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(54) Fusebox.

(57) A fusebox including an electrically insulating housing (11), a plurality of fuse clips (14) supported by the housing (11) for receiving and making electrical connection to fuses, and a plurality of terminals (15) accessible at the exterior of the housing (11). Electrical connecting components (16) electrically connecting the fuse clips (14) to appropriate terminals (15), said fuse clips (14) and terminals (15) being positioned generally parallel and transversely adjacent one another, and each fuse clip (14) is secured to its respective connecting component (16) by means including at least one resilient finger (23) pressed-out from a limb (18) of the clip (14). Each of said connecting components (16) includes a portion (16*b*) which is gripped between the finger (23) and the limb (18) of the respective clip (14), and each component (16) and its respective clip (14) includes alignment means (16*d*,23) positioning the clip (18) relative to the component (16) when the clip (14) is secured to the component (16) by engagement of said portion (16*b*) between said limb (18) and said finger (23).

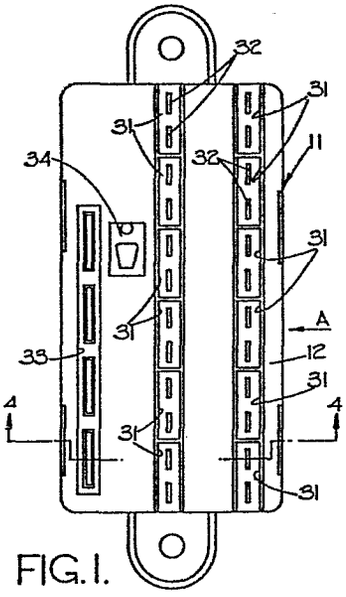

FIG.1.

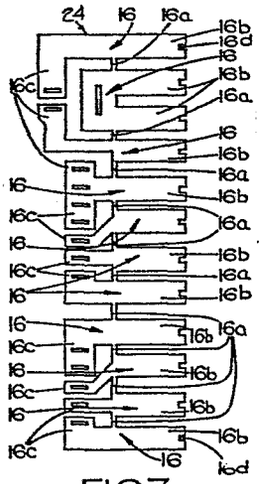

FIG.7.

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"FUSEBOX"

This invention relates to a fusebox, and to a method of manufacturing a fusebox, particularly but not exclusively for use in a road vehicle wiring system.

There are many known forms of fusebox in which the fuse clips and their respective external terminals are parallel and are longitudinally adjacent one another, for example by being axially coextensive. Such an arrangement gives rise to a fusebox of relatively large overall height and it is an object of the present invention to provide a fusebox having, by comparison with such known fuseboxes, a reduced overall height.

A fusebox according to the invention includes an electrically insulating housing, a plurality of fuse clips supported by the housing for receiving and making electrical connection to fuses, a plurality of terminals accessible at the exterior of the housing, and electrical connecting components electrically connecting the fuse clips to appropriate terminals, said fuse clips and terminals being positioned generally parallel and transversely adjacent one another, and each fuse clip being secured to its respective connecting component by means including at least one resilient finger pressed-out from a limb of the clip, each of said connecting components including a portion which is gripped between the finger and the limb of the respective clip, and each component and its respective clip including alignment means positioning the clip relative to the component when the clip is secured to the component by engagement of said portion between said limb and said finger.

Preferably each clip is soldered to its respective connecting component, the engagement of said portion of the component between the limb and the finger of its clip, and the alignment means of the clip and the component, serving to secure and position the clip relative to the component before soldering.

Desirably each terminal is soldered to its respective connecting component.

Conveniently the housing is a two-part housing, said clips and said terminals extending through recesses in one of the housing parts and being trapped in position relative to the housing by engagement of the second housing part with said one housing part.

The invention further resides in a method of manufacturing a fusebox comprising the steps of:

(a) commencing with a fret comprising a plurality of interconnected electrical connecting components,

(b) physically and electrically securing terminal members to chosen components of said fret,

(c) engaging fuse receiving clips with respective chosen components of said fret by introducing a portion of a chosen component between a limb of the respective clip and a resilient finger pressed-out from the limb of the clip so that said portion is gripped between the finger and the limb and alignment means on the clip and said component align the clip with the component such that the clips and the terminals are parallel and transversely adjacent one another, and, effecting a good electrical and physical connection between each clip and its respective component.

Preferably said terminals are soldered to their respective components.

Preferably the step of effecting a good electrical connection between each clip and its respective component comprises soldering the clip to the respective component.

Preferably the method includes the further steps of,

(a) introducing the fret carrying terminals and fuse receiving clips into a first part of a two-part electrically insulating housing such that the clips and terminals extend through recesses in the housing,

(b) severing the fret at predetermined points to separate, both electrically and physically, chosen connecting components from one another, and engaging the second part of said two part housing with said first part to trap the assemblies of terminals, connecting components, and clips in position relative to the housing.

One example of the present invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a plan view of a fusebox;
Figure 2 is a view in the direction of arrow A in Figure 1;
Figure 3 is a plan view of the underside of the box of Figure 1;
Figure 4 is a sectional view on the line 4-4 in Figure 1;
Figure 5 is a plan view of the lower part of the two-part housing of the fusebox;
Figure 6 is a view similar to Figure 5 but showing frets in position;

Figures 7, 8 and 9 are plan views respectively of the three frets seen in Figure 6;
Figure 10 is a perspective view of a fuse receiving clip;
Figure 11 is a side elevational view of the clip of Figure 10;
Figure 12 is an end view of the clip;
Figure 13 is a perspective view of the fret seen in Figure 9 after shaping and securing thereto of a pair of terminal blades and a single fuse receiving clip; and
Figure 14 is a view similar to Figure 13 of a small part of the fret of Figure 7.

Referring to the drawings, the fusebox includes a moulded synthetic resin housing 11 comprising upper and lower parts 12, 13 which are interengaged as a snap fit, and which are not intended to be separated once interengaged. The fusebox further includes a plurality of fuse receiving clips 14, externally accessible blade terminals 15, and, electrical connecting components 16 providing electrical interconnections within the housing between associated fuse clips and external terminals. The external blade terminals 15 may be of different sizes to accommodate different functions, for example power supply blade terminals may be of a larger dimension than the remaining blade terminals.

Each of the fuse receiving clips 14 is formed from a single sheet of brass and comprises a pair of parallel elongate limbs 17, 18 interconnected along part of one edge by a transversely extending web 19. Thus as is evident for example from Figure 12 each clip 14 is, adjacent one end which will be referred to as the lower end, U-shaped in cross-section. The upper end regions of the limbs 17, 18 are not interconnected by the web

19 and are curved inwardly to define jaws 21, 22 between which the blade like terminal of a fuse can be gripped. Adjacent its lowermost end the limb 18 of each clip 14 has an integral resilient finger 23 pressed-out therefrom. The term "pressed-out" is intended to indicate that the material of the limb 18 has been cut in, for example, an elongate U-shape and the finger bounded by the U-shaped slit, slot or shear line has then be pressed outwardly adjacent its root. As is evident from Figures 10 and 11 the finger 23, from a point adjacent its root, is inclined back towards the surface of the limb 18 except at its free end where it is turned outwardly.

The manufacture of the fusebox is as follows. Three frets 24, 25, 26 (Figures 7, 8 and 9) are stamped from copper sheet, the frets 24 and 25 defining a plurality of electrical connecting components 16 joined together by integral necks 16a. The connecting components 16 are intended to make electrical connection between clips 14 and terminal blades 15, and dependent upon the location within the fusebox, a component 16 may interconnect a single clip 14 with a single blade terminal 15, a single clip 14 with a plurality of blade terminals 16, a single blade terminal with a plurality of clips 14 (this variant not illustrated) or a plurality of blade terminals with a plurality of clips 14 (Figure 9 to be described in more detail later). Each component 16 cf each of the frets 24, 25 includes a clip receiving portion indicated by the suffix b and a blade terminal receiving portion indicated by the suffix c. The frets are bent during, or immediately after, stamping from the blank sheet so that the portions 16b extend at right-angles to the portions 16c. The portions 16c are formed with slots for receiving the shaped ends of the blade terminals 15, and the free end edges of the portions 16b are formed with a centrally disposed

rectangular notch 16d. A number of blade terminals 15 appropriate to a particular fret are placed in a jig with their fret connecting ends uppermost. The jig locates the blade terminals 15 parallel to one another in an orientation appropriate to the respective fret. The fret, with the portions 16c extending downwardly is then placed onto the blade terminals 15 so that the connecting end regions 15a of the blade terminals pass through the respective slots of the portions 16c of the fret and a flow soldering operation is used to effect a soldered connection between the portions 16c of the connecting components 16 and the blade terminals 15.

It will be recognised that following the securing of the blade terminals 15 to the portions 16c of the fret the blade terminals 15 extend from the component 16 parallel to, and in the same direction as the portions 16b, that is to say at right angles to the plane of the portions 16c. Thus the portions 16b and the blades 15 are parallel and transversely adjacent rather than being parallel and longitudinally adjacent as would be the case if the portion 16b had been bent to extend upwardly from the plane of the portions 16c.

The next stage in the manufacture is the attachment of the clips 14 to the portions 16b. As mentioned previously each of the portions 16b is formed with a rectangular notch 16d in its free end edge, the notch 16d being seen clearly in, for example, Figure 13. The width of the notch 16d is fractionally greater than the width of the finger 23 of each clip 14, and each clip 14 is engaged with its respective portion 16b by inserting the free end of the portion 16b between the finger 23 and the limb 18 of the respective clip 14. The clip 14 is then moved slidingly along the length of the portion 16b until the root of its finger 23 seats

within the notch 16d in the free end edge of the portion 16b. The portion 16b is of course gripped between the finger 23 and the surface of the limb 18 and so the clip 14 is secured to the limb 16b, and, by virtue of the engagement of the root of the finger 23 in the notch 16d of the portion 16b the clip is held aligned with the respective portion 16b, that is to say is held parallel to and transversely adjacent the blade terminals 15.

When each of the components 16 of the fret has been equipped with a clip 14 in this manner the limbs 18 of the clips 14 are soldered to their respective portions 16b. While the fingers 23 provide a sufficiently secure fixing of the clips to the portion 16b to facilitate handling of the sub-assembly they do not provide a sufficiently good electrical connection. The soldering of the limbs 18 to their respective portions 16b provides a more secure physical fixing, and a very good electrical connection of each clip 14 to the clip connecting portion 16b of the connecting component 16.

It will be understood that at this stage each fret 24 or 25 equipped with blade terminals 15 and clips 14, can be handled as a single unit since all of the necks 16a are still in tact. The frets together with blades and clips is then offered to the inner surface of the housing part 13 so that the blade terminals pass through appropriate slots 27 in the wall of the housing part 13 while the clips 14 are received in appropriately shaped recesses 28 of the housing. In order that the terminals 15 are shrouded, and yet are accessible at the exterior of the housing 11, the housing part 13 is formed in its lower surface with pockets 29 into which the blade terminals 15 extend. Thus it is the base of each of the pockets 29 which is formed with the slots 27. (Figure 4).

At this stage in the assembly therefore the blade terminals 15 extend downwardly through the slots 27, the clips 14 extend downwardly into the recesses 28, and the connecting portions 16 between the clips 14 and the terminals 15 are seated upon inner surfaces of the housing part 13. The housing part 13 does not provide a support surface immediately beneath the necks 16a of the fret and the next stage in the manufacture of the fusebox is to sever the connections between the component 16 by severing the necks 16a of the frets. It is anticipated that assembly of the frets into the housing part 13 will be an automatic procedure, and the handling device which presses the frets downwardly so that the clips 14 locate in the recesses 28 and the terminals 15 pass through the slots 27 will incorporate cutting devices which, when the components 16 are fully seated within the housing part 13, descend to sever the necks 16a.

The fret 26 shown in Figure 9 differs from the frets 24 and 25 in that it is in effect a single connecting component 16 for interconnecting a pair of power blade terminals 15 and six clips 14. It will be noted also, with particular reference to Figure 13, that for convenience and economy of material the intermediate portion between the clip connecting portions 16b and the terminal connecting portion 16c lies with its plane parallel to that of the portion 16b rather than the portion 16c as is the case with the frets 24, 25. The assembly of the clips 14 and terminals 15 to the fret 26 is exactly as described with reference to the frets 24 and 25, and the insertion of the fret equipped with blades and clips into the housing part 13 is also the same as described above.

The final stage in the manufacture of the fusebox is engagement of the upper housing part 12 with the lower housing part 13. The housing part 12 has barbed legs 12a (Figure 4) which pass, as a snap-fit, through corresponding apertures in the housing part 13. Internally the housing part 12 is formed with ribs or pads which engage the connecting components 16 and trap them against the lower housing part 13 thereby, in co-operation with the slots 27 and recesses 28, holding the clips, terminals, and connecting components in position relative to the housing 11.

The upper housing part 12 is formed externally with a series of fuse receiving recesses 31 arranged, as can be seen in Figure 1, in two parallel rows. The base of each of the recesses 31 is formed with a pair of slots 32 beneath each of which, and aligned with each of which, is a respective fuse receiving clip 14. Thus each fuse, which comprises a fusable element and a pair of co-planar blade-like terminals, can be inserted into a respective recess 31 such that the blade terminals pass through the slots 32 of the recess 31 and into engagement with the appropriate fuse receiving clip positioned beneath the slot 32. Additionally the upper surface of the housing part 12 is formed with a recess 33 for accommodating four spare fuses, and a retainer 34 for receiving a fuse extraction tool. The housing 11 is formed with mounting lugs for mounting the fusebox in a convenient location in use. It will be recognised that the fuses are accessible from the top of the fusebox, and electrical connections between the fuses and the wiring harness of the vehicle are made by plug-in connections at the underside of the fusebox, the mating connectors being introduced into the pockets 29 to engage the blade terminals 15 therein.

During assembly of the clips 14 to the portions 16b of the components 16 the alignment of the clips 14 relative to the portion 16b is effected, in the arrangement described above, by the engagement of the root of each finger 23 in the corresponding notch of the portion 16b. It is to be understood however that other arrangements are possible. For example, the limb 18 of each clip could be provided with a pair of spaced, parallel fingers each similar to a finger 23, and the free end edge of each of the portions 16b could be provided with a rectangular projection, rather than a rectangular notch, the rectangular projection passing between the roots of the two parallel pressed-out fingers to effect alignment of the clip relative to the portion 16b. Furthermore, although for convenience three separate frets 24, 25, 26 are produced it is to be understood that more or less than three frets can be used dependent upon the nature and layout of the fuse and terminal connections required. For example in the construction described above, the frets 24 and 25 could be replaced by a single fret fulfilling the functions of both. However, production of such a single fret would be more wasteful of material than the use of two separate frets 24 and 25 as described. Nevertheless, given a different layout of fuse receiving clips and terminals 15 then it may well be possible economically to produce a single fret to which all of the terminals and clips are assembled prior to insertion of the fret into the housing part 13.

It will be understood that the positioning of the blade terminals 15 and the clips 14 so that they are parallel to one another, and at the same time are transversely adjacent one another effects a considerable saving in the overall height of the fusebox by comparison with known arrangements where fuse receiving clips and their

respective blade terminals are parallel, but longitudinally adjacent, for example longitudinally co-extensive, since in this latter case the overall height will be at least the total of the length of the blade terminal added to the length of the fuse clip, whereas because in the above described arrangement the length of the fuse clip is alongside, or at least overlaps substantially, the length of the blade terminal the overall height will be less than the total of the length of the clip added to the length of the terminal.

In order to assist the friction between the blade terminals, the clips, and the housing lower part, in retaining the parts in position prior to engagement of the housing upper part, the blade terminals and/or the clips can be provided with roughened or barbed edge regions which bite into the material of the lower housing part when the clips, blades and connecting portions are correctly positioned, to resist withdrawal.

It is to be understood that in certain fusebox applications the frets illustrated in Figures 7, 8 and 9 may be utilized but with certain of the regions 16b and/or 16c devoid of clips 14 and/or blade terminals 15.

CLAIMS.

1. A fusebox including an electrically insulating housing (11), a plurality of fuse clips (14) supported by the housing (11) for receiving and making electrical connection to fuses, and a plurality of terminals (15) accessible at the exterior of the housing (11), the fusebox being characterized in that there are provided electrical connecting components (16) electrically connecting the fuse clips (14) to appropriate terminals (15), said fuse clips (14) and terminals (15) being positioned generally parallel and transversely adjacent one another, and each fuse clip (14) being secured to its respective connecting component (16) by means including at least one resilient finger (23) pressed-out from a limb (18) of the clip (14), each of said connecting components (16) including a portion (16b) which is gripped between the finger (23) and the limb (18) of the respective clip (14), and each component (16) and its respective clip (14) including alignment means (16d, 23) positioning the clip (18) relative to the component (16) when the clip (14) is secured to the component (16) by engagement of said portion (16b) between said limb (18) and said finger (23).

2. A fusebox as claimed in claim 1 characterized in that each clip (14) is soldered to its respective connecting component (16), the engagement of said portion (16b) of the component (16) between the limb (18), and the finger (23) of its clip (14), and the alignment means (23, 16d) of the clip (14) and the component (16), serving to secure and position the clip (14) relative to th component (16) before soldering.

3. A fusebox as claimed in claim 1 or claim 2 characterized in that each terminal (15) is soldered to its respective connecting component (16).

4. A fusebox as claimed in any one of claims 1 to 3 characterized in that said housing (11) is a two-part (12, 13) housing, said clips (14) and said terminals (13) extending through recesses (27, 28, 29) in one of the housing parts (13) and being trapped in position relative to the housing (11) by engagement of the second housing part (12) with said one housing part (13).

5. A method of manufacturing a fusebox characterized by the steps of:

(a) commencing with a fret (24, 25, 26) comprising a plurality of interconnected electrical connecting components (16),

(b) physically and electrically securing terminal members (15) to chosen components (16) of said fret,

(c) engaging fuse receiving clips (14) with respective chosen components (16) of said fret by introducing a portion (16b) of a chosen component (16) between a limb (18) of the respective clip (14) and a resillent finger (23) pressed-out fromthe limb (18) of the clip (14) so that said portion (16b) is gripped between the finger (23) and the limb (18) and alignment means (23, 16d) on the clip (14) and said component (16) align the clip (14) with the component (16) such that the clips (14) and the terminals (15) are parallel and transversely adjacent on another, and, effecting a good electrical and physical connection between each clip (14) and its respective component (16).

6. A method as claimed in claim 5 characterized in that said terminals (16) are soldered to their respective components (16).

7. A method as claimed in claim 5 or claim 6 characterized in that the step of effecting a good electrical connection between each clip (14) and its respective component (16) comprises soldering the clip (14) to the respective component (16).

8. A method as claime din any one of claims 5 to 7 characterized by the further steps of,

(a) introducing the fret (24, 25, 26) carrying terminals (15) and fuse receiving clips (14) into a first part (13) of a two-part electrically insulating housing (11) such that the clips (14) and teminals (15) extend through recesses (27, 28, 29) in the housing (11), and

(b) severing the fret (24, 25, 26) at predetermined points (16a) to separate, both electrically and physically, chosen connecting components (16) from one another, and engaging the second part (12) of said two part housing (11) with said first part (13) to trap the assemblies of terminals (15), connecting components (16), and clips (14) in position relative to the housing (11).

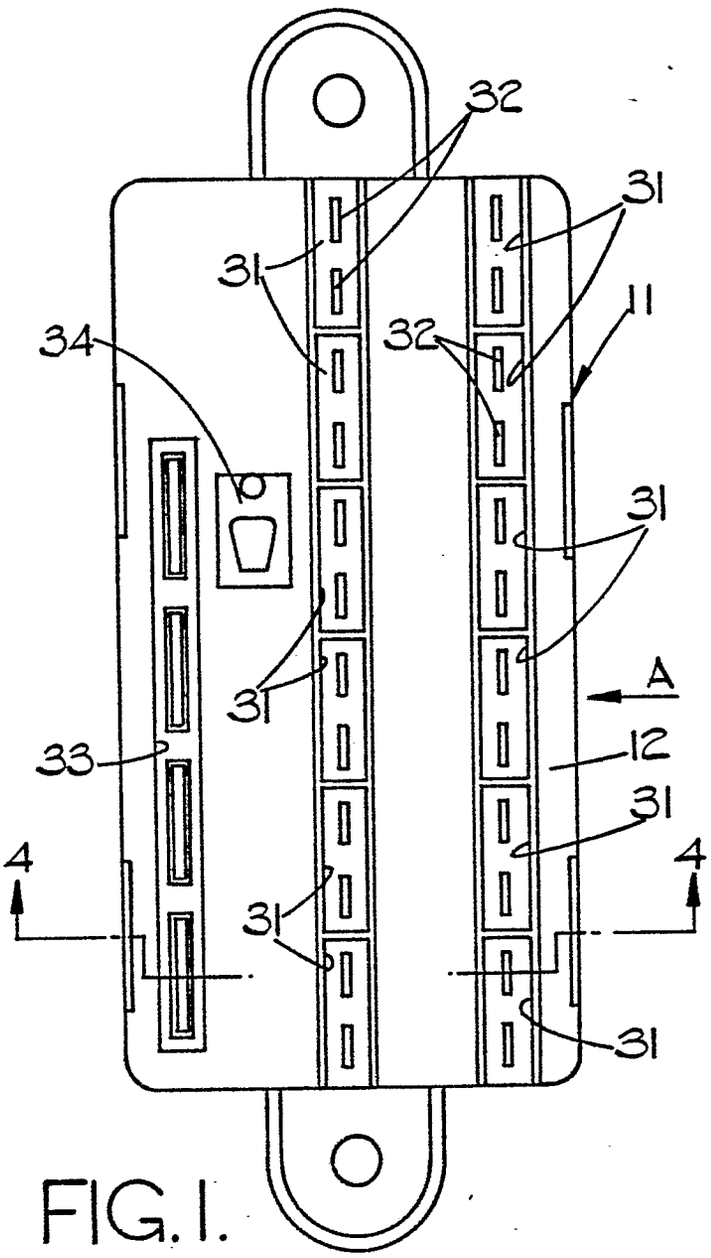

FIG.1.

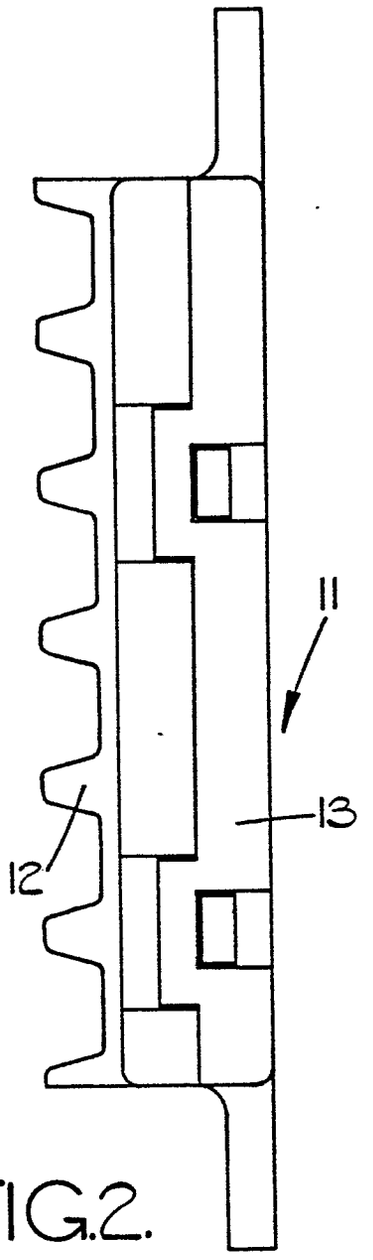

FIG.2.

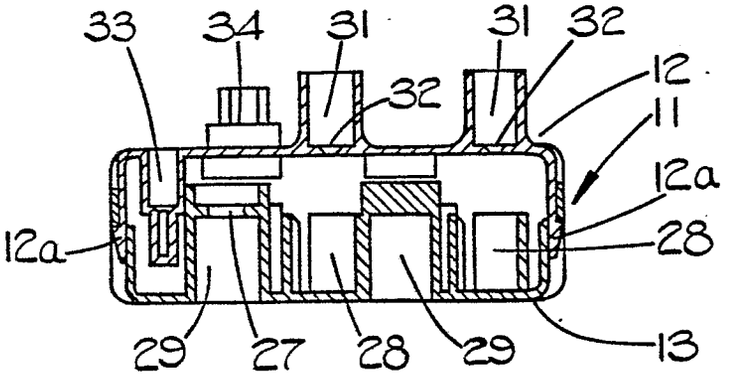

FIG.4.

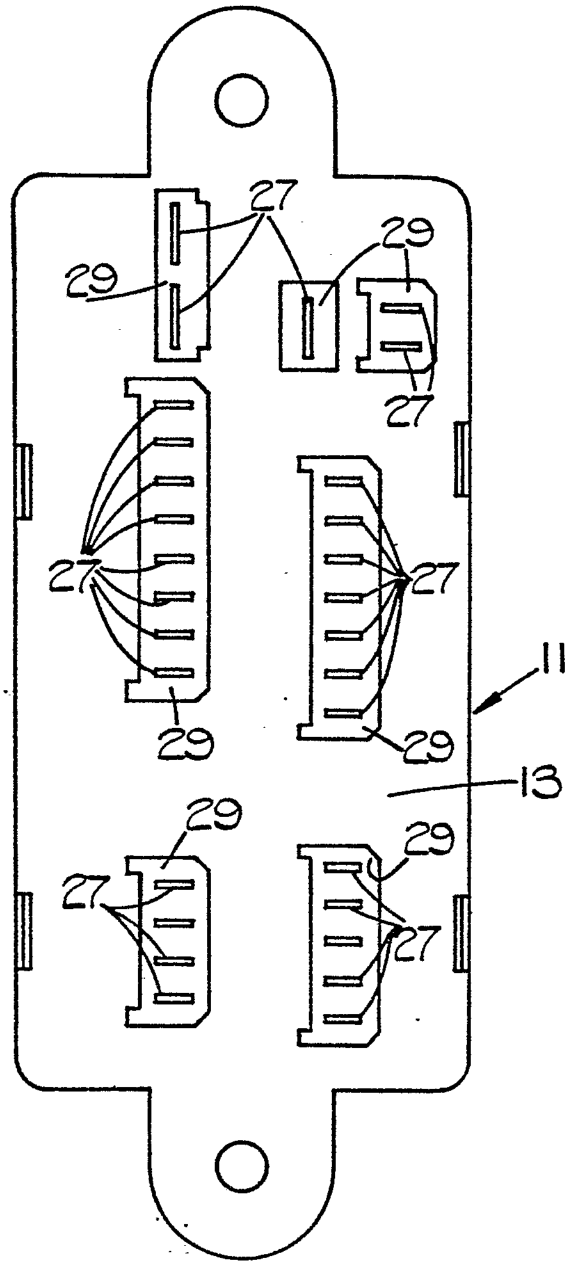
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FIG.3.

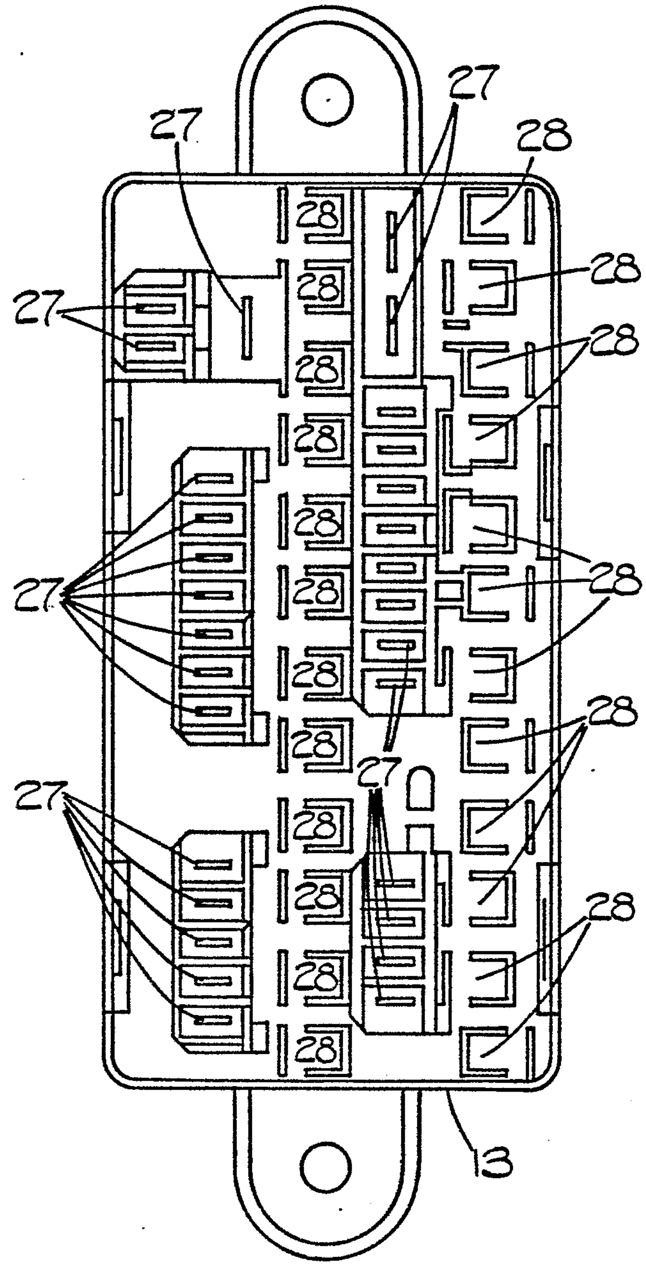
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FIG.5.

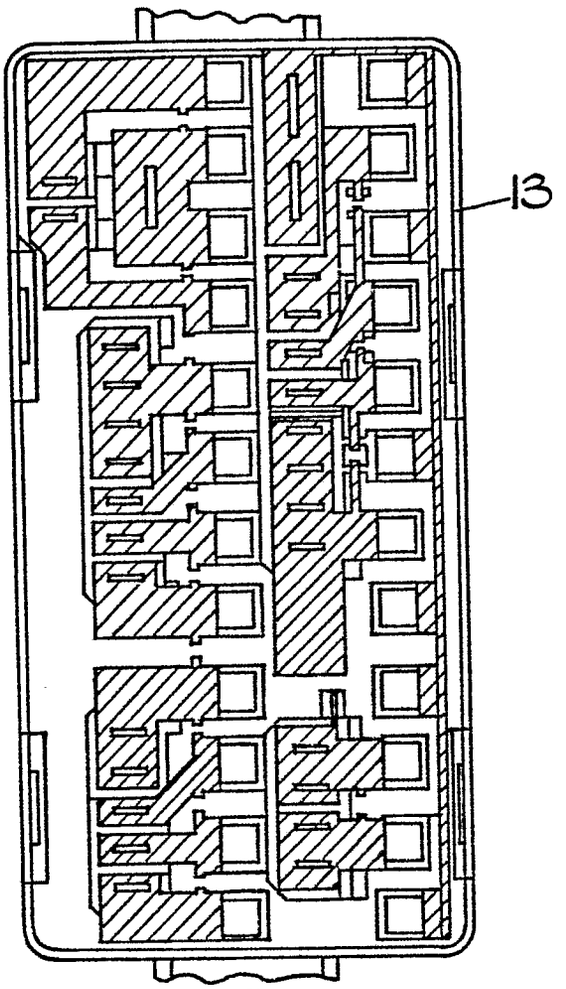

FIG.6.

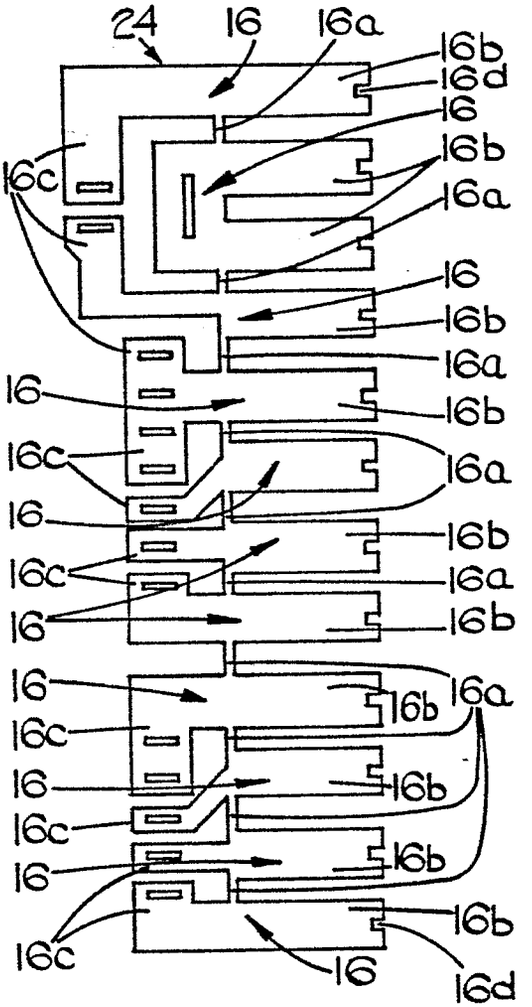

FIG.7.

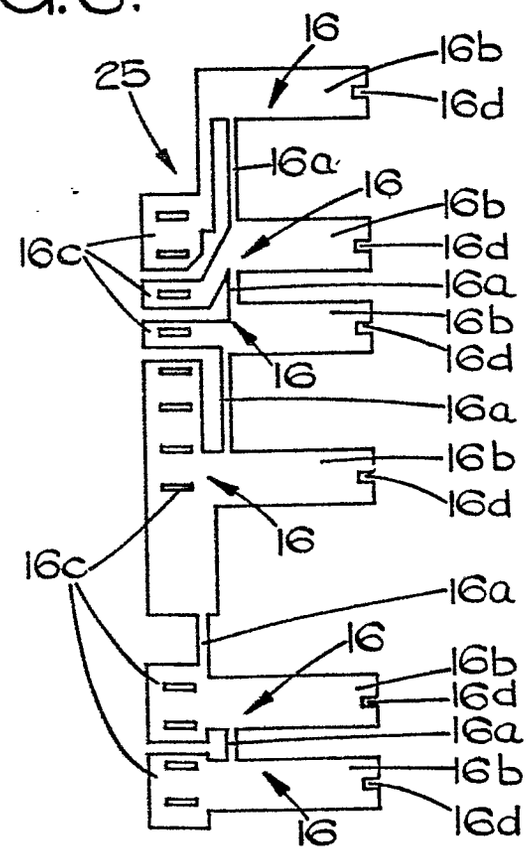

FIG.8.

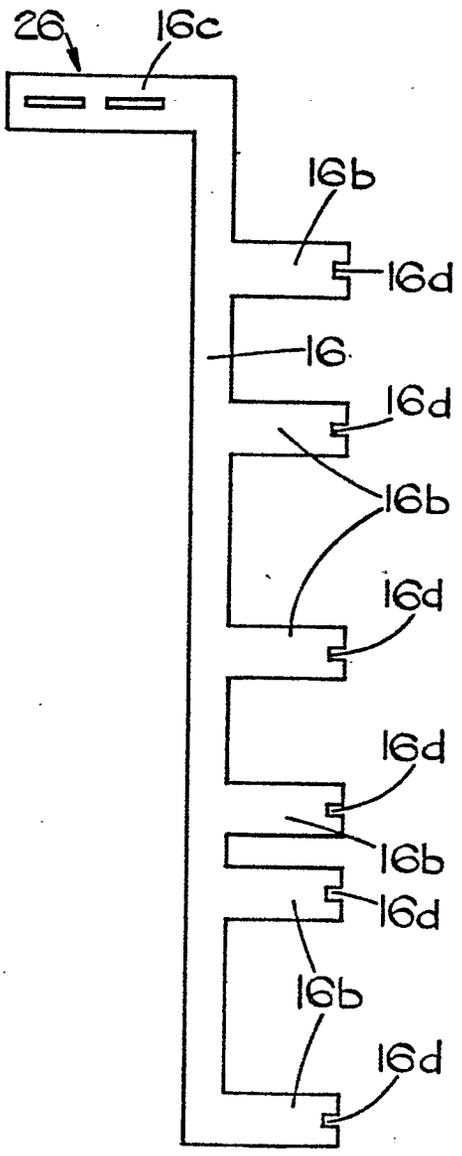

FIG.9.

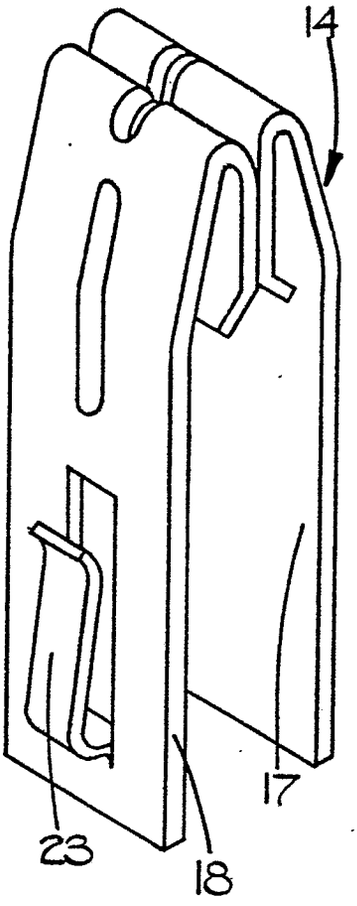

FIG.10.

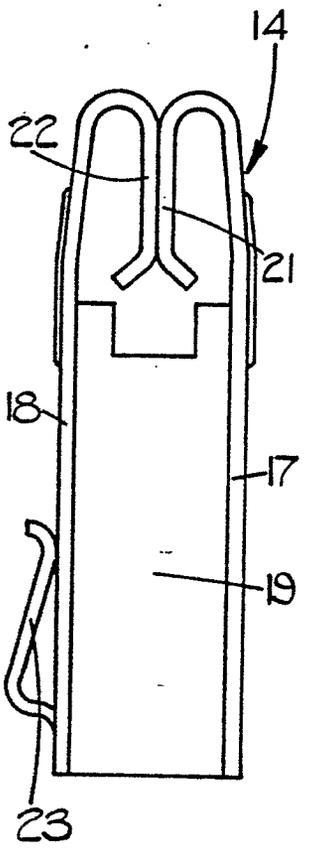

FIG.11.

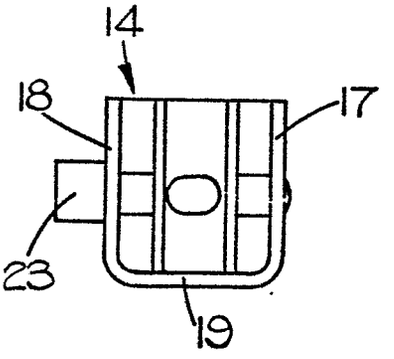

FIG.12.

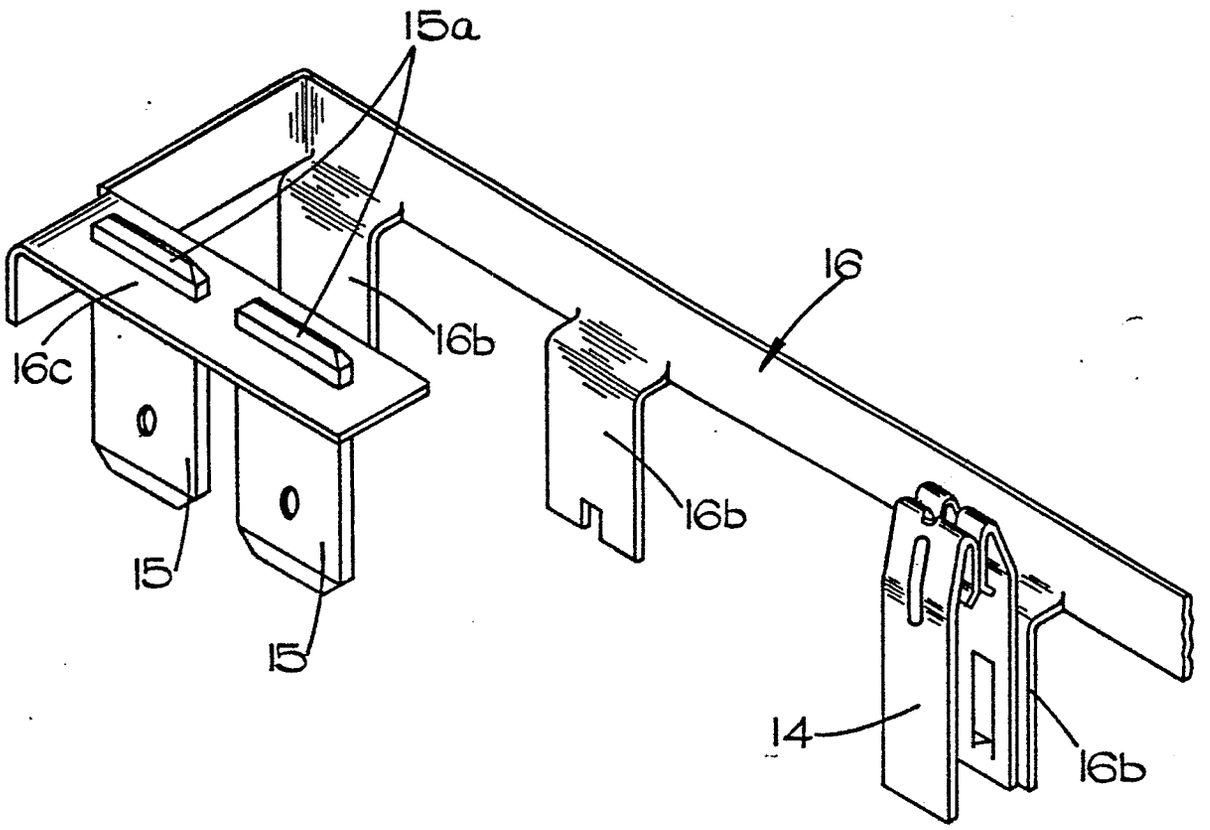

FIG.13.

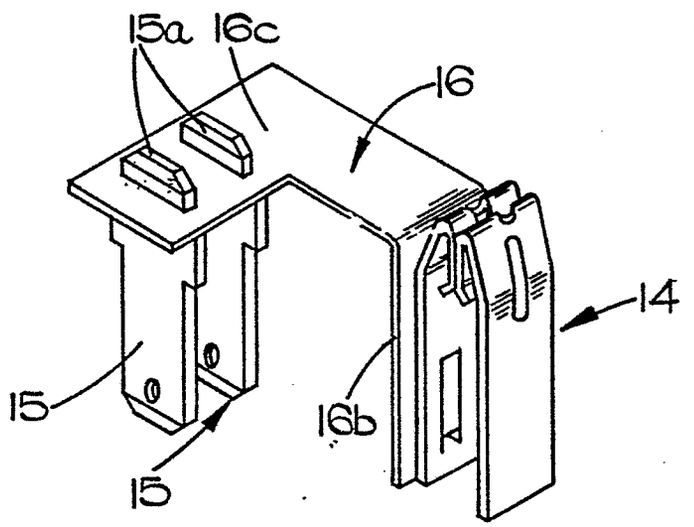

FIG.14.