

June 30, 1953

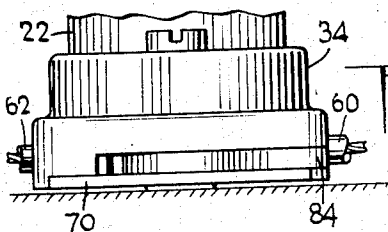
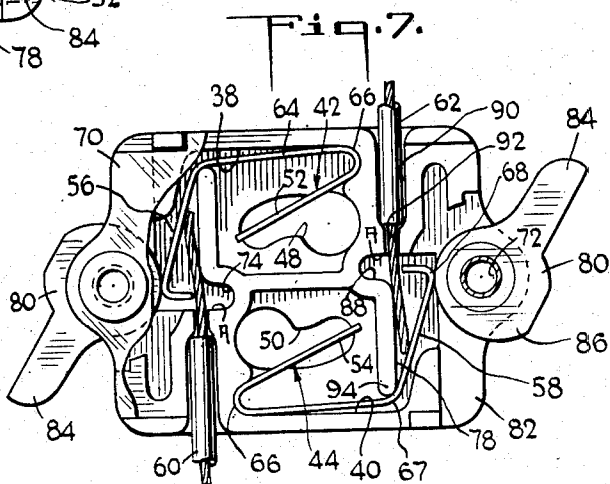
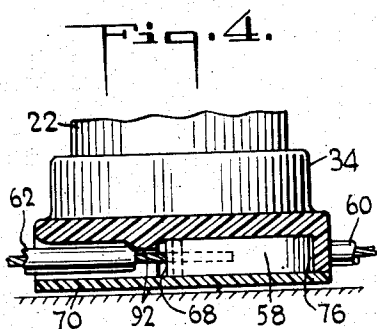
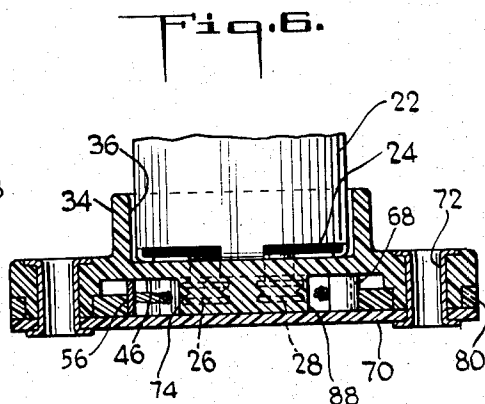
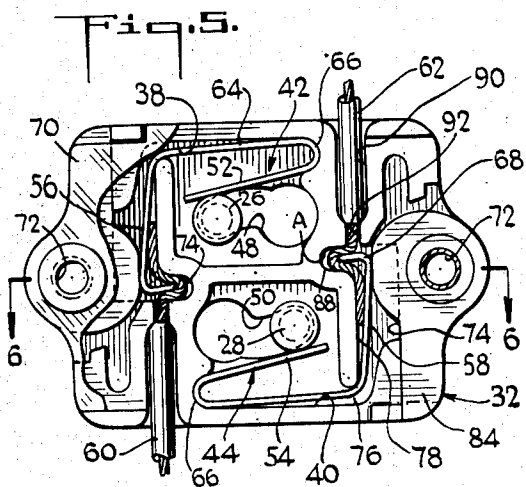
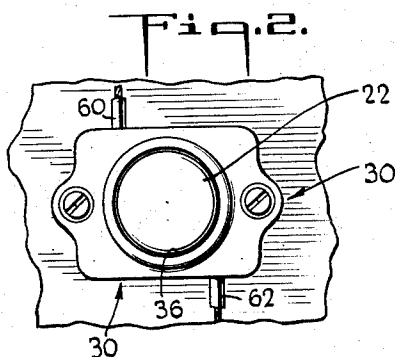
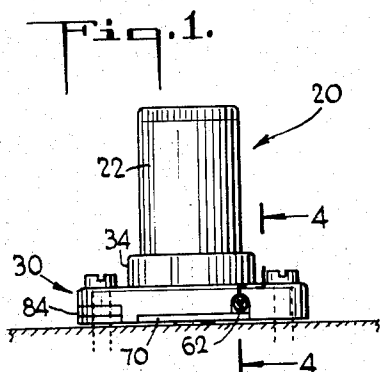
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2,644,144

TERMINAL FOR ELECTRIC FIXTURES

Filed Oct. 26, 1949

2 Sheets-Sheet 1



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TERMINAL FOR ELECTRIC FIXTURES

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2 Sheets-Sheet 2

Fig. 8.

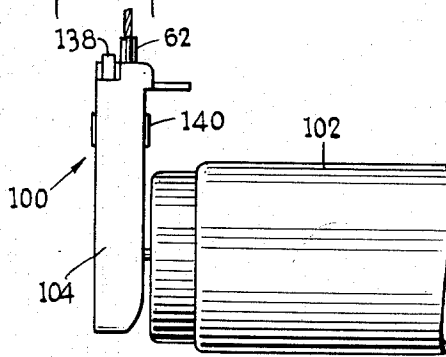


Fig. 9.

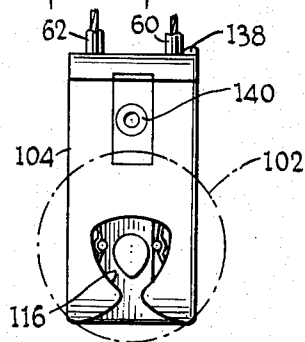


Fig. 11.

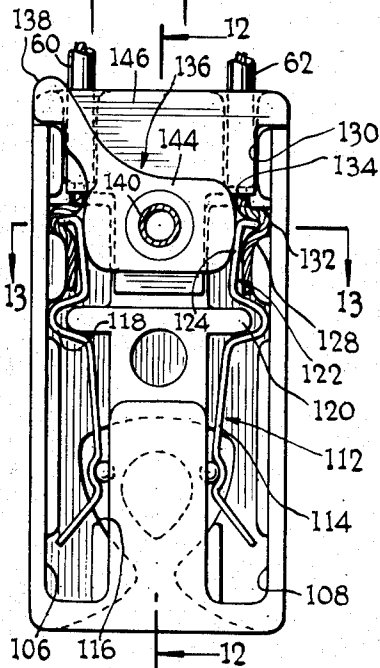


Fig. 12.

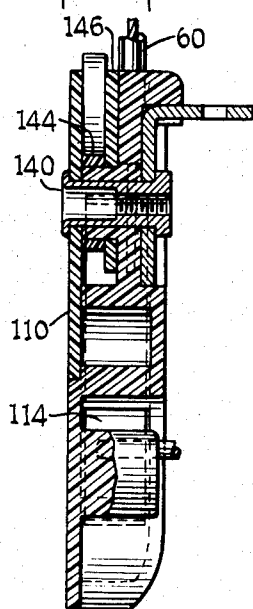


Fig. 14.

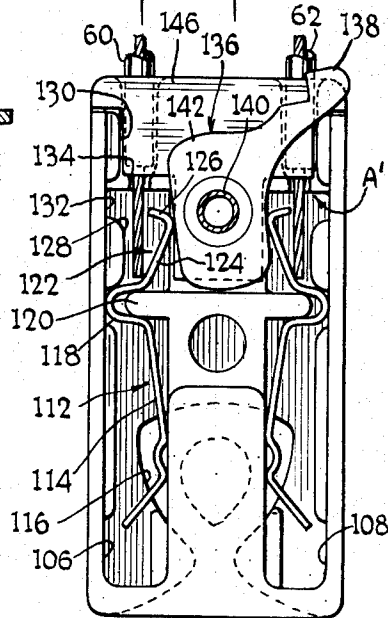


Fig. 13.

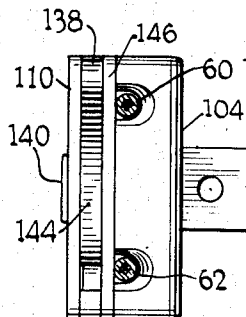
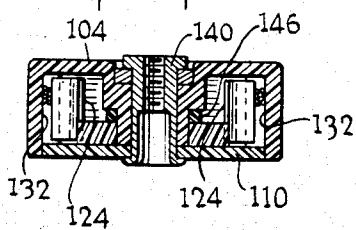


Fig. 10.

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TERMINAL FOR ELECTRIC FIXTURES

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Application October 26, 1949, Serial No. 123,767

9 Claims. (Cl. 339—189)

1

2

This invention relates to terminals for electric fixtures.

The actual terminals shown and described in the instant application are specifically designed to be used in sockets for fluorescent electric lamp starters and sockets for the lamps themselves, but it is to be understood that these particular embodiments of the invention are given by way of example only and are not to be interpreted as limitative.

A terminal of the type to which the present invention relates in general comprises a body of electrically non-conductive material, having a wire passageway with a laterally extending branch or notch. An electrically conductive member projects into the notch and forces wire into the same causing the wire to take the shape of a U with the legs of the U on opposite sides of the conductive member. This arrangement is intended to lock the wire in the body. Restraint against displacement of the wire is exercised by resistance of the wire to flow through the passageway defined by the recess and conductive member and frictional engagement between the wire and the walls of said passageway. However, in practice, due to manufacturing tolerances and the use of wires of slightly varying diameters, the frictional restraint usually is slight and, as a result, terminals of this type are not reliable and do not uniformly withstand the pull on the wire.

It is an object of my invention to provide an improved terminal of the character described whose operation is not affected by manufacturing tolerances and minor variations in wire size, and offers a uniform resistance to wire pull.

It is another object of my invention to provide a terminal of the character described which comprises very few and simple parts, can be produced at a low cost, and is rugged and efficient in operation.

It is another object of my invention to provide a terminal of the character described which can be manipulated by hand alone, i. e. without the use of tools or wrenches.

It is another object of my invention to provide a terminal of the character described which makes a good electric contact with a wire.

It is another object of my invention to provide a terminal of the character described in which the operating element is so constructed and arranged that it can be worked with ease.

Other objects of my invention will in part be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the fea-

tures of construction, combinations of elements and arrangements of parts which will be exemplified in the devices hereinafter described and of which the scope of application will be indicated in the appended claims.

The present invention is a continuation-in-part of my copending application, Serial No. 711,245 for Electric Connectors filed November 21, 1946, now abandoned.

In the accompanying drawings in which are shown various possible embodiments of my invention,

Fig. 1 is a front view of a starter for a fluorescent lamp, said starter being mounted in a socket having terminals constructed in accordance with the present invention;

Fig. 2 is a top view of the starter and socket shown in Fig. 1;

Fig. 3 is an enlarged end view of the socket;

Fig. 4 is an enlarged sectional view taken substantially along the line 4—4 of Fig. 1;

Fig. 5 is a rear view of the socket with its closure plate removed and with lead wires clamped in place;

Fig. 6 is a sectional view taken substantially along the line 6—6 of Fig. 5;

Fig. 7 is a view similar to Fig. 5 of the socket as it appears after the lead wires have been inserted, but before they have been clamped;

Fig. 8 is a side view of a fluorescent lamp socket having terminals constructed in accordance with the present invention;

Fig. 9 is a front view of the socket shown in Fig. 8;

Fig. 10 is a top view of said socket;

Fig. 11 is a rear view of the socket with the closure plate removed and with lead wires clamped in place;

Figs. 12 and 13 are sectional views taken substantially along the lines 12—12 and 13—13 of Fig. 11; and

Fig. 14 is a view similar to Fig. 11, showing the socket as it appears with the wires inserted but before they have been clamped.

Essentially the principal objects of my invention are achieved by making the conductive member, hereinabove referred to, both flexible and resilient instead of comparatively stiff as heretofore, although said member still must be resistant enough to bending to be able to force a wire into a U-shaped configuration in the notch.

For the foregoing purpose, in the terminals of my invention hereinafter described, the conductive member is fabricated from flat resilient electrically conductive stock, such for instance as

3

Phosphor-bronze strip, which is sufficiently thin to be flexible, and said member is prevented from becoming too flexible by not making the strip overly thin and by keeping short the length thereof which presses wire into the recess.

Certain ancillary features of my invention are achieved by having the conductive member biased to a position in which it leaves the wire passageway and recess clear and by employing a rotary cam for effecting movement of said member against this bias, the cam having a manipulatory tab so that operation of the terminal is a very simple matter.

Referring now in detail to the drawings and more particularly Figs. 1 through 7, the reference numeral 20 denotes a starter of a type conventionally employed to place a hot starting fluorescent lamp in operation. By way of example the starter comprises a cylindrical metal can 22, one end of which is closed by a disc 24 of electric insulating material through which a pair of terminal studs 26, 28 extend. These studs are electrically connected to a conventional starting switch located within the can.

The starter is removably received in a socket 30 whose purpose it is to connect said starter in the operating circuit for a fluorescent lamp. To this end, said socket comprises a block 32 of electrical insulating material from the upper surface of which an integral annular flange 34 extends to form a well 36 for receiving the end of the starter can from which the studs 26, 28 project. The undersurface of the block is fashioned with two recesses 38, 40 in which blade contacts 42, 44 are disposed. This arrangement results in the formation of a partition 46 across the base of the well 36. Said partition has a pair of arcuate concentric keyhole slots 48, 50, one running from each of the recesses 38, 40 to the well 36. Said slots are designed to accommodate the studs 26, 28, the larger portions of the slots being adapted to pass the enlarged heads of the studs and the smaller portions of the slots being adapted to accommodate the reduced shanks of the studs.

The blades 42, 44 include portions 52, 54 which are adapted to engage the starter studs 26, 28, these being in one piece with reaches 56, 58 that are adapted to engage the lead wires 60, 62 for placing the starter in a conventional fluorescent lamp circuit. The portions 52, 54 are of any standard configuration, for example straight, as shown.

Said blades are formed from a length of flat resilient electrically conductive stock, such for instance as a Phosphor bronze strip. In one piece with each stud engaging portion is a shank 64 which is connected to its corresponding portion by a return band 66. Each shank is connected to its associated reach 56, 58 by a right-angle bend 67. At the tip of each reach is a contact member 68 in the shape of a short toe disposed at an angle to the reach. This contact member is the "conductive member" hereinabove mentioned. Preferably the toe forms an acute angle with the reach, that is to say, an angle less than 90°. A toe at an angle of 75° functions satisfactorily.

It may be mentioned here that it is convenient from a manufacturing standpoint to make the stud engaging portions, shanks, reaches and contact members all in one piece. When such arrangement is employed, all these parts are flexible and resilient inasmuch as resiliency and flexibility are necessary in the stud engaging portions and/or their supports, in the contact members and in the supports for the contact members.

4

The resiliency of the contact member support is for biasing the contact members away from wire engaging position. The resiliency of the stud engaging portions and/or their supports is to enable the portions properly to engage the studs of the starter cam. The resiliency and flexibility of the contact members is to enable these latter to function in accordance with my invention as will be described in detail hereinafter. It is within the scope of my invention to have the blades made of several pieces or of non-uniform sections so that resiliency and flexibility is present only where necessary for operation.

The recesses 38, 40 are covered by a closure plate 70 held in position in any suitable manner, as for example by means of hollow rivets 72 extending through registered openings in the block 32 and plate 70 and having their ends flanged out.

Further pursuant to my present invention the back surface of the block includes a pair of recesses 74 which function as a part of the terminal construction. Said recesses are connected by channels 76 to the recesses 38, 40 and the right-angle bends 67 are disposed in these channels. The reaches 58, bends 66, 67 and shanks 64 are so shaped and are so held in the block 32 by suitable shaping of the recesses 38, 40 and channels 76 that when the reaches are unstressed, each reach is biased to an idle position away from the inner wall 78 of its associated recess 74, as illustrated in Fig. 7.

Means also is provided for forcing each reach toward its adjacent wall 78. In the form of the invention shown herein said means comprises a rotary member such as a cam 80. The cam is located at a side of the block in a shallow recess 82 that communicates with the recess 74. Said cam is made from an electrical insulating material and is journaled on the rivet 72. A radial tab 84 in one piece with the cam serves as a manipulatory handle therefore. Said cam has a flat lobe 86 which is the operative portion of the cam and is at the portion of maximum radius. The remainder of the cam surface is of lesser radius.

It will be apparent that when the cam is in the position illustrated in Fig. 7 with its smallest radius facing the reach, said reach will be remote from the wall 78. As the cam is turned approximately 150°, in a clockwise direction as viewed in Fig. 7, to the position shown in Fig. 5, the flat lobe will engage the reach and urge the same to a position adjacent the wall 78. In such position the tab 84 is received within the shallow recess 82.

The recess 74 has a laterally extending notch 88 running in a direction generally at right angles to the wall 78. The center of this notch is approximately aligned with the contact member 68 when the cam is in its operative position shown in Fig. 5.

The block includes a bore or wire passageway 90 which extends from an outer side thereof toward and into communication with the recess 74. Said bore meets the cavity at the mouth of the notch 88, being oriented transversely of the notch so that, if a lead wire is introduced into the bore 90 when the cam is in its idle position shown in Fig. 7, the end of the wire will extend across the mouth of the notch. The inner end of the bore adjacent the recess 74 is constricted as indicated at 92, there being a gradual narrowing of the bore into said constricted portion.

In the operation of the device the cam is moved

5

to its idle (Fig. 7) position. The end of a lead wire is stripped of its insulating sheath and is introduced into the bore 90. Insertion of the wire will be limited by crowding of the sheath in the gradually constricting end of said bore. The length of bare stripped wire is such that when insertion of the wire is limited in the foregoing fashion, the bare part extends through the constricted opening 92 across the mouth of the recess 88 and a short distance along the wall 78. It will be observed that when the conductor wire is inserted the reach 58 is away from the wall 78 so as not to interfere with proper placement of the wire. Next the tab 84 is manipulated to rotate the cam 80, thus forcing the contact member 68 into the recess 88 and nesting the tab in the recess 82. As this occurs the contact member bends the bare wire beneath it into the shape of a U.

This bending action by itself is the same as the bending to which wire is subjected in prior art terminals of the same general type. However, the locking actions differ because of the flexibility of the contact member 68. When the wire is pulled, said contact member flexes toward the wall A of the notch adjacent the bore 90 and in so doing presses the wire against this wall and exerts such a strong clamping action that the wire will break before it will pull out.

In order for the contact member to flex in the foregoing fashion, thin stock should be employed for its fabrication. I have secured excellent results when said stock constitutes a flat Phosphor bronze strip having a thickness of 0.015 inch, the terminal being used to secure in place a CF No. 18 wire such as conventionally is used with fluorescent fixtures. A satisfactory length for a contact member of such thickness is $\frac{1}{8}$ of an inch.

The depth of the notch should exceed the diameter of the wire held by the terminal; and I have observed that, where this depth is at least 1.5 times the diameter of the wire, best results are secured since this makes it certain that when the wire is pulled the tip of the contact member will force the wire against the wall A of the notch 88. By the same token the length of the contact member preferably is such that its tip extends into the notch a distance at least one-half the diameter of the wire to be used. A greater length of contact member and a correspondingly greater depth of notch does not affect the operation of my invention, providing that the contact member is not made so long that, due to a tendency to buckle or bend, it is unable to force wire into the notch. If desired, the notch can be deeper than the distance the wire is forced into the same.

The width of the notch should be at least sufficient to permit the contact member to push the wire therein in the shape of a U with the contact member between the legs of the same. Inasmuch as untinned stranded wire flattens when pressed, a satisfactory width of notch for the accommodation of such wire is 1.5 times the diameter of the wire. However, my invention functions just as well where the notch is wider, for example twice or 2.5 times the diameter of the wire. A notch of such greater width is desirable since it permits the terminal to be used with stranded wire which is tinned and does not flatten.

An even greater width of notch is permissible provided that the contact member is maintained close enough to the wall A of the notch 88 against which it presses a wire when the latter is pulled.

6

A distance between said member and the wall A up to about $1\frac{1}{2}$ times the diameter of the wire will enable the terminal to operate in a satisfactory manner. The spacing between said member and the wall A can be controlled through the length of the shank, the position of the wall A and the position of a stop 94 against which the bend 67 abuts.

In Figs. 8 through 14 I have shown a socket 100 embodying a modified form of my invention and designed to physically support and supply electric energy to one end of a hot starting fluorescent lamp 102. The socket construction is of the well-known twist type and differs from a conventional twist type socket only in its terminals.

Said socket includes a body 104 of insulating material whose rear face is provided with a pair of recesses 106, 108 covered by a closure plate 110. These recesses are mirror images of one another so only one will be described in detail. Each recess contains a blade 112 of thin Phosphor bronze strip stock, a portion 114 of which is fashioned in a conventional shape which is designed to engage a lamp pin that extends through an opening 116 in the front surface of the body 104. The blade is anchored by means of an integral U-shaped portion 118 which engages a rib 120 molded in the body.

Extending away from said anchoring portion is the terminal part 122 of the blade. Said part includes a reach 124 and a toe 126, the latter constituting a wire engaging or contact member. The terminal part 122 of the blade is disposed in a cavity 128 into which a wire passageway 130 runs, the cavity including a laterally extending notch 132. The reach 124 is of such shape that, when unstressed, it maintains the contact member away from the notch 132. However, upon flexing of the reach outwardly toward the side of the body, the contact member will enter said notch. A portion of the wire passageway 130 immediately adjacent the notch 132 is constricted as indicated at 134. When a lead wire is clamped in the terminal, a pull thereon causes the contact member to flex towards the wall A' of the notch 134 and press the wire against this wall.

A cam 136 is provided to flex the reach 124 outwardly. Said cam is fashioned from insulating material and includes a manipulatory handle 138. The cam is mounted on a hollow rivet 140 fixed in the body 104, said rivet also being employed to hold the closure plate 110 in position. The cam is located between the reaches 124 of the two blades so that but a single cam is necessary to flex both reaches. The cam accordingly is provided with two lobes 142 and two low points 144. The latter engage the reaches when the contact members are backed out of the notches and the former engage said reaches when the contact members are within the notches.

With a single cam operating the reaches of both blades, the manipulatory handle tends to block one or the other wire passageways (see Figs. 11 and 14). This is avoided by having the thickness of the cam less than the width of the blades and thus providing between the cam and the lamp side of the body a space to accommodate the wire passageways. In order better to define the wire passageways 130 and thus prevent the lead wires introduced into said passageways from being improperly positioned with respect to the terminals, and more particularly to insure that the lead wires are kept level with the

notches so that they can be properly clamped, I provide a partition 146 between the cam and wire passageways. Said partition is held in place by the hollow rivet 140.

It will be observed that in the socket 100 a single cam operates a plurality of terminals and said cam operates in a plane offset from the plane of the wire passageways.

The terminals of the socket 100 function in the same fashion as those of the socket 20.

It thus will be seen that I have provided devices which achieve all the objects of my invention and are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A terminal for an electric fixture, said terminal comprising an electrically nonconductive body having a wire passageway extending inwardly from the outer surface thereof and including a lateral notch, a flexible, resilient, elongated, blunt, electrically conductive terminal element in said passageway adjacent said notch, means to mount said element for movement into and out of said notch in the direction of its length whereby when the element is moved into the notch with a wire in the passageway extending across the notch, said element will force the wire into the notch in the shape of a U, said mounting means being disposed to locate said element close to that wall of the notch which is nearer the end of the passageway through which the wire enters, whereby when a wire forced into the notch by the element is pulled the element will flex toward said wall and clamp the wire thereagainst, and means mounted on and movable relative to said body to force said element into said notch, said forcing means being disposed to act adjacent the end of said element remote from the notch.

2. A terminal as set forth in claim 1 wherein the mounting means is resilient and biases the element away from the notch.

3. A mounting means as set forth in claim 1 wherein the flexible element is short so that it

will not buckle or bend when forcing the wire into the notch.

4. A terminal as set forth in claim 1 wherein the distance from the element to the mentioned wall of the notch does not exceed 1.5 times the diameter of the wire to be engaged by the terminal.

5. A terminal as set forth in claim 1 wherein the width of the notch does not exceed 2.5 times the diameter of wire to be engaged by the terminal.

6. A terminal as set forth in claim 1 wherein the distance from the element to the mentioned wall of the notch does not exceed 1.5 times the diameter of wire to be engaged by the terminal, and wherein the depth of the notch is at least 1.5 times the diameter of said wire.

7. A terminal as set forth in claim 1 wherein the distance from the element to the mentioned wall of the notch does not exceed 1.5 times the diameter of wire to be engaged by the terminal, wherein the depth of the notch is at least 1.5 times the diameter of said wire, and wherein the tip of the element extends into the notch at least one-half the diameter of said wire.

8. A terminal as set forth in claim 1 wherein the mounting means constitutes a flexible, resilient, elongated electrically conductive strip and wherein the flexible element constitutes an elongated toe angularly extending away from an end of the strip.

9. A terminal as set forth in claim 1 wherein the means mounted on and movable relative to the body for forcing the element into the notch constitutes a cam rotatably mounted within the body.

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