

Sept. 15, 1964

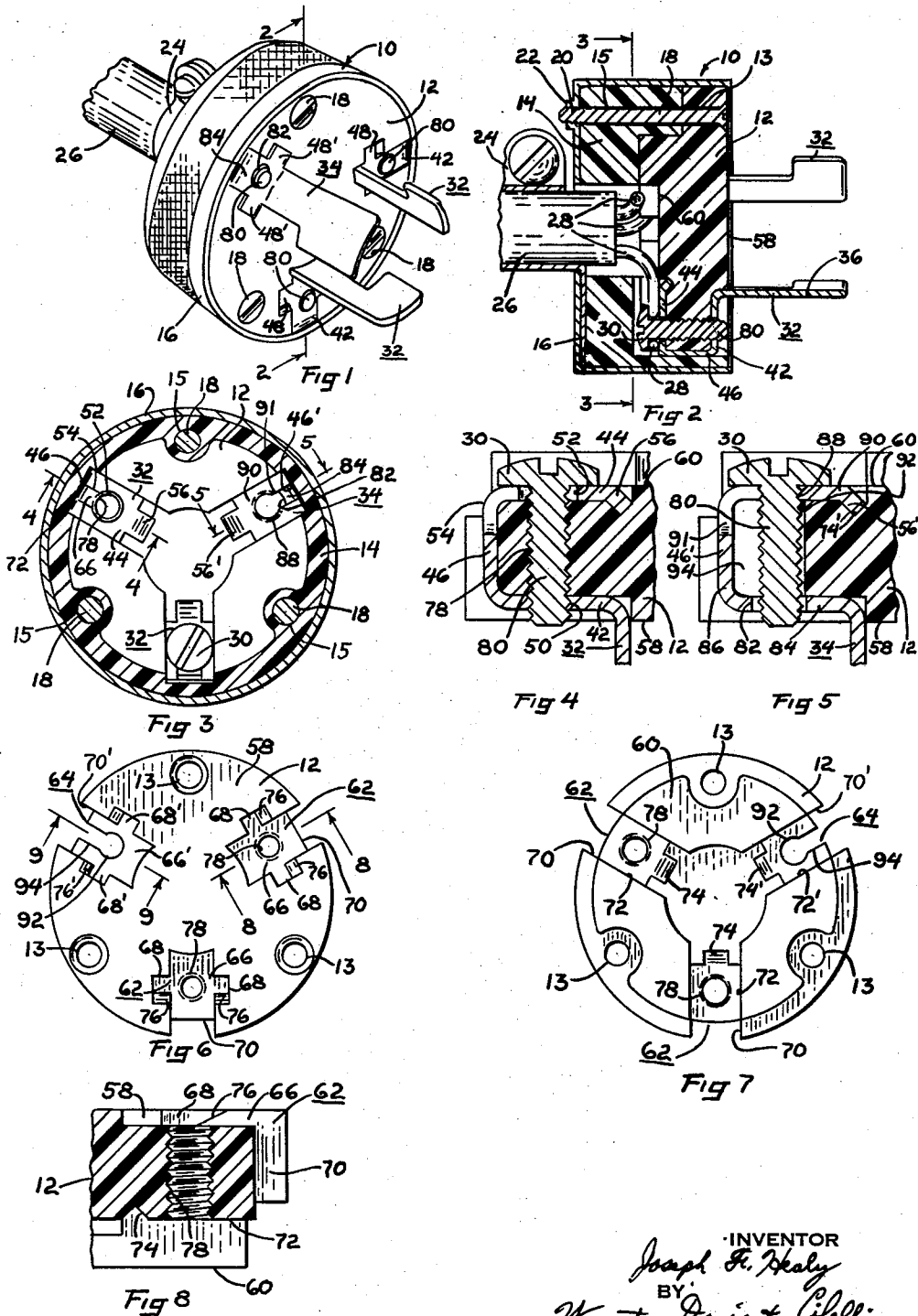
J. F. HEALY

3,148,930

ELECTRICAL CONNECTOR HAVING IMPROVED CONTACT-TERMINAL MEANS

Filed Dec. 11, 1961

2 Sheets-Sheet 1



INVENTOR
Joseph F. Healy
BY
Worster, Davis & Cifelli
ATTORNEYS

Sept. 15, 1964

J. F. HEALY

3,148,930

ELECTRICAL CONNECTOR HAVING IMPROVED CONTACT-TERMINAL MEANS

Filed Dec. 11, 1961

2 Sheets-Sheet 2

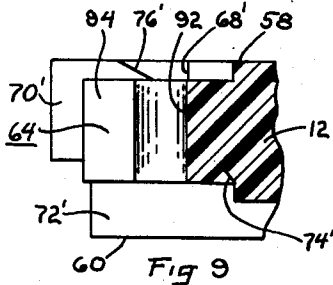


Fig 9

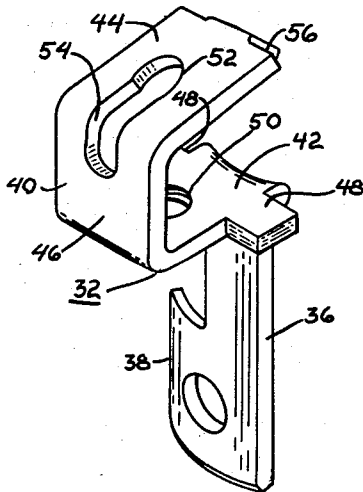


Fig 11

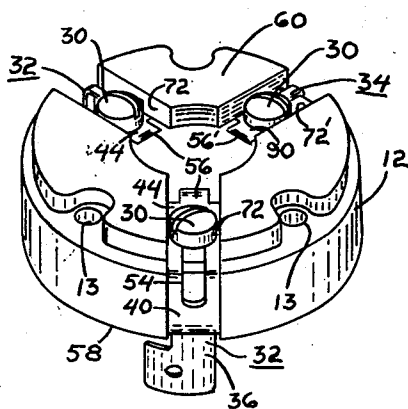


Fig 13

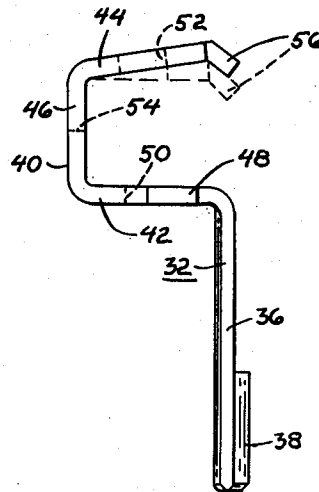


Fig 10

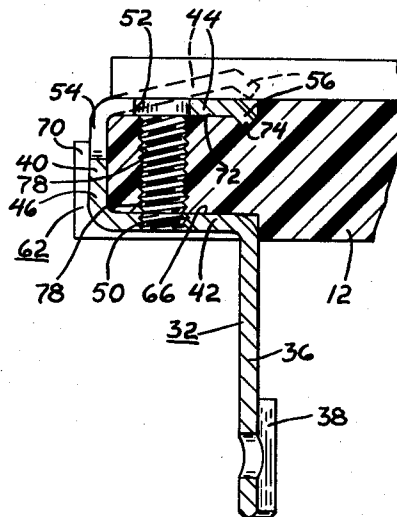


Fig 12

INVENTOR
Joseph F. Healy
BY
Wooten, Davis & Cipelli
ATTORNEYS

1

3,148,930

ELECTRICAL CONNECTOR HAVING IMPROVED CONTACT-TERMINAL MEANS

Joseph F. Healy, Westport, Conn., assignor to Harvey Hubbell, Incorporated, Bridgeport, Conn., a corporation of Connecticut

Filed Dec. 11, 1961, Ser. No. 158,283

4 Claims. (Cl. 339-196)

This invention relates generally to electrical cable or cord connectors and particularly to improvements therein in the construction and mounting of the contact-terminal means thereof.

In electrical connectors of the connector body and cap type which are designed to effect and permit selective connection and disconnection of electrical cable or cord, it is necessary and conventional to include in each connector component electrical contact means and electrical terminal means for effecting electrical connection of the usual wires of the cable or cord to the contact means. Usually the connector component comprises a body of electrical insulation material, frequently a suitable plastic material, to which is physically attached the contact means and the terminal means, which are usually electrical conducting metallic members. In the usual arrangement, the contact means is disposed to be accessible from the exterior of the connector component to be available for operative association with the cooperating contact means of an associated connector component, and the electrical wires of the cable or cord are connected to the terminal means therefor on the interior of the connector component, which usually includes a protective housing and/or shell of some type. Frequently the contact means and the terminal means are mounted on spaced walls on opposite sides of the electrical insulation body, one on the exterior and the other on the interior thereof. As it is necessary that the contact means and terminal means be electrically connected, this connection is frequently effected by the provision of a metallic bushing which is disposed in and extends through the electrical insulation body completely through the walls thereof, and has an end thereof projecting through one wall of the body and connected to the contact means and the opposite end thereof projecting through the other wall of the body and connected to the terminal means. The connections or joints between the bushing ends and the contact means and terminal means are usually effected by spinning over the bushing ends. This arrangement is widely employed in practice in the electrical wiring device industry. It has been ascertained in practice, however, that this arrangement is less than completely satisfactory. For example, it has been ascertained in practice that the quality of the joints between the respective bushing ends and the terminal means and the contact means is variable as it is dependent upon the nature of the spun-over connections between the bushing ends and the contact means and terminal means. It has been found in practice that the quality of these joints is dependent upon the amount of pressure applied by the operator of the machine which spins over the ends of the bushings to form the joints. It has also been found in practice that the prior art arrangement provides two locations, namely, the joints between the bushing ends and the contact means and terminal means, where overheating and structural failure frequently occur.

It is a further object of the invention to provide an electrical connectors having improved contact-terminal means, and particularly wherein such improved contact-terminal means includes the provision for direct electrical connection between the usual terminal binding screws forming a part of the terminal means and the contacts of

2

the contact means without the presence of any intervening joints.

It is another object of the invention to provide an improved electrical connector as set forth in the preceding paragraph which, though functionally superior to prior art constructions, is less costly to manufacture.

It is still another object of the invention to provide an improved electrical connector wherein the contact-terminal means is structurally stronger and more durable than prior art arrangements.

It is a further object of the invention to provide an improved electrical connector wherein the usual bushing which connects the usual terminal plate and the usual contact mounting plate is eliminated, along with the usual joints at the bushing ends.

It is a still further object of the invention to provide an improved contact-terminal construction and mounting for an electrical wiring device wherein the contact-terminal means comprises essentially a unitary contact-terminal member which is mounted on a body of plastic insulation material and which when mounted thereon is retained thereon by its own form.

Other objects and further details of that which I believe to be novel and my invention will be clear from the following description and claims taken with the accompanying drawings, wherein:

FIG. 1 is a perspective view of an electrical connector cap which incorporates the invention;

FIG. 2 is a longitudinal sectional view thereof taken substantially on line 2-2 of FIG. 1;

FIG. 3 is a sectional view thereof taken substantially on line 3-3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken substantially on line 4-4 of FIG. 3 with portions omitted for the sake of clarity;

FIG. 5 is an enlarged sectional view taken substantially on line 5-5 of FIG. 3 with portions omitted for the sake of clarity;

FIG. 6 is a bottom plan view of the insulation base per se which forms a part of the body of the cap;

FIG. 7 is a top plan view thereof;

FIG. 8 is an enlarged sectional view taken on line 8-8 of FIG. 6;

FIG. 9 is an enlarged sectional view taken on line 9-9 of FIG. 6;

FIG. 10 is an enlarged side elevational view of a contact-terminal member illustrated in solid lines in the original position it occupies prior to being fully mounted on the cap base and with the upper leg thereof shown in dotted lines in the position which it occupies when fully mounted;

FIG. 11 is a perspective view thereof;

FIG. 12 is a sectional view showing in solid lines a contact-terminal member mounted on the cap base, and showing the upper leg of the member in dotted lines in the original position which it occupies prior to final assembly, and

FIG. 13 is a top perspective view of a cap base showing three contact-terminal members mounted thereon.

In the drawings there is illustrated an electrical connector cap which incorporates the invention wherein the novel contact-terminal means thereof include male contact blades; however, it should be fully understood that the improved contact-terminal means and their mounting may be incorporated into other types of electrical wiring devices, such as connector bodies or receptacles where female contacts are employed, and that the disclosure in detail of the invention herein in an electrical connector cap is merely exemplary of one particularly useful application of the invention. It should be particularly realized that the improved contact-terminal means may

3

be incorporated into bases for tubes, such as electronic and photoelectric tubes.

The disclosed electrical connector cap is designated generally by reference numeral 10 and it generally comprises a two-part body preferably made of a suitable plastic electrical insulation material which parts herein will be referred to for convenience as the base 12 and the top 14, and a cylindrical outer metallic shell 16 which is assembled to the base 12 and the top 14 by a plurality of tie bolts 18 which pass through aligned openings 13 and 15, respectively, in the parts and have their threaded ends 20 anchored in threaded bosses 22 formed in the top wall of shell 16. The cap 10 also includes a plurality of uniquely constructed and mounted contact-terminal members which will hereinafter be described in greater detail, and a suitable known cord grip 24 for gripping and strain-relieving an electrical cable or cord 26 having a plurality of bared electrical wires 28 which are individually electrically connected to the terminal portions of the contact-terminal members by binding screws 30. As illustrated in FIG. 1, the contact portion of one of the terminal-contact members is formed of a different configuration from the other two so as to function as a key for controlling insertion of the cap into a cooperating connector body or receptacle in a predetermined manner, and each of the contact portions includes a laterally extending portion which functions as an interlocking lug. The number of contact portions and their particular configurations form no specific part of the invention; however, as illustrated, there are three interlocking contact blades, one of which is distinctively configured and may conveniently function as a grounding contact.

The invention has particular regard with relation to the base 12, the terminal-contact members and the mounting of the latter on the former. There are three contact-terminal members illustrated in the drawings; however, two of them are constructed and mounted in a similar manner, and the third is constructed and mounted in a different manner. Therefore, the two similar members are generally designated by the same reference numeral 32, and the third by reference numeral 34 and each will be separately described in detail. With reference to FIGS. 10 and 11, a terminal-contact member 32 may be observed. It comprises essentially a bent strip of metal including a slightly cross-sectionally curved elongated blade portion 36 having a lateral lug 38 formed thereon at its free end and a C-shaped mounting portion 40 comprising generally parallel spaced lower and upper legs 42, 44, respectively, connected at adjacent ends by connecting leg 46. The end of lower leg 42 opposite the one connected to connecting leg 46 is connected to the upper end of blade portion 36. Adjacent to the connection of lower leg 42 and blade portion 36 on opposite sides of leg 42 extends a pair of locating tabs 48. Centrally of and in the lower leg 42 is formed a threaded opening 50. In the upper leg 44 there is formed a plain opening 52 of larger diameter than opening 50, which openings are coaxially aligned when the terminal-contact member is fully mounted on base 12, as shown in FIG. 12. A slot 54 of narrower width than the diameter of the opening 52 but communicating therewith at one side thereof is formed through adjacent portions of the upper leg 44 and the connector leg 46 primarily to reduce weight and facilitate bending of the metallic strip which forms the terminal-contact member. The end of upper leg 44 opposite to the one connected to connecting leg 46 has an anchoring tab 56 of reduced width extending at a slight angle therefrom. It will be understood by those skilled in the art that terminal-contact members 32 may be made of an appropriate metal having the desirable electrical conducting characteristics and may be formed thereof in any convenient manner as by stamping and bending, and in the case of the opening 50, by tapping a thread. Prior to mounting, the terminal-contact members 32 are disposed as illustrated in full lines in FIGS. 10 and 11, and it

4

will there be observed that the upper leg 44 is not parallel to the lower leg 42, but inclined relative thereto to diverge therefrom, and therefore, the openings 50, 52 are not coaxial at this time; however, after being fully mounted on the base 12, the legs 42, 44 are parallel and their openings 50, 52 are coaxial, as can be seen in FIG. 12.

As can best be seen in FIGS. 6, 7, 8 and 13, the base 12 is roughly configured as a thin solid section of a cylinder, having a pair of spaced flat walls and a cylindrical side wall. The base 12 is recessed in three angularly spaced peripheral locations to accommodate the mounting portions of terminal-contact members 32, 34; however, only the two recessed locations which accommodate the members 32 will be described at this point. With reference to FIGS. 6 and 7, the lower side 58 of the base is illustrated in FIG. 6 and the upper side 60 thereof is illustrated in FIG. 7. The two recessed portions for accommodating members 32 are generally designated 62, and the recessed portion for accommodating the terminal-contact member 34 is designated generally by reference numeral 64.

Each recessed portion 62 comprises a shallow, generally rectangular recess 66 having a pair of oppositely extending small shallow recesses 68 formed in the bottom side 58; a radially inwardly and axially extending cutout portion 70 formed in the periphery of base 12, and a shallow, generally rectangular recess 72 formed in the top surface 60 having radially and axially inwardly extending smaller recess 74 at the radial inner end thereof. As can best be seen in FIG. 8, at one side wall of each small recess 68 the adjacent rim portion of the bottom wall 58 is inclined at 76; a threaded bore 78 is formed in and extends completely through the base 12, and recess 74 inclines axially inwardly. To mount a terminal-contact member 32 to the base 12, its mounting portion 40 is juxtaposed to a recessed portion 62, it should be noted that at this time the upper leg 44 thereof is disposed in the dotted line position, and the mounting portion 40 is moved radially inwardly relative to the base 12 into a recessed portion 62. The legs 42 and 44 of the mounting portion 40 are then forced relatively toward each other into final assembled position wherein they are securely mounted on the base 12, as by being set in a power press. A convenient and effective way of accomplishing assembly is to locate the tabs 48 in the recesses 68 to properly position leg 42 in recess 66, and then force upper leg 44 toward leg 42 to embed its anchoring lug 56 into recess 74. When in the final mounted position, the mounting means 40 occupies and is permanently set in the solid line position shown in FIGS. 4 and 12. In fully mounted condition, the following structural relationship obtains: The legs 42, 46 and 44 of the mounting portion 40 of the member 32 are disposed respectively in the recesses 66, 70 and 72. The tabs 48 are firmly seated in the small recesses 68 in the under side 58 of the base, their disposition therein having been facilitated by the inclined side walls 76 of the recesses, and the tab 56 is disposed and firmly embedded in recess 74. Also, threaded bore 78 in the base is aligned with the threaded opening 50 in the lower leg 42 and the plain opening 52 in the upper leg 44. When in this condition, the contact-terminal members 32 are permanently securely mounted on the base 12.

As can best be seen in FIG. 4, a terminal binding screw 30 may then be threadedly inserted into the assembled terminal-contact member and base subassembly and have its threaded shank 80 threadedly engage both the threaded bore 78 and the threaded opening 50 in the lower leg 42. It should be particularly noted that the opening 52 in the upper leg 44 being of larger diameter than the bore 78 and threaded opening 50, allows the threaded shank 80 to pass through it with ample clearance. Therefore, the binding screw 30 is anchored threadedly in the threaded bore 78 of the base and the threaded opening 50 of the lower leg 42. As can best be seen in FIG. 2, a bared wire 28 may be electrically connected to a con-

tact-terminal member 32 by being wrapped around the shank 80 of a terminal binding screw 30 immediately beneath its head and having the screw 30 tightened to clamp it in such position between the leg 44 and the underside of the screw head. It should be observed in FIG. 2 that

when a wire 28 is electrically connected to leg 44, it is directly connected to contact blade 36 through unitary member 32 without any intervening joints, and that the binding screw 80 adds additional structural strength to the mounting of member 32 on the base 12.

Terminal-contact member 34 is generally similar to members 32 with the exception, as can best be seen in FIG. 5, that the opening 82 in its lower leg 84 of its mounting portion 86 is plain and larger than the screw shank 80; the opening 88 in the upper leg 90 of its mounting portion is threaded, and the threaded opening 88 is of smaller diameter than the opening 82, such as to threadedly engage the threaded shank 80 of a terminal binding screw 30. Otherwise similar and corresponding portions of members 34 to members 32 are designated by the same reference numeral with a prime (') added. Although slot 91 may be formed in its mounting portion and intersect opening 88, the latter opening is threaded over a sufficient portion of its periphery to threadedly anchor a screw. The terminal-contact member 34 is mounted in recessed portion 64, which is generally similar to recessed portions 62 for accommodating members 32, with the exception that the bore 92 which forms a part thereof is not threaded, is of a larger diameter than the bores 78, and opens to the periphery of the base through a communicating slotted passage 94 (see FIG. 7). Otherwise, recessed portion 64 is constructed in generally the same manner as recessed portions 62, and therefore, corresponding elements thereof are designated by similar reference numerals with a prime (') added (see particularly FIG. 9). As can best be seen in FIG. 5, the terminal binding screw 30 associated with terminal-contact member 34 has its threaded shank 80 threadedly anchored in threaded opening 88 in upper leg 90, and the remainder thereof clears the bore 92 in base 12 and the plain opening 82 in the lower leg 84. Therefore, with the member 34, a binding screw 30 is anchored only in the upper leg of the mounting portion. The main practical effect of the different mountings of the members 32 and 34 resides in the ability of the member 34 to be mounted on the base 12 with a terminal screw already threadedly secured in the threaded opening 88 in the upper leg 90 thereof, as the slot 94 in the base will permit this mode of mounting. In practice, where feasible, this mode of mounting is preferred as it can be performed at the factory. This is desirable in practice, as it enables mass assembly and shipment of connector components with members 34 and their terminal binding screws already mounted on them. With the mounting for members 32, the binding screws must be separately attached to their members 32 after the members 32 are mounted on the base. With this mounting, binding screws may be shipped in bulk and attached to members 32 at the point of installation or use. It should be clearly understood that either of the two types of mounting for the contact-terminal members may be used for any type of contact, the selection being dependent on whether the binding screws are to be attached at the factory or at the point of installation, and not on the type of contact.

In view of the foregoing it will be apparent that an improved contact-terminal member has been provided which satisfies each and every object of this invention in that an arrangement has been provided in which an effective permanent mounting for metallic contact-terminal members on a plastic body base has been provided; there are no joints or connections between the contacts and the terminals, as where conventional connector bushings are employed; wherein conventional bushings have been eliminated; the terminal binding screws have direct con-

tact with the contacts of the members, and wherein the binding screws enhance the mounting of the members. In practice it has been found that in addition to providing a functionally superior contact-terminal means to prior art arrangements currently in vogue, the improved contact-terminal members are actually less costly to manufacture and assemble on a base, and savings in the order of fifty percent have been effected through utilization of the improved contact-terminal members.

As will be evident from the foregoing description, certain aspects of my invention are not limited to the particular details of construction of the examples illustrated, and I contemplate that various and other modifications and applications will occur to those skilled in the art. For example, as mentioned above, the illustrated embodiment of the invention comprises an electrical cable or cord connector cap, but the invention can be incorporated into other types of electrical wiring devices, such as connector bodies or caps, or into tubes, such as electronic or photoelectric tubes. In the latter regard, the sub-assembly of base and electrical contact-terminal members, as shown in FIG. 13, can function as a plug base for a tube by having appropriate elements mounted at the upper legs of the members and an appropriate glass envelope secured to the base. In this embodiment of the invention the contacts function as mounting means for the tube and for supplying electrical current to the internal tube elements in the glass envelope. It is, therefore, my intention that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of my invention.

Having thus set forth the nature of my invention, I claim:

1. In an electrical connector: a contact and terminal carrying base made of an electrical insulating material; a plurality of recessed portions spaced about the periphery of said base; locating recesses formed in said base; a plurality of unitary metallic contact and terminal members individually supported on and by said base; each of said members including a contact portion and an integral mounting portion; said mounting portion being C-shaped and having two spaced generally parallel legs and a connecting leg, all being arranged to be wholly disposed in said recessed portions; said mounting portion including locating tabs disposable in said locating recesses to properly position said members on said tabs; said mounting portion including means for contacting and frictionally gripping said base to anchor and retain the member on said base; said mounting portion and base having coaxial openings formed therein; and a terminal binding screw extending through said openings and being threadedly anchored in said mounting portion.

2. The device defined in claim 1 wherein one of said spaced legs is disposed on one side of said base and the other of said spaced legs and said contact portion are disposed on the opposite side thereof; the opening in said base is a plain slot which opens to the periphery of said base; and the opening in said one leg is threaded and the opening in said other leg is plain.

3. The device defined in claim 1 wherein one of said spaced legs is disposed on one side of said base, the other of said spaced legs and said contact portion are disposed on the opposite side thereof; the opening in said base is threaded; and the opening in said one leg is plain and the opening in said other leg is threaded.

4. For use in an electrical wiring device, a unitary metallic contact-terminal member comprising: a contact portion; a C-shaped mounting portion comprising a pair of spaced elongated legs connected at adjacent ends by a connector leg; one of said spaced legs at one of its ends being connected to said contact portion and having laterally extending locating tab means formed thereon intermediate its ends; the other of said spaced legs having an anchoring tab formed thereon and projecting at its free

end; said spaced legs initially diverging from said connector leg, but being deformable to a substantially parallel condition to mount the member on a support; a pair of alignable openings formed in said spaced legs for receiving a terminal binding screw; and one of said openings being smaller than the other and threaded.

1,804,803

1,815,212

2,015,421

2,201,578

2,269,241

2,908,886

References Cited in the file of this patent

UNITED STATES PATENTS

1,536,024 Kvaal ----- Apr. 28, 1925 10

108,048

Pattison ----- May 12, 1931

Ogg ----- July 21, 1931

Eckstein et al. ----- Sept. 24, 1935

Grohsgal ----- May 21, 1940

Ayers ----- Jan. 6, 1942

Frekko ----- Oct. 13, 1959

FOREIGN PATENTS

Australia ----- Nov. 25, 1927