Chapter 3.3 LOCALLY MANUFACTURED TOOLS

LIST OF CONTENTS

Scheme

3.3.1 **Introduction**

3.3.2 **Rivet removal tools**

3.3.3 **Rivet hole location jig**

INTRODUCTION

Scope of chapter

1. The schemes in this chapter relate to the production of repair tools which are of proven value but which have not been introduced as provisioned items. In some instances a tool described in this chapter may have a variety of applications and the instructions are written in fairly broad terms to allow for local adaptation.

New ideas

2. Local manufacture has always been a feature of Service workshops and the improvisation which is called for by difficult and unforseen situations is usually productive of some useful ideas. Many Units have designed repair tools which prove most effective in practice and by the interchange of ideas, through the medium of A.P.2662B, all Units will obtain the benefit of experience gained by others and a considerable saving in time, labour and materials can be made throughout the Services.

3. Proposals for the introduction or modification of schemes in this chapter should be made in the form of unsatisfactory feature reports, as stated in Scheme 1.1.4. The proposals will then be forwarded to the Directorate of Air Technical Publications, Ministry of Aviation, for inclusion in the A.P., if they are considered suitable.

4. Suggestions should be accompanied by as much information as possible on methods of construction and use. The information should include sketches or drawings and, if possible, photographs. A proposal should not be made until the equipment has been proved satisfactory in use, as further facilities for the manufacture and testing of such items may not be available.

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RIVET REMOVAL TOOLS

Drill guide

1. To prevent drill wander when removing rivet heads, the drill guide shown in fig. 1 has been designed as a simple tool which can be manufactured locally. The belled end should be concentric with the main bore and to achieve this the guide should be spun in a lathe to the correct form. The belling should also permit the tool to fit snugly around the rivet head, otherwise the purpose of the tool is lost and it would be less effective than centre-punching before drilling. The material used will depend upon the anticipated life of the tool; light-alloy tube is adequate for the removal of a few rivet heads but case-hardened steel tubing is preferable for extended use. On application it is essential to hold the drill at right-angles to the face of the work to avoid canting the drill centering tube.

Drill depth stop

2. A drill depth stop is desirable whenever a drill centering tube is used; it should be set in such a manner that after drilling the head, the rivet can be removed with a light chisel blow on the side of the head, followed by removing the shank with a parallel pin punch.

3. It may appear to be much quicker to centre-pop rivet heads and drill to a depth estimated by the experience of the operator; this method gives no accurate control of the depth drilled and can easily result in damage to the sheet metal. Using a depth stop and drill centering tube ensures that the sheet metal cannot be penetrated as the face of the sheet is used as a datum when setting the drill stop.

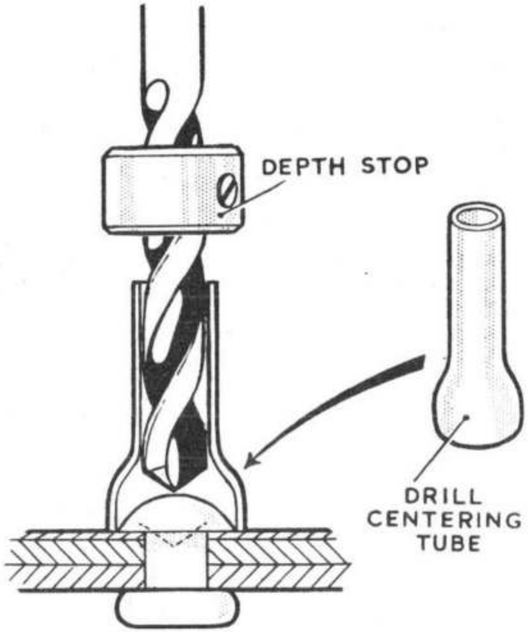

Fig. 1. Rivet removal

Rivet collector box

4. To avoid the danger of loose rivet shanks remaining in the structure after repair work has been completed, a collector box is recommended; this can take the form of a reaction block bored to permit the passage of a rivet head as it is punched out and counter-bored from the back to hold thirty or forty such rivets. The back of the block can be capped with a lid or a swing plate. Accessibility will determine whether or not the entry passage of the block should be concentric with the block or offset. The face of the block should be relieved to avoid interference with local rivet heads. Under no circumstances should loose rivets or swarf be allowed to remain within sealed compartments; apart from the danger of physical obstruction (e.g. blockage of drainage holes, interference with moving parts), corrosion due to electrolytic action is liable to occur and in the latter instance swarf, which is metal in the raw state, can be more harmful than a loose rivet which has had a protective treatment applied.

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RIVET HOLE LOCATION JIG

1. The location of existing rivet holes may need to be transferred to a new repair skin which overlaps the existing holes. If it is not possible to drill through from the holes which already exist, then a location jig must be improvised; such a jig is illustrated in fig. 1. Although the dimensions will be decided by the particular application, 16 s.w.g. mild steel strip, case-hardened locally at the pilot hole, will normally provide a satisfactory drill guide. The locating pin should be tapered and radiused to permit easy location and it must be smoothly finished at both ends to avoid scratching any protective treatment. The packing piece should be equal to the maximum gauge of material on which the tool may be used.

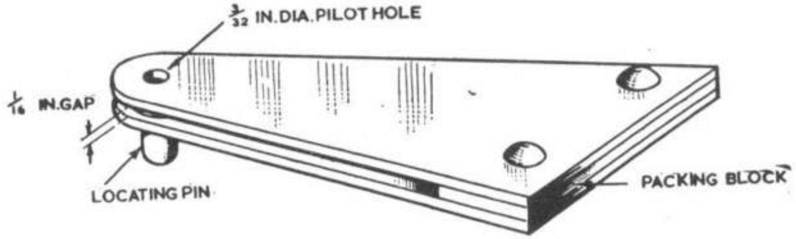

Fig. 1. Location jig

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Chapter 3.4 PROVISIONED EQUIPMENT

LIST OF CONTENTS

Scheme

3.4.1 Introduction

3.4.2 Score depth measuring gauge

INTRODUCTION

Scope of chapter

1. This chapter describes provisioned equipment which, although it may be familiar in general engineering practice, has a particular application in the field of airframe repairs. Scheme 3.4.2 introduces a typical example: a dial test indicator, an instrument in common use but which has been specially modified for the investigation of surface damage in the form of narrow scores. This equipment is particularly important in the inspection of pressurized hulls, where damage must be correctly measured to define the precise category of the damage in accordance with the aircraft Vol. 6 negligible damage tables. Previously used methods of inspection have involved very expensive equipment, which cannot be made generally available, or plaster cast techniques which are time-consuming and quite inadequate for precise measurements of one or two thousanths of an inch.

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SCORE DEPTH MEASURING GAUGE

Introduction

1. A score depth measuring gauge (Ref. No. 1B/5296) has been produced specially to meet the need for accurate and rapid measurement of damage in the form of nicks and scores in airframe structures. Negligible damage tables in aircraft repair books show that the accuracy of these measurements must be of a high order to avoid wrong classification. Particular care must be used to ascertain the extent of such damage in pressurized hulls, where apparently superficial damage that has actually passed the negligible damage stage may lead to early fatigue failure.

Description *(fig. 1)*

2. The gauge consists of a dial test indicator which normally records measurements from 0 to 0·250 in. in increments of 0·0001 in. An adjustable bezel, secured by a locking screw on the casing, permits the dial to be rotated as required to coincide with the main dial pointer. Each revolution of the main pointer, equal to 0·01 in., is recorded on a secondary dial set within the main face. An adjusting screw is incorporated in the top of the gauge to control a sensitive needle probe at the opposite side of the gauge. Movement of the needle probe by the adjusting screw is recorded on the dials. The needle probe is protected by a push-on adapter with two legs which permit the gauge to span a damaged surface up to approximately ⅛ in. wide. The modified gauge is not usable over its full normal range of movement but it is adequate for measuring the type of score which falls within the negligible damage range of most aircraft structures.

Recommended method of use

3. To use the gauge efficiently by hand alone, it is desirable to dispense with any movement of the needle probe adjuster, or the bezel locking screw, while the gauge is actually being used to measure damage. The method which will give the most accurate results is as follows:—

(1) Adjust the needle probe to line up, approximately, with the legs of the gauge, then place the gauge firmly on a true, undamaged surface which corresponds in general contour to the surface which it is intended to measure. Adjust the needle probe until the main dial pointer only just registers by a slight flicker as the instrument is gently rocked on to each leg alternately. Lift the gauge from the surface, release the bezel locking screw and turn the dial until zero is aligned with the main dial pointer *(A, fig. 2)*. Lock the bezel.

(2) Turn the needle probe adjuster counter-clockwise until the probe projects a distance somewhat more than the

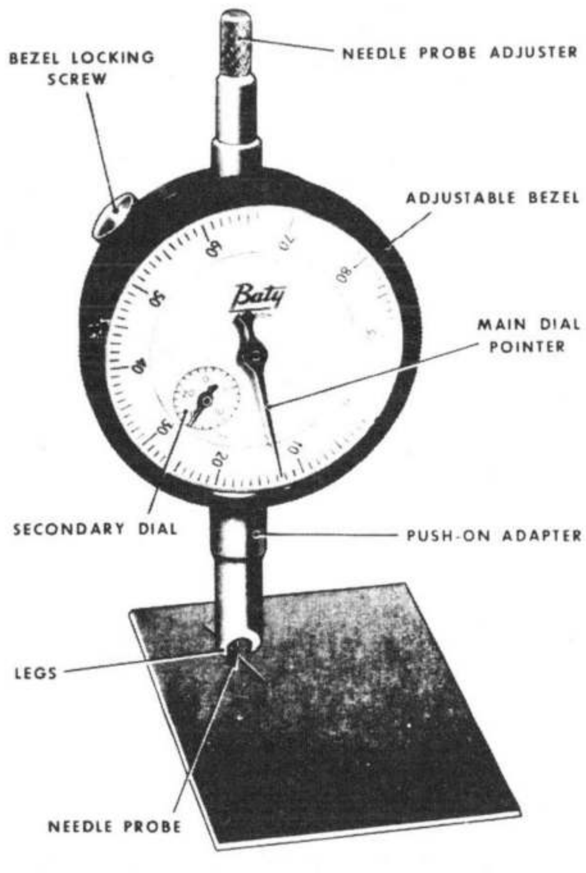

Fig. 1. Score depth measuring gauge

estimated depth of the score, say 0·004 in., shown on the dial as 60 *(B, fig. 2)*. Note that the dial pointer moves in a counter-clockwise direction.

(3) Again set the gauge firmly on the reference surface and ensure that the dial pointer indicates zero *(C, fig. 2)*. At this stage the indicator is set for any number of measurements on a surface corresponding to the reference surface and with scores not exceeding 0·004 in. in depth.

(4) To measure the depth of a score, span the score with the legs resting on undamaged material and with the needle probe penetrating into the deepest part of the score: note the dial pointer movement. The depth of the score is the measurement between zero and the main dial pointer, read in a counter-clockwise direction from zero, in this instance 0·0015 in. *(D, fig. 2)*. Several readings should be taken along each score to ensure that the greatest depth of damage is correctly established.

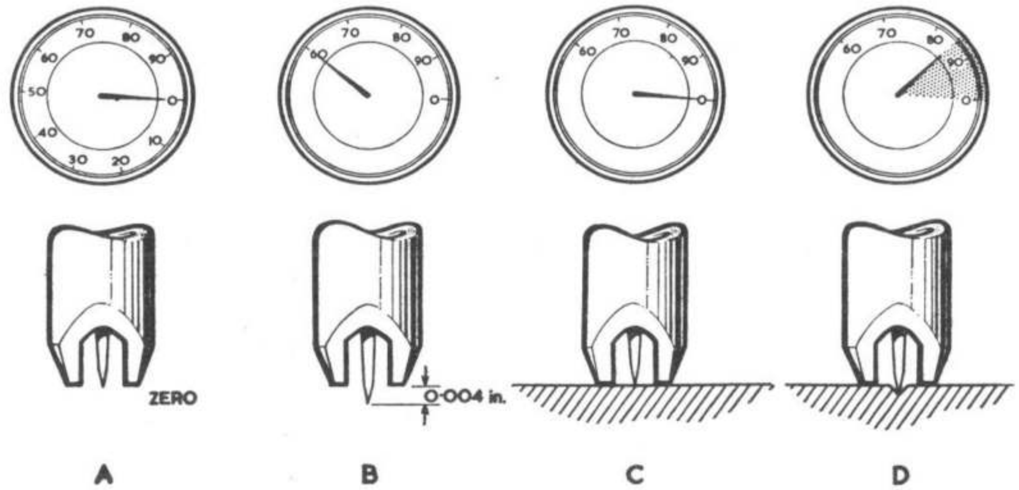

Fig. 2. Method of use

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Chapter 3.5 LOCALLY MANUFACTURED EQUIPMENT

LIST OF CONTENTS

Scheme

3.5.1 Introduction

3.5.2 Radiant-heat reflector

3.5.3 Adapter board

INTRODUCTION

Scope of Chapter 3.5

1. The schemes in this chapter relate to the construction of standard airframe repair equipment that is not available from normal provisioning sources. In the majority of cases, the items can be manufactured by User Units, using their existing facilities. If, however, M.U. or Aircraft Repair Yard facilities are required for manufacture of equipment, this fact will be stated.

Manufacturing details

2. Standard items cannot be precisely suitable for several different applications, either in terms of use for different purposes or on different types of aircraft. Therefore, manufacturing details in Chap. 3.5 schemes should not be regarded as mandatory and may be modified to suit particular applications unless it is specifically stated that the quoted information must be used. However, as an essential safety precaution, local modifications to the schemes must be approved by members of the appropriate trades, particularly modifications to electrical circuits.

Coverage of equipment

3. Some of the schemes refer to items of equipment that are complete in themselves and are used independently (*e.g. the radiant-heat reflector, Scheme* 3.5.2). Other schemes deal with items that are used in conjunction with existing provisioned or locally manufactured equipment (*e.g. the adapter board, Scheme* 3.5.3), or are introduced to modify existing equipment to enable it to be used for purposes for which it was not designed.

Instructions for use

4. When a scheme describes the construction of an item of equipment that is used for one specific purpose only, the scheme also contains the instructions for use of the item. If the equipment has several applications, however, only general instructions for use are given in the construction scheme in this chapter. Instructions for the use of equipment in this category for any specific application are given in the appropriate repair scheme, either in another Section of A.P.2662B or in the aircraft Vol. 6.

New ideas

5. The function of Chapter 3.5 is to supply information on the manufacture of time and labour-saving equipment for use in Service conditions. The obvious source of ideas and short cuts, based on experience, should be the Services themselves since the majority of minor airframe repairs during the life of an aircraft type are effected in the Services and not by aircraft manufacturers. The manufacturers normally have elaborate equipment to cover most contingencies and therefore have little incentive to produce ideas for equipment of this nature, particularly when the ideas are appropriate to field conditions.

6. Many units, and in some cases individuals, design and manufacture or improvise time and labour-saving repair equipment, often by modification of existing obsolete equipment originally intended for other purposes, but seldom develop or publicise these ideas. As far as can be ascertained no proposal for the inclusion, in A.P.2662B or its predecessor A.P.2662A, of a scheme for the local manufacture of equipment (or tools) has been received from the Services by the Section responsible for production of these A.P.s since A.P.2662A was first published. Similarly no recommendation for modification or improvement of existing schemes has been received.

7. By the interchange of ideas through the medium of the A.P., all Units will obtain the benefit of experience gained by others and a considerable saving in time and labour can be made throughout the Services.

8. The proposals for the introduction or modification of schemes in A.P.2662B should be made, in the form of reports of unsatisfactory features, as stated in Scheme 1.1.4, para. 6. The proposals will be forwarded to the Directorate of Air Technical Publications, Ministry of Aviation, for inclusion in the A.P., if they are considered suitable.

9. Proposals should be accompanied by as much information as possible on methods of construction and use. The information should include sketches or drawings and, if possible, photographs. A proposal should not be made until the equipment has been proved satisfactory in use, as facilities for the manufacture and testing of such items may not be available to the publications' personnel.

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Uses of the simplified reflector

1. The simplified form of reflector (*para.* 9) which has no temperature control, may be used for heating when a relatively high temperature is permissible and close control is not required. Typical applications in this category are for accelerated curing of the synthetic resin glue used for repairs to wooden components (*Sect.* 5) and of the synthetic resins used in repairs to glass fibre laminates (*Sect.* 7).

2. The simple reflector may be used for acceleration of protective treatment repairs (*Sect.* 9), but should not be placed directly on the repaired surface. Adequate ventilation must be provided by supporting the reflector clear of the surface and the new finish must be inspected periodically to ensure that bubbling or peeling is not caused by the application of excessive heat.

Use of the temperature-controlled reflector

3. The reflector fitted with thermostatic temperature control (*para.* 10) is used, for curing purposes, when it is necessary for the temperature to be maintained within a given range. A typical application is that of repairs to the neoprene covering on radomes (Scheme 9.4.1). The permissible temperature range for curing the neoprene is 25 $\pm$ 5 deg. C., and this range must be maintained for seven days. The temperature-controlled reflector may be converted to the simple type, for use at higher temperatures, by connecting together the thermostatic switch leads, thus eliminating the switch from the circuit. Suitable insulation should be provided.

Application to repairs

4. Various methods (*para.* 20, 21, 22) of retaining either type of reflector in position over a repair are used, according to the nature of the repairs and the contours of the surfaces. If a reflector is used for one restricted purpose only, permanent provision should be made for attaching the reflector to the appropriate aircraft structure. If the reflector is used for different purposes, or on surfaces with differing contours, it may be more expedient to use removable tapes of different lengths or sizes. If the reflector is not fitted with a dust and heat seal (*fig.* 5) soft packing (*para.* 17) should be used, when appropriate, between reflector and repair surface to prevent damage to the latter.

Earthing the reflector

5. As the reflector will be handled when switched on, an earth connection must be provided. If the supply can be obtained from a 3-hole socket and 3-pin plug, 3-core cable should be used and the earth lead, fitted with a suitable ring terminal, should be bolted to the reflector as shown in fig. 4. Some form of locking should be provided for the bolt. If the only source of supply available is a 2-lead lighting system, a separate earth wire should be bolted to the reflector and the other end of the wire should be connected to a suitable earth, such as a water pipe or radiator, when the reflector is in use.

MATERIALS AND CONSTRUCTION

Reflector materials

6. The most convenient material for the reflector shell is 20 s.w.g. polished aluminium sheet but aluminium alloy may be used if aluminium is not available. The degree of efficiency of the reflector, however, depends on the degree of polish of the reflecting surfaces and the lower the degree of polish, the greater will be the proportion of heat absorbed by the metal and dissipated to atmosphere.

7. Stainless steel sheet provides a good reflecting surface but is considerably more expensive than aluminium and is less likely to be available.

8. A bowl-type reflector with parabolic curvature is more efficient than the square design shown. If manufacture of a parabolic reflector (by spinning on a lathe) is undertaken, sufficient depth should be allowed to ensure that the lamp will be inset below the rim of the reflector.

Construction of simple reflector

9. The dimensions given in fig. 1 will provide a standard reflector suitable for many purposes, but the 16 in. and 10 in. dimensions may be varied to suit different requirements. The 2 in. central square should not be increased in size, however, as this would result in decreased efficiency. As the central hole accommodates a standard lamp socket, the quoted diameter of $1\frac{1}{8}$ in. is also standard for all sizes of reflector. The procedure for construction of the simple reflector (*para.* 1) is as follows: —

(1) Cut a 16 in. square from a sheet of 20 s.w.g. polished aluminium or alternative material (*para.* 6 *and* 7).

(2) Mark out the cut and bend lines and central hole as in fig. 1, omitting the 2 in. diameter ventilation holes.

(3) Cut the $1\frac{1}{8}$ in. diameter central hole.

(4) Drill a $\frac{1}{16}$ in. diameter hole at each corner (E, F, G and H) of the 2 in. square.

(5) At $\frac{7}{16}$ in. from E, on a diagonal EG, drill a $\frac{3}{16}$ in. diameter hole for the 2 BA earth-lead bolt (*para.* 5, *fig.* 4).

(6) Cut along the lines AE, BF, CG and DH.

(7) Bend along GK until the triangular tab GKC is raised approximately 45 deg. from the flat position. Bend up the corresponding right-hand tab on each of the other three sides in a similar manner.

(8) Bend along GH, HE, EF and FG in gradual stages, keeping the raised tab

RADIANT-HEAT REFLECTOR (*continued*)

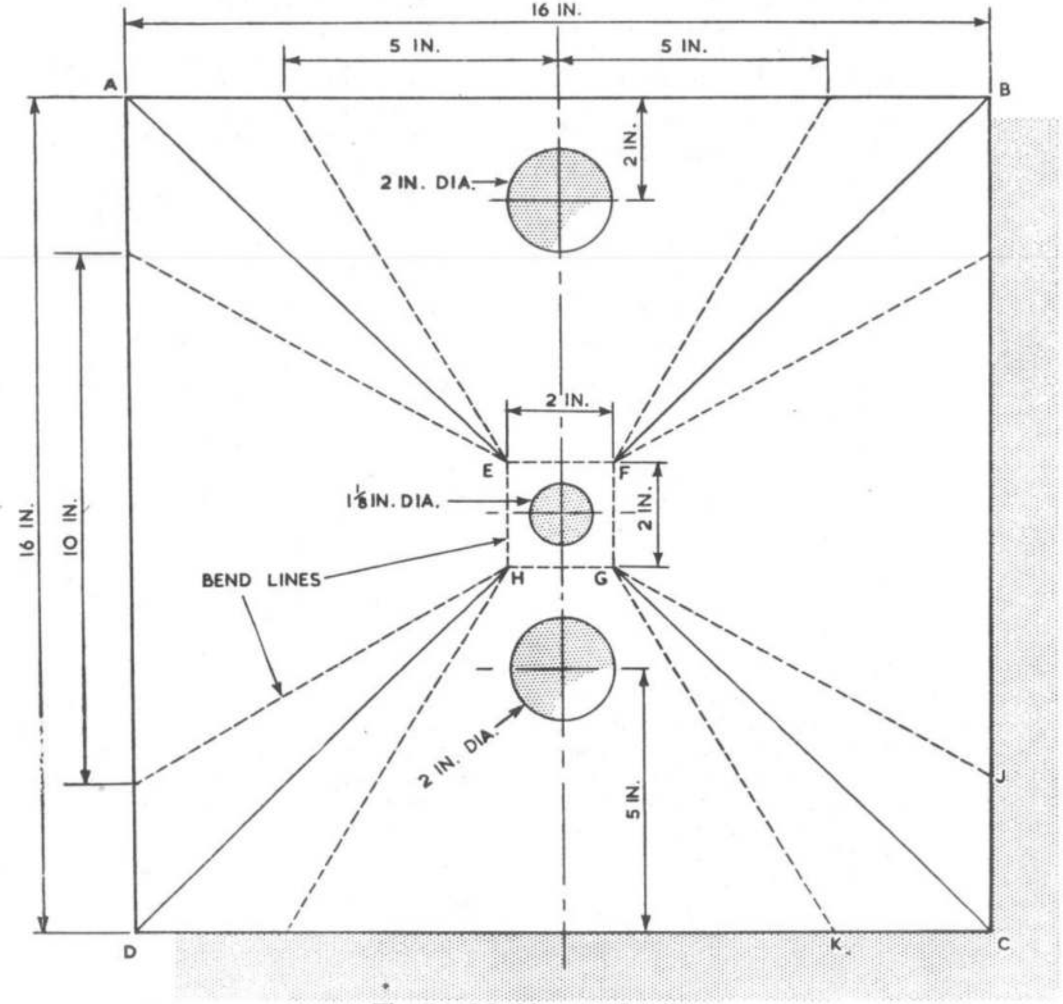

Fig. 1. Marking-out details

on the inside in each case, until the line JG coincides with line GK and the corresponding lines on the other three corners are similarly coincidental.

(9) Bend the tab JGC inwards, along the line JG, until the tab is flush on the adjacent face. Bend the remaining tabs until flush.

(10) Bend the protruding ends of the tabs alternately to the inside and outside, as in fig. 2, to clamp the sides together.

(11) Smooth off all sharp edges.

(12) Rivet attachment tapes in position or make alternative provision for attachment (*para.* 20, 21, 22).

(13) Insert a standard lamp socket into the hole provided and secure it by the threaded collar.

(14) Connect the supply leads to the lamp socket and bolt the earth lead (*para.* 5 *and fig.* 4) to the reflector.

Construction of thermostat reflector

10. The procedure for construction of the thermostatically controlled reflector is as follows:—

(1) Cut a square of the appropriate size and material (*para.* 9).

(2) Mark out the cut and bend lines and the positions of the central and ventilation holes (*fig.* 1). Also mark the positions for holes for the thermometer and for the clips for the thermostatic switch and leads (*fig.* 2 *and para.* 11 *to* 14), the swing cover bolts (*fig.* 3), the earth-lead bolt and thermostat leads (*fig.* 4 *and para.* 5) and the seal rivets (*fig.* 5). Mark the hole positions for the attachment tapes or brackets as appropriate (*para.* 20, 21, 22).

(3) Drill or cut all marked holes.

(4) Continue as in para. 9, operations (4) to (11) inclusive.

(5) If appropriate, fit brackets for attachment of the reflector to a stand or mounting.

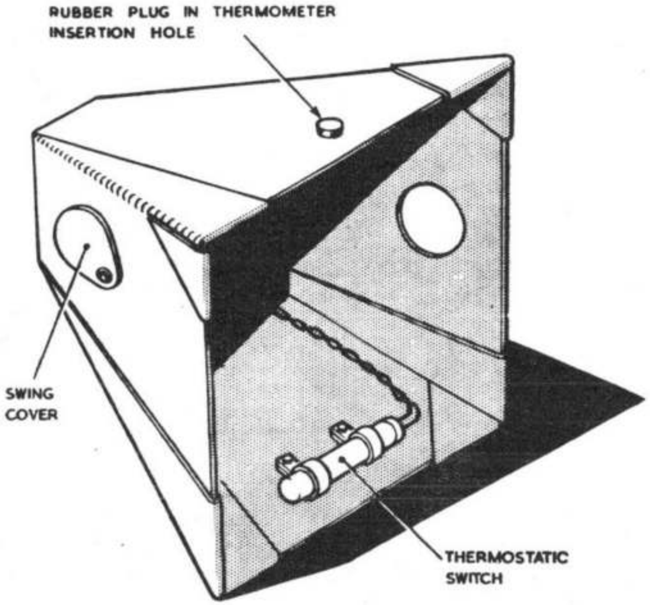

Fig. 2. Partially completed reflector

(6) Prepare the sealing materials (*para.* 17, 18, 19) and rivet the seal to the reflector (*fig.* 5).

(7) Prepare and fit the swing covers (*fig.* 3).

(8) Fit the standard lamp socket, thermostatic switch, heat insulating material and leads (*para.* 11 *to* 14) and complete the wiring as in fig. 4.

(9) If appropriate, rivet on the attachment tapes.

(10) Plug any holes or crevices that could admit dust with a suitable filler.

(11) Check the wiring, insert a 40-watt lamp in the socket and fit a suitable plug to the supply leads.

(12) Prepare the dust filters (*para.* 15) and attach the filters firmly to the inside of the shell with synthetic resin or similar adhesive. If appropriate, accelerate the cure of the adhesive by switching on the reflector and heating for the appropriate period.

(13) Close the swing covers and check the temperature range obtainable on an appropriate surface (*refer to Note*) by adjusting the thermostat first to minimum, then to maximum, allowing sufficient time in each case for the heat conditions to stabilize before checking the temperature at the repair surface by the use of a suitable thermometer. Repeat the check with the ventilation holes uncovered.

Note . . .

For a given thermostat setting, the temperature at the repair surface will vary according to the heat conductivity of the surface. Neoprene acts as insulation and will therefore be at a higher temperature than a metal surface which dissipates heat to the associated structure. The thermometer should be provided with a rubber sleeve to prevent contact between the thermometer and the edge of the access hole in the reflector.

(14) Repeat operation (13) with 25-watt and 60-watt lamps substituted in turn for the 40-watt lamp originally fitted, to ascertain which value is most suitable for use with the thermostatic switch fitted.

(15) With the most suitable lamp fitted and the reflector placed on the appropriate surface, adjust the thermostat to provide a temperature, as measured by the thermometer at the repair surface approximately at the mid-point of the range immediately required.

(16) Make a permanent record of the overall ranges of temperature available on different types of repair surface, with the swing covers open and closed and with different lamps, preferably by writing with a scriber on the external surface of the reflector. Record the effective temperatures given by the existing setting, as appropriate to the anticipated conditions of use of the reflector.

Thermostatic switch

11. The temperature range of operation required from the switch will be determined by the nature of the repairs for which the reflector is used. In the case of a radome neoprene repair (*Scheme* 9.4.1) the permissible temperature range is 25 ± 5 deg. C. (68-86 deg. F.). A thermostatic switch of the type used for regulating the water temperature in small fish-tanks or aquaria can be purchased locally for a few shillings and is suitable for the neoprene application. The fish-tank thermostatic switch is usually rated at 200-250 volts a.c., has a current-carrying capacity of at least 0.5 amp. and has provision for adjustment to an accuracy of 1 deg. F. within a range of 70 ± 10 deg. F. Other switches suitable for the reflector are those designed for use with small photographic appliances such as dishwarmers and print dryers.

12. A fixed-value switch may be suitable for some applications, but in the majority of cases provision for adjustment will be essential. In the simple form of thermostatic switch, adjustment is provided by a screw. The screw bears on a bi-metal strip, pressing a contact on the free end of the strip against a fixed contact. Forward rotation of the screw increases the pressure on the strip and thus increases the temperature required to cause the strip to break contact.

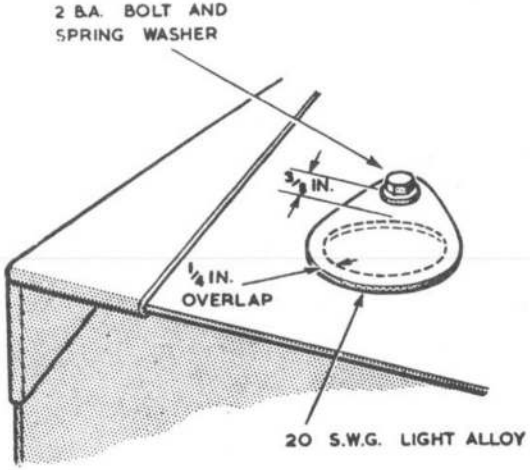

Fig. 3. Detail of swing cover

Fitting the switch

13. The use of clips for attachment of a cylindrical type of thermostatic switch is shown in fig. 2. When this type of switch is used, the clips must be positioned to make allowance for withdrawal of the switch from its tube for adjustment purposes. If possible the clips should be made from a heat insulating material. If metal clips are used, asbestos tape or mat packing should be inserted between clips and tube. Another strip of asbestos tape should be clamped between the clips and the reflector shell to screen the thermostat from direct heat from the shell. The heat insulation is necessary because too great a disparity between the temperature at the switch and the corresponding temperature at the repair surface would reduce the range available at the surface and could prevent the achievement of the minimum permissible surface temperature, even with the thermostat set to operate at its maximum.

Thermostatic switch leads

14. A rubber grommet should be inserted in the hole in the reflector provided for the leads connecting the thermostatic switch to the supply and lamp socket, to prevent chafing and to act as a dust seal. The leads should be clipped to the inside of the reflector but sufficient free length must be provided, when a cylindrical type of thermostat is used, to allow for withdrawal of the switch from its tube for adjustment purposes.

Dust filters

15. When a reflector containing ventilation holes is used for repairs from which all dust must be excluded (*e.g. radome neoprene repairs*), the holes must be covered with a suitable dust-proof material. The use of very fine mesh metal gauze or glass fibre fabric is recommended. If neither of these is available linen fabric may be used, but it is advisable to treat the fabric with a coat of dope. Sufficient dope should be applied to lay all loose fibres without completely sealing the fabric.

16. If swing covers are unnecessary, the dust filters should be fitted on the outer surfaces to effect the minimum possible reduction of the area of the reflecting surfaces. Clamping rings or an adhesive may be used. When it is necessary for the filters to be fitted on the reflecting surfaces, they should be cut to the minimum size possible, commensurate with a satisfactory bond to the shell, and attached by a synthetic resin or similar adhesive.

Prevention of surface damage

17. If a dust seal is not required, but direct contact between the reflector and the repair surfaces could cause damage to the latter, some form of soft packing must be provided. Either loose packing should be used or a rubber pad should be attached to each of the lower corners of the reflector.

Dust and heat seal

18. When the reflector is required for repairs from which all dust must be excluded (*e.g. radome neoprene repairs*), suitable sealing must be provided. Fig. 5 shows the construction of a typical seal, but this is only given as a guide. Any suitable design and materials may be used. The only basic requirements are that the seal must prevent the ingress of dust and that the

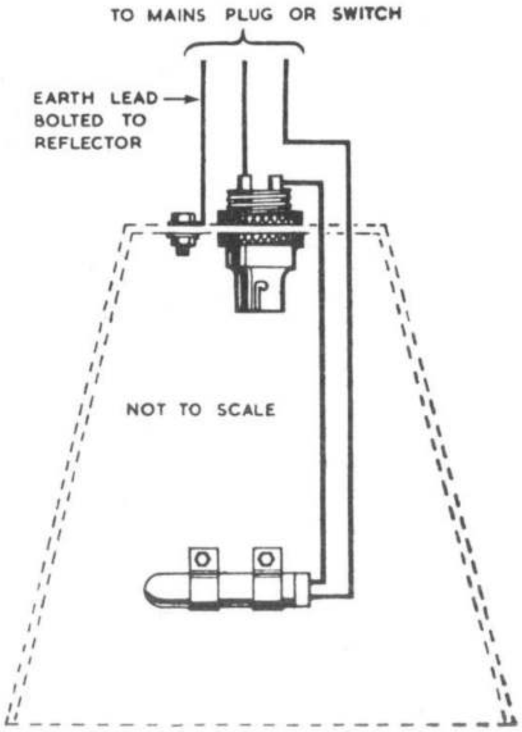

Fig. 4. Wiring of thermostat

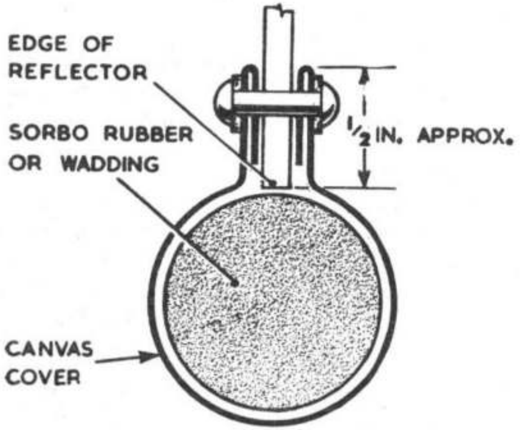

Fig. 5. Typical seal

external material of the seal should be free from loose fibres, that it should not harbour dust and that it should be easy to clean.

19. For an acutely curved repair surface, such as the nose of a radome, an additional wooden frame may be required to provide satisfactory sealing. The lower edges of the wooden frame should be shaped and padded to fit snugly against the structure to be repaired. The upper edges of the frame should be level. A suitable groove or rebate in the upper edges of the frame, to receive the reflector, may provide a satisfactory seal. Alternatively, a grooved rubber sealing strip may be attached to the wooden frame, or a canvas and rubber or wadding seal to the reflector.

METHODS OF POSITIONING THE REFLECTOR

Attachment tapes

20. When considerable mobility is required, the most convenient method of retaining the reflector in position over a repair is by the use of tapes or straps, each tape having a small lead-shot bag attached to one end. Cotton tape (Ref. No. 32B/407) or linen tape (Ref. No. 32B/759), 1 in. wide, will be suitable for the majority of applications. The free ends of the tapes should be either riveted to the reflector or tied or hooked through holes made in the reflector for this purpose. The reflector may be held in any required position by hanging the shot bags suitably over the aircraft structure. The lengths of tapes required will depend upon the size and shape of the aircraft or components to be repaired. Shot bags of approximately 2 lb. weight will be satisfactory when sealing is not required, but additional weight may be necessary when a reflector with a padded edge is to be pressed firmly against a repair surface to form a heat and dust seal.

21. When one reflector is required for use in a number of different locations, it is advisable to make up sets of tapes of different lengths. Some form of hook attachment should be provided.

Alternative methods of attachment

22. For bench repairs, the reflector may be mounted on an anglepoise-type bracket. Another useful type of mounting, for bench or *in situ* work, is a suitably modified pedestal lamp standard. Before adaptation is commenced, however, it should be ensured that the type of mounting used will provide adequate vertical and horizontal adjustment and swivelling action for the purposes for which the reflector is required. The mounting should have either locking devices or sufficient stiffness to retain the reflector in the appropriate positions. Many units hold obsolete lighting equipment that would be suitable for adaptation. Alternatively, adjustable stands can be manufactured from timber or metal.

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ADAPTER BOARD

Requirement for adapter board

1. The adapter board is required for use in conjunction with the accelerated gluing equipment described in Schemes 5.2.4 and 5.2.5 of this publication. The board is connected between the heating circuit and the starter trolley that supplies the necessary current. Each of the Schemes quoted includes an illustration showing the method of connection to be used.

Materials

2. The materials required for construction of the adapter board are listed in Table 1. Commercial quality plywood is satisfactory.

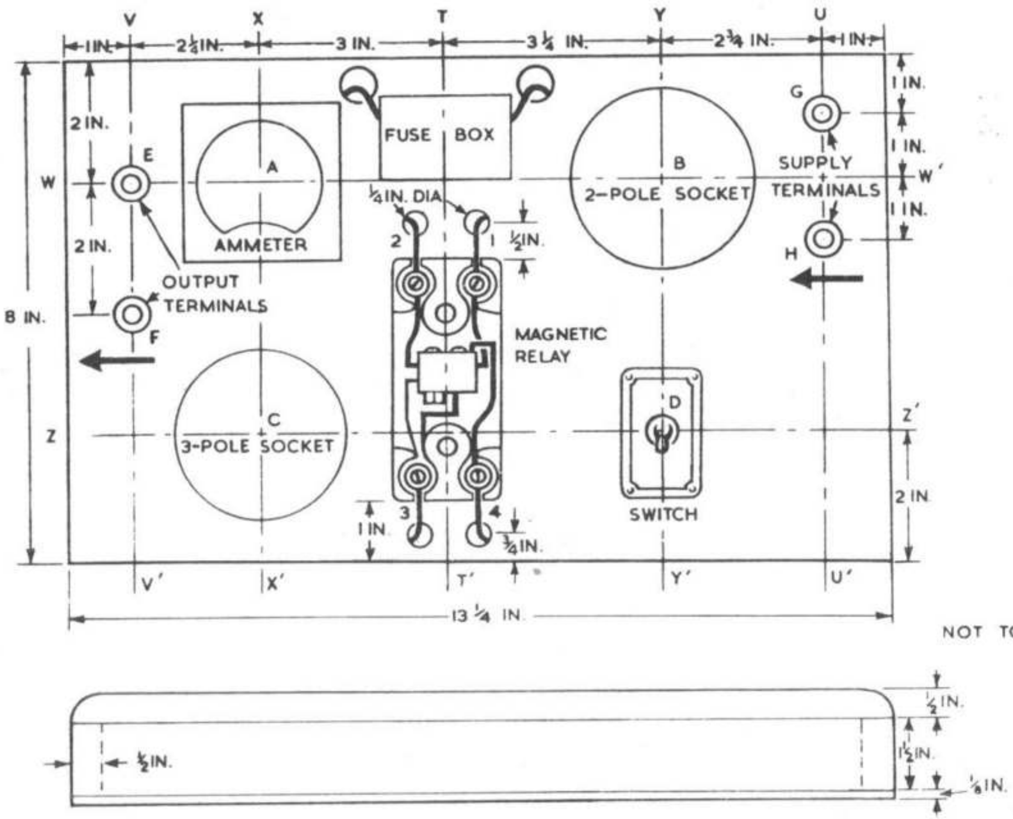
Construction

3. The procedure for construction of the adapter board is as follows:—

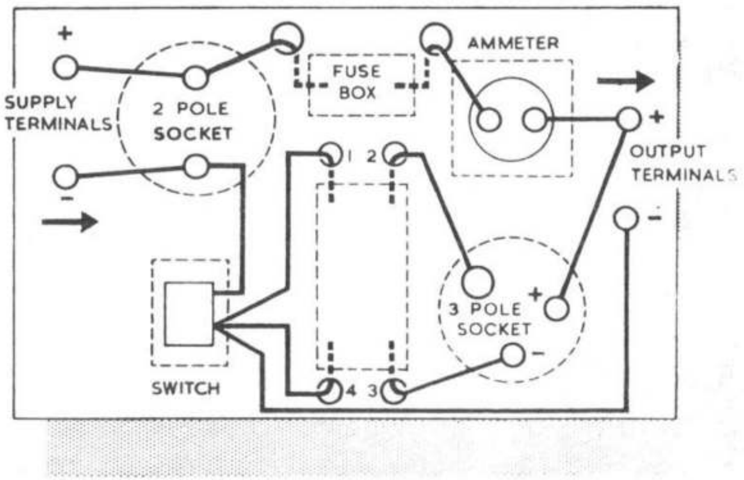
(1) Round off the 8 in. edges of the 13¼ × 8 × ½ in. ply that is to serve as the baseboard of the adapter.

(2) Mark out the construction lines TT', UU', VV', WW', XX', YY' and ZZ', as shown in fig. 1.

(3) With centre A, at the intersection of the lines XX' and WW', cut a hole to accommodate the ammeter. Mount the ammeter in position.



NOT TO SCALE



CIRCUIT DIAGRAM
(BOTTOM SURFACE OF BASE BOARD)

Fig. 1. Adapter board

(4) Mount the two-pole socket centrally over point B, where the lines WW′ and YY′ intersect. Holes must be drilled in the baseboard to accommodate the two terminals of the socket.

(5) With centre C, at the intersection of lines XX′ and ZZ′, cut a 1¼ in. diameter hole and mount the three-pole socket centrally over this hole.

(6) At D, at the intersection of the lines YY′ and ZZ′, cut a square hole with sides 1¼ in. long to accommodate the switch and fit the switch.

(7) At points E and F on line VV′ and at points G and H on line UU′, drill holes for the 0 B.A. terminals and fit the terminals.

(8) Mount the magnetic relay centrally over the construction line TT′. Drill the four holes to take the relay leads, as shown in fig. 1.

(9) Mount the fuse box centrally over the construction line TT′, with one edge along WW′. Drill two holes of ¼ in. diameter for the fuse box leads.

(10) Make and solder the connections shown in the circuit diagram, using Unicel 19 cable.

(11) Glue and screw the end pieces (7¾ × 1½ × ½ in.) and the side pieces (13¼ × 1½ × ⅛ in.) in position. Complete the box by attaching the ⅛ in. thick bottom.

Protection of components

4. If the circumstances of use and storage of the adapter board could lead to the possibility of accidental damage to the components, a hinged lid should be fitted to the board to protect them.

Table 1

Materials required

Ref. No.	Material	Size	No. required
—	Plywood	13¼ × 8 × ½ in.	1
—	Plywood	13¼ × 8 × ⅛ in.	1
—	Plywood	13¼ × 1½ × ⅛ in.	2
—	Plywood	7¾ × 1½ × ½ in.	2
—	Woodscrews	Various	As required
5Q/1632	Ammeter	0-50 amp.	1
5CY/2225	Socket, B.T.H. Type E.2, 2-pole	—	1
5A/2194	Socket, 3-pole, No. 1	25 amp.	1
5CW/543	Switch	20 amp. 24 v.	1
5CW/1722	Magnetic relay	—	1
5CZ/445	Fuse box, Type A	—	1
5CZ/1666	Fuse, Type L	—	1
5K/470	Terminals, instrument	0 B.A.	4
5E/1360	Cable, L.T., Unicel 19	—	As required

★ ★ ★