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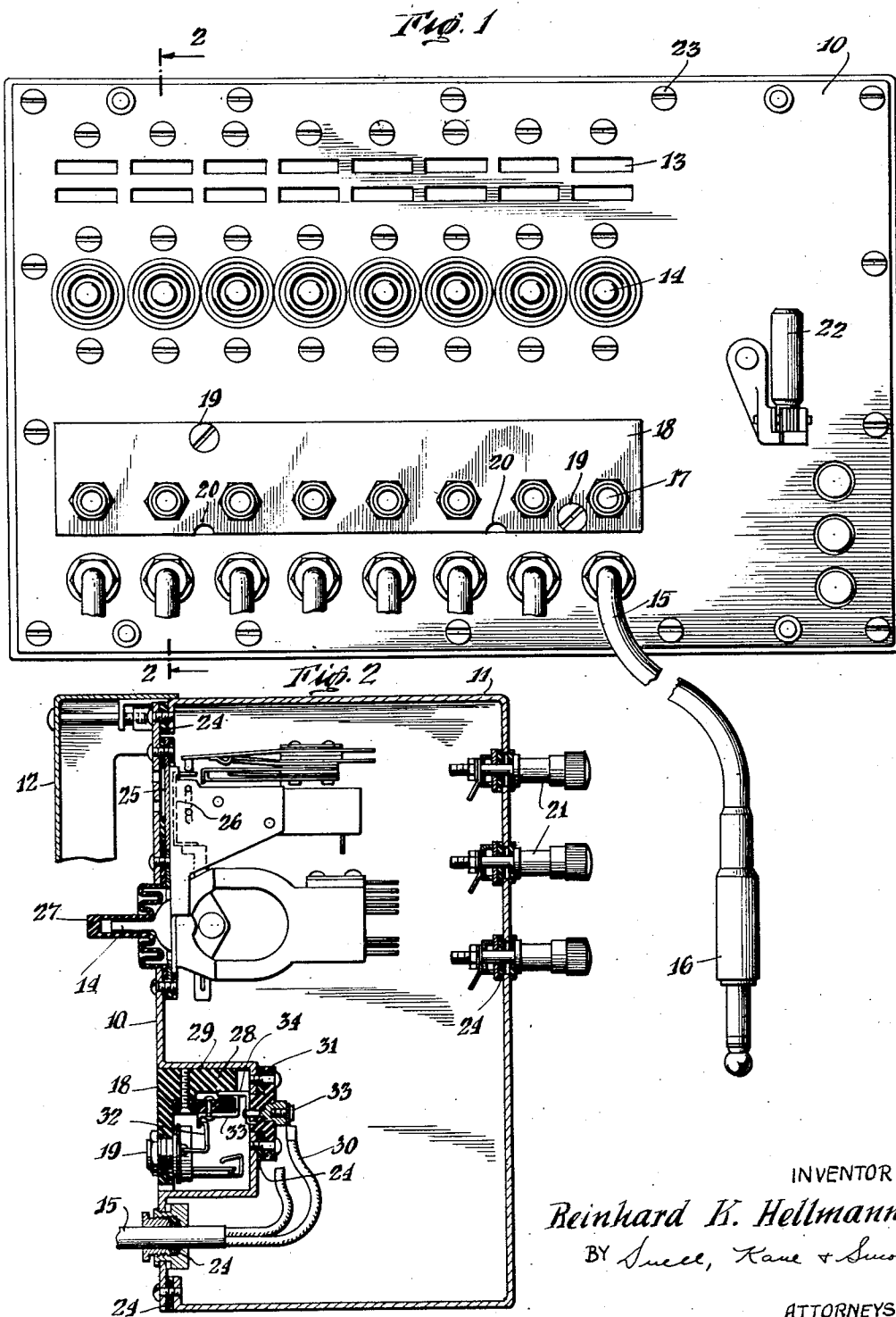
R. K. HELLMANN

2,447,753

HERMETICALLY SEALED SWITCHBOARD

Filed July 10, 1945

3 Sheets-Sheet 1



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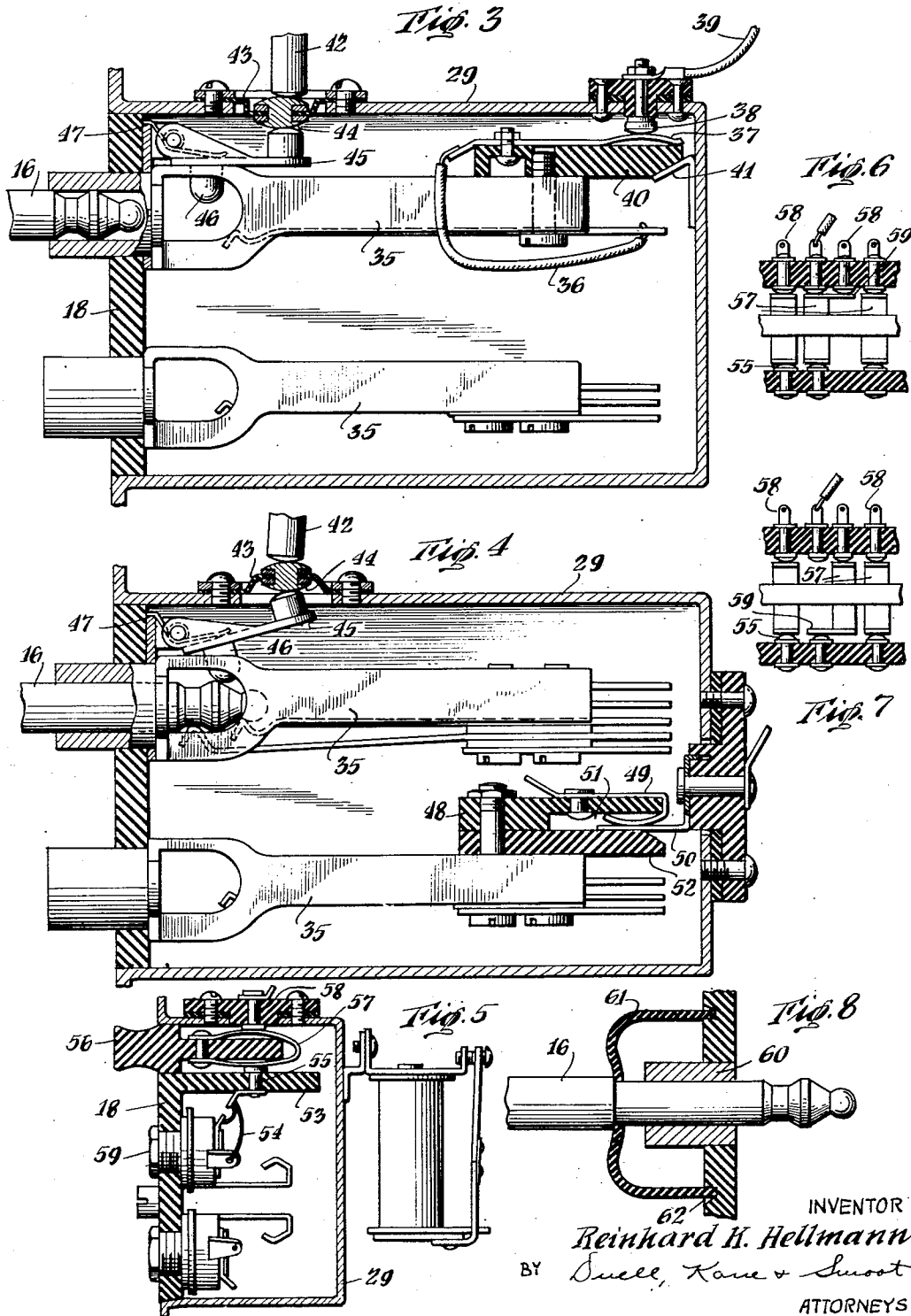
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 10

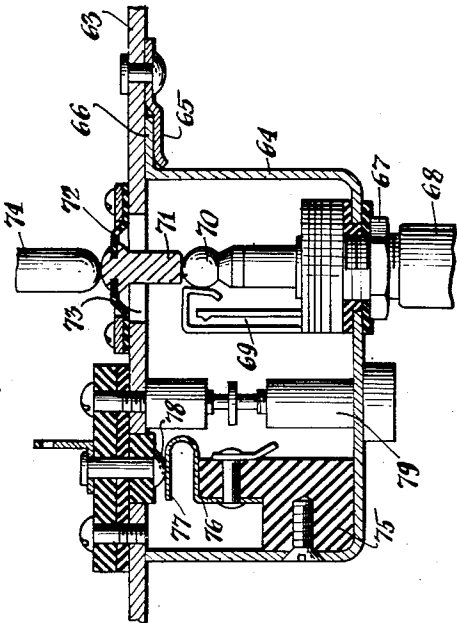


Fig. 12

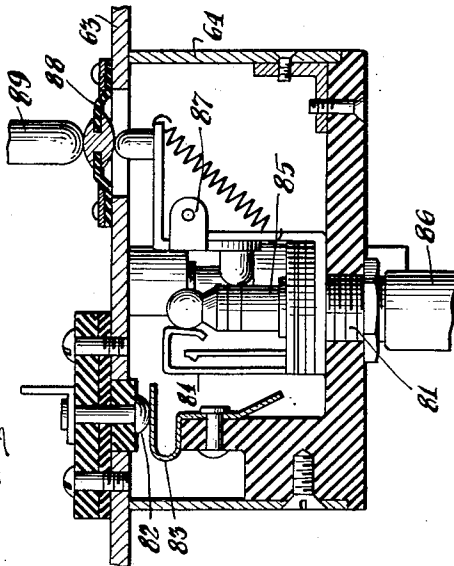


Fig. 9

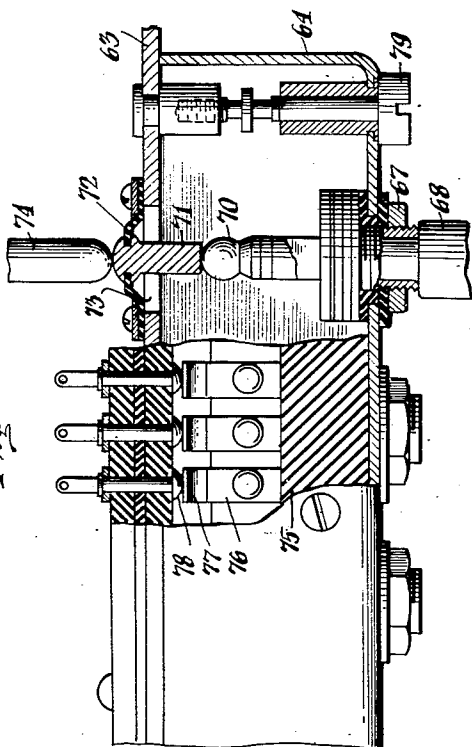
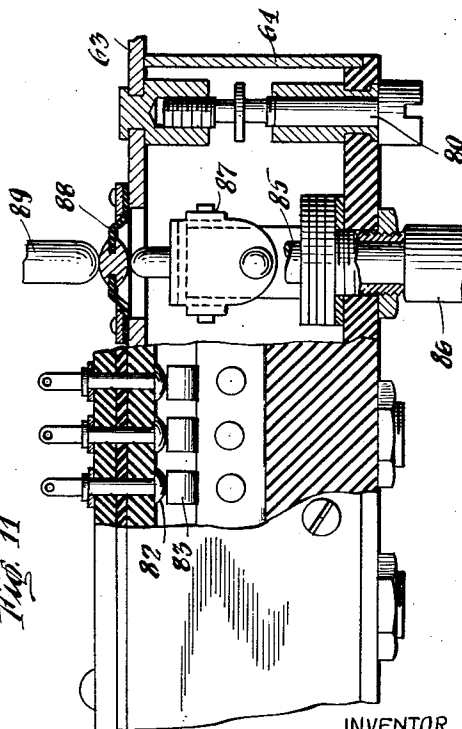


Fig. 11



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HERMETICALLY SEALED SWITCHBOARD

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8 Claims. (Cl. 179-91)

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This invention relates to a structurally and functionally improved switchboard and in its more specific aspects aims to provide a unit of this character primarily intended for use in connection with telephone or other communication systems.

It is an object of the invention to provide a switchboard which may be subjected to abuses such as immersion in water or mud without impairing its usefulness. Moreover, the unit may be maintained in operation for indefinite periods of time even when exposed to high humidity conditions such that the saturation of the atmosphere would ordinarily impair the further functioning of the apparatus.

An additional object is that of providing a unit of this type, certain parts of which may remain as a substantially permanent assembly, while others are readily removable for the purpose of cleaning the various surfaces which have been exposed to the action of moisture, sediment, etc.

Another object is that of providing a switchboard in which the several parts may be separated, cleaned and reassembled without the aid of special tools or skills; these operations being capable of achievement even under distracting circumstances such as would exist under service conditions with the armed forces.

A further object is to provide a switchboard, the interior of which may be hermetically sealed and may remain so during regular operation. Accordingly, the mechanisms within the apparatus will be unaffected by moisture and other factors to which the exterior of the apparatus is subjected.

Still another object is that of furnishing an apparatus of this type which will embody relatively few parts, each individually simple and rugged in construction; these parts being capable of assembly under virtually quantity production methods and when so assembled providing a switchboard operating over long periods of time with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating practical embodiments of the invention, and in which:

Fig. 1 is a face view of a switchboard or switch-containing unit;

Fig. 2 is a transverse sectional view thereof taken along the lines 2-2 and in the direction of the arrows as indicated in Fig. 1;

Fig. 3 is a view similar to Fig. 2 but showing an alternative form of construction and with

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the parts thereof in a certain predetermined position;

Fig. 4 is a view similar to Fig. 3 showing an alternative form of construction and with the parts thereof in a position different from that illustrated in Fig. 3;

Fig. 5 is a transverse sectional view of a still further form of construction;

Fig. 6 is a fragmentary sectional view of certain of the apparatus as illustrated in Fig. 5;

Fig. 7 is a view corresponding to Fig. 6 but with certain of the parts shifted to occupy a different position;

Fig. 8 is a fragmentary sectional view of a plug construction which may be utilized in conjunction with or independently of the structure shown in the preceding views;

Fig. 9 is a side elevation of an alternative form of mechanism with certain of the parts broken away to disclose underlying constructions and other of the parts being shown in section;

Fig. 10 is a transverse sectional view of the assembly as shown in Fig. 9;

Fig. 11 is a view similar to Fig. 9 but showing a still further type of construction which may be provided in accordance with the present teachings; and

Fig. 12 is a transverse sectional view taken through the apparatus as shown in Fig. 11.

With primary reference to Figs. 1 and 2, it will be seen that the reference numeral 10 indicates the panel of the switchboard and which conveniently provides the member which closes the open face of the receptacle or box 11. A cover 12 of any desirable construction may be associated with this receptacle or unit. When the latter is inoperative, the cover (if provided) should extend to cover the face of the panel 10 and thus protect the parts associated therewith. In accordance with conventional practice, the panel 10 may be formed with sight apertures or target openings 13 and have keys 14 extending beyond its outer face.

Also, cords 15 may extend beyond this outer face and mount plugs 16. The latter, in accordance with conventional practice, are capable of being received by one of a bank of jacks 17 exposed on the outer face of the panel and conveniently arranged above the points at which the cords 15 pass therethrough.

A magneto handle 22 may extend through the face of the panel 10 and terminals 21 may project from the rear face of the casing. Fastening elements 23 may secure the panel 10 in position. Gaskets or suitable waterproof packings

24 may be disposed between the parts at points where danger of leakage exists. Moreover, in line with the apertures 13 a transparent sheet of waterproof material 25 may be mounted so that the target 26 mounted within the casing 11 may be observed. The structure whereby the key 14 serves to shift the target has not been shown nor will it be described in detail in that such structure may follow more or less conventional practice.

Also, the keys 14 are preferably enclosed in boots 27 which may be secured to the face of the panel and embody flexibility such that each key may freely be shifted. These boots, as well as the several gaskets or packings heretofore referred to may conveniently be formed of rubber or similar material.

The interior of the receptacle and the mechanisms therein may be hermetically sealed. This may be accomplished, for example, by the gaskets and packings as heretofore referred to. However, as will be appreciated, the jacks present apertures through which fluid (air, water, and solutions) may pass if the teachings of the present invention are not followed. Therefore, the jacks 17 are preferably mounted on a separate panel 18 which latter may be secured in position by means of suitable quick-detachable fasteners 19. Also, this panel 18 is preferably provided with openings 20 adjacent its lower edge for purposes hereinafter brought out.

As will also be noted in Fig. 2, the panel 18 is preferably formed with a rearward extension 28 which bears against the inner face of one wall of a trough portion 29. This portion may conveniently form a part of the panel 10 and is of a width equal to the height of the sub-panel 18. While on this subject, it will also be noted that, as shown in Fig. 2, the edge of the sub-panel may be slightly flared to provide what might be termed a wedge structure assuring a firm seating of the parts with respect to each other such that no play will come into being between these parts. Leads such as have been indicated at 30 may be connected to a mounting strip 31 secured to the base of the trough 29.

Each of the jacks 17 may have any desired number of terminals. These terminals are connected by, for example, jumpers 32 to contact springs 33. The latter are secured to the panel 18 or to a mounting strip associated therewith. Each of these springs—with the sub-panel 18 in position—engages with a contact plate or element 34 conveniently mounted by the panel 31 secured to the trough 29. Under certain conditions and as will hereinafter be more particularly pointed out, a greater or lesser number of contact plates 34 may be employed. As will also be noted at this time, the details of wiring extending from each of the terminals of the jacks or other parts of the apparatus have not been shown. This is with a view to avoiding unnecessary confusion in the illustration. The details of such wiring are well known to those skilled in the art and may readily be visualized.

With a construction such as that heretofore described, it will be appreciated that a unit is provided which will furnish an enclosure such that moisture, water, silt and other harmful elements may not enter the interior of the casing 11. Such elements—especially with the plugs not mounted within the jacks—may, however, enter the trough 29. This cannot be avoided if, for no other reason than the fact that the openings defined by the jacks permit of such entrance. However, 75

moisture will readily drain through the openings 20. If the accumulation of moisture is such, or the presence of foreign substances additional to water prevents the proper operation of the jacks, then all that an operator has to do is release the fastening elements 19. Thereupon, the sub-panel 18 may be withdrawn from the trough.

With such withdrawal of the panel 18, the contact springs move out of engagement with the plates 34. It will be observed, however, that moisture cannot enter the main part of the casing 11 through the face of the trough. The operator may now flush or otherwise clean the elements exposed on the rear face of the panel 18. Also, he may similarly clean the interior of the trough 29. Thereupon, the panel may again be positioned within the trough. Automatically, with such positioning, the circuits established by engagement of the springs 33 and plates 34 will again be completed. The parts may now be operated by simply inserting the plugs as required into the jacks and, as will be appreciated, the structure of the latter will be in all senses conventional, if this is desired. In any event, they will present no delicate wiring problem or maintenance technique such as would be the case if their contacts and springs were provided as part of a special structure designed to prevent the entrance of foreign elements into the interior of the trough. In fact, in the case of severe accumulation of foreign material and after the sub-panel 18 has been removed, a unit such as a wire or pipe cleaner may be employed to free the apertures or bores of the jacks from any accumulation of sediment.

With respect to the quick-detachable and automatic connection provided by the insertion of the panel 18 in the trough or similar portion of the casing, attention is directed to Fig. 3. This figure shows what is in many respects a preferred form of construction. As will be noted, a pair of jacks 35 have been indicated in this view. In order to avoid confusion, only a single terminal or spring of this jack has been shown as connected in complete circuit. To that terminal there is attached a jumper 36 connected to a spring plate or finger 37 which is engageable with the terminal or plate 38. The latter, through a waterproof lead-in, is connected to a lead 39. The spring finger 37 may be supported upon a mounting strip 40 which has its inner end beveled or undercut. This face conveniently cooperates with a support or cam 41 secured to the inner face of the trough 29. It is apparent that, as the panel 18 is secured in position and accordingly shifted inwardly within the trough, the strip 40 will engage against the support or cam 41, to force the fingers 37 into engagement with the terminals 38. Thus, a circuit will be established in an entirely positive and desirable manner. Conversely, upon the parts being shifted outwardly, the fingers 37 would readily be freed from the terminals 38 so that no binding of the parts may occur.

As also shown in this view, the rod 42 which may serve to reset the target or actuate any other desirable portion of the apparatus is disposed in line with an opening in the upper face of the trough. This opening is sealed by means of a diaphragm 43 of proper material and which may centrally mount a bearing element engageable with the rod 42. This bearing element has been indicated by the reference numeral 44 and is engaged by a similar bearing element mounted by one arm of a bell crank lever 45. The opposite arm 46 of this lever may be contactable with a portion of the plug 16 insertable into the jack.

It therefore follows that at this point there is also provided a watertight connection. While, according to present day practice, a lever such as 45—46 will ordinarily be employed, it will be appreciated that entirely different types of elements might be utilized. These elements might also serve to actuate any desired mechanisms within the receptacle. To secure such actuation, either a rod similar to rod 42 may be employed or a different type of actuating member may be utilized.

This connection, as shown in Fig. 4, will, however, readily permit of a thrust being imparted by the bell crank lever 45, and incident to the insertion of the plug, to the rod 42. The latter, in shifting, will serve to operate the mechanism (not shown) attached to the rod. As soon as the plug has been withdrawn, the parts will return to their normal positions incident to the provision of the spring 44. The latter, obviously, need not necessarily be employed where gravity itself will assure that the parts automatically assume their initial positions.

As also shown in Fig. 4, it is apparent that many alternative forms of electrical coupling may be provided over and above those illustrated in Figs. 2 and 3. Thus, as shown in this view, the lower jack has secured to it a mounting strip 48. A spring finger 49 is suitable connected to one of the terminals of the jack assembly and bears against the contact plate 50. The mounting strip 48 may, in effect, include a divided body presenting a channel 51 into which the strip or terminal extends when the parts are in their normal position. The outer edge of one arm of the mounting strip 48 may be beveled as indicated at 52 to present a cam surface. The latter cooperates with the strip 50 as the parts are shifted to their seated position and in order to assure that the strip will be shifted into firm circuit-maintaining engagement with the finger 49. Again, by means of this structure, an assembly is provided which may, without difficulty, be detached.

A further alternative form of structure is shown in Fig. 5. This has the added advantage of permitting definite permutations of circuits to be selected. More particularly, as will be seen in this view, the reference numeral 18 again indicates the sub-panel which, in this instance, is provided with a rearward extension 53. The terminals of the jack 59 are connected by jumpers or leads 54 with contacts 55. The latter are supported by the extension 53. The sub-panel 18 is, in this form of construction, conveniently of a width less than the trough portion 29. The space intervening the edge of the panel and the adjacent surface of the trough portion may be filled by a mounting strip 56. The latter supports spring contacts or fingers 57. These bear respectively on the terminals 55 and terminals 58, which latter connect with the interior of the casing of which this assembly forms a part.

As shown especially in Figs. 6 and 7, certain of the spring fingers or contacts 57 may be provided with extensions 59. Assuming that the parts are disposed in the manner shown in Fig. 7, it will be noted that one of the spring fingers 57 is not engaged by any of the spring fingers 57. We may assume that this terminal is, for example, connected to a buzzer or similar unit. Therefore, with no circuit being completed, that unit will be rendered inoperative. If, on the other hand, the strip 56 is withdrawn, reversed and re-inserted in position as shown in Fig. 6,

the particular terminal will be engaged by the extension 59. Therefore, the circuit will be completed. Consequently, any unit such as a buzzer connected thereto will be energized.

A structure such as this is useful in many different associations. For example, and especially where the switchboard may be employed by the armed forces, it might be desirable to utilize the apparatus without any buzzer or other unnecessary acoustical effect being present. Therefore, by simply withdrawing the panel 18 and the strip 56, the parts may be reassembled with the latter in the position indicated in Fig. 7. This will produce the desired result. By simply withdrawing and reversing the position of the strip, the circuit through the buzzer or other unit may again be re-established.

Finally, referring to Fig. 8, it will be noted that a plug 16 has been indicated which is insertable through the bore or opening of a jack 60. The shank of this plug has secured to it a cup member 61 preferably of rubber. The edges of this cup may bear within an annular groove 62 concentrically disposed with reference to the aperture of the jack. The normal tension of the cup will be such that the base portion will not be bulged. However, when associated with the mounting panel as in Fig. 8, the overall length of the side walls of the cut may be adequate to assure that these side walls will be slightly compressed, thus bulging the base of the cup. Consequently, a sealing contact is established between the cup and the panel. This is especially pronounced if a groove such as 62 is employed. Thus, in effect, a stopper structure is provided.

This will be especially valuable if the plugs are inserted into the jacks at the time that the switchboard assembly is intended to be inoperative and, for example, transported from one locality to the other. If the drain openings 20 are dispensed with under these circumstances and even if the switchboard is immersed, an entrance of water or other foreign material through the apertures of the jacks will be prevented. Consequently, it will—except under most extraordinary circumstances—be unnecessary to dismount the panel 18 for purposes of cleaning the space defined by the interior of the trough as well as the parts secured to the rear face of the panel.

In certain types of apparatus it may not be desirable to provide a trough portion. In fact, in many layouts it might be preferred to produce a hermetically sealed receptacle or switchboard in which the panels or surfaces did not include a relatively recessed part. In order to illustrate the application of the present teachings to such types of constructions, attention is invited to Figs. 9 to 12 inclusive.

In these views, the reference numeral 63 indicates the panel or surface of the receptacle and 64 a cover removably mounted by the latter. In the form of construction shown in Figs. 9 and 10, the cover is moved laterally or parallel over the surface of the panel in order to mount the the former on the latter. Therefore, a retaining flange or clip 65 may be mounted by the panel to receive the extended portion 66 of the cover 64. The cover may carry any suitable number of jacks 67 which receive plugs 68 to, for example, actuate the switch structure 69 by their stems 70. Also, these stems may serve to shift actuators 71 mounted by diaphragms 72. The latter serve to seal the openings 73 against the

entrance of fluid and foreign material. A member to be actuated such as, for example, a rod 74 may be disposed adjacent the actuator 71.

Preferably mounted upon a di-electric block 75 within the cover 64 are terminals 76 having extensions 77 which latter embody resiliency. Contacts 78 are mounted by the panel 63 and, by means of suitable backing structures, the entrance of fluid and materials into the interior of the receptacle is prevented despite the fact that these contacts extend from the exterior to the interior of the latter. A suitable securing unit 79 may serve to retain the cover 64 in mounted position above the panel 63.

With a structure such as the foregoing, it will be appreciated that an operator, by simply loosening the securing unit 79 may slide the cover 64 over the surface of the panel and away from the recess provided by the clip or flange 65. When the cover once clears this structure, it may be moved in a direction transverse to and away from the panel 63. Conversely, the cover may be mounted by following a reverse procedure. Under such procedure, it will be apparent that no damage will occur to the parts because a mere wiping engagement will be all that can follow as a consequence of the application of the cover to the panel. In other words, the terminals and especially the extensions 77 thereof will merely wipe against the adjacent faces of the contacts 78 as the cover is shifted into position. Likewise, the parts are so arranged that the actuator 71 will not come into engagement with portions of the mechanisms as supported by the cover and as the latter is being mounted. However, when the stem of the plug is inserted in the jack, the latter will be caused to function. Also, if the actuator 71 is present, the insertion of the stem will cause the actuator to engage the unit 74 to be operated. This will be permitted as a consequence of the flexibility of the diaphragm 72.

The structure shown in Figs. 11 and 12 contemplates that the cover will be moved in a plane perpendicular to the panel in order to mount the former on the latter or detach it therefrom. Securing devices such as 80 may be employed. Again, jack structures 81 are associated with the cover and contacts 82 which have their bodies connected with a lead within the interior of the receptacle are exposed on the exterior of the panel surface where the cover is to be mounted. These contacts are engaged by terminals 83 which again are of preferably resilient or yielding type. A conventional and suitable switch mechanism 84 may form a part of the jack and to be operated by the stem 85 of the plug 86. A lever 87 may be pivotally supported by the jack structure and serve to engage an actuating portion or area of a flexible sealing member such as the diaphragm 88. The latter, in turn, may serve to act against and shift a rod 89 or other suitable operating unit.

In this form of construction, it will be apparent that, in common with the structure shown in Figs. 9 and 10, a supplemental receptacle is, in effect, provided and the interior of which may readily be cleaned. In this connection, it will be appreciated that drain openings (not shown) but as previously described may form a part of the housing 64. The interior of the main receptacle or switchboard may be hermetically sealed under all normal operating conditions. Simply by moving the housing as shown in Figs. 11 and 12 towards the panel 63 and securing it in position, the necessary electrical connections are established. 75

Also, the apparatus is set up so that if mechanical connections are to be provided these are also automatically established.

Thus, among others, the several objects of the invention as specifically afore noted are achieved. Obviously, numerous changes in construction and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A telephone switchboard including in combination a casing formed with a sight opening to the rear of which an indicator unit is positioned, means whereby said unit may be restored to a non-indicating condition, a receiving surface forming a part of said casing, said casing and surface being formed to prevent the entrance of fluid into said casing, terminals within the area of said surface and electrically connected with the interior of said casing, a jack, means for mounting the latter to extend adjacent said surface, means for connecting said jack with said terminals, actuating means manipulatable from the exterior of said casing, and means interposed between said restoring means and actuating means and providing a fluid-tight connection such that the functioning of said actuating means will cause an operation of said shifting means.

2. A telephone switchboard including in combination a substantially waterproof casing, wall members forming a trough portion inside said casing and in substantially fluidtight relationship thereto, terminals disposed within said trough portion and connected to the mechanism within said casing, a mounting member adapted to be disposed adjacent said trough portion, apertured jacks supported by said mounting member, and means for connecting said jacks with said terminals.

3. A telephone switchboard including in combination a substantially fluid-tight casing, wall members forming a trough portion inside said casing and in substantially fluidtight relationship thereto, terminals disposed within the area of said trough portion and connected to the mechanism within said casing, a mounting member adapted to be disposed adjacent said trough portion, apertured jacks supported by said mounting member, means for connecting said jacks with said terminals, and said mounting means presenting an opening through which accumulations of materials between said member and trough portion may drain.

4. A telephone switchboard including in combination a substantially fluid-tight casing, wall members forming a trough portion inside said casing and in substantially fluidtight relationship thereto, terminals disposed within said trough portion and connected to the mechanism within said casing, a mounting member adapted to be disposed adjacent said trough portion, apertured jacks supported by said mounting member, and quick-detachable connecting means functioning automatically upon said member being extended into said trough portion to electrically connect the jacks with said terminals.

5. A telephone switchboard including in combination a substantially fluid-tight casing, wall members forming a trough portion inside said casing and in substantially fluidtight relationship thereto, terminals disposed within the area of said trough portion and connected to the mechanism within said casing, a mounting member adapted to be disposed adjacent said trough portion, apertured jacks supported by said mounting member,

quick-detachable connecting means functioning automatically upon said member and extending inside said trough portion to electrically connect the jacks with said terminals, and said connection comprising spring fingers and plates engageable by said fingers.

6. A switchboard including in combination a substantially fluidtight casing, a mounting surface forming part of said casing, terminals extending from the face of said surface, a switch-mounting panel disposable adjacent said surface, terminals mounted by said panel, a strip disposable adjacent said panel and terminals, contacts carried by said strip and extending from opposite faces thereof, the contacts at one of said faces being adapted to engage all of the corresponding terminals and the contacts at the other face being adapted to engage only a selected number of the corresponding terminals, and the said strip being adapted to be reversed so as to electrically connect different permutations of said two sets of terminals.

7. A switchboard including in combination a substantially fluidtight casing having a trough portion, terminals extending from the inner face of said portion forming part of said casing, a switch-mounting panel disposable across said portion, terminals mounted by said panel, a strip interposed between the terminals mounted by said panel and the terminals extending from the face of said portion, different permutations of contacts

carried by said strip, and means for securing said panel and strip with reference to said switchboard and whereby the strip may be optionally reversed to connect different permutations of the terminals carried by the panel with terminals carried by the trough portion.

8. In a telephone switchboard, in combination, walls forming a substantially fluidtight casing, an aperture disposed in one of said walls, a flexible seal extending across said aperture and adapted to seal the same against the entrance of fluid and foreign matter; a rigid contact member peripherally supported by said seal and in fluid tight relationship thereto and relatively movable, normally spaced elements, forming a composite actuating mechanism, the latter elements being disposed at opposite faces of said flexible seal and being adapted to enter into relative engagement through the intermediary of said rigid contact member.

REINHARD K. HELLMANN.

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