Nov. 18, 1930. J. A. STIRLING 1,781,962

JACK SWITCH

Filed Dec. 10, 1924 2 Sheets-Sheet 1

Fig. 1.

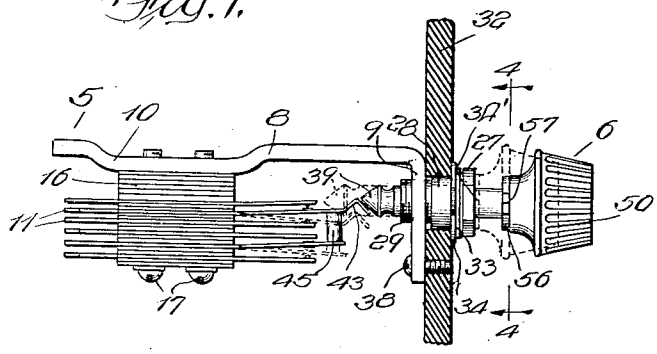



Fig. 2.

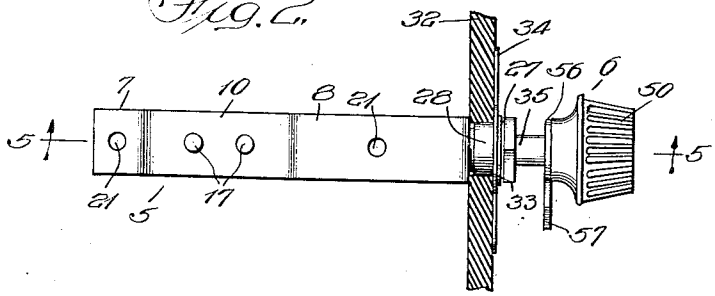



Fig. 3.

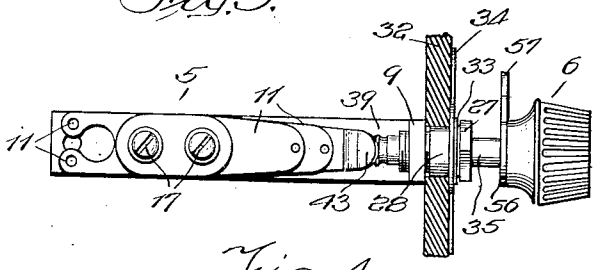
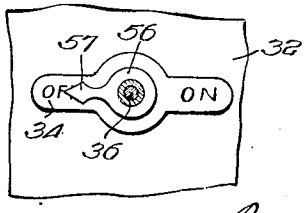



Fig. 4.




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Fig. 5.

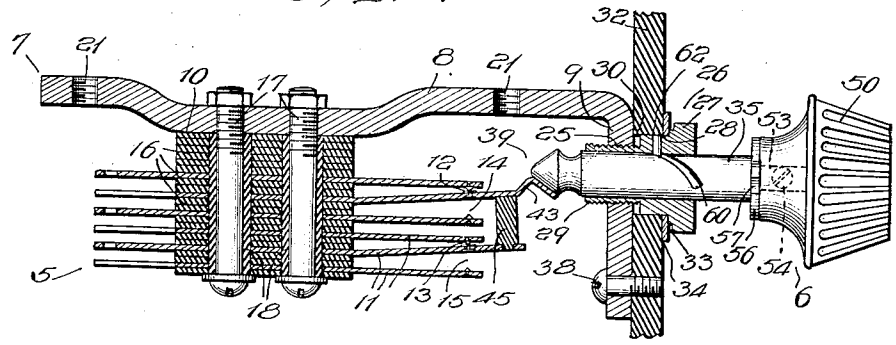



Fig. 6.

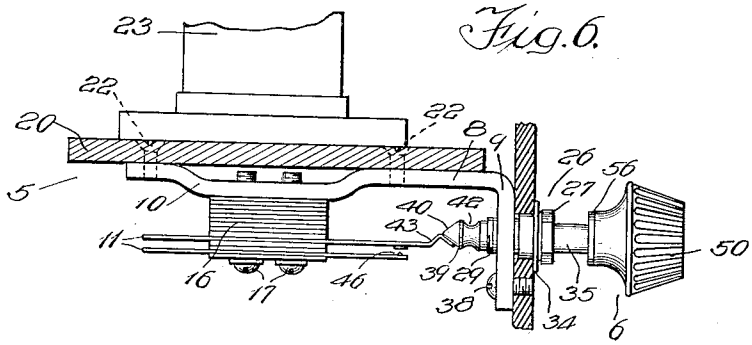



Fig. 7.

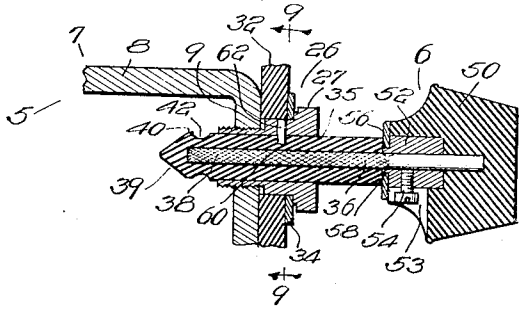



Fig. 8.

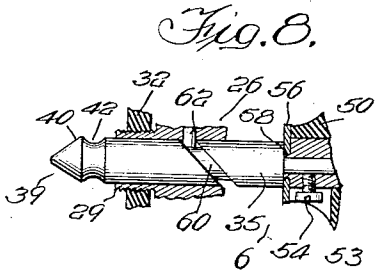
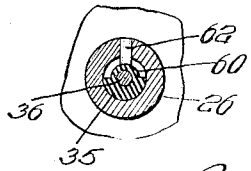



Fig. 9.




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Patented Nov. 18, 1930 1,781,962

# UNITED STATES PATENT OFFICE

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## JACK SWITCH

Application filed December 10, 1924. Serial No. 754,926.

My invention relates to telephony and more particularly to an improved jack switch especially adapted for use in connection with radio receiving instruments, although it may be employed wherever found desirable.

The desirability of different switching arrangements in instruments of this sort and of controlling a number of circuits or contacts from a common handle are well known. Another important consideration is that of providing a snap action and assuring positive and firm contact and it is also desirable that there be a standard provision universally adaptable to all different switching arrangements and adapted for controlling different circuits and contact arrangements and a number of circuits from a common handle or operating element.

It is furthermore desirable to make up devices of this character so that a minimum number of standard or stock parts may be employed and to standardize the structure and assembly of the different devices used in such instruments to permit as much interchangeability of the different parts and devices as can be had, consistent with a good reception. For example, I find it desirable to have a switch that can be mounted on a panel, plate, base-board, shelf, or other support, and one that is interchangeable with a jack, and it is also desirable to have an operating element which can be combined with different contact arrangements to control any desired combination of circuit connections and contact arrangements.

The art has taught the general reliability of jack and plug switches for currents of no appreciable magnitude.

According to my invention, I take what amounts to a regular or standard jack and with a simple operating element having rotary motion, I provide for making or breaking any contact arrangement and for controlling any combination of circuit connections. I believe that I am the first to move the contact springs of a jack by rotary motion of the operating element and this is, therefore, an important aspect of my invention. The rotary operating element can be combined with any standard or preferred type of jack and with any contact spring arrangement. In operation, the desired snap action is produced, positive, firm contact is assured and the device may be mounted upon substantially any panel or plate arrangement and is interchangeable with a jack.

It provides for controlling different circuits and combinations thereof and for controlling a number of circuits from a common handle, and a minimum number of standard parts are employed and simple, standardized assembly is permitted. The operation and different positions of the operating element is such that the operator may be apprised by his sense of touch whether the circuit is open or closed.

The structure and manner of carrying out my invention will appear from the following detailed description and the claims taken with an inspection of the accompanying drawings, in which:

Figure 1 is a side elevational view of a device embodying my invention showing the same mounted on a panel;

Fig. 2 is a top plan view of the same;

Fig. 3 is a bottom plan view;

Fig. 4 is a transverse section on line 4—4 of Fig. 1 showing the indicator and pointer from the front;

Fig. 5 is an enlarged vertical section on line 5—5 of Fig. 2;

Fig. 6 is a side elevational view showing a different contact spring arrangement and a plate or sub-panel mounted upon the jack and supporting the tube sockets, transformers, or any or all other parts of the set.

Fig. 7 is an axial section through the operating element and its mounting;

Fig. 8 is a fragmentary showing of the same with the operating plug in elevation; and

Fig. 9 is a vertical detail section on line 9—9 of Fig. 7.

The set shown comprises generally a jack 5 and a rotatable operating element designated generally at 6.

The jack shown is of the type to which the copending application of Herbert H. Frost, Serial No. 753,033, filed December 1, 1924, is directed, said jack lending itself to

all panel, table and other mountings and adapted for supporting a shelf, plate, or sub-panel for supporting or mounting the transformers, tube sockets, or other parts of the instrument, and adapted for connecting a plurality of angularly related panels. The present invention is not, however, limited to use in connection with any particular type of jack. Any standard, suitable, or preferred jack may be employed, from which it will appear that the universal mounting and supporting functions of the jack may be omitted, in so far as my present invention is concerned.

The jack shown comprises an angular jack frame 7 having a base 8 and a thimble leg 9. Between its ends the base 8 has an offset portion 10 forming a seat for the contact springs 11 which are mounted on said seat. The contact spring arrangement shown in Figs. 1 and 5 is adapted to have contact broken at 12 and 13 and made at 14 and 15 by operation of the operating element in one direction and made at 12 and 13 and broken at 14 and 15 when said operating element is moved into its other position. The contact arrangement of Fig. 6 is a typical two spring open contact arrangement. The number of spring contacts employed and the particular arrangement thereof forms no part of my present invention and will vary widely according to the particular installation and purposes to which the jack is to be put.

Strips 16 of insulation are interposed between and insulate the contact springs 11 from each other, and these strips and the contact springs are secured together and firmly upon the seat 10 by a pair of screws 17 which extend through registering openings in the spring contacts and insulating strips and are insulated from the contacts by suitable insulating sleeves or bushings 18. The screws 17 have threaded engagement with tapped openings through the seat 10 and passing through said seat may be provided on their outer ends with lock nuts, if desired.

The offset portion 10 permits the ends of the screws 17 to project through the jack base without interfering with the mounting of said base upon a plate, table, or the like, or with the mounting of a plate or sub-panel 20, as shown in Fig. 6, upon said base 8.

On each side of the offset portion 10 the base 8 has a tapped opening 21 for fastening the base to a panel or plate, or a panel or plate 20 to the base, by means of suitable screws 22, as shown in Fig. 6, the heads of such screws being preferably countersunk in the panel 20 so as not to interfere with the mounting or supporting functions of said panel. In Fig. 6 I have shown a tube socket 23 mounted upon the sub-panel 20, this being merely illustrative of any part of the set that may be mounted upon the sub-panel as, for example, the transformers or tube sockets.

The thimble leg 9 has a tapped opening 25 and a thimble or sleeve 26 having a head 27 of hexagonal or other suitable formation for engagement by a wrench, for example, an enlarged base 28 and a reduced threaded inner end 29 is passed through an opening or aperture 30 in the plate or panel 32, and is threaded at its inner end into the opening 25 through the thimble leg of the jack frame to bind the jack firmly in place upon the panel.

The opening 30 is preferably large enough to take the enlarged base 28 of the thimble which, by its greater diameter, spaces the threaded end of the thimble from the panel opening and prevents distortion or marring of the threads on the thimble. The head 27 is preferably under-cut at 33 and clamped between the reduced inner projecting end of said head and the outer surface of the panel 32 is an indicator plate 34 having suitable markings for indicating in co-operation with a pointer on the operating element the open and closed conditions of the switch.

A washer 34′ may be interposed between the indicator plate 34 and the head 27 of the thimble. Where the panel is thicker, the washer 35 may be omitted or, where the panel is thinner, additional washers may be employed. A screw 38, passing loosely through the thimble leg 9 of the jack frame below the aperture 25 and threaded into the panel 32, or provided at its outer end with a suitable nut, firmly holds the jack frame against the turning movement of the operating element.

The rotatable operating element 6 comprises a generally cylindrical plug 35 which passes through and has rotary movement in the thimble or sleeve 26. Where there are no circuit connections through the plug 35, this plug is preferably of bakelite or other suitable insulating material, and it is molded or otherwise secured upon a metallic, preferably a brass pin 36 inserted axially therethrough and terminating preferably just short of the tip end of the plug, thereby imparting strength and durability to the plug throughout substantially its entire length. That portion of the pin 36 lying within the plug 35 is knurled or otherwise roughened at 38 to bind the plug firmly upon the pin.

The tip end 39 of the plug has the usual or any suitable hill 40 and valley 42 formation for cooperation with the generally V-shaped hump 43 on the contact spring with which the plug co-operates. In Figs. 1 and 5, the hump 43 is shown at the plug end of the second spring contact from the top, and a stop or block of hard rubber or other suitable insulation 45, secured on the next to the bottom spring, cooperates with this humped spring so that upon the inward motion of translation or projection of the plug 35, the tip 39 thereof, by its cooperation with

the hump 43, moves the next to the top and the next to the bottom spring contacts to break contact at 12 and 13 and make contact at 14 and 15, as already pointed out. Upon the withdrawal or outward motion of translation of the plug, the tip 39 by its movement out of cooperation with the hump 43, releases the next to the top and next to the bottom spring contacts and permits them to return to the positions to which they are normally biased, again making contact at 12 and 13 and breaking contact at 14 and 15. In the spring arrangement shown in Fig. 6, inward movement or projection of the plug moves the top spring contact down and makes contact at 46, and upon withdrawal of the plug out of cooperation with hump 43 and the upper spring contact, returns to the position into which it is normally biased as shown, and breaks contact at 46.

Although this may be varied as desired, one of each pair of the cooperating contacts on adjacent spring arms, has a pointed contact tip with a reduced stem passing through the contact arm and riveted over, and the other contact may be riveted over flat at one or both ends, depending upon whether it makes contact at both or only one side, all as shown in Fig. 5.

Rotary movement is imparted to the outer end of the operating element 6 by a knob or finger piece 50 which is preferably of molded or other suitable insulating material, and has molded or otherwise secured axially therein, a metallic, preferably brass, insert 52, which forms a mounting sleeve for securing the knob upon the outer end of the pin 36. The pin 36 passes axially through the insert 52 and on axially into the body of the knob 50, as shown in Fig. 7. The inner converging end of the knob 50 has a groove 53 which opens radially into the insert receiving bore of the knob, to receive a screw 54 which threads radially through the insert or sleeve 52 and is adapted for engagement at its inner end with the pin 36 to bind the knob 50 firmly in place thereon. Loosening of the screw 54 permits removal of the knob 50 from the pin 36, and upon replacement of the knob tightening of the screw 54 quickly binds the knob in place upon the pin.

The knob 50 carries a pointer 56 having a pointed end 57 which co-operates with the "Off" and "On" markings on the indicator plate 34 to indicate the position of the knob and thereby the condition of the switch. The enlarged generally circular mounted end of the pointer has an aperture and the inner end of the insert 52 has an annular lip 58 which passes through this aperture and is headed or riveted over at the opposite side of the pointer and thereby firmly binds the same in place upon the inner end of the knob.

For converting rotary movement of the knob 50 into motion of translation of the tip 39, or for transmitting motion of translation to the tip of the plug by turning or rotary movement of the operating element, the plug 35 is provided with a generally helical groove 60. In that substantially one-half a rotation or 180° turning of the plug is sufficient for the present purposes, the groove 60 is shown as extending substantially 180° around the plug. The length of the groove may be either greater or less, if desired. The groove 60 is of relatively great or quick pitch to impart a relatively quick motion of translation to the tip 39 when the operating element is turned or rotated. This, with the co-operation of the tip 39 with the hump 43, provides a quick snap action which is highly desirable and positive movement of the plug from one position to the other, and permanent positioning in the position into which it is moved, is assured. This provides positive, permanent and firm contact which is also highly desirable.

A pin 62 passing radially through the thimble or sleeve 26 and riveted over at its outer end or otherwise suitably secured in said sleeve, projects at its inner end into the groove 60, and it is by the engagement of this pin in the groove 60 that motion of translation is imparted to the operating element upon turning or rotating the knob 50. The pin 62, in addition to its cooperation with the groove 60 for imparting motion of translation to the tip 39, coperates with the ends of the groove 60 at the limits of rotation of the operating element and thereby serves as a stop for limiting that rotation and the motion of translation of the tip in each direction. In assembly, the plug 35 is mounted in the sleeve or thimble 26 and the pin 62, upon being inserted through the thimble into cooperation with the groove 60 and secured in place, holds the plug against displacement from the thimble in either direction.

Where the panel 32 is relatively thin, a washer 34′ of sufficient thickness or a plurality of washers are preferably employed for spacing the inner end of the enlarged thimble base 28 from the leg 9 so that proper clamping or binding engagement of the nut or head 27 with the washer or indicator on the outer surface of the panel may be secured, without a second engagement of the end of base 28 with leg 9 which might otherwise prevent firm binding at the outer end and thereby firm attachment to the panel.

From the foregoing it will now be apparent that I have made a standard provision universally adaptable to all different switching arrangements and adapted for controlling different circuits and contact arrangements or a number of circuits from a common handle or operating element. The device is interchangeable with a jack and is adapted for mounting upon substantially any panel or

plate arrangement. It is simple, employs a minimum of stock parts and its structure is standardized. The operator can by his sense of touch ascertain in the dark, for example, the axial position of knob 50 and from that he can quickly tell whether the switch is open or closed without reference to pointer 56 and indicator 34, although these are always open to view so that he may at any time be apprised as to the position of the switch from them.

While I have described my invention in connection with the details of a particular embodiment, it is to be understood that modifications and variations are contemplated and that I do not intend to be limited to those details.

For example, the provision for imparting motion of translation to the plug tip instead of being embodied at the thimble 26 may be embodied at the tip 39 of the plug as for example, by providing such cooperative engagement between the tip 39 and hump 43, as will impart motion of translation to the tip 39 upon rotation of the knob 50. The relatively great pitch of groove 60, in addition to imparting a quick or snap movement to the tip, holds the tip firmly in its inner projected position and against outward displacement under the action of the spring contact. Should it be desirable to provide a circuit connection through the plug, such a connection may be provided within the scope of my invention.

I claim:—

1. In a device of the class described, the combination of a jack and an operating element therefor, said element having rotary motion, and means for converting the rotary motion into longitudinal motion to move the element into and out of its operated position.

2. In combination, a rotatable plug, means for imparting translatory movement to said plug upon rotation thereof, and a jack construction operable by said plug in response to said translatory movement.

3. In a device of the class described, the combination of a plug, means for turning said plug, means for converting turning movement of the plug into motion of translation and a jack operated by motion of translation of said plug.

4. In combination, a jack frame having a base and a thimble leg, contact springs mounted on said base, a thimble passing through said thimble leg, and an operating plug rotatably mounted in said thimble said plug being non-conducting with respect to said springs and being capable of a screw like movement.

5. A jack switch operating means which is adapted to be mounted on a standard jack having a mounting sleeve and plug therein, comprising a sleeve, and a sliding and rotary element, said last named sleeve and element being adapted to replace said standard jack mounting sleeve and plug.

6. In combination, a jack frame having a base and a thimble leg, contact springs mounted on said base, a thimble passing through said thimble leg, an operating plug rotatably mounted in said thimble, and means for converting rotary motion of said plug into motion of translation, said means comprising a helical groove in the plug, and a pin mounted in said thimble and engaging in said groove.

7. In a jack switch, the combination of a jack and an operating element for said jack, said element comprising a plug of insulation said plug and jack having cooperating helical guiding surfaces.

8. In a jack switch, the combination of a jack and an operating element for said jack, said element comprising a plug of insulation, said plug being rotatable about its longitudinal axis and means for converting rotary motion of said plug into motion of translation.

9. The combination with a jack plug comprising a frame having a contact spring pile up thereon and means for mounting said part on a panel, of an element rotatable about its longitudinal axis and means for imparting a translatory motion thereto, thereby imparting translatory motion to said spring pile up upon rotation of said element.

10. In combination, a jack construction comprising a frame having a plurality of contact springs mounted thereon, a mounting panel, said frame having a lateral portion abutting said panel, a sleeve for securing the lateral portion of the frame to the panel, a rotatable element extending through said sleeve, and means connecting the sleeve to the rotatable element for causing said element to be moved longitudinally into co-operation with the contact springs upon rotation of the element.

11. In combination, a plate, a jack attached thereto, said jack having contact springs and a thimble, a plug rotatably mounted in said thimble and adapted for operating said jack, said plug having a helical groove and a relatively fixed pin engaging in said groove.

12. A jack plug comprising a body of insulation having a helical groove in its periphery.

13. In a device of the class described, an operating element comprising a metallic pin having a plug tip of insulation molded thereon, an operating knob comprising a body of insulation having an axial metal insert comprising a sleeve, said pin extending into said sleeve and a screw passing laterally through said insert and into co-operation with said pin for binding the knob in place thereon.

14. In combination, a finger piece comprising a body of insulation having an axial metal insert molded therein, said insert having an annular lip at one end and a pointer having a mounting aperture, said lip passing through said aperture and headed to bind said pointer firmly upon said finger piece.

15. In combination, a plate, a jack frame having a base and a lateral leg, a headed sleeve passing through said plate and threaded into said lateral leg, a rotatable operating plug mounted in said sleeve, and means adapted upon rotation of said plug to impart a screw like movement thereto into and out of the full operated position of said plug.

16. In combination, a panel, a jack frame having a base and a lateral leg, a headed sleeve passing through said plate and threaded into said lateral leg, an indicator clamped between the head of the sleeve and the panel, an operating plug having rotary motion in said sleeve, a finger piece on said plug and a pointer carried by said plug and co-operating with said indicator to indicate the position of the switch.

17. In combination, a panel, a jack frame having a base and a lateral leg, a headed sleeve passing through said plate and threaded into said lateral leg, an operating plug having rotary motion in said sleeve, a finger piece on said plug, said plug having a helical groove in its periphery and a pin secured in said sleeve and engaging in said groove.

18. In combination, a jack having a spring contact provided with a hump, an operating plug, said plug having rotary movement and a hill and valley tip co-operable with said hump and means for imparting motion of translation to said tip with rotary movement of the plug along its longitudinal axis.

19. In combination, a panel, a plug rotatably mounted in said panel, said plug having a finger piece on one side of the panel for imparting rotary movement to the plug, a tip on the other side of the panel and means for converting rotary movement of the plug into motion of translation for reciprocating the plug.

20. In combination, a plurality of relatively rigid contact members, a plurality of spring contact members adapted for contact with said first contact members, means for bringing said first contact members into and out of contact with said second contact members, said means comprising a plug adapted to be contemporaneously turned and moved axially.

21. A switch comprising a contact member and a cooperating contact making member, a rotatable element adapted to operate one of said members, and means associated with said element for giving it a transverse movement while it is rotated.

22. A switch comprising a contact member and a cooperating contact making member, a rotatable element adapted to operate one of said members, a mounting for said element, and means associated with said mounting for giving said element a transverse motion when it is rotated to operate one of said elements.

23. In a device of the class described, the combination of a jack and an operating element therefor, said element having rotary motion, means for converting the rotary motion into longitudinal motion to move the element into and out of its operated position, and an indicator for indicating the longitudinal position of the element by the amount of rotation of said element.

24. A switch comprising a bearing portion, a contact member, a rotary member in said bearing portion, and means adapted to impart translatory motion to said rotary member upon rotation thereof for causing said rotary member to contact said contact member, said means comprising a pin and spiral groove.

25. A switch comprising a bearing portion, a contact member, a rotary member having a spiral groove, and a stud carried by said bearing portion and projecting into said spiral groove so that a translatory motion is imparted to said rotary member upon rotation thereof, thereby causing said rotary member to contact said contact member.

In witness whereof, I hereunto subscribe my name this eighth day of December, 1924.

JAMES A. STIRLING.