

Aug. 9, 1949.

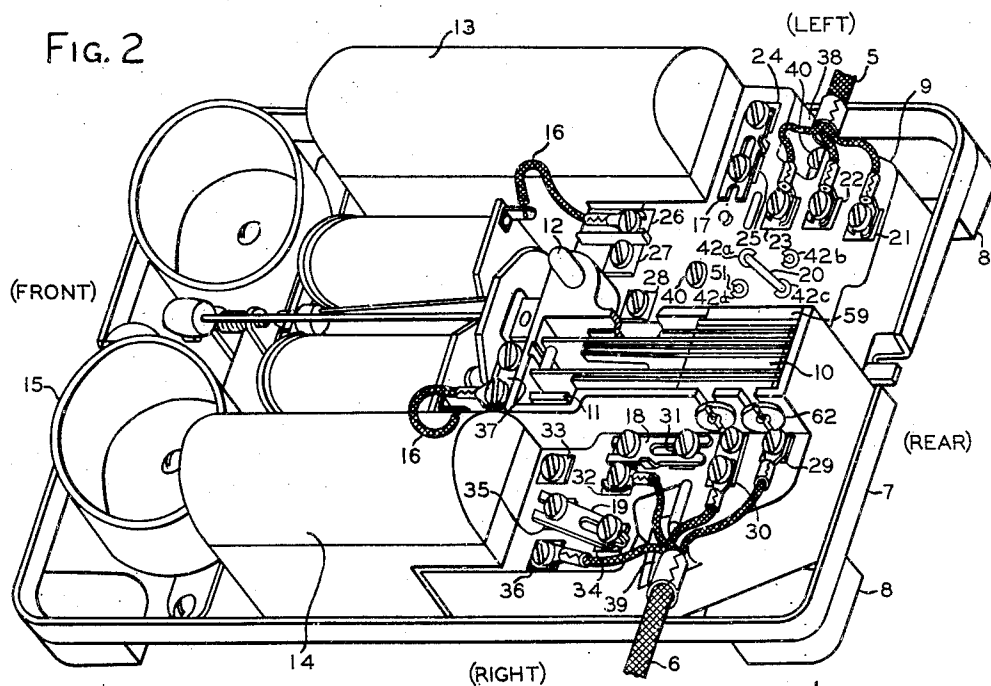
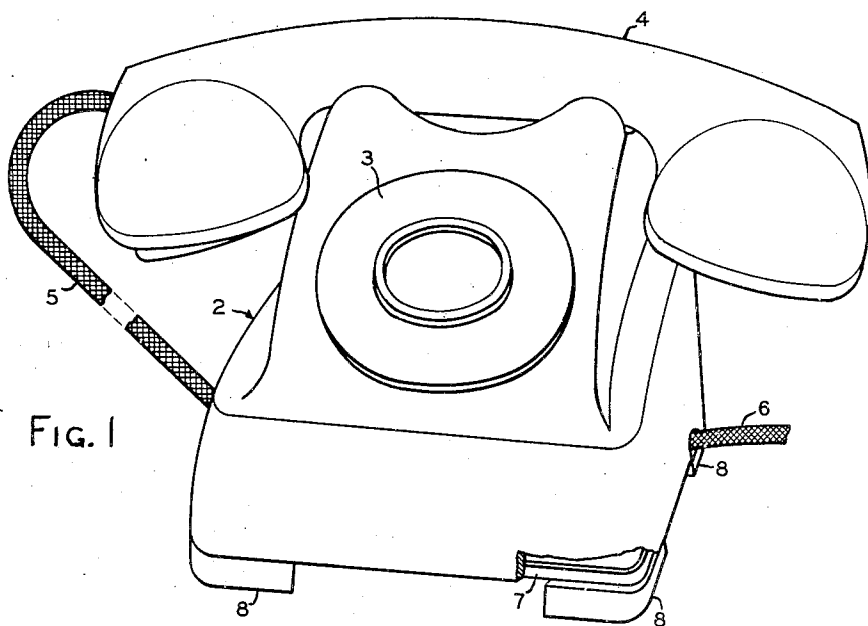
E. L. EARLE

2,478,469

TELEPHONE SET

Filed April 3, 1946

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

FIG. 3

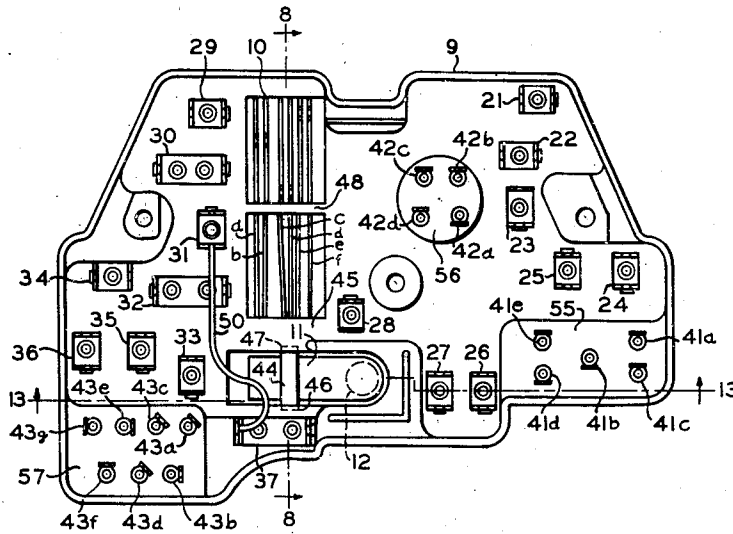


FIG. 4

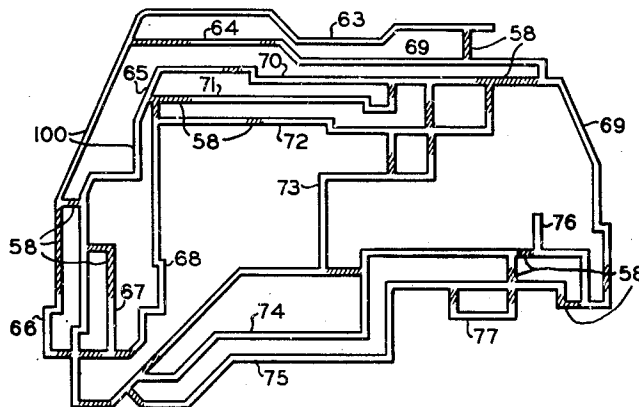
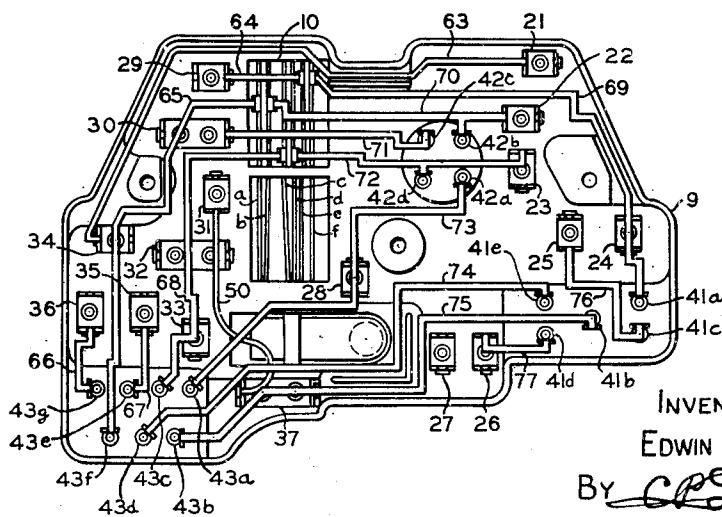


FIG. 5



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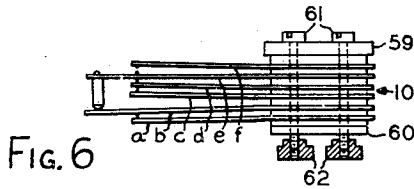


Fig. 7

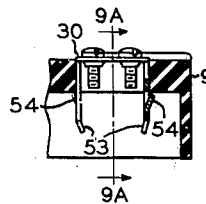
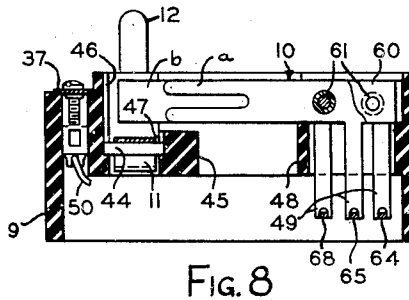
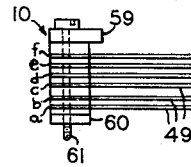


Fig. 9

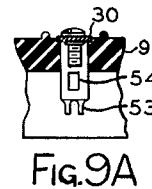


Fig. 9A

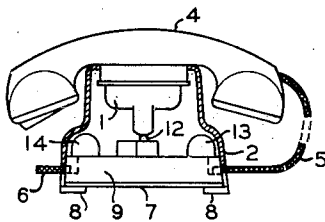


Fig. 10

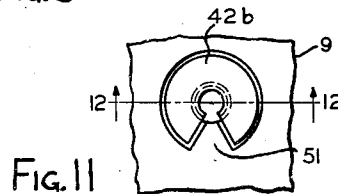


Fig. 11

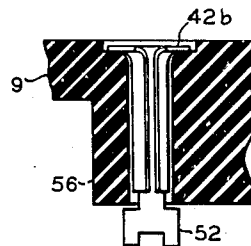


Fig. 12

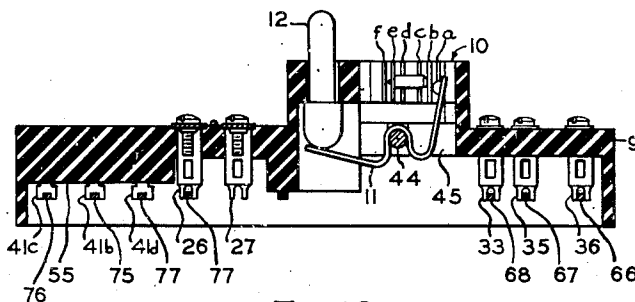


Fig. 13

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UNITED STATES PATENT OFFICE

2,478,469

TELEPHONE SET

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Application April 3, 1946, Serial No. 659,208

2 Claims. (Cl. 173—324)

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This invention relates to telephone sets such as are installed at subscriber stations. Its general object is to provide an improved form of base-block assembly containing a hookswitch, together with locally interconnected terminals for all the remaining apparatus and conductors of the entire telephone set.

One feature of the invention includes the use of a one-piece conductor part which, after assembly with the fixed terminal members of the base block, is readily separable into the several required local conductors. In the illustrated embodiment of the invention, this conductor part takes the form of a grid, punched from sheet material, with the several local conductors left joined together to retain them in predetermined fixed relationship to each other until after they have been attached to their respective fixed terminal members.

A further feature concerns the provision of terminal members which are readily installed within separate openings through the base block, and reliably secured in place, to become the relatively fixed terminal members thereof. These terminal members, in the illustrated embodiment, take the form of snap-in screw terminals of a U-shaped form, and generally tubular pin-socket terminals.

Another feature resides in the provision of a simple bell-crank lever for operatively interconnecting the hookswitch with its control plunger. A special feature of this arrangement is that the bell-crank lever includes a loop adapted to be placed on a suitable pivot pin on which the lever is retained by contact with a hookswitch, assembled after the lever is in place.

Other objects and features of the invention will appear as the description progresses.

The accompanying drawings, comprising Figs. 1 to 13, show views of a telephone set constructed according to the invention.

Fig. 1 is a perspective view, generally from the front, of a telephone desk set incorporating the invention.

Fig. 2 is a view of the base assembly incorporated in the telephone set of Fig. 1, as seen from a point above the right rear corner thereof.

Fig. 3 is a bottom view of base block 9 of Fig. 2, in an unwired condition, except for local conductor 50.

Fig. 4 is a view of grid 100 which includes local conductors 63 to 77 joined together by unsevered shaded sections 58.

Fig. 5 is a view similar to Fig. 3, showing the base block completely wired by the application

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of grid 100 thereto and the severance of shaded sections 58.

Figs. 6 to 8 are views of hookswitch 10 of Figs. 2, 3, and 5.

Figs. 9 and 9A are fragmentary views, partly in section, of screw terminal 30 of Fig. 2 and the associated portion of the base block.

Fig. 10 is a reduced-scale rear view of the telephone set of Fig. 1, with the rear part of the housing broken away.

Figs. 11 and 12 show how the pin-socket terminals are constructed and held in place in base block 9.

Fig. 13 is a sectional view, taken generally along line 13—13 of Fig. 3, showing how the hookswitch is controlled.

The general arrangement

It has been chosen to illustrate my invention as applied to a telephone set constructed generally according to the disclosure in the co-pending application of Joseph F. Houdek, Jr., for Telephone sets, Serial No. 604,856; filed July 13, 1945.

As shown in Fig. 1, the illustrated telephone set is supported on feet 8, attached to base plate 7. It includes the base assembly shown in Fig. 2, and a housing 2 providing a cradle within which handset 4 normally rests. Handset cord 5 contains conductors interconnecting handset 4 with the base assembly, and line cord 6 contains conductors for making all required external connections to the set.

The base assembly, shown in Fig. 2, includes base plate 7 and the parts attached thereto. These attached parts include base block 9, which carries all necessary attachment terminals for the entire set; condenser block 13; coil block 14; and ringer 15. Hookswitch 10, together with its actuating parts 11 and 12, is mounted in base block 9.

The base block

Base block 9 is secured to base plate 7 by three screws 40, two of which are seen in Fig. 2. Recesses 38 and 39 laterally receive handset cord 5 and line cord 6, incoming through marginal slots in housing 2 (Fig. 1). The metal fasteners customarily secured to cords such as 5 and 6 are conveniently secured under the heads of the two mounting screws 40 which lie respectively within recesses 38 and 39.

As is indicated best by comparison of Figs. 2, 3, 5, and 13, the base block 9 has the back portion recessed to form a rear cavity within which the local interconnecting conductors 50, and 63

to 77 (Figs. 3 to 5) are supported, by the pronged terminal ends to which they are attached, within the confines of the base block and in spaced relation to the base plate 7 on which the block is mounted. The pronged terminal ends to which interconnecting conductors 63 to 77 attach all lie in the same general horizontal plane.

As disclosed in the Houdek application hereinbefore referred to, screw terminals are carried in base block 9 as follows: 21 to 23 for the conductors in handset cord 5; 29, 30, 32, and 36 for the conductors contained in line cord 6; 26 and 37 for flexible leads 16 attached to ringer 15; 28 and 33, serving as attachment points for flexible leads attached to a bridging retard coil (not shown) when a local-battery set is to be adapted for common-battery signalling; 24 and 25, provided to enable the two-position condenser link 17 to alter the condenser capacity in the ringer circuit; 31, provided as one connection point for a two-position ringer link 18 which cooperates alternatively with a second screw in each of the double-screw terminals 30 and 32 to enable one ringer connection to be shifted alternatively between a line conductor and ground; and screw terminals 34 to 36, which cooperate with three-position transmitter link 19, when the set is used for common-battery operation, to adapt the set for operation according to the resistance of the line to which it is connected.

A bottom view of the pin-socket terminals through which condenser block 13 and coil block 14 of Fig. 2 attach (mechanically and electrically) to base block 9 is shown in Figs. 3 and 5. These include five terminals 41a to 41e for condenser block 13, and seven terminals 43a to 43g for coil block 14.

The four similar pin-socket terminals 42a to 42d are provided to receive a calling-device plug when the set is used as an automatic telephone set. When the calling device is not employed, terminals a and c in group 42 are bridged by a link 20 (Fig. 2) which may be a section of wire of suitable size, bent in the form of a staple.

Screw terminals

Base block 9 has openings formed therein for receiving individually the several screw terminals 21 to 37. Each such opening is in the form of a rectangular shaft. The opening for receiving double-screw terminal 30 is shown in fragmentary sectional view Figs. 9 and 9A. Fig. 9A shows that this opening is wide enough to receive the terminal ends 53, but of insufficient width to receive the wider main horizontal portion of the screw terminal. The terminal ends 53 are formed inwardly at their bifurcate ends for easier installation. Outwardly pointed barbs 54 engage the under surface of base block 9 to hold the screw terminal securely in its installed position. The screw terminals are preferably made of material having substantial spring action.

As can be seen from Fig. 9, barbs 54 cause a slight inward compression of terminal ends 53 as screw terminal 30 is being forced downwardly into its illustrated installed position, followed by an outward snap action to the illustrated locked position.

The width of the main horizontal portion is such that the screw terminal cannot be pushed through the opening in the direction of insertion, while the barbs 54 engage the under surface of the base block to prevent withdrawal.

Similar openings, but of a reduced length, are

provided for single-screw terminals such as 21, 22, etc. A single barb such as 54 suffices to retain any single-screw terminal in place.

When desired, as when maltreatment results in a stripped screw thread, terminal 30 can be readily removed by first compressing end members 53 together sufficiently to render its retaining barbs 54 ineffective. The other screw terminals are similarly readily removable.

Pin-socket terminals

Suitable openings in base block 9 are provided for each of the pin-socket terminals comprising groups 41, 42, and 43. The wall of the base block is thickened at regions 55, 56, 57, (Fig. 3) by formations which may be described as dependent bosses. Bosses 56 and 55 are shown in section in Figs. 12 and 13. This thickening of the wall permits a satisfactory support length for the pin-socket terminals not required for the screw terminals.

All of the pin-socket terminals may be of the same construction. Fig. 11 is an enlarged top view of the section of base block 9 which contains pin-socket terminal 42b of Figs. 2, 3, and 5, while Fig. 12 is a sectional view of the base-block fragment shown in Fig. 11, illustrating terminal 42b in profile. This terminal has the general form of a split tube which lies loosely within its opening in base block 9. A flat flange is formed integrally with the top end of the tubular portion to limit downward movement of the terminal within the base block. This flange is wide enough to remain outside the confines of the opening in any lateral position of the terminal therein, keeping in mind that the opening is enough larger (as shown) than the tubular portion of the terminal to permit substantial lateral shifting of the terminal when the pins of the dial plug (not shown) are inserted into terminals 42a to 42d (Fig. 2).

Referring to Figs. 3 and 5, it will be noted that the pin-socket terminals in groups 41, 42, and 43 are variously positioned rotationally so as to permit concerned ones of conductors 63 to 77 to enter their respective bifurcate attachment tabs. Each pin-socket terminal is retained in its desired rotational position by a locating sector such as 51 of Fig. 11. Any such sector lies within the incomplete portion of the top flange of its associated pin-socket terminal, as is shown for terminal 42b and sector 51 by Figs. 11 and 12.

Base block 9 is recessed as shown in Figs. 11 and 12 to receive the top flange of each pin-socket terminal, permitting the attachment plugs (not shown) to contact the surface of block 9 without interference, as any sector 51 is flush with its surrounding surface of the block.

If an installed pin-socket terminal becomes damaged or excessively worn, part 52 can be re-curved, or removed (as by bending it back and forth until it breaks), to permit the pin-socket terminal to be withdrawn for replacement by a new one.

The main tubular portion of terminal 42b is connected to bifurcate attachment portion 52 by a narrow neck. This construction permits part 52 to be formed generally tubular initially to enable it to be passed down through the block, and to then be flattened to its illustrated form (Figs. 3 and 5) without distorting the main tubular portion. When so flattened, part 52 is wide enough to engage the under surface of the base block to hold the pin-socket terminal reliably in place.

The hookswitch

As shown generally in Fig. 2, base block 9 has a generally oblong, vertical opening through the wall thereof for accommodating hookswitch 10. The upper portion of this opening is surrounded by a wall which has a rectangular opening in one side to accommodate insulating plate 59 of the hookswitch, and has a pair of slots on the opposite side to enable the preassembled hookswitch to be clamped in place by a pair of shoulder nuts 62.

In Figs. 6 and 7, the hookswitch 10 is shown removed from the base block, while Fig. 8 (taken along line 8—8 of Fig. 3) shows a profile view of the hookswitch in place. It includes six leaf springs *a* to *f* supported and adjusted to make contact as shown when the handset is removed from the cradle. As will subsequently be explained, when the handset is placed on the cradle, the free end of the hookswitch is moved to the left to cause leaf springs *a* and *b* to break contact with each other; to cause leaf springs *c*, *d*, and *e*, to break contact with each other; and to cause leaf springs *e* and *f* to make contact. For this purpose, leaf springs *b* and *e* are interconnected mechanically by an insulating stud, as shown.

The leaf springs are held in assembled position by the pressure applied by two screws 61 acting to clamp them and their illustrated insulating plates between clamp plates 59 and 60. Plate 60 is threaded to receive screws 61, which pass freely through openings in plate 59, as well as through the intervening parts.

The leaf springs are provided with downward extending tabs 49, which have bifurcate ends to receive the concerned ones of the local conductors 63 to 77 (Fig. 5) lying within the cavity contained in the hollow back portion of block 9. It is to be noted that the side tabs of the leaf springs are provided in pairs, each pair being disposed at a different location along the clamped portion of the springs to enable the local conductors to make contact with them when arranged in the orderly manner shown in Fig. 5. As shown in Fig. 5, the tabs 49 of each such pair are bent outwardly prior to being attached to their respective conductors.

As seen best in Fig. 8, the opening in base block 9 which receives hookswitch 10 is provided with a rear ledge, and with a locating bridge 48, on which parts hookswitch 10 comes to rest when inserted into the opening.

The arrangement for operating hookswitch 10 is illustrated best in Figs. 8 and 13 (see also Figs. 2, 3, and 10). Slot 46 in the front wall of the hookswitch opening, and slot 47 in bridge 45, support pivot pin 44. As seen best in Fig. 13, bell-crank lever 11 has a generally horizontal end portion underlying plunger 12, and a generally vertical end portion extending alongside the free end of the contact springs of hookswitch 10. The intermediate portion of lever 11 is curved to provide a pivot loop resting on pin 44 to support the lever.

During assembly, pivot pin 44 is first placed in slots 46 and 47, and the shouldered actuating plunger 12 is inserted from below and temporarily held in place, as by hand. Bell-crank lever 11 is next inserted and turned to bring it in place over pin 44, following which hookswitch 10 may be installed to retain parts 11, 12, and 44 in position without further fastening means.

The generally vertical arm of bell crank 11 is

arranged to normally engage the free end of leaf spring *b* of hookswitch 10 and displace it slightly toward its normal (handset-on) position so as to urge plunger 12 upwardly with the shoulder thereof snugly in contact with the surrounding under surface of base block 9. The hookswitch is then in its illustrated alternate (handset-off) condition.

When the housing is finally assembled, and handset 4 is placed in its cradle as shown in Figs. 1 and 10, plunger 1 in the housing (in longitudinal alignment with plunger 12 carried by the base) is depressed under the weight of the handset, thereby depressing plunger 12 and rotating bell crank 11 about pivot pin 44. The free end of the hookswitch is thereby moved to the left as seen in Fig. 13 (upwardly as seen in Fig. 6), to bring the hookswitch to its normal (handset-on) position. The hookswitch returns to its illustrated alternate position responsive to any subsequent removal of the handset.

Wiring arrangement

As disclosed in the Houdek application heretofore referred to, the screw terminals, hookswitch terminals, and pin-socket terminals are so distributed in the base block that (with a single exception) they may be interconnected according to the desired circuit arrangement by local conductors which do not cross each other. A previously noted feature of this invention resides in the method and arrangement whereby the non-crossing local conductors are installed as one piece which is later separated into the desired number of individual conductors. The practical carrying out of this feature requires care in positioning the terminal ends so as to avoid undue crowding of the local conductors at congested points.

The openings in base block 9 within which screw terminals 21, 22, 29, 33, 32, 34, and 37 are received, are so disposed that the bifurcate end portions of these terminals may freely receive conductors extending horizontally across the sheet on which Figs. 3 to 5 are drawn, while the base-block openings within which screw terminals 23 to 28, 31, 33, 35, and 36 are received, are so disposed that the bifurcate end portions of these latter terminals may freely receive conductors extending vertically across the said sheet.

The previously described locating sectors 51 (Fig. 11) are so disposed around their associated openings within which the pin-socket terminals are received that the bifurcate terminal ends of all those in groups 41 and 42, and terminal *f* in group 43, are so disposed as to freely receive conductors extending vertically across the sheet containing Figs. 3 to 5; terminals *b*, *e* and *g* of group 43 are so disposed as to receive conductors extending horizontally across the sheet; and terminals *a*, *c*, and *d* of this group receive conductors extending diagonally across the sheet.

Hookswitch 10 is so located in the base-block assembly that the bifurcate ends of side tabs 49 thereof freely receive conductors extending horizontally across the sheet in question.

With the bifurcate terminal ends disposed as above noted, the local conductors required to interconnect them (excepting 31 and 37) may take the form of orderly arranged strips 63 to 77 (Fig. 5), which all lie in the same general wiring plane; are adequately separated from each other; and no one of them crosses another one of them at any point.

As shown in Fig. 4, each of the local conductors

63 to 77 of Fig. 5 comprises a section of grid 100, which may be punch-formed from a single sheet about the size and shape of base block 9.

The base block 9, with all terminals in place as described, but completely unwired, is wired as shown in Fig. 5 in the following steps.

1. Wire 50 is cut to length, bent, installed in the position shown in Figs. 3 and 5, and is secured in place as by soldering it to terminals 31 and 37, or crimping the bifurcate end portions together, or both. The base block is now in the condition shown in Fig. 3.

2. Grid 100 is next so laid on the remaining unwired terminals shown in Fig. 3 (except spare terminal 27 and ground terminal 32) that the portions 63 to 77 thereof enter the bifurcate terminal ends according to the arrangement shown in Fig. 5.

3. These portions of grid 100 are then secured in place as by soldering them to the concerned terminals, or crimping the bifurcate ends of these terminals, or both.

4. Shaded sections 58 of grid 100 are next removed, as by clipping, thereby separating grid 100 of Fig. 4 into the separate conductors 63 to 77 of Fig. 5.

In Figs. 2 and 8, it is shown that screw terminal 37 is mounted on a raised portion of block 9, wherefore the concerned portion of conductor 50 lies at a higher level than conductors 63 to 77, whereby the crossovers shown in Fig. 5 occur without actual contact of the concerned conductors.

I claim:

1. An assembly for a telephone substation set including a base block having openings there-through, and a number of terminal members of substantially the same length passing through the openings, respectively, and held similarly in place therein, each said terminal member having the end portion thereof lying on a given side of the block formed to receive a local inter-terminal conductor, the base block being generally flat, whereby said end portions lie generally in the same wiring plane and support the said local conductors in such plane, a portion of the block through which one of said terminal members passes being offset longitudinally of the terminals to bring the said formed end portion of the concerned terminal member to a location between the block and said wiring plane to permit local

conductors attached to other terminal members to cross the last-named end portion without coming into contact therewith, and to permit a local conductor attached to such end portion to cross other local conductors without coming into contact therewith.

2. An assembly for a telephone substation set including a base block having openings there-through, and terminal members of substantially the same length passing through the openings, respectively, and held similarly in place therein, each said terminal member having the end portion thereof lying on a given side of the block formed to receive a local inter-terminal conductor, the base block being generally flat, whereby said end portions lie generally in the same wiring plane and support the said local conductors in such plane, a portion of the block through which one of said terminal members passes being offset longitudinally of the terminals to bring the said formed end portion of the concerned terminal sufficiently to one side of said wiring plane to permit a local conductor attached thereto to cross other local conductors without coming into contact therewith.

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