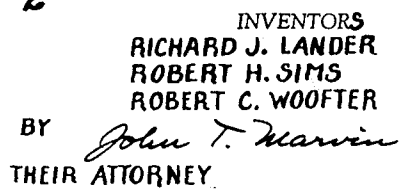


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2 Sheets-Sheet 1



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FUSE PANEL ASSEMBLY

Filed June 12, 1958

2 Sheets-Sheet 2

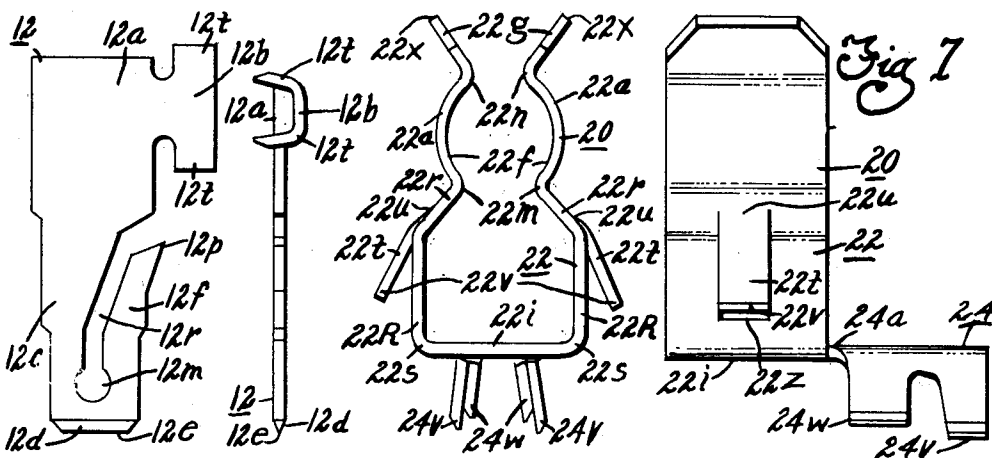


Fig. 5 Fig. 6 Fig. 7A

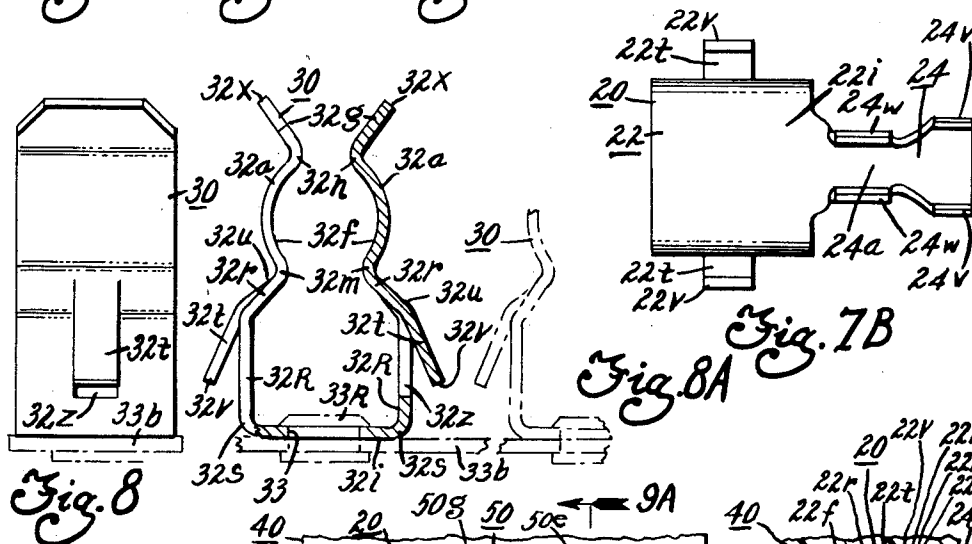


Fig. 8

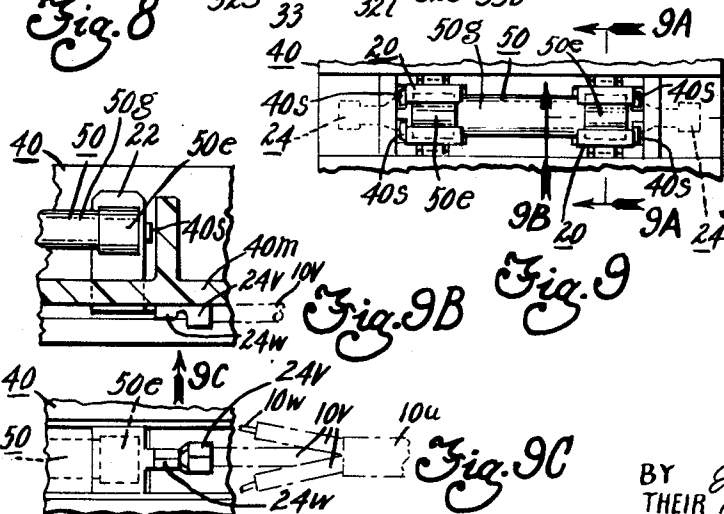


Fig. 9B

Fig. 9

Fig. 9C

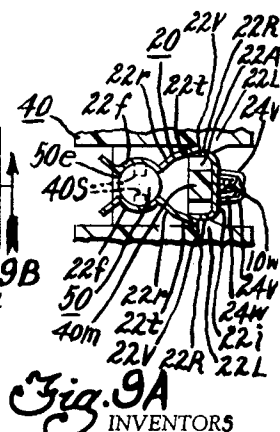


Fig. 9A

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FUSE PANEL ASSEMBLY

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4 Claims. (Cl. 200—133)

This invention relates to a fuse panel assembly, and particularly, to an insulating body or panel and electrical contact or terminal means adapted to be snapped into the body and adapted to be connected to electrical conducting means.

An object of this invention is to provide a fuse panel assembly consisting of two parts, namely, a combination fuse clip and terminal for connection to wiring and an insulating body having a cavity provided for each fuse clip to snap into from one side.

Another object of this invention is to provide a combination clip and terminal having a cylindrical contact or clip portion made resilient and complementary to a fuse body, lamp bulb base and/or like electrical devices with cylindrical contact portions and having an integral ductile terminal portion provided with lateral wings adapted to be crimped to a wire of an insulated conductor such as would project from a wiring harness or cable.

Another object is to provide a fuse clip having a substantially U-shaped body portion provided with a pair of legs each including a semi-arcuate segment complementary to a fuse and each having a locking segment projecting outwardly on one side of the semi-arcuate segment, the locking segment being adapted to engage a mounting panel having an aperture for insertion of each fuse clip.

Another object is to provide a fuse clip having a substantially U-shaped body portion including a base segment adapted to be joined to a conductor such as a cable or bus bar for electrical connection and including a pair of legs each including a semi-arcuate segment complementary to an annular fuse end and having a locking segment including tangs projecting outwardly on one side of the semi-arcuate segment, opposite legs with the locking segment and tangs being spread away from each other by an annular fuse end inserted therebetween for maintained positive engagement of the locking segments and tangs relative to a mounting panel having an aperture adapted for receiving each fuse clip.

Still another object is to provide a clip having a resilient U-shaped body portion adapted to engage an electrical device such as a fuse and like electrical devices provided with a cylindrical contact portion and also having an integral ductile terminal portion extending to one side of the body portion and provided with segments adapted to be crimped to a conductor.

A further object is to provide a fuse panel assembly incorporating a fuse block molded of insulating material with holes into which at least one flange projects extending longitudinally and maintaining minimum separation between semi-arcuate segments of a pair of resilient legs of a fuse clip inserted through each hole and joined by an intermediate base portion of the clip, the base portion being adapted to engage one side of the fuse block for limiting insertion of the clip relative to a hole and lock-

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ing means provided on each leg for snapping into locking engagement relative to an opposite side of the fuse block.

Another object is to provide a fuse panel assembly incorporating a fuse block molded of insulating material with a plurality of openings provided between walls projecting on opposite sides of the fuse block and separating fuse clips that are attached directly to a conductor and then snapped into openings of the fuse block.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a plan view of a fuse block mounting panel in accordance with the present invention.

Figure 2 is a cross sectional elevational view taken along line 2—2 of Fig. 1 and includes a phantom representation of a fuse clip inserted in accordance with the present invention.

Figure 3 is a cross sectional elevational view taken along line 3—3 and includes a phantom representation of a male connector insertable through an opening of a mounting panel.

Figure 4 is a fragmentary cross sectional elevational view taken along line 4—4 of Fig. 1.

Figure 5 is a plan view of a male terminal insertable through an opening of a mounting panel.

Fig. 6 is an end view of the terminal of Fig. 5.

Figure 7 is a side view of a combination fuse clip and terminal in accordance with the present invention.

Figure 7A is an end elevational view of the combination fuse clip and terminal of Fig. 7.

Figure 7B is a bottom view of the combination fuse clip and terminal of Fig. 7.

Figure 8 is a side view of a modification of the fuse clip of Fig. 7 together with a phantom representation of a bus bar connector.

Figure 8A is a partially sectioned end elevational view of the clip and phantom bus bar of Fig. 8.

Figure 9 is a plan view of a fuse panel assembly in accordance with the present invention.

Figure 9A is a cross sectional elevational view taken along line 9A—9A of Fig. 9.

Figure 9B is a fragmentary cross sectional elevational view taken along line 9B—9B of Fig. 9.

Figure 9C is a fragmentary view taken in the direction of arrow 9C in Fig. 9B.

With particular reference to Fig. 1 there is shown a fuse block generally indicated by numeral 10 which forms part of a fuse panel assembly in accordance with the present invention. The fuse block is molded preferably of thermoplastic material such as polystyrene or of a thermosetting resin such as Bakelite. The fuse block has a main floor portion 10a provided with a mounting opening or aperture 10b through which a screw or mounting stud can be inserted for attaching the fuse block to a support such as a fire wall or dashboard panel of a motor vehicle. Adjacent to the opening 10b there is a conduit extension 10c through which a wiring harness or cable carrying a plurality of insulated conductors is inserted to project and provide bare wire to an under side of the main floor portion 10a of the fuse block.

In accordance with the present invention, a plurality of walls are provided projecting both upwardly and downwardly relative to the main floor portion 10a of the fuse block. For purposes of illustration, a pair of sockets, cavities, or chambers 10d are provided as illustrated in Figures 1 and 2 and each of these sockets 10d extends through the main floor portion 10a and is surrounded both above and below the main floor portion by insulat-

ing walls 10e and 10f. It is noted that the walls 10e and 10f as best seen in Fig. 2 each begin along a bottom edge 10g which is in alignment with a bottom edge of a downwardly extending skirt portion 10h of the fuse block. The bottom edge of the skirt portion 10h and the bottom edge of the walls 10e and 10f are positioned adjacent to a mounting surface into which the fuse block is fastened by providing a screw or mounting stud through the opening 10b. As visible in Fig. 2, an upper edge 10i of the walls 10e and 10f is shorter in height relative to the bottom edge of the fuse block than is an upper edge of a fuse mounting portion 10j provided integrally with the main floor portion 10a of the fuse block. Terminal means inserted in each cavity 10d will be described in further detail below.

The main floor portion 10a is provided with a second diagonally spaced mounting aperture 10k located substantially diagonally away from aperture 10b. The fuse block is provided with a section of floor or median lateral member 10m interconnecting upwardly projecting end walls 10n and other upwardly projecting walls 10p which are spaced laterally from and substantially parallel to the end walls 10n. There is a plurality of these walls 10p provided at spaced lateral intervals and each projecting transversely relative to median member 10m. Each of the upwardly projecting walls 10n at opposite ends of the bank of walls and walls 10p provided parallel thereto has a cutout portion or recess 10r provided to result in a lower height near a midportion of each wall as is better seen in the view of Fig. 3. The purpose of the recess 10r in each of these parallel walls is associated with the function of longitudinal chambers or cavities or adjacent spaces 10s into which annular or cylindrically shaped fuse members are inserted. The recesses 10r permit either fingers or tools to be inserted relative to each of the spaces 10s and permit fingers or tools to grip individual fuse members for insertion or removal thereof relative to terminal means provided in accordance with the present invention.

The cross sectional elevational view Fig. 2 illustrates a phantom outline of one embodiment of terminal means in accordance with the present invention as the terminal means are snapped into position from one side of the main floor portion 10a of the fuse block. Each space or chamber portion 10s is surrounded by walls including side walls 10t extending parallel to each other and connected to opposite ends of the parallel spaced walls 10n and 10p which extend transversely relative to side walls 10t. Thus the composite of walls 10n, 10p and 10t results in a bank of a plurality of chambers or spaces 10s into each of which a cylindrically shaped fuse is insertable for connecting and protecting a circuit connected through a wire providing power from a source such as a battery to such vehicle components as instrument panel lamps, heating and air conditioning means, radio, back-up lights, tail lights, spot lights, etc. A wire or power lead can be provided for each of these circuits and is brought to the fuse block through a cable or wiring harness 10u outlined in phantom in Figures 2 and 3 and positioned in an entrance channel or conduit 10c mentioned earlier. Each wire of the cable or harness is provided with an insulated portion 10v and a wire or conductor portion 10w fragments of which are outlined in Fig. 2. It is apparent that the skirt portion 10h of the fuse block provides sufficient height and clearance between the bottom edge 10g of the lower surface of walls extending downwardly from the main floor portion 10a of the fuse block for permitting insulated wires to be connected to various terminal means and contacts insertable relative to spaces and openings provided by the fuse block. The skirt 10h forms a protective guard surrounding all of the insulated conductor wires provided adjacent to the underside of the main floor portion 10a and the walls 10n, 10p and 10t extending upwardly from the main floor portion form a protective enclosure for each

of the spaces 10s into which cylindrical or annular fuse members are insertable.

Fig. 3 illustrates a cross sectional elevational view of one of the chambers or spaces 10s enclosed by wall portions 10p and 10t. Wall portions 10n are provided only for the end chambers at opposite ends of the bank of chambers 10s illustrated in the plan view of the fuse block in Fig. 1. The mounting opening 10k and median member 10m are visible in Fig. 3 together with locking means provided by the fuse block for engagement by combination fuse clip and terminal means in accordance with the present invention. The locking means and locking structure provided by the fuse block and combination clip and terminal means in accordance with the present invention will be described in further detail below.

Figures 1 and 3 illustrate an additional socket portion 10x provided by the fuse block including upwardly extending walls 10y forming a honeycomb-type rectangular structure through which chambers or passages 10z extend from a top edge of the walls 10y through floor portion 10a into a space adjacent to a bottom edge 10g of the skirt 10h extending from an underside of the main floor portion 10a of the fuse block. Each of the chambers 10z is adapted to provide mounting means in space for a male terminal or prong adapted to be snap-fitted into locking engagement with the fuse block from an underside of the main floor portion 10a. A phantom illustration of such male terminal means is outlined in the view of Fig. 3 and these male terminal means will be described in further detail below.

Fig. 4 is a fragmentary cross sectional elevational view of one of the spaces 10z surrounded by upwardly extending walls 10y formed integral with the main floor portion 10a of the fuse block. The skirt portion 10h of the main fuse block is also visible in Fig. 4.

The upwardly extending walls 10e and 10f as well as the honeycomb structure formed by the plurality of upwardly extending walls 10y are adapted to provide a plurality of pairs of male sockets relative to which male terminals or prongs are locked into engagement relative to the fuse block and are adapted to be engaged by female terminal means or sockets containing female terminal members engageable relative to the male prongs such as those illustrated in the phantom outline in the cross sectional elevational view of Fig. 3. Wiring for connection to the male terminal means or prongs can be included as part of the wiring harness or cable 10u which is inserted through the conduit or channel portion 10c. For purposes of clarity a phantom outline of cable 10u is provided in space adjacent to conduit or channel 10c in both Figures 2 and 3.

With particular reference to Fig. 5, there is shown a single male terminal generally indicated by numeral 12 similar to a double male terminal outlined in the phantom of the male terminal means inserted relative to the honeycomb structure surrounding spaces 10z as shown in Fig. 3. For convenience, the details of the single male prong 12 can be best seen in the views of Figures 5 and 6 wherein the male terminal means are illustrated away from the structure of the fuse block. Each male terminal whether provided with a single or double male body portion is provided with a terminal wire connecting portion. This terminal wire connecting portion includes a central floor 12b provided integral with a main body portion 12a of the male terminal 12. Extending laterally to one side of the central floor portion 12b are side wings or tangs 12t projecting away from each other in the blank of the terminal 12 as illustrated in Fig. 5. As the terminal is formed and adapted for receiving a wire of an insulated conductor, these tangs 12t are bent upwardly at substantially right angles relative to the central floor portion 12b of the male terminal. The central floor portion 12b as illustrated in Fig. 6 is bent to one side of the main body portion 12a of the male terminal so that an offset is provided relative to which a

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wire such as 10w is inserted between the tangs 12i which are then bent or crimped relative to the floor portion 12b and serve to connect the wire relative to the male terminal 12. The main body portion 12a of each male prong is integral with both the terminal conductor receiving floor portion 12b and a male contact portion 12c. The contact portion 12c has a cut or bevelled end portion 12d which is provided with a sharp leading edge 12e. Slanted surfaces are provided on opposite sides of the cut or bevelled portion 12d and these slanted surfaces converge along the edge 12e. The slanted surfaces provide a wedge-shaped structure for facilitating spreading of a female terminal and facilitating insertion of the contact portion 12c of the male terminal relative thereto. The contact portion 12c is provided with a flange section 12f having one end integral with the contact portion 12c and having an opposite end terminating in a free barb or projection 12p engageable against a shoulder provided by a mounting panel such as the main floor portion 10a of the fuse block illustrated in Figures 1-4.

Specifically, the single terminal or male prong 12 of Fig. 5 is insertable preferably relative to individual chambers such as 10d which are at right angles relative to each other. The projection or barb 12p is engageable against a ledge projecting laterally inwardly relative to an opening or chamber such as 10d and the specific structure of this ledge and cooperating barb or projection 12p is not part of the present invention, and therefore, is not illustrated specifically relative to the chamber 10d. It is also possible for the chamber 10d to be adapted for mounting a female terminal means relative to which a male terminal such as 12 would be insertable through an upper aperture 12g formed by opposite wall portions 10h and 10i extending toward each other as shown in Figures 1 and 2 and serving as guides for insertion of a male prong into the chamber 10d wherein a female terminal would be locked into engagement with a shoulder of a flange 12x.

A better illustration of how a male terminal is inserted relative to an insulating housing is obtained by referring to Fig. 3 wherein there is illustrated an outline of double male terminal 14 having a main body portion 14a integral with a wire connecting floor portion 14b from which tangs 14t project similar to structure illustrated with the single male 12 of Figures 5 and 6. The chambers 10z provided by the fuse block have opposite outwardly extending slots 14s relative to which side wings 14w of contacting portions 14c of the double male terminal means are insertable. The double male terminal 14 illustrated in the outline or phantom view thereof in Fig. 3 has two contact portions 14c each of which is integral with a flange portion 14f having a free end provided with a barb or projection 14p. This barb or projection 14p is engageable against a shoulder 14z that extends laterally inwardly relative to each chamber or space 10z. Each shoulder 14z is integral with the main body or floor portion 10a of the fuse block.

Each chamber 10z has a pair of shoulders 14z located opposite each other and extending laterally inwardly relative to the chamber or passage through the main floor portion 10a of the fuse block. As visible in the plan view of Fig. 1, the shoulders 14z are in alignment with the substantially parallel slots 14s provided through the main body or floor portion 10a of the fuse block. Each of the contact portions 14c has a pair of lateral wings 14w which fit longitudinally through the slots 14s and a further lateral extension 14u of the wings is provided for engaging an underside of each of the shoulders 14z. Engagement of the extension 14u relative to an underside of the shoulders 14z limits insertion of the male terminals relative to the floor portion 10a and the flange 14f is sufficiently resilient to permit temporary dislocation of barb 14p during insertion of the contact portion 14c into the chamber 10z until the

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barb 14p locks the male terminal relative to the chamber 10z because of engagement of barb 14p relative to an upper surface of the shoulder 14z. A slanted slot or recess 14r extends longitudinally and laterally relative to the contact portion 14c of the male terminal and this slot or recess terminates in an annular opening 14m in a central portion of the contact portion 14c of each of the double terminal portions.

Structure comparable to the structure of double terminal 14 is illustrated for terminal 12 in Figures 5 and 6 in that a lateral and longitudinally inwardly extending recess 12r is provided in the contact portion 12c and this recess terminates in an annular opening 12m adjacent to the edge 12e and cut portion 12d of the male prong or terminal. A leading edge 14e and cut portion 14d are provided for the double terminal means as outlined in Fig. 3. One of the particular advantages of the male terminal means 12 and 14 lies in the fact that the conductor fastening tangs 12t and 14t extend laterally to one side of the body portions 12a and 14a respectively such that a flag-type male terminal is provided by the structure of terminals 12 and 14 respectively. This flat-type structure is particularly adapted for use with a fuse block of the type illustrated in Figures 1-4 so that a wire such as 10w can be supplied through cable 10u within the confines of the skirt portion 10h which is adapted to be mounted relative to a mounting wall of an instrument panel or fire wall, for example, and wire such as 10w can be engaged by bending or crimping of the tanks 12t and 14t, for example, and inserted in space between the lower edge 10g of the skirt portion 10h and bottom surface of floor portion 10a.

Fig. 7 illustrates a side view of a combination fuse clip and terminal means for use in a fuse panel assembly including the fuse block 10 of the present invention. The combination fuse clip and terminal means of the present invention is generally indicated by numeral 20 and includes a main body portion 22 and a conductor connecting portion 24. The main body portion 22 and conductor terminal portion 24 are formed integral with each other and are laterally spaced relative to each other as shown in Fig. 7.

Fig. 7A is an end view of the fuse clip and terminal means of the present invention. The main body portion 22 includes a central base or floor portion 22i which is located intermediate bent resilient leg portions or arm portions 22a. An elbow segment 22s of each of the arms or legs 22a joins the legs to the intermediate or base portion 22i. Each of the arms or legs includes an outwardly extending free end or guide portion 22g having free edges 22x remote from each other illustrated in Fig. 7A. Each of the guide segments 22g is adapted to provide surfaces sloping downwardly and inwardly toward the intermediate base portion 22i but terminating along adjacent upper bent necks 22n. The necks 22n are closer to each other than the remote edges 22x and the necks 22n are integral with semi-arcuate or annular fuse engaging segments 22f. The semi-arcuate fuse engaging segments 22f are adapted to be complementary to annular or cylindrical outer surfaces of a fuse end insertable relative to each fuse clip body portion 22 of the combination fuse clip and terminal means 20 of the present invention. Each semi-arcuate segment 22f is integral both with the upper necks 22n as well as lower necks 22m which are bent inwardly toward each other and are integral with laterally outwardly extending locking segments 22r. The laterally outwardly extending segments 22r include vertical sections 22R which are integral with the elbow sections 22s connected with the intermediate portion 22i. The substantially vertical sections 22R of the locking segment are substantially parallel to each other and are laterally spaced from each other a distance greater than a width between free edges 22x of the guide segments 22g. The purpose for the lateral spacing and

width between the sections 22R of the locking segment 22r will be more apparent in the description below. Also included in each locking segment 22r is an outwardly projecting tang or tongue 22t having a free end 22v and an end 22u integral with the locking segment 22r adjacent to each lower neck portion 22m. The tang or tongue is bent outwardly from the locking section 22r and where each tang is bent out there is an open space 22z left within the section 22R.

As illustrated in the view of Fig. 2, the tongues or tangs 22t are adapted to be locked with each edge 22v thereof in engagement with a lug 33L protruding laterally inwardly relative to an opening 22A through the main body or floor portion 10a adjacent to each space or chamber 10s provided with the fuse block. There are lugs 22L on opposite sides of each opening 22A and a top surface of each of these lugs 22L is engaged by free edge 22v of each tang or tongue 22t. As visible in Fig. 1, each lug 22L is integral with a protective wall such as 10n or 10p and each lug 22L forms a web interconnecting end abutments, corner flanges or fillets 22F. Each of the flanges or end fillets 22F has a surface 10F engageable by an outer surface of the substantially vertical locking sections 22R of locking segment 22r. It is to be understood that the distance between laterally opposite surfaces 10F is substantially equal to the width or distance between outer surfaces of the substantially vertical and parallel locking sections 22R of the locking segments 22r. Thus as outlined by the phantom representation of a terminal body portion 22 in Fig. 2, the tangs or tongues 22t are engageable against lugs 22L and outer surfaces of locking sections 22r engage longitudinal surfaces 10F of the end fillets or flanges 22F. Lateral movement of the combination fuse clip and terminal means of the present invention is prevented due to engagement of the sections 22R relative to surfaces 10F of fillets 22F. Longitudinal movement downwardly out of the opening 22A is prevented due to engagement of tongues 22t relative to lugs 22L. A positive locking engagement preventing removal of the clip and terminal means in either direction out of the opening 22A is assured due to engagement of the intermediate or base portion 22i of the main body portion 22 of the clip relative to intermediate lateral projections 22I formed integral with the main body or floor portion 10a of the fuse block and extending laterally inwardly toward each other in the aperture or opening 22A. The top surface of the intermediate or base portion 22i of the clip engages against a bottom surface of the projection 22I. Thus the main body portion 22 of the fuse clip is locked into positive engagement relative to the body portion 10a by means of intermediate base portion 22i and tangs 22t.

Another feature of the fuse block for the fuse panel assembly of the present invention lies in the provision of a guide flange 22G extending longitudinally of each opening 22A and formed integral with protective wall portions 10t and one of the pair of intermediate members 22I. The purpose of this longitudinal flange portion 22g is best illustrated in Fig. 2 where the fuse clip neck portions 22n and 22m have lateral edges abutting against opposite lateral edges of guide flange 22G. Thus the flange 22G serves to maintain a minimum separation between opposite leg portions 22a of the fuse clip portion 22 of the combination fuse clip and terminal means 20 of the present invention. Also each guide flange 22G is located axially to one end of chamber or space 10s into which a cylindrically shaped fuse is inserted and a portion of the guide flange lying within the bonds of necks 22n and 22m between each of the semi-arcuate segments 22f of the fuse clip serves as a back stop or means for limiting longitudinal movement of a substantially cylindrical fuse having opposite ends inserted into separate fuse clip portions of combination fuse clip and terminal means of the present invention.

The combination fuse clip and terminal means 20 illus-

trated in Fig. 7 includes a terminal portion 24 carried by and formed integral with the intermediate or base portion 22i of the fuse clip portion 22. The terminal portion 24 includes a body portion 24a best visible in Fig. 7B which is a bottom view of the fuse clip and terminal means 20 of Fig. 7. The body portion 24a of the terminal portion extends to one side of the intermediate or base portion 22i of the fuse clip portion 22. A first pair of wings or tangs 24w are provided extending laterally and downwardly from the body portion 24a and are adapted to be bent over relative to each other or crimped as shown in end view of Fig. 9A. The wings 24w when crimped as indicated in Fig. 9A are in tight engagement and establish electrical contact with wires such as 10w while a second pair of laterally downwardly extending tangs 24v are also provided and are bent or crimped to engage an insulating covering 10v of a conductor through which wire 10w extends. As noted earlier, the conductor including covering 10v and wire 10w is brought to fuse panel assembly of the present invention by means of a cable or wiring harness 10u outlined in phantom in Figures 2 and 3. A fragmentary showing of the insulating conductor and wiring is also made in Figures 9A, 9B and 9C.

One of the advantages of the present invention lies in the fact that the fuse panel assembly disclosed herein or at least the combination fuse clip and terminal means 20 can be prepared and sold as part of a wiring harness. In a preferred embodiment of the fuse panel assembly, the fuse clip and terminal means shown in Figures 7, 7A, and 7B are inserted from one side of the fuse block illustrated in Figures 1, 2, and 3. The combination fuse clip and terminal means 20 can be secured by means of the terminal portion tangs 24w and 24v to wiring which forms part of a motor vehicle harness. With the wiring so attached, the combination fuse clip and terminal means 20 can be easily snapped into the openings provided in the fuse block of insulating material. A substantially cylindrical fuse member inserted into the fuse clip portion semi-arcuate segments 22f serves to spread the semi-arcuate segments of each of the legs of the fuse clip portion 22 away from each other such that the locking segments 22r including the locking sections 22R are spread away from each other together with the tangs 22t integral with the locking segments 22r. The lateral spreading of the locking segments 22r effects a lateral displacement of the locking sections 22R into engagement with opposite surfaces 10F of the fillets or corner flanges 22F and thereby the fuse clip and terminal means of the present invention is precluded from moving laterally within each opening 22A. Furthermore, the locking of the ends 22v of the tangs 22t relative to lugs 22L is assured more positively due to the spreading of the locking segment 22r and locking section 22R as ends of a substantially cylindrical fuse are inserted between semi-arcuate segments 22f of the fuse clip portion 22. With the tongue 22t and edges 22v thereof spread more firmly into engagement relative to the top surfaces of lugs 22L, the intermediate or base portion 22i of the fuse clip portion 22 positively engages bottom surfaces of intermediate flanges 22I mentioned above.

The combination fuse clip and terminal means of the present invention can be easily snapped into the openings of a fuse block after wiring has been crimped into position relative to the wings or tangs 24w and 24v. Preferably the combination fuse clip and terminal means of the present invention is made of steel having the lowest carbon content available because the cylindrical contact or clip portion is preferably more resilient than the terminal portion having tangs preferably softer and more ductile for crimping or gripping the conductor insulation and wire. Generally proper spring tension for the clip portion would require a hardness in excess of the hardness permitted for proper ductility to form a crimp

for insulated cable conductors. Therefore the combination clip and terminal means of the present invention can be formed using spring steel in an unhardened form. The clip portion can be subjected to a low heat such as obtained from an induction heater and a low temperature is used during a tempering process to obtain proper hardness. Terminals are preferably made in strip form, run through the induction heater and spray quenched instead of immersion quenched and then the strips are coiled on reels. The reels are put into a tempering furnace and then cooled in air. However the combination clip and terminal means can also be heat treated and tempered without selective heat treating and annealing thereby precluding the necessity of heat treating by induction. Finally the terminals are cleaned and silver-plated to obtain optimum electrical contact characteristics when ready for use. Silver-plating is necessary both to protect the steel from corrosive action and to increase electrical properties due to high electrical conductivity provided by use of silver as a plating material.

It is to be understood that the protective walls 10n, 10p, and 10t form relatively uncomplicated cavities though the walls next to the clips protect the clips from being touched by a hand or other objects which could contaminate or damage and corrode the silver plating on the fuse clip portions of the combination fuse clip and terminals of the present invention.

The advantages of the fuse panel assembly of the present invention over previous fuse panel assemblies are quite apparent. One of the main advantages is the reduction in the number of parts required for forming a fuse panel assembly. Previous fuse panel assemblies have required an insulating body together with fuse clips having panel terminals riveted thereto and requiring a male terminal attached to a wire conductor of a cable for connection of the cable relative to the female terminal. The fuse panel assembly of the present invention in essence uses only two parts, namely; the fuse block of insulating material illustrated and described with Figures 1-4 and a combination fuse clip and terminal 20 illustrated particularly in Figures 7, 7A, and 7B. A considerable saving in labor and cost of material is realized due to elimination of rivets for connecting female terminals to the fuse clips per se and also due to elimination of separate male terminals required to make connection between a cable and the female terminals previously riveted to the fuse clips. The only assembly operation required in the fuse panel assembly of the present invention comprises the crimping of the terminal portion 24 of the combination fuse clip and terminal means 20 relative to a wire conductor of a cable. A simple snapping of the combination fuse clip and terminal means attached to the cable wires relative to a fuse block body cavity completes the fuse panel assembly. A considerable reduction in cost of assembling and installing the fuse panel assembly of the present invention relative to a fire wall or dashboard panel for example, is realized because with the present invention instead of both fastening the fuse block to the car and later attaching the clips with male terminals to the female terminals as is presently done, the entire fuse panel assembly including combination fuse clip and terminal means 20 attached to a conductor wire of a wiring harness can be assembled to a vehicle while the wiring harness is being installed.

During manufacture of a spring hardened fuse portion and integral soft ductile insulation and wire core gripping portion, metal such as SAE 1045 steel can be heat treated at 1475 to 1550 degrees F. followed by a salt water quench at a temperature of approximately 150° F. followed by treatment for tempering at a temperature of 700-750° F., after which the terminals are allowed to cool in air. Heat treatment can be carried out using an induction hardening or heating means until the metal

attains a light red color. As soon as the light red color is attained there is an immediate immersion or spraying in a 24% salt water solution at a temperature of 150° F. approximately followed by tempering for 30 minutes at a temperature of approximately 725° F. in an electric furnace. Other processes or methods for tempering the fuse clip portion while leaving the terminal portion in a soft ductile condition may be used without departing from the essence of the present invention. Loose parts can be made of SAE 1050 steel tempered and hopper fed to assembly. The method for making the combination clip and terminal means of the present invention as outlined above is merely presented for purposes of illustration.

In Fig. 8 there is illustrated another embodiment of fuse clip means generally indicated by numeral 30 substantially like the fuse clip portion 22 illustrated in Fig. 7. Fig. 8A is a partially sectioned end view of the fuse clip means 30 and the parts comparable to parts referred to with reference numerals 22, 22a, 22g, 22x, etc., are referred to as 32, 32a, 32g, 32x, etc., using numerals in the 30's for each of the respective parts. The main modification in the fuse clip 30 lies in the provision of an aperture 33 through which a rivet 33R indicated in phantom is inserted for attaching a bus bar 33B relative to the fuse clip base or intermediate portion 32i. The bus bar as well as the rivet are indicated in phantom together with a fragment of an adjacent fuse clip 30 that can be attached to the bus bar at a predetermined distance away from the previous fuse clip 30 and interconnected relative thereto by means of the bus bar or conductor 33B. When a plurality of fuse clips 30 are attached to a bus bar 33B, a common connection between common electrical ends such as electrical ground connections of the fuses insertable relative to the fuse clips can be quickly and easily made. Preferably such a common connection could be provided along one row of fuse clip means inserted in the fuse block of Fig. 1 in the extreme right openings 22A illustrated in Fig. 1.

The fuse clip 30 of Figures 8 and 8A has locking segment 32r provided with locking section 32R extending laterally beyond the outer edges 32x of the guide segments 32g so that insertion of a fuse end between the semi-arcuate segments 32f effects a spreading of the locking segments 32r tending to engage an outer surface of each locking section 32R against a surface such as 10F of each corner fillet 22F provided for each of the passages or apertures 22A of the fuse block of insulating material illustrated in Figures 1, 2, and 3.

Another embodiment of a fuse panel assembly in accordance with the present invention is illustrated in the views of Figures 9, 9A, 9B and 9C. The combination fuse clip and terminal means illustrated in Figures 9, 9A, 9B and 9C is substantially like that of Figures 7, 7A and 7B except that insulating fuse block or body 40 does not have the longitudinal guide flange 22G illustrated in Figures 1 and 2 and therefore stop members 40s are provided extending laterally inwardly toward each other from semi-arcuate fuse clip segments 22f substantially identical with the segments 22f illustrated in Figures 7, 7A, and 7B. The purpose of the stop members 40s is to provide a means for limiting longitudinal movement of the ends of a fuse generally indicated by numeral 50 inserted between combination fuse clip and terminal means in accordance with the present invention. Lugs and corner fillets provided in fuse block 40 are comparable to structure illustrated in the fuse block of Fig. 1 and therefore comparable reference numerals are applied in Figs. 9, 9A, 9B, and 9C for these structural parts. The fuse 50 includes a central member 50g of a usual type permitting visual inspection of a fuse element engaged therein and the fuse element interconnects metallic ends 50e of the fuse as outlined in Figures 9, 9A, 9B, and 9C. The fuse block or insulating panel 40 differs slightly from the fuse block of Fig. 1 in that a central strip or member 40m is provided extending transversely

through an opening such as 22A and the intermediate or base portion 22i of the fuse clip portion 22 is filled against an undersurface of the intermediate or median strip member 40m when the free ends 22v of tongues 22t of the locking segment of the fuse clip portion are engaged relative to shoulders or lugs 22L. Fuse blocks such as 10 and 40 can be formed of any suitable and moldable insulating material.

The combination clip and terminal means can be used to establish electrical connection for any electrical device having a cylindrical contact portion. Thus a fuse or a lamp bulb having a cylindrical contact portion can be snapped or fitted into engagement with the cylindrical contact or clip portion. The clip portion could even be provided with cutouts adapted to accommodate projections of a bayonet fastening for a cylindrical lamp bulb base or contact locked and secured in position against rotation relative to the clip portion by the bayonet projections.

While the embodiments of the present invention as herein disclosed constitute a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A fuse panel assembly, comprising, a fuse block of insulation material having side walls and a floor portion through which a plurality of holes extend, at least one flange extending longitudinally of and projecting laterally inwardly relative to each hole, a fuse clip for each hole and having a pair of resilient legs joined by an intermediate base portion, said base portion being adapted to engage one side of said floor portion for limiting insertion of each clip relative to each hole, and locking means provided by each of said legs for snapping into engagement relative to an opposite side of said fuse block, said one flange having at least a portion integral with one of said side walls and adapted to maintain a predetermined minimum separation between said resilient legs of each fuse clip.

2. A fuse panel assembly, comprising, a body of insulating material including a floor portion and a plurality of walls forming spaced and separated chambers substantially parallel to each other, each chamber having a pair of end walls interconnected by transverse walls, said floor portion having a pair of holes spaced a predetermined distance from each other and extending through said floor portion relative to each chamber, at least one flange extending laterally inwardly from each end wall and longitudinally of each hole, a fuse clip for each hole and including a pair of resilient legs joined by an intermediate base portion, a pair of opposite legs provided by said floor portion and extending laterally inwardly relative to each hole, and a locking tang extending laterally outwardly from each resilient leg and adapted to engage one side of said pair of opposite legs, said one flange being engaged also by said resilient legs along one side such that a predetermined minimum spacing of said legs relative to each other is maintained thereby.

3. A fuse panel assembly, comprising, a body of insulating material including a floor portion and a plurality of walls forming spaced and separated chambers substantially parallel to each other, each chamber having a pair of end walls interconnected by transverse walls, said floor portion having a plurality of holes spaced a predetermined distance from each other and extending through said floor portion, at least one flange extending laterally into each hole and integral with said body, a combination clip and terminal means for each hole and including a pair of resilient legs integrally joined by an intermediate

base portion, a conductor connecting portion also extending fully integrally from said base portion and including at least one pair of tangs adapted to be crimped and bent into engagement relative to a conductor fitted thereto in a location on one side of said floor portion, said base portion being adapted to engage one side of said floor portion for limiting insertion of each combination clip and terminal means relative to each hole, locking means provided by each of said legs for snapping into engagement relative to an opposite side of said floor portion, said one flange integral with said body having a location so as to maintain a predetermined minimum separation between said resilient legs, and a channel-like conduit portion integral with said body to provide a passage for grouped positioning of conductors secured to said conductor connecting portion of said combination clip and terminal means, said conduit portion in retention of grouped conductors assuring uniform positioning of said conductors and said combination clip and terminal means relative to said body of insulating material of the fuse panel assembly.

4. For a mounting panel of insulating material having a pair of holes therethrough relative to each of which at least one flange extends laterally into each hole and integral with the insulating material panel relative to which conductors are fitted for establishment of electrical connection to electrical devices having cylindrical contact portions, a combination clip and terminal means for each hole and including a pair of resilient legs each including a semi-arcuate segment complementary to a cylindrical contact portion of an electrical device, an intermediate base portion integrally joining said resilient legs in a clip-like manner, a conductor connecting portion also extending fully integrally from said base portion and including a terminal-like deformable ferrule means adapted to be crimped and bent into engagement relative to a conductor fitted thereto in a location on one side of the panel of insulating material, said base portion being adapted to engage one side of the panel for limiting insertion of each combination clip and terminal means relative to each hole, locking means provided by each of said legs for snapping into engagement relative to an opposite side of the panel of insulating material, said resilient legs having a predetermined minimum separation maintained therebetween due to the one flange that extends laterally into each hole and integral with the insulating material panel, said resilient legs together with said base portion having a clip-like substantially U-shape completely integral with said conductor connecting portion and deformable ferrule means thereof relative to both each hole of the insulating material panel and each flange for maintenance of predetermined separation of said legs of each combination clip and terminal means.

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