

March 27, 1962

S. T. DEAKIN

3,027,534

PLUG TYPE ELECTRIC-CIRCUIT SELECTOR

Filed March 15, 1960

3 Sheets-Sheet 1

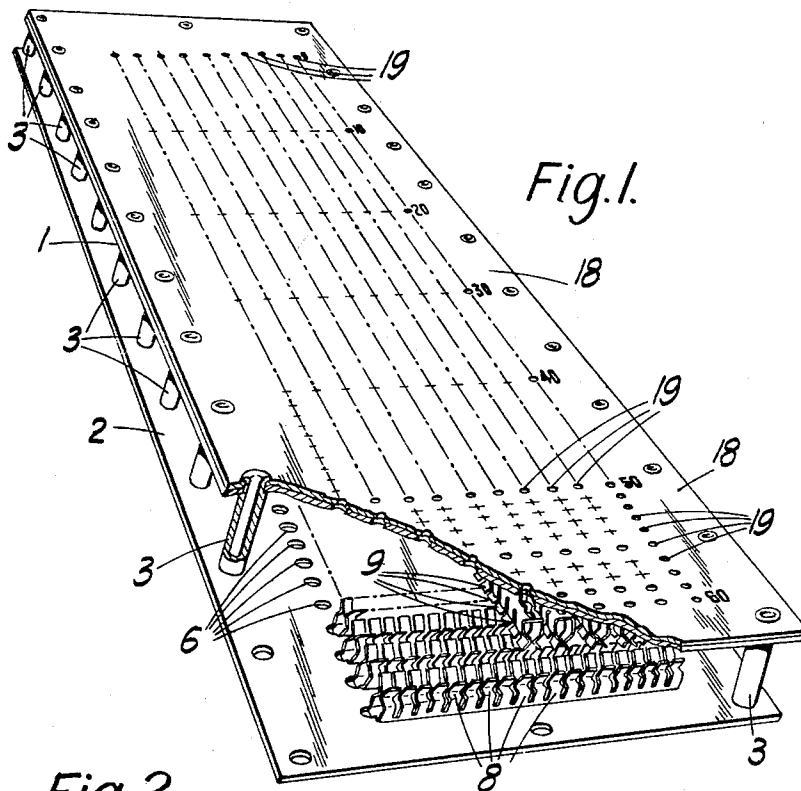
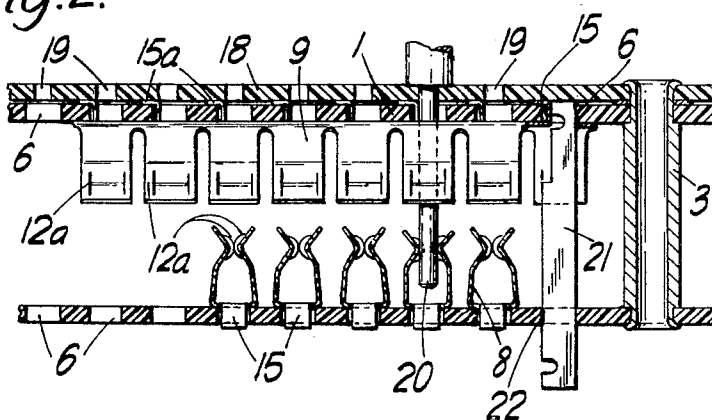


Fig. 2.



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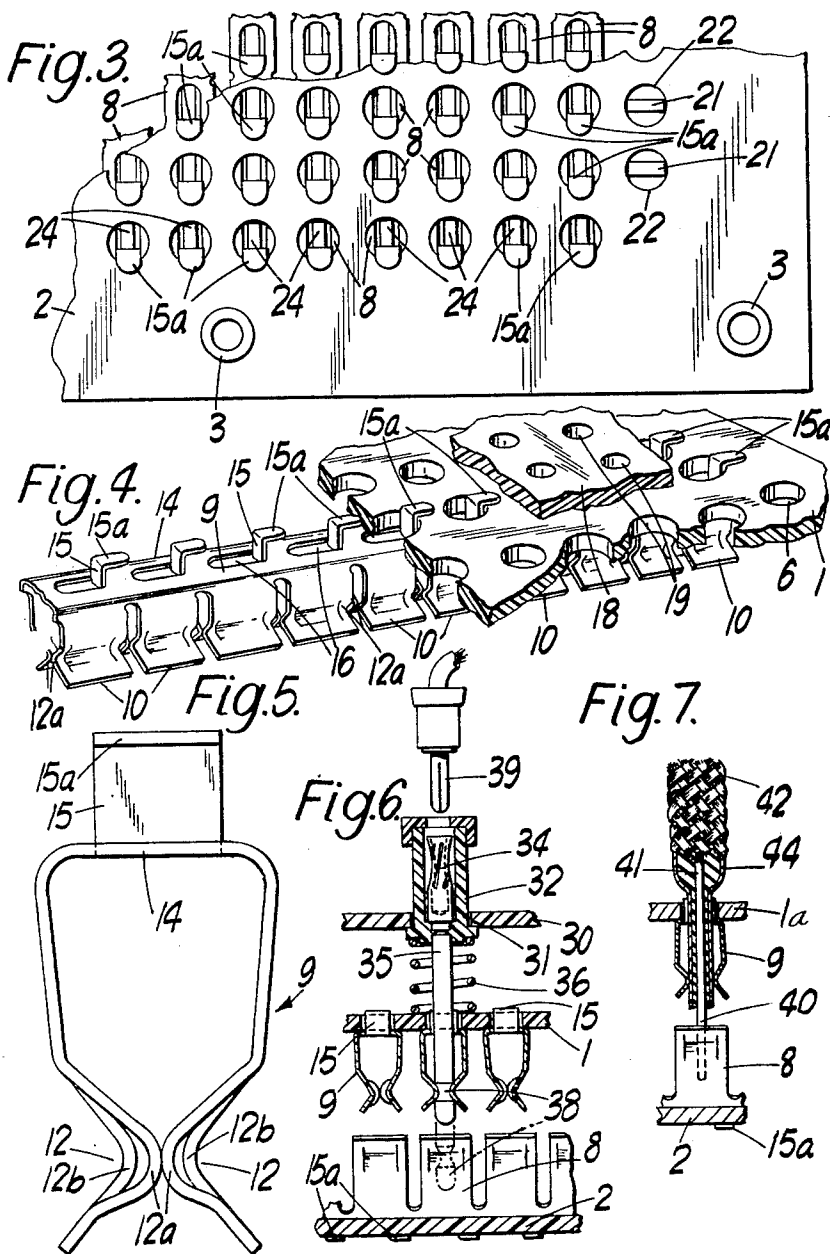
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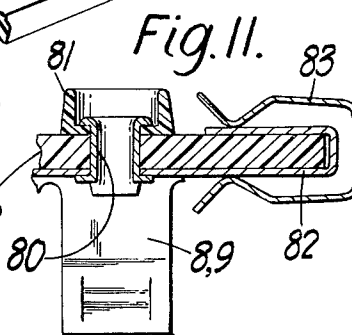
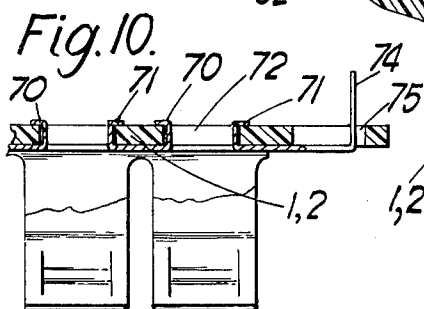
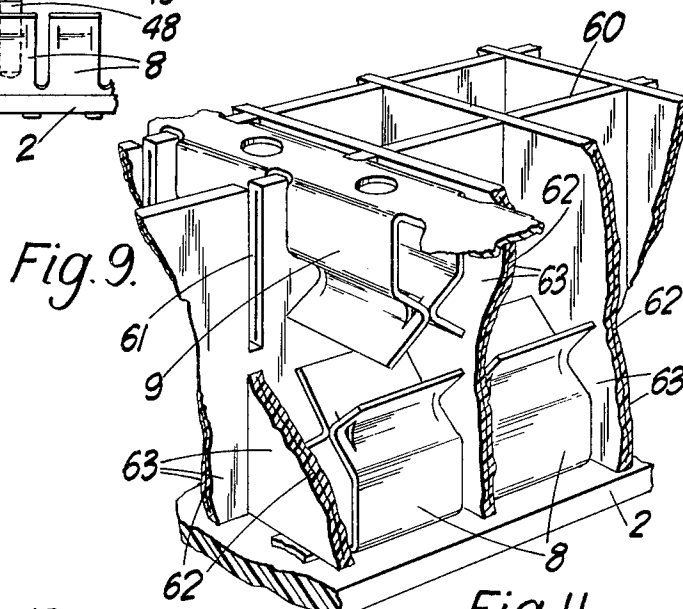
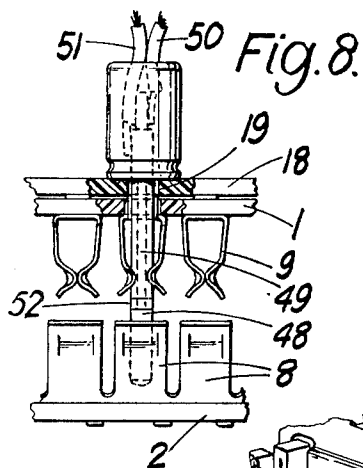
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PLUG TYPE ELECTRIC-CIRCUIT SELECTOR

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3 Sheets-Sheet 3



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3,027,534

PLUG TYPE ELECTRIC-CIRCUIT SELECTOR

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9 Claims. (Cl. 339—18)

The invention relates to electric-circuit selectors of the kind having at least two sets of socket contacts arranged in substantially parallel rows, the rows of one set of contacts overlying and crossing the rows of the other set with the sockets of the two sets aligned in pairs one over the other at the positions of intersection of the rows and at least one of the sockets of each pair being formed as a throughway whereby selected socket contacts of one set may be electrically connected with the socket contacts of the other set which are aligned therewith, by the insertion of connecting pins through the socket contacts having throughways into the socket contacts aligned therewith. Usually the contacts in each row, or at least some of the rows, are electrically connected together and have a common means of connection to an external circuit. With such an arrangement the insertion of a connecting pin into a selected pair of sockets provides a electrical connection between two external circuits to which the two rows are respectively connected. When only one socket of each pair has a throughway it is usually convenient that these shall all be in the same set of contacts. There may be more than two sets of contacts providing a corresponding number of contacts aligned over one another for insertion therethrough of connecting pins.

In accordance with the present invention an electric-circuit selector of the above kind has some or all of the rows of socket contacts each formed by a channel shaped member of which the walls are divided into opposed pairs of sections, each pair providing with the channel base a socket contact of generally U-shape which is connected to an adjacent element by the base of the channel.

Preferably the sections are inclined inwardly towards one another, or provided with inward projections remote from the base of the channel, in order to provide contact surfaces which are spaced from the base of the channel and resiliently supported from the base by the divided arms of the channel.

When the contacts are to have throughways for the connecting pins, apertures are provided in the base of the channel in alignment with the socket contacts and for passage of the pins.

The channel shaped members may be secured, by their bases, to panels or plates of insulating material, the walls of the channels projecting away from the panels or plates, which are provided with holes, where required, for the passage of the connecting pins. The panels may be in substantially parallel planes and in the case where there are two sets of contacts carried by two panels respectively, the contacts may be located between the panels.

Some specific constructions of electric-circuit selectors according to the invention will now be described, by way of example and with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a selector, partly broken away,

FIGURE 2 is a section through a part of the selector of FIGURE 1,

FIGURE 3 is an under plan of part of the selector,

FIGURE 4 is a perspective view of a part of the selector, largely broken away,

FIGURE 5 is an end view of a row of contacts,

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FIGURE 6 is a section through part of a different construction of selector and contact pin,

FIGURE 7 is a section through part of another construction of selector and pin,

FIGURE 8 is a section through part of yet another construction of selector and pin,

FIGURE 9 is a perspective view showing parts of another selector construction,

FIGURE 10 is a section through part of another construction of selector, and

FIGURE 11 is a view similar to FIGURE 10 of yet another construction of selector.

The selector forming the subject of FIGURES 1-5 comprises two rectangular support plates 1, 2 of insulating material held in spaced parallel relation by pillars 3 at the corners of the sheets and at intervals along the sides. These two plates will be referred to as the top and bottom plates. Each of these plates is formed with parallel rows of equidistant round holes 6, the rows being parallel to the sides of the plates and the holes are spaced apart along the rows by amounts equal to the separation of the rows so that the holes are at the corners of squares, and the holes in the two plates are aligned perpendicular to the planes of the plates.

The bottom plate, 2, has a set of rows of socket contacts 8 parallel to the shorter sides of the plate and the plate 1 has a set of rows of socket contacts 9 parallel to the longer sides of the plate, the contacts being in the space between the plates. Apart from the length of the rows of the contacts, they are all of the same construction and only one row of contacts will be described.

The row of contacts is constructed by bending a silver-plated copper-beryllium blank to channel form (seen most clearly in FIGURE 5) the side walls of the channel being divided into pairs of opposed sections (see FIGURE 4), one pair for each hole in the plate. The sections are inclined inwardly and, near the mouth of the channel, are deformed to V-form, as viewed along the channel, the apices 12 of the V's being directed inwardly towards one another. Furthermore the end portions 12a of the apices are separated from the central portions and pressed inwardly to form convexly rounded abutment surfaces which hold the central portions 12b at a minimum separation. The central portions 12b constitute the contact surfaces and are resiliently pre-loaded to tend to move together, even at the minimum separation aforesaid.

Opposite to each pair of contact sections, the base 14 of the channel is cut to form a tongue 15 which extends lengthwise of the channel and is rounded at its end. This tongue is bent outwardly of the channel (i.e. away from the contact sections) through a right angle and at about the centre of its length it is again bent through a right angle to provide a limb 15a which is parallel to the base of the channel, is spaced therefrom by the thickness of the plate 1 or 2, and is directed along the channel away from the hole 16 left by the removal of the tongue.

To assemble the row of contacts on the plate, the aforesaid limbs 15 of the tongues are passed through the holes 6 in the plate and the channel moved lengthwise to engage the edge portions of the plate around the holes between the limbs 15a of the tongues and the base 14 of the channel. Reverse lengthwise movement is prevented as later described.

Secured over the top plate 1, there is a cover plate 18 held by the pillars aforesaid. This plate is formed with guide holes 19 for connecting pins 20 to be inserted in the socket contacts. The holes 19, which are smaller than the holes 6 in the top and bottom plates, are aligned with those holes and with the contacts, so that a pin may be inserted through any hole 19 into the contacts of the top and bottom plates which are aligned therewith. The

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limbs 15a aforesaid of the tongues of the contacts secured to the top plate 1 are clamped between that plate and the cover plate 18.

At one end of each row of contacts on the top plate 1 there is a contact strip or tag 21 (shown in FIGURES 2 and 3 but not in FIGURE 1) which fulfills the dual purpose of providing means for connecting the row to an outside circuit and of locking the row of contacts in place. The tag is in the form of a strip which passes through holes in the top and bottom plates. The hole 22 in the bottom plate 2 is blank (i.e. without a socket contact strip). At the top plate the strip is soldered or spot welded to the last tongue 15 of the contact strip and by occupying the hole 6 it prevents lengthwise movement of the channel. Similarly a contact tag 24 at the end of each row of contacts 8 in the bottom plate is soldered to the end of the row and by passing through holes in the two plates, serves to lock the contacts in place. The holes in the top plate which receive the tags 24 are without contacts. The tags 21 and 24 project from the bottom plate for connection to external circuits.

FIGURE 6 shows another construction in which a push-button contact pin is used. The selector comprises a bottom plate 2, a top plate 1 and rows of contacts 8 and 9 as in the previous example. The cover plate 18 is however omitted and replaced by a plate 30 held spaced away from plate 1. The plate 30 has a large hole 31 above each contact 9 and in this hole there is slidable an insulating bushing 32 containing a socket 34 attached to a contact pin 35. A light spring 36 urges the bushing upwardly. When it is desired to make electrical connection between contacts 8 and 9, the bushing is depressed to move the pin into the position shown in chain lines. The pin is retained in this position, against the action of spring 36, by engagement of contact 8 in a groove 38 in the pin. The socket 34 is for reception of a test plug 39. If desired, the upper part of pin 35 may be coated with insulating material so that when in the chain line position, electric connection is made between socket 34 and contact 8 only whereas when in the full line position, connection is made between the socket and contact 9. The socket may be omitted from the arrangement as shown.

FIGURE 7 shows a construction in which a screened lead is employed. In this construction all the contacts 9 are electrically connected, the plate 1a being of metal and this plate is connected to earth or ground. The contacts 8 are as previously described. A contact pin 40 is attached to an insulated lead wire 41 surrounded by a braided screen 42. The screen is attached to a tubular contact 44 which is engageable in contact 9.

FIGURE 8 shows a construction in which the selector is as shown in FIGURES 1-5 but the contact pin is in the form of a jack plug having two contact portions 48, 49 insulated from one another by an insulating insert 52 and connected to separate wires, 50, 51.

In FIGURE 9 there is shown an arrangement by which the individual contacts 8 and 9 are separated and screened from one another. There is a honey-comb of partitions 60 held between the plates 1 and 2, the partitions being halved together with notches 61 in the manner of the partitions of an egg box. Each partition consists of a sandwich of a metal layer 62 between two sheets 63 of insulating material, the metal layer stopping short of the top and bottom edges of the partition and being connected to earth or ground.

FIGURE 10 shows an alternative manner of attaching the contacts to the plates 1 and 2. In this alternative the single tongues 15 are each replaced by a pair of tongues 70, 71 which are bent up from the channel base over the edges of the hole 72. This figure also shows a contact tag 74 formed by the end of the channel base.

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This tag may be bent up through a hole 75 as shown or it may be left unbent and project beyond the edge of the plate.

FIGURE 11 shows still another way in which the contacts may be attached to the plates 1 and 2. In this arrangement, the tongues are omitted and replaced by a tubular rivet 80 which is also used to hold a coloured identification disc 81. To provide means for connection of the contacts to an external circuit, the end of the channel base is bent over the edge of the plate 1 or 2 as shown at 82 and a spring contact clip 83 is pressed over the bent end.

As an alternative to the construction shown in the drawings and described above, the contact sections may be deformed to approximately semi-circular form so as to provide, together, a substantially circular or cylindrical socket.

I claim:

1. An electric circuit selector having:

- (a) substantially flat upper and lower panels, each with a plurality of rows of holes therethrough, the rows of one panel crossing the rows of the other panel with the holes in the upper panel overlying the holes in the lower panel,
- (b) means for maintaining the panels in fixed, spaced apart, relation,
- (c) a set of contact strips extending along the rows of holes of each of the panels, respectively, each strip being of channel shape with a continuous base and with side walls divided into a plurality of pairs of opposed contact jaws, each pair providing with the channel base a socket contact of generally U-shape which is connected to an adjacent contact by the base of the channel, and said jaws being resiliently resistant to separating movement,
- (d) portions struck out from each of said strips providing openings in the base section of the contacts, said portions for at least some of the contacts of each strip being bent to form L-shaped tags projecting from the face of the channel base opposite to the jaws and each comprising a vertical limb attached to the base at one end and a horizontal limb projecting from the other end of the vertical limb substantially parallel to the base,
- (e) the horizontal limbs of each strip all projecting in the same direction from the vertical limbs,
- (f) the vertical limbs passing through the holes in the related panel each adjacent one side of the holes, which holes are sufficiently large for the passage therethrough of the horizontal limbs which register with the openings in the base,
- (g) the channel base engaging one face of the panel and the horizontal limbs engaging the other face thereof after the vertical limbs have been inserted through the holes and the channel is moved longitudinally of the panel in the direction in which the limbs point, to effect such engagement and hold the strip to the panel, said horizontal limbs serving as the sole support for the channel on the panel after said horizontal limbs have engaged said other face, and,
- (h) means for retaining the strips and the horizontal limbs carried thereby against reverse longitudinal movement.

2. A circuit selector as claimed in claim 1 in which each jaw of a pair is bent about a line extending lengthwise of the strip to provide a convex contact surface opposing the contact surface of the other jaw of the pair and at each end of such convex surface there is a projection towards the other jaw abutting against the projection on the other jaw to hold the contact surfaces spaced apart.

3. A circuit selector as claimed in claim 1 in which the portion struck out to form each opening in the con-

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tact strips form an L-shaped tag which passes through the panel opening.

4. A circuit selector as claimed in claim 1 in which the means recited in sub-paragraph (h) for retaining the strip in said holding engagement comprise a retaining member fitting in a panel hole and engaging one of said vertical limbs. 5

5. A circuit selector as claimed in claim 4 in which said retaining member is electrically connected to the strip and constitutes an electrical connector for connecting the strip into an electrical circuit. 10

6. A circuit selector as claimed in claim 1 in which the rows on the two panels cross at right angles.

7. A circuit selector as claimed in claim 1 and including a plug-in pin electrically connecting two selected upper and lower strips, the pin engaging in a socket contact of each strip. 15

8. A circuit selector as claimed in claim 7 in which the plug pin has spaced contact portions insulated from one another, engaging the two socket contacts respectively and has separate wires connected to the two portions respectively. 20

9. An electric circuit selector having:

(a) a plurality of substantially flat superimposed panels, each with a plurality of rows of holes there-through, the rows of one panel crossing the rows of another panel with the holes in the several panels being vertically aligned, 25

(b) means for maintaining the panels in fixed, spaced apart, relation, 30

(c) a set of contact strips extending along the rows of holes of each of the panels, respectively, each strip being of channel shape with a continuous base and with side walls divided into a plurality of pairs of opposed contact jaws, each pair providing with the channel base a socket contact of generally U-shape which is connected to an adjacent contact by the base of the channel, and said jaws being resiliently resistant to separating movement, 35

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(d) portions struck out from each of said strips providing openings in the base section of the contacts, said portions being bent to form L-shaped tags projecting from the face of the channel base opposite to the jaws and comprising a vertical limb attached to the base at one end and a horizontal limb projecting from the other end of the vertical limb substantially parallel to the base,

(e) the horizontal limbs of each strip all projecting in the same direction from the vertical limbs,

(f) the vertical limbs passing through the holes in the related panel each adjacent one side of the holes, which holes are sufficiently large for the passage therethrough of the horizontal limbs,

(g) the channel base engaging one face of the panel and the horizontal limbs engaging the other face thereof after the vertical limbs have been inserted through the holes and the channel is moved longitudinally of the panel in the direction in which the limbs point, to effect such engagement and hold the strip to the panel, and

(h) means for retaining the strips and the horizontal limbs carried thereby against reverse longitudinal movement.

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