

PLUG INNER FRAME

BACKGROUND OF THE INVENTION

The present invention relates to a plug inner frame and, more particularly, to a plug inner frame in which a fuse can be received.

5 Electric appliances or equipment utilized in daily lives or industries generally utilize a plug for coupling with a socket for electrical connection. A typical plug includes two blades and an optional grounding prong or blade. A fuse can be mounted in the plug for safety consideration. The fuse melts when there is an excessive current load, forming an open circuit for safety. The blades are fixed on an inner frame and then placed in a
10 mold so that a housing can be formed around the inner frame by injection molding.

FIG. 1A shows a perspective view of a conventional plug inner frame 1. FIG. 1B shows a perspective view of the plug inner frame 1 of FIG. 1A with wires attached to the plug inner frame 1. FIG. 2 shows a bottom plan view of the plug inner frame 1 of FIG. 1A. FIG. 3 shows a top plan view of the plug inner frame 1 of FIG. 1A.

15 Plug inner frame 1 includes a frame body 11 having opposite first and second sides 10 and 13. First side 10 includes a fuse-receiving seat 12 having a recessed portion 121 for receiving a fuse and forming a raised portion 122 on second side 13, with first and second lower areas 123A and 123B formed on second side 13 and located at opposite sides of raised portion 122. First and second conductive plates 124 and 125 are
20 mounted in recessed portion 121 and extend from first side 10 through second side 13. First and second blades 15 and 14 extend away from first side 10 of plug inner frame 1 and located at a side of recessed portion 121. A grounding prong 16 extends away from first side 10 of plug inner frame 1 and spaced from first and second blades 15 and 14 by recessed portion 121. A first wire-receiving seat 151 is formed in first lower area 123A
25 and electrically connected to first blade 15. A second wire-receiving seat 141 is formed

on raised portion 122 and electrically connected to first conductive plate 124. Second conductive plate 125 is electrically connected to second blade 14. Thus, second wire-receiving seat 141 is electrically connected to second blade 14 when a fuse is received in recessed portion 121 and in electrical connection with first and second
5 conductive plates 124, 125. A third wire-receiving seat 161 is formed on second lower area 123B and electrically connected to grounding prong 16. Each wire receiving seat 151, 141, 161 receives an end of a wire 171 having an insulating plastic sheath 17. However, the thickness of second wire-receiving seat 141 and the thickness of raised portion 122 result in a bulky structure needing more material. The final plug product is
10 heavy and not aesthetically pleasant.

FIG. 4 shows a perspective view of another conventional plug inner frame 2. The plug inner frame 2 includes a frame body 21 that has a raised portion 222. A first wire-receiving seat 251 is formed on a lower area at a side of raised portion 222 and includes an opening 252 facing away from frame body 21. A second wire-receiving seat
15 241 is formed on the raised portion 222 and has a U-shaped opening 243 for clamping an end of a cable, providing a lower profile of the resultant plug product. However, opening 243 of second wire-receiving seat 24 and opening 252 of first wire-receiving seat 25 have different orientations and, thus, require two separate wire-coupling processes.

FIG. 5 shows an exploded, perspective view of a further conventional plug inner
20 frame 3 with a cap 36. An example of such a conventional plug inner frame is disclosed in GB 2370163. Plug inner frame 3 includes a frame body 37 having a raised portion 30 on a side and a recessed portion on the other side. A conductive plate is received in the recessed portion and has a flat extension 31 connected to a wire-receiving seat 32 in a lower area 33. Two wire-receiving seats 34 and 35 are placed on opposite sides of
25 wire-receiving seats 32. Wire-receiving seat 35 is electrically connected to a grounding prong (not labeled). A cap 36 is coupled to frame body 37 and includes partitioning walls

361 for isolating wires coupled to wire-receiving seats 34, 32, 35. However, wire-receiving seats 34, 32, 35 having U-shaped cross sections must be rolled by a tool to clamp wires in place, which is difficult to carry out in a small space where wire-receiving seats 34, 32, 35 are placed side by side and have small spacing
5 therebetween. Furthermore, the tool that rolls wire-receiving seats 34, 32, 35 at the same time is liable to break. Further, the isolating function is lost if no cap 36 is provided.

BRIEF SUMMARY OF THE INVENTION

A plug inner frame according to the preferred teachings of the present invention includes a frame body having opposite first and second sides. The first side includes a
10 fuse-receiving seat having a recessed portion for receiving a fuse and forming a raised portion on the second side. A first lower area is formed on the second side and located at a side of the raised portion. First and second conductive plates are mounted in the recessed portion and extend from the first side through the second side. First and second blades are mounted to the frame body and extend away from the first side. The second
15 blade is electrically connected to the second conductive plate. A first wire-receiving seat is formed in the first lower area and electrically connected to the first blade. A second wire-receiving seat is formed in the first lower area and spaced from the first wire-receiving seat. The second wire-receiving seat is electrically connected to the first conductive plate. The second wire-receiving seat is electrically connected to the second
20 blade when the fuse is received in the recessed portion and in electrical connection with the first and second conductive plates. The second wire-receiving seat is intermediate the first-wire receiving seat and the second blade. Each of the first and second wire-receiving seats includes an opening facing away from the frame body.

In a most preferred form, the frame body includes a protrusion extending from
25 an edge of the second side. The first lower area includes two spaced ribs adjacent to the protrusion. The first conductive plate includes an extension extending from the raised

portion to the second wire-receiving seat. The extension is received and positioned in a path defined by the ribs and has a distal end fixed in a groove in the protrusion. Furthermore, the raised portion includes a projection, and the first conductive plate includes a section mounted on the raised portion and having a through-hole through which the projection extends, positioning the first conductive plate in place. The second side further includes a second lower area spaced from the first lower area by the raised portion. A grounding prong extends away from the first side. A third wire-receiving seat is formed on the second lower area and electrically connected to the grounding prong.

In a most preferred form, the raised portion includes a coupling groove. A cap is coupled to the second side and includes an engaging plate coupled with the coupling groove. The cap further includes an end having spaced first, second, third, and fourth partitioning plates, defining first, second, and third compartments therebetween. The first partitioning plate includes a first arcuate edge at an outer side thereof. The first and second partitioning plates are interconnected by a first interconnecting wall therebetween. The first interconnecting wall has a second arcuate edge. The third and fourth partitioning plates are interconnected by a second interconnecting wall therebetween. The second interconnecting wall has a third arcuate edge. The fourth partitioning wall includes a fourth arcuate edge at an outer side thereof. The third partitioning plate has L-shaped cross section and defines a corner receiving the second wire-receiving seat. The cap can further include a tail piece abutting distal ends of the first, second, third, and fourth partitioning plates.

In a most preferred form, the frame body further includes a carrier plate extending therefrom. Spaced first, second, third, and fourth partitioning walls extend perpendicularly from the carrier plate. A first spacing is formed between the first and second partitioning walls for receiving a first cable coupled to the first wire-receiving seat. A second spacing is formed between the second and third partitioning walls for

receiving a second cable coupled to the second wire-receiving seat. A third spacing is formed between the third and fourth partitioning walls for receiving a third cable coupled to the third wire-receiving seat. The second and third partitioning walls have a protrusion formed therebetween. A groove is formed in the protrusion. The first
5 conductive plate includes an extension having a distal end fixed in the groove.

The present invention will become clearer in light of the following detailed description of illustrative embodiments of this invention described in connection with the drawings.

DESCRIPTION OF THE DRAWINGS

10 The illustrative embodiments may best be described by reference to the accompanying drawings where:

FIG. 1A shows a perspective view of a conventional plug inner frame.

FIG. 1B shows a perspective view of the plug inner frame of FIG. 1A with wires attached to the plug inner frame.

15 FIG. 2 shows a bottom plan view of the plug inner frame of FIG. 1A.

FIG. 3 shows a top plan view of the plug inner frame of FIG. 1A.

FIG. 4 shows a perspective view of another conventional plug inner frame.

FIG. 5 shows an exploded, perspective view of another conventional plug inner frame with a cap.

20 FIG. 6 shows a perspective view of a plug inner frame of an embodiment according to the preferred teachings of the present invention.

FIG. 7 shows a bottom plan view of the plug inner frame of FIG. 6.

FIG. 8 shows a top plan view of the plug inner frame of FIG. 6.

FIG. 9 shows an exploded, perspective view of the plug inner frame of FIG. 6
25 and a cap mounted to the plug inner frame.

FIG. 10 shows a perspective view of the plug inner frame and the cap of FIG. 9.

FIG. 11 shows a cross-sectional view of the plug inner frame of FIG. 6.

FIG. 12 shows a perspective view of a plug inner frame of another embodiment according to the preferred teachings of the present invention with wires attached to the plug inner frame.

5 FIG. 13 shows a final product of a plug formed by the plug inner frame according to the preferred teachings of the present invention.

FIG. 14 shows an exploded perspective view of the plug inner frame of FIG. 12 and a cap mounted to the plug inner frame.

FIG. 15A shows a perspective view of the plug inner frame and the cap of FIG.
10 14.

FIG. 15B shows a cross-sectional view of the plug inner frame and the cap of FIG. 15A.

FIG. 16 shows a cross-sectional view of the plug inner frame of FIG. 14.

All figures are drawn for ease of explanation of the basic teachings of the
15 present invention only; the extensions of the Figures with respect to number, position, relationship, and dimensions of the parts to form the preferred embodiment will be explained or will be within the skill of the art after the following teachings of the present invention have been read and understood. Further, the exact dimensions and dimensional proportions to conform to specific force, weight, strength, and similar requirements will
20 likewise be within the skill of the art after the following teachings of the present invention have been read and understood.

DETAILED DESCRIPTION OF THE INVENTION

A plug inner frame according to the preferred teachings of the present invention is shown in FIGS. 6-11 of the drawings and generally designated 4. According to the
25 preferred form shown, plug inner frame 4 includes a frame body 41 having opposite first and second sides 40 and 43. First side 40 includes a fuse-receiving seat 42 having a

recessed portion 421 for receiving a fuse and forming a raised portion 422 on second side 43, with first and second lower areas 423A and 423B formed on second side 43 and located at opposite sides of raised portion 422. Raised portion 422 includes a projection 427 on an end thereof. Furthermore, raised portion 422 includes a coupling groove 426.

5 Frame body 41 further includes a protrusion 412 extending from an edge of second side 43 and having a groove 413 formed therein. First lower area 423A includes two spaced ribs 431 adjacent to projection 427. A path is defined between ribs 431.

According to the preferred form shown, first and second conductive plates 424 and 425 are mounted to frame body 41. First conductive plate 424 includes two arms
10 424D (FIG. 7) in recessed portion 421 and extending from first side 40 through second side 43. First conductive plate 424 further includes an interconnecting section 424A interconnected between arms 424D and located on raised portion 422. Interconnecting section 424A has a through-hole through which projection 427 extends to position first conductive plate 424 in place. First conductive plate 424 further includes an extension
15 424B extending from interconnecting section 424A and received and positioned in the path between ribs 431. Extension 424B has a distal end 424C fixed in groove 413 (FIG. 7). Thus, first conductive plate 424 is prevented from shifting away its position due to pressure or vibration during subsequent wire-coupling procedures and a subsequent injection molding procedure. Second conductive plate 425 includes two arms 425C (FIG.
20 7) in recessed portion 421 and extending from first side 40 through second side 43. Second conductive plate 425 further includes an interconnecting section 425A interconnected between arms 425C and located on raised portion 422 and spaced from interconnecting section 424A. Second conductive plate 425 further includes an extension 425B extending from interconnecting section 425A.

25 Spaced first and second blades 45 and 44 extend away from first side 40 and located at a side of recessed portion 421. Second blade 44 is electrically connected to

extension 425B of second conductive plate 425. A grounding prong 46 extends away from first side 40 and spaced from first and second blades 45 and 45 by recessed portion 421. A first wire-receiving seat 451 is formed in first lower area 423A and electrically connected to first blade 45. A second wire-receiving seat 441 is formed in first lower
5 area 423A and electrically connected to extension 424B. Second wire-receiving seat 441 is electrically connected to second blade 44 when a fuse is received in recessed portion 421 and electrically connected to arms 424D and 425C of first and second conductive plates 424, 425. Second wire-receiving seat 441 is intermediate first wire-receiving seat 451 and second blade 44. Each of first and second wire-receiving seats 451, 441 includes
10 a receptacle having an opening 452, 442 facing away from frame body 41. The receptacles extend toward frame body 41. A third wire-receiving seat 161 is formed in second lower area 123B and electrically connected to grounding prong 16. Each wire receiving seat 151, 141, 161 receives an end of a wire 471A, 471B, 471C (FIG. 12) having an insulating plastic sheath 17.

15 According to the preferred form shown, a cap 48 is coupled to second side 43 of frame body 41. Cap 48 includes an engaging plate 481 (FIG. 9) for coupling with coupling groove 426 of raised portion 422. This prevents molten plastic material for forming the housing of the plug flows along a gap 411 (see FIG. 12) between a periphery of first conductive plate 424 and raised portion 422 into recessed portion 421 at first side
20 40. Thus, plastic material would not form a structure in recessed portion 421 hindering insertion of the fuse.

Cap 48 further includes spaced first, second, third, and fourth partitioning plates 483A, 483B, 483C, and 483D on an end thereof, defining first, second, and third compartments 483E, 483F, and 483G therebetween for receiving and isolating wires
25 471A, 471B, 471C. First partitioning plate 483A includes an arcuate edge 483H at an outer side thereof. First and second partitioning plates 483A and 483B are interconnected

by a first interconnecting wall therebetween. The first interconnecting wall has an arcuate edge 483J. Third and fourth partitioning plates 483C and 483D are interconnected by a second interconnecting wall therebetween. Second interconnecting wall has an arcuate edge 484L. Fourth partitioning plate 483D includes an arcuate edge 483I at an outer side thereof. Third partitioning plate 483C has L-shaped cross sections and defines a corner receiving second wire-receiving seat 441 to prevent second wire-receiving seat 441 from falling during injection molding. Short circuit or poor contact resulting from falling of second wire-receiving seat 441 during injection molding is, thus, avoided. Arcuate edges 483H, 483I, 483J, 483L guide and allow easy mounting of wires 471A, 471B, 471C. This avoids wires 471A, 471B, 471C from being pinched and allows easy assembly.

FIGS. 12, 14, 15A, 15B, and 16 show a modification of the plug inner frame 4 according to the preferred teachings of the present invention, wherein like reference numerals designate like elements. In this embodiment, the frame body 41 does not have protrusion 412. However, frame body 41 includes a carrier plate 49 extending from an edge of first lower area 423A. Spaced first, second, third, and fourth partitioning walls 490, 491, 492, and 493 extend perpendicularly from the carrier plate 49. A first spacing is formed between first and second partitioning walls 490 and 491 for receiving and guiding a wire 471A coupled to first wire-receiving seat 451. A second spacing is formed between second and third partitioning walls 491 and 492 for receiving and guiding a wire 471B coupled to second wire-receiving seat 441. A third spacing is formed between third and fourth partitioning walls 492 and 493 for receiving and guiding a wire 471C coupled to third wire-receiving seat 461. Thus, short circuit resulting from contact between wires 471A, 471B, 471C is prevented. Furthermore, second and third partitioning walls 491 and 492 have a protrusion 494 formed therebetween. A groove 495 is formed in protrusion 494 and securely receives distal end 424C of extension 424B.

Undesired displacement of first conductive plate 424 resulting from pressure or vibration during subsequent injection molding is, thus, avoided. Note that the path between ribs 431 also position first conductive plate 424 to prevent undesired displacement of first conductive plate 424 during subsequent injection molding.

5 According to the preferred form shown, cap 48 is also modified to include a tail piece 482 (FIG. 14) extending outward from a body thereof. Tail piece 482 abuts distal ends of first, second, third, and fourth partitioning walls 490, 491, 492, 493 to prevent disengagement of wires 471A, 471B, 471C. Note that first, second, third, and fourth partitioning plates 483A, 483B, 483C, 483D extending inward from tail piece 482 across
10 a portion of a body of cap 48.

 It can be appreciated that isolation of wires 471A, 471B, 471C can be achieved without cap 48 to save manufacturing costs when partitioning walls 490, 491, 492, 493 are utilized. It can be further appreciated that both openings 452 and 442 of first and second wire-receiving seats 451 and 441 face away from frame body 41 in the same
15 direction and spaced from each other to allow easy wire-coupling processing without the risk of breakage of the tool for carrying out the wire-coupling processing while allowing smooth and quality-stable wire-coupling processing, for first and second wire-receiving seats 451 and 441 are well supported by frame body 41.

 Plug inner frame 4 according to the preferred teachings of the present invention
20 can be placed in a mold, and a final plug product 6 (FIG. 13) can be obtained after injection molding.

 Thus since the invention disclosed herein may be embodied in other specific forms without departing from the spirit or general characteristics thereof, some of which forms have been indicated, the embodiments described herein are to be considered in all
25 respects illustrative and not restrictive. The scope of the invention is to be indicated by the appended claims, rather than by the foregoing description, and all changes which

come within the meaning and range of equivalency of the claims are intended to be embraced therein.

CLAIMS

1. A plug inner frame comprising, in combination:

a frame body (41) including opposite first and second sides (40, 43), with the first side (40) including a fuse-receiving seat (42) having a recessed portion (421) for receiving a fuse and forming a raised portion (422) on the second side (43), with a first lower area (423A) being formed on the second side (43) and located at a side of the raised portion (422);

first and second conductive plates (424, 425) mounted in the recessed portion (421) and extending from the first side (40) through the second side (43); and

first and second blades (45, 44) mounted to the frame body (41) and extending away from the first side (40), with the second blade (44) being electrically connected to the second conductive plate (425), with a first wire-receiving seat (451) being formed in the first lower area (423A) and electrically connected to the first blade (45), with a second wire-receiving seat (441) being formed in the first lower area (423A) and spaced from the first wire-receiving seat (451), with the second wire-receiving seat (441) being electrically connected to the first conductive plate (424), with the second wire-receiving seat (441) being electrically connected to the second blade (44) when the fuse is received in the recessed portion (421) and in electrical connection with the first and second conductive plates (424, 425), with the second wire-receiving seat (441) being intermediate the first-wire receiving seat (451) and the second blade (44), with each of the first and second wire-receiving seats (451, 441) including an opening (452, 442) facing away from the frame body (41).

2. The plug inner frame as claimed in claim 1, with the frame body (41) including a protrusion (412) extending from an edge of the second side (43), with a groove (413) being formed in the protrusion (412), with the first conductive plate (424)

including an extension (424B) extending from the raised portion (422) toward the protrusion (412), with the extension (424B) being in electrical connection with the second wire-receiving seat (441) and having a distal end (424C) fixed in the groove (413).

5 3. The plug inner frame as claimed in claim 1, with the raised portion (422) including a projection (427), and with the first conductive plate (424) including a section (424A) mounted on the raised portion (422) and having a through-hole through which the projection (427) extends, positioning the first conductive plate (424) in place.

 4. The plug inner frame as claimed in claim 1, with the first conductive
10 plate (424) including an extension (424B) extending from the raised portion (422) to the second wire-receiving seat (441), with the first lower area (423A) further including two spaced ribs (431) defining a path, and with the extension (424B) being received and positioned in the path.

 5. The plug inner frame as claimed in claim 1, with the raised portion (422)
15 including a coupling groove (426), with the plug inner frame (4) further comprising, in combination: a cap (48) coupled to the second side (43), with the cap (48) including an engaging plate (481) coupled with the coupling groove (426).

 6. The plug inner frame as claimed in claim 5, with the cap (48) further including an end having spaced first, second, third, and fourth partitioning plates (483A,
20 483B, 483C, 483D), defining first, second, and third compartments (483E, 483F, 483G) therebetween, with the first partitioning plate (483A) including a first arcuate edge (483I) at an outer side thereof, with the first and second partitioning plates (483A, 483B) being interconnected by a first interconnecting wall therebetween, with the first interconnecting wall having a second arcuate edge (483J), with the third and fourth
25 partitioning plates (483C, 483D) being interconnected by a second interconnecting wall therebetween, with the second interconnecting wall having a third arcuate edge (484L),

and with the fourth partitioning wall (483D) including a fourth arcuate edge (483I) at an outer side thereof.

7. The plug inner frame as claimed in claim 1, with the second side (43) further including a second lower area (423B) spaced from the first lower area (423A) by the raised portion (422), with a grounding prong (46) extending away from the first side (40), with a third wire-receiving seat (461) being formed on the second lower area (423B) and electrically connected to the grounding prong (46), with the frame body (41) further including a carrier plate (49) extending therefrom, with spaced first, second, third, and fourth partitioning walls (490, 491, 492, 493) extending perpendicularly from the carrier plate (49), with a first spacing being formed between the first and second partitioning walls (490, 491) for receiving a first cable (471A) coupled to the first wire-receiving seat (451), with a second spacing being formed between the second and third partitioning walls (491, 492) for receiving a second cable (471B) coupled to the second wire-receiving seat (441), and with a third spacing being formed between the third and fourth partitioning walls (492, 493) for receiving a third cable (471C) coupled to the third wire-receiving seat (461).

8. The plug inner frame as claimed in claim 7, further comprising, in combination: a cap (48) coupled to the second side (43), with the cap (48) including a tail piece (482) extending outward from a body thereof and abutting distal ends of the first, second, third, and fourth partitioning walls (490, 491, 492, 493).

9. The plug inner frame as claimed in claim 8, with the cap (48) further including spaced first and second partitioning plates (483A, 483B) extending inward from the tail piece (482) across a portion of the body of the cap (48).

10. The plug inner frame as claimed in claim 9, with the cap (48) further including a third partitioning plate (483C) spaced from the first and second partitioning

plates (483A, 483B) and extending inward from the tail piece (482) across a portion of the body of the cap (48).

11. The plug inner frame as claimed in claim 10, with the third partitioning plate (483C) having substantially L-shaped cross sections and defining a corner
5 receiving the second wire-receiving seat (441).

12. The plug inner frame as claimed in claim 7, with the second and third partitioning walls (491, 492) having a protrusion (494) formed therebetween, with a groove (495) being formed in the protrusion (494), and with the first conductive plate (424) including an extension (424B) having a distal end (424C) fixed in the groove
10 (495).