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㉙ **Fuse clip assembly.**

㉚ The present specification discloses a fuse clip assembly (11,12) for use primarily but not exclusively in a vehicle electrical system fuse box. The assembly comprises a bus bar (11) with a number of terminals (14) to which an electrical connection is made by a clip arrangement (22,24). The clip arrangements in known bus bars (11) are formed by stamping and folding the material of the bus bars (11) and this therefore limits the minimum spacing between the terminals (14) and limits the minimum overall size of the assembly.

The present invention provides a fuse clip assembly comprising an elongate bus bar (11) having integral therewith a plurality of juxtaposed parallel blade terminals (14) extending transverse to the length of the bus bar (11), and a plurality of fuse clips (12). Each fuse clip (12) has a fuse engaging portion (21) and an integral socket terminal portion (22), each fuse clip (12) being carried by and electrically connected to the bus bar (11) by engagement of a respective blade terminal (14) in a socket terminal portion (22). Thus, as the bus bar (11) only has blade terminals, the length of the assembly can be more readily minimised.

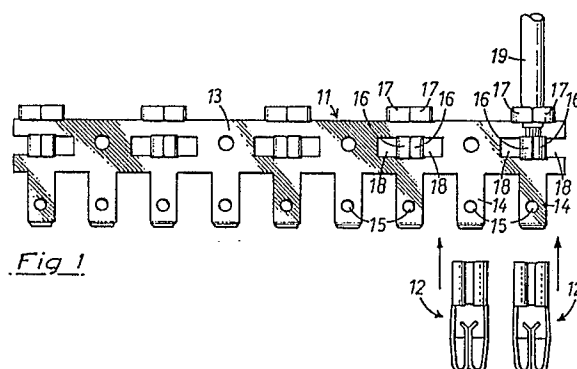


Fig 1

Description

FUSE CLIP ASSEMBLY

The present invention relates to a fuse clip assembly for use primarily but not exclusively in a vehicle electrical system fuse box to a bus bar and a fuse clip for use in such an assembly, and to a fuse box utilising such an assembly.

In our British Patent No. 2123626 there is disclosed a fuse clip unit wherein a bus bar is integral with, and electrically interconnects, a plurality of spaced parallel fuse clips, the unit being formed from sheet brass which is stamped and folded to define the fuse clips, the bus bar and means for gripping and making electrical connection to one or more electrical connecting leads.

The fuse clip unit of Patent 2123626 is suitable for many applications but presents problems where a close positioning of adjacent parallel clips is required. The problem results from the fact that the clips are integrally formed by stamping and folding sheet material, the developed width (the unfolded width) of each clip determining the minimum spacing between clips along the bus bar. For example, where the developed (unfolded) width of the clips is 15mm and the clips, in their developed form, are symmetrical about centre lines at right angles to the length of the integral bus bar, then the minimum spacing of clips (centre line to centre line) is 15mm.

It has previously been proposed to overcome this difficulty by producing the unit with minimum spacing and then folding or otherwise deforming the bus bar between adjacent clips to reduce the spacing between clips. Such a solution is in itself disadvantageous in that additional manufacturing steps are necessary to shorten the bus bar between clips, the shortening operation risks damage to the unit so increasing the failure rate and may, through mechanical working of the bus bar, affect its electrical properties, and the shortened bus bar takes up more space in the fuse box in the direction in which the bus bar is deformed and this dimension must be accommodated in the fuse box design. A further disadvantage of the unitary construction is that the bus bar and the clips are formed from the same material whereas ideally the bus bar is formed from a material of high conductivity whereas the material of the clip should exhibit good resilience and in the unitary construction therefore the material is a compromise between the two requirements.

It is an object of the present invention to provide a fuse clip assembly wherein the aforementioned problems are mitigated or avoided.

In accordance with the present invention there is provided a fuse clip assembly comprising, an elongate bus bar having integral therewith a plurality of juxtaposed parallel blade terminals extending transverse to the length of the bus bar, and,

a plurality of fuse clips, each fuse clip having a fuse engaging portion and an integral flat, socket terminal portion, each fuse clip being carried by and electrically connected to the bus bar by engagement of a respective blade terminal of the bus bar in the

socket terminal portion of the clip.

Preferably the bus bar includes at least one integral connector means whereby an electrical connecting lead can be electrically connected to the bus bar.

Desirably the bus bar is formed from copper sheet or strip and the fuse clips are formed from brass sheet or strip.

The invention further resides in a bus bar for use in a fuse clip assembly, the bus bar comprising an elongate conductive strip having integral blade terminals projecting parallel to one another transverse to the length of the strip.

The invention still further resides in a fuse clip for use in a fuse clip assembly, the clip comprising a fuse engaging portion, and an integral flat socket terminal portion for receiving a blade terminal.

The invention yet further resides in a fuse box comprising an electrically insulating housing, a fuse clip assembly as specified above disposed in the housing with each fuse clip thereof disposed adjacent a further fuse connector so that each clip defines with a respective connector a pair of elements for receiving respectively the terminal regions of a fuse.

The present invention will now be further described, by way of example, with reference to the accompanying drawings wherein,

Fig. 1 is a diagrammatic plan view illustrating the components of one embodiment of a fuse clip assembly constructed according to the present invention;

Fig. 2 is a side elevational view of a fuse clip as shown in Fig. 1;

Fig. 3 is a view in the direction of arrow A in Fig. 2;

Fig. 4 is a diagrammatic perspective view, to an enlarged scale of the fuse clip of Figs. 2 and 3; and

Fig. 5 is a diagrammatic representation of a fuse suitable for use with the assembly of Fig. 1.

Referring to the accompanying drawings, the fuse clip assembly illustrated includes a bus bar 11 and a plurality of fuse clips 12.

The bus bar 11 is stamped from tinned copper strip material and includes an elongate connecting strip 13 having integral therewith a plurality of juxtaposed parallel blade terminals 14. The blade terminals 14 are coplanar with the strip 13 and protrude from one edge of the strip at right angles to the length of the strip. The blade terminals are equidistantly spaced along the edge of the strip and the free-end region of each blade terminal is chamfered. Moreover, each blade terminal is pierced, adjacent its free end, to define an aperture 15 therein.

At predetermined points along the length of the strip 13, conveniently aligned with the root of alternate blade terminals 14, the strip 13 defines two pairs of integral deformable tags 16, 17. The tags 17 are at the edge of the strip 13

opposite that carrying the blade terminals 14, and the tags 16 are formed within the body of the strip, the reference numerals 18 identifying rectangular apertures produced by bending the tags 16 out of the plane of the strip. At the right hand end of Fig. 1 the tags 16 and 17 are shown deformed around an electrical connecting lead 19, the tags 17 being deformed around the insulating sheath of the lead 19 and the tags 16 being deformed around a bared portion of the core of the lead 19. Thus the two pairs of tags provide a physical connection of the lead to the bus bar, and the tags 16 provide an electrical connection between the core of the lead 19 and the bus bar 11. The remaining pairs of tags 16, 17 along the length of the bus bar are shown bent over to lie in facial contact with portions of the bus bar lying between the roots of the tags. During manufacture of the bus bar, as the bus bar is stamped from the strip of copper, the strip material is cut to define the tags, and at the same time the tags are bent upwardly to lie generally at right angles to the plane of the strip. Clearly if they were left in this position during use of the bus bar then they would materially increase the space needed to house the bus bar. For this reason during use of the bus bar those tags which are not associated with a lead are bent to lie flat, either by being pressed back to lie coplanar with the strip 13 of the bus bar, or, as shown in Fig. 1, by being folded over as if they were making connection to a lead.

Each fuse clip 12 is formed from a sheet or strip of tinned brass. The use of copper for the bus bar 11 is preferred to the use of brass primarily owing to its better conductivity. The bus bar does not require resilience, and so the lack of resilience of copper is of no consequence. However, the clips 12 do require resilience and thus the use of brass is preferred to copper.

Each fuse clip 12 has two distinct, but integral portions, a fuse engaging portion 21 and a flat socket terminal portion 22. The flat socket terminal portion 22 of each clip comprises a generally flat base 23 and a pair of inwardly rolled side portions 24. The shape of the portion 22 conforms to that of the well recognised female "LUCAR" terminal designed to receive, grip and make electrical connection to a flat blade terminal.

The fuse engaging portion 21 of each fuse clip 12 is integral with the socket terminal portion 22 and comprises a pair of elongate, transversely spaced, resilient arms 25 extending outwardly in the direction of the length of the terminal portion 22. Part-way along their length the arms 25 are bent to a U-shape so that the end regions of the arms 25 lie close together, or even in facial contact, and extend back towards the socket portion 22 between their respective root portions. It will be recognised therefore that the closely adjacent portions 25a of the arms 25 define a pair of substantially planar regions urged, by the

inherent resilience of the arms 25, towards facial contact with one another. A flat blade-like terminal 27 of a fuse 26 (Fig. 5) introduced between the portions 25a will be gripped thereby, and there will be established a good electrical connection over a large surface area.

The fuse clip assembly is completed by engaging the desired number of fuse clips 12 with respective blade terminals 14 of the bus bar 11, the bus bar 11 first having been cut to an appropriate length determined by the number of fuse clips required. Each blade terminal 14 is received in the flat socket terminal portion 22 of the respective fuse clip 12, and in order to resist withdrawal of a fuse clip 12 from the bus bar 11 the base 23 of the terminal portion 22 of each fuse clip 12 is formed with a locking projection which engages within the aperture 15 of the mating blade 14 when the fuse clip is correctly engaged with the bus bar. In the event that it is necessary at some stage to remove fuse clips from the bus bar then the projection on the base 23 may be a rounded projection which provides a good latching of the terminal portion 22 on the blade terminal 14, but does not prevent deliberate, subsequent withdrawal, or alternatively where the fuse clips are to be substantially permanently attached to the bus bar then the projection on the base 23 of each fuse clip may be a half-sheared formation which, in effect, locks into position in the respective aperture 15.

One or more electrical connecting leads 19 will be attached, as described above, to the bus bar 11 at some convenient point in the assembly, and this may be before, or after, engagement of the fuse clips with the bus bar. It will be recognised that with the type of construction described above the fuse clips and the bus bar can be formed from different, and individually suitable materials, and moreover, the minimum spacing between adjacent fuse clips of the assembly is governed primarily by the thickness of the material used to form the fuse clips. The developed width (that is to say the unfolded width) of the fuse clips is irrelevant in determining the minimum spacing since the clips are attached to the bus bar as individual items. The tags 17 and 18 can be spaced as desired along the length of the bus bar, and thus their developed width is also irrelevant. The blade terminals 14 do not involve folding of material and thus they can be positioned as close as desired along the length of the strip. The only parameter of importance therefore is the thickness of the material of the clips 12, since the spacing between adjacent blade terminals 14 must, at minimum, be twice this thickness to permit fuse clips to be engaged simultaneously with adjacent blade terminals.

A fuse clip assembly as described above is utilised in the fuse box which comprises a moulded synthetic resin housing having means whereby the fuse clip assembly can be mounted therein with the fuse engaging por-

tions 21 of the clips extending towards an open face of the housing. The clips 12 will of course, by virtue of the bus bar 11, be arranged in a linear row, and within the fuse box housing there is a parallel linear row of fuse connectors. The fuse connectors have fuse engaging portions identical in form to the fuse engaging portions 21 of the clips 12, but do not necessarily incorporate respective socket terminal portions 22. For example the fuse connectors may be secured to a printed circuit board forming the base of the fuse box, the printed circuit board carrying conductive tracks electrically connected to respective fuse connectors of the board. Each fuse connector will be positioned adjacent a respective clip 12, and a fuse, for example of the kind illustrated in Fig. 5, will have one of its terminal blades 27 engaged in the portion 21 of a clip and the other of its terminal blades engaged in the respective adjacent fuse connector so that the fuse electrically interconnects the lead 19, attached to the fuse clip assembly, with the printed circuit board conductive track which is associated with the respective fuse connector.

The invention is not restricted to the specific fuse engaging portion 21 described above. A number of different fuse configurations are presently available, and the nature of the fuse engaging portion 21 of each clip 12 will be determined by the nature of the fuse with which the clip is to be utilised. For example the fuse clips may be shaped to accommodate the cylindrical end-caps of cartridge type fuses.

Claims

1. A fuse clip assembly characterised by an elongate bus bar (11) having integral therewith a plurality of juxtaposed parallel blade terminals (14) extending transverse to the length of the bus bar (11), and a plurality of fuse clips (12), each fuse clip (12) having a fuse engaging portion (21) and an integral socket terminal portion (22), such fuse clip (12) being carried by and electrically connected to the bus bar (11) by engagement of a respective blade terminal (14) of the bus bar (11) in the socket terminal portion (22) of the clip (12).

2. A fuse clip assembly as claimed in claim 1, wherein the bus bar (11) includes at least one integral connector means (16) whereby an electrical connecting lead (19) can be electrically connected to the bus bar (11).

3. A fuse clip assembly as claimed in claim 1 or claim 2, wherein the bus bar (11) includes at least one integral tag (17) for use in solely physically attaching an electrically connecting lead (19) to the bus bar (11).

4. A fuse clip assembly as claimed in any one of claims 1 to 3, wherein the bus bar (11) is made of copper sheet or strip and the fuse clips

are formed from brass sheet or strip.

5. A fuse clip assembly as claimed in any one of claims 1 to 4, wherein each blade terminal (14) and fuse clip (12) have interengaging means (15) for retaining the fuse clip (12) on the blade terminal (14).

6. A fuse clip assembly as claimed in claim 5, wherein the interengaging means (15) is formed by an aperture (15) in the blade terminal (14) and a protuberance on the fuse clip (12), which protuberance engages on the aperture (15) when the fuse clip (12) is slid into the blade terminal (14).

7. A fuse clip assembly as claimed in any one of claims 1 to 6, wherein the socket terminal portion (22) of each fuse clip (12) comprises a generally flat base (23) and a pair of inwardly rolled side portions (24).

8. A fuse clip assembly as claimed in any one of claims 1 to 7, wherein the fuse engaging portion (21) of each fuse clip (12) comprises a pair of elongate, transversely spaced, resilient arms (25), the arms (25) extending from the socket terminal portion (22) and being each bent to a U-shape so that the end regions of the arms (25) lie close together or even in contact, and extend back towards the socket portion (22).

9. A fuse clip assembly as claimed in any one of claims 1 to 8, when installed in a fuse box, with each fuse clip (12) disposed adjacent to a further fuse connector so that each clip (12) defines with a respective connector a pair of elements for respectively receiving the terminal regions of a fuse (26).

10. A bus bar for use in a fuse clip assembly, comprising an elongate electrically conductive strip (13) having juxtaposed integral blade terminals (14) projecting parallel to one another transverse to the length of the strip (13).

11. A bus bar as claimed in claim 10, wherein at least one integral connector means (16) is included whereby an electrical connecting lead (19) can be electrically connected to the bus bar (11).

12. A bus bar as claimed in claim 10 or claim 11, wherein the bus bar (11) includes at least one integral tag (17) for use in solely physically attaching an electrically connecting lead (19) to the bus bar (11).

13. A fuse clip for use in a fuse clip assembly, comprising a fuse engaging portion (21) and an integral socket terminal portion (22), the socket terminal portion (22) being suitable for electrically and physically attaching the fuse clip (12) to a blade terminal (14).

14. A fuse clip as claimed in claim 13, wherein the socket terminal portion (22) comprises a generally flat base (23) and a pair of inwardly rolled side portions (24).

15. A fuse clip as claimed in claim 12 or claim 13, wherein the fuse engaging portion (21) comprises a pair of elongate, transversely spaced, resilient arms (25), the arms (25) extending from the socket terminal portion (22)

and being each bent to a U-shape so that the end region of the arms (25) lie close together or even in contact, and extend back towards the socket portion (22).

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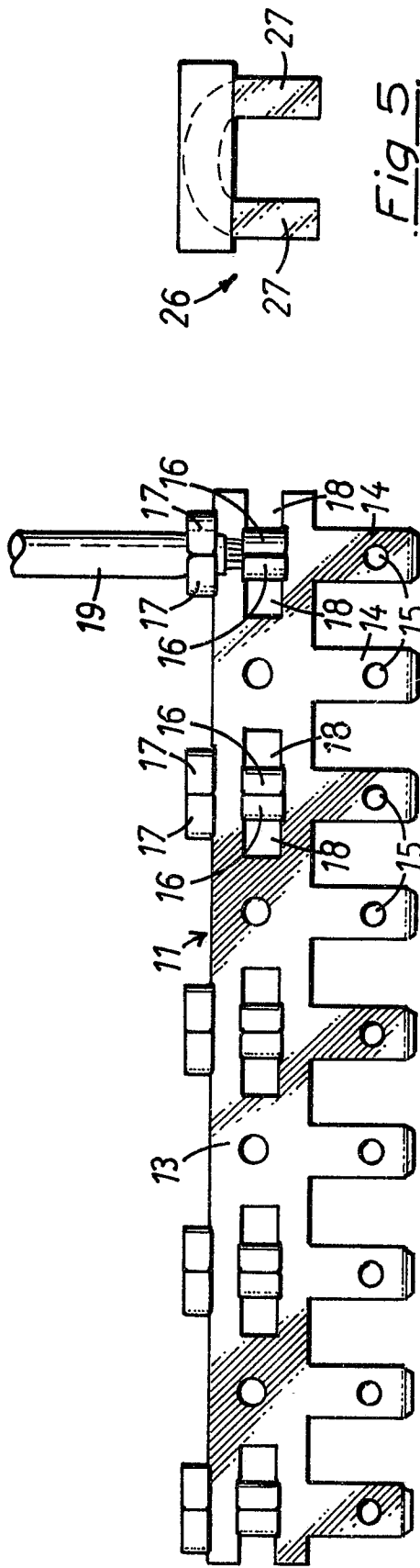


Fig. 1

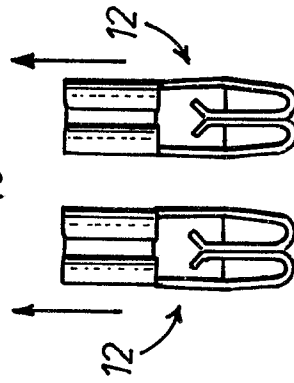


Fig. 2

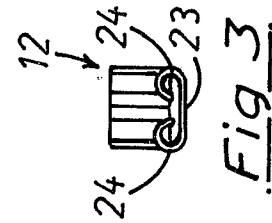


Fig. 3

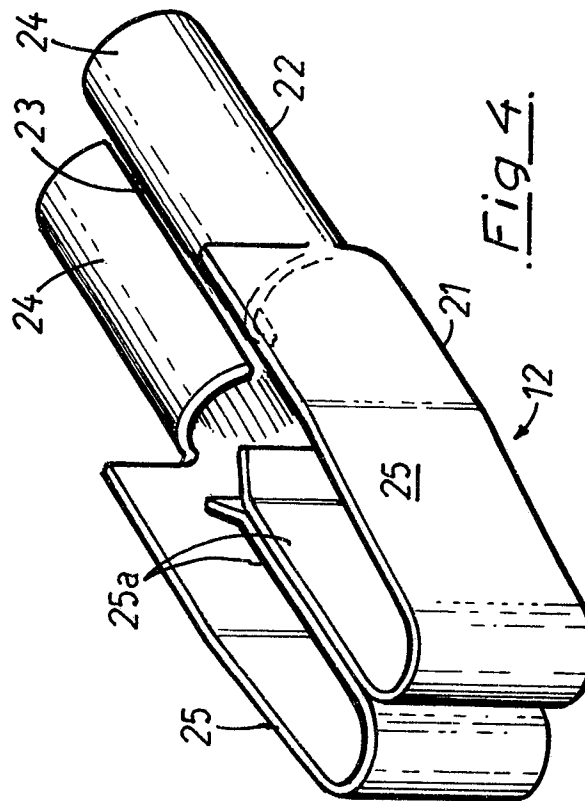


Fig. 4

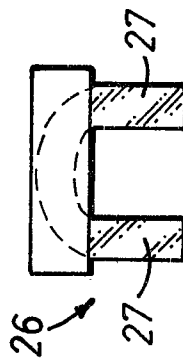


Fig. 5