

Description

The present invention relates to a plug-in fuse assembly including a housing made of insulating material and including a pair of upwardly extending side walls bridged by a pair of upwardly extending end walls; and a conductive plug-in fuse element secured in said housing and having laterally spaced, generally parallel confronting terminals at the bottom thereof projecting downwardly from the bottom of said housing, said terminals having upwardly extending current-carrying extensions, and a fuse link extending between said current-carrying extensions and confronted by said pair of side walls; portions of said current-carrying extensions and said fuse link being enclosed by said end and side walls;

Such a fuse-assembly is disclosed in EP-A-63 207 and also in US-A-4 449 447. Of the known fuses upper portions of the housing overhang the rest of the housing to provide convenient, centered, gripping surfaces at the side and ends of the housing, so that any selected plug-in fuse assembly in a fuse block can be readily grasped for removal from the fuse block, despite small clearances between adjacently mounted plug-in fuse assemblies.

However, the housings of the known fuses are designed in a manner which make it difficult to reliably stack the fuses in hoppers and the like and deliver the same at the most desired high speeds to the location of the automobile fuse blocks where the fuses are machine inserted into terminal-receiving cavities in the fuse block. Depending upon circumstances, it may be desirable to stack the fuses in end-to-end, side by-side or one above the other relationship in the hopper. The feeding speed and reliability of the insertion operation depends upon the stability of the stacked fuses within the hopper. In the known fuses, the side, end and top walls of the fuse housing are shaped that when they are stacked in any of these relationships, they could wobble, so that they do not have a sufficiently fixed or stable orientation desired for very high speed feeding thereof. The present invention provides a solution to this problem, in that each of said side and/or end walls has outermost vertical coplanar wall surfaces parallel to the corresponding outermost vertical coplanar wall surfaces on the opposite side or end of the housing, said outermost vertical coplanar wall surfaces being configured to engage the complementary outermost vertical wall surfaces of an identical plug-in fuse assembly placed with the identical orientation in face-to-face engagement to provide for stable non-tilting stacking of numbers of identical plug-in fuse assemblies in a stacking hopper or the like, said outermost vertical coplanar wall surfaces of each of said walls

occupying only a fractional part of the total outer exposed area of its associated wall, the remainder of which is recessed within the vertical plane thereof.

It has to be noted here that the fuse assembly of the cited EP-A-63 207 and of US-A-449 447 is provided with flat coplanar surfaces on the end walls of the fuse housing, that is on the minor walls. These flat coplanar surfaces are located along the vertical middle line of the respective minor end walls. The purpose of such flat coplanar surfaces in the middle of the end walls is indexing and guiding the fuse into an appropriate configured fuse socket.

The construction of the fuse housing of the fuse assembly according to the invention provides a stable stacking of the fuses preferably in any one of three different stacking relationships described, although the broader aspects thereof envision a housing design which does so in either end-to-end or side-by-side relationship.

Summary of the Invention

In the fuse descriptions and claims to follow, for purposes of convenience and simplicity, the fuse assemblies will be assumed to have an orientation where the terminal blade portions of the all metal plug-in fuse element extend downwardly from the fuse housing. However, the fuse assembly may have any orientation when actually used.

In accordance with one of the features of the invention and assumed fuse orientation, the fuse assembly housing, preferably molded of synthetic plastic material, has side walls with outermost vertical flat surfaces which are parallel to each other and the housing sides so that they can stably abut the corresponding opposed outermost vertical flat surfaces of the side walls of the housings of identical fuse assemblies having identical orientations beside it in a hopper with a rectangular cross section. Most of the exposed surface areas of the side walls are recessed within these vertical flat surfaces and the walls which form these recessed portions taper in the direction which facilitates separation of the mold parts which form them.

When these housings are molded, the mold parts generally includes an upper mold part which usually terminates at the gripping surface plane near the top of the housing, and a bottom mold part which mates with the bottom portion of the upper mold part. These two mold parts define the various connecting cavities of the housing into which the synthetic plastic material will flow during the molding process. It is known that the ease and the desired high speed with which the upper and lower mold parts can be separated to free the molded housing is facilitated if the opposed inter-

facial surface areas between the mold parts and molded housing are inclined to the vertical toward one another in the direction of mold separation (i.e. that is the downward direction for the lower mold part). The degree of taper of these surfaces can be so small as to be visibly imperceptible. However, to enable adjacent fuses to be stably stacked side by side within a hopper, the abutting outermost surfaces of the side walls of the housings of adjacent fuses to be stacked in side-by-side relationship in a hopper must not incline to the vertical and must occupy a sufficient horizontal vertical extent to prevent relative movement between abutting fuse housings.

A specific, but not necessary, aspect of the invention is that the extent and location of these outermost vertical flat surfaces should be such as not to interrupt the desired centered finger or tool gripping surfaces needed for ease of fuse removal from the fuse block in which the fuse assembly is mounted. To this end, the outermost flat vertical surfaces of the side walls of the housing described are preferably located along margins of the side walls, such as along narrow vertical bands at the ends of each housing side wall thereof and along a horizontal band at the top of the housing, where they form inverted U-shaped projections. The rest of the side walls are recessed within these inverted U-shaped projections. The upper, horizontal legs of these projections form at the bottoms thereof centrally located, downwardly facing finger or tool gripping surfaces on the opposite sides of the housing.

To minimize the amount of molding material needed, provide a more constant and even shrinkage, and reduce mold part costs, it is desirable that the interfitting mold parts form a housing with a fairly constant wall thickness. Since it is known to be desirable to space the fuse link from the housing side walls, with the outer ends of the housing side walls fairly closely enveloping the current-carrying extensions of the terminal blades, the central portion of the housing side walls must bulge out opposite the fuse link if the side wall thickness is to remain fairly constant. In the broadest aspect of the invention, these centered bulging portions of the side walls could be part of the outermost flat vertical surfaces described, and would then not fall along inverted U-shaped paths. Also, the areas occupied by such centered bulging portions of the housing side walls would undesirably increase the non-tapered areas of the mold parts and would eliminate the desired entered finger or tool gripping surfaces at the sides of the housing. Thus, these bulging side walls are preferably located within the vertical planes of the inverted U-shaped side wall projections described and are tapered in a downward direction. The vertical legs of these inverted U-shaped projections are separated from the cen-

tered bulging portions of the side walls by deeply recessed portions of the side walls to keep the wall thickness fairly constant.

In accordance with another feature of the invention, to provide for a most stable end-to-end or side-by-side stacking of the fuses within a hopper of rectangular cross section, the end walls of the housing are designed like the side walls described to provide narrow bands of outermost flat vertical surfaces. These outermost flat vertical surfaces of the end walls also preferably follow an inverted U-shaped pattern and so are found in narrow bands at the side margins and top of the housing and enclose tapered recesses which form near the top of the housing centered, downwardly facing finger or tool gripping surfaces. In the most preferred form of the invention, the side and upper legs of the inverted U-shaped projection of the side and end walls of the housing merge and intersect at the corners of the housing. The outermost flat vertical surface of the side and end walls thus give the fuse assembly housing a rectangular horizontal profile which can fit within a slightly larger correspondingly shaped rectangular cavity in a fuse block and be guided by the walls thereof into its final fully-plugged condition. The fuse block cavity has terminal blade-receiving terminals mounted deeply within each cavity, which is slightly larger than the rectangular horizontal profile of the fuse housing.

The horizontal and vertical legs of the inverted U-shaped projections of the housing side and end walls described provide good stacking stability also when the fuses are stacked one on top of the other within a hopper with a stacking channel of rectangular cross section.

Additionally, as an aid in guiding each fuse assembly into a cavity of a fuse block and to make the fuse assembly more compact overall, the outer margins of the terminal blades which have tapered ends are in vertical alignment with the outermost vertical flat surfaces of the housing end walls.

It should now be apparent that the fuse assembly is initially guided into a fuse block cavity by the tapered ends of the terminal blades. Since the outer margins of the terminal blades are aligned with the outermost flat vertical surfaces of the fuse housing end walls. Thereafter, the fuse assembly is smoothly guided for movement fully into the fuse block cavity which enclose both the terminal blades and the lower portion of the fuse assembly housing. The upper end thereof remains above the fuse block cavity where the downwardly facing gripping surfaces are exposed to aid in removal of the fuse from the fuse block. This unique in-line relationship between the housing end walls and terminal blades contrasts with prior art fuse designs where the terminal blades were located within the outer margins of the fuse housing end walls, and thus could

not guide the fuse assembly into a fuse cavity which is to closely envelop the fuse housing.

The above and other features and advantages of the invention will become apparent upon making reference to the specification and claims to follow and the drawings.

Description of the Drawings

Fig. 1 is a perspective view of a preferred form of the plug-in fuse assembly of the invention;

Fig. 2 is an exploded view of the housing and plug-in fuse element of Fig. 1 before they are assembled;

Fig. 3 is a top plan view of the plug-in fuse assembly of Fig. 1;

Fig. 4 is a vertical longitudinal sectional view through the plug-in fuse assembly shown in Fig. 3, taken along section line 4-4 therein and includes in fragmentary section the defining walls of a fuse blank cavity into which the fuse assembly is to be placed;

Fig. 5 is an enlarged bottom view of the plug-in fuse assembly of Fig. 1;

Fig. 6 is an enlarged transverse vertical sectional view through the plug-in fuse assembly shown in fig. 4, taken along section line 6-6 thereof and includes in fragmentary section the defining walls of a fuse blank cavity into which the fuse assembly is to be placed;

Fig. 7 is an enlarged vertical transverse sectional view through the center portion of the plug-in fuse assembly shown in Fig. 4, taken along section lines 7-7 thereof;

Fig. 7A is an enlarged fragmentary horizontal sectional view through Fig. 6, taken along section lines 7A-7A thereof prior to the insertion of the plug-in fuse element;

Fig. 7B is a fragmentary enlarged sectional view through a fuse block cavity with the fuse of the invention fully mounted therein, and showing the top of the fuse assembly projecting above the fuse block, the clearance spaces shown, as in other figures, being exaggerated for drawing convenience;

Fig. 7B is a fragmentary, enlarged sectional view through a fuse blank cavity and fuse blank mounted therein showing the top of the fuse assembly projecting above the fuse block;

Fig. 8 is a sectional view through a hopper containing fuses of the present invention stably stacked in side-by-side relationship;

Fig. 9A is a view through a hopper showing the fuses of the invention stacked in end-to-end relationship;

Fig. 9B is a transverse section through the hopper of Fig. 9A taken along section line 9B-9B;

Fig. 10A is a view through a hopper wherein the

fuses of the invention are stacked so that the terminal blades of one fuse engage the flat outer wall of the housing of the adjacent fuse assembly; and

Fig. 10B is a sectional view through the hopper of Fig. 10A taken along section line 10B-10B thereof.

Description of the Preferred Embodiment of the Invention

Referring now more particularly to Figs. 1-4, there is shown a preferred plug-in fuse assembly 21 of the invention. This assembly is made of only two component parts, namely an all fuse metal plug-in fuse element 30, which may be a single stamping from a strip of fuse metal, and a housing 36 which most advantageously is a single piece of transparent synthetic plastic molded part defining a space therein into which portions of the plug-in fuse element 30 extend and are secured in any suitable way, but most preferably by a cold staking and ultrasonic welding operation.

For purposes of simplicity of description and claiming, the fuse assembly will be assumed to have an orientation as shown where the terminal blade portions 30a-30a' of the plug-in fuse element 30 extend downwardly from the housing 36. However, the fuse assembly may have any orientation. Most commonly, it plugs into a fuse block (not shown) which has a vertical fuse monitoring wall with fuse-receiving openings facing horizontally so that the terminal blades extend horizontally rather than vertically as shown.

The terminal blade portions 30a-30a' are plated with a highly conductive metal like tin and extend downwardly in spaced parallel juxtaposed relationship from the inner or bottom margin of the housing 36. The ends of the terminal blade portions 30a-30a' of the plug-in fuse element are most advantageously tapered at 39-39' to form pointed end portions which readily guide the entire fuse assembly into place within a rectangular fuse block cavity 37' of a fuse block 37 having a length (only slightly) larger (e.g. by about 1/32") than the distance between the outermost vertical margins of the terminal blade portions 30a-30a'.

The terminal blade portions 30a-30a' have current-carrying extensions 30b-30b' which are also preferably tin plated, and the outer end portions thereof form probe-receiving tabs 30d-30d'. The current-carrying extensions 30b-30b' are interconnected by an unplated or plated S-shaped fuse link portion 30c which is shown narrower in width than the other current-carrying portions of the plug-in fuse element. The current-carrying capacity of the fuse link portion 30c may be varied by varying its location, and configuration, and its width, length

and thickness dimensions. However, the basic configuration of the terminal blade and current-carrying extension portions are standardized for the different configurations used in the fuse link portions, so that common mechanical staking and ultrasonic-welding equipment can be used for all fuses. All of the various parts of the plug-in fuse element are shown substantially in coplanar relation. To anchor the plug-in fuse element 30 within the housing 36, staking or anchoring apertures 30e-30e' are formed in the current-carrying extensions 30b-30b' to receive anchoring projections 36g-36g' formed in the housing side walls 36b-36b'.

The confronting outer edges of the terminal blade portions 30a-30a' of the fuse assembly merge with inwardly offset outer vertical margins 30f-30f' (Fig. 2) of the current-carrying extensions 30b-30b'. The terminal blade portions 30a-30a' are preferably of a consistent width up to the point where that portion of the plug-in fuse element passes into the housing 36. These inwardly offset outer vertical margins form upwardly facing stop shoulders 30m-30m' and clearance spaces above for the narrow end walls 36c-36c' of the housing 36. These end walls in prior art fuse designs projected substantially horizontally beyond the vertical outer margins of the current-carrying extensions. In the fuse illustrated, the housing end walls are in substantially vertical alignment with the outer vertical margins of the terminal blade portions 30a-30a' of the plug-in fuse element 30 to make the fuse more compact and provide a smooth guided movement of the fuse assembly in the rectangular cavity 37' in the fuse block 37.

The fuse assembly illustrated in the drawings may be made exceedingly small (e.g. the fuse width is less than 1/2 of an inch). In such case, the problem of punching the very small fuse links make desirable configurations not used in much larger fuses to which the present invention also applies. In such small fuses, inwardly offset confronting margins 30j-30j' of the current-carrying extensions 30b-30b' of the terminal blade portions 30a-30a' starting immediately above the terminal blade portions are provided to increase the spacing between the lower loop of the fuse link portion 30c and the left current-carrying extension 30b. This increases the width and mechanical strength of the portion of the manufacturing punch used to punch out this portion of the all metal plug-in fuse element 30 from a strip of fuse metal. The punch needed to punch out that portion of the plug-in fuse element to the left of the fuse link portion 30c shown in Fig. 4 becomes especially weak if the punch becomes unduly narrow at the points thereof spaced substantially from the upper end thereof. For similar reasons, it is desirable to maximize the spacing between the upper loop of the fuse link portion 30c

and the inner vertical margin of the upper end of the right current-carrying extension 30b'.

While the housing 36 could be made in separate parts snappable or otherwise secured together to form a single piece at the time the housing is assembled, the housing is most advantageously a single piece integral molded part as shown where the various walls thereof are, for the most part, of similar thickness. It preferably has, in addition to the relatively wide side walls 36b-36b' (Figs. 1, 6, and 7), the flat horizontal top wall 36a, and narrow end walls 36c-36c'. The current rating of the plug-in fuse assembly is indicated by indicia on the flat horizontal top wall 36a of the housing (see "2" to left of dashed circle 49" and "0" to the right of the dashed circle in Fig. 3) and by a distinctive housing color. Each side wall has narrow deeply recessed end portions 38-38 or 38'-38' on opposite sides of a less deeply recessed wide central bulging portion 40 or 40'. As best shown in Figs. 5 and 6, the deeply recessed portions 38-38' at each end of the housing are closely spaced and define therebetween a narrow upwardly tapering passageway 41 or 41' which closely receives one of the current-carrying extensions 30b or 30b' of the all metal plug-in fuse element 30. These extensions are held initially within the housing during the assembly process by confronting ribs 43-43 and 43'-43' (Figs. 6 and 7A) projecting from the housing interior in the upper portions of the tapered passageway 41 or 41'. Each passageway 41 or 41' terminates in an outwardly flaring opening 45 or 45' at the top of the housing, which opening exposes the peened upper end of the associated probe-receiving tab 30d or 30d'. Fig. 6 shows that the deeply recessed side wall portions 38-38' are downwardly tapered by virtue of their downwardly and inwardly inclining outer surface 39-39' and define recesses 44-44' on the outside of the housing. The wall portions 38-38' and the other recessed wall portions of the housing taper downwardly so that a lower mold part (not shown) which forms the side walls 36b-36b' and the rest of the housing below the uppermost part thereof can be readily separated from the molded housing by relative vertical downward movement thereof.

The central bulging side wall portions 40-40' have opposite surfaces 47-48 and 47'-48' inclining downwardly toward each other so that the bulging side wall portions taper in thickness in a downward direction as indicated, to facilitate mold separation. The inner surfaces 48-48' of these wall portions are spaced relatively appreciably from the fuse link 30c so that they have minimum heat sinking effect on the fuse link. They define a central upwardly tapering passageway 49 communicating through narrow slots 52-52' (Fig. 5) with the current-carrying extension-receiving passageways 41-41'. The cen-

tral passageway terminates at the top thereof in a generally concave upper portion 49' having an upwardly projecting cylindrical extension 49'' which joins the top wall 36a of the housing at this point to form a circular area of maximum transparency through which part of the fuse link portion 30c of the all metal plug-in fuse element 30 may be more readily visible. The circular area in the top wall 36a may have the form of a lens of the Fresnel-type. With such construction the visibility of the fuse element 30 is enhanced.

The bulging side wall portions 40-40' merge with the most deeply recessed end side wall portions 38-38 and 38'-38' in slightly outwardly inclining bridging wall portions 51-51 and 51'-51' (Figs. 2 and 5). The bulging side wall portions 40-40' terminate below in the top wall 36a of the housing and within the margins thereof at horizontal downwardly-facing finger or tool gripping surfaces 53-53' on opposite sides of the housing (Fig. 7). The surfaces 53-53' are in alignment with the horizontal downwardly-facing surfaces 55-55 at the top of the deep recesses 44-44 and 44'-44' (Fig. 6).

As previously indicated, the unique part of the present invention is the provision of outermost projecting portions in the side walls 36b-36b' and the end walls 36c-36c'. They are preferably narrow, inverted U-shaped projections P1-P1' and P2-P2' (Figs. 1, 6 and 7) extending along the side and top margins of the side and end walls. The outer surfaces of each of these projections is in the same vertical plane parallel to the side of the housing involved. The projections P1 and P1' have vertical legs 60-60 and 60'-60' at each end of the fuse housing, and horizontal legs 62-62' at the top of the housing. The bottom margins of the horizontal legs 62 and 62' define the gripping surfaces 53-53' and 55-55 and 55'-55'. The end wall projections P2-P2' have vertical legs 61-61 and 61'-61' and horizontal legs 63-63' supported by tapered recesses 70-70'. The bottom margins of these horizontal legs 63-63' form horizontal downwardly facing gripping surfaces 57-57' which are in the same plane as the other gripping surfaces 53-53' and 55-55'. To facilitate mold separation, as best shown in Fig. 4, that portion of the housing end walls 36c-36c' forming the recesses 70-70' have downwardly tapering cross sections formed by downwardly converging opposite wall surfaces 75, 77 and 75', 77'. The vertical legs 60-60 and 60'-60', and 61-61 and 61'-61' of the upper side and end wall projections P1-P1' and P2-P2' merge at the corners of the generally rectangular housing 36 as best shown in Fig. 1.

The overall area of the vertical outer surfaces of the projections P1 and P1' on the side walls is less than half, preferably less than 25%, of the surface area of the side walls 36b-36b' so that they

do not substantially hinder the separation of the lower mold part which forms all but the uppermost portion of the housing from the molded fuse housing. The area of the end wall projections P2-P2' are also a small percentage of the overall-surface area of the housing.

The outermost vertical flat surfaces of the side and end wall projections P1-P1' and P2-P2' fall along a horizontal rectangle defined by the margins of the top housing wall 36a as viewed in Fig. 3. The margins of the fuse block cavity 37' fall along a slightly larger rectangle which facilitates the high speed automated mounting of the fuse assemblies into the fuse block 37.

The housing 36 is initially opened at the bottom thereof so that during assembly of the fuse, the housing can be slipped over the top of, the all metal plug-in fuse element 30. The thin gap located between the terminal blade portions 30a-30a' of the all metal plug-in fuse element 30 is preferably closed by a flap 76 shown in Fig. 7. The flap 76 initially forms an extension of the bulging side wall 40' (Figs. 2 and 7) and is bent into a recess 78 in the other bulging side wall 40 and is ultrasonically welded to the defining walls thereof or held frictionally thereto by latching barbs (not shown).

It can be seen that when fuses are stacked side-by-side within a hopper 83 (see Fig. 8), adjacent fuses will abut over the mutually parallel, extensively horizontally and vertically distributed vertical surfaces of the projections P1-P1'.

Figs. 9A and 9B show the end to end stacking of the fuse assemblies in a hopper 83'. The abutting surfaces of the end wall projections P2-P2' provide a stable stacking of the fuses within the hopper 83'.

The fuses are also readily stackable in the manner shown in Figs. 10A and 10B where the fuse assemblies are shown stacked one on top of the other. In such case, the bottom of each of the terminal blades 30a and 30a' engages the flat top wall 36a of the housing of the fuse therebelow. The positions of the fuse housings are stabilized within the hopper 83'' thereshown because the fuse stacking channels within these hoppers, as is also the case with the hoppers and 83', have the same rectangular shape and size as a rectangle along which the flat outermost vertical surfaces of the projections P1-P1' and P2-P2' extend.

The fuse assemblies can be fed from these hoppers at high speed and automatically inserted into the fuse block cavities 37'. During fuse insertion into a fuse block cavity, the tapered ends of the terminal blades engage the end margins of a rectangular fuse block cavity 37'. The defining walls of this cavity also guide the movement of the similarly shaped and sized fuse housing into its

final position where the fuse blades engage the fuse block terminals (not shown). The top of the fuse housing is then still above the level of the fuse block 37 so that the gripping surfaces 53-53' and 55-55' thereof are fully exposed for fuse gripping purposes.

Claims

1. A plug-in fuse assembly (21) including a housing (36) made of insulating material and including a pair of upwardly extending side walls (36b, 36b') bridged by a pair of upwardly extending end walls (36c, 36c'); and a conductive plug-in fuse element (30) secured in said housing (36) and having laterally spaced, generally parallel confronting terminals (30a, 30a') at the bottom thereof projecting downwardly from the bottom of said housing (36), said terminals (30a, 30a') having upwardly extending current-carrying extensions (30b, 30b'), and a fuse link (30c) extending between said current-carrying extensions (30b, 30b') and confronted by said pair of side walls (36b, 36b'); portions of said current-carrying extensions (30b, 30b') and said fuse link (30c) being enclosed by said end and side walls; characterized in that each of said side and/or end walls (36b, 36b', 36c, 36c') has outermost vertical coplanar wall surfaces parallel to the corresponding outermost vertical coplanar wall surfaces on the opposite side or end of the housing, said outermost vertical coplanar wall surfaces being configured to engage the complementary outermost vertical wall surfaces of an identical plug-in fuse assembly placed with the identical orientation in face-to-face engagement to provide for stable non-tilting stacking of numbers of identical plug-in fuse assemblies in a stacking hopper (83, 83', 83'') or the like, said outermost vertical coplanar wall surfaces of each of said walls (36b, 36b', 36c, 36c') occupying only a fractional part of the total outer exposed area of its associated wall, the remainder of which is recessed (38, 38', 70, 70') within the vertical plane thereof.
2. The plug-in fuse assembly according to claim 1, characterized in that said housing (36) is a molded body and the walls forming the recessed portions (38, 38', 40, 40', 70, 70') of said housing walls (36b, 36b', 36c, 36c') are tapered to permit the easy separation of the mold parts forming the same.
3. The plug-in fuse assembly according to claim 1 or 2, characterized in that said vertical coplanar wall surfaces occupy only relatively

narrow bands at the sides and top of each of the walls involved, the recessed portions of each wall beneath the band at the top thereof forming a downwardly facing gripping surface (57, 57', 53, 53', 55, 55') at least beneath the central region of the band.

4. The plug-in fuse assembly according to claims 1 to 3, characterized in that most of each wall of said housing (36) is of similar thickness, each of said side walls (36b, 36b') of said housing (36) having a relatively wide bulging central portion (40, 40') extending for most of the height of the housing and spaced from the fuse link (30c) of said conductive plug-in fuse element (30), said bulging portion (40, 40') joining on each side thereof a deeply recessed side wall portion (38, 38') relatively closely enveloping said current-carrying extensions (30b, 30b') of said conductive plug-in fuse element (30), and said outermost vertical coplanar wall surfaces on each side wall (36b, 36b') including wall surfaces on the outer side of each deeply recessed portion (38, 38') thereof and extending for most of the height of the housing (36) in a vertical plane beyond said bulging portion (40, 40') of the side wall involved.
5. The plug-in fuse assembly according to claims 1 to 4, characterized in that the outermost vertical surfaces of the terminals (30a, 30a') have tapered outer margins (39, 39') and are in vertical alignment with said outermost vertical surfaces of said housing end walls, so that these tapered margins can guide the fuse assembly (21) into a rectangular fuse holder cavity (37') of slightly greater size than a rectangle along which said outermost vertical surfaces of said housing walls fall.
6. The combination according to claim 5, characterized in that the upper portion of said housing (36) extends above the fuse holder (37) and is provided with downwardly facing gripping surfaces (53, 53', 55, 55') exposed above said fuse holder (37).

Revendications

1. Assemblage à fusible embrochable (21) incluant un logement (36) réalisé en matériau isolant et incluant une paire de parois latérales verticales (36b, 36b') reliées par une paire de parois d'extrémité verticales (36c, 36c') ; et un élément fusible embrochable conducteur (30) fixé dans ledit logement (36) et comportant en bas du logement des connexions se faisant



final position where the fuse blades engage the fuse block terminals (not shown). The top of the fuse housing is then still above the level of the fuse block 37 so that the gripping surfaces 53-53' and 55-55' thereof are fully exposed for fuse gripping purposes.

Claims

1. A plug-in fuse assembly (21) including a housing (36) made of insulating material and including a pair of upwardly extending side walls (36b, 36b') bridged by a pair of upwardly extending end walls (36c, 36c'); and a conductive plug-in fuse element (30) secured in said housing (36) and having laterally spaced, generally parallel confronting terminals (30a, 30a') at the bottom thereof projecting downwardly from the bottom of said housing (36), said terminals (30a, 30a') having upwardly extending current-carrying extensions (30b, 30b'), and a fuse link (30c) extending between said current-carrying extensions (30b, 30b') and confronted by said pair of side walls (36b, 36b'); portions of said current-carrying extensions (30b, 30b') and said fuse link (30c) being enclosed by said end and side walls; characterized in that each of said side and/or end walls (36b, 36b', 36c, 36c') has outermost vertical coplanar wall surfaces parallel to the corresponding outermost vertical coplanar wall surfaces on the opposite side or end of the housing, said outermost vertical coplanar wall surfaces being configured to engage the complementary outermost vertical wall surfaces of an identical plug-in fuse assembly placed with the identical orientation in face-to-face engagement to provide for stable non-tilting stacking of numbers of identical plug-in fuse assemblies in a stacking hopper (83, 83', 83'') or the like, said outermost vertical coplanar wall surfaces of each of said walls (36b, 36b', 36c, 36c') occupying only a fractional part of the total outer exposed area of its associated wall, the remainder of which is recessed (38, 38', 70, 70') within the vertical plane thereof.
2. The plug-in fuse assembly according to claim 1, characterized in that said housing (36) is a molded body and the walls forming the recessed portions (38, 38', 40, 40', 70, 70') of said housing walls (36b, 36b', 36c, 36c') are tapered to permit the easy separation of the mold parts forming the same.
3. The plug-in fuse assembly according to claim 1 or 2, characterized in that said vertical coplanar wall surfaces occupy only relatively

narrow bands at the sides and top of each of the walls involved, the recessed portions of each wall beneath the band at the top thereof forming a downwardly facing gripping surface (57, 57', 53, 53', 55, 55') at least beneath the central region of the band.

4. The plug-in fuse assembly according to claims 1 to 3, characterized in that most of each wall of said housing (36) is of similar thickness, each of said side walls (36b, 36b') of said housing (36) having a relatively wide bulging central portion (40, 40') extending for most of the height of the housing and spaced from the fuse link (30c) of said conductive plug-in fuse element (30), said bulging portion (40, 40') joining on each side thereof a deeply recessed side wall portion (38, 38') relatively closely enveloping said current-carrying extensions (30b, 30b') of said conductive plug-in fuse element (30), and said outermost vertical coplanar wall surfaces on each side wall (36b, 36b') including wall surfaces on the outer side of each deeply recessed portion (38, 38') thereof and extending for most of the height of the housing (36) in a vertical plane beyond said bulging portion (40, 40') of the side wall involved.
5. The plug-in fuse assembly according to claims 1 to 4, characterized in that the outermost vertical surfaces of the terminals (30a, 30a') have tapered outer margins (39, 39') and are in vertical alignment with said outermost vertical surfaces of said housing end walls, so that these tapered margins can guide the fuse assembly (21) into a rectangular fuse holder cavity (37') of slightly greater size than a rectangle along which said outermost vertical surfaces of said housing walls fall.
6. The combination according to claim 5, characterized in that the upper portion of said housing (36) extends above the fuse holder (37) and is provided with downwardly facing gripping surfaces (53, 53', 55, 55') exposed above said fuse holder (37).

Revendications

1. Assemblage à fusible embrochable (21) incluant un logement (36) réalisé en matériau isolant et incluant une paire de parois latérales verticales (36b, 36b') reliées par une paire de parois d'extrémité verticales (36c, 36c') ; et un élément fusible embrochable conducteur (30) fixé dans ledit logement (36) et comportant en bas du logement des connexions se faisant



- face généralement parallèles, espacées latéralement (30a, 30a') s'écartant vers le bas à partir du fond dudit logement (36), lesdites connexions (30a, 30a') comportant des prolongements conducteurs s'étendant verticalement (30b, 30b'), et une lame fusible (30c) s'étendant entre lesdits prolongements conducteurs (30b, 30b') et placée face à ladite paire des parois latérales (36b, 36b') ; des parties desdits prolongements conducteurs (30b, 30b') et de ladite lame fusible (30c) étant enfermées par lesdites parois latérales et d'extrémité ; caractérisé en ce que chacune desdites parois latérales et/ou d'extrémité (36b, 36b', 36c, 36c') comporte des surfaces de parois coplanaires verticales les plus à l'extérieur parallèles aux surfaces de parois coplanaires verticales les plus à l'extérieur correspondantes sur le côté opposé ou l'extrémité opposée du logement, lesdites surfaces de parois coplanaires verticales les plus à l'extérieur étant configurées pour engager les surfaces de parois verticales les plus à l'extérieur complémentaires d'un assemblage à fusible embrochable identique placé avec l'orientation identique dans un engagement face à face pour produire un empilage stable non inclinable d'un certain nombre d'assemblages à fusible embrochable dans un magasin pour empilement (83, 83', 83'') ou analogue, lesdites surfaces de parois coplanaires verticales les plus à l'extérieur de chacune desdites parois (36b, 36b', 36c, 36c') n'occupant seulement qu'une part fractionnelle de l'aire totale tournée vers l'extérieur de sa paroi associée, dont le reste est évidé (38, 38', 70, 70') dans le plan vertical de celle ci.
2. Assemblage à fusible embrochable selon la revendication 1, caractérisé en ce que ledit logement (36) est un corps moulé et les parois formant les parties évidées (38, 38', 40, 40', 70, 70') desdites parois du logement (36b, 36b'), 36c, 36c') sont coniques pour permettre la séparation facile des parties moulées formant le corps.
3. Assemblage à fusible embrochable selon la revendication 1 ou 2, caractérisé en ce que lesdites surfaces de parois coplanaires verticales n'occupent seulement que des bandes relativement étroites au niveau des côtés et du dessus de chacune des parois impliquées, les parties évidées de chaque paroi au-dessous de la bande au niveau de son dessus formant une surface de saisie tournée vers le bas (57, 57', 53, 53', 55, 55') au moins sous la région centrale de la bande.

4. Assemblage à fusible embrochable selon les revendications 1 à 3, caractérisé en ce que la majeure partie de chaque paroi dudit logement (36) est de même épaisseur, chacune desdites parois latérales (36b, 36b') dudit logement (36) possédant une partie centrale saillante relativement large s'étendant sur la majeure partie de la hauteur du logement et écartée de la lame fusible (30c) dudit élément fusible embrochable conducteur (30), ladite partie saillante (40, 40') rejoignant sur chacun de ses côtés une partie de paroi latérale évidée en profondeur (38, 38') enveloppant de façon relativement étroite lesdits prolongements conducteurs (30b, 30b') dudit élément fusible embrochable conducteur (30), et lesdites surfaces de parois coplanaires verticales les plus à l'extérieur sur chaque paroi latérale (36b, 36b') incluant les surfaces de paroi sur le côté extérieur de chaque partie évidée en profondeur (38, 38') de la paroi et s'étendant sur la majeure partie de la hauteur du logement (36) dans un plan vertical au-delà de ladite partie saillante (40, 40') de la paroi latérale concernée.
5. Assemblage à fusible embrochable selon les revendications 1 à 4, caractérisé en ce que les surfaces verticales les plus à l'extérieur des connexions (30a, 30a') possèdent des bordures extérieures chanfreinées (39, 39') et sont en alignement vertical avec lesdites surfaces verticales les plus à l'extérieur desdites parois d'extrémité du logement, de sorte que ces bordures chanfreinées peuvent guider l'assemblage de fusible (21) dans une cavité rectangulaire de porte-fusible (37') de dimension légèrement supérieure à un rectangle le long duquel tombent lesdites surfaces verticales les plus à l'extérieur desdites parois du logement.
6. Combinaison selon la revendication 5, caractérisé en ce que la partie supérieure dudit logement (36) s'étend au-dessus du portefusible (37) et est prévue avec des surfaces de saisie tournées vers le bas (53, 53', 55, 55') présentées au-dessus du porte-fusible (37).

Patentansprüche

1. Aufsteckschmelzsicherungsanlage (21) mit einem Gehäuse (36) aus einem isolierenden Material, welches ein Paar sich nach oben erstreckender Seitenwandungen (36b, 36b') aufweist, welche durch ein Paar sich nach oben erstreckender Endwandungen (36c, 36c') verbunden sind, mit einem leitfähigen, in dem Gehäuse (36) gesicherten Aufstecksicherungselement (30), welches an seinem unteren Ende

seitlich voneinander beabstandete, im allgemeinen parallele, gegenüberliegende Anschlüsse (30a, 30a') besitzt, die vom unteren Ende des Gehäuses (36) nach unten ragen, wobei die Anschlüsse (30a, 30a') sich nach oben erstreckende, stromführende Verlängerungen (30b, 30b') aufweisen, sowie ein Sicherungsverbindungsglied (30c), welches sich zwischen den beiden stromführenden Verlängerungen (30b, 30b') erstreckt und an welches die Seitenwandungen (36b, 36b') angrenzen, wobei Teilbereiche der stromführenden Verlängerungen (30b, 30b') und das Sicherungsverbindungsglied (30c) von den End- und Seitenwandungen umschlossen sind,

dadurch gekennzeichnet, daß

jede der Seiten- und/oder Endwandungen (36b, 36b', 36c, 36c') äußere vertikale, koplanare Wandungsflächen aufweist, welche zu den entsprechenden äußeren vertikalen, koplanaren Wandungsflächen an der entgegengesetzten Gehäuseseite bzw. dem entgegengesetzten Gehäuseende parallel sind, wobei die äußeren vertikalen, koplanaren Wandungsflächen so gestaltet sind, daß sie in komplementär ausgebildete, äußere vertikale Wandungsflächen einer benachbarten identischen, gleich ausgerichteten Aufsteckschmelzsicherungsanlage an den Seiten eingreifen, um ein stabiles, kippfreies Stapeln einer Anzahl von identischen Aufsteckschmelzsicherungsanlagen in einem Stapelbehälter (83, 83', 83'') oder dergleichen zu gewährleisten, wobei die äußeren vertikalen, koplanaren Wandungsflächen jeder Wandung (36b, 36b', 36c, 36c') nur einen Bruchteil des gesamten freiliegenden Außenbereiches der zugehörigen Wandung einnehmen und der restliche Teil in ihrer vertikalen Ebene zurückgesetzt (38, 38', 70, 70') ist.

2. Aufsteckschmelzsicherungsanlage nach Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse (36) ein Spritzteil ist und die den zurückgesetzten Bereich (38, 38', 44, 44', 70, 70') der Gehäusewandungen (36b, 36b', 36c, 36c') bildenden Wandungen konisch ausgebildet sind, um eine leichte Trennung von den diese Wandungen bildenden Formteilen zu ermöglichen.
3. Aufsteckschmelzsicherungsanlage nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die vertikalen koplanaren Wandungsflächen nur relativ schmale Abschnitte an den Seiten und am oberen Ende der entsprechenden Wandungen einnehmen, wobei die zurückge-

setzten Bereiche jeder Wandung unterhalb dem am oberen Ende der Wandung gelegenen Abschnitt zumindestens unter dessen Mittelbereich eine nach unten zeigende Greiffläche (57, 57', 53, 53', 55, 55') bilden.

4. Aufsteckschmelzsicherungsanlage nach den Ansprüchen 1 bis 3, dadurch gekennzeichnet, daß nahezu alle Wandungen des Gehäuses (36) eine ähnliche Dicke aufweisen, wobei jede der Seitenwandungen (36b, 36b') des Gehäuses (36) einen relativ breiten, erhabenen Mittelbereich (40, 40') aufweist, welcher sich über nahezu die gesamte Höhe des Gehäuses erstreckt und von dem Sicherungsverbindungsglied (30c) des leitfähigen Aufstecksicherungselementes beabstandet ist, wobei sich an jeder Seite des erhabenen Bereiches (40, 40') ein tief zurückgesetzter Bereich (38, 38') der Seitenwandung anschließt, welcher die stromführenden Verlängerungen (30b, 30b') des leitenden Aufstecksicherungselementes verhältnismäßig eng umgibt, und wobei die äußeren vertikalen, koplanaren Wandungsflächen jeder Seitenwandung (36b, 36b') Wandungsflächen an der äußeren Seite jedes tief zurückgesetzten Bereiches (38, 38') umfassen und sich über nahezu die gesamte Höhe des Gehäuses (36) in einer vertikalen Ebene über den erhabenen Bereich (40, 40') der entsprechenden Seitenwandung hinaus erstrecken.
5. Aufsteckbare Schmelzsicherungsanlage nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß die äußeren vertikalen Wandungen der Anschlüsse (30a, 30a') konisch zulaufende Außenränder (39, 39') besitzen und vertikal mit den äußeren vertikalen Flächen der Gehäuseendwandungen fluchten, so daß aufgrund dieser konischen Ränder die Schmelzsicherungsanlage (21) in einer in dem rechteckigen Sicherungshalter vorgesehen Aussparung (37') eingeführt werden kann, welche geringfügig größer ist als das durch die äußeren vertikalen Flächen der Gehäusewandungen gebildete rechteckige Profil.
6. Aufsteckschmelzsicherungsanlage nach Anspruch 5, dadurch gekennzeichnet, daß der obere Bereich des Gehäuses (36) sich über dem Sicherungshalter (37) nach oben erstreckt und nach unten zeigende Greifflächen (53, 53', 55, 55') aufweist, welche über dem Sicherungshalter (37) freiliegen.

