

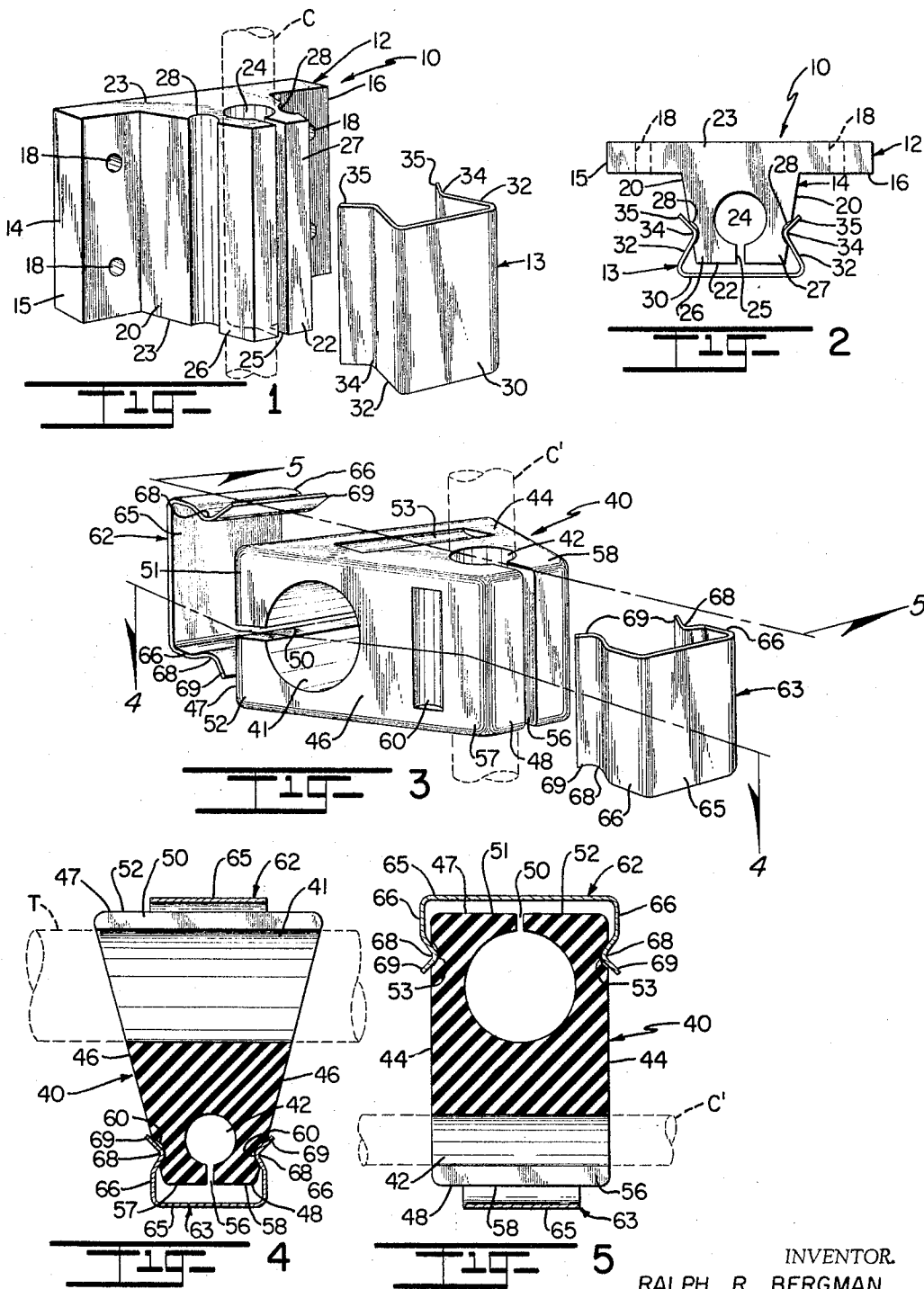
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R. R. BERGMAN

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RELEASABLE CONNECTOR

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INVENTOR.
RALPH R. BERGMAN

BY

John E. Reilly
ATTORNEY

1

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RELEASABLE CONNECTOR

Ralph Roger Bergman, 510 S. 43rd St., Boulder, Colo.

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This invention relates to novel and improved connectors, and more particularly relates to a releasable connector which is useable either singly or in series to effect rapid and positive connection between a cable line or other electrically conductive wire and a stationary supporting member.

The numerous advantages and features of the present invention may be best exemplified by its use in the mounting of antenna feed lines in antenna installations wherein extended lengths of cables defining the feed lines are to be securely attached at closely spaced intervals to an antenna tower. For instance, each cable may extend vertically for lengths of 500 feet or more and, being somewhat flexible, is necessarily secured at closely spaced intervals to a series of cross braces on the antenna tower. Thus, it will be appreciated that each connector must be low in cost, easy to install and afford a means for quick, secure connection of the cable to the tower structure. Conventionally, each cable is formed with a thin outer electrically conductive sheath which is highly sensitive to any strain or distortion imposed when mounted or supported in place. Consequently, an important requirement in mounting the cable is that it be firmly held without binding, stressing or otherwise damaging the outer sheath. Other requirements are that the connector be so constructed as to enable positive but releasable connection of the cable in order to permit fast repair or replacement when required, and in addition will absorb vibrations or loads imparted to the antenna tower, for example, as a result of high winds or other adverse weather conditions.

The present invention is therefore directed to the construction and arrangement of an insulated block which may be formed from various commercially available rubber or rubber-like materials to provide the necessary electrical insulation, yet be strong and durable enough to bear the weight of the cable line. An important consideration also is that the connecting block as a whole must be strong and durable but have limited "give" in order to prevent any damage to the cable lines upon connection. Thus, specifically, the block is formed to provide added flexibility around the opening or bore for the cable in order to permit ease of insertion and, upon insertion, to firmly embrace the cable and hold it securely in place against slipping or release. Moreover, special means of connection may be incorporated within the mounting block for connection to the tower without reducing its strength, and which is characterized by facilitating rapid insertion and positive but releasable connection of each cross brace to the mounting block and in such relation that the cable line will run perpendicular to the cross brace.

Accordingly, it is an object of the present invention to provide for an insulated mounting block which will serve as a quick and dependable means of connection for electrical cables and the like to a supporting structure, the mounting block being characterized by permitting rapid, secure interconnection between the cable and the supporting structure without damaging or otherwise affecting the conductivity of the cable line.

It is another object of the present invention to provide a releasable connector for cable lines and the like which is of one-piece construction, inexpensive to manufacture, simplified in construction, easy to install, and rugged and durable in use; and further wherein the connector is characterized by effecting rapid connection and release of the cable line without the use of special tools or hardware.

It is a further object of the present invention to provide

2

a mounting device which is conformable for use in releasably connecting various types of conducting wires or lines to a supporting structure and wherein one or more mounting blocks may be employed for connection of one or more conducting wires, the device establishing firm locking engagement between the members to be connected, and further will absorb any slack introduced due to wear or changes in dimensions thereby eliminating the need for close tolerances between the device and the members to be connected.

It is a still further object of the present invention to provide for a solid sturdy block of electrically non-conductive material formed with recessed, flexible connecting end portions therein which are selectively expandable to the full diameter of the member to be secured without reducing the strength of the mounting block structure; and, to provide for the use of a connecting clip to cooperate with the block in releasably holding the connected member securely in place and in such a way that the clip may be manually connected and released without the use of tools in a minimum amount of time.

It is an additional object of the present invention to provide for mounting blocks useable in series which will provide for connection of cables and the like in perpendicular relation to a supporting structure, such as, the cross braces of an antenna tower and wherein the mounting blocks will securely support the cables against vibration or displacement, yet will permit rapid repair or replacement of the cables when required with minimum time and effort.

The above and other objects, advantages and features of the present invention will become more readily understood and appreciated from a consideration of the following detailed description of alternate forms of the present invention when taken together with the accompanying drawings, in which:

FIGURE 1 is a perspective view of one form of releasable connector illustrating the parts in disconnected relation, in accordance with the present invention.

FIGURE 2 is a top plan view of the connector shown in FIGURE 1 with the parts arranged in connected relation.

FIGURE 3 is a perspective view of another form of connector, in accordance with the present invention, being specifically designed for use in connecting a cable line to a cross brace member in an antenna installation.

FIGURE 4 is a sectional view taken on lines 4—4 of FIGURE 3; and

FIGURE 5 is a sectional view taken on lines 5—5 of FIGURE 3.

Referring in detail to the drawings, there is shown by way of illustrative example in FIGURES 1 and 2 a releasable connector 10 broadly comprised of a mounting block 12 and connecting clip 13. Preferably, the block 12 is composed of a hard rubber or rubber-like material, such as, a neoprene compound or other synthetic resin compound having high hardness and strength characteristics and limited flexibility or resilience. In construction, the mounting block 10 includes a body portion 14 having connecting flanges 15 and 16 projecting laterally from opposite sides of the block with suitable bolt holes 18 formed in the flanges to permit connection of the block to the surface of a supporting structure, not shown. The connecting flanges are relatively thin compared to the thickness of the entire mounting block and, due to the limited flexibility of the material, the flanges will readily conform for attachment to flat, rounded, or irregular supporting surfaces.

As shown in FIGURES 1 and 2, the body portion 14 has forwardly convergent sides 20 terminating in a relatively flat common end surface 22 and parallel top and

3

bottom surfaces 23. In order to provide for rapid insertion and connection of a member of generally cylindrical configuration, represented in dotted form at C, to the mounting device, a vertical recess or through-bore 24 extends through the thickness of the body portion adjacent to the front end surface 22 and intermediately between the convergent sides 20. A vertical entrance slot 25 extends laterally through the front end surface 22 into communication with one side of the bore 24; and preferably the bore 24 and the slot 25 are formed symmetrically about the center line of the entire block so as to divide the forward portion of the block surrounding the bore 24 into arcuate flexible arms or split ends 26 and 27 of progressively reduced width toward their forward terminal ends. Due to the reduced width of the flexible arms 26 and 27 in relation to the rest of the body portion, the arms may be pried open or separated along the slot to a width approximating the full diameter of the bore thereby to permit lateral insertion of the member C within the bore. It will be noted that the rearward half of the bore is surrounded by a relatively thick section of the body so as to provide a comparatively rigid or firm backing behind the member C when inserted within the bore 24.

Vertical clip-receiving grooves 28 are formed along opposite sides 20 in alignment with one another and adjacent to the front end surface 22 for the purpose of receiving opposite sides of the connecting clip 13. In the form shown in FIGURES 1 and 2 the grooves traverse the entire width of the sides 20 and preferably are located just forwardly of the longitudinal axis of the bore 24 so that inward pressure applied along the grooves will tend to compress the arcuate flexible arms 26 and 27 inwardly about the forward half of the member C within the bore.

The connecting clip 13 is preferably defined by an elongated generally rectangular strip composed of spring steel or other resilient metallic material formed into generally U-shaped configuration to include an intermediate closed end portion 30 and opposed, forwardly extending arms 32. The arms are bent first inwardly then outwardly to form inwardly directed groove-engaging corners 34 and outer divergent free ends 35, respectively. The spacing between corners 34 is less than the distance between grooves so that in placement of the clip on the mounting block the arms are sprung outwardly as they are forced over the end of the block, then will snap into place within the grooves 28 to compress the arcuate flexible arms 26 and 27 inwardly into tight-fitting surrounding relation to the member C.

In the form of invention shown in FIGURES 1 and 2, the body portion of the block is dimensioned so as to provide a relatively broad rigid area of support adjacent to the connecting flanges while the sides taper or converge forwardly from the supporting end, the amount of convergence depending upon the diameter of the bore 24; since in forming the through-bore 24 the remaining section of material between the wall of the through-bore and the remaining section of material between the wall of the through-bore and the sides must be sufficiently thin to afford the necessary flexibility for expansion of the slot to the full diameter of the opening. Of course, the amount of expansion permitted will depend not only on the thickness of the material but on its inherent flexibility or resilience as well, but generally speaking it is desirable that the block be wider at the supporting end than at the connecting end so as to provide a rigid supporting area in relation to the flexibility of the connecting end.

In the alternate form of invention shown in FIGURES 3 to 5, the insulating block 40 is designed specifically for use in connecting a cable line C' to a cross brace, represented at T. In this particular application, the cable line forms an antenna feed line in an antenna tower installation, now shown, having a series of cross braces to facilitate attachment of the cable lines normal

4

to each of the braces T. Accordingly, the block 40 has mutually perpendicular openings or recesses 41 and 42 arranged in spaced relation to one another, the opening 41 being dimensioned to accommodate the cross brace T, and the opening 42 being dimensioned to receive the cable line C', the latter being of relatively small diameter in relation to that of the cross brace. Accordingly, the insulating block 40 is relatively thick with flat, parallel top and bottom surfaces 44; in horizontal section, the block is of generally trapezoidal configuration having convergent sides 46 extending forwardly from a rearward end surface 47 and terminating in a relatively narrow front end surface 48. The block is proportioned such that a relatively broad surface area is formed along the rearward end portion 47, and the opening 41 is in the form of a horizontal through-bore having its longitudinal axis parallel to the longer end surface 47 intermediately between the top and bottom surfaces 44. A horizontal end slot 50 extends through the end surface 47 into communication with the opening 41 again to equally divide the block into upper and lower split ends defining flexible arms 51 and 52. Horizontal, aligned clip-receiving grooves 53 are of limited length and form concave depressions in the top and bottom surfaces of the block rearwardly of the longitudinal axis of the opening 41, that is, between the longitudinal axis of the opening 41 and the end surface 47.

The opening 42 is in the form of a vertical through-bore extending through the thickness of the forward end portion of the block in perpendicular spaced relation to the through-bore 41 and is located adjacent to the front end surface 48 intermediately between the forward convergent sides 46. A vertical entrance slot 56 is formed through the front end surface 48 into communication with the side of the through-bore 42 to equally divide the front end portion into split end portions defining flexible arms 57 and 58 in surrounding relation to the bore 42. Vertical aligned grooves 60 of limited length form concave depressions on opposite sides 46 of the block and as in the form of invention shown in FIGURES 1 and 2 are located just forwardly of the longitudinal axis of the bore 42.

Spring clips 62 and 63 again are provided for positioning over the rearward end portion and the forward end portion of the block, respectively, so as to clamp or compress the split end portions into snug-fitting engagement over the cross brace and cable line, respectively. In general, each connecting clip 62 and 63 is similarly formed of an elongated rectangular strip of metal dimensioned or sized in accordance with the thickness of the body and width of the forward end portion, respectively. Each clip includes a closed end portion 65 and arms 66 extending in a common direction from opposite sides of the end portion 65. In turn, each arm is bent inwardly to form a depression 68, then is flared outwardly into a divergent free end 69 in order to permit the clip arms to slide over opposite sides of the block for movement of the depressions 68 into snap-fitting relation with the grooves 53 and 60, respectively. In each of the clips, the arms are biased to exert an inward force holding the split ends of the block tightly in place over the cross brace and cable line members.

In the form of invention shown in FIGURES 3 to 5, the block is of course dimensioned in accordance with the diameter of the openings to be formed therein; and accordingly the block is of sufficient thickness between the top and bottom surfaces to permit formation of a larger diameter opening 41, with the remaining thin section of material between the wall of the opening and top and bottom surfaces being relatively flexible to permit expansion to the full diameter of the opening between the sides of the entrance slot 50 while at the same time having sufficient body to securely support the supporting member therein.

Since the opening 42 is of relatively small diameter in relation to the opening 41, the block is tapered forwardly from the rearward supporting end such that the remain-

5

ing section of material between the wall of the opening 42 and opposite sides is sufficiently thin to afford the necessary flexibility to permit expansion of the slot 56 to the full diameter of the opening for insertion of a cable line. At the same time, the block is most desirably increased in width at the area of connection for the cross brace so that the block will engage the brace over a broader area to resist any tendency of the block to twist or pivot about the brace once in connected relation.

Mounting blocks formed in accordance with the present invention may be used without clips where the weight of the connecting member is not such as to necessitate their use. In this event, the resilient material of the block may be prestressed to exert sufficient gripping or compressive action of its own on the connecting member once inserted in place. Also if desired, inserts may be used in the through-bores or openings with the desired coefficient of friction, for example, where it is desired to impart increased friction for firmer gripping than would be afforded by the material itself, keeping in mind that due to the simplicity of the block a plurality of blocks may be used in series to support a predetermined weight of connecting member. To release the connecting member it is of course merely necessary to spring apart the ends of the clips and force outwardly away from the connecting end portion of the block as in the form of invention shown in FIGURES 3 to 5; or in the form shown in FIGURES 1 and 2 the clip merely may be slipped vertically along the grooves 28 both for placement and removal.

From the foregoing, it will be evident that the forms of invention shown will enable quick secure connection and release between members to be connected such as, a cable line and supporting structure or coaxial or mutually perpendicular cable line members. Nevertheless, its ready and effective application to other uses will be readily apparent, principally in view of the many advantages secured by obviating the removal or loosening of parts as well as the use of special tools in connecting and releasing the clip portions. It is therefore to be understood that various changes and modifications may be made in the construction and arrangement of parts as well as the intended application of the device without departing from the spirit and scope of the present invention, as defined by the appended claims and reasonable equivalents thereof.

What is claimed is:

1. A releasable connector for connecting a cylindrical member to a support, said connector comprising a resilient solid body having a supporting end portion and forwardly convergent sides terminating in a common connecting end portion with an opening extending transversely through said body adjacent to the connecting end portion and with an entrance slot extending through the connecting end portion into communication with one side of the opening to divide the connecting end portion into spaced flexible arms surrounding the opening, said arms being movable outwardly away from one another to provide for lateral insertion of a cylindrical member through the slot into the opening, and spring clamping means being dimensioned for disposition over the connecting end portion into direct clamping engagement with the flexible arms to compress the arms inwardly into gripping engagement with the cylindrical member, the convergent sides having aligned grooves adjacent to the connecting end portion on opposite sides of the opening, and said clamping means being engageable with the grooves to compress the flexible arms inwardly about the cylindrical member.

2. In a releasable connector, a body composed of resilient material having convergent sides terminating in opposed parallel end surfaces with a pair of bores extending through the body in mutually perpendicular, spaced relation to one another adjacent to opposed end surfaces intermediately between the sides and with an

6

entrance slot extending through each of the end surfaces into communication with one side of each bore to divide each end surface into a pair of spaced flexible arms surrounding each bore, the material of the body being of sufficient flexibility to enable spreading of the arms to the full diameter of the bores for lateral insertion of a member into each bore whereupon the arms will return to closed, surrounding relation to each of the bores and to the members positioned therein.

3. A releasable connector for use in connecting an elongated generally cylindrical member to a stationary support, said connector comprising a body made of a hard rubber-like material of limited resiliency, said body being relatively thick and having forwardly convergent sides terminating in a common end surface with an opening extending transversely through said body in spaced adjacent relation to the end surface intermediately between the convergent sides, the end surface being provided with a lateral entrance slot in communication with one side of the opening, the slot dividing the end surface and sides into a pair of flexible arms surrounding the forward half of the opening, the resiliency of the body in relation to the thickness of the arms being such that the arms are flexible apart the full width of the opening for lateral insertion of the member into the opening, and a releasable spring clip overlying the common end surface and releasably engaging opposite sides of said body to hold the member in stationary relation within the opening.

4. A releasable connector for use in connecting elongated generally cylindrical members, said connector comprising a body made of a hard rubber-like material of limited resiliency, said body being relatively thick and having relatively flat top and bottom surfaces and opposite sides terminating in opposed end surfaces with a pair of bores extending through the thickness of said body in mutually perpendicular, spaced relation to one another, each of the bores being disposed in spaced adjacent relation to one of the end surfaces intermediately between the opposite sides, each end surface being provided with an entrance slot in communication with one side of the bore, each slot symmetrically dividing the end surface into a pair of flexible arms surrounding the forward half of the bore, the resiliency of the body in relation to the thickness of the arms being such that the arms are flexible apart the full width of the respective bores for lateral insertion of the member into each bore.

5. A releasable connector according to claim 4, said connector including clamping means for releasably engaging the flexible arms for each bore to compress the arms inwardly into surrounding relation to the member inserted within the bore.

6. A cable connector comprising a relatively thick body made of resilient electrically non-conductive material, said body being of generally trapezoidal configuration to define forwardly convergent sides extending between longer and shorter opposed end surfaces, said body including relatively flat top and bottom surfaces with a first through-bore extending through said body in adjacent spaced relation to the longer end surface intermediately between the top and bottom surfaces, and a second through-bore extending through the thickness of said body in adjacent spaced relation to the shorter end surface intermediately between the forwardly convergent sides, an entrance slot formed in each of the longer and shorter end surfaces in axial alignment with the respective bores to divide that portion of said body surrounding the bores into symmetrical halves, a first pair of aligned clip-receiving grooves in the top and bottom surfaces adjacent to the longer end surface and a second pair of aligned clip-receiving grooves in the convergent sides adjacent to the shorter end surface, and a pair of releasable spring clip members being dimensioned for disposition over each of the longer and shorter end surfaces for clamping engagement with each pair of aligned

7

grooves to compress said body inwardly around the respective bores.

7. A cable connector comprising in combination a relatively thick body made of resilient electrically non-conductive material, said body being of generally trapezoidal configuration to define vertical forwardly convergent sides extending between longer and shorter opposed end surfaces, said body including relatively flat, horizontal top and bottom surfaces with a first through-bore extending horizontally through said body in adjacent spaced relation to the longer end surface and intermediately between the top and bottom surfaces, and a second through-bore extending vertically through the thickness of said body in adjacent spaced relation to the shorter end surface and intermediately between the forwardly convergent sides, an entrance slot formed in each of the longer and shorter end surfaces in axial alignment with the respective bores to divide the end portions of said body surrounding the bores into symmetrical halves, a first pair of aligned clip receiving grooves in the top and bottom surfaces adjacent to the longer end surface and a second pair of aligned clip receiving grooves in the convergent sides adjacent to the shorter end surface,

8

and a pair of releasable spring clip members, each being dimensioned for disposition over one of the longer and shorter end surfaces, each clip member including opposed arms for clamping engagement with each pair of aligned grooves to compress said body inwardly around the respective bores.

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CLAUDE A. LE ROY, *Primary Examiner.*