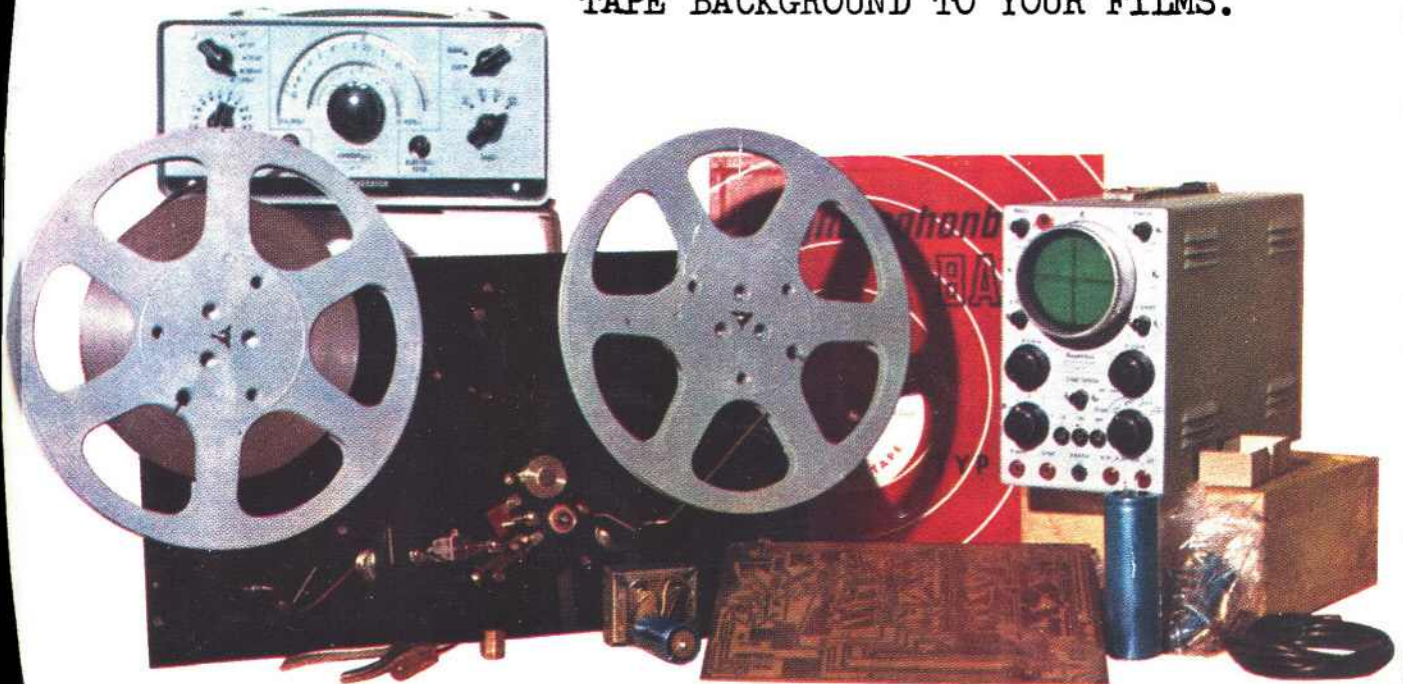


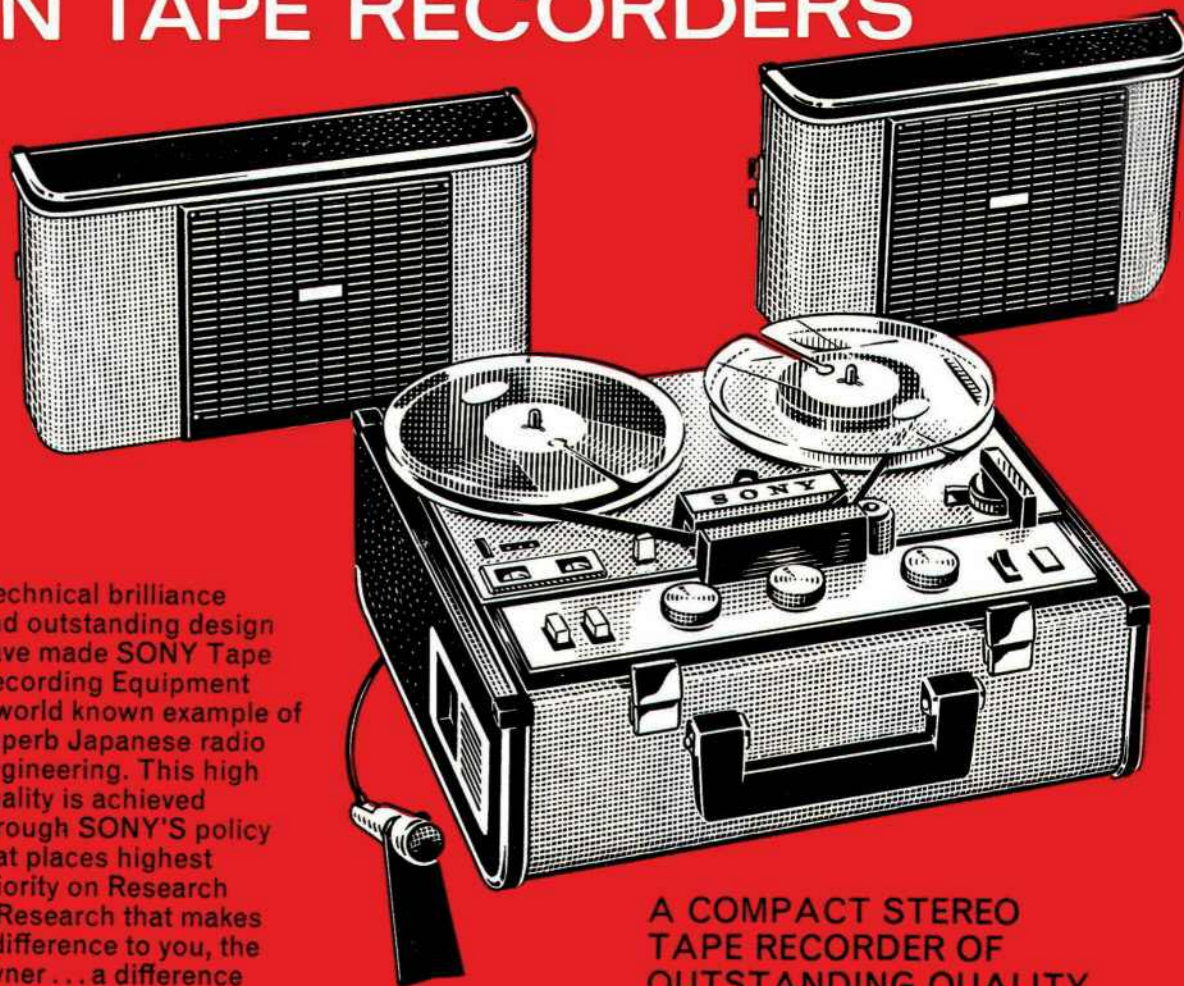
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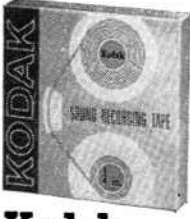
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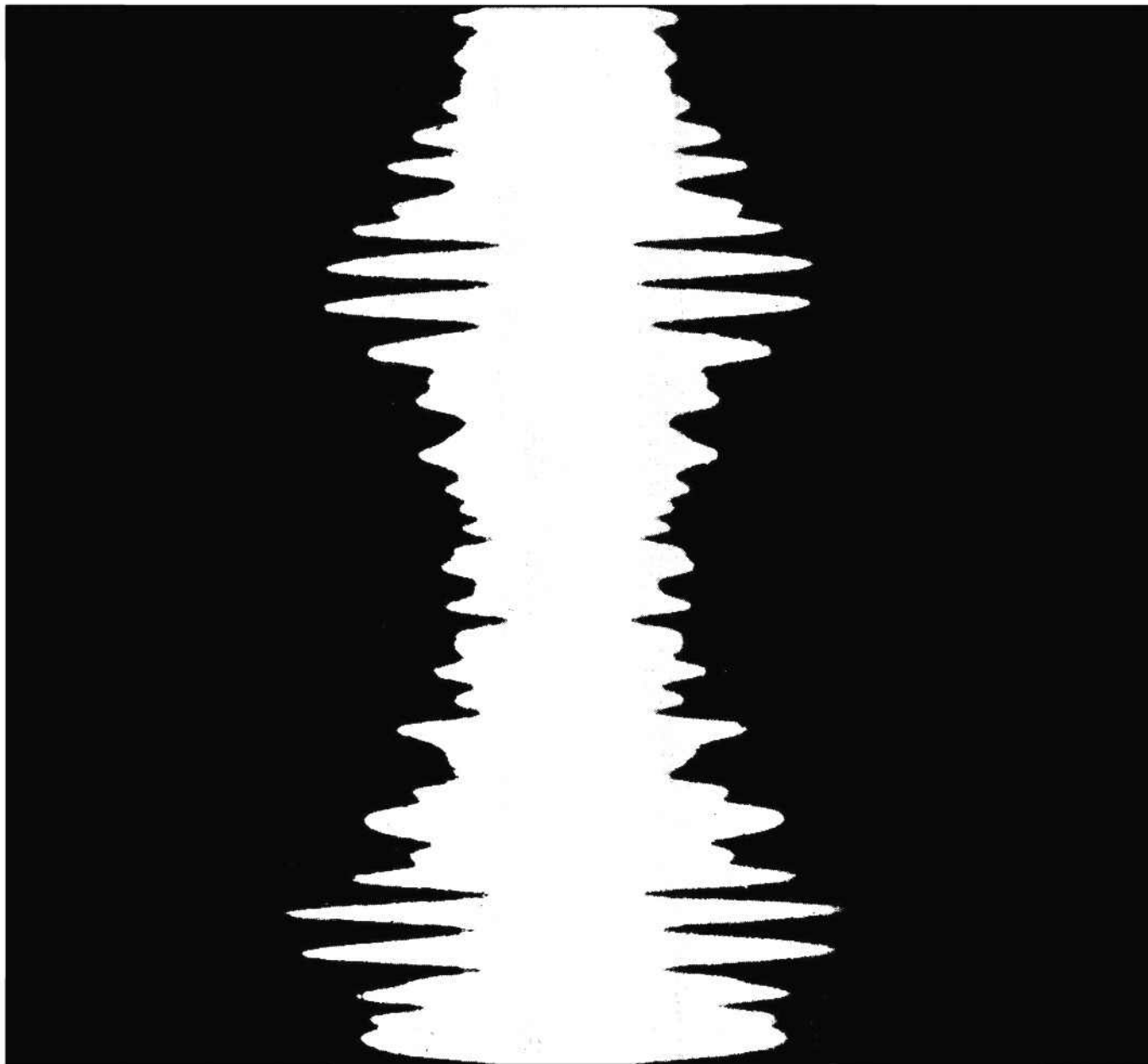
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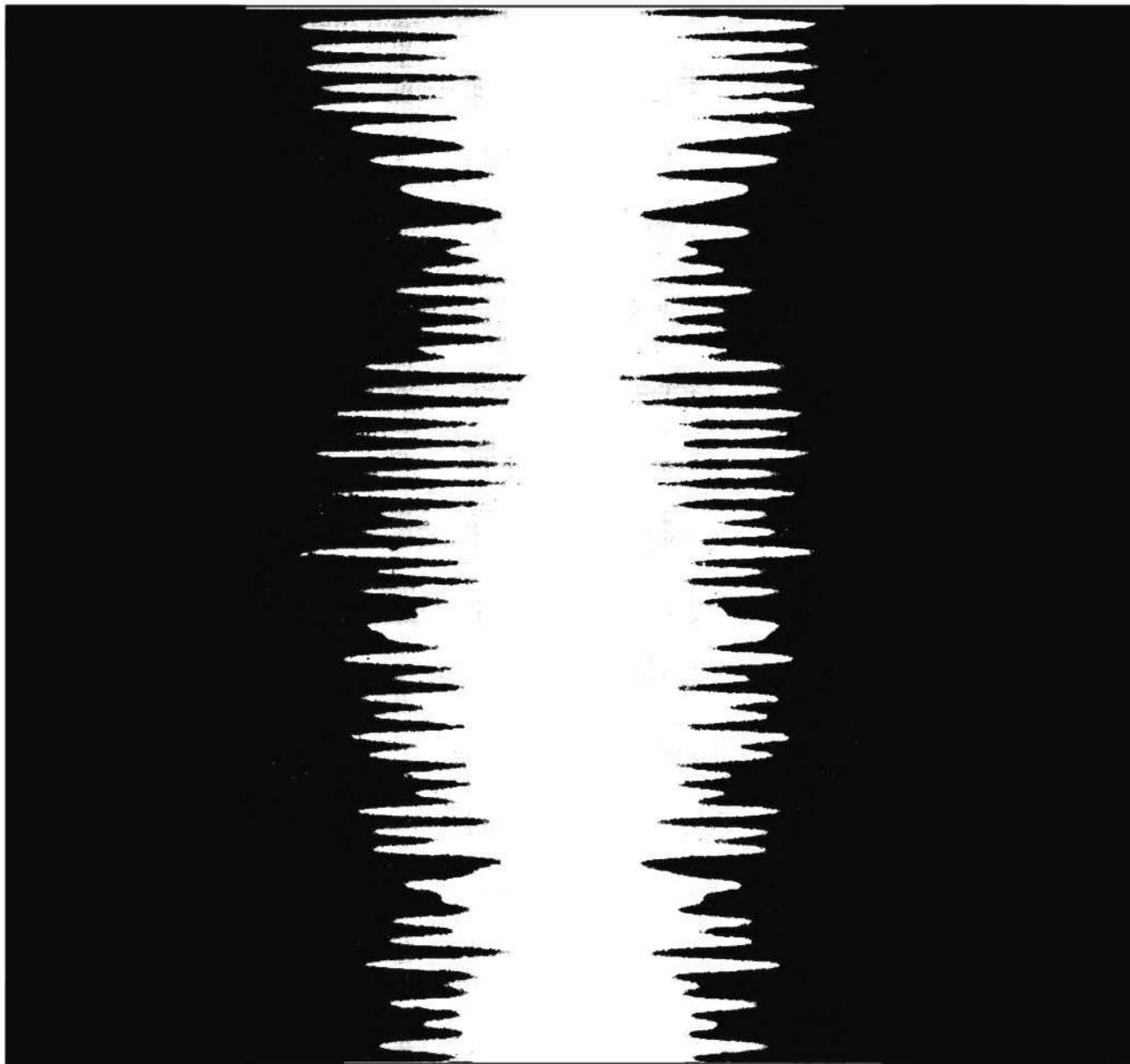
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Kodak T-100 Standard Play Tape



Lawrence of Arabia



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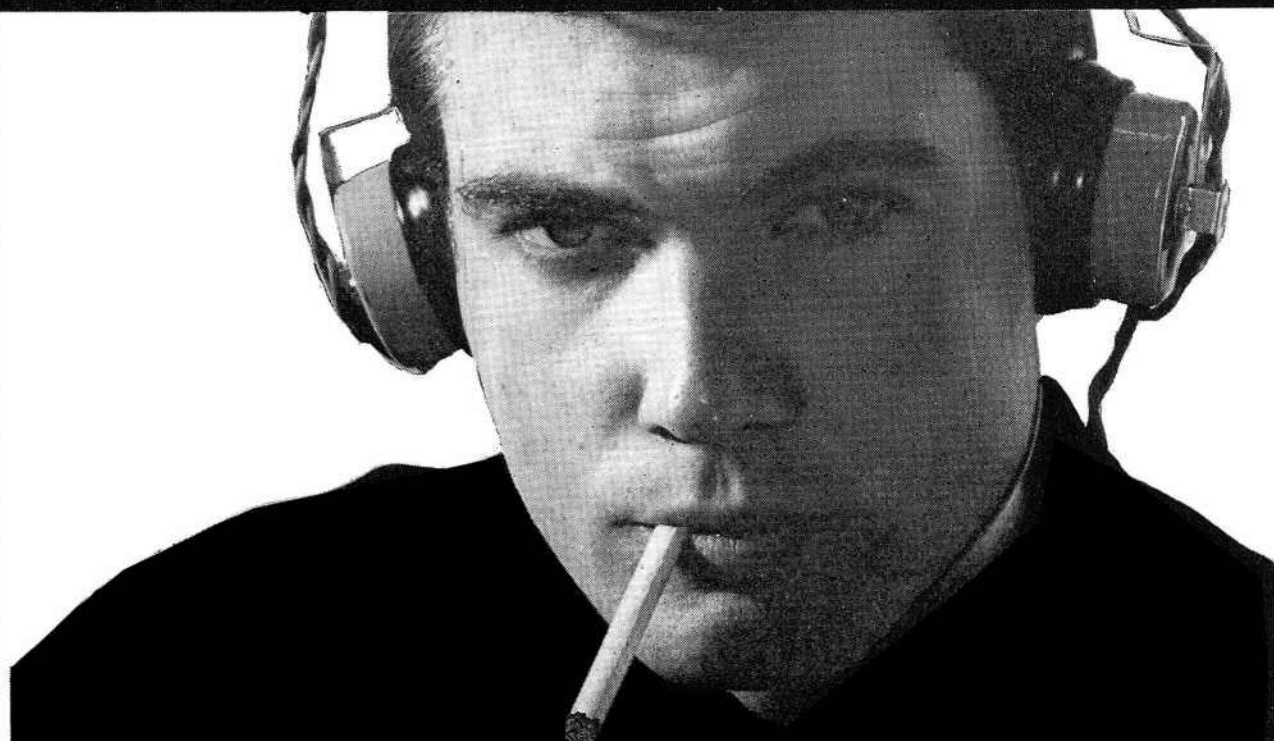
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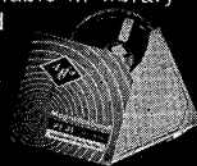
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MGM's production of Anatole de Grunwald's 'The Yellow Rolls Royce'. The Sam Spiegel David Lean Production of 'Lawrence of Arabia' A Columbia Picture release.



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AMATEUR TAPE RECORDING

VIDEO & HI-FI

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Editor: F. C. JUDD, A.Inst.E.

Advertisement Manager: E. McKeown

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for the Wesgrove VKR 500
see the video section, pages 21-24.

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IN THE SPRING

... we hope your fancy will lightly turn to thoughts of a new tape recorder, hi-fi equipment or perhaps that extra loudspeaker you've been wanting, because springtime is Audio Festival time.

Although it is too early yet to announce details of new equipment that will be on show at the Audio Festival in April, we shall see considerable advancement in technical design and facilities. Many manufacturers have already announced that they will be showing something completely new but which must remain secret until the day the Festival opens. So we must wait and see, but ATR will be presenting some of the highlights of the Audio Fair next month.

With the April issue, ATR will also be well and truly established with its new publishers, Haymarket Press Limited, and apart from the

Audio Fair preview the magazine will be presenting a wider editorial coverage of tape recording and hi-fi. So make sure of the special extra large April issue by subscribing or by placing a firm order with your local newsagent now!

Following the recent video recording breakthrough it is now quite certain that a number of prominent manufacturers are ready to launch home television tape recorders. This month we fulfil the need for practical information with our first contributions on television tape recording which we believe has a big future. Already there is talk of small battery operated portable video recorders and cameras that will enable us to make sound and vision recordings out of doors. Development in the video field will be quite rapid, in fact we predict that domestic video recording will become fairly commonplace within two years.

LOUDSPEAKER ENCLOSURES

WHEN a loudspeaker cone is vibrating, sound is radiating from both the front and the rear of the cone. The radiation from the rear of the cone is out of phase with the radiation from the front of the cone and they will, thus, tend to cancel each other. It is therefore necessary to mount the speaker on some form of baffle which controls the radiation from the rear. The baffle will also increase the efficiency of the speaker at low frequencies. We shall now examine the various types of baffles and enclosures that are used for moving coil, direct radiating loudspeakers.

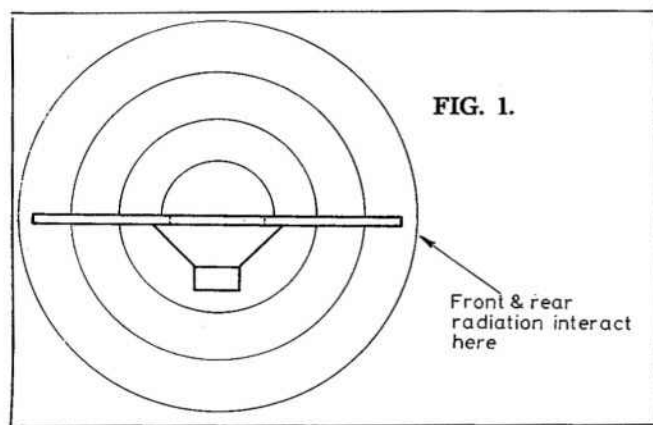


FIG. 1.

FLAT BAFFLE

An ideal method of segregating the sound waves from the rear of the cone is to mount the speaker on an infinite baffle. In practice any very large enclosure can be considered to be an infinite baffle and one practical method of achieving this is to mount the speaker in a wall. This can be convenient if the rear of the speaker radiates into a garage or outhouse, but can be very disturbing and impossible if the room arrangement

makes this unpractical. The infinite baffle is normally used for standard loudspeaker measurements.

As mentioned above, it is often not possible to use an infinite baffle, and a finite baffle is used, as shown in Fig.1. This is not a very good arrangement, however, because the size of the baffle will become very large if it is to be effective at low frequencies. For a baffle to be effective down to 100 c/s the baffle would need to be nearly 6 feet square, while to be effective down to 50 c/s would need a baffle of nearly 12 feet square. Even with baffles of these dimensions, distortion is generated when the sound waves reach the edge of the board. It is better to mount the speaker off-centre in the baffle in order to reduce this distortion, but it cannot be eliminated.

Fig.2 shows the difference in frequency response on a 12" diameter speaker when (a) off baffle, (b) on a small 18" square finite baffle, (c) infinite baffle. The conditions for all measurements were identical.

A variation of the finite baffle is the open-back cabinet. This is, in effect, a finite baffle with the sides folded, but has a further disadvantage in that it acts as a pipe, and at certain frequencies will resonate. This effect can be made use of for some commercial applications in order to obtain a large peak in the response at a certain frequency, but for high fidelity purposes this is generally unacceptable.

CLOSED BOX

By completely enclosing the loudspeaker, as shown in Fig.3, the back to front radiation is once again segregated and the effect is similar to that of the true infinite baffle. The difference is that on the infinite baffle the speaker has an infinite volume of air behind it, while the speaker in a closed box is trying to compress the volume of air that is enclosed by the box. Obviously, this mass of air will substantially affect the speaker performance, but with the advent of smaller loudspeaker

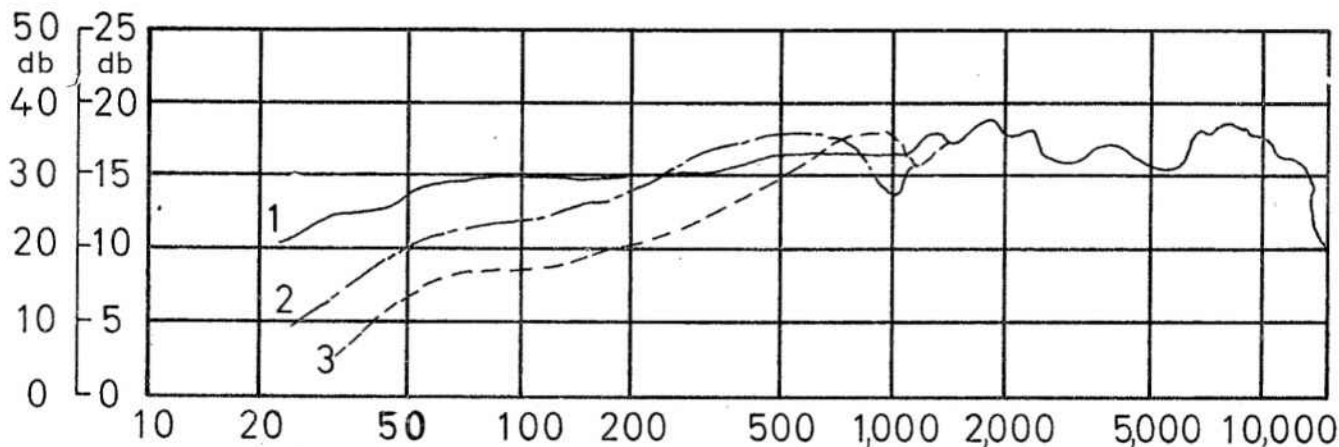


FIG. 2. 1 Infinite baffle. 2. Finite baffle 18"x18". 3. Off baffle.

PART 3 DJ BARNETT

systems it has been possible to design units that can take advantage of this "pneumatic cushion" and increase the low frequency content. The use of a small closed box will normally reduce the sensitivity of a system, but with modern amplifier performances, this is generally unimportant. It is usual to fill the box with an amount of acoustic wadding, in order to reduce the speed of sound within the cabinet. This effectively increases the size of the cabinet. Closed boxes are effective when the volume of the box must be small.

REFLEX ENCLOSURES

This is a closed box in which an opening, known as a vent or port, has been made (Fig. 4). When the cone vibrates, and compresses the air inside the box, some air moves outwards through the port. Thus, the port can be considered as a second 'cone' which is driven by the loudspeaker. At very low frequencies the radiation from the port is out of phase with the radiation from the cone and there is a cancellation effect. As the signal frequency approaches and finally passes the resonant frequency of the cabinet then the vent has the effect of increasing the total radiation from the system. It is impossible to deal with the design of reflex enclosures in detail in this article and, in fact, much of the information that is required depends not only upon the particular speaker to be used but also upon the amplifier that is driving the speaker.

The standard formula for calculating reflex enclosures is as follows:

$$V = \pi r^2 \left[\frac{4.66 \times 10^6}{f^2 (L + 1.7r)} + L \right] \text{ cu. in.}$$

where

V = Volume of cabinet

L = length of tunnel (in.)

r = effective radius of cone (in.)

f = resonant frequency of loudspeaker (c/s).

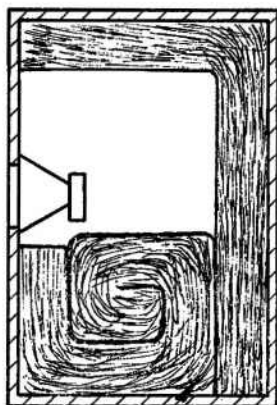


fig. 3

Acoustic wadding

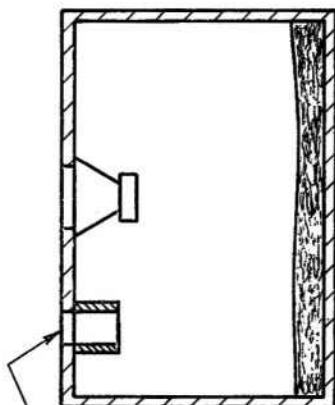
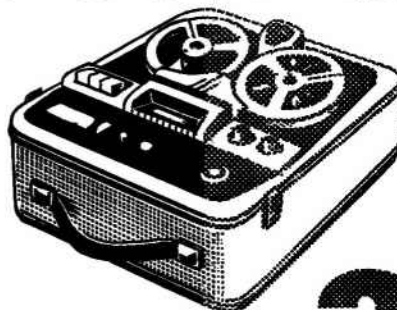


fig. 4

Port or vent

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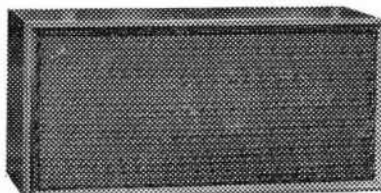
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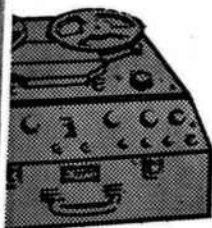
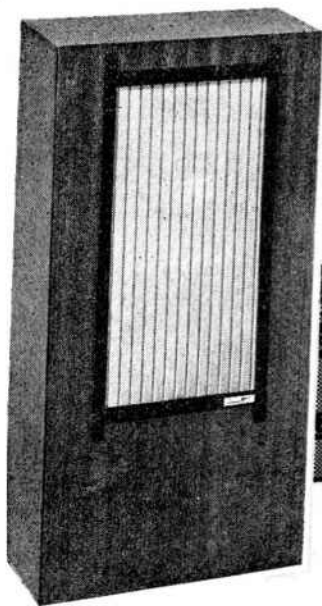
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LOUDSPEAKER ENCLOSURES

In this case the cross-sectional area of the vent must be the same as the effective area of the cone. Most loudspeaker manufacturers publish designs of cabinets that are specially suited for their own speakers. It is usually better to utilise these plans or at least consult with the manufacturer before constructing a cabinet. The manufacturer has much more information regarding speaker performance, production tolerances, etc, and, of course, the experience.

THE TUNED PIPE

This enclosure is literally a pipe with the speaker at one end and the other end either totally open or closed. This system is little used now, due to the many resonances that must occur in the response. Modifications to the simple tuned pipe that can effect improvements are to taper the pipe and to mount the speaker one-third of the length along the cabinet in order to eliminate third harmonic resonance. In this case the end of the pipe nearest the speaker is closed and the other end open.

THE LABYRINTH

This is a simple principle in that the radiation from the rear of the cone is fed into a long heavily damped tube in order to absorb the sound. These cabinets are usually expensive to make and are not often used.

THE HORN

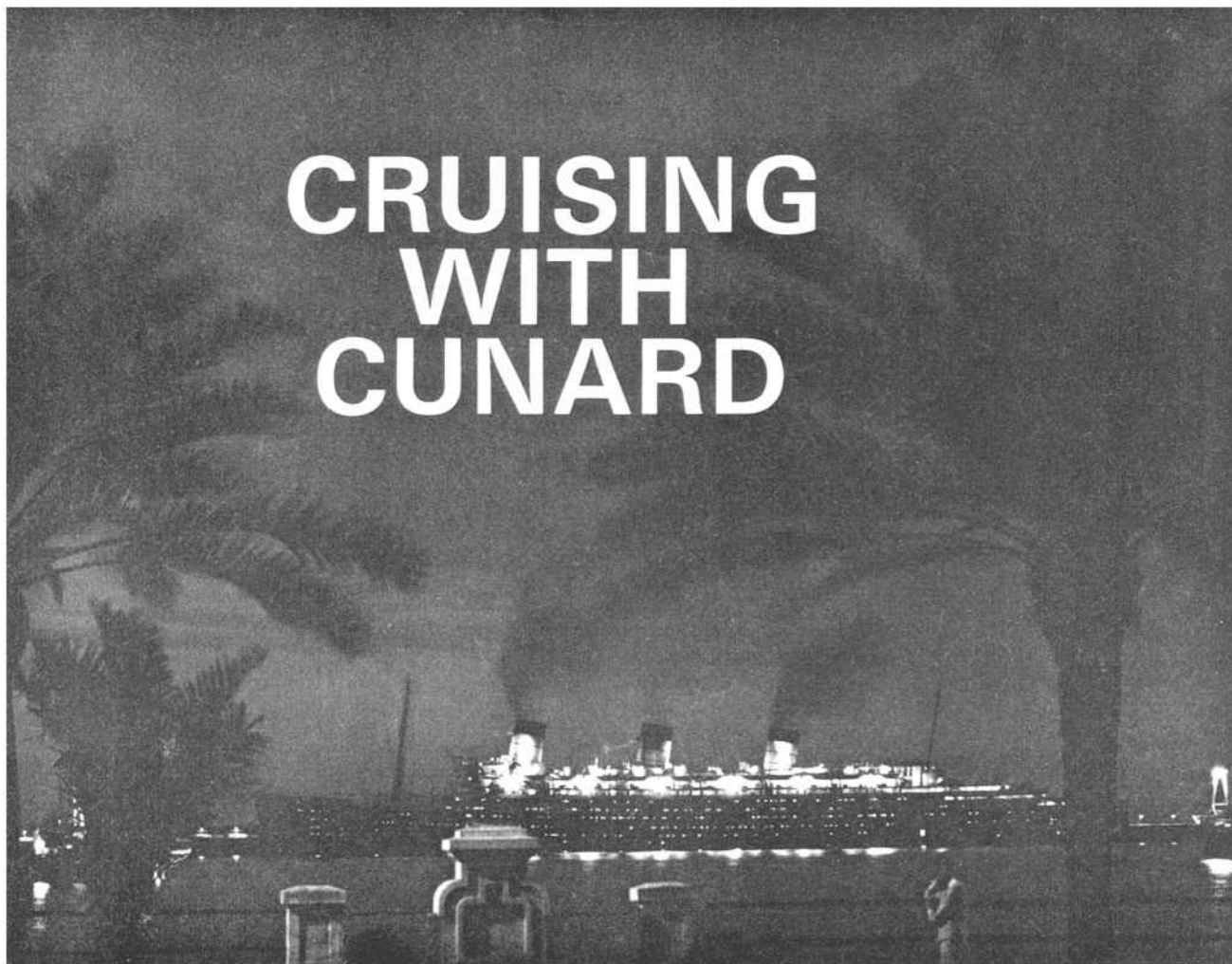
This is probably the most "perfect" loading for the speaker, but there is one major snag. The size of a horn to work down to about 40 c/s will be enormous and is consequently usually impossible for domestic applications. A solution to the size problem is to limit the low frequency performance and to "fold" the horn. This seems to affect the performance seriously, and makes construction difficult and expensive.

GENERAL

The above are some of the more usual loudspeaker enclosures. Variations and combinations of these are numerous, but the most common enclosures are either closed boxes or reflex cabinets.

It is essential that all enclosures are substantial in order to stop the cabinet walls vibrating and thus radiating themselves. Wooden cabinets should be of a minimum thickness of ¾" and large panels should be braced. All joints should be firm and glued. This is vital for if this is not done, air leaks will occur and will introduce distortion. Brick and cement enclosures are satisfactory but somewhat less transportable. The speaker fret should be of open weave in order not to attenuate high frequency radiation. Some cabinet designs require the use of sound absorbing material on all internal walls of the cabinet in order to avoid high frequency reflections. Attention to detail in cabinet construction can make all the difference to the final performance.

CRUISING WITH CUNARD



Bob Danvers Walker captures a multitude of sights and sounds on board the Queen Mary as she travels the holiday highways of the seas.

The battery operated, transistorised portable tape recorder is rapidly changing the companionate relationship between tape and film into a marital union between sound and picture. Photographs can ill afford to remain silent any longer. The colour transparency backed with its relevant sound is a logical development in home photography.

Particularly is this so when the camera enthusiast is most active — on holiday. To illustrate this and provide ATR readers with a few basic points I'm going to deal with cruising; a round-the-calendar form of vacation very much on the increase just now. Few places are

more rewarding to a recordist than an ocean-going liner. Among Britain's many giant passenger ships extensively engaged in holiday cruising is the second largest liner in the world, the Cunard Royal Mail Steamer "Queen Mary", 81,237 tons. Within an area approximating to three of London's largest hotels rolled into one is a high concentration of tape potential to satisfy the most avid collector of sound tracks. Then of course there are the ports of call which on any sea trip provide their unique contribution of authentic music and fascinating sounds. A cruise can also offer opportunities for interviews with notable people.

The Cunard liner
"QUEEN MARY"
illuminated at
her berth at
Las Palmas last
Boxing Day



2	3	6	
	4	5	7
			8

Cruising with Cunard

Since passenger capacity aboard the "Queen Mary" is 1,970 and Officers and Crew number 1,282, you're sure to find someone willing to co-operate.

In all cases programmes of music and cabaret are offered. The private individual, recording sequences of professional performances for his own and not public presentation, would be well advised to ask formal permission from the artiste or orchestra leader beforehand, just as one does out of politeness in taking the photograph. The Performing Right Society state that recordings made purely for domestic use would in no way contravene the Copyright

Act of 1956. The photographs on these pages can be likened to the transparencies one might take on such occasions and also suggest recordable subjects. This photo report contains the kind of information you will need to gather when it comes to recording a commentary for a narrative track. A sound effects track will make all the difference when presenting your film show personally. The accompanying illustrations were taken for me by my travelling companion ace photographer Barry Hicks. They range through the delights of ocean travel aboard the luxury liner and peep into the other world below the water line where four sets of turbines, developing 160,000 shaft horse power, drive four propellers each weighing 35 tons yet so delicately

balanced that they can be turned by a touch of the hand. It is permissible to visit this labyrinthine realm of massive machinery generating power equal to that of fifty modern passenger locomotives.

The sea is criss-crossed with holiday highways leading to exciting places. The sea-borne hotels contain their own dancing salons, cabarets, cinemas, sports decks, swimming pools, gymnasiums, shopping centres and cocktail bars.

Take a look now at the photo of the "Queen's" forward funnel. It is 70 feet in height and would permit three modern locomotives, placed abreast to pass through. You see it as I was recording the deep chested note of the siren which is keyed to lower bass "A". It can be heard at a distance of at least ten miles and as the



Photographs by Barry Hicks.

2

Bob Danvers-Walker in the Crow's Nest recording the booming note of the liner's siren at noon in the Bay of Biscay. A 100-rung ladder through the hollow forward mast leads to the look-out platform.

3

In the well-equipped ship's gymnasium it's **Walker versus Walker**. Champion heavyweight boxer Billy Walker has a work out and records a spot during his holiday cruise prior to his big fight.

4

Pop music by "The Eagles" in the Beachcomber Club, highly favoured by the younger passengers.

5

Jenny Johnson, well-known on BBC-TV programme "Tonight" is a Star cabaret act during the cruise singing nightly in the Flamenco Room, one of thirty-eight public rooms aboard.

6

Thirty feet below the water line on the manoeuvring platform the mysteries of the aft engine room



are explained. Passengers are taken on escorted visits to boiler and engine rooms where four main turbine develop 160,000 shaft horse power. Sound-wise it is like any vast power generating station.

7

Ashore at Las Palmas Bob Danvers-Walker visits the "Altavista" Night Club overlooking the Queen Mary alongside the Mole. Organised Cooks' Tours take the ship's passengers to see a performance by Spanish Flamenco dancers. Silhouetted are Paco Ruiz, Teresa Maizal and guitarist Jose Mareno.

8

Camel ride through the Canary Village at Las Palmas to record the costumed singers in this traveller's haven on the island of Gran Canaria.

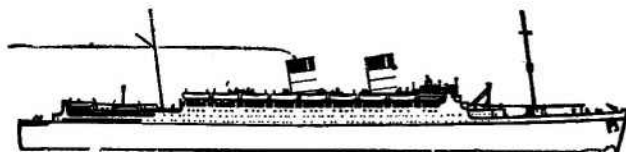
reverberations keep going they can be detected from 50 to 100 miles away. To show the great horns, each weighing a ton, I obtained special permission to climb the hundred steps inside the forward mast and enter the crow's nest. There, of course, the sound is ear-shattering but even so the automatic volume control on my Fi-Cord 202 coped with the blast. I got it best right at the stern with the Beyer M.66 directional microphone turned away from the forward funnel. It is a pretty even bet that this coming summer some of you will be off to the sunshine by ship. This will be an ideal opportunity to gather sound sequences to edit into a master tape to run synchronously with your transparency projector. Don't miss it!

March, 1965



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SLIDE AND SOUND SHOW WITH A DIFFERENCE

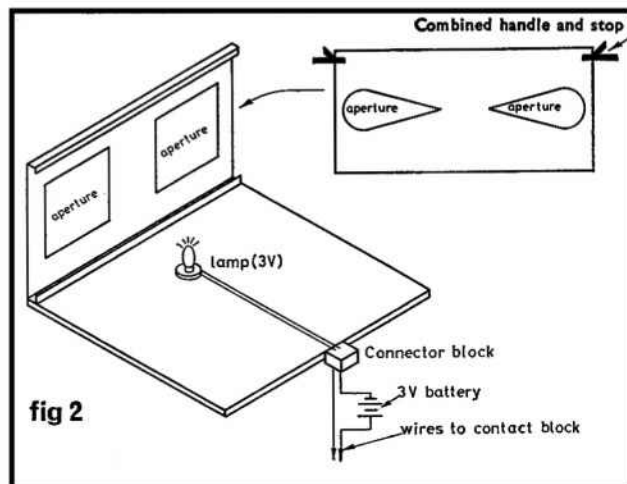
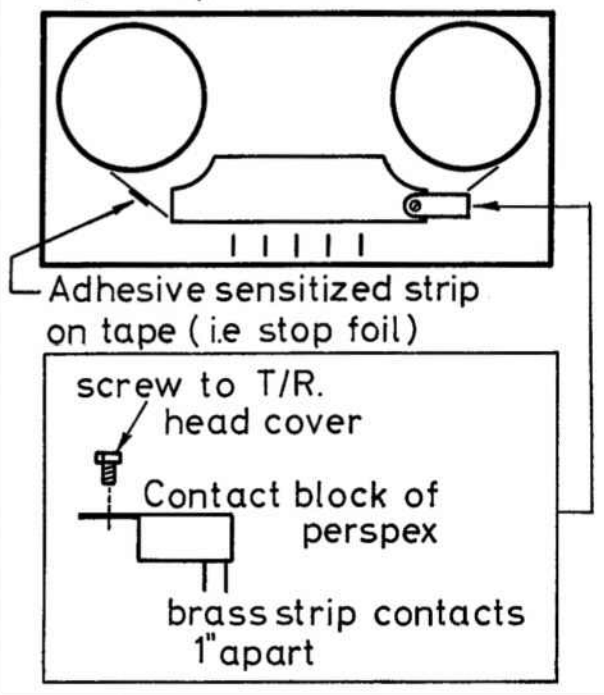
A Simple, Inexpensive Lap Dissolve System for Colour Slides

A friend and I recently put on a sound and slide show with a difference by introducing "lap dissolves" on every slide. Total cost 5s 8d! The accompanying diagrams may help to explain.

We had 100 colour slides of a particular theme for which we made a commentary and background music recording on tracks 2 and 3 of a Philips four track recorder. The entire commentary and music ran to the same timing as the slide show (namely 25 minutes) and was therefore all recorded on one direction of the tape, so as to obviate the need to change over spools.

Whenever a slide change was required, adhesive stop foil placed at the back of the tape completed the circuit through two contacts (Fig.1) connected to a battery and bulb, as shown in Fig.2. The diagram showing the construction of the "lap dissolver" is self explanatory. We cut two "tear-drop" shaped apertures in the long panel of hard-board which slides along the two channels on the upright section attached to the 24 x 24 inch baseboard. These were made so as to operate with any two slide projectors of equal focal length. In our case both projectors were Wray 'Moths' and both loaded so that when the bulb lit up (via the tape contacts) all we had to do was slide the panel across from one projector to the other. This gradually stops down the lens of one and opens the other and the effect is an excellent "lap dissolve" from one picture to another.

Fig 1 Tape recorder



BRITISH TAPE RECORDING CONTEST 1965

YOU CAN WIN A PRIZE IN ANY ONE OF THESE THREE SECTIONS!

NOVICES: If you have only recently bought a tape recorder, and if you have never entered a tape recording contest before, you are eligible for the Novices' section. Maximum playing time of your entry tape — **4 minutes.**

AMATEURS: If you have owned a tape recorder for one year or more, and as long as tape recording is only your hobby, you are classed as an amateur. Maximum playing time of your entry tape — **10 minutes.**

PROFESSIONALS: If you are, or have been, employed as a professional recordist, this is the only section open to your entry. Maximum playing time of your entry tape — **15 minutes.**

SCHOOLS AND CLUBS CAN ENTER TOO!

Prizes include Nine Silver Cups and Trophies. CASH awards totalling £125. The chance to hear your tape broadcast.

PRIZEWINNERS. The outstanding tape in the whole Contest will be selected the 'Tape of the Year' and will win a handsome silver trophy and a cash prize of £50. The best tape in each of the three sections will also win a silver trophy plus a cash prize of £25. There will be further awards for other outstanding tapes. **The winners will have their fares paid to London for a special celebration party.** All cups and trophies will be held by the winners for one year.

YOU COULD WIN AN INTERNATIONAL AWARD! If your entry tape is considered good enough by the judges, it may be selected for submission to the International Recording Contest 1965. Last year, in this contest, British competitors won four awards — **one of which was an all-expenses-paid visit to the United States!** Entries for the International Contest are submitted by the Federation of British Tape Recording Clubs, which is represented on the Organising Committee of the British Contest.

COPYRIGHT CAUTION. Tapes must be original recordings. They **must not** contain any material from radio programmes or commercial recordings. If any copyright material is used (for example, if you play or sing a 'pop' song) full authorisation for its use must be submitted with the tape. For advice on copyright, you can consult the Mechanical Copyright Protection Society Ltd.

THE KIND OF RECORDING YOU CAN SUBMIT. Tapes, however, need not include any copyright material. Quite often the simplest tapes are found to be best. The 'Tape of the Year' in 1964 was a collection of recordings of water gurgling out of hotel wash-basins, linked by a witty commentary. On the other hand, you could win with a good recording of a teenager improvising on a guitar, or with a 'sound snapshot' captured while on holiday. Or perhaps the judges might find your documentary recording of an old rural custom or public ceremony a winner. Unusual snatches of bird-song, interviews with interesting personalities, good recordings of children's voices — any of these, too, could win you a prize.

AMBITIOUS RECORDINGS. You'd be surprised what can be recorded in the 10 minutes allocated to the Amateur entrants. Sketches, extracts from plays — these are just the things that a school or club is well equipped to do. Another popular exercise for established Amateurs is technical experiment — the compilation of musical and special effects by ingenious editing, copying, speed changing and other techniques.

HINTS ON MAKING A WINNING TAPE. There are plenty of ways in which you can improve the quality of recordings. Experiment with different positions for the microphone. Make full use of facilities to fade in or out on background music or effects, or to superimpose. If you are doing anything complicated, its worth preparing a simple script and rehearsing until you have exactly the result you wish to submit. Avoid the temptation to include inessential matter; although you are bound by a maximum playing time, there is no rule on how **short** your recording can be!

JUDGING OF ENTRIES. All entries will be judged by a panel of distinguished tape recording experts. They will take into full consideration the capabilities of your tape recorder and any other equipment used, so that you will not be handicapped by modest resources. This is essentially a **recording** contest and your prime aim should be to ensure the best recording you and your machine can give.

CLOSING DATE. The closing date for entries is Monday, 31st May, 1965. All tapes, together with completed entry forms, must be submitted to reach British Amateur Tape Recording Contest, 7, Tudor Street, London, E.C. 4, by that date. Stamps to cover return postage must be included.

The British Amateur Tape Recording Contest was established in 1957, and is now sponsored by an Organising Committee representing Agfa, BASF, Emitape, Kodak, Mastertape, Scotch, Philips and Ilford-Zonatape.

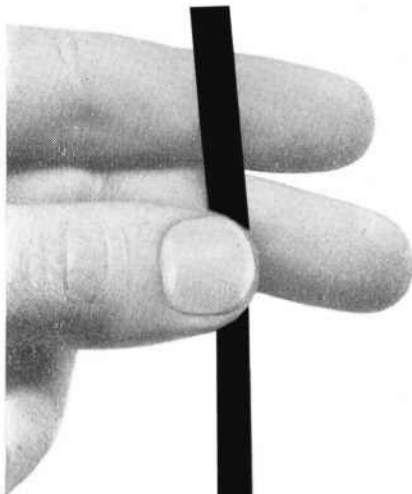
ENTRY FORM: BRITISH TAPE RECORDING CONTEST 1965

Name and Address (in block letters)		
Age	Occupation	How long have you been recording?
Special interests		
Data on the attached recording:— (1) Title — if there is one		
(2) Duration	(3) Category: Novice : Amateur : Professional	
(4) Make of recorder used	(5) Recorded at a speed of inches per second	
(6) Make of magnetic tape used	(7) Details of any other equipment used	
(8) When and where was the recording made?		
* (9) Titles of works used. Names of authors or composers, duration, etc.		
(10) Names of any assistants and how they helped in making the recording		

DECLARATION: (cross out whichever is not applicable).

* I declare that the enclosed tape is entirely my own work, and that I have not included on the tape any copyright material from radio, commercial recording, or any other source.

* I declare that I hold documentary authorisation to use any copyright material Signed



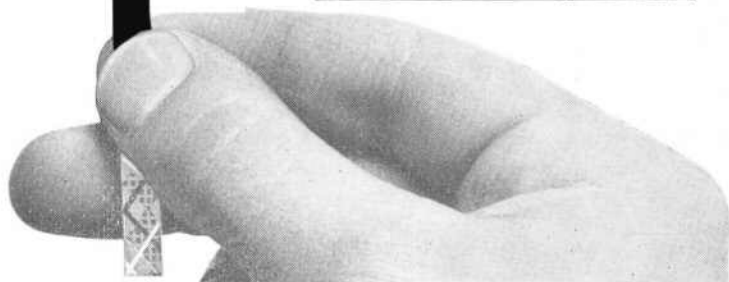
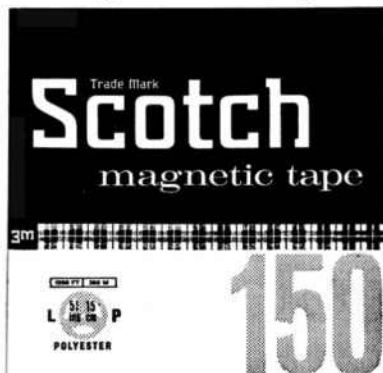
When you give a magnetic tape a new coat that

- is shiny black
- eliminates oxide rub-off,
- cuts down cleaning,
- increases tape life fifteen times,
- ensures intimate head-to-tape contact,

what do you call it?

"Superlife"

It's shiny, black and it is on all polyester tapes throughout the range of Scotch Magnetic Tape.



3M
COMPANY

Minnesota Mining & Manufacturing Co. Ltd., 3M House, Wigmore St., W.1.

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TAPE RECORDER OF THE MONTH **GRUNDIG TK 23A**

FOUR TRACK AUTOMATIC/MANUAL
TAPE RECORDER. F.C. JUDD, A. INST. E.

So far I have presented two distinctive types of tape recorder, one of these being a less expensive but nevertheless excellent general purpose machine, the other being a more expensive type favoured by the ardent enthusiasts or hi-fi exponents. This month I have chosen the Grundig TK23A which I think will appeal to the wider section of the tape recording fraternity, namely those who just like to record music from one source or another and those who enjoy tapesponding etc, all with a minimum of effort when it comes to doing the actual recording.

The Grundig TK23A is a nice compact recorder and does not take up too much space. It has a single speed of $3\frac{1}{2}$ i.p.s. a wide frequency response and an excellent dynamic range, plus a little "automation" which adds up to good quality recording, requiring a minimum of effort or adjustment in the first place. The Grundig TK23A has an automatic recording level system which presets the required level for best results as soon as recording is commenced so there is no need to worry too much when you have to switch on quickly to capture a favourite item from the radio — just set the recorder running — the Grundig "magic ear" takes care of correct level.

SOME TECHNICAL DETAILS

The TK23A is otherwise a conventional four track tape recorder and can be used with the manual recording control and level indicator in the normal way. It will provide a total of six hours playing time for 1,800 ft of tape and takes $5\frac{1}{2}$ inch diameter spools. There is provision for external loudspeaker, external amplifier, radio and microphone connection and there is a socket for headphone monitoring. The latter facility enables monitoring of a track already recorded whilst another recording is made on one of the other tracks. Both recordings can be replayed together.

The remainder of the technical details are given separately but these do show the electrical qualities and performance which are of course guaranteed by the makers. To witness the actual performance of the TK23A however, I paid a visit to the Newlands Park

factory of Grundig Limited, where a stock recorder was connected up and put through its paces. Of particular interest was the function of the automatic recording level system which responds almost instantaneously to the first sounds and then sets the overall recording level which it maintains for some time after all sounds have ceased. It can of course be re-set quickly if necessary by switching from auto to manual and back whereupon the automatic system will once more re-set itself for the correct recording level for whatever sounds are being recorded.

A pre-recorded tape of music was also put on to show off the replay performance and again the TK23A gave a good account of itself. The mechanical function and performance are both excellent and the actual operation of a TK23A is made delightfully simple by the push button controls which select the deck functions etc. I liked the neat appearance of this recorder too and since a microphone, tape and spools are included, one gets good value for the 49 gns. The TK23A also features automatic tape stops, inter-locking controls which prevent incorrect operation, and a superimpose control.

Having had this recorder demonstrated to my satisfaction, which is what everyone should do when buying a tape recorder, I then asked about the guarantee and after sales service. Well, most new articles whether they be tape recorders, washing machines, TV sets or whatever, usually carry a guarantee which covers the replacement free of charge of faulty components etc. The cost of labour involved in effecting replacement or repairs is chargeable. Although this normally applies to Grundig tape recorders they do act very fairly towards customers in that no labour charge is normally made when a tape recorder is returned because of some fault that might have developed during the first few months following purchase.

The normal service turn round for new tape recorders is a matter of a few days only and even during the very busy periods, older model tape recorders sent for repair are rarely kept for more than two weeks. Only in exceptional cases, for instance where a fault fails to show up, or where the recorder may require a long test, does



the service turn round exceed three weeks. Spares ? Well Grundig can supply any spare part for any tape recorder right back to the first they ever made. I wish the same could be said of all tape recorder manufacturers. Finally if you doubt my word as to the performance of the TK23A why not go along to your local dealer and have one demonstrated because if you do happen to be looking for a lazy man's tape recorder with a top performance this is it. If you would like further technical details without moving from the armchair, write to the makers of the TK23A namely Grundig (Great Britain) Limited, Newlands Park, London SE26, or to their showrooms at 15 Orchard Street, London W1.

TECHNICAL SPECIFICATION

Mains voltage :	110, 130, 220 and 240v AC 50 c/s only
Power consumption :	58W approx.
Fuses :	0.8A surge resisting for 110-130V 0.4A surge resisting for 220-240V 125mA surge resisting for HT.
Valve Line-up :	EAF86 - EF83 - ECL86 - ECC81 - EM84 plus 3 Rectifiers.
Maximum spool size :	5½"

TECHNICAL SPECIFICATION.

Tape Speed :	3¼" per second ± 2%
Running time per 1800 feet of tape :	1½ hours per track, 6 hours total.
Rewind time per 1800 feet of tape :	3 minutes 4 seconds approx.
Recording sense :	International, four track.
Wow and Flutter :	Not exceeding ± 2%
Frequency Response :	60 - 12,000 c/s + 3-5dB.
Signal to noise ratio :	Better than 45dB.
Power output :	4W across 5 Ohms.
Loudspeaker :	High quality permanent dynamic 5½" × 4½" elliptical unit.
Input sensitivities	
Microphone:	2.2-45mV across 1.5M Ohm.
Diode :	2.2-45mV across 22k Ohm.
Radio/Gram PU :	100mV-2V across 1M Ohm.
Outputs	
High impedance :	700mV across 15k Ohm.
Earphone :	12V across 220k Ohm.
Weight :	20 lbs approx.
Dimensions :	13¼" × 11¼" × 7"

**THERE'S
BIG
NEWS
COMING
FROM**

GRUNDIG

**NEXT
MONTH!**

See the April Issue
of this magazine, or,
if you can't wait, look
out for the giant an-
nouncements in the
National Press on
Friday, March 12th.

VIDEO NEWS

TELEVISION TAPE RECORDING FOR THE AMATEUR by N. S. Rutherford Grad.I.E.E.

1. FUNDAMENTALS AND THE PROBLEM

IN this series of articles it is intended to trace the problems encountered in the recording of television signals on tape beginning with a discussion of the elementary ideas of magnetic recording and then going on to the special requirements for the recording of television. Following this we will also deal with the construction of an actual machine to record television pictures and sound.

FREQUENCY RANGE

Most readers are familiar with the requirements of a tape recorder to record ordinary speech and music. For speech we require to record a frequency spectrum from 300 cycles per second to 3,000 cycles per second as a minimum to give reasonably intelligible speech. For music this must be extended to cover a spectrum of from 50 cycles per second to 12,000 cycles per second. A frequency range such as this will give reasonable reproduction of the original music. Thus from the above we can see that to reproduce speech we require a range of about 4 octaves and for music a range of about 8 octaves. The techniques for handling this magnitude and range of frequencies in magnetic recording are well established and I do not intend here to cover the techniques of normal sound recording. Having considered the range of frequencies we have to handle in the recording of audio signals, let us now consider the range which has to be handled if we are to record successfully television pictures.

As a television picture consists of a moving spot of light constantly changing its brilliance, a complete television picture could be considered over a period of time to consist of a screen full of spots of light of varying intensity. Thus for example if we take a television picture which has 400 lines of definition and these lines repeat to give a complete change of picture 25 times per second, we can simply work out how many spots of light we have to produce per second to form a television picture. If there are 400 lines horizontally it is obvious that to get equivalent horizontal and vertical definition we would require the equivalent of 400 vertical lines. Therefore there are 400 times 400 spots of light to form one complete television picture and if this picture is repeated 25 times per second we have 400 times 400 times 25 spots of light per second, which is approximately 4,000,000. Since a complete cycle of change represents two transitions from negative to positive we can divide the number of changes or number of spots of light we require per second by 2 to convert this to the equivalent frequency which would be 2,000,000 electrical changes per second. That is to say we would have to record a maximum

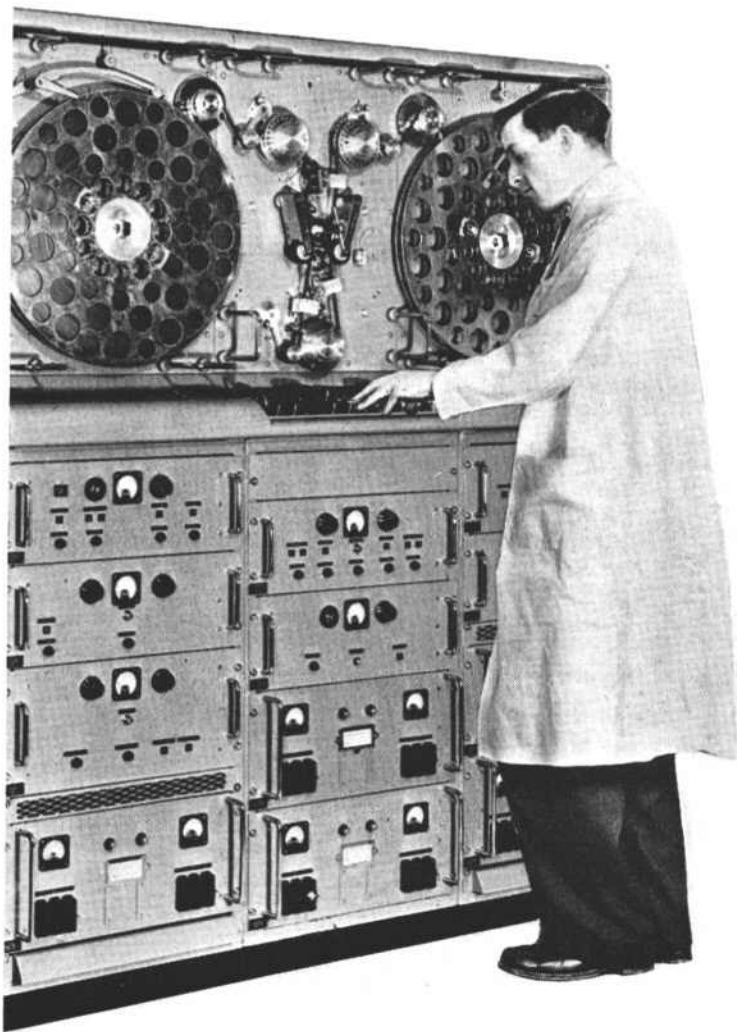


Fig.1. THE FIRST BBC TELEVISION TAPE RECORDER. Tape speed about 200 i.p.s. (photo by courtesy of the BBC)

VIDEO NEWS

frequency of 2 megacycles. A practical case is that of British television which employs 405 lines and a picture aspect ratio of 3 to 4. The fact that certain parts of the scanning time are lost both horizontally and vertically due to the process of blanking and synchronising, increases the ideal frequency response to 3 megacycles. That is not to say that to reproduce a satisfactory television picture one must always have the capability of recording 3 megacycles. This is just a figure where the vertical and horizontal definition are equal and in fact on the 405 line system it is possible to produce a perfectly adequate television picture with a bandwidth of 1 megacycle.

In addition to considering the high frequency response of the system we must consider the lower frequencies that exist in a television picture and a closer examination will reveal the lowest frequency we have to reproduce is one continuous line of either white or black. Now again taking the example of the 405 line system, this line is equivalent to one ten-thousandth part of a second.

At first sight it would seem to those not familiar with television wave forms that the lowest frequency one would have to record would be ten thousand cycles per second. However we must consider that the line we are talking about is continuous black or white all the way along, and obviously consists of frequencies other than ten thousand cycles per second. Otherwise all we could do would be to reproduce part of the ten thousand cycle wave which would be shaded along the line. In actual fact we have to reproduce a ten thousand cycle per second square wave and to produce this ideally, that is to get a pure white or pure black line without any shading one would have to theoretically reproduce all frequencies down to direct current. In practice, however,

in normal television systems response does not go below about 50 cycles and in a specially designed system, which we will discuss later in this series, it is possible to get perfectly satisfactory television pictures limited in the lower frequency response to 1,000 cycles per second.

Thus we may compare the frequency range of a television signal with that of an audio signal and work out its octave range. In the ideal 405 line system, if we are going to cover the frequency range from 50 cycles per second to 3,000,000 cycles per second, we would require a frequency range of 16 octaves which is very great compared with that in the recording of audio signals. In the specially designed system I mentioned earlier we would only require 11 octaves to produce a satisfactory picture.

From the aforementioned requirements it is obvious that we have a totally new field of problems to overcome when we consider the recording of television signals on tape compared with recording audio signals. During the past 10 years different forms of television recorders have emerged. In the early days television signals were recorded directly on to tape in a manner similar to the recording of audio signals using the tape at a correspondingly higher speed to accommodate the increased frequency range (Fig.1). However, this has considerable problems both of practicability and of techniques. The later systems evolved utilized non-conventional methods of tape transport increasing the relative tape to head speed by rotating the head across the tape (Fig.2) — that is to say scanning the tape which gives a considerably higher effective head-to-tape speed than the actual tape speed and not recording the signal directly on the tape in its original form but by utilizing the form of a frequency modulated carrier. However, when we start to look at the problem of designing a tape recorder for the amateur this method is both costly and very critical. The alternative is to design a machine which is virtually a speeded up audio recorder utilizing special techniques.

One of the major problems in recording television signals directly on to tape is the octave range that has to be covered. As most readers appreciate the output from a tape is not identical to the input when no corrections are applied. In fact the inherent process of recording and playback is to differentiate the signal, and apply equalization in the form of integrity to restore the signal to its original condition. Where one is only handling a few octaves this is very easily achieved, but where equalization by integration has to be achieved over a frequency range in excess of 11 octaves, the technique becomes extremely difficult. This is one of the major problems in the design of a low cost video recorder.

Having now considered the difference between the requirements for a television tape recorder and an ordinary sound tape recorder my next article will discuss some further problems that exist and then go on to outline a possible design for a simple television tape recorder. The major functional parts of the circuit will also be dealt with.

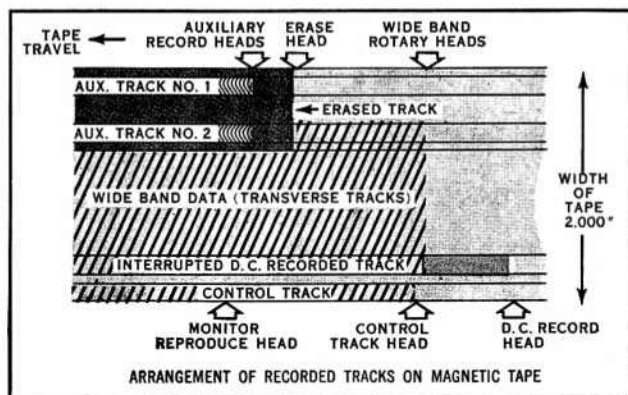


Fig.2. TRANSVERSE TRACK system on present day professional video tape recorders
Courtesy of Ampex Ltd.

PRACTICAL DOMESTIC VIDEO RECORDING

A LITTLE over a year ago ATR announced the first practical domestic video (television) tape recorder and at the same time speculated on the future of this exciting new creative recording medium combining vision and sound. As with most new inventions further research and development is often necessary before the manufactured version can be widely and confidently distributed. This has been the case with domestic video recording but there is no doubt now that several domestic video tape recorders will soon be appearing on the market. The electronics industry has not been idle in the development of this application of the now familiar method of recording on magnetic tape.

Many enthusiasts will remember that sound recording on magnetic tape was also a somewhat slow development to begin with, not so much in the method itself but rather the achievement of high quality recording over a wide audio frequency range. The magnetic recording of sound once required a working tape speed of 60 inches per second and even then the frequency range was limited. Then came 30 inches per second and later 15 inches per second and now of course high fidelity sound reproduction is commonplace for a tape speed of only $3\frac{1}{2}$ inches per second. It is important to remember this when considering the technical performance of domestic video recording equipment like the Wesgrove Electrics VKR500 which we announced last month.

It is also worth going back a little into the history of television itself; back to the first experimental work by John Logie Baird, who employed the Nipkow disc scanning system and finally produced a 30 line television picture only three by four inches in size; but it was a beginning and very soon other ingenious methods were devised, all with improvement to picture size and definition in mind. Most of these were mechanical systems such as the mirror drum method by Dr Karolus

shown in Fig. 1, but finally came the cathode ray tube and the high definition multi-line electronic scanning system now universally employed for television pictures. Modern high definition television however, requires transmitting and receiving equipment with a very wide frequency response and the same applies when we try to record, electronically or magnetically, television pictures from either a TV transmission or a TV camera. The technicalities of video magnetic recording will be explained in the articles by N. S. Rutherford, the first of which is included in this issue. It is interesting to note, however, that because of the narrow frequency response then required, television pictures produced by some of the early mechanical scanning systems could have been recorded quite easily on an ordinary modern sound tape recorder!

THE VKR500 VIDEO TAPE RECORDER

During the past month I have constructed and set in operation the VKR500 video tape recorder now available from Wesgrove Electrics Limited in kit form or as a finished and working instrument. I must however, emphasise that construction and successful operation from the kit requires fairly extensive knowledge of television and magnetic recording techniques as well as some practical experience in mechanics. Test equipment such as a multi-range meter and an oscilloscope are also necessary and the constructor must be prepared to locate certain parts of the circuitry in a standard television receiver.

The VKR500 kit comprises the recording deck, tape heads for sound and vision, a printed circuit board and all the components for the video and sound record/replay amplifiers and power supply. A full set of instructions and diagrams are included with the kit but these quite definitely assume that the constructor will have a reasonable knowledge of television and electronics etc.

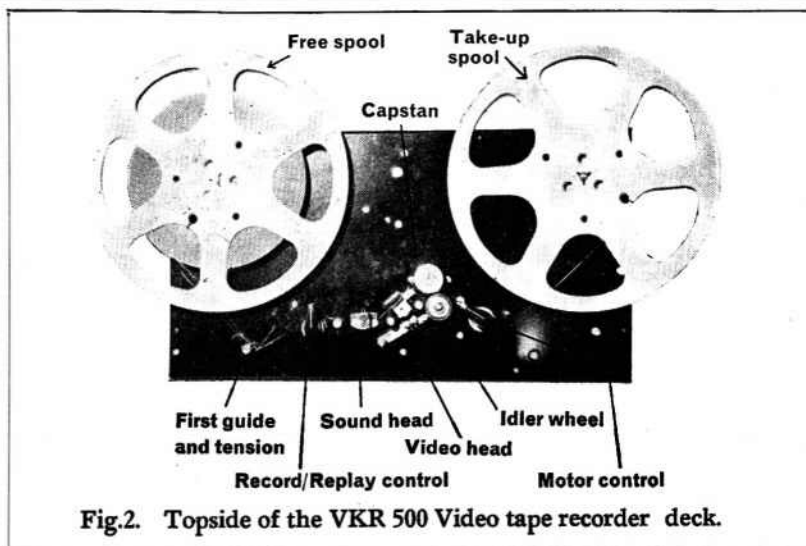
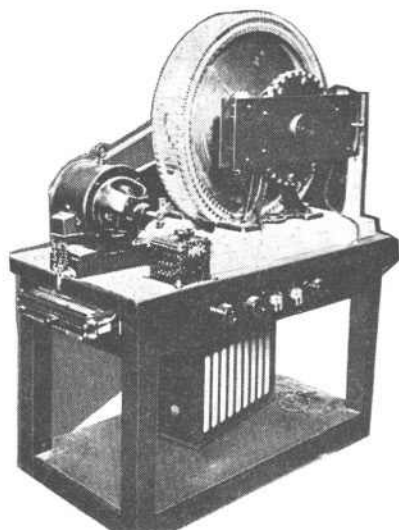


Fig. 2. Topside of the VKR 500 Video tape recorder deck.

VIDEO NEWS

It should be remembered too that at first video recording will be rather like beginning all over again with sound recording. In the early days of magnetic sound recording we knew little about the best kind of tape to use, the correct setting for recording bias, head alignment and other technical requirements. Frequency response correction, track designation and even the direction of the tape across the heads was something as then not standardised. It would be as well then to continue with something about the mechanics of the VKR500 deck and track designation etc.

THE VKR500 DECK

A topside view of the deck is shown in Fig. 2 and this may at first glance give the reader a false impression. Certainly it has the appearance of a conventional tape deck, which basically it is, but the tape path around the heads and guides for instance is a little more complex than usual. The tape spools are much larger ($11\frac{1}{2}$ " diameter), the single drive motor is much larger and more powerful than one would find in a sound recorder and when the deck is running the high tape speed is at first somewhat alarming. The tape runs through in the same direction as a modern sound recorder, i.e. left to right, but the speed is 12.5 feet or 150 inches per second. Two other speeds are available, namely 7.5 and 10 feet per second. The VKR500 takes standard quarter inch wide tape and for maximum playing time the use of triple play tape is recommended. I am at present using B.A.S.F. type PES.18 triple play, although it is possible that quadruple play tape might be used also, but so far no tests have been made with this. The track designation is similar to standard half-track sound recording in as much that the tape is divided so that each half carries a video and F.M. sound channel together. One can therefore utilise the two half-tracks in the same way as for sound only. The track arrangement is shown in Fig. 3, but at present

there is no certainty that this will become standard practice. There is a possibility that some simple form of cross-scan recording for quarter inch tape may be developed which would mean two different recording systems coming to use. There is also the possibility of half inch wide tape being used in conjunction with a cross-scan recording system or even utilised for four tracks with the system employed in the VKR500.

The VKR500 deck mechanism is comparatively simple as shown in Fig. 4. The integrated capstan-flywheel is belt driven from the motor and the capstan engages the tape with an idler wheel during record or replay. The take up spool is simultaneously belt driven from the motor via a slipping clutch so that the take-up spool winds up the tape smoothly as it leaves the capstan. This much is conventional but there is no forward or reverse re-wind and to re-wind a tape means reversing the spools and lifting the tape away from the heads. This has been done mainly to simplify the mechanism and drive and therefore keep down the cost of the deck.

There are two record-replay heads, one for video and one for sound. Erase is magnetic and is carried out by a small magnet mounted in a rotating guide which comes into operation during recording. Old tracks are therefore automatically erased. The video head employs the crossfield method which means there are two parts to the head, one each side of the tape. The wearable part of the head is replaceable. The sound system consists of a high frequency carrier which, in turn, is frequency modulated by the audio signals. The F.M. carrier is recorded directly onto the tape through the narrow track width head.

The electronics of the VKR500 are quite complex although construction is greatly simplified by the printed board which contains all the amplifiers, F.M. carrier generator and record replay switching etc. This I will deal with next month but at the time of writing I have just completed the construction of a VKR500 and have made and played my first television recording —from a BBC programme!

F. C. Judd

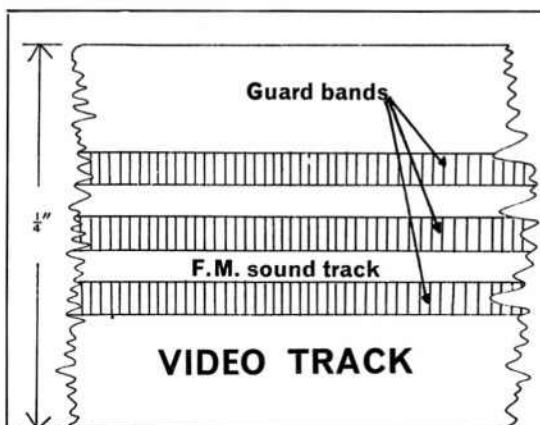


Fig.3. Track designation of the VKR 500 Video tape recorder.

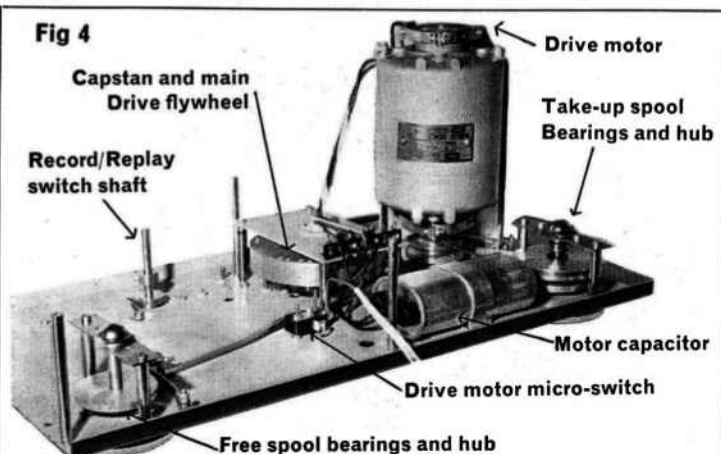


Fig.4. Underside of the VKR 500 Video tape recorder deck.

IMMEDIATE DELIVERY

TAPE T.V. PICTURES AT HOME NOW!

The amazing V.K.R. 500 is the world's first low-price Television Tape Recorder for immediate delivery! Its ingenious design in kit form allows easy assembly for the engineer and enthusiast alike.

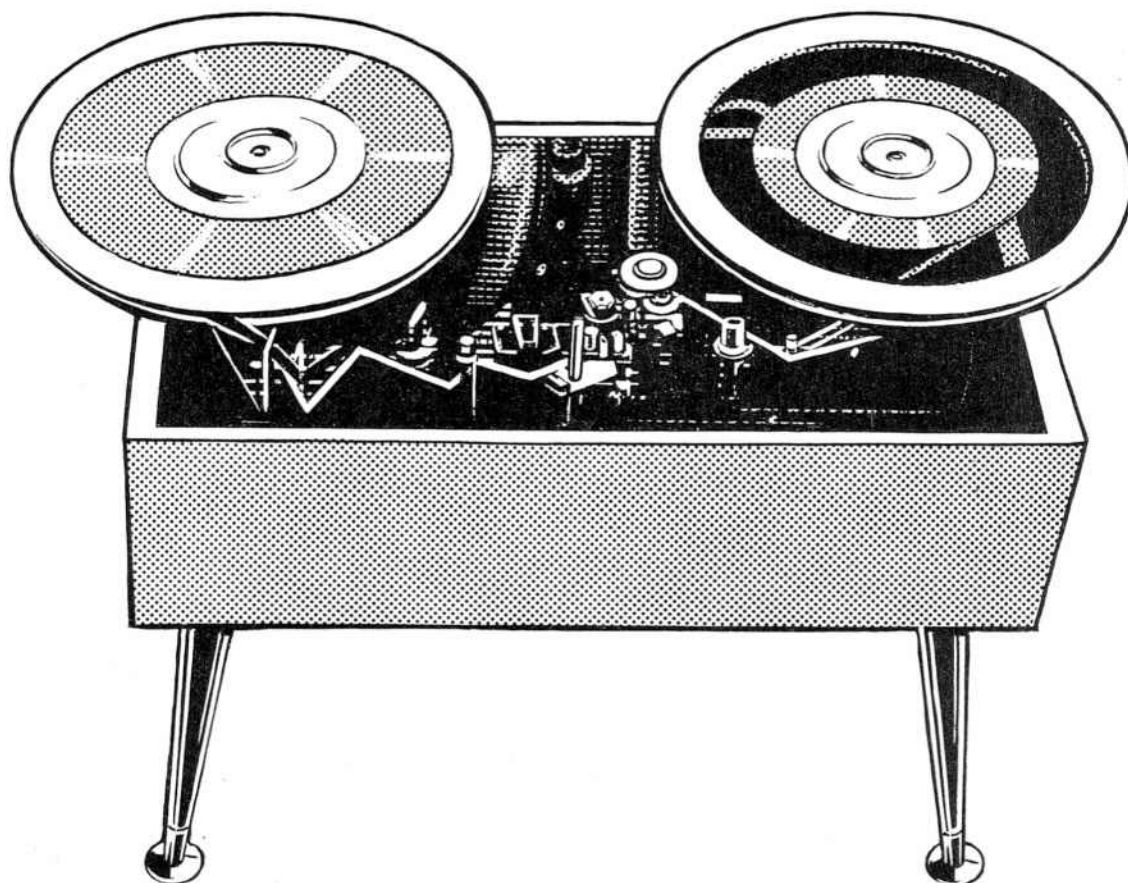
The V.K.R. 500 has entirely transistorised circuits, using silicon transistors on single printed circuit board, and may be used for recording from your own closed circuit television camera or "off the air" television programmes. A special feature is the employment of N.I.S.R. (Non. Integrating Sync. Regeneration) for really stable operation.

The V.K.R. 500 is the machine you've been waiting for! Running time up to 30 minutes approximately on each side of standard $\frac{1}{4}$ " magnetic tape.

**DON'T DELAY—ORDER
TODAY**

WESGROVE ELECTRICS LIMITED
Nash House, New Street, Worcester
Telephone: Worcester 25848

VIDEO RECORDER KIT ONLY £97-10-0 Complete



TAPE & TRANSISTORS

IN this series so far we have discussed the need for equalisation in the record and playback channels and last month we investigated methods used for feeding a constant signal current into the record head at all frequencies, excepting the effects of equalisation, of course.

Now let's take a look at the record channel as a whole, taking in the methods used for treble lift. The record channel usually employs three transistors. In domestic type machines, these would also be used in the replay channel, being switched from one function to the other by the "record/playback" switch.

In the "record" position, the first transistor is arranged as a low-noise programme amplifier stage, accepting, for instance, a low level microphone signal. The second transistor is an intermediate amplifier and it is often in this stage that the treble boost is applied. The third transistor is also an amplifier but it is in addition arranged to feed a constant signal current to the record head. Mostly, the three transistors will be found in the common-emitter mode.

A typical record channel circuit is shown in Fig. 1. Here the first transistor operates as a low-noise common-emitter stage with a high input impedance. This will, for example, accept a signal from a crystal microphone, crystal pickup or from any other high impedance programme source.

LOW-NOISE HIGH IMPEDANCE INPUT

The low-noise characteristic is facilitated (i) by the use of a low-noise transistor and (ii) by running the transistor with a relatively low collector current. The collector current is set to around 500 micro-amps by the base current, this in turn being set by the ratio of the base potential-divider resistors. These are the 220k and the 27k connected direct to the base of Tr1.

The high impedance input characteristic is provided (i) by a small value of forward current in the emitter junction, (ii) by the 1M resistor in series with the signal source and the base and (iii) by the employment of negative feedback.

Negative feedback results from (i) returning the top resistor of the base potential-divider to the collector instead of to the battery negative line and (ii) leaving the emitter resistor unbypassed. All the circuitry which we have considered in past articles is thus featured in the first stage.

To ensure that the noise performance of the first stage remains at optimum (that is applying always to its base the strongest programme signal), the volume control appears at the output of the stage. Of course, on the record channel this is the "record level control". Thus, the amplified first stage signal is fed to the top of the volume control through the 8mFd electrolytic capacitor.

TREBLE LIFT

The required level of signal is then tapped off by its slider and fed to the base of Tr2, again through an 8mFd capacitor. Now, Tr2 is arranged as an amplifier with frequency selective negative feedback. The feedback is made frequency selective by the parallel tuned circuit comprising L1 and C1 between the collector and base.

First, let us consider the operation of the stage at frequencies well removed from the tuned frequency of L1/C1. The tuned circuit will look to the signal almost as a dead short. Thus negative feedback is applied from the collector through the 8mFd isolating capacitor and the 5k preset resistor to the base. A very much smaller amount of feedback will also occur through the 220k resistor which is connected between the collector and the base electrodes.

Most of the feedback will be controlled by the setting of the 5k preset resistor, and the idea is to adjust this to provide the required nominal gain of the record channel.

Now let us see what happens at signal frequencies which correspond to the tuned frequency of the circuit L1/C1. As this is a parallel tuned circuit its through impedance rises considerably at the tuned or resonant frequency. At such frequency, therefore, the impedance of the major feedback loop is very much increased. This is the same as a reduction in feedback. The effect, then, is that the gain of the stage rises. In the response characteristic of the record channel we thus get a considerable lift in gain at the tuned frequency. This can be revealed on the response curve, as in Fig.2.

Just how much the relative boost will be will depend upon the original nominal setting of the gain by the 5k preset. If the gain was initially made very low (that is, with hardly any R in the loop circuit), at resonance the relative boost would be far greater than what it would be if the nominal gain was initially made large (with maximum R of the 5k preset in the loop circuit). The boost is relative to the nominal "off resonance" gain.

Now, just how peaky the top of the boost response will be will depend upon the Q of the tuned circuit. If this circuit is heavily damped resistively the top of the boost response will be quite flat and be effective over a wide range of frequencies. On the other hand, if the damping is small the boost response will occur over a comparatively narrow range of frequencies. The two conditions are shown in the example response characteristic in Fig.2.

Some treble boost circuits of this kind have a resistor across the tuned circuit to set the boost width (this may be a fixed or a variable resistor). In Fig.1, however, the damping is set to a compromise value by the 220k

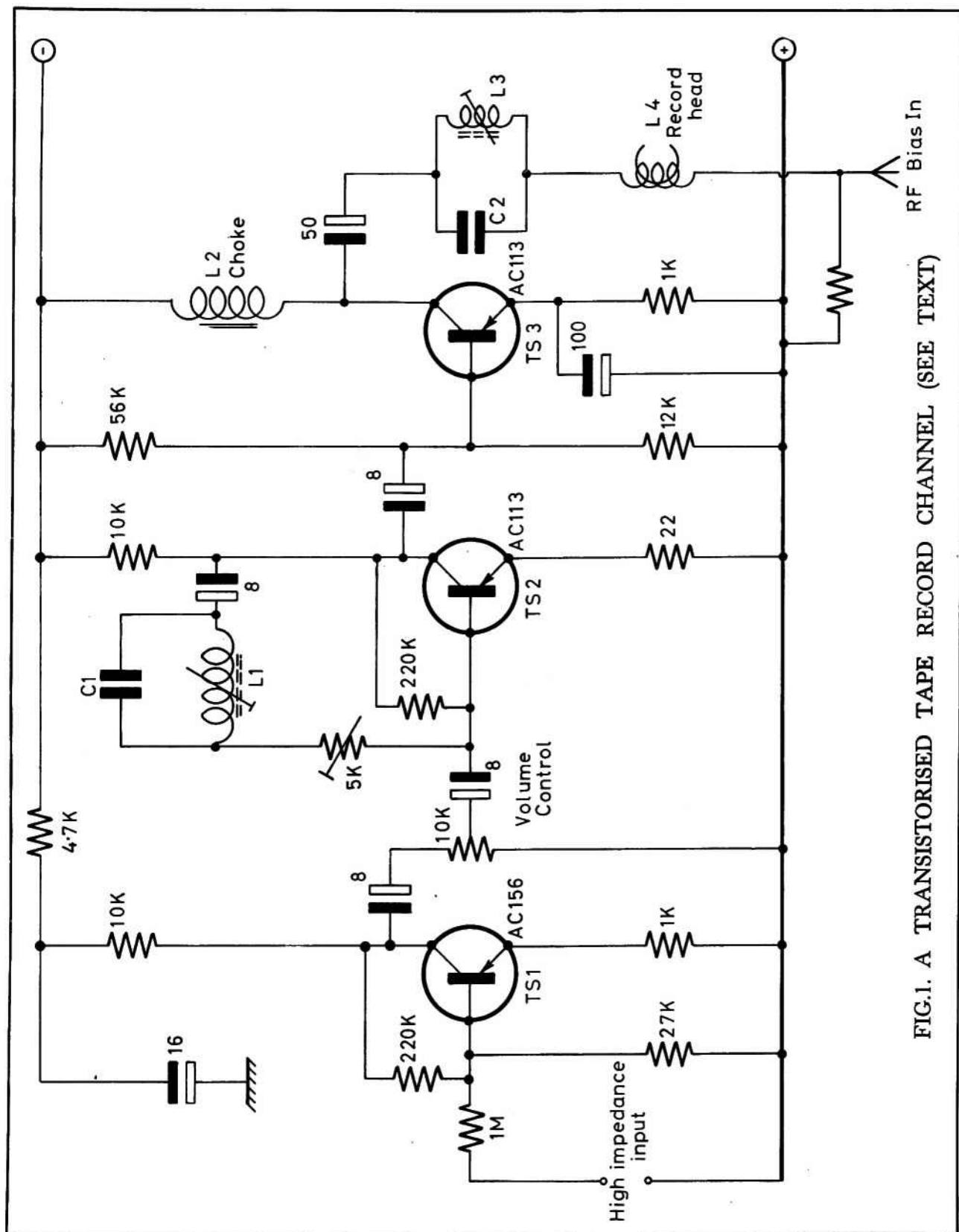


FIG.1. A TRANSISTORISED TAPE RECORD CHANNEL (SEE TEXT)

TAPE & TRANSISTORS

between the collector and the base of Tr2. This resistor is effectively in parallel with the tuned circuit. To recap, then, we have the core tuning adjustment on L1 which allows the boost to be adjusted to the required range of frequencies and we have the preset 5k which allows the amount of boost to be adjusted relative to the nominal gain of the channel. The width of the boost being controlled by the damping across the tuned circuit.

D.C. STABILISATION

It will be noted that Tr2 does not have the usual potential-divider connected to its base circuit. Without this, it may be wondered how d.c. stabilisation is effected. The action of the circuit in this respect is as follows.

The forward current in the emitter/base junction is established, of course, by the current flowing through the 10k collector resistor, the 220k base resistor and the 22-ohm emitter resistor. As the vast majority of the resistance in this circuit is in the 220k base resistor, it is this which sets the base current. The base current in microamperes can be discovered by dividing the collector voltage by the base resistance value in megohms. Thus, we have, say, 10 volts collector voltage divided by 0.22 megohms. This works out to about 45 micro-amps.

Now, suppose excessive temperature or some other cause incited an increase in collector current. Without d.c. stabilisation, it will be remembered, the collector junction would rise in temperature, producing a further increase in collector current and a further increase in temperature. A chain reaction would thus be set up and the transistor would soon destroy itself without a circuit artifice to counter the effect.

One of my earlier articles showed how the emitter resistor combats the effect in conjunction with the ordinary base potential-divider resistors. For example, Tr1 and Tr3 stages in Fig.1 have this form of d.c. stabilisation. It works like this; an increase in collector current produces a similar increase in emitter current. This increases the volts drop across the emitter resistor which makes the emitter rise negatively with respect to the base. This is the same as the base going less negative with respect to the emitter, a condition which pulls back the collector current automatically and thus prevents the stages going into so-called "thermal runaway".

So far as Tr2 stage (Fig.1) is concerned this effect cannot apply firstly because the base has no resistive circuit to the bottom of the emitter resistor and secondly, because the emitter resistor is only of a low value.

Nevertheless, an increase in collector current causes an increase in volts drop across the collector resistor which reduces the collector voltage. Because the base resistor is returned to the collector, a drop in collector volts causes a drop in base current. Therefore, as the collector

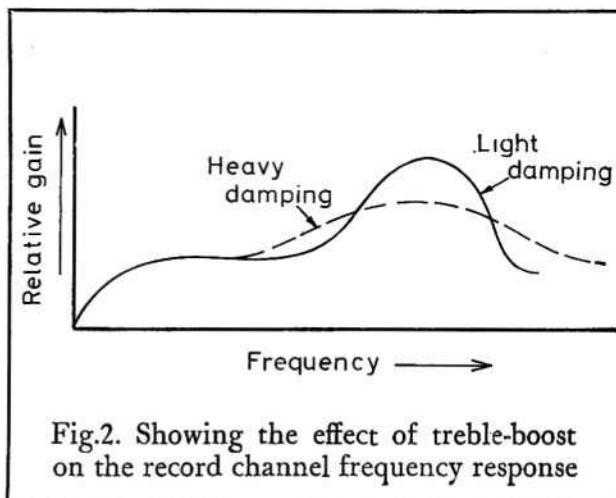


Fig.2. Showing the effect of treble-boost on the record channel frequency response

current tends to rise the base current falls which partly holds off the collector current rise.

The stabilisation with this kind of current is somewhat less potent than that with stages Tr1 and Tr3. However, it is of practical use for low power, small signal stages, and in any case, the relatively high value collector resistor makes it impossible for the transistor to pass a destroying collector current. The 10k resistor here in Fig.1, for example, would limit the transistor current due to a 10-volt power line to 1 milli-amp. The worse that could happen, therefore, would be saturation of the transistor. That is, for the collector leakage current (for it is this current that predominates when the junction temperature rises) to outweigh the collector current due to normal transistor action. The effect is called "bottoming" of the transistor and it kills all gain.

To finalise stage Tr2, it should be noted that the 22-ohm resistor in the collector provides a little negative feedback which tends to increase the input impedance and thus facilitates the action of the treble-boost system.

CONSTANT-CURRENT RECORDING

The signal at the collector of Tr2 is coupled through the 8mFd electrolytic capacitor to the base of Tr3. This latter transistor is arranged in a very conventional circuit, the collector of which is loaded to a choke and the record head to provide constant current recording, as explained in last month's article.

In some transistor record channels a tuned circuit, as L3/C2 on Fig.1 is included in series with the record head. This is tuned to the bias signal frequency, and the circuit, being of the parallel-tuned variety, prevents the signal from getting back into the record output transistor (Tr3) where its presence could cause interference and intermodulation troubles.

Next month we shall investigate the type of "record level" monitoring arrangements used in transistorised tape recorders, and we shall go on to explore the playback channel and its equalisation.

By Gordon J. King



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Sound Scene

News and views of the latest developments in tape recording

The Beocord 1500 Tape Recorder

This new stereophonic tape recorder from Bang and Olufsen is based on the design of the current Beocord 2000. Without mixing facilities or an output replay amplifier the Beocord 1500 is more suitable for the user who already owns a high quality hi-fi system yet desires the inherent qualities of the Bang and Olufsen Beocord 2000.

The Beocord 1500 features meter type recording level indicators. Provision is also made for any corrections required to stereo balance on recording or replay. Unlike the Beocord 2000 there is NO output replay amplifier, mixing facilities or provision for public address system. The Beocord 1500 retails at 89 guineas. For further details write to St Aldate Warehouse Limited, Innsworth Lane, Gloucester.



Kodak Tapes

Of particular interest to all owners of battery portable tape recorders is the news that 4" spools are now available within the range of 'Kodak' Sound Recording Tapes.

Kodak are now using a new and improved method of coating for all their tapes.

Kodak double play P200 (600ft), triple play P300 (900ft) and the remarkable new quadruple play P400 (1200ft.), tapes are all now available on 4" spools.

In the event of any difficulty in obtaining Kodak Tapes please contact Kodak Limited, Department 70, Kodak House, Kingsway, London WC2.

The Optacord 408 Tape Recorder

The new model from Highgate Acoustics is the Optacord 408, a portable mains, battery or car battery controlled tape recorder which retails at 39 guineas. It is a fully transistorised twin track mono recorder providing 60 minutes playing time



per track. Tape speed is $3\frac{1}{2}$ i.p.s. and the recorder takes $4\frac{1}{4}$ " diameter spools. It has a signal lever meter which also checks the state of the batteries which may be internal (5 x $1\frac{1}{2}$ v U2 cells) or external (6 or 12 volt car battery). The recorder will operate from main supplies of 110-240v, 40-60 c/s. The Optacord 408 has an internal speaker, monitoring facilities, provision for remote control and weighs only 4lb. Further details from Highgate Acoustics, 71-73 Great Portland Street, London W1.

New Message Tape (Fig.1)

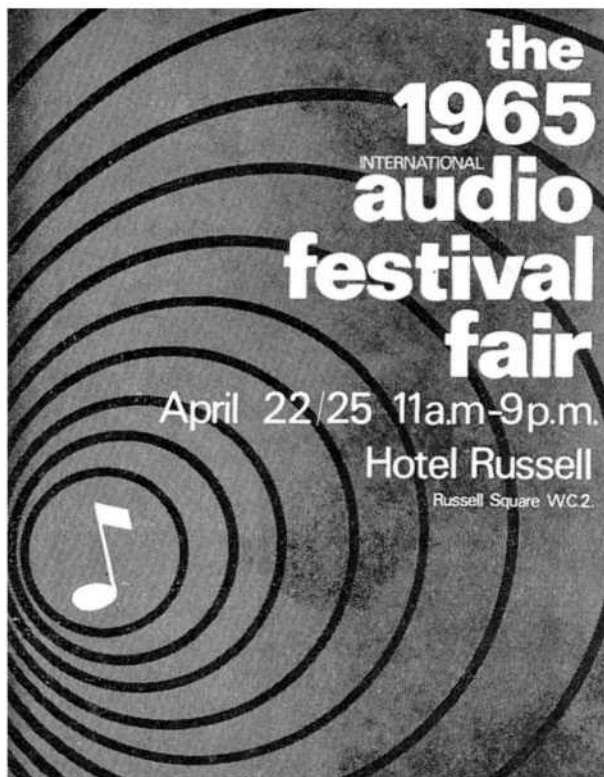
Mastertape announce that the Mini-Voice Letter, 10 minutes playing time on a 3" spool in a postal pack weighing $1\frac{1}{2}$ oz and retailing at 2s 6d has now been joined by the MASTERTAPE Send-a-Message, a new revolutionary postal packet with the same 10 minutes playing time but so spooled that the complete pack weighs less than $\frac{1}{2}$ oz. These retail at 3s each and are supplied to the trade on attractive wall cards, each containing 12 tapes.

The Mastertape Send-a-Message postal pack consists of a specially designed box measuring less than 2" x 2" with two address labels. The unbreakable polypropylene spool containing Triple Play tape, is only $1\frac{1}{4}$ " in diameter but has the standard hub centre. By virtue of its extremely light weight, postage by airmail to America is 1s 3d and Australia 1s 6d.

FIG.1.



Winner of the ATR Hi-Fi Competition No. 4 —
Philip Nichols, 21 Cedar Road, Bromley, Kent.



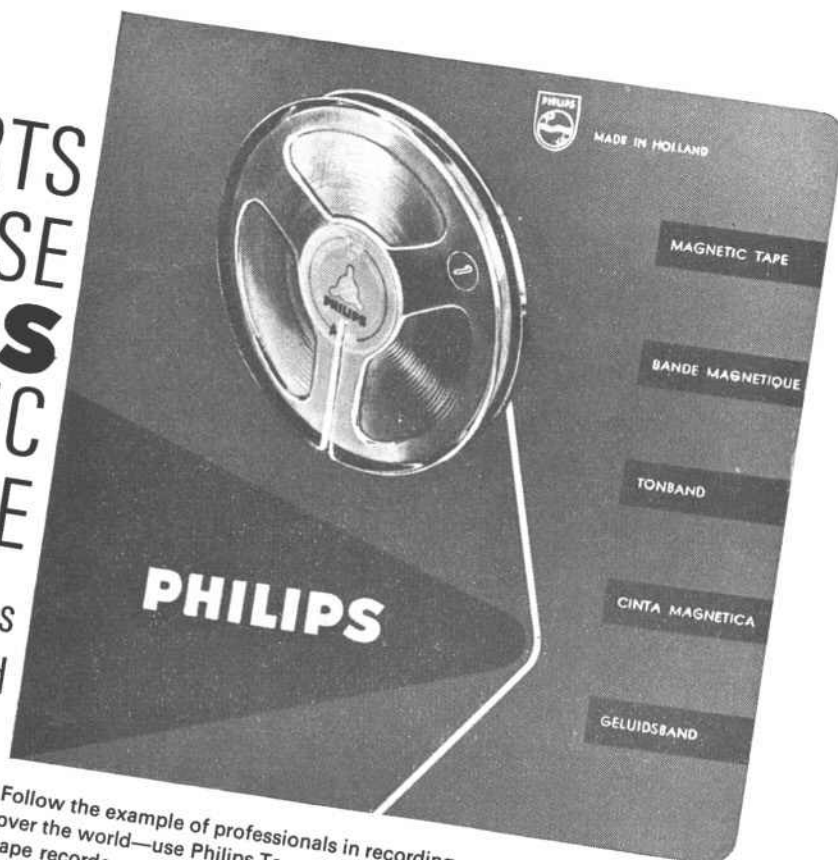
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(PTA0065A)

Amateur Tape Recording Video & Hi-Fi



TAPE RECORDING SIMPLIFIED

TAPE RECORDING AS A KEY TO MUSIC

THERE is no school of musical appreciation to equal a tape recorder provided all the apparatus used is of high quality. Before starting to record in 1961 I had listened to concerts, radio and discs, and while these gave a solid foundation the structure of my musical knowledge remained relatively narrow. Before discussing why this should be, here is a description of my methods. I do not say either that they are or are not the best but they are good enough for me.

RECORDING BROADCAST MUSIC

When I decided to acquire a tape recorder I wanted to be able to make the usual family records of live sounds. Because I had no serious purpose in doing so, I knew that the novelty

would fade, as in fact it did. Primarily I wanted to record and enjoy broadcast music, within the limits permitted by the copyright laws and the BBC. It was essential therefore, that the quality of reproduction should be the best I could afford, though I knew it could not be cheap. I think I might have done a little better by spending more money on loudspeakers, but so little for so much more money that I have no regrets.

First, the signal must be received. For this I use a Leak Trough-Line II VHF (FM) tuning unit, with automatic frequency control (necessary for recording VHF). This gives more than enough power for feeding the signal direct into the recorder, thus eliminating any further amplifiers and the risk of avoidable distortion.

The signal then goes into a Ferrograph recorder, a two-track machine, although after trials I chose the model giving speeds

TAPE RECORDING SIMPLIFIED

of $7\frac{1}{2}$ and $3\frac{1}{2}$, and always use the former for serious music. Ideally I suppose one should record at 15, but as I could not tell the difference (possibly because my ears have passed their prime) I elected the lower speed and half the tape consumption. A speed of $3\frac{1}{2}$ is quite satisfactory for speech but noticeably inferior for music.

The tuning-unit gain should be set fairly high and the recorder gain fairly low. I keep the former at about "3 o'clock" and the latter at about $1\frac{1}{2}$. This minimises noise-to-signal ratio, and there is no significant tape-hiss. The red line on the recording level meter should not merely never be passed by the needle, it should never be reached. On my meter the red line is at 8, and I try and make the needle touch 6 at the loudest points. If the BBC tuning note is used to make a start the needle should be under 5 on the meter. All this prevents noticeable distortion. It is a good idea to set the gain earlier in the programme, before the wanted item is reached, but speech is useless for this purpose. Once the gain is set leave it alone, or you will have to make adjustments during playback.

Switch everything on at least twenty minutes before recording. I chose the Ferrograph after making comparisons. Personally I believe it to be the finest tape recorder of its class for music, not only for quality but for ruggedness of construction. The capstan and heads must be kept clean, and until the bearings are run in they may be noisy (which, however, does not affect the recording).

If tape economy is important, as it is with me, both tracks must be used. This means that the length of tape cannot be tailored to fit each programme, and there may be some waste at the end. Usually the BBC give an indication of the length of the item. I have about fifty assorted reels of tape: 3,600, 2,400, 1,800 and 1,200 feet in length. There is to me no noticeable difference in quality between long play and double play, but "standard" thickness is noticeably inferior and should not be used for music.

It is likely that you will want to record single items out of a programme, though you may be lucky enough to be able to use a whole concert for your collection. By noting the time occupied by each item and subtracting it from the total playing-time of the spool you know how much playing-time you have left. Sooner or later you will want to record something which will almost fill the gap.

INDEXING

Indexing is simple but necessary to prevent hopeless confusion.

Revs.	Composer	Composition	Time

Each reel should be numbered and allotted a card. Each side of the card should be marked with reference to the tape track, in the top right-hand corner. The number of the spool should be marked in the top left-hand corner of each side of the card, which should be ruled in four columns with the headings shown in diagram below.

Under "Revs." enter the reading, on the revolution counter, at which each item begins. The first such reading on each side of the card will, of course, be "0".

Keep the cards in a filing box in number order. If the red leader tape on the spool happens to be at the beginning keep this side of the card to the front, and when you have played that tape turn the card round so that information concerning the other track faces the front.

There should also be a nominal index, as well as the numerical index. This should have a set of alphabetical guide cards with a separate card for each composer. His compositions are listed on his card, against the number of the spool and the track.

I have a third device, the rota. This is a box of cards with a number of a reel on each. As each is played it goes to the bottom, and if I have no special reason for choosing one reel rather than another, when I feel like listening to music, I choose the reel corresponding to the number on the top card of the rota, which is then put at the bottom. This serves the purpose of giving each tape an airing from time to time and discourages me from choosing music which I already know and like rather than break new ground. The device is of remarkable educative value.

ANNOUNCEMENTS

It is a matter of taste how much of the announcement, if any, is recorded. Personally I think it is a waste of tape, and distracting, to record announcements. It also becomes boring to hear the announcement each time the tape is played. It is better to write the necessary data on the cards, and have nothing but silence on the tape before and after each item. When waiting to record have your hand on the recorder switch, ready to switch on the instant the announcer stops speaking.

PLAYING BACK

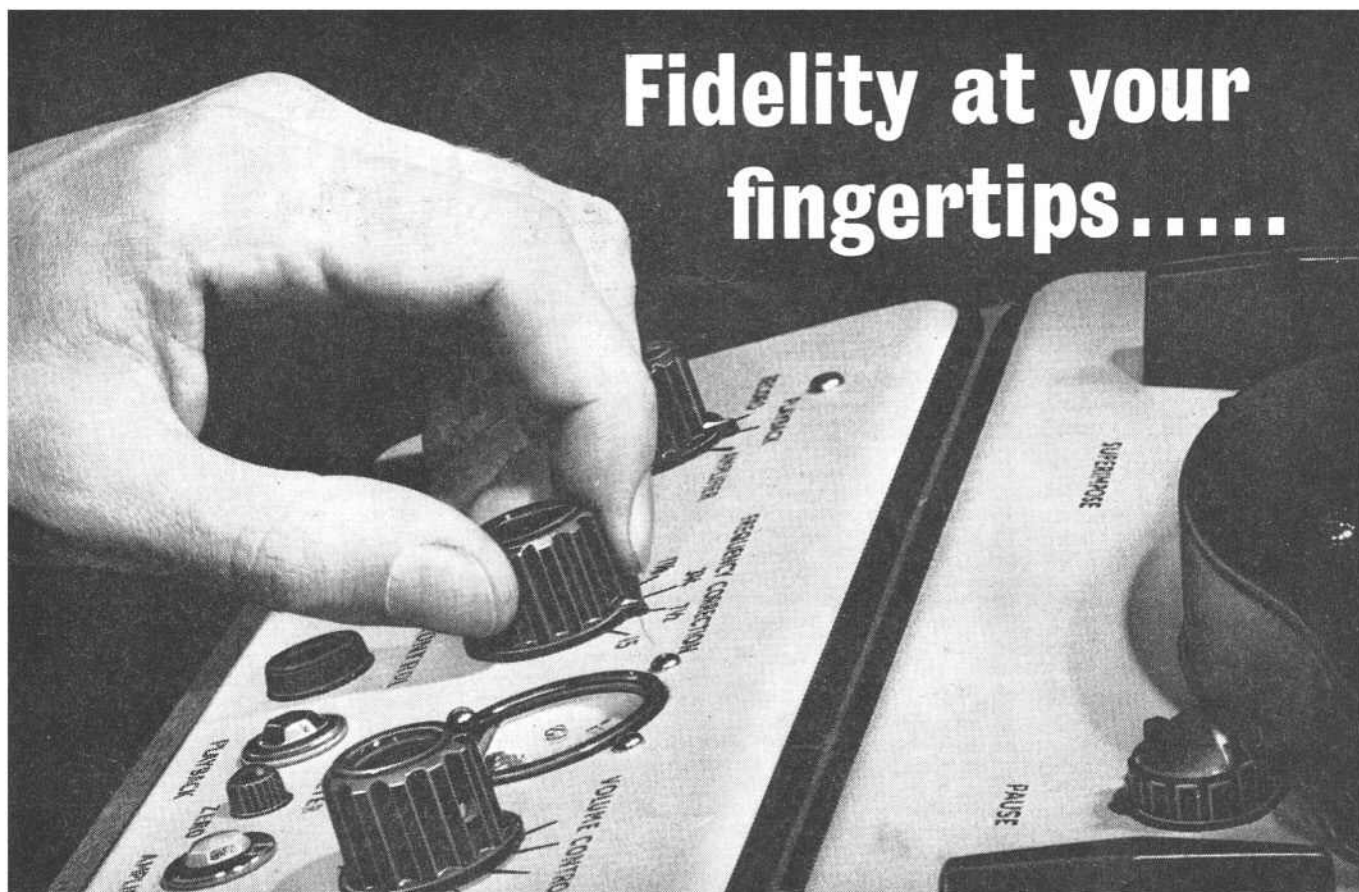
Loudspeakers tend to be the weak link in the technical chain, and their quality and installation are vital. I use a twelve-inch for the base and an eight-inch for the upper register. It might be better to divide the frequency range between three or more speakers, but I am content with my particular arrangement. The enclosure for the base speaker should be as large as conveniently possible, not less than nine cubic feet. The best position for a loudspeaker is in the corner of the room.

RADIO AND DISCS

Much has been said about the comparative merits of tape, radio and disc in the reproduction of music. For sheer quality a well-engineered and well-reproduced broadcast may be the best, but it sometimes comes when one is not in the mood. Above all, there is no possibility of repetition at will, which is essential if one's musical mind is to be broadened. Before I had a tape recorder Shostakovich bored and irritated me. Now I regard him as one of the few great living composers. Whether I am right or wrong about this I have gained a deal of unexpected enjoyment, which I should never have had without my recorder.

Discs give a high quality of reproduction but unless the listener has unlimited means it is difficult to use them as a means of exploring new music. I do not judge any music until I have heard it at least three times, but even if I like a piece of music I may have had enough of it after twenty-five performances. The merely superficially attractive is as useless as the downright bad.

E. B. SIMMONS



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TAPE CLUB NEWS

SEASON OF SPRING CLEANING

With spring really on its way, the prospect of loads of outdoor recording opportunities from now until October, clubs seem to have shaken themselves out of their apparent winter somnolence. Not that many clubs have actually been dormant during the past winter, but spring is a little more conducive to the spirit of "having a go". Many clubs too, are making the most of the spring spirit by shaking the cobwebs out of their organisation. Fresh committees, new programmes and the seeds of new ideas always seem to fall on more fertile ground at this time. News from club secretaries has been coming in thick and fast, and the choice of Club of The Month has been a particularly difficult one. By a very close shave, the honour goes to RUGBY A.T.R.S. who have been up to so much, and have so many things planned that I couldn't pass on the whole ten pages of news received from them!

"FERRO" NEWS

The second issue of "Ferro" contains twelve pages of news, views and listings of the newly formed **British Ferrograph Owners' Club**. Three Round Robin tapes (two mono and one stereo) are now doing the rounds, and a visit to the Ferrograph factory is being planned. It is hoped that this will also incorporate a useful get-together in the London area.

SWOPPING PROGRAMMES

Radio Barnsley is widening its horizons by frequent contact and exchanges with the Sheffield club. This means that good interviews, such as the recent one with the Beatles, will reach a much wider audience. Barnsley are keen to extend this idea to swops with other hospital broadcasting clubs further afield, thus lengthening the "life" of each recording, and incidentally reducing the headaches of the programme planners. Enquiries to C. T. Wilkinson at Radio Barnsley, Y.M.C.A., Eldon Street, Barnsley.

WORLD WIDE LINK

The **Bedford Tape Recording Group** and **World Tape Pals** were the links in a chain reuniting a mother from Eastern Europe with her dying son in a Bedford hospital. Taped messages were sent each way, and this human story rapidly reached international level, and national and political barriers were swept away, so that finally the woman was granted permission to leave her home and cross the Iron Curtain. Tape can often succeed where normal diplomatic channels fail! Club members have also enjoyed demonstrations of Grundig, Truvox, Elizabethan, Cossor, Tandberg, Goodman, Maxim, K.E.F. and Leak equipment as well as an interesting visit from members of the Aylesbury Club.

THE AGE OF MATURITY

The members of **Coventry Tape Recording Club** may well feel that they can lay claim to maturity after eight years of existence. In spite of setbacks and disputes (which occur in the best mannered families) the club has consolidated its position in such a way that at the recent A.G.M. the committee was re-elected almost en-bloc. Secretary is still Roy Reynolds of 1 Thurlstone

Road, Coventry. The club have also been working in co-operation with the **Coventry Film Production unit** in the making of a twenty minute colour film "The Mask of the Red Death", and are also making a documentary on the actual production of the film.

ENTHUSIASM

When the town of Derby was enveloped in thick fog recently the Chairman of **Derby Tape Recording Club** envisaged having to call off the club's fortnightly meeting. Much to his surprise and delight fifteen members groped their way to the meeting—that's enthusiasm for you! Tests of machines and loudspeakers have also kept the club attendance at a high level.

LEARNING ESPERANTO?

For the international medium of taping, what better than an international language? It seems that there are a number of tape addicts who are learning Esperanto, and Mr G. Stephenson of Hazelwood, Langshott, Horley, Surrey, would like to form a club of all who are interested in any way with learning, teaching or using this language. Anyone interested in this project should contact Mr Stephenson either by tape or letter giving name, address, main interests and basic details of recorder used.

CHANGE OF ADDRESS

The Secretary of the **Friern Barnet Tape Recording Club** has now moved to 86 Goldsmith Road, Friern Barnet, London N11. The Secretary is Mr A. S. Andrews.

HELPING DR BARNADOS

Members of the **London Tape Recording Club** have arranged another visit to the children of Britannia Lodge, the Dr Barnado's home at Woodford Bridge. With the spirit of Christmas fortunately lingering on throughout the year members are hoping to collect toys, sweets, chocolates, biscuits and even money to take with them. The children should prove charming subjects for the microphone. The club is also arranging an auction and a presentation of useful gadgets. Members have been asked to bring along any sundry items of equipment which they might like to pass on to other members. Vendors have the

choice of having items auctioned for club funds or if preferred auctioned for the member 10% going to club funds. A useful money raiser this.

WHYS AND WHEREFORES

Two recent programmes of the **North London Tape and Hi-Fi Club** have been devoted to the whys and wherefores of members' preferences. The first was entitled "My Favourite Tape" (along the lines of the recent ATR article?), and in the second entitled "My Machine" each member discussed the reason for his particular choice of recorder.

NEW SECRETARY

Following their recent AGM, members of the **Radio Club of Scotland** have elected a new committee which is busily planning programmes for the months ahead. The club meets each Monday at 7.30 pm in the club room at 336 North Woodside Road, Glasgow NW. The new secretary is John Douglas, 113 Novar Drive, Glasgow W2. Recent meetings have included demonstrations of a tuner/amplifier, a talk on interviewing, and a look back at the best items included in the past six issues of the Club's sound magazine "Spotlight".

RESOLUTION

After having done very well in the **ATR League Competition** during recent years (fourth, fourth and third over the past three years) members of the **Rugby Amateur Tape Recording Society** have unanimously resolved to be champions this year. They have started off in fine style with plans to provide tape programmes for local homes for the aged, and it is also hoped that members will re-form the club play reading group. A talk on **Amateur Radio**, a visit from **Coventry club**, a demonstration of **Acos mics** by **Cosmocord**, and taping with the **Millom club** are all helping to keep members busy, and the committee on their toes.

WELL-ESTABLISHED

Despite problems, including the inevitable turnover of membership apparently common to all local societies, the **South Devon Tape Recording Club** feels it has established itself as a reputable organisation in the Torbay area. This opinion

is strengthened by the fact that club meetings are now held in conjunction with the further education centre of the Devon County Education Committee. Recent activities have included tape and colour slide show of a continental scooter tour, and an interclub "tape battle" against a Plymouth club. This was won by S.D.T.R.C. with a score of 231½ points to Plymouth's 226. A return match has been planned.

CONTRIBUTIONS PLEASE

The editor of "Rounder", the magazine of Stereo International is appealing to British members of the club for editorial contributions to the magazine. It appears that although the officers of the club in this country have co-operated splendidly, the members have been utterly unforthcoming, and as a result they will not now receive, automatically, copies of "Rounder". It is disappointing that there are obviously still people who think that membership of a club is all take and no give.

THE PRICE OF FAME

Members of the Thornton Heath Tape Recording Club are finding that the price of fame is—more hard work! Recent publicity, both local and through ATR, has brought many outside appeals for help, none of which is turned down unless it is totally unavoidable. Outside teams have been covering the usual round of winter fairs and hospital programmes. The current four month programme includes visits from Tim Eckersley of the BBC, 3M's, Armstrong, Truvox, and a return visit from Derek Chatterton of the British Council. The club has also had a request from Boston Soundhunters to provide an evening's entertainment on tape for them, and Soundhunters will be returning the service.

MEMBERS PLEASE

The Ulster Tape Recording Society at present going through a rough patch are interested both in finding new members and hearing from other clubs. The new secretary is John McEntee of 68 Abyssinia Street, Belfast 12, N. Ireland.

GOOD FOR BOTH

The recent visit of Lustraphone to the Uxbridge and District Tape Recording Club turned out to the advantage of both sides. Lustraphone made a sale, and the very impressed club members are now proud possessors of two Lustraphone ribbon mics. These were put to the test when the club had to record a children's choir on the condition that the children were unaware of the recording being

TOP TEN FOR FEBRUARY

- 1 I.T.A.C.
- 2 Boston Soundhunters
- 3 Walthamstow
- 4 Rugby
- 5 Thornton Heath
- 6 Derby
- 7 I.V.A.S.
- 8 Hinckley
- 9 N. London
- 10 Harlow

TOP TEN FOR MARCH

- 1 Rugby
- 2 Thornton Heath
- 3 Walthamstow
- 4 Uxbridge
- 5 London
- 6 Coventry
- 7 Bedford
- 8 S. Devon
- 9 Barnsley
- 10 Radio Club of Scotland

LEAGUE TABLE

- | | | |
|----|----------------------|----|
| 1 | Rugby | 27 |
| 2 | Walthamstow | 26 |
| 3 | Thornton Heath | 25 |
| 4 | I.T.A.C. | 15 |
| 5 | Boston | 14 |
| 5 | Derby | 14 |
| 7 | Uxbridge | 12 |
| 8 | London | 11 |
| 8 | N. London | 11 |
| 10 | Coventry | 10 |
| 11 | Bedford | 9 |
| 11 | I.V.A.S. | 9 |
| 13 | Hinckley | 8 |
| 13 | S. Devon | 8 |
| 15 | Barnsley | 7 |
| 16 | Harlow | 6 |
| 16 | Radio Scotland | 6 |
| 18 | Esperanto | 4 |
| 18 | Ferroglyph Owners | 4 |
| 18 | Friern Barnet | 4 |
| 18 | Stereo International | 4 |
| 18 | Ulster | 4 |

made. With Tandberg and Truvox recorders hidden behind stage curtains, microphones that had cannily been placed beforehand, and a lot of connivance in appearing to be ordinary spectators, the stereo recordings obtained were absolutely first class. Clubs interested in hearing the results of these efforts should send a tape and postage cover to secretary Reg Bonney, at 25 The Close, Uxbridge, Middlesex. Tapes run for thirty minutes.

COUNCIL GRANT

Members of the Walthamstow and District Tape Recording Society were very pleased to receive from the Local

Council a cheque for £12 towards expenses incurred in the production of "Tapelink" their sound magazine for the blind. A contest held to find a signature tune for "Tapelink" was won by a junior member of the club, and his efforts will now precede the contents of each tape. The club's General Election documentary has now been completed and will soon be played back to candidates of the political parties concerned.

That's all for this month. Club reports should be sent to Mrs C. T. Cook, Haymarket Press, 86-88 Edgware Road, London W2.

THE TAPE DIRECTORY

An ATR Service to promote friendships through Tape Correspondence

Particulars of Tapespondents are given in the following order:—name, age, occupation, address; special interests, taste in music; type of machine, spool sizes, speeds; area of tapesponding required.

AUSTRALIA

GEORGE HARRIS, 23, E.T.A. with Postmaster General, 7 Coleman Avenue, Homebush, New South Wales, Australia. Radio/T.V., photography, cine; classical, light, but not rock. Elizabethan Pop 200, 5½ in., 33. Anywhere English speaking.

HARRY JAY, 59, Photographer, 5 Iona Street, Black Rock, Melbourne 9. Shows of theatre and cabaret, native music of all countries, life recordings; all types. National 703 and 773, Uher 4000 S. mono and stereo, 7 in., 1½, 3½, 7½. Anywhere.

FRANK KING, 38, Senior Police Constable, 12 Calstock Avenue, Ackland Gardens, South Australia. Science fiction, building construction, people; musical comedy. Philips EL 4-track, 7 in., 33. England, anywhere English speaking.

VAL T. STEPHEN, Doctor, 1 Eden Court, Toorak, Victoria, Australia. Creating and recording electronic music and musique concrete; Hammond Organ. Rola 66. National twin-track monaural, 7 in., 1½, 3½, 7½. Anywhere.

B. K. TAYLOR, 35, Examiner of Patents, 56 Altona Street, Heidelberg, N.23, Victoria, Australia. Literature, theatre; light classical and musical comedy. Robuk RK 3, 7 in., 1½, 3½, 7½. Netherlands, U.K., or elsewhere.

ERROL J. VANBLERK, 16, Student, 29 Singleton Avenue, Panania, Sydney, N.S.W. Cycling, bushwalking, recording bird calls, Boy Scouts (Seniors); jazz and popular, 6 in., 33, 7½. Anywhere.

BRITISH FORCES

S.A.C. JOHN R. H. TREND, 22, Air Traffic Control, R.A.F., Khormaksar, B.F.P.O. 69. Cinema, aero modelling; show music, pops. Country and Western, Akai M7, 7 in., 1½, 3½, 7½. U.S.A., British West Indies, especially Bermuda.

DEVON

FRANK WEBB, 19, Student Psychiatric Nurse, 11 Woodford Crescent, Marsh Mills, Plymouth, South Devon. Amateur dramatics, sound effects, matchbox collecting, reading, sailing, current affairs, short story writing; classical, light and heavy, film music, theme tunes and unusual pieces. Robuk RK 3, 7 in., 1½, 3½, 7½. U.K., U.S.A., Anywhere English speaking. Male contacts only, same age. Letters first.

DURHAM

COLIN GROCOCK, 17, Painter and Decorator, 7 Sun Street, Darlington, Durham. Photography, chess; Beatles. Elizabethan LZ 29, 7 in., 1½, 3½, 7½. England.

ESSEX

TREVOR F. MINNS, 31, Local Government Officer, Appley Lodge, New Captains Road,

West Mersea, Colchester, Essex. Royal Observer Corps, electronics, national costumes; folk and national music, light classical and operetta. Philips 4-track, 7 in., 15/16ths, 1½, 3½, 7½. Anywhere English speaking.

HERTS

GEORGE WILLETT, 21, Film projectionist, 160 Tippendell Lane, St. Albans, Herts. Electrical wiring, cinema film projectors, films, girls; most music. Brenell Mark 5 (Type M), 8½ in., 1½, 3½, 7½, 15. England—girls approx. 18-21. All tapes answered.

LANCASHIRE

NORMAN E. BEAUMONT, 20, Joiner, 21 Amersham Close, Davyhulme, Urmston, Lancs. 35 mm and cine photography, hi-fi and records, stamps, dancing; all music. Elizabethan 4-track mono, Truvox PD 87 2-track mono/stereo, 7 in., 1½, 3½, 7½. Anywhere English speaking, any age, either sex.

DENYS H. EASTWOOD, 42, Leatherworker, 11 Casserley Road, Colne, Lancs. Reading, music, travel, taping; all music. Philips 2- and 4-track, 7 in., 33. Anywhere.

CLIFFORD GRAY, 50, Aircraft woodworker, 21 Roas Avenue, Lytham Road, Ashton, Preston, Lancs. Sociology, travel, writing, poetry; popular, 4-track, 5½ in., 33. Abroad, not U.K.

JOHN WILFRID HARRISON, 27, Nylon Weaver, 48 St. Wilfrid's Road, Standish, Wigan, Lancs. 35 mm colour and b/w photography, hi-fi, collecting records; classics, Latin-American, most others. Truvox PD 82 twin-track mono, 7 in., 1½, 3½, 7½. Anywhere English speaking, outside U.K.

LEICESTERSHIRE

C. R. FIRTH, 48, Caretaker, Bungalow, Lantern Lane, East Leice, Loughborough. Varied interests, but mainly all aspects of sound recordings; all music. Simon SP 5, Uher 712, 7 in., 33, 7½. Anywhere English speaking.

LONDON

MAURICE SMITH, 17, Hairdresser, 74 Highclere Street, Sydenham, S.E.26. Tape recording; pop. Philips EL 3541 four-track, 7 in., 33. Anywhere English speaking, male or female.

ERIC G. WATERS, 46, Clerk, M4, 218 Portland Road, London, S.E.25. General; almost anything, except pop, music of the 40's. Stern/Mullard, 7 in., 1½, 3½, 7½. Everywhere—in England.

MIDDLESEX

MIKE WHEELER, 24, Assistant Theatre Manager, 5 Ennismore Avenue, Greenford, Middlesex. Films, theatre, photography, T.V.; jazz, pop. Philips EL 3549, 7 in., 15/16ths, 1½, 3½, 7½. U.K. and U.S.A. Male only.

NORFOLK

LEONARD A. ASK, 38, Male nurse, 7 High Street, Gorleston, Gt. Yarmouth, Norfolk. Bible study, nature, tropical fish; Dixie to light classics. Cossor, 7 in., 1½, 33. Anywhere, English speaking.

RALPH SIMPSON, early 30's, Woodworker, 8 Wellgreen, Grettenham, Norwich, NOR 027, Norfolk. Learning foreign languages, photography, travelling, collecting records; firm opera fan, also classics. Grundig TK 30, 7 in., 33, 7½. Anywhere in England—female opera fan preferred.

NORTHUMBERLAND

J. ANTHONY CORBETT, 23, Student teacher, 44 Burden Terrace, Jesmond, Newcastle-on-Tyne, 2. Photography, scooter riding; all types, especially accordion. Stellophone ST 450, 7 in., 1½, 33, 7½. Anywhere.

SHROPSHIRE

DENNIS G. DAVIES, 40, Railway Clerk, 41 Gobowen Road, Oswestry, Shropshire. 35 mm photography, canal cruising, travel, all; trad jazz, overetta, popular classics. Ultra 4-track, 5½ in., 1½, 33. Anywhere English speaking, either sex.

SOMERSET

PETER THOMAS, 39, 4 East View, Mangotsfield, Bristol. Still photography (all branches), shotgun shooting, long distance motoring to mountainous areas in England, Scotland and Wales; light music. Reps R 10 2-track mono, 7 in., 1½, 33, 7½. Any English speaking peoples.

SURREY

BROMLEY R. RUSSELL, 35, Sailor, 10 Denehurst Gardens, Richmond, Surrey. Travel, ships, M/N and R/N, photography; mixed. Philips EL 3585, 7 in. Anywhere.

MILES WILSON, 18, Own private recording business, Banstead Recording Studio, 5 Beacon Way, Banstead, Surrey. All forms of recording, radio/T.V., electronics; pop, light, jazz, light classical, Brenell Mark 5 M, Grundig TK 12, 8½ in., 1½, 33, 7½, 15. France, Southern England mainly.

SUSSEX

PETER NEEDHAM, 16, Arc Welder, 26 Etchingham Road, Eastbourne, Sussex. Anything concerning aircraft, travel films, swimming, photography, astronomy, sound FX; Sinatra, Martin Denny, big jazz bands, Continental pops. Cossor CR 1604, 4-track, 7 in., 1½, 33. Anywhere English speaking outside U.K. Some German spoken. Letters first.

WILTSHIRE

J. RAYBURN, over 50, Government Employee, Safari Kwisha, Harnwood Road, Salisbury, Wilts. Colour photography, history, travel; old fashioned, Grundig TK 23, 5½ in., 33. U.S.A., Canada, Australia. (Male only).

WALES

J. R. TILLER, 43, Laboratory technician, 138 Gladstone Road, Barry, Glam. Ballroom dancing, sailing, bowls; mainly classics. Grundig TK 14, 5½ in., 33. Anywhere English speaking.

DAVID LLOYD DIX, 27, Insurance Agent, 7 Greenhill Road, Pennar, Pembroke Dock, Pembrokeshire. Local preacher, children, photography, nursing; light music and pop. Philips twin-track, 5 in., 33. Anywhere overseas.

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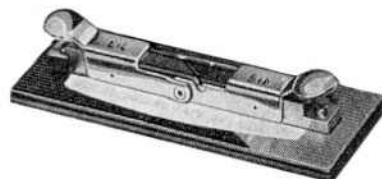
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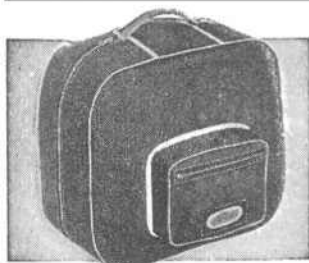
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More about video recording—another first-class "Tape Recorder of the Month"—a further absorbing article by D. Barnett on loudspeakers—these are some of the items you'll find in the April issue of A.T.R. In addition, E. A. Rule, chief designer of Armstrong Audio, will be discussing the advantages of F.M. tuners. H. Burrell Hadden of the B.B.C. will be writing about stereophonic sound. You can enjoy from your armchair the gaiety of the Rhine Wine Festival with Bob Danvers-Walker as your guide. There will be extra pages in this special April issue of A.T.R., and the demand will be great. Don't risk disappointment. Order your copy now.

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