July 13, 1965 E. R. PLASKO ETAL 3,194,931

IMPROVED BLOCK-ELECTRICAL BRUSH ASSEMBLY

Filed May 10, 1961 2 Sheets-Sheet 1

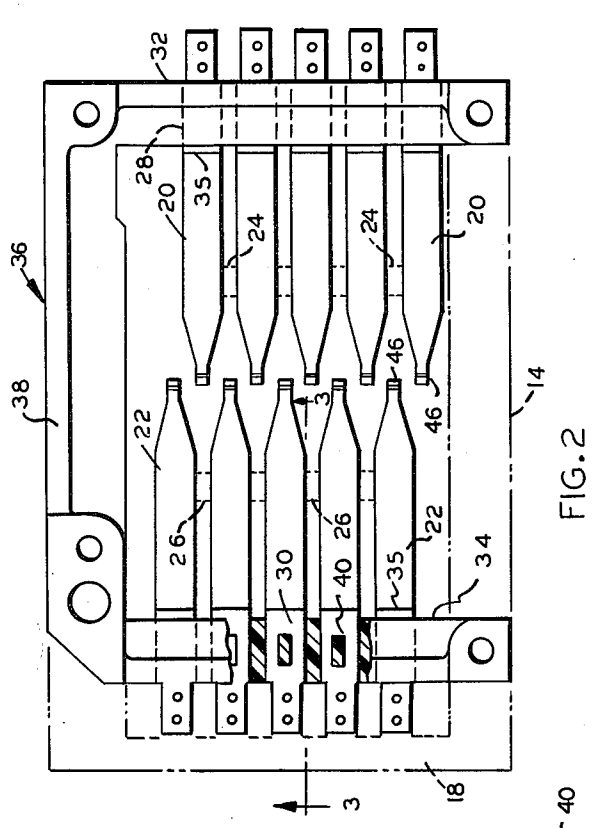


FIG. 2

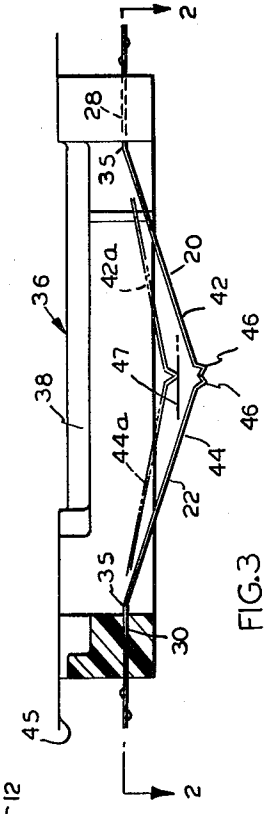


FIG. 3

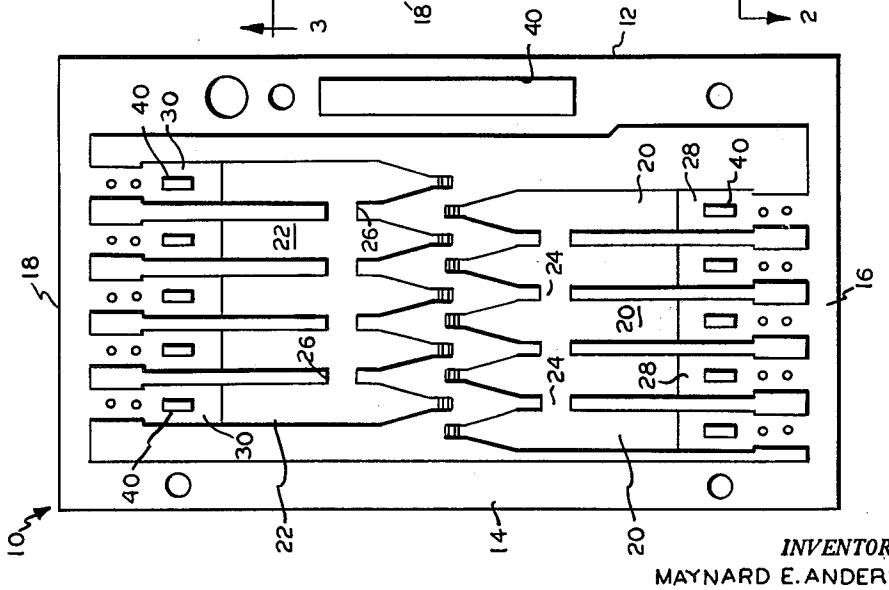


FIG. 1

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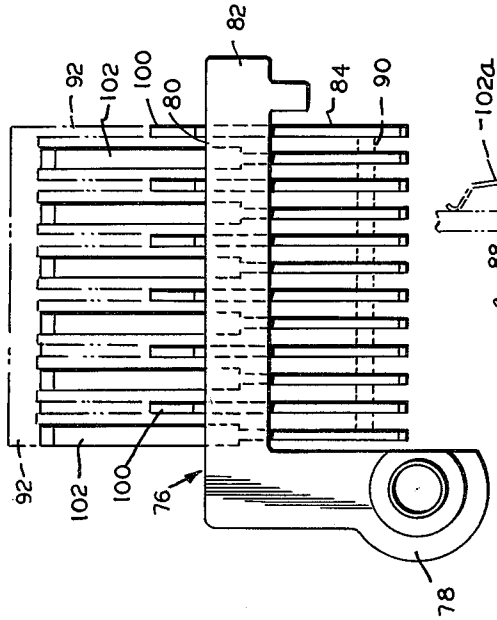


FIG. 6

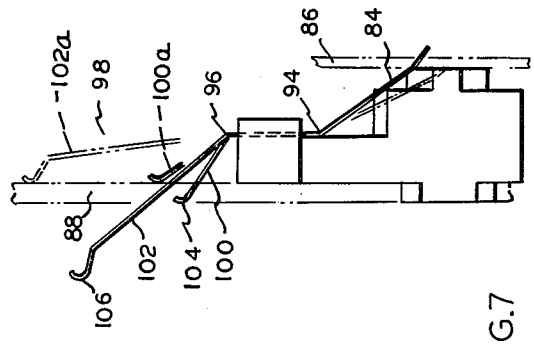


FIG. 7

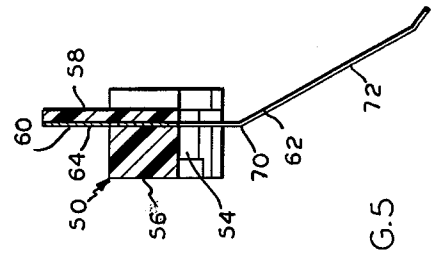


FIG. 5

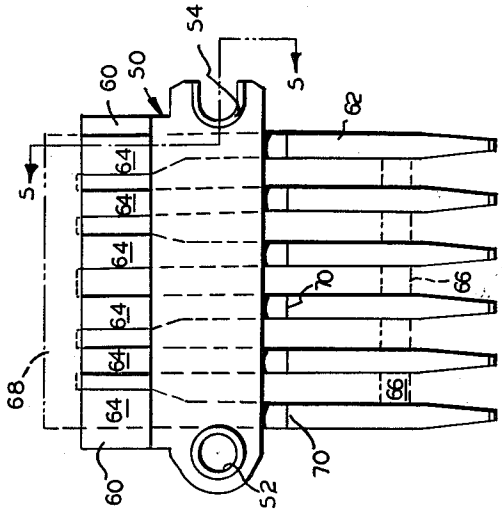


FIG. 4

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United States Patent Office 3,194,931 Patented July 13, 1965

3,194,931

IMPROVED BLOCK-ELECTRICAL BRUSH ASSEMBLY

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Filed May 10, 1961, Ser. No. 109,174
1 Claim. (Cl. 200—166)

This invention relates to electrical switch mechanisms, and to methods of manufacturing same. The mechanisms of the invention are particularly applicable in delivering current to printed circuit boards in rotary program timers utilized to control the operation of conventional domestic clothes washing machines. There are of course other fields of application of the invention, such as in the related problems of delivering current to analog-to-digital encoders discs, and the use of contact leaves in multi-contact relays.

One object of the invention is to provide a contact brush and method of manufacturing same, wherein a series of reed-like brush elements can be quickly and conveniently mounted in a di-electric block element at very low cost.

A further object of the invention is to provide a mechanism and method of manufacture wherein a series of low-cost commutating brush devices can be accurately located in close tolerance relationship, with comparatively small spacings between adjacent brushes, thereby permitting a large number of circuits to be completed in a compara tively small physical space.

A further object of the invention is to provide a contact brush and method of manufacturing same, wherein the individual brush elements may be physically embedded in a di-electric mounting block and retained therein without danger of loosening or otherwise causing the brush assembly to have a shortened service life.

An additional object is to provide a contact brush assembly having the desired features of low cost, quick assembly, excellent parts quality, satisfactory alignment of parts, sufficient contact pressure, relatively small spacing between adjacent contact brushes, and improved structural strength.

Other objects of the invention will be apparent from the following description.

In the drawings:

FIGURE 1 is a plan view of an electrically conductive frame member utilized in the practice of the invention;

FIG. 2 is a plan view with parts sectioned on line 2—2 in FIG. 3 and showing the FIG. 1 frame after assembly thereof with a di-electric mounting block and after trimming off of certain excess frame portions;

FIG. 3 is an elevational view with parts thereof sectioned on line 3—3 in FIG. 2;

FIG. 4 is a plan view of another embodiment of the invention;

FIG. 5 is a sectional view taken substantially on line 5—5 in FIG. 4;

FIG. 6 is a plan view of a third embodiment of the invention; and

FIG. 7 is an elevational view of the FIG. 6 embodiment.

Referring in greater detail to the drawings, and particularly FIG. 1, there is shown therein an annular electrically conductive metal frame 10 having elongated side portions 12 and 14 interconnected by web-forming and wall portions 16 and 18. Extending inwardly from respective ones of end wall portions 16 and 18 are two sets of elongated parallel strips 20 and 22. The end areas of these strips remote from wall portions 16 and 18 are interconnected by short web walls 24 and 26, so that the entire frame 10 may be blanked from a single sheet of material

with the various strips 20 and 22 accurately located in non-varying positions, i.e., the strips 20 and 22 are prevented from bending, twisting or wiggling while they are connected together by the web portions 24 and 26.

Referring now to FIG. 2, the strips 20 and 22 are shown with intermediate portions 28 and 30 thereof embedded in the leg portions 32 and 34 of the U-shaped di-electric block 36, said block having a web portion 38 interconnecting the two leg portions 32 and 34 to form a rigid support for the two sets of conductive strips 20 and 22.

In constructing and assembling the strips 20 and 22 and block 36, the strips are formed as part of the frame 10 (as in FIG. 1), after which frame 10 may be placed as an insert in a mold cavity shaped to the configuration of block 36. Moldable di-electric material is then molded around the portions 28 and 30 of the brush-forming strips 20 and 22 so that the strips become firmly anchored to the block leg portions 32 and 34. Preferably, although not necessarily, the strip portions 28 and 30 are apertured, as at 40, to insure a gool locking of the di-electric material to the strips. After or before the block 36 is formed parts of the frame may be bent on lines 35 to redirect the reed-like strips 20 and 22 at angles to the general plane of the frame. Subsequent to the molding operation the various web portions 16, 18, 24 and 26 are separated or trimmed from the strips 20 and 22 to form the assembly as shown in full lines in FIG. 2. Preferably the bending step is performed prior to the trimming step since the various strips tend to be more regular in the amount of bend imparted thereto if they are bent while still part of the frame.

As will be noted from FIG. 3 (full lines) the terminal ends 46 of the strip portions 42 and 44 are V-shaped and are slightly out of line with one another. When the block 36 is mounted between a suitable support surface 45 and printed circuit surfaces 47 the strip portions 42 and 44 are deflected upwardly to the dotted line positions, 42*a* and 44*a*, respectively; and the V-shaped terminal end portions 46 are then aligned with one another so that all of the terminal portions contact surfaces 47 on a common line. This relationship is particularly advantageous when the mechanism is utilized in association with printed circuit boards in program timers of the types shown in co-pending applications, Serial Nos. 106,697, filed May 1, 1961, now Patent No. 3,151,257 or 106,730, filed May 1, 1961. In these types of circuit boards it is desirable that all of the board contacts be on a common line to simplify and facilitate the timer design.

Referring now to the form of the invention shown in FIGS. 4 and 5, there is provided a di-electric mounting block 40 having suitable openings 52 and 54 molded therein to permit mounting screws, rivets or the like to extend therethrough. As best shown in FIG. 5, the mounting block is provided with a relatively thick section 56 and a relatively thin section 58 having a flat surface 60 formed thereon. A series of metallic electrically conductive reed-like brushes 62 extend through the mounting block 50, with end portions 64 of said brushes having their face areas in the general plane of surface 60 so as to be exposed for engagement with conductor devices not shown.

Brushes 62 may be initially formed as part of a metallic frame having the webs 66 interconnecting the brushes adjacent one of their ends and having the web walls 68 interconnecting the strips 62 at their other ends. The process of manufacturing the FIG. 4 construction involves blanking the metallic frame, positioning the frame in the mold cavity of a plastic molding apparatus, molding the di-electric block 50 around portions of the conductive frame, bending the brushes about a common line 70, and trimming web portions 66 and 68 from the brushes. The bending step at 70 may be performed prior to the trimming and molding steps if desired.

In use of the FIG. 4 construction the molded block 50 is mounted in place so that the thin flat portion 58 is located in an area where it can receive a female plug-on connector (not shown). Such connectors are generally provided with a series of U-shaped electrically conductive gripper devices; flange 58 is of a sufficient thickness that when a conventional female connector is inserted thereon the U-shaped gripper portions engage the upper and lower surfaces of the flange. The U-shaped grippers thus contact the exposed portions 64 of the brushes 62 for establishing the desired electrical snap-on connection.

As with the previously described embodiment, the reed-like portion 72 of each brush 62 may be utilized to engage a printed circuit board (not shown) so that the device may serve to transmit current between the circuit board and the aforementioned snap-on connector.

Referring now to the embodiment of the invention shown in FIGS. 6 and 7, there is provided a di-electric mounting block 76 having a hub portion 78, and elongated arm portion 80, and a terminal portion 82. As shown in the aforementioned application, Serial No. 106,697, the mounting block may be disposed with hub portion 76 located on the shaft of a program timer and with the terminal portion 82 disposed within a notch on a wall of the timer housing. By this arrangement the mounting block is enabled to utilize structure of the timer for its fixed positionment adjacent printed circuit rotary timer disc or board 86. The mounting block has embedded therein a series of electrically-conductive reed-like brushes 84 arranged so that one end of each brush may engage the printed circuit on board 86 and so that the other end of each brush may engage the printed circuit on a board 88.

As shown in dotted lines in FIG. 6, the various brushes 84 are initially formed as part of a frame having the web portions 90 adjacent one end of the brush strips and having web portions 92 interconnecting the other ends of the brush strips. After the mounting block 76 has been molded around intermediate portions of the brush strips the web portions 90 and 92 are trimmed off. The various brushes may then be bent on lines 94 and 96 so that the opposite end portions of the strips extend angularly obliquely in different directions relative to the general plane of the block as denoted by imaginary line 98.

It will be noted from the drawings that the strips designated by numeral 100 are relatively short and the strips designated by numeral 102 are relatively long. Also, the strips 100 are bent about line 96 at a relatively large angle to plane 98, whereas strips 102 are bent at a lesser angle to imaginary plane 98. The arrangement is such that when block 76 is installed between printed circuit boards 86 and 88, the strips 100 and 102 are automatically

moved from the full line positions to the dotted line positions, 100*a* and 102*a* respectively with surfaces 104 and 106 thereof in firm pressure engagement with contact areas on board 88. By forming each strip 102 longer than strip 100 the contact areas 104 and 106 are located on different lines, and the contact strips can be placed closer together than would otherwise be possible.

The above description has illustrated three embodiments of the invention, but it will be understood that the invention is capable of practice with other embodiments, and that variations in method and construction may be resorted to without departing from the spirit of the invention as set forth in the appended claim.

We claim:

In a brush assembly for use with a printed circuit board: a one piece molded di-electric block formed to include a relatively thick mounting portion and a relatively thin plug-on portion extending therefrom and adapted to receive a female connector, said plug-on portion having first and second closely spaced parallel flat faces formed thereon; a series of parallel spaced electrically-conductive strips embedded in said block; said strips being formed of flat thin gage sheet material, and all of said strips having the longest cross sectional dimension of their embedded portions disposed in the same plane; said strips having first portions thereof disposed in the plane of said first flat face of the plug-on portion, whereby to make electrical connection with connectors in the aforementioned female connector; said strips having second portions extending through the relatively thick mounting portion, and third reed-like elongated portions extending freely of the block bent at an appreciable angle to the second portions for swinging movement, whereby when the block is located in a stationary position adjacent a rotary printed circuit board the reed-like portions are deformed by the board surface to effect pressure engagement between the board and the reed-like portions.

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