull subject can become when a well-thought-out commentary is added. (*Having seen and heard some of Mr. Kirk's efforts, we heartily agree.—Ed.*)

need not accompany *every* slide as sound effects are often more suitable. Readers with only one recorder can make up for their lack of dubbing facilities by editing sound effects, music and commentary, with scissors, splicing block and jointing tape. Fading, though not cross-fading, can be obtained by erasing the sequence where the fade is required with a magnet moved in at an angle to the tape.

Many recorders are equipped with facilities for mixing one high
(continued on page 483)



One of the most versatile light-meters available, the Weston Master costs about £10



3 1/4-inch reel . . . 5 1/2 hours playing time!

Now Kodak introduce the world's first quadruple play tape

From today your battery portable has mains recorder capacity. Kodak's amazing new Quadruple Play tape provides an unprecedented 5 1/2 hours playing time—that's more than 100 'pops' or all Beethoven's nine symphonies—on a single 3 1/4-inch reel.* Small as they are, these reels hold no less than 800 feet of tape. And for smaller recorders 3-inch reels are available. But if your recorder has a greater reel capacity you're even better off. 4-inch reels—holding 1,200 ft. of tape and giving 7 1/2 hours playing time—are on the way.

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The polyester base of this remarkable new tape is specially pre-stretched and treated to overcome distortion during use. In fact, Kodak Quadruple Play tape is tough enough to stand up to every stress likely to be met with under all normal conditions, no matter what the make of your battery recorder.

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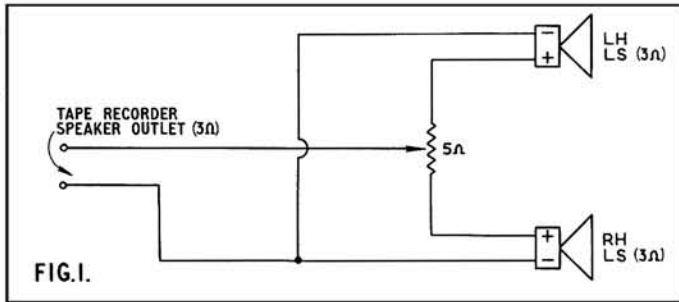
Kodak Ltd., Dept. 70, Kodak House, Kingsway, London, W.C.2

Kodak sound recording tapes . . . the best tapes in the world

SOUND-SLIDE SHOW CONTINUED

and one low level signal. Where more than two signals are being mixed together, however, a unit of the type described by Mr. Foord on page 496 is ideal.

The use of a script ties the recordist down to a fixed pattern; he will be unable to ramble in his commentary, or accidentally leave out slides. Even so, the final master recording will probably require editing to remove clicks, bangs, stutters and mumbled commentary. Plenty of time should be allowed for this often lengthy process. There is little point in leaving a few badly recorded sections in a tape which is otherwise well produced. Many recording tyros waste much of their time during editing, lifting the tape from the recorder to splicing equipment on a separate table. By resting the block on the head-cover or deck, it is possible to edit without removing the spools.



With slides and commentary prepared for display, we face the last task of combining the two into an integrated show. Most readers of this magazine will possess their own tape recorders and these will perform quite adequately once the recording has been made. Several of the larger manufacturers, such as Philips, Telefunken and Grundig, produce add-on slide changing devices for their recorders. These can often be modified to suit other makes, the main requirement being a suitable means of mounting the unit on the deck.

The purpose of the adaptor is to provide a cueing signal when the slide is to be changed. This signal can be relayed to the operator via headphones, one earpiece being fed with the signal and the other with the recording being played to the audience. On hearing the signal, the operator can perform the necessary actions required to change the slide. Some projectors can, in fact, be connected directly to the attachment to give complete automation of slide changing. The 'operator' is then left with nothing to operate—which may seem a little pointless to some.

AN ALTERNATIVE SYSTEM

Another method of connecting the tape recorder to control slide changing is to insert short lengths of metal stop-foil to complete a circuit at the 'remote-control' input, via the 'automatic-stop' relay. If no auto-stop device is fitted, electrically isolated guide pins could be wired to give the appropriate switching. The resulting short silence occurring during slide changing might be overcome by splicing recording tape and stop-foil 'back-to-back'—depending on the layout of guides.

Apart from tape synchronising facilities, one considerable advantage of the expensive projectors is the inclusion of high wattage lamps. The wattage is restricted by the projector's ventilation arrangements, and inserting a lamp of higher power than specified by the manufacturer can lead to serious trouble—such as cracking of lenses or damage to internal wiring. The high power projector will operate efficiently in quite poorly dimmed rooms, but a 35mm slide projected with a 150W lamp in semi-daylight (indoors) becomes almost invisible if shown more than a foot wide. A minimum of 300W is needed for clear projection of good-sized pictures in semi-darkened conditions during daylight hours. After dusk, however, when almost complete darkness is not difficult to obtain, the 150W projector will give a clear picture of practically any size likely to be required.

A good screen increases the reflection efficiency and hence the picture brightness, though a light plain wall will serve fairly adequately. A good screen does not necessarily mean an elaborate tripod-mounted

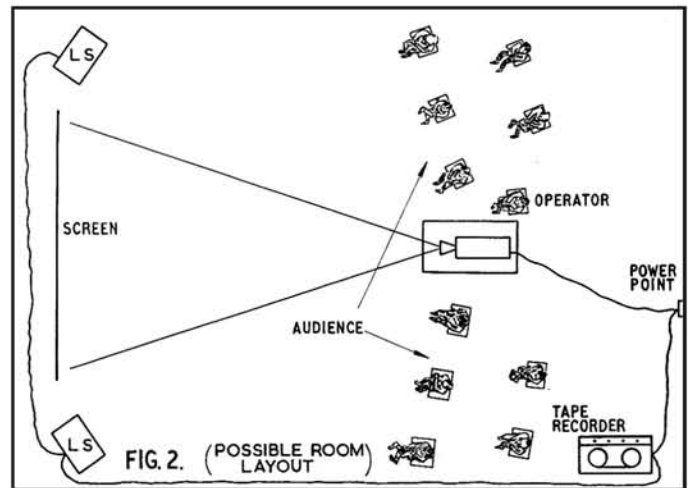
glass-beaded device of the type sold for about £8. Just as good (some consider better) is a large white sheet suspended from a wooden picture rail. Once the undulations and creases have been removed, projection problems are almost over.

The use of loudspeakers positioned near to, or behind, the screen, is an effective way of overcoming any disjointedness between sound and slide which might be present in the mind of the audience. As the average screen is suspended from a wall, the positioning of speakers *behind* it presents some difficulty. A conveniently placed recess, such as a cupboard or serving hatch, might be temporarily fitted with speakers which are then covered by the screen. Alternatively two speakers could be used, placed on either side—preferably concealed—to give the effect of sound coming from the middle of the screen. This of course, suggests the use of stereo to give some indication as to what, on the screen, is generating the noise.

As the 'stereo' effect would have to be very exaggerated to be really noticeable, owners of mono equipment might like to experiment with a crude form of stereo that is best designated 'moveable mono'. This would entail wiring a potentiometer as shown in fig. 1. The value of 5 ohms may prove difficult to obtain but can be varied without significant deterioration in volume. It could be mounted in a small box and operated through a few feet of connecting cable from a convenient part of the room. The box might be calibrated in accordance with the position of the visual sound source (car, train, etc.): LEFT, LEFT-CENTRE, CENTRE, RIGHT-CENTRE and RIGHT. If the accompanying recording is simply of music, the potentiometer could be set at CENTRE.

Continuing the presentation details, the positioning of equipment and audience should be carefully planned to suit the number of onlookers and position of power sockets. The projector, depending on the picture size required, may find itself beaming over the heads of the audience from the back of the room, or it may be positioned between their heads and the screen—in which case nobody will see a thing. Some juggling with, even temporary removal of, furniture may be called for, but the most suitable general layout is that shown in fig. 2.

Generous use of long speaker leads and mains cable means the recorder can be positioned at any convenient part of the room, although,



apart from at the beginning and end of the programme, it should not be necessary to touch it. Projectors are rather more of a problem where mains cable is concerned, as many models have very short leads. The solution to this is to construct a power extension lead, comprising a plug and socket at either end of a suitable three-core cable; alternatively, a new cable could be fitted to the junction box inside the projector. The practice of joining power cable with insulation tape is strongly deprecated as, with the many searching feet of an audience stepping around chairs and equipment-choked floors, the splice might be the first link to break should anyone trip on it. One is liable to lose friends in this manner!

Thus the slide display is completed. Visiting relatives and friends have watched in awe and amazement (one hopes!) and the next show is past the planning stage. What, then, does one do with a show everyone has seen? Quite simple . . . one joins the sizeable band of tape correspondents who have taken to exchanging slides with their tapes.

COSSOR KEF WHARFEDALE BUTOBA DECCA garrard quad JASON uher
 PYE GOODMANS ARMSTRONG
 LOWTHER STELLA PHILIPS WYNDSOR elizabethan
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WHENEVER anything is recorded, certain queries are likely to arise so far as copyright is concerned. Broadly speaking, everything connected with copyright is covered by the Copyright Act, 1956. This, however, is by no means straightforward, and so, in an article of this length, it is not possible to give more than a broad outline of the position as it is likely to affect you.

Copyright is an exclusive protection vested in the owner of such copyright. Among other things, it includes:—

- (a) a protection against unauthorised copying by any means.
- (b) a protection against unauthorised public performance by any means.

Copyright subsists in every original literary, dramatic or musical work. An entirely separate manufacturer's copyright subsists in sound recordings quite apart from the copyright in the musical works reproduced thereon. In the case of music, the right of copying is controlled by the *Mechanical-Copyright Protection Society Ltd.*, and the right of public performance by the *Performing Right Society Ltd.* Similarly, in the case of sound recordings, the right of copying the record is controlled by the individual recording companies and the public performance rights on their behalf by *Phonographic Performance Ltd.*

Thus, broadly speaking, copyright can be divided into two parts: the right to perform the work *in public*, and the right to reproduce it by *any means*. Any performance in private is not subject to copyright. The Copyright Acts of 1911 and 1956 do not define what constitutes a public performance. Nevertheless, a number of precedents now exist, from which it can be stated very broadly that performances which do not form part of the domestic or home life of those participating are public within the meaning of the Copyright Act. Thus permission will be needed if material is played to members of a gramophone or tape recording club. Incidentally, in this connection, although the members may have bought the tapes or discs, they will not have bought the rights to give a public performance in this way.

In the United Kingdom, copyright in music continues to subsist for a term of fifty years from the end of the calendar year in which the composer died and, in the case of sound recordings, for a term of fifty years from the end of the calendar year in which the recording was first published.

Nevertheless, even while subject to copyright, apart from being used for private purposes it may be used for review purposes (if, for instance, subsequently you genuinely will write about it). Also, it may be used for research and private study of the copyright work, provided this is subject to "fair dealing". Besides this, permission is not required if material is to be used by a teacher or a pupil for educational purposes in a classroom in school hours. Incidentally, there are no "fair dealing" provisions for sound recordings. The usual permission for copying must be secured from the individual recording companies concerned.

If, therefore, any copyright work will be heard at a public gathering, permission from the copyright holder must be obtained and a fee paid (for this is how authors and composers, and their dependents after them, receive an income). The *Performing Right Society* (29/33 Berners Street, London, W.1) undertakes the collection and distribution of fees for over 3,000 British composers and authors—which probably represent 99% of the active creators of music in this country. The Society also represents in Britain more than 130,000 composers from all parts of the world. Nevertheless, if an author or composer is not represented by the Society, it will be necessary to approach him direct.

Besides this, however, it is necessary to have a licence actually to give a public performance, of anything which has been recorded. When a commercial sound recording is used publicly, a licence must be obtained from *Phonographic Performance Ltd.* (62 Oxford Street, London, W.1.)

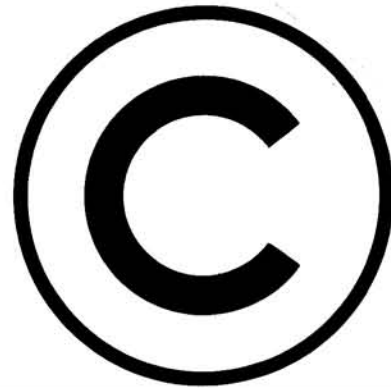
Whereas these two organizations deal with the licences necessary to give a public performance, it is also necessary to obtain permission actually to make a recording of a work. This is when the *Mechanical-Copyright Protection Society Ltd.* (380 Streatham High Road, London, S.W. 16) comes in. Its permission is needed to make a recording, and the fees which it receives are paid to the actual copyright owners of the music concerned.

That is a start, but it is by no means the end of the complications.

Suppose, for instance, you want to make a recording of a concert to which you are going. In the first place, whether the material used is subject to copyright or not, you will have to obtain the permission of the sponsors or the owners of the building to make the recording. This may be forbidden. And, before a recording may be made of a

THE COPYRIGHT POSITION

BY JOHN GASELEE



a conducted tour through a legal maze

live performance for subsequent public use, permission in writing must be obtained from all the performers involved.

If you want to make a recording of a commercial record, you will have to obtain the permission of the record company concerned. In fact, it is most unlikely that this permission will be given. For, obviously, to allow people to make their own recordings of records could have a serious effect on the sales of the latter. Nevertheless, there are special occasions when permission might be granted, on payment of a suitable fee. One possible occasion is if a play is to be put on in a church or for charity. If *parts* of different records are wanted on a continuous tape as incidental music, permission might be granted. But you would not be allowed to make your own recordings of records for background music anywhere, or for dances. Clearly, in these instances, the conventional records could be used. In this case, however, a licence would have to be obtained from the *Performing Right Society* and *Phonographic Performance Ltd.* Besides this, even if a commercial or other record is dubbed or re-recorded with the permission of the owner of the copyright in the recording, this does not automatically confer licence to reproduce copyright material which may be included, and the *Mechanical Copyright Protection Society* would have to be approached.

There are fresh complications so far as sound radio or television broadcasts are concerned, for the BBC and ITA have been granted copyright protection for their programmes to prevent illegal recording for other than purely private and domestic purposes. This right, however, is distinct and separate from the copyright which may subsist in the *material* of which such programmes may be made up, and which may not be recorded for any purpose other than those exempted under the Copyright Act 1956, i.e. fair dealing and private study. The copyright in such programmes subsists for a period of fifty years from the end of the calendar year in which the broadcast was made. In seven years time the BBC will be celebrating its fiftieth anniversary. Anyone with recordings of broadcasts made in those early days will be able to use them without obtaining permission from the BBC. But if the *composer* is alive, or has not been dead for more than fifty years, it will still be necessary to obtain the various other licences.

As an example of the procedure, therefore, let us consider taking a tape recording of a record played on the radio, which one wishes to use to entertain the public (or members of a club) in some way. We will assume that the author and/or composer have not been dead for more than fifty years.

In the first place, it would be necessary to obtain the permission of the BBC (or the television company, if it was an independent television programme). Secondly, it would be necessary to obtain the permission of the Record Company which made the record. Actually to make the recording, you will need to obtain the requisite licence from the *Mechanical-Copyright Protection Society Ltd.* You will have to obtain permission from *Phonographic Performance Ltd.* to use the recording in public, and you will need a licence from the *Performing Right Society* to use the music in public.

In this case, five separate permissions are needed. A fee will be charged for each, although, if the performance is for charity, this may

(continued on page 499)

FACILITIES for monitoring either the incoming signal or the recorded signal as the recording is actually progressing are essential for many applications. It is not always possible, of course, to set up all the recording equipment within the immediate area from which the programme material is derived. The recorder and ancillaries often have to be installed in a small room nearby, the programme signal then being fed in through the microphone cables.

Unless the recordist under these conditions has some means himself of listening to the programme as it is going on to the tape, or as it was recorded a second before, he is completely cut-off from the heart of things, and it then lies truly in the lap of the Gods as to whether or not a reasonable recording will result, or even whether sufficient editable material will be patterned on the tape.

The success or otherwise of the recording can only be discovered after such a recording session on a replay—but it may then be too late to do anything about it.

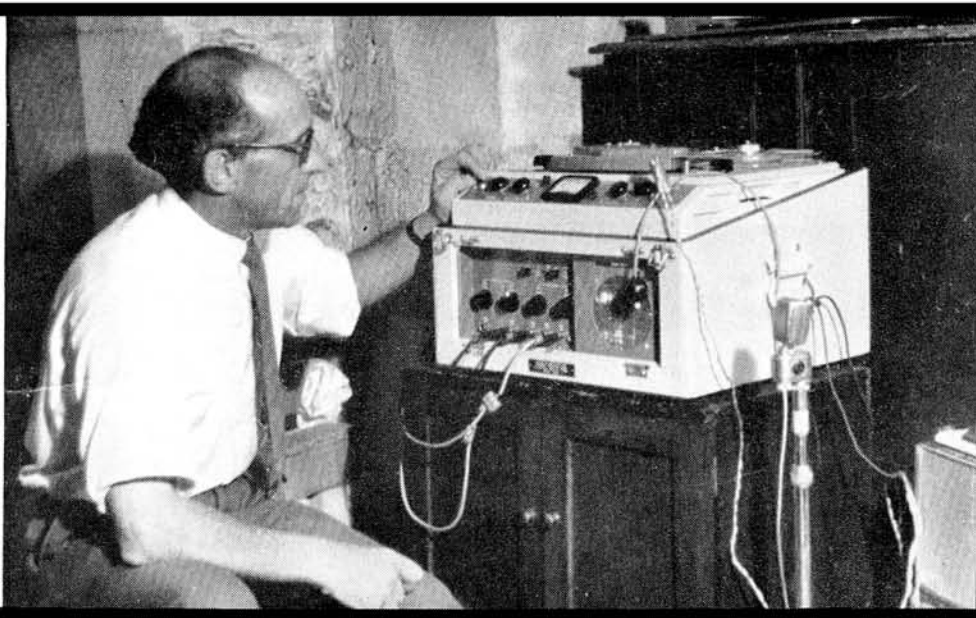
When the recording equipment is, in fact, in the same room as the microphone(s), the need for monitoring facilities is considerably less, but even under that condition it is nice to hear exactly what is going on the tape, in spite of the fact that the record level indicator may be revealing that the level of the signal is just right for a good recording

and, of course, in that condition does not represent a truly balanced signal as it should appear from the output of the replay channel. Nevertheless, as long as this signal shortcoming is understood, head monitoring is quite useful and is better than no monitoring facility at all.

A machine that is not fitted with this simple kind of monitoring facility can easily be modified to make it available. Whether or not this is entrusted to a dealer skilled in the arts of tape recording will depend upon one's own technical and mechanical ability. The exercise is by no means a difficult one, and for those of our readers who would like to try their hands at fixing a simple monitor socket, the following instructions are given.

Firstly, either on the tape deck or somewhere on the cabinet a position must be located to fix a jack socket. This is not a very large item and can usually be tucked in at some corner with a little room to spare. Before drilling a hole to accommodate the socket, however, it is as well to have the socket which is to be fitted at hand so that the overall dimensions can be matched to the space available on the recorder. It is not a good idea to drill the metal panel of a tape deck, for this action can weaken and distort the mechanism and give rise to wow and flutter and other bad troubles. Look for a place

towards better taping PART TEN



MONITORING THE SIGNAL

BY GORDON J. KING

Fig. 3 (above) :
*Mr. Harry Mudd preparing
to record an organ
in the New College chapel
pump room.*

depth, and that programme peaks are being avoided by judicious use of the record level control.

Moreover, it is not always a good thing to have the tape recorder in hearing distance of the microphone(s), for it is surprising just how sensitive a microphone is to noises like motor buzz, tape click and spool rattle, even though they seem insignificant against a background of relatively loud programme noise.

It often pays, then, to put the recorder out of acoustical sight of the microphones, which takes us back again to square-one and the need for monitoring facilities.

Some machines in the 'popular' category feature a high impedance jack socket for monitoring purposes. This circuit is designed to channel a little of the signal existing across the record head into a pair of high impedance headphones. This it does without imposing too great an extra load across the head and record amplifier output. From the phones is then heard the programme signal as it exists actually at the input of the record head.

Thus, provided the record head is without fault, the tape is correctly threaded and the oxide-coated side is passing the head gap in contact with the pole pieces, and the oscillator is pumping a bias signal of correct amplitude into the record head and erase head, one can be reasonably sure that what is heard in the phones is, in fact, getting on to the tape! The quality of the monitor signal is usually poor from this kind of monitoring channel, since at the record head the signal is equalised in various ways to suit the record/replay characteristics,

on the cabinet or amplifier panel. Some machines have a socket panel at the rear, this being an ideal mounting place.

The jack socket needs only to be a two-contact type, and there are a variety from which to choose, ranging from sub-miniature types to standard types which fit jack plugs to BS666. Any reputable dealer in hi-fi will help to sort out a suitable socket and matching plug.

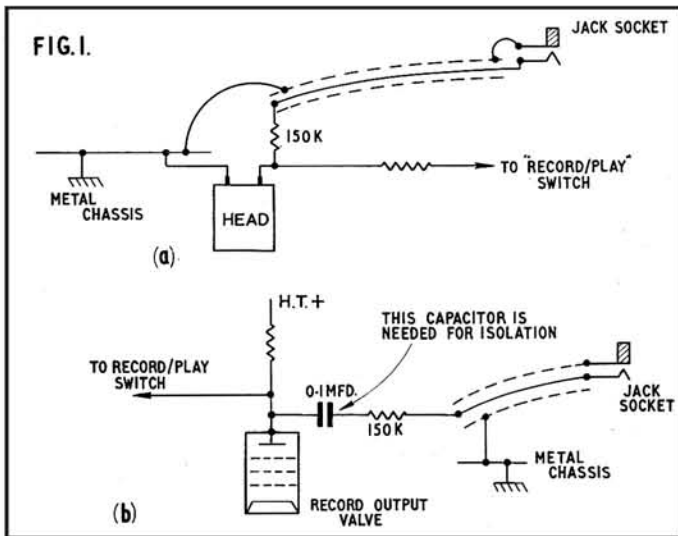
Having fitted the jack socket, the next move is to connect it to the record output circuit. Screened cable with a single, insulated inner conductor and a PVC outer sheath should be used for the connection.

One part of the circuit can be connected without further ado, and that is the braid which forms the screening. This is used as the 'earthy' conductor in the circuit.

The braid should be soldered to the 'earthy' tag on the jack socket at one end of the lead and to the chassis of the recorder amplifier at the other end. The inner conductor at the jack socket end should be carefully dressed and soldered to the remaining tag on the socket taking care to avoid a short-circuit between inner conductor and screen (braid).

The remaining part of the exercise now resolves simply to finding somewhere to connect the inner conductor at the far end of the screened lead! Actually, of course, this conductor has to be connected to a part of the circuit which, when the instrument is switched to RECORD, carries the programme signal to the record head (note here that although we are referring to the head as the "record head", in the majority of the popular range of recorders the same head is used for both record and replay, a changeover switch being used to direct either the programme signal to the head on record or the head signal to the replay amplifier on replay).

We are now, then, truly up against the problem of locating the circuit which feeds the signal to the head on record. We could simply connect the inner conductor to the 'live' tag on the head (the other tag



is generally considered as 'earthy' since it is connected to the metal chassis—or HT negative line—of the amplifier), but this could load the head too much and upset the recording characteristics. The best plan is to connect the inner conductor to the head circuit through a resistor of about 150K ($\frac{1}{2}$ -watt, carbon). The resistor will ensure that the head circuit is not loaded very heavily and will prevent interference with the bias signal (fig. 1 (a)).

Alternatively, the inner conductor could connect to the anode of the record output valve via the resistor and an isolating capacitor. Since that valve is often also used as an amplifier on replay, the same socket could be used to deliver a replay monitor signal as well (fig. 1 (b)).

High resistance headphones must be used for the best results, an impedance value in the order of 1K to 4K being suitable.

MONITOR PLAYBACK HEADS

Professional tape recorders feature a separate replay head placed just after the record head so that the material actually recorded on the tape can be monitored almost immediately and while the recording is taking place. This means that adjustments can be made of signal level, programme balance and also to the bias amplitude, if necessary, for the best possible recording.

It is not completely outside the scope of the enthusiast to fit his own separate monitor head—indeed, some tape decks are designed to cater for a head of this kind. It is a good idea to select a head which matches the existing replay and/or record-replay head. In that way the replay input circuit and preamplifier can be duplicated, for, of

course, the level of the signal across the monitor head will generally be insufficient to work a pair of headphones direct. The signal level is so low that virtually nothing would be heard in the phones.

The monitor head pre-amplifier should embody equalisation to give the necessary CCIR replay characteristics. At that stage, the signal could, if required, be applied direct to a pair of phones and good quality reproduction would be expected if all is well with the recording (fig. 2).

FEASIBLE CONNECTION

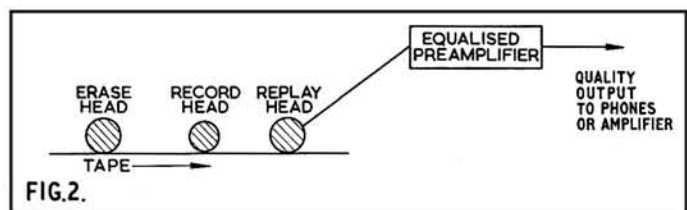
It is quite feasible, of course, to connect the equalised monitor signal to the input of a separate hi-fi amplifier and in that way obtain the sort of monitor quality that one would expect to achieve by playing the recorded tape back into a quality replay channel. It is, indeed, useful to have available a monitor signal of good quality from a separate head.

Ingoing and immediately recorded signals should only be monitored at high level in a room removed from that containing the microphones. If, for instance, a monitor channel terminating in a loudspeaker is established in the room from which the programme is being recorded, it is almost certain that acoustic feedback will ensue from the speaker back to the microphone, through the amplifier and back to the speaker again. The resulting loop can set up a very disconcerting howl which can only be avoided either by switching off the monitor channel or turning its output down to a low level. Even then, the reproduction may sound rather 'ringy', although there may not be sustained feedback. For local monitoring, therefore, a pair of headphones must be employed.

The situation is entirely different when the recorder and monitoring equipment are out of hearing of the microphones. It is perfectly in order then to run the monitor channel at as high a level as may be desired. It is often desirable, in fact, to wind up a monitor amplifier (as fed from a monitor head) to a fairly high level to drive a good quality enclosed speaker to secure the 'feeling' of the programme being recorded.

WELL-KNOWN AUTHORITY

The author has assisted with the recording of organ music, in association with the well-known authority, Mr. Harry Mudd, when this kind of high-level monitoring has been very much favoured. Fig. 3 shows Harry Mudd at the controls of the professional EMI stereo recorder during a session of organ recording at New College Chapel, Oxford. The exercise was for the production of a master tape, under the musical direction of Dr. David Lumsden, leading to the publication of one of the well-known records under the Alpha Records label (AudioVision Developments Oxford Ltd.).



Here the equipment is set-up in the organ pump room and the monitor channel of the EMI recorder is fed to a Mullard 20W hi-fi amplifier, the output of which is driving a Goodmans speaker system reflex loaded in an enclosure mainly of marble! Only in this way has Mr. Mudd found it possible to re-create the vastness of the organ music in the small pump room—above the background noise of the pump in full action—so that accurate monitoring could be maintained.

Incidentally, Mr. Mudd favours a separate 'talk channel' direct to the organist, which is the purpose of the ribbon microphone to the right of the recorder. During many of his organ recording sessions Mr. Mudd has adopted closed-circuit television so that he can observe the relative position of the choir and give immediate instructions with regard to re-positioning through the talk channel while at the same time monitoring the programme!

Here, then, is food for thought and shows one way, at least, of marrying television to tape recording.

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TR31

OUR READERS WRITE . . .

. . . about four-track stereo tape records

From : T. Ingham, 11 Simister Road, Failsworth, Lancs.

DEAR SIR, I am a regular traveller to the U.S.A. and one thing puzzles me in regard to the attitude in the U.K. towards 4-track tape recorders and in particular four-track stereo tape records.

No matter what English magazine I read on hi-fi or tape recorders, there never seems to be any mention of four-track stereo tapes. Why is this? Surely it is not because there is no market for them (or have they not been introduced to the market?)

We are still getting mono tape reviews in England; in the States these are completely obsolete and very rarely does one see even a twin-track stereo tape in America. Are we really so backward in England as to be still enthusing over mono tapes, when they are practically the same as when tape recorders first became popular at least twelve years ago.

Even the twin-track stereo tapes are very limited and dreary in their content; I am quite sure that if the stereo enthusiast were to listen to four-track stereo tapes he would be very discontented with his mono reproduction. Please can't the public be given the chance to compare tape with disc. I am quite sure what they would go for after that. British manufacturers really ought to wake up to the trend, which is to stereo, and get some four-track stereo tapes on the market now.

Yours faithfully,

Editor's note: We review all the tapes which are submitted, and this has included a few 4-track stereos. The fact is that in the U.K. the overwhelming majority of recorders in use are mono machines, whereas most people with stereo equipment concentrate on discs.

. . . about carets and hats again

From : D. P. Robinson, Flat 3, 11 Woodside Avenue, London, N.12.

DEAR SIR, Mr. Pratt has provided, in December *Readers' Letters*, an interesting symbol for the centre position of S.10 of the Stereo Mixer, to indicate that the meter is reading either A or B, whichever is the greater. I am not sure that it is instantly recognisable as such, but it certainly should inspire many questions from people using a mixer with this symbol! It would indeed be disastrous in this application to read the vector product of A and B, but since $A \wedge B$ can be expanded to $AB \sin \theta$, where θ is the angle between A and B, the symbol could be used for phase meters in other applications.

I was stimulated by Mr. Pratt's letter to make a few more enquiries myself, with the conclusion that there is no simple answer other than the one he proposed. I did manage to produce three other ways:

the maximum of A or B, written as |A, B|
the straightforward writing A (A > B), B (B > A)

$$\frac{A + B}{2} + \frac{A \sim B}{2}$$

where \sim is the positive difference of A and B.

It is also possible to write, in even more complex form, expressions from Dirac and Heaviside functions, but the panel space under S.10 is not large enough to contain these! I think that Mr. Pratt's symbol should be very satisfactory and I am hoping to see it on many mixers in the future.

Yours faithfully,

. . . about one man's editing

From : Robert J. Powell, 52 Harcourt Road, Alexandra Park, London, N.22.

DEAR SIR, Referring to the article *One Man's Editing* in the November issue of *Tape Recorder*, may I say that I find one or two points rather misleading.

(1) Fiddling about with crocodile clips may put off some people; I find the end of the index finger far easier. If the splicing tape is held between the thumb and index finger of the right hand and cut with a razor blade held in the left hand, the splice is left sticking to the index finger. From here it may easily be transferred to the tape held in the editing block.

A few words here about the *EMI* block. Some people do not like having such things permanently fixed to their machine. If two rubber 'suckers' are glued to the underside of the block it may be held firmly in position while the editing is being done and removed afterwards.

(2) The caption under the photograph of the *EMI TR 90* deck on page 399 may lead readers to believe that the playback head is inaccessible. In fact the TR 90 is the easiest machine I have ever had to edit on, as the playback head is very easy to 'get at'. All this, however, does not detract from an interesting article.

Yours faithfully,

. . . about hydro-bagpipes

From : R. S. Finlayson, 64 Downlands Road, Purley, Surrey.

DEAR SIR, Without ready access to six fathoms of water I have not been able to conduct the experiment suggested by your correspondent, Mr. Rimmer (page 372, October). However, a similar experiment has been done by one of my countrymen, who, to the surprise and financial disadvantage of a betting cousin from across the Atlantic, successfully played the bagpipes on water-skis in much more than six fathoms of water off the West Coast of Scotland.

The result, as far as I know, was not recorded on tape, and so I am conducting more modest experiments in my bathroom in approximately one fathom. If Mr. Rimmer cares to contact me I will be happy to let him hear the results backwards and forwards at the same time without moving the bar.

I do not intend to publish a paper on the subject, however, because the fees therefrom are unlikely to cover the cost of the bagpipes.

Yours faithfully,



. . . about the Williamson pre-amp and Hoddinott microphone

From : E. Birchenall, 368 East Second Street, North Vancouver, British Columbia, Canada.

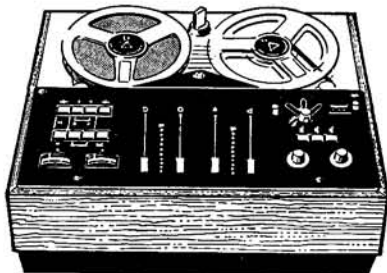
DEAR SIR, I do not know whether you are interested in readers' interpretations of the various constructional articles which appear in your publication from time to time (*We are always interested—Ed.*) but on the offchance that you may be, I am enclosing details and a photograph of my own version of the transistorised microphone pre-amplifier which was described in the September 1963 issue.

For a 'one shot' project printed-circuitry seemed hardly worth while, so having read something of the modular form of construction I decided to try my hand and came up with the results illustrated. While I realise that my efforts cannot be compared with a commercial packaged product, they may prove of interest to those of your readers who are not so well 'heeled' as, outside of circuit components, cost of
(continued overleaf)

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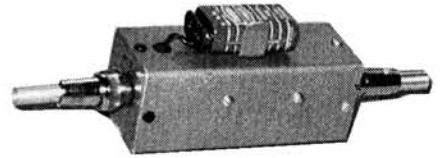
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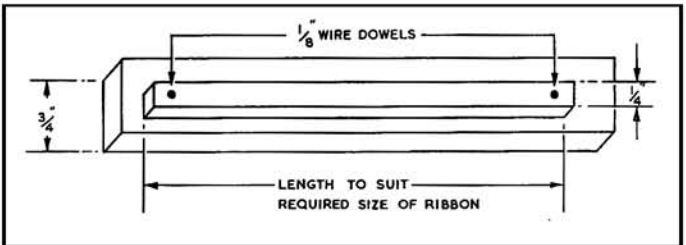
materials was minimum. The wafers were of phenolic board (Paxolin sheet) $\frac{1}{16}$ in. thick, the wire risers of pre-stretched hook-up wire and the lateral supports, also of Paxolin sheet, were notched and secured with contact cement. The brass eyelets through which the risers pass are of the type used in model airplane construction.

The 9V battery was 'piggy-backed' on the aluminium case to avoid delving into the 'innards' when renewal becomes necessary. This also avoids possible damage arising from a dead battery and obviates the need for a switch as one only needs to remove the battery connector.



Incidentally, the case was also 'home rolled' and soldered with aluminium solder. This is mentioned as I have heard doubts expressed as to the efficacy of this material. It really does work provided proper techniques are employed.

Also in the process of construction is the ribbon microphone described in the July and August 1963 issues. Some difficulty was experienced in cutting accurately the ribbon for this project, so a simple jig was devised, sketch of which is also enclosed. The foil is sand-



wiched between the two sections clamped tightly with, failing anything else, two Bulldog paper clips and given the prescribed treatment with a new razor blade as described in the original article; it is good for about four cuts before it becomes scored.

Yours faithfully,

. . . about the Akai 345 review

From: Pullin Optical Co. Ltd., Ellis House, Aintree Road, Perivale, Greenford, Middlesex.

DEAR SIR, In a recent review of the Akai 345 tape recorder (August 1964), your reviewer complained that the deck would only accept American type spools and that Continental spools could not be fitted to it.

We must point out that, by removing the rubber sleeve from the locating peg on the spool turntable, any Continental spool can be placed on the machine, although in many cases the manufacturer's label obscures the hole in which the locating peg fits and it is necessary to pierce the label at this point with a pencil or small screwdriver.

Perhaps you would be good enough to draw the attention of your readers to this simple solution.

Yours faithfully,

. . . about plastic spools

From: Albert E. Pye, 37 Hawthorne Avenue, Reepham Road, Norwich, NOR 30M.

DEAR SIR, It is about two years now since I was introduced to tape recording and every time I see a machine in use my eye travels straight to the plastic spools.

I have yet to see a plastic spool which has been in use for at least a month that does not run out of true. Side One will probably run dead true, but turn it over to Side Two and the up and down movement can be seen and very often heard as well, as the tape touches the rims. Much of the wow complained of could be due to the spools and not the machines.

Is it not possible to make spools of a material that does not warp?
Yours faithfully,

THE Series 80 Tape Deck has been used in a number of different machines, and it might be as well to begin this article by outlining the differences. Firstly, the deck itself comes in four versions: D82, $\frac{1}{2}$ -track with two heads; D84, $\frac{1}{4}$ -track with two heads and track-selector/stereo switch; D86, $\frac{1}{4}$ -track with three heads, suitable for stereo; D87, $\frac{1}{2}$ -track with three heads, stereo.

Next, there are versions of the above, having the same numbering, but with the prefix PD, denoting 'deck with pre-amp'. These comprise an '80' deck, with a recording amplifier, a playback pre-amplifier, a push-pull bias and erase oscillator, and an integral power pack. Intended to be an adjunct to an existing hi-fi rig, the PD units are supplied on a wooden plinth, with rear connections. Alternative arrangements are available. There are two independently controlled inputs, superimposition and auto-stop. Outputs are 1V at 47K and up to 10V at 250K. Input specifications are as for the complete recorders—see later. The valve line-up is as follows: EF86 first stage; ECC81, two-stage amplifier; ECC82, push-pull oscillator;



EM87, record level indicator; with metal rectifiers used for both mains rectification and auto-stop circuit, and a crystal diode (OA81) signal rectifier.

In addition to the four PD units, there are two special units, constructed for use by Educational Authorities, the PD83 and PD85, $\frac{1}{2}$ - and $\frac{1}{4}$ -track respectively. The main difference is that GPO jack sockets are fitted to a panel at the front, and a meter is used instead of the EM87. Presumably the little horrors make so much noise that a more accurate balance by the master in charge is required. The circuit is a little different, with an additional ECC83, and a single output of 1V at 47K intended to match into existing audio equipment at the school.

The complete tape recorders are the R82 and R84. Both are designed as mono machines, but conversion to stereo is a simple matter. To fill in some further deck details, two speeds are provided, $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s, spool size is 7in. and the well-known hub-locking system is used. The addition to the PD82 and PD84 is a power output stage, built around an EL84, and a 9 x 5in. high-flux loudspeaker. This gives 4W output, and allows the extra facility of a tone control, incorporates a speaker muting switch and has extension loudspeaker matching for 3 or 15 ohm units.

The deck is a truly British piece of engineering. Before the cynics descend on me, let me say that this is not intended as a sneer. Despite the remarks made by the late lamented John Berridge in his last article

from America (see *Hi-Fi News*, Nov. 64), I am convinced that the virtue of British design is its rugged and maybe uncompromising solidity. JB asserted that we were losing exports because British manufacturers would not angle their design more toward the buying country's standards. While this may be true of some equipment in the 'popular' category and is certainly a point which more production teams should note when drawing up specifications for such things as outlet sockets, and mains plugs, I do not believe it to be true of the kind of equipment into which the '80' may be classed. Our friends abroad are looking for the 'British' label—*Rolls* quality, if you like.

TAPE RECORDER SERVICE

No. 37 TRUVOX SERIES 80

BY H. W. HELLYER

After which digression, those who have not seen a Truvox deck may imagine something steely and functional. Of course, the opposite is true. The deck is very tasteful in design and appearance, and the only doubtful point about it, the heavy action of the push-buttons, has been overcome in the later '90' series with finger-touch keys.

The deck is built on a heavy die-cast plate and uses three motors. Where previous decks (the *Mark VI* may be familiar to many readers) employed similar BTH motors, the 80 has a *Papst*, external rotor, hysteresis motor for the capstan drive, and separate induction motors for the spool drive. Each speed position has its own pulley, and these are completely disengaged when the machine is switched to the OFF position. A heavy, balanced flywheel is used. Wow and flutter is better than 0.15% at $7\frac{1}{2}$ i/s and better than 0.2% at $3\frac{3}{4}$ i/s.

HEAD SPECIFICATIONS

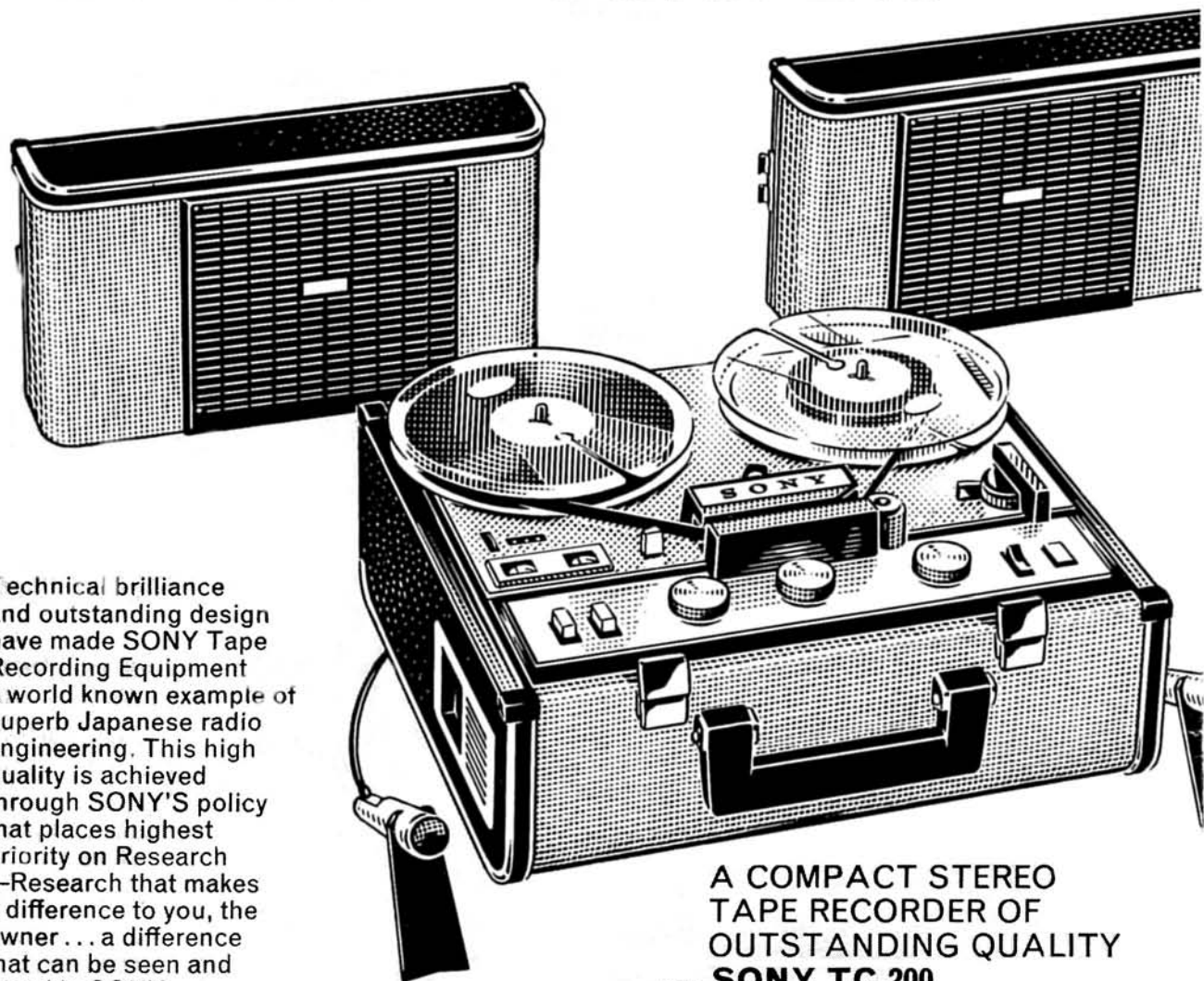
Head details are as follows: Record/Playback head inductance is 1.25mH ($\frac{1}{2}$ -track) and 850mH on either section ($\frac{1}{4}$ -track). Impedances are 7.8K ($\frac{1}{2}$ -track) and 5.5K ($\frac{1}{4}$ -track). Resistances: 1.1K ($\frac{1}{2}$ -track) and 1.1K ($\frac{1}{4}$ -track). Erase head inductance is 1.4mH ($\frac{1}{2}$ -track) and 80 μ H ($\frac{1}{4}$ -track).

Record signal current is 70 μ A for the $\frac{1}{2}$ -track head and 50 μ A for the $\frac{1}{4}$ -track head, and the required bias voltages for these are 120V and 75V respectively. Bias and erase frequency is 55 Kc/s and erase voltage is 45V ($\frac{1}{2}$ -track) and 12V ($\frac{1}{4}$ -track). The gap length is 0.00014in., and the crosstalk figure stated for the two-gapped head is better than 55dB.

Azimuth adjustment is quite simple, with three-screw fixing employed, spring-tensioned. The top edge of the record play head facing

(continued on page 493)

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CONTINUED

Push-pull bias oscillator circuitry

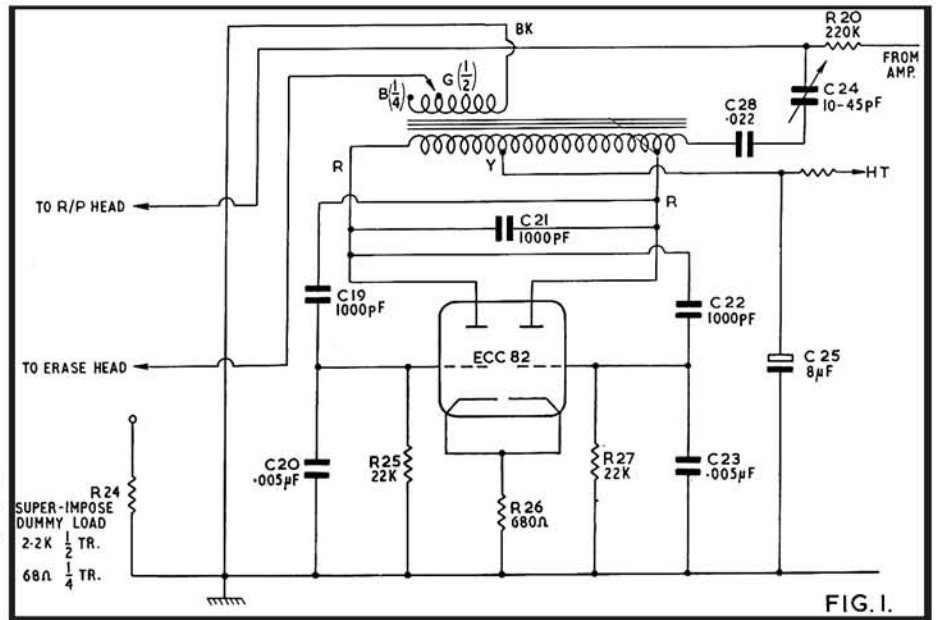


FIG. 1.

must be 0.01in. from the top of the tape. The top edge of the erase head should be level with or very slightly above the top edge of the tape.

Details of the principal deck adjustments for this series were given in my article (No. 14) of February 1963, with a few notes appertaining to common faults and their cures. This article fills in the gaps rather than repeats this information. The special reason for preparing these notes is to answer a number of queries that have arisen, some of which certainly reveal that neither the original article nor the manufacturer's comments on Alec Tutchings's review of July 1963, have been read.

Taking last things first: our reviewer noted a 50 c/s hum recorded on the tape after erasure, and also commented on the higher than usual

howled down, is that there should be an easier method of bias adjustment to allow for differences in tapes, and also for recording at different speeds.

Anyone who wants to pursue the subject still further can do so after studying the circuit of fig. 1, which is the push-pull oscillator circuit of the PD80 amplifier. Note that little chap C24, which is a 10-45 pF compression trimmer. Failure in this component can upset your bias. Note also that there is a tapped secondary, with alternative connections for 1/2- and 1/4-track working, a similar transformer being used in both types. The blue wire is used for 1/4-track heads and the green wire for 1/2-track heads.

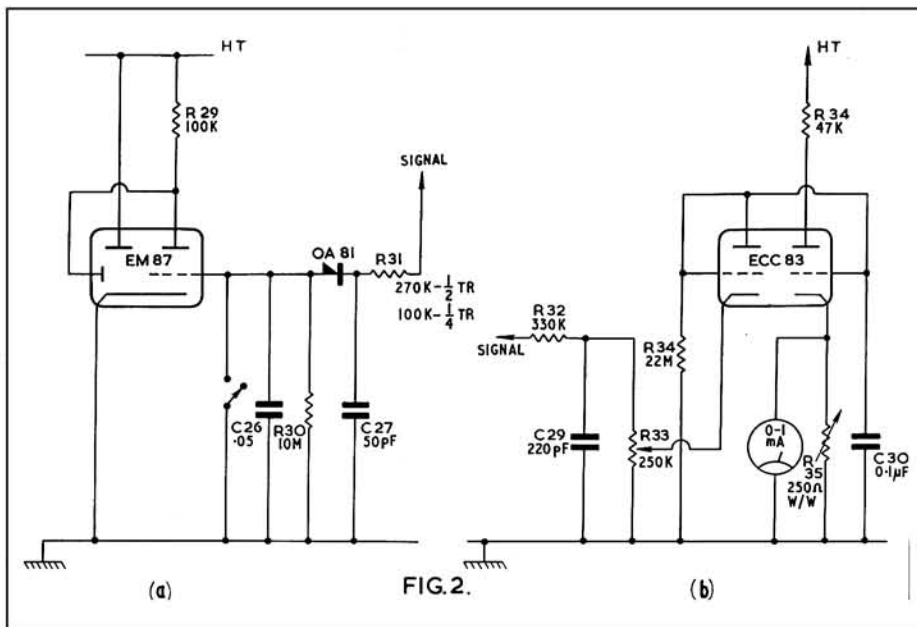


FIG. 2.

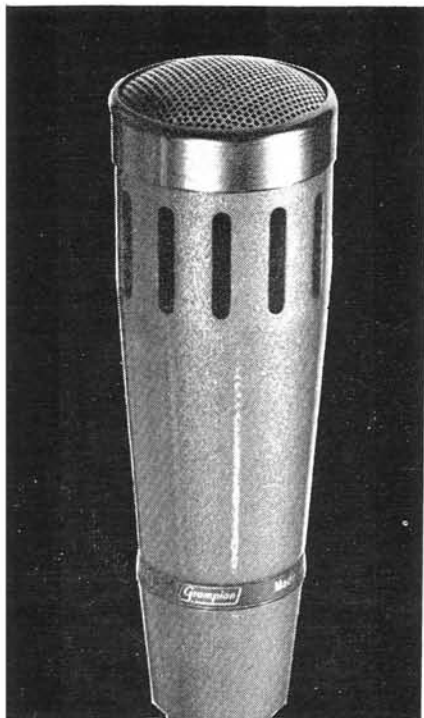
Side-by-side circuits for magic eye (a) and vu-meter (b)

hiss level. The makers came back smartly with the answer that in all probability the mains transformer had moved, causing hum induction. On later models an improved transformer mounting is fitted. The second point, they suggested, may have been caused by a change in characteristics of the oscillator valve.

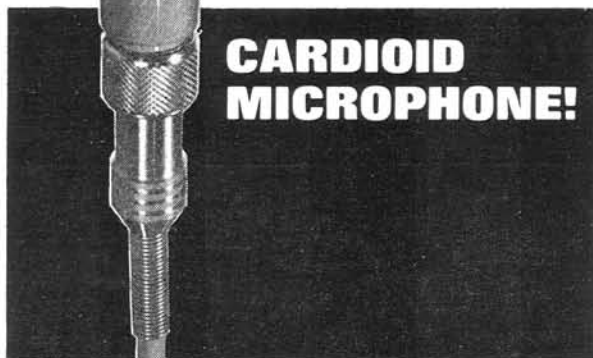
This has not satisfied some readers, who say, in effect, "What is the use of having a push-pull oscillator if such a small change in characteristics can give a 4 to 6dB increase in hiss level?" I do not propose to be drawn into this argument, but would refer readers to the excellent series of articles by K. R. Wicks on *Bias in Tape Recording*, which commenced in April 1964. One thing I will state, at the risk of being

Something of a bonus is the circuit given in fig. 2. As stated above, the machines designed for use by the Education Authorities have a VU-meter instead of the EM87 magic eye. An ECC83 is used as signal amplifier and detector, and the meter is a 0-1mA type. Many readers have asked what alterations would be needed to their machines to substitute a meter for the less accurate magic eye. Here is a direct comparison which may prove a useful guide—and may save us a few stamps! Fig. 2a is the conventional magic eye circuit, with the signal applied via R31 (270K in 1/2-track models, 100K in 1/4-track), and rectified by the OA81 for application to the control grid of the EM87.

(continued overleaf)



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Fig. 2b shows what is basically the same circuit, with the first half of the ECC83 strapped as a diode and used to rectify the signal, whose level is controlled by a 250K potentiometer. The resultant DC is fed to the second half of the ECC83 and the amplified anode current is measured by the meter.

The measurement is taken across the cathode resistor of this triode, which is a 250-ohms, wire-wound potentiometer connected as a variable resistor. Adjustment of this resistor regulates the standing anode current of the valve (normally 1.2mA) and shunts the meter. Correct setting is for zero reading with no signal input. R33 is then adjusted to give the required peak indication. A wide range of control is thus possible.

MAGIC EYE SENSITIVITY

For full closure of the magic eye, or an indication to figure 7 on the meter (calibrated 0 - 10), an input of 1.5mV into input 1, and 150mV into input 2 is correct. Input 1 accepts 1mV into 2 Meg. for normal modulation level, and input 2, 150mV into 500K. The inputs quoted above for full modulation should also give a 3V reading with valve-voltmeter across pins 2 and 3 of the output socket. For the same input, a reading of between 50 and 70 μ A record current should be obtained. This is measured across a 100-ohm resistor in the earthy lead of the record playback head. Input is a 1 Kc/s signal. For the recording sensitivity check, the oscillator valve should be removed.

Although this may seem a topsy-turvy way of pursuing a subject, the reason is simply that dismantling information, requested by some people who were nervous about inadvertently doing damage, had to be added at the end of the main details, if space was left. To paraphrase the lorry-driver's sign: 'If you can read this, the Editor has not been too close!' (*We have kept our distance.*—Ed.)

After moving the lead and ensuring that the rear pocket is empty, invert the machine, preferably on a cloth, not on the polished table. Remove the handle and the two screws on the sides. Lift the case clear of the mechanism. Then resume the correct position by holding the firm sides of the deck-plate. To refit the case, invert the mechanism, and tilt the case over it to an approximate position, and turn the whole works the right way up. This needs a little care, but is much easier than fiddling for screw-holes. Next, get the chassis as far forward as possible, refit the handle, then the side screws (shorter one to the left), tighten screws in turn, to make sure the chassis is not pulled to one side.

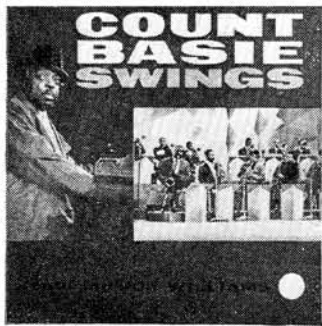
SEPARATED BY UNSOLDERING

The deck is separated by unsoldering the four connections on the tag panel at the left, unsoldering the erase head cable from the circuit, and disconnecting the record lead, which may be soldered or fitted with a coaxial plug. The spindle couplings should be loosened, the four corner screws removed, and the deck can be lifted clear.

If the flywheel or capstan spindle has to be withdrawn, a grub-screw near the lower shaft of the flywheel has to be loosened. Then, if the flywheel is supported with one hand, the spindle can be withdrawn with the other. Again, some care is needed to reduce the risk of damage to bearing surfaces. The lower end of the spindle seats on a steel ball which rests on a thrust pad. This pad, in its housing, must be free. Lubrication should be sparing, and the recommended lubricant, after washing the bearing clean with white spirit, is *Shell Tellus II*.

One final note: when reassembling, check the action of the PAUSE control. A tongue which engages a pin on a lever and operates the microswitch is limited in its travel by the top cover. Correct setting is for the nylon screw of the microswitch actuator to push to close just as the pinch wheel leaves the capstan by the initial action of this lever. The tongue may have to be bent slightly if difficulty is encountered.

tape reviews



COUNT BASIE SWINGS.
Featuring Joe Williams.

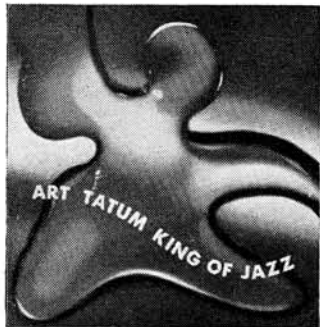
World Record Club
TT331. 3½ i/s mono. 29s.

THIS is really a showcase for Joe Williams, with lots of solid swinging backing from the Basie band. Joe Williams joined Basie about ten years ago, and the recording is from that period.

In addition to being an outstanding blues singer Joe Williams is equally successful with ballads. Track One is given over to four blues, including that great record success *Every Day I have the Blues*. My own favourites are *The Comeback* and a very fine version of Leroy Carr's *In the Evening* which features Frank Wess on flute backing the vocal. The ballads which take up most of the other track may not appeal to all who would enjoy the blues; my own choice of the best of these is Joe Williams's own sophisticated composition *My Baby Upsets Me*.

The magnificent Basie band is superb throughout, as we have come to expect. This band, which has been on the jazz scene for nearly thirty years with only Ellington to rival its excellence, provides perfect backing for every number. More tribute should be paid to the men responsible for the arrangements used by Basie, men like Ernie Wilkins and Frank Foster who deserve recognition every bit as much as the rest of the musicians. The continued popularity of this band is surely due to a very large extent to the outstanding work of the arrangers, plus the fact, of course, that despite changes over the years it remains firmly rooted in the Blues. The quality of the recording is first class.

T.F.



ART TATUM KING OF JAZZ
and **ART TATUM ALONE.**

World Record Club TT279
and **TTP 226** respectively. 3½ i/s
mono. Both 29s.

THESE recordings of the near blind pianist Art Tatum were made at a private party in California in 1956, shortly before he died. Burnett James, writing in the notes that accompany *Art Tatum King of Jazz*, states a truism that jazz players are often at their best and most inventive in informal settings; but whoever else this may be applied to, it is certainly not, in my opinion, true of Tatum. For me Tatum was at his best when subjected to the discipline of playing with a small group.

Few, if any, jazz pianists have equalled the technical abilities of Tatum, and the same can be said about his extraordinary harmonic sense. But it was these very achievements that were so often responsible for Tatum's undoing as a jazz pianist, especially when playing solo. Dozens of jazz piano players with very much less technique have left behind them a much greater volume of great recorded jazz. Too much technique carried a good deal of Tatum's solo work over the border that demarks jazz from the music of the cocktail lounge.

If, however, you reject these heresies and remain a Tatum fan you will probably wish to have at least one of these tapes. *Art Tatum King of Jazz* is the better of the two; although both recordings are made up almost entirely of good jazz numbers, *TT279* has several really fine pieces of delicate tasteful jazz piano, above all *Jitterbug Waltz* and *Mr. Freddie Blues*.

The recording quality is good, if you make allowances for the odd party voice that occasionally breaks in, just not loud enough to catch what is being said. T.F.

ANTON BRUCKNER. Symphony No. 4 in E flat major. "Romantic" (1889). Vienna Symphony Orchestra conducted by Franz Konwitschny. **World Record Club TCM52**, 3½ i/s mono twin-track. 29s.

IT is interesting to note that Bruckner did not turn to music as a career until he was a mature person (he was over forty years of age when his first symphony was performed), and this, I feel is worth bearing in mind when listening to his music. His symphonic works are very often based on very simple ideas, extended compositions though they are, but are never naive. He was a teacher of composition at the Vienna Conservatory for a number of years and among his pupils was Mahler. Mahler, of course, became a composer of great originality, but in listening to Bruckner's symphonies certain sequences of modulation used by Mahler reveal their source.

This lengthy fourth symphony of Bruckner's is called "romantic", though it could better be described as "pastoral" if its title were to give an idea of the character of the music. The themes used in all the four movements are simple and are developed and orchestrated in such a way as to evoke an atmosphere of woods and glades and peaceful countryside. Even when, as in the last movement, a theme is developed into something of a climax, the music reverts to its more serene mood very quickly afterwards. In the third movement hunting calls are played on the horns during the presentation of the main theme, but these are soon followed by peaceful, pastoral pipings from the woodwind.

The performance given on this tape record is, I feel, well suited to the work. No great depths are plumbed and no great heights are scaled, for this is a serene performance of serene music. Conductor and orchestra work their way steadily through the symphony without fuss, effectively presenting each section when its turn arrives, and producing a satisfying overall effect of rest and calm.

The recorded sound is not always perfectly clean, particularly in passages where the brass instruments are playing. This, coupled with the rather reverberant presence, spoils the clarity of some of the more heavily scored passages. The dynamic range of the recording is not wide, but users of smaller machines would possibly find it adequate. G.G.

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be nominal. Nevertheless, it does show how easy it is to infringe somebody's copyright.

Tiresome as this may be, there is a purpose behind it. And that is to see that the composers actually receive the royalties to which they are entitled. As a result, although in the past a composer's main income consisted of royalties on the sale of sheet music, now his principal source of livelihood is recording fees and royalties and the performing right royalty charges—payable by anyone wishing to record or perform the work in public or to broadcast it. Most people are likely to agree that it is only fair that such a system should operate, and, one hopes, will abide by the Copyright Act and not try to defraud others of their due income.

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book reviews

TAPE RECORDING AND REPRODUCTION. By A. A. McWilliams.
287 pages and 180 illustrations. Price 42/-. Published by Focal Press
Ltd., 31 Fitzroy Square, London, W.1.

THIS book is one of a series of six, called *The Technique of Sound Reproduction*, which is intended "to form a single authoritative work" on the subject. According to the author's preface, this volume is aimed at hi-fi enthusiasts with "some knowledge of the fundamental principles of electricity, including valves, transistors and amplifiers". The technical level of the text is in fact very variable, but in general is rather more suited to the technical student readership envisaged by the series editor. Most of it has obviously been written with professional techniques and equipment in mind.

By either standard the book has misfired. About half of it (Chapters 3, 4, 6, 7, 10, 12 and 13) is good and sometimes excellent. The remainder has serious faults, the most noticeable being its uncertain intentions noted above. The technical level varies from the naively obvious, i.e. "The provision of fast spooling facilities enables a rapid search to be made for a particular part of a recorded programme. This search can be expedited if some indication is given of the extract's exact position on the tape. Most recorders include this facility . . ." (p. 37), to detailed analyses of various equaliser networks (pp. 152-157). Where the author is writing for the inexperienced, his advice is often a professional approach simply explained—apart from the language—rather than something which the amateur can practicably apply. For instance (p. 217) on *Testing the Recording Chain*: "It is therefore desirable to . . . select a few reels which are matched with regard to sensitivity, bias requirements and peak recording level".

Secondly, there are too many inaccuracies and doubtful, confusing, misleading and even contradictory statements. On p. 185 the author says, in effect, that a constant-current feed to a recording head requires a source resistance of some ten times the head impedance at the highest interesting audio frequency. In fact the source of resistance need be only twice the highest head impedance to limit the drop in head current at that frequency to about 2dB. On p. 195 he says magic-eyes should be connected before any recording equaliser; in fact they must follow the equaliser if one is not to risk overloading the tape at high frequencies. And on p. 19 we find: "Whatever (sound reproduction) system is used it must not alter the sound in any way. By this is meant, the sound issuing from the loudspeaker must be the same in form, if not in level, as that which actuates the microphone". My italics of course.

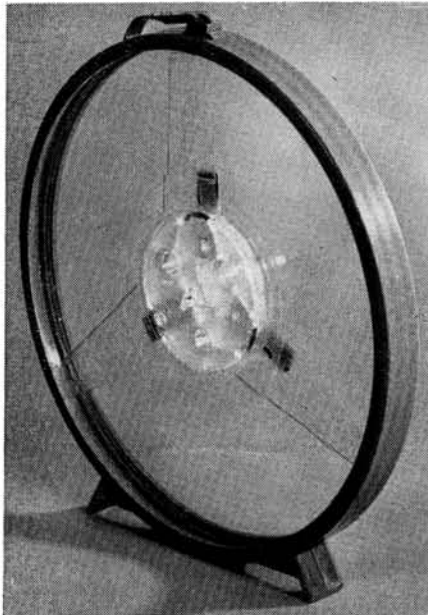
TRANSISTORS ARE SHUNNED

Thirdly, there is little evidence apart from the date at the front to suggest that the book was published in 1964; all but a few passages could equally well come from a book ten years old. Transistors, for example, are mentioned perhaps half-a-dozen times (usually followed by the word "portable") with no attempt to describe any typical circuitry, nor even to examine the problems of using them with heads. Multi-gap erase heads are ignored. Even in the chapter on *Equalisers*—one of the best explanations I have seen—there is no mention of how judicious pre-emphasis can reduce background noise appreciably and no hint that the Standards Committee have been discussing this (not to mention some recorder manufacturers using the technique) for four or five years now.

Lastly the text is unbalanced. Many topics (e.g. motors, magnetic theory, and recording without bias) are given far more space than their importance to the reader warrants, while others (e.g., playback amplifiers, background noise and power supplies) are very sparsely treated.

In short, this book fulfils neither the author's intention nor the aims of the series editor. About half the book is worth reading, but this is not enough to make it a good buy for anyone unless he is clear-headed and knowledgeable enough to detect the flaws in the rest.—G.C.B.

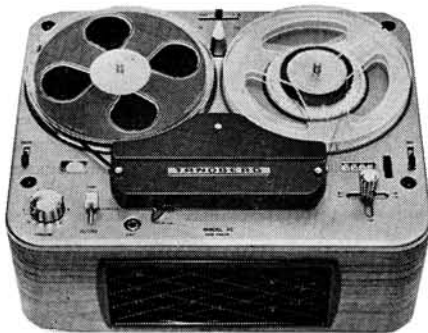
**SCOTCH
SELF-THREADING
SPOOL**



AUTOMATION entered a new field recently, with the introduction by 3M of a self-threading spool. Available only with 7in. reels of Scotch 150-18 tape, price £2 12s. 6d., the new spool has solid flanges and a free-standing "snap-closure collar". No hooks or catches are used to thread the tape which is merely laid between the flanges or close to the hub. When the recorder is switched to PLAY the tape winds on to and later unwinds from the spool of its own accord. **Manufacturer:** Minnesota Mining & Manufacturing Co. Ltd., 3M House, Wigmore Street, London, W.1.

Q.P. PRICES

KODAK quadruple-play tape, first announced in the October issue is now available on 4in. spools. Prices for the P.400 brand are as follows: 600ft. on 3in. spool, £1 13s. 6d.; 800ft. on 3½in. spool, £2 2s.; 1,200ft. on 4in. spool, £2 18s. 6d. **Manufacturer:** Kodak Ltd., Kodak House, Kingsway, London, W.C.2.



**TWO NEW
TANBERGS**

LAATEST additions to the Tandberg range are the Series 8 and Model 90. Both models are monophonic and similar in style to the popular Series 6 and 7.

Series 8 machines operate at 3½ and 1½ i/s and are available with ½- or ¼-track heads and a choice of cabinet. Stereo playback is possible with the ¼-track version, using an equalised external pre-amplifier. Frequency response is 40 c/s to 10 Kc/s ±2dB at the faster speed and 40 c/s to 5.5 Kc/s ± 2dB at the slower. Respective wow and flutter

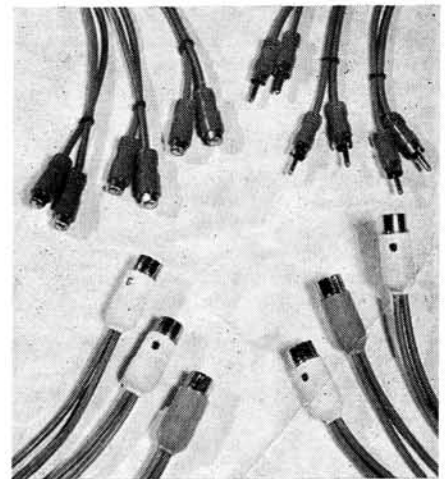
figures are 0.2% RMS and 0.3% RMS. Fast-wind transports 1,200ft. of tape in three minutes. A bass switch gives 12dB rise at 70 c/s on playback. Noise level on both ½- and ¼-track models is 50dB below maximum recording level. Output power is 3W to an internal 7 x 4in. speaker. Remote control of recording, playback and fast-wind is possible on the Model 8F which uses solenoid switching.

A similar specification is applied to the Model 90 which features the extra speed of 7½ i/s at 0.15% wow. Frequency response at this speed is from 40 c/s to 16 Kc/s ± 2dB. Both models incorporate an EAM86 magic eye with a dynamic range of 20dB plus overload. Prices are as follows: Model 823 (½-track in teak cabinet) £52 10s.; Model 843 (¼-track version) £56 14s.; Model 822 (½-track in portable cabinet with lid) £56 14s. Model 842 (¼-track version) £59 17s. The Model 92 costs £72 9s., optional carrying case £7 1s. 8d. **Distributor:** Elstone Electronics Ltd., Edward Street, Templar Street, Leeds 2.

MASTERTAPE SPLICING KIT

FIVE reels of coloured leader, tape splicer and cutter, metallic stop-foil and jointing tapes are included in the new MSS splicing kit. Full details on using the splicer are printed inside the lid. Selling at 21s., the kit is attractively packed in an eye-catching box. **Manufacturer:** MSS Recording Co. Ltd., Poyle Trading Estate, Colnbrook, Slough, Bucks.

**STEREO
CONNECTING
LEADS**



TAPE Recorder Maintenance, suppliers of spares and service for many brands of tape recorders, recently added a series of stereo leads to their range of interconnection accessories. Use of the five adapter leads and two-way 'Y' adapters bring the maximum possible combinations to many thousands from a total of thirty-three leads. Prices are as follows: twenty-two mono leads—£6 16s. 6d. Five adapter leads—£2. 0s. 6d. Six stereo leads—£2 17s. 'Y' adapters—6s. 9d. All are individually packed and available separately. **Manufacturers:** Tape Recorder Maintenance Ltd., 323 Kennington Road, London, S.E.11.

ENDLESS TAPE CASSETTE

USING special lubricated tape, an endless tape cassette is now available on the amateur market. The unit has several uses, being capable of continuous running for an indefinite period without attention. Several versions are available, with different playing times, between three minutes and one hour, and for left-to-right and right-to-left tape transport systems. Prices vary between £3 7s. 6d. and £7 15s., depending on length of tape. By joining the tape (which is coated on both sides) into a *mobius loop* double recording time is obtainable. **Manufacturer:** D.T.V. Group, Beulah Electronics Ltd., 126 Hamilton Road, West Norwood, London, S.E.27.

the heart of a very good, very reliable tape recorder
THORN Mk.II TAPE DECK



Only the Thorn Mk.II tape deck gives you all these many extra features!

The Thorn Mark II tape deck is an all-British built and designed piece of equipment *incorporating more exclusive recording features than are to be found in any other similarly priced tape deck.*

✓ Piano key controls	✓ Pause control	✓ Reel diameter 5 $\frac{3}{4}$ "
✓ Tape 'inching' facilities	✓ Track selector push buttons	✓ Audio output power: 3 watts
✓ Fast spooling in both directions	✓ 'Playthrough'/superimpose button	✓ Remote control button microphone
✓ Four track, two speeds:— 3 $\frac{3}{8}$ " per sec; 1 $\frac{7}{8}$ " per sec	✓ Press-button reset for tape position indicator	✓ Automatic stop operates at both ends of tape
✓ Electron beam recording interlocked with tape motion keys	✓ Microphone input (on deck cover), radio input, pickup input. Output to radio, amplifier or external loudspeaker (internal loudspeaker automatically muted)	

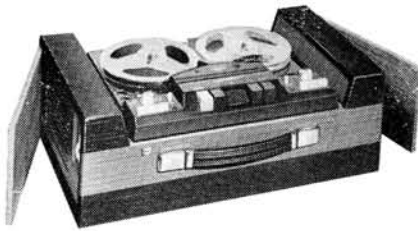
Thorn Mark II tape deck now incorporated in all tape recorders under the brand names

FERGUSON "HIS MASTER'S VOICE" Marconiphone ULTRA



THORN ELECTRICAL INDUSTRIES LIMITED, THORN HOUSE UPPER SAINT MARTIN'S LANE, LONDON, W.C.2

equipment reviews



SIEMENS
STEREO
TAPE
RECORDER

Manufacturer's Specification: $\frac{1}{2}$ -track transistorised stereo tape recorder. **Power Consumption:** 50W. **Mains Supply:** 110-240V at 50 c/s, or 110V at 60 c/s (AC only) by request. **Speeds:** $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ i/s. **Frequency Response:** 50 c/s—18 Kc/s, 50 c/s—10 Kc/s and 50 c/s—6 Kc/s respectively, ± 2 dB on playback, ± 3 dB record and playback. **Tape Heads:** Three—erase, record and playback. **Signal-to-noise ratio:** 55dB weighted. **Wow and Flutter:** 0.13% at $7\frac{1}{2}$, 0.16% at $3\frac{3}{4}$ and 0.2% RMS at $1\frac{7}{8}$ i/s. **Tone Controls:** Separate bass and treble push-buttons. **Spool Capacity:** 7in. **Distortion:** Pre-amplifiers at full drive: 0.5%; Power amplifiers at $2\frac{1}{2}$ W per channel: 1.5%. **Other facilities:** Inter-track recording and parallel playback. **Weight:** 26lb. **Price:** £91 7s. **Distributor:** Denham & Morley Ltd., 173-175 Cleveland Street, London, W.1.

GOOD domestic recorders come in either large layouts (such as Brenell, or Ferrograph) or smaller neat and natty styles (e.g. Bang & Olufson and Tandberg), yet often evolve around the same 7in. spool size. The transistorised Siemens Stereo 14 is in the latter class being only fractions over 15 x 12 x 6in. in its teak case, while the chassis cut-out goes as small as $14\frac{1}{4}$ x $11\frac{1}{4}$ in. Model 10, the portable version with one front loudspeaker, is two inches broader, and the Model 12 (which is illustrated above) is $21\frac{1}{4}$ in. long; but all qualify as pint-pots into which a generous quart has been neatly fitted without cramming. The use of a $9\frac{3}{4}$ x $2\frac{3}{4}$ in. elliptical speaker in the front of the teak-case version now reviewed helps to keep down the overall height.

The deck relies for all its functions on a single central motor, outer-rotating-cage type and running continuously; it rim-drives the capstan flywheel via a rubber inter-wheel engaging three alternative stepped diameters on the motor-pulley. Flat pressure-spots are prevented as the STOP button disengages all. This, however, means a stationary capstan until the START tab is pressed, and a run-up wow of almost a second. The pause-button can be used for sharp starts, but in this case the tape-speed is 1% high initially, settling to true after, again, one second—just noticeable to those with sharp ears. The pause-button—marked STOP—also gives a wow if not smartly operated, but its action is duplicated by a solenoid worked by a remote control on the microphone (separate if desired), and with this a rapid start is much safer.

Once running, fluctuations in tape-speed (total wow and flutter) were 0.11%, 0.125% and 0.17% RMS, at $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ i/s (well within the maker's specification), using a tape having less than 0.02% deviations of its own. But tapes recorded on the Siemens registered 0.15%, 0.2% and 0.26%, mostly flutter at inter-wheel rhythm. In listening terms, these variations would not be noticed except at $1\frac{7}{8}$ i/s on a good pre-recorded tape of pianoforte, but are respectively detectable, noticeable, and then quite obtrusive if the piano is recorded at home, at each speed in turn.

As the response-curves show, replay performance is generally good, and overall record and replay a little less so; the fall-off in bass was easily explained when a signal-generator was matched into the replay-input in place of the heads, as the correct bass rise is preserved down to 60 c/s only. Not a lot is lost by this unless one is particularly keen on Organ pedals (and has the speakers to cope!).

Treble equalisation depends somewhat on peaks around 14 Kc/s, 10 Kc/s and 6 Kc/s at the respective speeds, but by the use of separate record and playback heads with optimum gaps the treble response is well maintained. The $7\frac{1}{2}$ i/s claim of up to 18 Kc/s is a little ambitious, especially as spurious beat-frequencies with the bias become noticeable above 10 Kc/s, and in any case there is little above 15 Kc/s in any likely programme-sources to date.

It is essential when wishing to record full treble to check that the

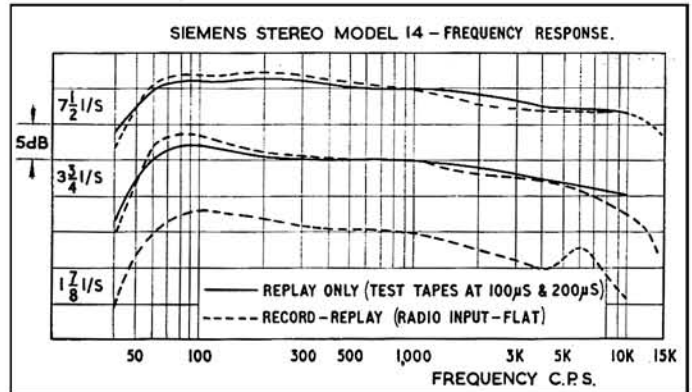
treble button is not left pressed down, as this, surprisingly, is in circuit on record as well as replay; the bass button, however, acts on replay only. These tone-circuits have been well chosen to give a comfortable degree of bass-cut, treble-cut or both on replay, and when in use give -10dB at 100 c/s and -9dB at 10 Kc/s. In common with all the push-buttons (except the tape-handling tabs) these are second-touch cancellers; the others are: DUO for coupling left and right signals if combined mono is wanted; INT and EXT, switching the loudspeaker arrangements; and MICROPHONE and RADIO/PU to select inputs—both may be pressed together to mix speech with incoming music, but as there is only one volume-control, the RADIO/PU levels must be varied at their source.

The five tape-handling tabs are: FAST FORWARD and REWIND, to right and left of a central wide stop-tab, and the outer pair are START (far right) and RECORD INTERLOCK to the left of the row; this alone is coloured red, and the remainder green. The spool controls are not latched by the start, so immediate fast-forward, rewind and reversals are in order without going through the STOP position. Either spool-tab does, however, lock the START button, so the tape cannot accidentally be engaged to play without first being brought to rest. Tabs are distinctly noisy in use, and must be well pressed home to lock their functions correctly.

A good feature is the ability to engage the RECORD latch for level setting before starting the tape, but to record it must be held down while the START tab is pressed, otherwise it is released upwards as a precaution against accidental erasure. Unfortunately, on the machine reviewed the tape had a slow forward creep once the RECORD latch was down; this meant a restraining finger on the left spool until the actual start, or some inches of chipmunk noises ahead of the recording proper!

There is an insulated guide-post at the tape-slot exit giving auto-stop, if a metal foil passes, by closing a relay to cut off the motor-supply; the STOP-tab should be used reasonably soon to free the rubber wheels and relay, and this re-starts the motor.

The two edge-reading VU-meters beside the tape-slot are fast-acting on programme peaks, and also spring up for good measure on the start! Plus One in the red sector is the onset of record-distortion on an oscilloscope. The meters continue to operate on playback—useful for

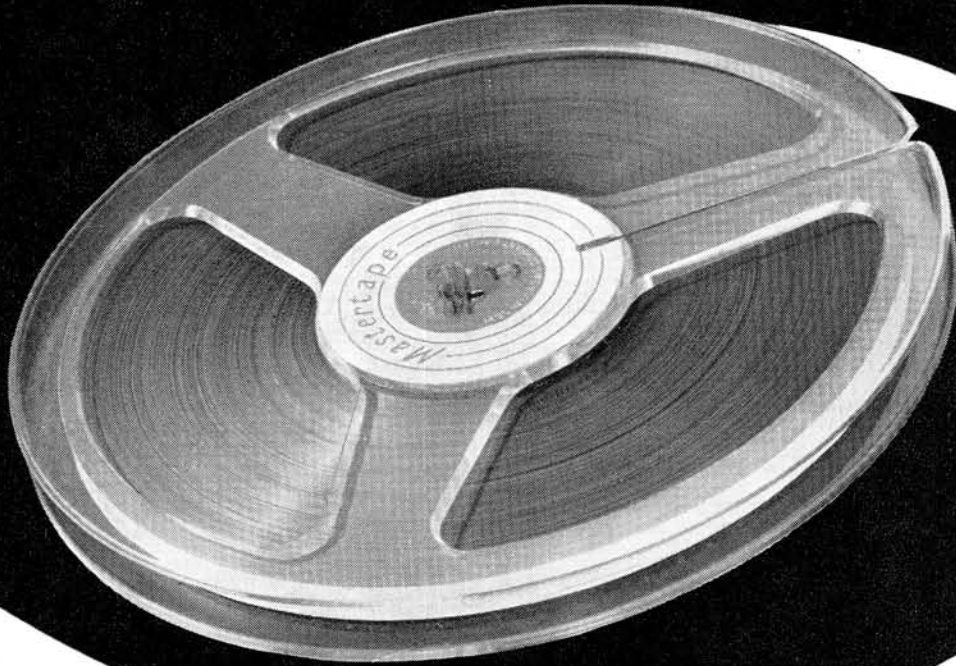


comparing the recorded level on 'foreign' tapes. Another handy feature is their illumination from behind; only one is lit on mono, left or right corresponding to track selected, while both dials light for stereo.

The amplifiers come on with operation of any tape-tab, and are switched off again by the STOP control. There is no warm-up delay but a 'come-up' time of just under a second from start, while voltages settle, helps to mask the capstan run-up on replay; the amplifiers come on with the red tab on RECORD. They are wired on horizontally mounted printed-circuit boards and all their connections 'make' by rows of spring finger-clips; if one amplifier fails, the faulty circuit-board is released and slid out sideways, the spring-clips all making to the new board as it is slid in place, with no soldering. The power-transistors are mounted vertically in the rear-plate, giving a good heat-

(continued on page 505)

*** Elizabethan, Fidelity, Wyndor and other famous makers fit MASTERTAPE!**



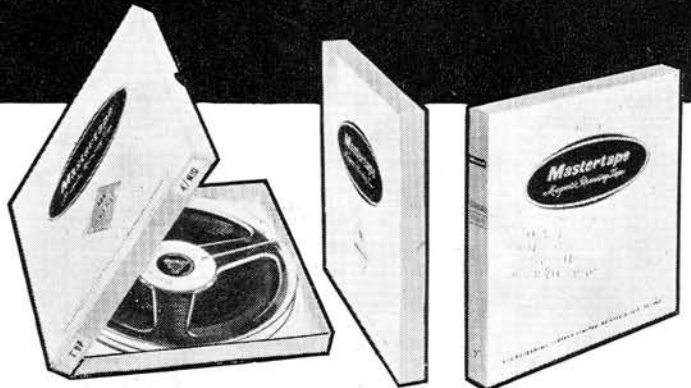
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... there is a Mastertape to suit your requirements. Just compare these prices for the most popular sizes: 5½" 900 ft. Standard Play (P.V.C.) 20/-; 5½" 1200 ft. Long Play (P.V.C.) 25/-; 7" 2400 ft. Double Play (Polyester) 55/- and our 10 minute Mini-Voice Letter at 2/8d. — the best quality and value in high grade recording tape!

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Tel: Colnbrook 2431 (8 lines)



sink, and the 2½W per channel, though not, perhaps, enough to give the 'hi-fi' volume-levels that some expect (perhaps unfairly) from internal amplifiers, proved quite adequate for domestic listening.

Two fuses protect the instrument—one is neatly embodied in the rotary mains-selector at the rear, but the other is mounted inside the back of the 'works'. Failure of this, however, would indicate a radical runaway or similar fault, curing of which would mean removing the chassis anyhow. The cabinet-bottom, which has a generous ventilation plate below the motor, is not removable: 'service-bottoms' are not without their risks in the wrong hands.

There seems to be no arrangement to take full advantage of the three-head system, namely, monitoring off tape and comparison with input signals. There is, however, a comprehensive 'sound-on-sound' arrangement embodied in the rotary track-selector switch, with a headphone monitoring socket, though the claim in the specification that this enables "an unlimited number of superimposed recordings to be built up" is definitely precluded by noise build-up. The signal-to-noise ratio is claimed as 55dB weighted; measurement showed hum and noise 47dB below the +1 level recorded above; -46dB with motor stopped—figures unweighted. It depends what you mean by weighting: the hum, for example, was more audible as harmonics with motor running, in spite of the extra 1dB on the ratio and the close-fitting mu-metal shield around the replay pressure-pad. The record-head has a pad also, unshielded, while wrap-around pins hold the tape to the erase-head.

RECORDING NOISE

Noise put on the tape during recording was measured by a symmetry-tape method as 5dB above the inert-tape figure, and was unchanged by de-gaussing the heads; this is as good as any domestic recorder so far measured, and the slight hiss it represents, with complete absence of 'bumping', on bulk-erased tape, is swamped by other inevitable sources of hiss.

Owing to the constant angular-velocity drive of a single motor, spooling was rather slow: the fast forward trip of a 7in. 1,200-ft. tape took 2 min. 25 sec. and made a few ridges, but the return trip was ten seconds less and smoothly wrapped—tight spooling in each case. A small felt drag-brake is drawn on to the feed-spool platform below-decks to provide some forward spooling tension, while the rewind relies on slight drag from the three-figure tape counter coupled to right-hand spool—this may account for the more even rewind. The instant-reset button on the counter may be used while the tape is playing, and even be held down for cueing, without protest. The counter is very consistent, producing an error of two final digits only, after four rewinds from various spots: Magnetophon practice allows up to six final digits out on this test.

The general impression was of neat reliability throughout, with very cool running, and the Siemens should prove a long-service machine, free from the risk of obsolescent standards.—B. R. J. Plumtree.

VALRADIO MODEL 12/80B CONVERTER

Manufacturer's Specification: DC to AC converter handling up to 80W. DC input: Min. 11V, nominal 12V, max. 13V. Output: 100/250V AC. Frequency: 50 c/s. Watts: min. 40W, max. 80W. Weight: 14lb. Dimensions: 13 x 5 x 4½in. Price: £14 14s. 6d. Manufactured by Valradio Ltd., Browells Lane, Feltham, Middlesex.

THIS is a little out of line with our normal tape recorder reviews, but nevertheless it is an accessory which will be called for whenever a mains operated tape recorder has to be used away from the mains supply.

The 12/80B is a vibrator type converter which will provide adequate power for most single motor tape recorders. There are certain precautions which have to be taken when powering a recorder from such a source and these will become clearer if we first consider the operation of the vibrator converter.

The actual vibrator operates rather like a buzzer or electric bell. When the battery is connected, a reed or armature is attracted by a

(continued on page 507)

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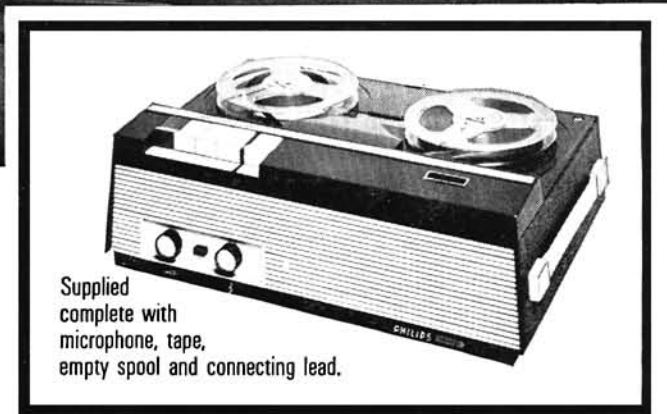
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solenoid or coil, but, as it moves, it breaks the battery circuit and springs back towards its original position. Once again the battery circuit is made and the cycle continues. The operating frequency is determined by the mass and compliance of the reed and is set to 50 c/s within small limits. The vibrating reed operates heavy-duty contacts which connect the battery alternately to the ends of a low voltage centre-tapped primary of the power transformer. The high voltage secondary is tapped to provide the required voltage for the load. See fig. 1.

Theoretically the output voltage should be a square-wave, but in practice resonances in the power transformer and filter circuits add a certain amount of 'ring', fig. 2A.

The DC input is even more peculiar (fig. 2B), as it also contains the excitation current of the vibrator (the narrow square-topped pulse).



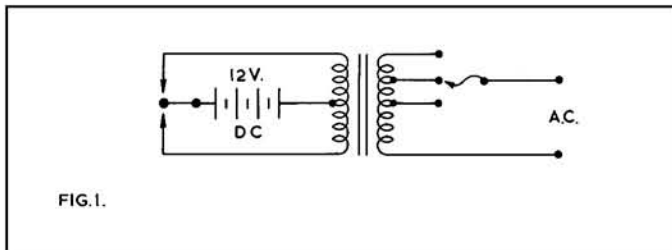
*Valradio
DC to AC
Converter.
Input : 12V DC.
Output : 250V AC
at 50 c/s.*

Because of these odd waveforms, ordinary RMS current or voltage readings are almost meaningless, and the only exact readings are those derived from CRT waveform observations which give the peak-to-peak figures of fig. 2.

The reason for all this pre-amble is to emphasise the harmonic content of the vibrator converter output. A pure 50 c/s mains supply contains one frequency only—50 c/s ; a perfect 1:1 50 c/s square-wave contains all odd harmonics in diminishing proportions from 50 c/s to infinity. The converter output contains frequencies up to the leakage-reactance/secondary-capacity resonant frequency, which will be several hundred cycles at least. The result of all this depends to a large extent on the shielding and screening of the tape recorder used with the converter.

A 'BUZZY' HUM

If a little hum from the motor windings is picked up by the sensitive magnetic head of the recorder, for example, it may be completely inaudible on the mains supply but very audible, as a 'buzzy' hum, on the converter. In the same way, electrostatic hum from one part of the circuit to another can be very annoying when the power supply waveform is impure.



To gain some practical experience on this problem, two different types of recorder were tried on the 12/80B : the first was the Cossor CR1604 which I reviewed in the March issue, and the other was an older, low-priced unit using a single-motor deck and open printed circuit construction using valve amplifiers. The Cossor was perfectly quiet on both play and record under all conditions, but the other

(continued on page 509)

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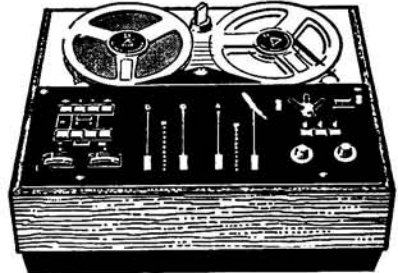
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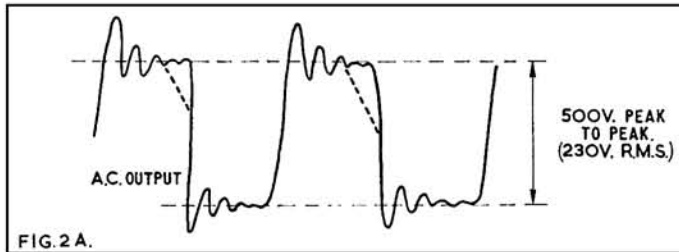
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VALRADIO CONVERTER REVIEW CONTINUED

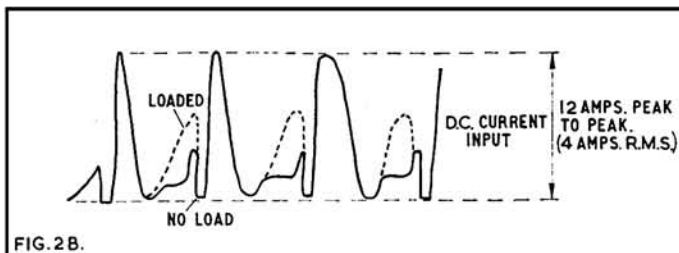
suffered from a continuous 'buzz' background on both record and play which could not be cured by external shielding or earthing of this machine.

It is impossible to generalize on this matter. Price is not a controlling factor—some expensive recorders buzz like a bee at the sight of a converter, and other cheap outfits are perfectly quiet on the same



supply. Nor is it a design fault in either the converter or any of the recorders—if they agree with each other all is well, if they do not there is very little you can do about it.

When testing, it is very important to minimise the acoustic noise of the converter which can be picked up on a sensitive microphone when it is hardly audible to the ear. When used with a car, the converter can often be placed in the boot, or inside the car, if the recorder is to



be used some distance away. The AC output can safely be extended any reasonable distance by using good quality mains cable, but any extension of the battery leads must be done in very heavy car type cable as peak currents of 20 amps or so are quite common.

Valradio also supply a range of transverters, using power transistors to replace the mechanical vibrator to give a much higher conversion efficiency, and some of these models can be fitted with a sinusoidal filter to reduce the harmonic content of the AC output to the same order as that of a normal mains supply, with only a slight loss of peak output. Such filtered transverters should cope with the most temperamental recorder.—A. Tutchings.

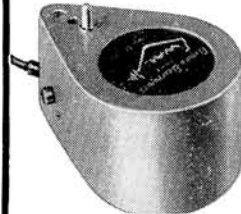
SATURDAY BEFORE CHRISTMAS CONTINUED

PEGGY: That's right.
 GERALD: You're being too stupid for words.
 PEGGY: The atmosphere is cold but dry. The tree will look very pretty. I shall put the presents on it — and the candles. And the tinsel. (scornfully) I'm not going to disappoint the children — even if you are!
 GERALD: (loftily) Don't be such a fool. All the presents will get stolen.
 PEGGY: This happens to be the season of goodwill. Give the underworld some credit. (turning away) Even criminals probably care more for Christmas than you do!
 (Peggy snatches up her parcels and exits, slamming door. Pause. She suddenly returns, bursting into the room.)
 PEGGY: (breathlessly) Gerald! Gerald!
 GERALD: (wearily) What's the matter now?
 PEGGY: The Christmas tree—someone has stolen it!
 GERALD: (incredulously) Stolen it? A thing of that size?
 PEGGY: There's nothing left except a great big hole.
 GERALD: (jumping up, furiously) [moving back] What damn cheek! Our Christmas tree? The swine! (snatching up 'phone) We must get the police right away . . . (dialling 999).



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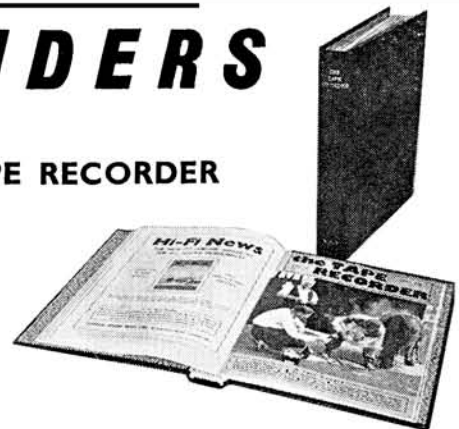


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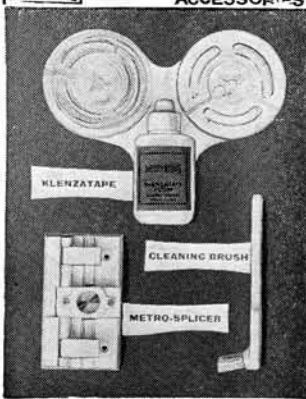
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READERS' PROBLEMS

Readers encountering trouble with their tape equipment are invited to write to the editorial office for advice, marking their envelopes "Readers' Problems—Tape". Replies will be sent by post and items of general interest may also be published in this column at a later date. This service does not, however, include requests for information about manufacturers' products when this is obviously obtainable from the makers themselves. Queries must be reasonably short and to the point, limited to one subject whenever possible. In no circumstances should such letters be confused with references to matters requiring attention from other departments at this address. We cannot undertake to answer readers' queries by telephone.

BIAS BEAT ON THE LIGHT

Dear Sir, I am experiencing a little difficulty with recordings made from the BBC AM Light Programme. My recorder seems to send out a signal (presumably from its bias oscillator) right on the frequency of the Light. This induces a high pitched tone in the wireless which shows up on the recording.

I understand that the introduction of a sub-carrier frequency filter may correct this. Would such a filter detract from the quality of the recording?

Yours faithfully, F.W., Newcastle.

The trouble you are experiencing is undoubtedly due to a beat note being set-up between the bias frequency of the tape recorder and the intermediate frequency of the receiver, which is about its eighth harmonic. Suppressing the bias frequency radiation is not really practical; it is surprising how easily this strong field escapes complete shielding, which becomes a major task. Far better to alter the 'spacing' between the frequencies so that the beat becomes inaudible. You can do this by slightly altering the bias oscillator frequency, either with the pre-tuned coil (you do not specify your machine) or with a change in component values. The actual frequency is not critical within the limits required. Suppression at the radio aerial input would be completely useless.

MAINS CONVERSION

Dear Sir, I am having a problem with my tape recorder and wonder if you could help me.

Our ship's power supplies are 110V DC, but unfortunately for a long period after charging the batteries the voltage is about 125V and takes some 8 hours to drop down to 110V.

The DC/AC converter for my tape recorder (a Telefunken 97) has been a Valradio converter, and lately a German KACO vibrator-converter. Neither will stand this variation in voltage.

I have tried putting a resistance on the DC side to bring the voltage back to 110V to protect the vibrator, but then I find that the output of the converter drops and the tape recorder does not work properly. I am now thinking of using a small rotary-converter to do the job.

Can you recommend a model? I shall be in England in a few weeks time and will be able to pick it up if you could let me have the address of a firm who could supply one.

Yours faithfully, A.V.T., c/o M.Y.M., Monaco.

A rotary converter would probably give better regulation than a vibrator converter. However, it may still be necessary to employ a constant-voltage transformer between the AC output and the tape recorder mains input.

It is understood that suitable components can be obtained from Radio Component Specialists, 337 Whitehorse Road, West Croydon.

TAPE HEAD PREAMPLIFICATION

Dear Sir, I am thinking of constructing an electro-mechanical Reverberation/Echo unit, using a rotating magnetic drum employing variable record and playback head positions.

Could you please advise me of any pre-amp kits and heads which
(Continued overleaf)

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READERS' PROBLEMS CONTINUED

would be suitable for the record/playback system? Sufficient output is required to match the 250mV input of my power amp. Is it possible to utilise dry battery power for the electronics leaving the motor only on mains supply?

The main problems with my present tape loop system are motor rumble, excessive hum at full echo and tape speed fluctuation. Inputs which are required for the unit would be for guitar pick-up and high impedance crystal and moving-coil microphones.

Yours faithfully, R.L., Coleford.

One of the Mullard circuits could be adopted to give the necessary gain to match the output of the head you propose using. The best way is to design with a tape head in mind so that all the factors are taken into account, and heads and suggested outputs are given in the Mullard specifications.

Mullard Kits are available from various suppliers, but we do not think a complete kit to match your requirements is at present available. However, a few enquiries from London suppliers would soon yield that information. Alternatively, the tape head pre-amp on page 498 might be employed.

AN OVERHEATING MOTOR

Dear Sir, I have a Vortexion W.V.A. which has given very good results in all respects except for the fact that the take-up hub occasionally stops. The tape, of course, continues feeding through, resulting in a tangle unless spotted early.

Last August, I took it to London to be overhauled by the manufacturers. The fault remains, however, due, I suspect, to overheating of the motor, as it usually stops after a moderate period of use. The instruction book does state that this motor heats up considerably during normal running.

The brake appears to be in good order and the motor can be turned by hand when it and the brakes are switched off. Can you please tell me how to remedy this annoying fault?

Yours faithfully, D.B.O., Thorner.

It does appear that your deduction, an overheated motor, is correct. Probably the lower bearing of the right-hand motor is binding, and a few drops of light oil at this point could help matters.

This is a matter that has bothered several other readers with machines employing the Wearite deck and we have been in touch with the company. They advise using Aeroshell No. 3 oil and to give this treatment about every 1,000 running hours.

You might check the 1.2K shunt resistor (27W) and experiment by fitting a 1K. But try lubrication first. If you still have trouble, write to the Technical Advisory Dept., Wright and Weaire, South Shields, Co. Durham, who will probably be able to help you.

LOW-NOISE HEAD AMPLIFICATION

Dear Sir, I am constructing a tape recorder around the EMI two-speed tape deck. The amplifiers are to be completely transistorised and this has led to a certain amount of trouble with the signal-to-noise ratio in the replay amplifier. The replay head is a Miniflux VKH4/19. The amplifier uses a GET 106 and two OC 44s in the circuit given by P. Ridler in *Wireless World* February 1962.

My aim is for the limiting signal-to-noise ratio of the equipment to be that of the tape itself, but at the moment the tape noise is just below amplifier noise at 3½ i/s. The amplifier noise appears to be the base-emitter noise of the transistor GET 106. I should therefore like to know if there is any way in which I can reduce this noise with this circuit. Failing this, could you possibly give me a circuit which is suitable for use with this head and would give the required signal-to-noise ratio.

Yours faithfully, T.J.R., Shotton.

There are several low-noise circuits which could be adapted to improve upon the specifications of your circuit by Mr. Ridler. There was no claim for a particular low-noise input. The GET 106 is quite suitable for general-purpose work, but your requirements appear to be more stringent.

A new low-noise transistor has been recently introduced by Mullard, and we feel sure you would get some information from them. Enquiries should be addressed to: Applications Dept., Mullard House, Torrington Place, W.1.

CLASSIFIED ADVERTISEMENTS

Advertisements for this section must be pre-paid. The rate is 6d. per word (private), minimum 7s. 6d. Box Nos. 1s. 6d. extra; trade rates 9d. per word, minimum 12s. Box Nos. 2s. extra. Copy and remittance for advertisements in **FEBRUARY 1965** issue must reach these offices by **21st DECEMBER** addressed to: The Advertisement Manager, Tape Recorder, Link House, Dingwall Avenue, Croydon, Surrey.

Replies to Box Nos. should be addressed to the Advertisement Manager, Tape Recorder, Link House, Dingwall Avenue, Croydon, Surrey, and the box no. quoted on the outside of the envelope. The district after box no. indicates its locality.

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D 19 B Microphone wanted. N. Inglis, 18 Regent Terrace, Edinburgh 7. (pp)

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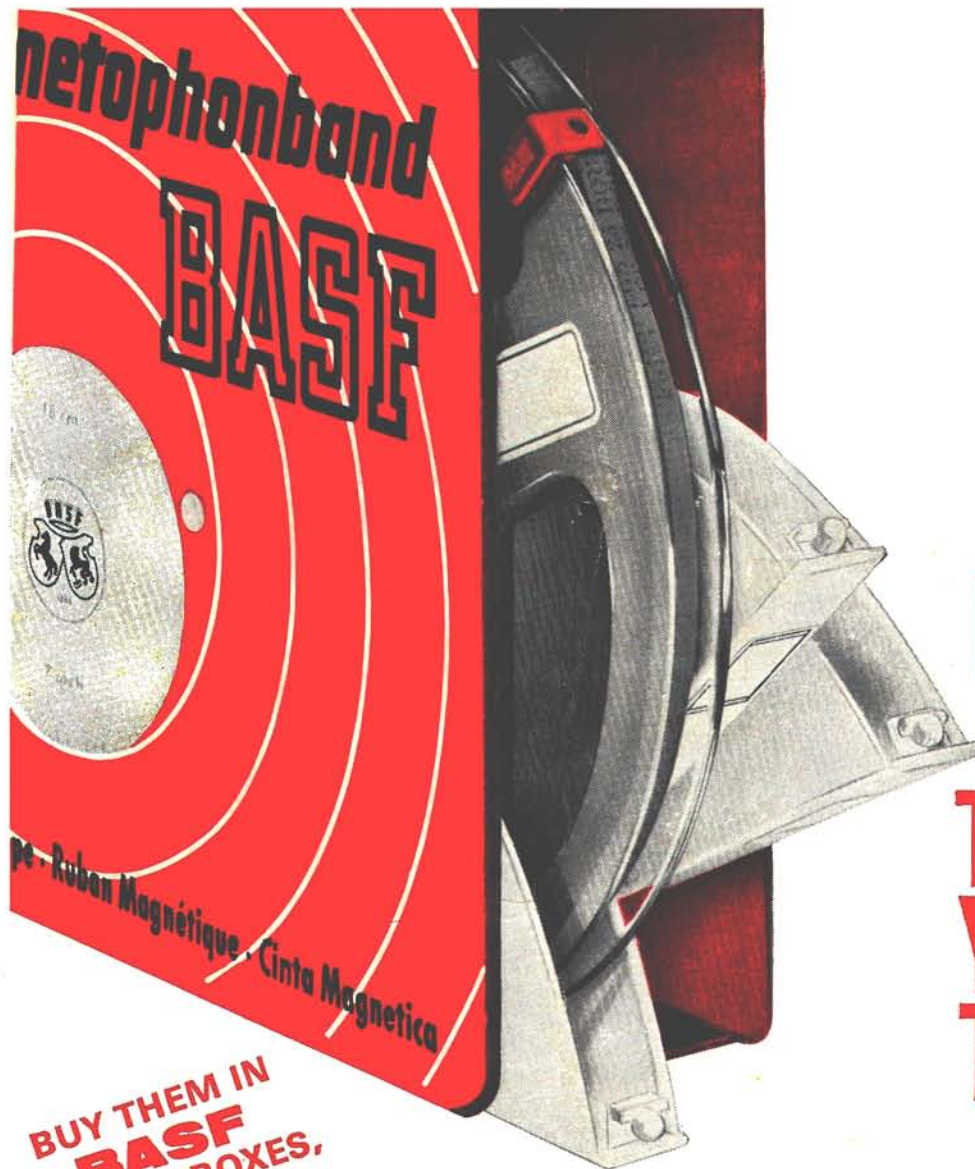


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