

Jan. 5, 1954

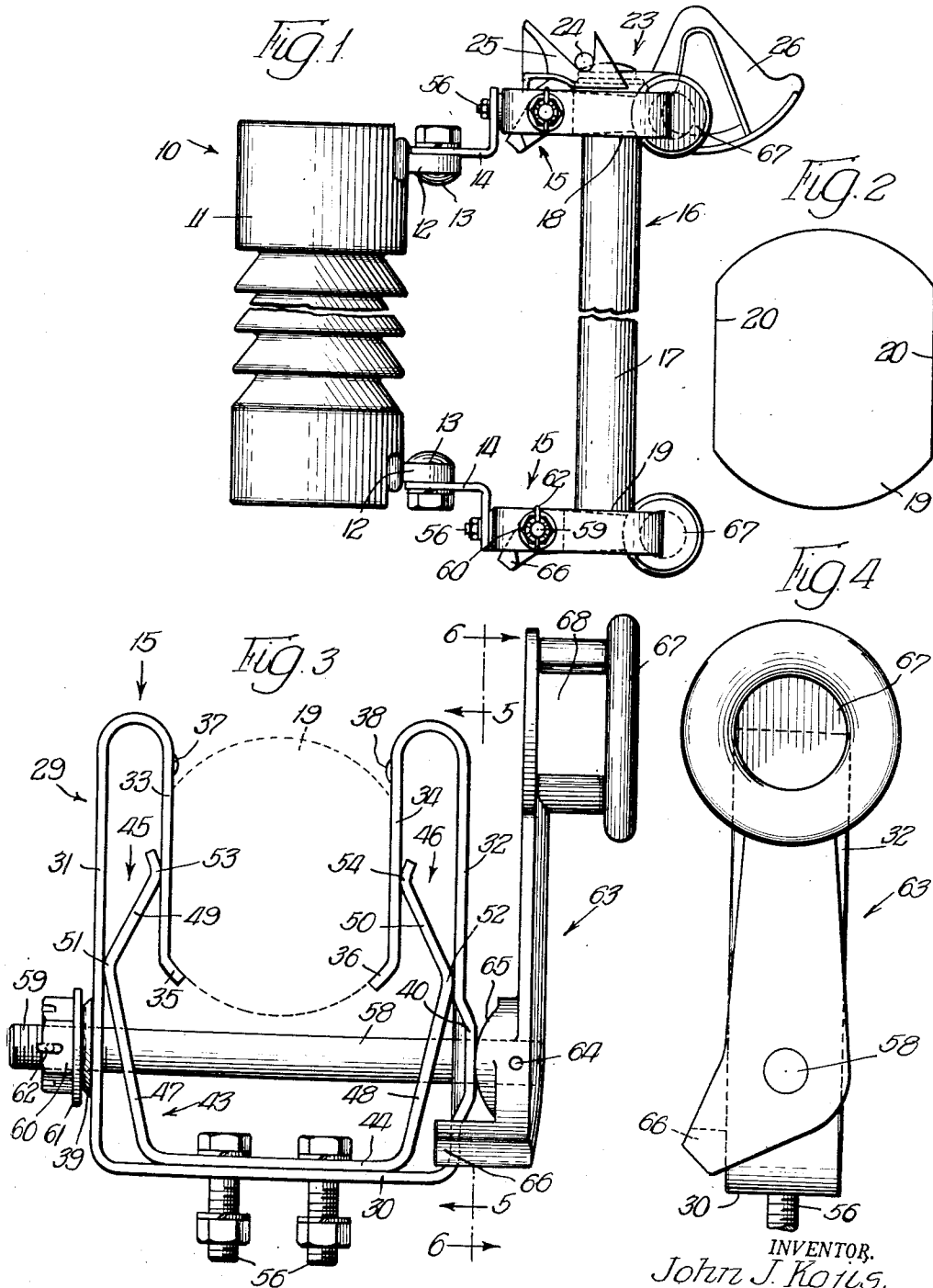
J. J. KOJIS

2,665,415

FUSE CLIP CONSTRUCTION

Filed Aug. 9, 1950

2 Sheets-Sheet 1



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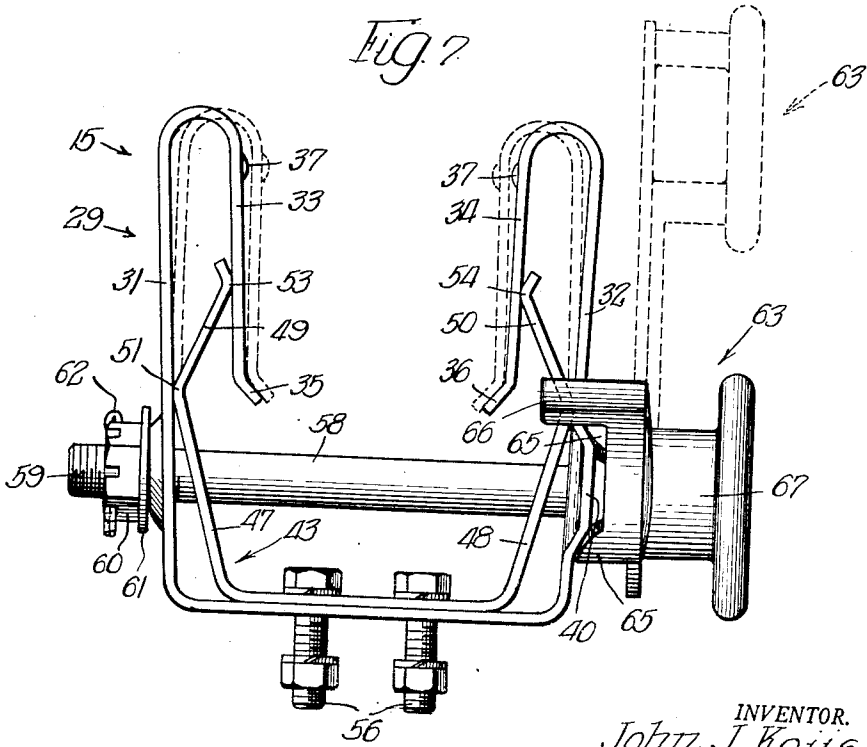
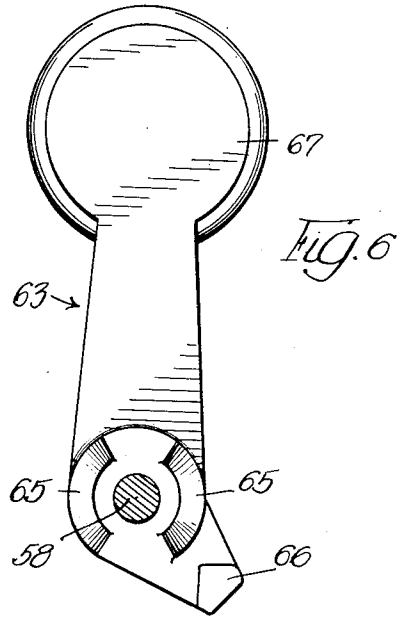
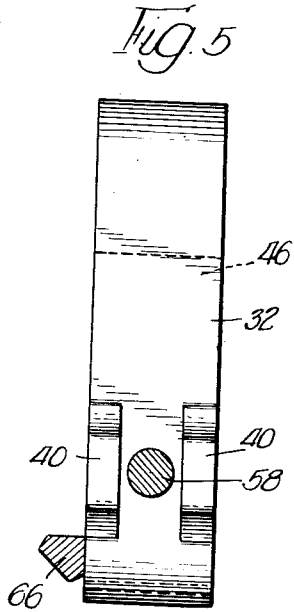
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,665,415

FUSE CLIP CONSTRUCTION

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5 Claims. (Cl. 339-259)

1 This invention relates, generally, to the construction of fuse clips and it has particular relation to fuse clips for mounting high voltage heavy duty fuses by gripping the ferrules thereof from opposite sides. This invention constitutes an improvement over the mounting for fuses disclosed in Ramsey Patent No. 2,147,316, issued February 14, 1939, and assigned to the assignee of this application.

Among the objects of this invention are: To simplify and reduce the cost of the prior fuse clip construction such as disclosed in said Ramsey patent; to accomplish this by reducing the number of specially fabricated parts and the number of assembly operations; to separate the gripping surfaces of the jaws of a fuse clip by a spring nested therein in a new and improved manner and to transmit force through portions of this spring for the purpose of gripping a fuse tube ferrule between these surfaces; and to employ manually remotely operable means for exerting force against the action of the fuse clip spring and acting therethrough to grip the fuse tube ferrule.

Other objects of this invention will, in part, be obvious and in part appear hereinafter.

This invention is disclosed in the embodiment thereof shown in the accompanying drawings and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of this invention, reference can be had to the following detailed description, taken together with the accompanying drawings, in which:

Figure 1 is a view, in side elevation, of a fuse mounting employing fuse clips in which the present invention is embodied and illustrating their use in conjunction with a conventional high voltage heavy duty fuse;

Figure 2 is a bottom plan view of the lower ferrule of the fuse shown in Figure 1, the illustration being substantially at full scale;

Figure 3 is a view in bottom plan of one of the fuse clips illustrated in the mounting shown in Figure 1, the outline of a fuse tube ferrule which is gripped thereby being shown by broken lines;

Figure 4 is a view, in end elevation of the fuse clip shown in Figure 3;

Figures 5 and 6 are detail sectional views taken

2 generally along the lines 5-5 and 6-6, respectively, of Figure 3; and

Figure 7 is a view similar to Figure 3 showing by full lines the positions of the parts of the fuse clip when they are arranged to release the fuse tube ferrule and by broken lines the positions which they occupy when they grip the fuse tube ferrule.

Referring now particularly to Figure 1 of the drawings, it will be observed that the reference character 10 designates a fuse mounting of the general type disclosed in Baker application Serial No. 16,268, filed March 22, 1948, now Patent No. 2,606,954 and assigned to the assignee of this application. The fuse mounting 10 includes an insulator 11 having mounting brackets 12 at its ends. The intermediate mounting bracket by which the insulator 11 is mounted on a cross arm or the like is not shown. The mounting brackets 12 have bolts 13 projecting therethrough for securing thereon L-shaped fittings 14 which are arranged to carry fuse clips, shown generally at 15, in which the present invention is embodied. Since the construction of the fuse clips for the upper or lower mounting bracket 12 is the same, the description hereinafter given will apply to both.

The fuse clips 15 are arranged to mount a fuse, shown generally at 16, such as a liquid type fuse having a fuse tube 17 that is formed of glass. Upper and lower ferrules 18 and 19 are provided at the upper and lower ends of the fuse tube 17 for the purpose of closing these ends and making electrical contact with the mechanism within the fuse tube 17. As shown in Figure 2, each ferrule, for example the lower ferrule 19, has flat sides 20 to facilitate a large area contact engagement therewith.

A suspension clamp, shown generally at 23 in Figure 1, is secured to the upper ferrule 18 and it has a pair of trunnions 24 projecting from opposite sides for interfitting with a hook member 25 that is carried by the upper fuse clip 15. The suspension clamp 23 includes an eye member 26 for receiving a suitable tool which permits manipulation of the fuse 16 and the operation of the clamp mechanism associated with the fuse clips 15 in a manner to be described hereinafter.

The details of construction of either of the fuse clips 15 are shown more clearly in Figure 3 of the drawings. It will be noted that the fuse clip 15 includes a generally U-shaped fuse clip 29 which is formed of good conducting material such as hard drawn copper. The illustration in Figure 3 is substantially at full scale. However, it will be

understood that different proportions can be employed without departing from the present invention. The fuse clip 29 has a flat bottom 30 and extending upwardly from the ends thereof are flat sides 31 and 32. The outer end portions 33 and 34 of the sides 31 and 32 are turned inwardly generally parallel thereto for the purpose of engaging the flat sides 20 of the ferrule 19 and similar flat sides of the upper ferrule 18. The extreme end portions 35 and 36 are bent inwardly toward each other for the purpose of providing a stop which limits the inward movement of the ferrule that is gripped between the flat surfaces of the end portions 33 and 34. Nibs 37 and 38 are deformed outwardly from the end portions 33 and 34 at the positions shown for limiting the outward movement of the ferrule associated therewith which might occur under particularly heavy fault current conditions.

Near its lower end the flat side 31 has an integrally formed outwardly extending stiffening boss 39 while in a corresponding position on the flat side 32 there is provided a pair of outwardly extending laterally spaced cams 40, Figure 5. The boss 39 and cams 40 are employed, as will appear hereinafter, in conjunction with the operating mechanism that is employed for moving the end portions 33 and 34 toward each other to grip a ferrule of a fuse therebetween.

With a view to separating the end portions 33 and 34 for the purpose of facilitating the positioning of a ferrule of a fuse therebetween and also for the purpose of applying force thereto to grip the ferrule, a fuse clip spring, shown generally at 43, is nested within the fuse clip 29. It will be observed that the fuse clip spring 43 is generally U-shaped and has the same width as the fuse clip 29. It is formed of resilient material such as Phosphor bronze or stainless steel. The fuse clip spring 43 has a flat bottom 44 which overlies the flat bottom 30 of the fuse clip 29. Also it has outwardly bowed flat sides that are indicated, generally, at 45 and 46. These flat sides extend between the flat sides 31 and 32 of the fuse clip 29 and the outer end portions 33 and 34, respectively, thereof as illustrated more clearly in Figure 3.

The details of construction of the outwardly bowed sides 45 and 46 of the fuse clip spring 43 are important. These sides are made up, respectively, of relatively long legs 47 and 48, extending outwardly and upwardly from the ends of the flat bottom 44, and relatively short legs 49 and 50 extending upwardly and inwardly from the upper ends of the long legs 47 and 48. The outermost bowed portions or the junctions 51 and 52 between the legs 47 and 49 and the legs 48 and 50, respectively, bear against the inner sides of the flat sides 31 and 32 and act to bias them apart to the positions shown by the full lines in Figure 7. Their movement is accompanied by corresponding movement of the outer end portions 33 and 34 so as to facilitate the insertion and removal of the ferrule of a fuse therebetween.

The outer ends 53 and 54 of the relatively short legs 49 and 50, respectively, bear against the inner sides of the outer end portions 33 and 34. Their purpose is to transmit force to the outer end portions 33 and 34 on movement of the outermost bowed portions or junctions 51 and 52 toward each other for the purpose of gripping the flat sides of the ferrule therebetween. The outer end portions 53 and 54 are rounded to facilitate sliding over the inner surfaces of the end portions 33 and 34 with a minimum of friction. The relatively long legs 47 and 48 are employed to permit

greater travel with the exertion of less force and thereby reducing the likelihood of the fuse clip spring 43 taking a permanent set on being deformed in the process of gripping the flat sides of the fuse tube ferrule. Because of the relatively short lengths of the short legs 49 and 50, they are relatively stiff and are able to transmit force therethrough to the end portions 33 and 34 for the purpose of gripping the flat sides of the fuse tube ferrule with considerable pressure. The flat bottom 44 of the fuse clip spring 43 is secured to the flat bottom 30 of the fuse clip 29 by means of bolts 56. These bolts 56, as shown in Figure 1, also project through the corresponding fitting 14 and serve to mount the fuse clip 15 in position thereon.

It will be recalled that the fuse clip spring 43 is employed for biasing the end portions 33 and 34 apart, as shown in Figure 7, to release the ferrule therebetween. This spring pressure is overcome and the end portions 33 and 34 are moved toward each other by clamping pressure applied to the flat sides 31 and 32 for the purpose of moving them toward each other. This clamping mechanism includes a shaft 58 which extends centrally through the sides 31 and 32 of the fuse clip 29 and also through the relatively long legs 47 and 48 of the fuse clip spring 43. As shown in Figure 5 the shaft 58 extends centrally between the laterally spaced cams 40. Also it projects centrally through the stiffening boss 39. One end 59 of the shaft 58 is threaded for receiving a restraining nut 60. The nut 60 acts against the stiffening boss 39 through a flat washer 61. If desired, the washer 61 can be omitted. It will be understood that the nut 60 permits adjustment of the clamping mechanism for the purpose of providing the desired degree of pressure to be exerted by the end portions 33 and 34 against the flat sides of the fuse tube ferrule. When the position of the nut 60 has been finally determined, it may be held in such position by suitable means such as a cotter pin 62.

At the other end of the shaft 58 a lever arm 63 is mounted and it is held fast thereon by means of a transverse pin 64. The lever arm 63 has a pair of laterally spaced cams 65 on opposite sides of the shaft 58 as shown more clearly in Figure 6. These cams 65 are arranged to cooperate with the cams 40 on the flat side 32 for moving the sides 31 and 32 relatively toward each other. This is accomplished on rotation of the lever arm 63 from the position shown by full lines in Figure 7 to the position shown by the broken lines therein where the cams 65 overlie the cams 40 as illustrated in Figure 3. This movement takes place since the lever arm 63 is fixed in position at one end of the shaft 58 and the restraining nut 60 reacts against the stiffening boss 39 through the washer 61 at the other end. The shaft 58 acts as a tension member during this operation.

A stop 66 is formed integrally with the lever arm 63 and is arranged to abut one side of the lower end of the flat side 32, as shown in Figure 4, to locate the lever arm 63 properly in the position where the fuse tube ferrule between the end portions 33 and 34 is securely gripped with a maximum of force, and to limit movement of the lever arm 63 to about 90 degrees. The stop 66 acts to prevent over-travel of the lever arm 63 when the fuse clip 15 is opened. Sufficient pressure is applied by the fuse clip spring 43 through the cams 40 and 65 to hold the lever arm in the upright open position.

At its outer end the lever arm 63 has an in-

tegrally formed socket or bowl 67 that is provided for receiving the tip of an operating tool that is employed for effecting remote manual operation of the fuse clip 15. The socket or bowl 67 has a side opening 68 for receiving a similar tool therein in the event that the quarters are so close that the tool cannot be inserted endwise into the socket or bowl 67.

In operation, with the fuse mounting 10 in operative position on a cross arm or the like and with the lever arms 63 in the positions illustrated by the full lines in Figure 7 with the end portions 33 and 34 spaced apart, the fuse 16 is inserted in position. This is accomplished by placing the prong of the tool in the opening in the eye member 26 and lifting the fuse 16 to such position that the trunnions 24 interfit with the hook member 25. The ferrules 18 and 19 then are positioned properly in the respective upper and lower fuse clip 15. Next the prong of the tool is inserted in the bowl 67 of the fuse clips 15 one after the other and the lever arms 63 are swung to the clamping positions, such as the positions shown by the broken lines in Figure 7. When this takes place the end portions 33 and 34 are moved toward each other into gripping relation with respect to the flat sides of the respective upper or lower fuse tube ferrule that is positioned therebetween. When the fuse 16 is to be removed, as when it has blown, this sequence of operations is reversed. When the lever arms 63 are swung to the released positions, the respective fuse clip spring 43 in each fuse clip functions to move the end portions 33 and 34 out of engagement with the flat sides of the respective fuse tube ferrule. The fuse 16 then can readily be removed and replaced by an unblown fuse.

Since certain changes can be made in the foregoing construction and different embodiments of the invention can be made without departing from the spirit and scope thereof, it is intended that all matter shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

What is claimed as new is:

1. A contact assembly for gripping the opposite flat sides of a fuse tube ferrule comprising, in combination, a generally U-shaped fuse clip having a flat bottom and flat sides the outer end portions of which are turned inwardly generally parallel thereto for engaging said flat sides of said fuse tube ferrule, a generally U-shaped fuse clip spring nested with said fuse clip and having a flat bottom overlying and secured to the flat bottom thereof with flat sides extending between said flat sides of said fuse clip and said inturned outer end portions thereof, each flat side of said fuse clip spring being bowed outwardly with the outermost bowed portion bearing against the inner side of the corresponding flat side of said fuse clip and acting to bias the same and said inturned outer end portions apart for receiving said fuse tube ferrule and the outer end bearing against the inner side of the corresponding inturned outer end portion of said fuse clip, and operating means for moving said flat sides of said fuse clip relatively toward each other against the biasing force of said fuse clip spring and through said outer ends thereof relatively moving said inturned outer end portions of said fuse clip into gripping engagement with said flat sides of said fuse tube ferrule.

2. A contact assembly for gripping the opposite flat sides of a fuse tube ferrule comprising, in combination, a generally U-shaped fuse clip having a flat bottom and flat sides the outer end portions of which are turned inwardly generally parallel thereto for engaging said flat sides of said fuse tube ferrule, a generally U-shaped fuse clip spring nested with said fuse clip and having a flat bottom overlying and secured to the flat bottom thereof with flat sides extending between said flat sides of said fuse clip and said inturned outer end portions thereof, each flat side of said fuse clip spring being bowed outwardly with the bowed portion formed by a relatively long leg extending from said flat bottom thereof and a relatively short leg whose outer end bears against the inner side of the corresponding inturned outer end portion of said fuse clip, the junction of said legs bearing against the inner side of the corresponding flat side of said fuse clip and acting to bias the same and said inturned outer end portions apart for receiving said fuse tube ferrule, and operating means for moving said flat sides of said fuse clip relatively toward each other against the biasing force of said fuse clip spring and through said short legs thereof relatively moving said inturned outer end portions of said fuse clip into gripping engagement with said flat sides of said fuse tube ferrule.

3. A contact assembly for gripping the opposite flat sides of a fuse tube ferrule comprising, in combination, a generally U-shaped fuse clip having a flat bottom and flat sides the outer end portions of which are turned inwardly generally parallel thereto for engaging said flat sides of said fuse tube ferrule, one of said flat sides of said fuse clip having a pair of integrally formed outwardly extending laterally spaced cams adjacent said flat bottom, a generally U-shaped fuse clip spring nested with said fuse clip and having a flat bottom overlying and secured to the flat bottom thereof with flat sides extending between said flat sides of said fuse clip and said inturned outer end portions thereof, each flat side of said fuse clip spring being bowed outwardly with the outermost bowed portion bearing against the inner side of the corresponding flat side of said fuse clip and acting to bias the same and said inturned outer end portions apart for receiving said fuse tube ferrule and the outer end bearing against the inner side of the corresponding inturned outer end portion of said fuse clip, a shaft extending through said flat sides of said fuse clip spring and of said fuse clip centrally of said laterally spaced cams, restraining means on one end of said shaft reacting against the other of said flat sides of said fuse clip, and a lever arm at the other end of said shaft having a pair of laterally spaced cams for cooperating with said cams on said one flat side of said fuse clip to move said flat sides thereof relatively toward each other and thereby through said outer ends of said fuse clip spring relatively moving said inturned outer end portions of said fuse clip into gripping engagement with said flat sides of said fuse tube ferrule.

4. A contact assembly for gripping the opposite flat sides of a fuse tube ferrule comprising, in combination, a generally U-shaped fuse clip having a flat bottom and flat sides the outer end portions of which are turned inwardly generally parallel thereto for engaging said flat sides of said fuse tube ferrule, one of said flat sides of said fuse clip having a pair of integrally formed outwardly extending laterally spaced cams adja-

cent said flat bottom, a generally U-shaped fuse clip spring nested with said fuse clip and having a flat bottom overlying and secured to the flat bottom thereof with flat sides extending between said flat sides of said fuse clip and said inturned outer end portions thereof, each flat side of said fuse clip spring being bowed outwardly with the bowed portion formed by a relatively long leg extending from said flat bottom thereof and a relatively short leg whose outer end bears against the inner side of the corresponding inturned outer end portion of said fuse clip, the junction of said legs bearing against the inner side of the corresponding flat side of said fuse clip and acting to bias the same and said inturned outer end portions apart for receiving said fuse tube ferrule, a rotatable shaft extending through said flat sides of said fuse clip spring and of said fuse clip centrally of said laterally spaced cams, restraining means on one end of said shaft reacting against the other of said flat sides of said fuse clip, and a lever arm at the other end of said shaft having a pair of laterally spaced cams for cooperating with said cams on said one flat side of said fuse clip to move said flat sides thereof relatively toward each other and thereby through said short legs of said fuse clip spring relatively moving said inturned outer end portions of said fuse clip into gripping engagement with said flat sides of said fuse tube ferrule.

5. A contact assembly for gripping the opposite flat sides of a fuse tube ferrule comprising, in combination, a generally U-shaped fuse clip having a flat bottom and flat sides the outer end portions of which are turned inwardly generally parallel thereto for engaging said flat sides of said fuse tube ferrule with the extreme end portions extending toward each other to provide a stop for said ferrule against inward movement, said outer end portions having nibs extending toward each other providing a stop for said ferrule against outward movement, one of said flat sides of said fuse clip having a pair of integrally formed outwardly extending laterally spaced

cams adjacent said flat bottom and the other of said flat sides having an outwardly extending stiffening boss opposite said cams, a generally U-shaped fuse clip spring nested with said fuse clip and having a flat bottom overlying and secured to the flat bottom thereof with flat sides extending between said flat sides of said fuse clip and said inturned outer end portions thereof, each flat side of said fuse clip spring being bowed outwardly with the bowed portion formed by a relatively long leg extending from said flat bottom thereof and a relatively short leg whose outer end bears against the inner side of the corresponding inturned outer end portion of said fuse clip, the junction of said legs bearing against the inner side of the corresponding flat side of said fuse clip and acting to bias the same and said inturned outer end portions apart for receiving said fuse tube ferrule, a rotatable shaft extending through said flat sides of said fuse clip spring and of said fuse clip centrally of said laterally spaced cams and said stiffening boss, a restraining nut on one end of said shaft reacting against said stiffening boss, and a lever arm secured to the other end of said shaft and having a pair of laterally spaced cams for cooperating with said cams on said one flat side of said fuse clip to move said flat sides thereof relatively toward each other and thereby through said short legs of said fuse clip spring relatively moving said inturned outer end portions of said fuse clip into gripping engagement with said flat sides of said fuse tube ferrule.

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