

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO FUSE UNITS

(71) We, ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED, of 1, Stanhope Gate, London W1A 1EH, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to fuse units and improvements thereto.

Fuse units of known construction are usually manufactured from mouldable materials, such as phenolic resin for the housing, and metal parts for the current carrying components, and generally comprise two distinct assemblies, namely at least one removable fuse link carrier containing the fuse link carrier contacts and provisions for securing in use a suitably rated fuse link to them, and a base assembly comprising a set of moulded components and containing at least two cable terminals having provisions for engageably accepting the fuse link carrier contacts so as to provide electrical continuity from at least one incoming cable through the fuse link to at least one outgoing cable. The components of the base assembly usually include a base section containing the cable terminals, and a top section or, as hereinafter referred to, a shield, which is removable to allow access to the cable terminals during installation or maintenance. When the fuse unit is in use removal of the shield could expose live terminals, and for safety reasons at least those associated with the incoming cable or cables must be separately shielded. The cable terminals used in such fuse units are commonly of the tunnel type containing slotted head pinching screws which can be tightened on to the ends of cables inserted into the terminal tunnels to clamp the cable-conductors to the terminals.

It is an object of the present invention to provide a fuse unit which is easier to

manufacture and intrinsically safer in installation, service and maintenance than conventional fuse units.

In accordance with the present invention, in a fuse unit comprising at least one removable fuse link carrier and a base assembly, which base assembly comprises a base section containing cable terminals with pinching screws and provision for engageably accepting the fuse link carrier contacts, the pinching screws are of the socket type, and the base assembly incorporates a shield permanently secured to the base section and provided with two or more slots to allow passage of the fuse link carrier contacts for engagement with the cable terminals and having a plurality of openings located so as to permit an operating tool, capable of rotating the screws, to be passed through any one of said openings and to be engaged with an associated pinching screw, for the purpose of tightening or loosening the screw, the openings having a transverse dimension which is less than the maximum diameter of the pinching screws.

Since the shield is permanently in position the need for separate terminal shields is avoided.

Preferably, the base assembly comprises a moulded base section and a moulded shield, which are permanently joined together and enclose the cable terminals.

Alternatively, the base section and the shield may be formed as a single moulding enclosing the cable terminals.

Socket screws have an advantage over slotted head pinching screws as used hitherto, as in order to apply a satisfactory clamping torque to the latter it is necessary to use a screwdriver having a blade width of dimensions comparable with the screw diameter, which is usually nearly equal to the tunnel diameter to prevent the cable-conductors slipping past the screw.

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On the other hand screws of the socket type can be rotated by a tool of smaller width than the screw diameter, and consequently the openings in the shield through which the tools are inserted for tightening or loosening the screws can be of smaller dimensions than those needed to receive the blades of screwdrivers used for slotted head screws. The dimensions of the openings can therefore be such that the moulding which forms the shield can retain a substantial wall section between the holes and the slots required for the passage of the fuse link carrier contacts. Moreover, by making the opening with a transverse dimension less than the maximum diameter of the pinching screws complete withdrawal of the pinching screws from the unit is prevented.

The socket of each pinching screw is preferably of hexagonal cross-section, and has a maximum transverse dimension which is less than the diameter of the threaded part of the pinching screw.

Preferably, the shield carries adjacent to each of the pinching screws a moulded recess of a shape and size such that the corresponding pinching screw can be completely withdrawn from its associated threaded bore but is held in alignment with that bore even after complete withdrawal.

Alternatively, the shield constitutes or carries stops which are positioned to prevent complete withdrawal of the screws from their associated threaded bores in the cable terminals.

Such stops may, for example, be in the shape of raised shoulders protruding from a surface of the shield adjacent to the pinching screws and surrounding each of the said plurality of said openings in the shield.

Alternatively, the stops may be of the form of recesses in the said surface and surrounding said openings, being possibly of a shape and size such as to provide for a positive positioning of the pinching screws.

The invention will be explained further by way of example only and with reference to the accompanying drawings of which:—

Figure 1 shows an overall perspective view of one form of a fuse unit in accordance with the invention.

Figure 2 shows a similar perspective view of the base section of the fuse unit of Figure 1.

Figure 3 shows a plan view of the base assembly of the fuse unit partly cut away to reveal an end of the base section.

Figure 4 shows a section of the base assembly cut along the line IV-IV of Figure 1 parallel to the end faces of the fuse unit.

Figure 5 shows a modified base assembly in perspective view.

Figure 6 shows a sectional view similar to that of Figure 4 of the modified base

assembly, and

Figure 7 shows a similar sectional view of a further modification of a base assembly.

Referring to Figures 1 to 4, the fuse unit 1 comprises a removable fuse link carrier 2 of known construction enclosing the fuse link (not shown) and incorporating the fuse link carrier contacts 14 and a base assembly 4 containing the cable terminals 12. The base assembly comprises three sections, 3, 5 and 6, where 5 and 6 form the base section and 3 the shield, permanently joined during manufacture along the joint lines 9 and 10 respectively.

On removal of the fuselink carrier, the carrier and the base assembly separate along 11. The base assembly further incorporates at each end a cable guide 7, each having a pair of bores 8 in alignment with and leading to respective tunnels 15 of the cable terminals 12. Cable-conductor pinching screws 13 are seated in threaded bores 16 extending transversely through the sides of the cable terminals 12 into the tunnels 15, each tunnel having a pair of pinching screws.

The pinching screws 13 serve to secure cable-conductors 17 in a respective tunnel 15 and to provide additional electrical contact area, the screws being approximately of the same diameter as the tunnels 15 so as to prevent the conductors 17 slipping past the pinching screws. The outer end of each pinching screw 13 is formed with a hexagonal socket 18 to accept a hexagonal wrench (not shown) used to rotate the screws 13 for the purpose of releasing or clamping the conductors 17.

The shield 3 is in the form of a box joined permanently to the base section 5, 6 along the joint line 10, by means of rivets, such as, for example, a hollow rivet through bore 38, adhesive, or in any other suitable manner. The base 23 of the shield contains slots 19 for allowing the passage of the contacts 14, and eight circular holes 20 each disposed so as to align with the axis of rotation of a respective one of the screws 13 and of a diameter only slightly larger than the distance between two opposite edges of the said hexagonal wrench.

The projecting ends of the contacts 14 provide electrical contact at the inwardly facing surfaces 21 of the cable terminals 12 and are secured at their other ends (not shown) to the fuse link in the carrier 2, so as to provide electrical continuity from the conductors of an incoming cable through the fuse link to the conductors of an outgoing cable. The contact pressure of the fuse contacts onto the surfaces 21 is further increased by means of leaf springs 22 secured to the contacts 14.

The base 23 of the shield 3 is provided on the side adjacent the cable terminals with cylindrical recesses 24 which align with the

pinching screws 13, and which are of a depth such that they limit the extent to which the pinching screws 13 can be withdrawn from their associated threaded bores 16, and are of a diameter slightly larger than the top sections of the screws so as to provide positive positioning of the screws in their withdrawn position (lefthand side of Figure 4). The length of each screw 13 in relation to the height above the cable terminals 12 of the surfaces 24 of the recesses is such that the pinching screws are completely withdrawn from the tunnels 15 when abutting against the surfaces 24, but still well inside the threaded bores 16.

The bore 38 allows the assembly to be secured to a suitable support structure.

The invention enables the base assembly housing to be formed from only two mouldings, the parts 3 and 6 of the first embodiment being effectively combined.

Figures 5 and 6 show one such base assembly 25 which is similar to the assembly 4 of Figure 1 but comprising only two moulded sections 26 and 27 permanently joined during manufacture along the joint line 28 the base section 27 corresponding to the section 5 of the unit described with reference to Figures 1 to 4 and the section 26 corresponding to the sections 3 and 6.

In this embodiment the shield carries a recess 39 adjacent to each pinching screw 13, which extends from the base 23 of the shield towards the cable terminals 12 far enough to ensure that the associated screw is held in alignment with its threaded bore even after its complete withdrawal from the bore. In this way the application of excessive force by the screw to the moulding on withdrawal is avoided.

In this embodiment, also, the extensions 7 which provide the cable guides are formed wholly on the section 27, all other features which are identical to those of the assembly 4 illustrated in Figures 1 to 4, are denoted by the same references.

Figure 7 shows a sectional view of another form of base assembly generally similar to that of Figure 3, but with the shield 30 fitting within the integral base section 29, and abutting partly against shoulders 31 of the base section, and at the same time positioning the cable terminals 12 by means of the end section 35 of the sides 33 of the shield. The base of the shield 30 is formed with shoulders 32 surrounding the holes 20 which serves to restrict the axial movement of the pinching screws 13, of which only one is shown, the base 29 and the shield 30 being permanently joined either by one or more rivets, or along sections or the whole of the plane 37 by means of an adhesive.

It will be obvious that the invention includes any suitable combination of the

features as exclaimed above.

It will furthermore be appreciated that the principles of construction of a fuse unit in accordance with the invention is applicable to single-phase and neutral, three-phase and neutral, and multiphase and neutral fuse units.

It is also obvious that the use of socket screws in conventional fuse units provides the advantages of positive positioning of a screw to be inserted into the cable terminals and thus of improved safety in installation and service.

WHAT WE CLAIM IS:—

1. A fuse unit comprising at least one removable fuse link carrier and a base assembly, the base assembly comprising a base section containing cable terminals with pinching screws and provisions for engageably accepting the fuse link carrier contacts, wherein the pinching screws are of the socket type, and the base assembly incorporates a shield permanently secured to the base section and provided with two or more slots to allow passage of the fuse link carrier contacts for engagement with the cable terminals and having a plurality of openings located so as to permit an operating tool, capable of rotating the screws, to be passed through any one of said openings and to be engaged with an associated pinching screw, for the purpose of tightening or loosening the screw, the openings having a transverse dimension which is less than the maximum diameter of the pinching screws.

2. A fuse unit as claimed in Claim 1, wherein the base assembly comprises a moulded base section and a moulded shield which are permanently joined together and enclose the cable terminals.

3. A fuse unit as claimed in Claim 1 wherein the base section and shield are formed as a single moulding enclosing the cable terminals.

4. A fuse unit as claimed in any preceding Claim wherein the sockets of the pinching screws are of hexagonal cross-section.

5. A fuse unit as claimed in Claim 4 wherein maximum transverse dimension of the socket of each pinching screw is less than the diameter of the threaded part of the pinching screw.

6. A fuse unit as claimed in any preceding claim wherein the shield carries adjacent to at least one of the pinching screws a moulded recess of a shape and size such that said pinching screw can be completely withdrawn from its associated threaded bore but is held in alignment with that bore even after complete withdrawal.

7. A fuse unit as claimed in Claims 1 to 5, wherein the shield constitutes or carries one or more stops positioned to prevent complete withdrawal of at least one of the

pinching screws 13, and which are of a depth such that they limit the extent to which the pinching screws 13 can be withdrawn from their associated threaded bores 16, and are of a diameter slightly larger than the top sections of the screws so as to provide positive positioning of the screws in their withdrawn position (lefthand side of Figure 4). The length of each screw 13 in relation to the height above the cable terminals 12 of the surfaces 24 of the recesses is such that the pinching screws are completely withdrawn from the tunnels 15 when abutting against the surfaces 24, but still well inside the threaded bores 16.

The bore 38 allows the assembly to be secured to a suitable support structure.

The invention enables the base assembly housing to be formed from only two mouldings, the parts 3 and 6 of the first embodiment being effectively combined.

Figures 5 and 6 show one such base assembly 25 which is similar to the assembly 4 of Figure 1 but comprising only two moulded sections 26 and 27 permanently joined during manufacture along the joint line 28 the base section 27 corresponding to the section 5 of the unit described with reference to Figures 1 to 4 and the section 26 corresponding to the sections 3 and 6.

In this embodiment the shield carries a recess 39 adjacent to each pinching screw 13, which extends from the base 23 of the shield towards the cable terminals 12 far enough to ensure that the associated screw is held in alignment with its threaded bore even after its complete withdrawal from the bore. In this way the application of excessive force by the screw to the moulding on withdrawal is avoided.

In this embodiment, also, the extensions 7 which provide the cable guides are formed wholly on the section 27, all other features which are identical to those of the assembly 4 illustrated in Figures 1 to 4, are denoted by the same references.

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It will be obvious that the invention includes any suitable combination of the

features as explained above.

It will furthermore be appreciated that the principles of construction of a fuse unit in accordance with the invention is applicable to single-phase and neutral, three-phase and neutral, and multiphase and neutral fuse units.

It is also obvious that the use of socket screws in conventional fuse units provides the advantages of positive positioning of a screw to be inserted into the cable terminals and thus of improved safety in installation and service.

WHAT WE CLAIM IS:—

1. A fuse unit comprising at least one removable fuse link carrier and a base assembly, the base assembly comprising a base section containing cable terminals with pinching screws and provisions for engageably accepting the fuse link carrier contacts, wherein the pinching screws are of the socket type, and the base assembly incorporates a shield permanently secured to the base section and provided with two or more slots to allow passage of the fuse link carrier contacts for engagement with the cable terminals and having a plurality of openings located so as to permit an operating tool, capable of rotating the screws, to be passed through any one of said openings and to be engaged with an associated pinching screw, for the purpose of tightening or loosening the screw, the openings having a transverse dimension which is less than the maximum diameter of the pinching screws.

2. A fuse unit as claimed in Claim 1, wherein the base assembly comprises a moulded base section and a moulded shield which are permanently joined together and enclose the cable terminals.

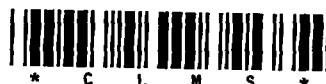
3. A fuse unit as claimed in Claim 1 wherein the base section and shield are formed as a single moulding enclosing the cable terminals.

4. A fuse unit as claimed in any preceding Claim wherein the sockets of the pinching screws are of hexagonal cross-section.

5. A fuse unit as claimed in Claim 4 wherein maximum transverse dimension of the socket of each pinching screw is less than the diameter of the threaded part of the pinching screw.

6. A fuse unit as claimed in any preceding claim wherein the shield carries adjacent to at least one of the pinching screws a moulded recess of a shape and size such that said pinching screw can be completely withdrawn from its associated threaded bore but is held in alignment with that bore even after complete withdrawal.

7. A fuse unit as claimed in Claims 1 to 5, wherein the shield constitutes or carries one or more stops positioned to prevent complete withdrawal of at least one of the





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pinching screws from its associated threaded bore.

8. A fuse unit as claimed in Claim 7 wherein at least one of the stops comprises a raised shoulder protruding from a surface of the shield adjacent to the pinching screws and surrounding the associated one of said openings.

9. A fuse unit as claimed in Claim 7 wherein at least one of the stops is of the form of a recess in a surface of the shield adjacent the pinching screws and surrounding the associated one of said openings.

10. A fuse unit as claimed in Claim 2 wherein the base section and the shield are joined together with one or more rivets.

11. A fuse unit as claimed in Claim 2 wherein the base section and the shield are

joined together by means of an adhesive compound.

12. A fuse unit substantially as hereinbefore described with reference to and as shown in Figures 1 to 4 of the accompanying drawings.

13. A fuse unit substantially as hereinbefore described with reference to and as shown in Figures 5 and 6 of the accompanying drawings.

14. A fuse unit substantially as hereinbefore described with reference to and as shown in Figure 7 of the accompanying drawings.

For the Applicants,
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