

SCOTTISH SCHOOLS SCIENCE

EQUIPMENT RESEARCH

CENTRE

Bulletin No. 44.

January, 1971.

Contents

Introduction	- future exhibitions	Page 1
	- SSSERC services	1
Physics Notes	- reports summary	2
	- transistor amplifier	6
Display Laboratory		7
Trade News		8
In The Workshop	- mobile fume cupboard	9
Address List		12

Introduction

Our programme of exhibitions has filled up considerably in the past few weeks, and we will not be able to undertake other exhibitions until late May and June. The following are the dates which have been arranged for exhibitions in the spring; teachers intending to visit the display laboratory on or near these dates should telephone us in advance since it may well happen that the equipment they wish to see has been packed for exhibition.

<u>Exhibition</u>	<u>Place</u>	<u>Time</u>
SSSERC Apparatus*	College of Education, Dundee.	20th January
SSSERC Apparatus**	College of Education, Aberdeen.	10th February
SSSERC Apparatus*	College of Education, Jordanhill.	19th March
I.S.C. Second Cycle	Kirkcudbright	25th March
SSSERC Apparatus	A.S.E. Meeting, Dundee.	5th-8th April
I.S.C. Second Cycle	Science Centre, Ayr.	28th-29th April

Notes * College students only.
** Open to teachers in the evening.

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The New Year is by tradition a time for the forming of resolutions, usually of a distasteful nature and associated with the reformation of character and the strengthening of moral fibre. May we offer to all science teachers in Scotland, a resolution which for some of them at least, comes within that category? It is to make more use of the services which SSSERC offers in the forthcoming year. Once again we would emphasise that no query, whether by phone or letter, is too trivial to merit our attention. Our advice is free, and has the advantage of all advice that no one is obliged to follow it. It has always been our contention that the teacher who is to use apparatus should have the responsibility of deciding what that apparatus should be; our function is to provide as much and as up-to-date information as we can to enable him to reach a decision. As an instance of the type of help we are providing to those who ask for it, consider a typical batch of mail, such as might leave the Centre two or three times per week.

1. Letter to a teacher confirming his reservation of a chart recorder, and giving advice on how to connect up a Vuespec to it.
2. Letter to a L.E.A. advising on the purchase of top pan balances.
- 3./

3. Letter to an adviser in science confirming a future exhibition.
4. Letter to a teacher advising him that some surplus equipment he was unable to obtain earlier had come into stock and was being reserved for him.
5. Letter to a College of Education regarding bulletin addresses.
6. Letter to an English school teacher, enclosing an equipment list.

Add to this a similar volume of correspondence with manufacturers, and the answering of phone calls on such diverse subjects as a recipe for alkaline accumulator electrolyte, 8mm loop films on human reproduction, and how best to aid a school which is fighting its laboratory furnishers over bad finishing of the chemistry benches, and this gives an indication of the bread-and-butter service we provide to individuals.

Many teachers do make use of our services. It is certain that many more than actually write to tell us so, are grateful for the continued help the regular bulletin issue gives them. We have one carefully preserved letter from a teacher who confesses that were the school to go on fire, our bulletins would have precedence over the class register in any rescue operation. But we know too that there are some who remain unaware of the extent to which we may be able to help them. There are some who have conditioned reflexes to apparatus, so that when one says to them "Balance", quick as a flash the reply comes back - "Oertling"; say to them "Signal generator" they reply "Advance"; "Oscilloscope" - "Teleequipment"; "Power supply" - "Labpack". It is not our intention here to argue that these are not the best; merely to point out that there are others worthy of consideration, and that any teacher who takes his responsibility seriously ought to be aware of them before making his choice.

Physics Notes

Since the Centre came into being over five years ago we have produced more than 100 reports on various pieces of apparatus. During that time some of these items have been modified or become obsolete. We have therefore completed a review of our test reports, the intention being to bring the situation up to date, and we give below the results of this review in so far as it affects items of physics apparatus. The remaining reports, concerning biology and chemistry apparatus, will be reviewed in a future bulletin.

In the columns we give the firm who supplied the equipment, model or catalogue number, when the report was first issued and the current price. If a current price is given, it can be assumed that the model is on the market substantially unaltered from the assessment in our report, and no new report will be issued. Where no price is given, the explanation is usually that the model has been discontinued and may have been replaced by another. Where this has happened it can be assumed that we are testing the new model/

model, and a report on it will be available in due course.

E.H.T. Power Units

<u>Firm</u>	<u>Model No.</u>	<u>Report Issued</u>	<u>Current Price</u>	<u>Remarks</u>
Advance	PP12	4/69	-	Discontinued
Griffin and George	N10-380	1/69	£41.50	-
Philip Harris	P7998/01	2/69	£48.00	-
M.L.I.	95-14	9/69	£43.00	-
Baird and Tatlock	70/1532	2/69	£42.90	-
Radford Electronics	N14R	9/69	£32.50	-
Unilab	022.131	9/69	£37.50	-

E.L.T. Power Units

Griffin and George	GN104	5/67	£6.44	Cat. No. now N13-200
Philip Harris	P7997	5/67	-	Replaced by P7027/01
Philip Harris	P7997/12	5/67	-	Replaced by P7027/02
Linstead Electronics	S5	4/69	£5.25	-
M.L.I.	95-104	9/69	£6.60	-
Baird and Tatlock	K95/1520	6/67	£7.25	-
Radford Electronics	N104R	5/67	£9.00	-
Unilab	022.311	8/67	£4.00	-
"	022.312	5/67	£4.25	-

H.T. Power Units

Advance Electronics	PP13	11/68	-	Discontinued
Derritron Electronics	S1001	5/70	£24.00	-

H.T. Power Units, continued.

<u>Firm</u>	<u>Model No.</u>	<u>Report Issued</u>	<u>Current Price</u>	<u>Remarks</u>
Griffin and George	GN15	7/68	£34.80	Cat. No. now N10-400
Philip Harris	P7996	7/68	£37.50	-
Labgear	D4160	8/68	-	Discontinued
Linstead Electronics	S3	9/69	£20.00	-
Baird and Tatlock	70/1531	11/68	£45.00	-
Unilab	022.321	7/68	£32.00	-

L.T. Power Units

Advance Electronics	PP14	1/68	-	Discontinued
	PP15	1/68	-	Discontinued
B.E.R. Co.	PSU1	4/68	£38.50	Discontinued
Griffin and George	GN59	4/68	£27.80	Cat. No. now N11-580
Philip Harris	P7997/02	2/68	£22.00	-
	P7997/04	2/68	£25.00	-
	P7997/06	7/68	£34.50	-
Irwin and Partners	J1	1/70	£12.50	-
	EJ32	1/70	£19.80	-
Linstead Electronics	S4A	4/69	£17.00	-
Baird and Tatlock	K95/1300	5/68	£30.00	-
Radford Electronics	N59R	4/68	£22.50	-
	Lab59R	4/68	£26.50	-
Unilab	022.314	2/68	£12.00	-
	022.316	2/68	£25.50	-
Weir Electrical Inst. Co.	LV169	6/70	£19.00	-

L.T. Transformers

Douglas Electronics	MT51AT	4/69	£3.04	-
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L.T. Transformers, continued.

<u>Firm</u>	<u>Model No.</u>	<u>Report Issued</u>	<u>Current Price</u>	<u>Remarks</u>
Griffin and George	N10-660	1/69	£6.90	-
Philip Harris	P7009	2/69	£8.75	-
M.L.I.	95-27	4/69	£6.60	-
Baird and Tatlock	70/1556	4/69	£7.70	-
Unilab	022.212	1/69	£6.50	-

Millikan's Apparatus

Griffin and George	L89-960	11/66	£37.50	Cat. No. now L89-961
Philip Harris	P7988C	11/66	£24.75	Cat. No. now P7988/01
"	P7988R	11/66	£10.25	Cat. No. now P7988/04
"	P7970A	11/66	£4.00	Cat. No. now P7370/01
"	P7851	11/66	£14.87½	Cat. No. now 7988/02
Baird and Tatlock	N7/2463	9/66	£60.75	Cat. No. now 70/2463
"	N7/1533	9/66	£20.90	Cat. No. now 70/2463/12

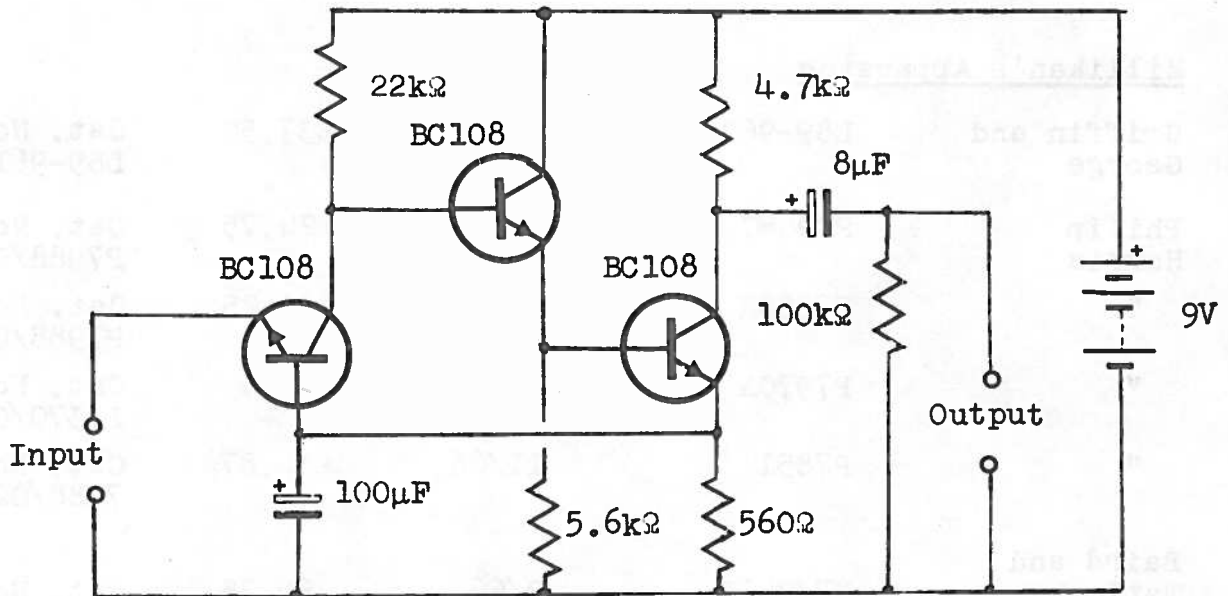
Pulse Electroscope

Griffin and George	L91-008	7/67	£9.42½	-
"	L91-013	7/67	£1.95	-
"	L91-017	7/67	£6.49	-
"	L91-025	7/67	£3.33	-
"	L91-043	7/67	£7.71	-
"	L91-260	7/67	£8.00	-
"	L91-262	7/67	£11.50	Replaced by L91-263
"	L91-160	7/67	£0.35½	-

Pulse Electrosopes, continued.

<u>Firm</u>	<u>Model No.</u>	<u>Report Issued</u>	<u>Current Price</u>	<u>Remarks</u>
Griffin and George	L91-046	7/67	£2.95	Replaced by L89-990
"	L91-049	7/67	£1.74	-
"	L51-120/21	7/67	£7.20	Cat. No. now L91-012
Philip Harris	P7990	6/67	£46.15	-
	P7990TH	6/67	£3.80	Cat. No. now P7990/05

* * * * *



The circuit given above is for a low input impedance pre-amplifier suitable for working into an oscilloscope such as the S51ES or OS12. The input requires to have a resistance of a few hundred ohms or less, so that it will operate with moving coil pick-ups, microphones etc. Perhaps its principal use in schools will be for displaying on an oscilloscope induced e.m.f's. from one source or another. Thus a reel of enamelled copper wire - and in some cases the inside end of the wire is accessible - which has had the wooden bobbin filled with florists' wire (Griffin and George, L71-950) will act as a pick up coil for Barkhausen effect, and the amplifier output may be fed to an oscilloscope or to a loudspeaker through a power amplifier.

The same coil will usually exhibit sufficient residual magnetism to show an induced e.m.f. if the teeth of a steel gear wheel are rotated close to one end of the core. Another application of the amplifier is in showing the waveforms obtained from a sonometer wire, by vibrating it in a magnetic field, even the earth's field in some instances.

No difficulty should be experienced in wiring the circuit on a/

a piece of Veroboard using the technique described in Bulletin 18. The current drain of the circuit is quite small, 2mA in operation and about 12mA if the input is open circuited, so that a small 9V battery such as a PP6 will be adequate, and any box which can take the components and the necessary input and output terminals will do. The circuit was originally built using OC71 transistors but BC108's are now cheaper than OC71's, besides being a better transistor. They can be purchased for as little as 7½p each from Diotran Sales or more usually 12½p each from e.g. Henry's Radio or Electrovalue. For those who have OC71's which they wish to use, the same circuit will serve provided that the polarity of the supply and of the capacitors is reversed.

Display Laboratory

The following items have been added to the Display Laboratory since this item was last included in Bulletin 40.

<u>Item</u>	<u>Manufacturer</u>
Water Barometer	SSSERC
Circular Motion Air Bed	SSSERC
Kinetic Energy Experiment	SSSERC
Moire' Fringes	SSSERC
Apparatus Trolley	SSSERC
Air Table for O.H. Projector	SSSERC
Orbital Models	SSSERC
Chlorine/Methane Experiment	SSSERC
Electrodes for Electrolysis	SSSERC
Proton Transfer Model	SSSERC
Mouse Breeding Cage	SSSERC
Mouse Observation Cage	SSSERC
Gerbil Cages	SSSERC
Xenopus Breeding Tank	SSSERC
Locust Breeding Cage	SSSERC
Differential Air Thermometer	SSSERC
Potometer with Atmometer Attachment	SSSERC
Photosynthesis Apparatus	SSSERC
Compensated Respirometer	SSSERC
Mobile Fume Cupboard	CLEAPSE
Safety Equipment	Safety Products
Rat and Mouse Cages	North Kent
Mouse Cage	Cope
AZ Microscope	Opax
M10A Microscope	Vickers
5/40 Stereomicroscope	Gray
Olympus HSC Microscope	Gallenkamp
Olympus VTII Stereomicroscope	Gallenkamp
Advanced Microscope	Griffin and George
Stereomicroscope	Griffin and George
Sterimag I Stereomicroscope	Vickers
Sterimag II Stereomicroscope	Vickers
Prefect Stereomicroscope	Perry
Swift 959-R Microscope	Pyser-Britex
Swift 82B Stereomicroscope	Pyser-Britex

Trade News

Three way plastic taps which we have used in many of our plant physiology demonstrations, are obtainable for 2s.6d. each from Henley's Medical Supplies. The function of the tap is such that the position of the handle indicates which of the three outlets is blocked off, the other two being connected. Although the outlets are of smaller bore, we believe that tubing could be adapted to use the taps for the more expensive glass type used on the Exelo gas syringe kit.

The NES microscope by Opax is now provided with fixed stage clips and eyepiece. The cost is £16.16s; this involves obtaining import duty remission on a DFA3 form which Opax will send on receipt of order.

Most of the drilling which the laboratory technician does is on thin sheet, although the hole sizes may vary from the very small for screws to the very large, e.g. for mounting meters. It is therefore very useful to have a single tool which will cut any size of hole in sheet metal, wood or plastic up to 3mm thick, or by reversing the sheet and cutting through from the opposite side, up to 6mm. The tool is in the shape of a stepped cone, each step corresponding to a 3mm diameter increase in hole size. Although made in a variety of sizes, probably the most useful in the science workshop is the largest, which will drill holes from 8 up to 38mm dia. Called the Bradrad, the tool costs £7.10s. from Wood and Cairns.

The same firm can also supply 4mm sockets in six different colours at a cost of £2 per 100, mixed or monochrome.

In our Chemistry Apparatus List, Item 131, hot air blower, (hair dryer) the Acme address which we gave is wrong. The correct address is given in the address list to this Bulletin, but it should be pointed out that this firm will not sell directly to schools, but can advise them of the nearest stockists.

Jay-Jay (Educational Measurements) have introduced a miniature Wheatstone bridge with electronic null detector, selling at £29.18s. The accuracy is 0.2% and the range extends from zero to 1.1M Ω .

The biology firm of P.K. Dutt have moved to new premises the address of which is given in the appendix to this Bulletin.

Service Trading Co. who advertise regularly in Wireless World, have a ring (toroidal) transformer, which offers the cheapest way yet of constructing a versatile low voltage power supply. The 100VA model, type RT 100VA requires 3.2 turns per volt, and costs £2.8s.6d. including postage.

Linstead Electronics are sole agents for the Rank Audio-Visual series of demonstration electronic tubes.

In The Workshop

We continue here the description of the mobile fume chamber which was started in Bulletin 43. The two sheets 76 x 43cm perspex form the doors. Brass slide bolts, 25 x 50mm, one at each corner of the front are used as hinges and have the advantage that the doors can be completely removed if necessary for inside cleaning. The hasps in which these bolts engage are fixed to the speedframe using self-tapping screws. At top and bottom of the inside inner edge of each door are fixed two terry clips, size 80/000. In the top and bottom members of the speedframe opposite these clips, four holes are drilled and tapped to OBA size. A 10mm length next the head of an OBA bolt is turned on the lathe to remove the thread, the bolt with a locking nut attached is screwed into the hole in the speedframe and the head of the bolt is then cut off. This forms a peg to engage the terry clip and so keep the doors shut (see Fig. 4).

In the lower half of each door is cut a 22cm square arm-hole, the lower edge being 8cm above the chamber floor. Thick rubber sheet 2cm wider all round, which in our case was cut from the inner tube of a lorry tyre is bolted with 4BA countersunk bolts round the rim and two cross-cuts are made in it to allow hands and arms to be pushed through for operating apparatus with the doors shut. In the lower edge of the right hand door at a point convenient to the electrical socket (see Fig. 1) a 15mm dia. semi-circular notch is filed out to allow any mains cable from the socket to enter the chamber. Perspex door handles, cut to the profile shown in Fig. 5 are bolted to each door.

In the floor of the chamber we have provided for water inlet and outlet, gas inlet, and waste water runnel emptying into a polythene bottle carried underneath. Water inlet and outlet would be used for example if a supply of coolant water was required; for intermittent use only one of these inlets would be joined to the tap situated on a bracket above the runnel. The latter is simply a polypropylene funnel set into a hole of approximate size trepanned out of the chamber base. If a funnel with an upper lip is chosen, e.g. Gallenkamp FP332, 11.5cm dia. the contour of the hole may be shaped to take the lip and no further means of support are necessary.

A 25cm length of brass bar, 25 x 3mm, is bent in a double L shape to make a bracket for the water tap, and is screwed into the floor. The tap, which is a nylon stopcock from Gallenkamp, ST-740, is held on the bracket with a Terry clip. The same stopcock is used for the gas inlet, and is a push fit into a tufnol bush turned to the dimensions shown in Fig. 6, and screwed to the floor. Although we made our own through connectors for the two water inlets, a push fit polythene tubing connector, Gallenkamp, TX-858 will serve equally well, being cemented with Araldite into a hole in the floor. A plate of mild steel sheet, bent up on all four sides to a height of 8cm to form an open box, is screwed to the trolley floor underneath the runnel, with dimensions such that it will just hold a polythene bottle of 3-5 litre capacity. A length of rubber tubing connects the funnel into the bottle to carry off waste/

waste water etc. A metal plate, made from 18 SWG mild steel sheet and measuring 13 x 23cm is used to support the control box for the fan, and a 13A electric socket with switch. It is bent to L shape and bolted to the floor of the chamber, and reinforced by a 25mm wide strip of the same sheet. The bolts fixing the plate to the floor are countersunk into it and are covered by the fillet running along the front edge of the floor; those fixing the reinforcing strap must be drilled and tapped into the floor if the latter is Sindanyo, but can be wood screws if a chipboard floor is used. Details of this are shown in Fig. 7.

Besides the necessary fixing holes, the metal plate requires four grommets holes for cable entry. These are one hole for mains input cable, two holes to carry the same mains connection between the control box and the mains socket, and one for the cable to the fan. A three-pin in-line cable connector is inserted in the fan cable near to the fan itself, so that it may be disconnected if the top of the fume chamber is removed. Clips made from copper sheet, and secured to the speedframe with self tapping screws are used to run the cable from the control panel along the framework to the top at the rear where the cable connector joins it to the fan. A jubilee clip is used to secure the flexible ducting to the fan outlet, and the necessary length of polythene tubing is pushed over the ducting and the free end passed out through a convenient open window.

The whole inside surface of the chamber was given three coats of polyurethane varnish as a protection against fumes, although we have since discovered that this stains in contact with even dilute acids, and we would have done better to have left the floor of the chamber untreated, save round the fillets which are unlikely to have glassware set on or near them. Certainly formica or sindanyo will withstand contamination from liquids better than varnish. N.B. In Bulletin 43 we wrongly stated in the list of materials that the thickness of the doors was 3mm, a mistake which arose when translating from imperial to metric dimensions. The perspex forming the doors should in fact be 5 - 6mm thick, as for the rest of the chamber.

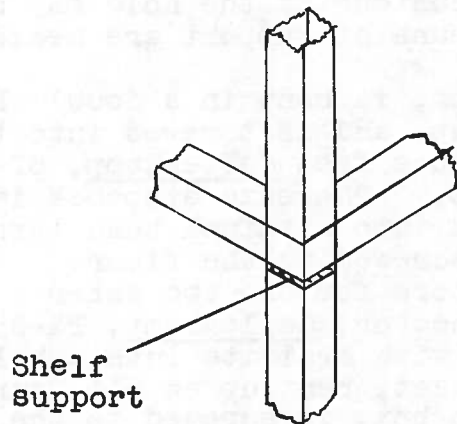


Fig. 2.

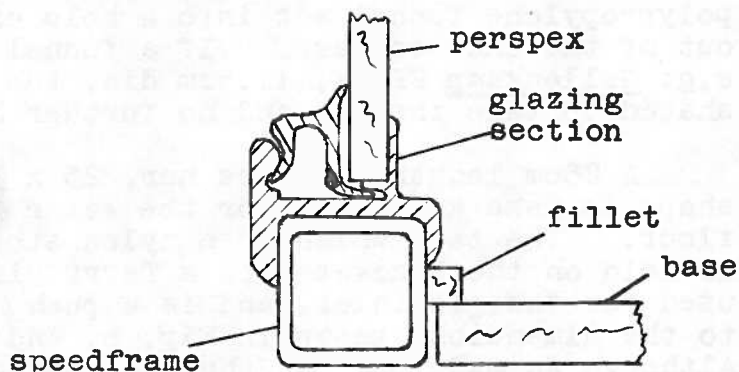


Fig. 3.

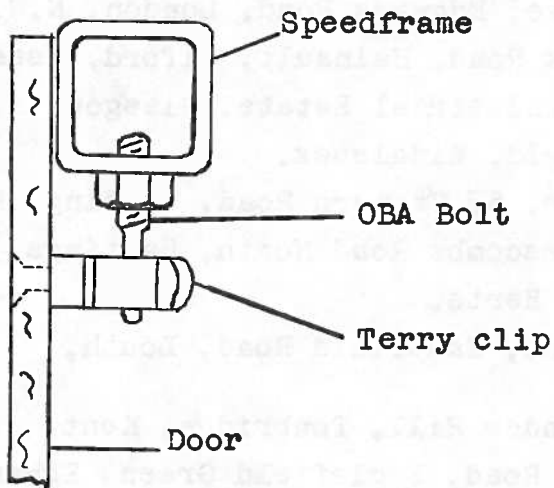


Fig. 4. Door catch.

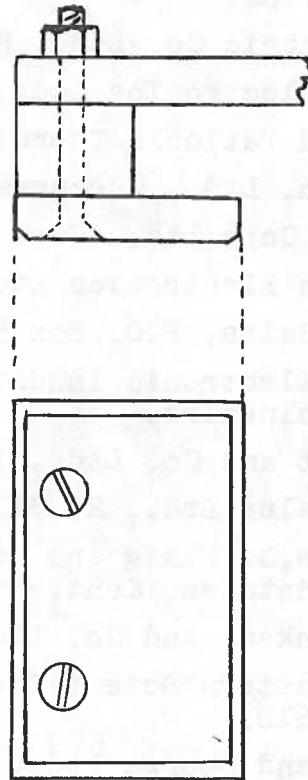


Fig. 5. Door handle, full size.

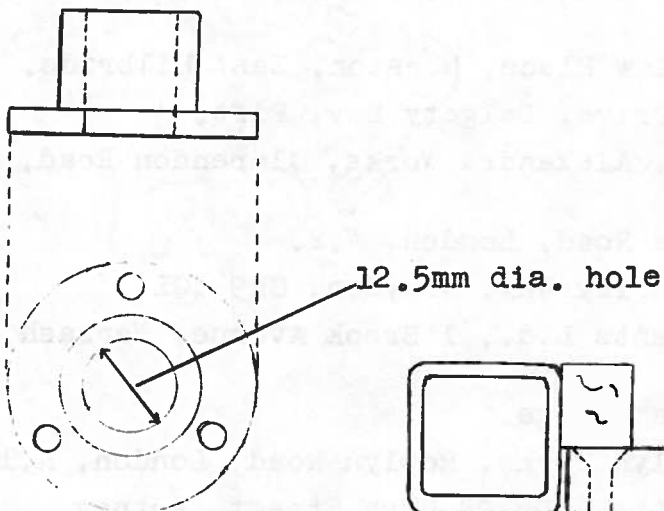


Fig. 6. Tufnol bush, full size.

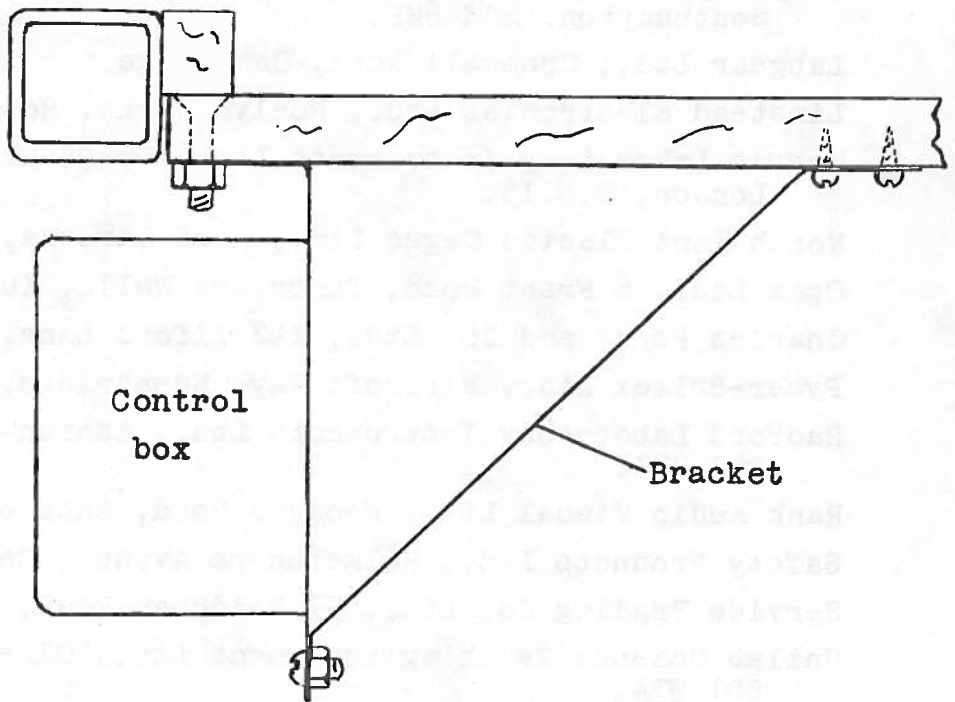


Fig. 7.

S.S.S.E.R.C., 103 Broughton Street, Edinburgh, EH1 3RZ. Tel. 031-556 2184.

Acme Electric Co. Ltd., Hyde House, Edgware Road, London, N.W.9.

Advance Electronics Ltd., Roebuck Road, Hainault, Ilford, Essex.

Baird and Tatlock, Thornliebank Industrial Estate, Glasgow.

B.E.R. Co. Ltd., Queensway, Enfield, Middlesex.

Cope and Cope Ltd., Vastern House, 57 Vastern Road, Reading, RG1 8BX.

Derritron Electronics Ltd., Sedlescombe Road North, Hastings, Sussex.

Diotran Sales, P.O. Box 5, Ware, Herts.

Douglas Electronic Industries Ltd., Eastfield Road, Louth, Lincolnshire.

P.K. Dutt and Co. Ltd., 115 Lavender Hill, Tonbridge, Kent.

Electrovalue Ltd., 28 St. Jude's Road, Englefield Green, Egham, Surrey.

(Exelo) W.G. Flaig and Sons Ltd., Exelo Works, Margate Road, Broadstairs, Kent.

A. Gallenkamp and Co. Ltd., Portrack Lane, Stockton-on-Tees.

(Gray) Eastern Scientific Instruments Ltd., Carrow Hill, Norwich, NOR 61B.

Griffin and George Ltd., Braeview Place, Nerston, East Kilbride.

Philip Harris Ltd., St. Colme Drive, Dalgety Bay, Fife.

Henley's Medical Supplies Ltd., Alexandra Works, Clarendon Road, Hornsey, London, N.8.

Henry's Radio Ltd., 303 Edgware Road, London, W.2.

Irwin and Partners Ltd., 294 Purley Way, Croydon, CR9 4QL.

(Jay-Jay) Educational Measurements Ltd., 1 Brook Avenue, Warsash, Southampton, SO3 6HP.

Labgear Ltd., Cromwell Road, Cambridge.

Linstead Electronics Ltd., Roslyn Works, Roslyn Road, London, N.15.

Morris Laboratory Instruments Ltd., 96-98 High Street, Putney, London, S.W.15.

North Kent Plastic Cages Ltd., Home Gardens, Dartford, Kent.

Opax Ltd., 6 Frant Road, Tunbridge Wells, Kent.

Charles Perry and Co. Ltd., 192 Ilford Lane, Ilford, Essex.

Pyser-Britex Ltd., Fircroft Way, Edenbridge, Kent.

Radford Laboratory Instruments Ltd., Ashton Vale Road, Bristol, BS3 2HZ.

Rank Audio Visual Ltd., Woodger Road, Shepherd's Bush, London, W.12.

Safety Products Ltd., Holmethorpe Avenue, Redhill, Surrey.

Service Trading Co. Ltd., 57 Bridgman Road, London, W4 5BB.

Unilab Science Teaching Equipment Ltd., Clarendon Road, Blackburn, BB1 9TA.

Vickers Instruments Ltd., Haxby Road, York, YO3 7SD.

W. J. Electrical Instrument Co. Ltd., Bradford-on-Avon, Wilts.

W. J. and Cairns Ltd., 7-9 King Street, Dundee, DD1 2JE.