Aug. 16, 1960 H. J. GLUECKSTEIN ET AL 2,949,522

ELECTRICAL COMPONENT

Filed May 31, 1957 2 Sheets-Sheet 1

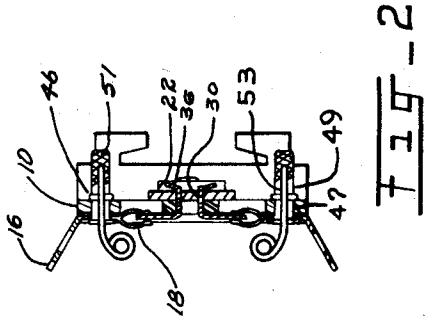

FIG - 2

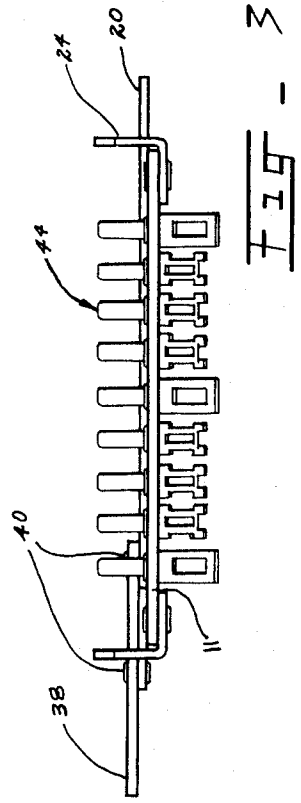

FIG - 3

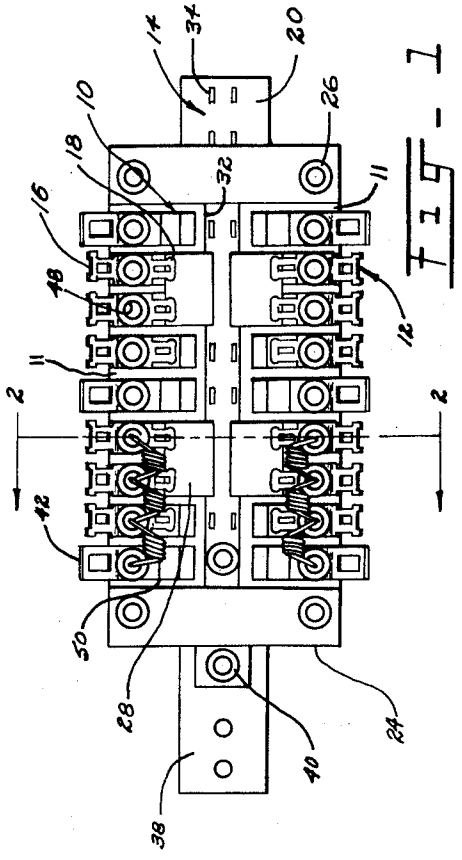

FIG - 1

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ELECTRICAL COMPONENT

Filed May 31, 1957 2 Sheets-Sheet 2

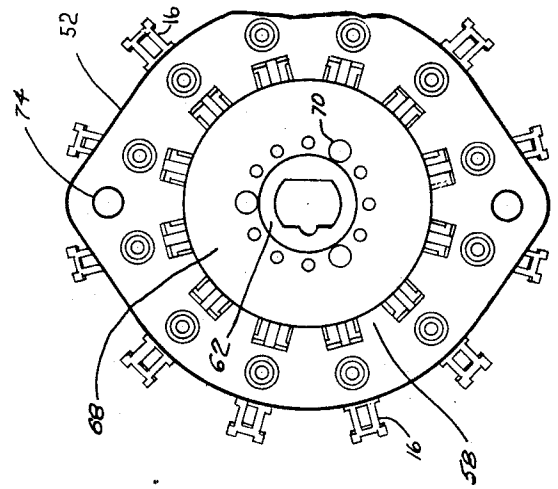

FIG-6

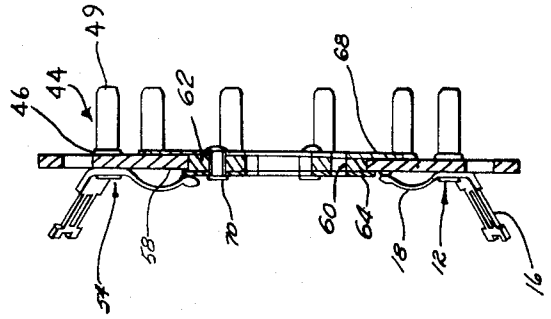

FIG - 5

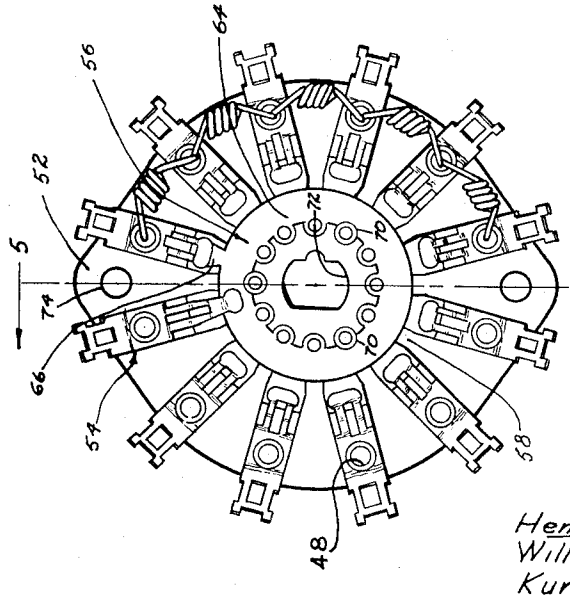

FIG - 4

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United States Patent Office 2,949,522 Patented Aug. 16, 1960

2,949,522

ELECTRICAL COMPONENT

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Filed May 31, 1957, Ser. No. 662,822

4 Claims. (Cl. 200—166)

This invention relates to electrical components of the type which may be quickly mounted and dismounted to and electrically connected and disconnected with established circuits.

It is an object of this invention to provide a component of this type which uses a minimum number of readily assembled parts, including like parts, which may be combined in selected groups to provide components having a wide variety of operating characteristics.

Although this invention is particularly well adapted for all applications requiring detachable electrical connection of components with established circuits of associated equipment, the advantages are particularly evident when considered in connection with a switch. For this reason such an application has been selected as a representative embodiment.

A switch embodying the present invention includes a sheet of insulating material, a plurality of stationary contacts positioned on a side of the sheet, and a plurality of connectors each having a portion engaging the sheet and the stationary contacts to mechanically hold the contacts to the sheet and electrically connect the connectors to the stationary contacts. Each connector has a cylindrical portion extending normal to the plane of the sheet and adapted for engagement in a socket to electrically connect the stationary contacts to the circuits to be switched. A movable contactor is mounted on the sheet and adapted to move in and out of contact with the stationary contacts, whereby electrical circuits can be selectively completed between the connectors.

The connectors may be hollow with the terminal ends of various electrical components such as coils, resistors, capacitors, etc. inserted in the ends of the connectors which hold the stationary contacts to the sheet. The terminal ends of the various components may then be soldered to the connectors.

The stationary contacts may be arranged in rows on the sheet with a movable contactor slidably mounted between the rows or they may be arranged in a circle with a movable contactor rotatably mounted at the center of the circle.

Other objects and advantages will be pointed out in, or be apparent from the specification and claims, as will obvious modifications of the two embodiments shown in the drawings, in which:

Fig. 1 is a top plan view of a switch embodying the present invention;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a side elevation view of the switch shown in Fig. 1;

Fig. 4 is a top plan view of a modified switch with the stationary contacts arranged in a circle;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4; and

Fig. 6 is a bottom plan view of the switch shown in Fig. 4.

Referring to Figs. 1, 2 and 3 of the drawings, the switch includes a two-piece stator sheet **10** of insulating material comprising a pair of spaced strips **11** fastened to brackets **24** by eyelets **26** to form rectangular opening **32** therebetween. Sheet **10** has suitable cut-out portions for mounting stationary contact clips **12** in parallel rows along opposite edges thereof and a contactor assembly **14** slidably mounted between the rows. The clips are of standard design having a double layer or leaf construction with terminal portions **16** adapted for connection to circuit conductors (not shown) and oppositely facing resilient double wiping contacts **18** for contact with a moving switch part.

The movable contactor assembly **14** comprises a strip **20** of insulating material slidably mounted in openings **22** in the vertical legs of supporting angle brackets **24**. A plurality of metal contactors **28** are mounted on strip **20** by fingers **30** extending downwardly from the contactor through rectangular opening **32** between strips **11** of sheet **10** and then through openings **34** in strip **20**. The ends of fingers **30** are bent over as at **36** (Fig. 2) to hold them securely in place on strip **20**. Strip **20** is actuated by a plate **38** fastened to the end of the strip by eyelets **40**.

Although various arrangements of clips **12** may be employed, they are shown in groups of three with a terminal clip **42** mounted between each group and at the end of each row. Contactors **28** are of sufficient width to span a pair of adjacent clips. The movement of strip **20** will shift contactors **28** from a position whereby it connects the middle clip of each group of three with one of the end clips to a position where the middle clip is connected to the other end clip, thereby producing a switching action between the middle clip of each group and the end clips thereof.

Terminal clips **42** and contacts clips **12** are fastened to sheet **10** by connector pins **44**. Annular rings **46** on the pins form shoulders abutting the underside of sheet **10** with one end portion **47** of the pin extending through sheet **10** and clips **12**. The ends of portions **47** extending through the clips are riveted over to securely fasten the clips, pins and sheet in assembled position and to establish a good electrical connection between the pin and clips. While clips **42** and **12** and contactors **28** are shown mounted on only one side of the stator sheet, it should be understood that they could be mounted on both sides of the sheet to provide additional switching if desired.

The other end portion **49** of each pin is cylindrically shaped and extends normal to the plane of sheet **10**. Portion **49** is of conventional configuration and size adaptable for plug-in connection with a standard type socket clip. Pins **44**, therefore, serve to both fasten the clips to the sheet and also as a means for detachably connecting the assembled stationary contacts to the circuits to be controlled.

Pins **44** are hollow with openings **48** extending lengthwise therethrough. Terminal ends **53** of coils **50** (or other electrical components such as resistors, capacitors, etc.) may be mounted in openings **48** (through top portion **47**) and electrically connected therein by solder **51**. This soldered connection can readily be made by dip-

soldering whereby portions 49 of the assembled pins are inserted in molten solder causing the solder to rise up in openings 48 around terminal ends 53 by capillary action where it is retained and hardens in place. The outside of portions 49 of the pins may be nickel-plated prior to assembly and soldering to prevent solder from adhering to the pins and adversely effective plug-in connection to sockets in associated equipment.

Figs. 4, 5 and 6 show a rotary-type switch with the stationary contact clips arranged in a circle. The switch includes a generally circular stator sheet 52 of insulating material having suitable cut-out portions for mounting normal size stationary contact clips 12, elongated stationary contact clip 54, and a movable contactor assembly 56. A plurality of clips 12 and the elongated clip 54 are fastened to the sheet by pins 44 in the manner previously described with respect to the slide-type switch shown in Figs. 1, 2 and 3. The clips are arranged radially in a circle with the double-wiping contacts 18 arranged for contact with a moving switch part mounted at the center of the circle. The lower contact arms of the clips extend below the surface of the sheet through portions cut out to form radial projections 58 which define a circular space 60 at the center of stator sheet 52.

The movable contactor assembly 56 comprises a disc 62 of insulating material of a size for rotation in space 60. Disc 62 has mounted on one side thereof a washer-like metallic ring 64 with a contact lug 66 extending beyond the periphery of the ring. A plate 68 of suitable insulating material is mounted on the other side of the disc 62 by rivets 70 or eyelets which fasten plate 68, ring 64 and disc 62 together. Another ring 64 could be substituted for plate 68 if switching on both sides of the sheet was desired. Contact ring 64 and plate 68 each extend beyond the periphery of disc 62, thus forming a channel into which the radial projections 58 extend to retain the movable contactor assembly in place in circular space 60.

An operating shaft (not shown) can be mounted in opening 72 in disc 62 and supported by structure mounted on sheet 52 by means of openings 74 therein. Rotation of the shaft will move contact ring 64 continuously between the contacts of elongated clip 54 and will move contact lug 66 alternately between the contacts of short clip 12 to selectively complete circuits between the connector pin connected to clip 54 and any of the other pins.

Coils 50 or other electrical components such as capacitors, resistors, and the like, may be connected to the pins by mounting the terminal ends 53 thereof in openings 48 and soldering in the manner previously described.

In the embodiments of the present invention shown, the connector pins 44 connect the stationary contacts of a switch to a sheet of insulating material. It should be understood, however, that the connector pins could be used in other applications, as, for example, to mount the elements of a variable resistor on a sheet of insulating material for plug-in connection of the unit with established circuits in associated equipment.

Although but two embodiments of the present invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. A plug-in switch comprising, a sheet of insulating material, a plurality of stationary contacts positioned on one face of said sheet, a plurality of hollow connector pins open at both ends and having an end portion engaging said sheet and said stationary contacts to mechanically hold said contacts to said sheet and electrically connect said connector pins to said stationary contacts, said connector pins each having a cylindrical portion extending from the other face of said sheet and adapted for engagement in a socket to electrically connect said stationary contacts to the circuits to be controlled by plug-in connection of said switch with a panel having sockets mounted therein, and a contactor movably mounted on said base for movement in and out of contact with said stationary contacts whereby electrical circuits can be selectively completed between said connector pins.

2. A plug-in switch comprising, a sheet of insulating material, a plurality of stationary contacts positioned on said sheet, said stationary contacts each having a clip portion adapted for engagement with a movable contactor, a terminal portion adapted for connection to a conductor, and a mounting portion adapted for engagement with a connector pin, a plurality of hollow connector pins open at one end and having a portion at said open end engaging said sheet and said mounting portion of said stationary contacts to mechanically hold said contacts to said sheet and electrically connect said connector pins to said stationary contacts, said connector pins each having a cylindrical portion adapted for engagement in a socket to electrically connect said stationary contacts to the circuits to be controlled by plug-in connection of the switch with a panel having sockets mounted therein, and a contactor movably mounted on said base for movement in and out of contact with the clip portions of said stationary contacts whereby electrical circuits can be selectively completed between said connector pins.

3. A plug-in switch comprising, a sheet of insulating material, a plurality of stationary contacts positioned in a row on one face of said sheet, said stationary contacts each having a clip portion adapted for electrical engagement with a movable contactor, a terminal portion adapted for connection to a conductor, and a mounting portion adapted for engagement with a connector pin, a plurality of hollow connector pins open at one end and having a portion at said opening end engaging said sheet and said mounting portion of said stationary contacts to mechanically hold said contacts to said sheet and electrically connect said connector pins to said stationary contacts, said connector pins each having a cylindrical portion adapted for engagement in a socket to electrically connect said stationary contacts to circuits to be switched by plug-in connection of said switch with a panel having sockets mounted therein, a plurality of movable contactors slidably mounted on said one face of said sheet and adapted for movement in and out of contact with said clip portions of said stationary contacts whereby electrical circuits can be selectively completed between said connector pins, and an actuator strip for said movable contactors slidably mounted on the other face of said sheet and held in place on said sheet by said plurality of movable contactors which are fastened to the actuator and extend from said other face of said sheet to said one face of said sheet for contact with said clip portions of said stationary contacts.

4. A plug-in switch comprising, a sheet of insulating material, a plurality of stationary contacts positioned on one face of said sheet, a plurality of hollow connector pins open at both ends and having an end portion engaging said sheet and said stationary contacts to mechanically hold said contacts to said sheet and electrically connect said connector pins to said stationary contacts, said connector pins each having a cylindrical portion extending from the other face of said sheet and adapted for engagement in a socket to electrically connect said stationary contacts to the circuits to be controlled by plug-in connection of said switch with a panel having sockets mounted therein, said openings in said end portion of said pins adapted for receiving the terminal ends of an electrical component such as a coil, resistor, capacitor, and the like, and said openings in the end of said cylindrical portions of said pins being of sufficient size to permit molten solder to rise up in said pins by capillary action when said pins are inserted in molten solder, and a contactor movably mounted on said base for movement in and out of contact with said stationary

contacts whereby electrical circuits can be selectively completed between said connector pins.

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