Title: EXTENDABLE CHANNEL UNIT CONTAINING A CONDUCTOR

Abstract: An extendable channel unit such as molding unit (21) has a pair of telescopically arranged relatively extendable conduits (55, 75) with a conductor (22) interconnected in conductive relation between the conduits, with an intermediate section (137) of the conductor effective to accommodate the relative extension of the conduits. The intermediate section may include a sinuous configuration (133) or expandable coils (139). The channel unit may be installed along a wall (145) or other surface for decoratively covering the installation of the conductor for connection with an operated device (153). The channel unit may be installed into a ramp (163) when installed along a floor, such as within a doorway (171). Methods of assembly utilizing such channel units are also disclosed. One such method affixes the channel unit at a predetermined distance from a reference surface by incorporating a mounting device (27) incorporating a breakaway reference section (31).
EXTENDABLE CHANNEL UNIT CONTAINING A CONDUCTOR

FIELD OF THE INVENTION

This invention relates in general to channel units utilized in signal conductor systems, and in particular, to an improved extendable molding unit and improved methods of assembling such molding units to form at least a part of such systems.

BACKGROUND OF THE INVENTION

In the past, various different moldings have been provided to form an electrical system in a room. For instance, U.S. Patent No. 2,175,144 shows long molding units having a set of hollow conductors extending there through and being essentially flush with the opposite ends of such long molding units. A plurality of differently shaped short molding units are also illustrated as having pairs of male terminals, and one set of male terminals of a pair of short molding units are conductively received in the hollow conductors of the adjacent long molding unit. A combination of short and long units must be selected in an attempt to accommodate various room sizes.

U.S. Patent No. 2,441,698 illustrates a molding carrying a pair of conductors with each conductor having a socket or prong-receiving end arranged flush with an end of the molding and a prong end projecting from the opposite end of the molding. A part of the molding is open along the entire length thereof to provide access to the conductors, which are contained for sliding movement lengthwise of the molding. If it is desired to shorten the molding, the conductors are manually lengthwise moved to extend the socket end thereof exteriorly of the molding by an amount or length equal to the length of the prong ends. With the socket ends of the conductors so withdrawn from the molding, the molding can be sawed or otherwise cut through to provide a short molding section of any desired length, and of course the conductors conjointly cut through with the molding. After the cutting operation, the conductors are moved lengthwise in the short molding sections returning the sockets to their original flush arrangement with an end of the molding and extending the conductors exteriorly of the sawed end of the short molding section to provide new prongs having the same length as the original prongs which formed a part of the cut off
conductor portions. The new prongs are ready to be interconnected with sockets provided in another electrical molding.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a mounting device, which may be utilized in the practice of a method of assembling an extendable channel unit along a wall of a room in one form of the invention;

FIG. 2 is partial sectional view the assembled sections of the mounting device secured to the wall of the room;

FIG. 3 is a sectional view showing the extendable channel unit releasably mounted to the mounting section of the mounting device and extending along the wall in predetermined space apart relation from a reference surface;

FIG. 4 is a plan view of the above-mentioned extendable channel unit in one form of the invention; which is illustrated in its retracted position.

FIG. 5 is a sectional view taken along section line 5-5 in FIG. 4;

FIG. 6. is a sectional view taken along section line 6-6 in FIG. 5;

FIG. 7 is an end view of the extendable channel unit taken along line 7-7 in FIG. 5;

FIG. 8 is an end view of the extendable channel unit taken along line 8-8 in FIG. 5;

FIG. 9 is a partial view taken from FIG. 5 and illustrating an alternative conductor having expansible coils therein which is adapted for use in the extendable channel unit;

FIG. 10 is a partial view illustrating the conductive interconnection of an adjacent pair of the extendable channel units arranged in end-to-end relations in cross-section;

FIG. 11 is a schematic diagram of a wiring system for a room with the wiring systems having a plurality of the extendable channel units arranged in end-to-end relation therein;

FIG. 12 is an elevation view illustrating a ramp device disposed along a floor in a doorway with a plurality of the extendable channel units arranged in end-to-end relation within an elongate ramp having opposite end caps and utilized to span a part of a wiring system across the doorway;
FIG. 13 is a partial plan view illustrating the end caps secured to the ramp;
FIG. 14 is a side elevational view of the one end cap showing a face thereof
for mounting against the ramp;
FIG. 15 is a sectional view taken along line 15-15 in FIG. 13;
FIG. 16 is a sectional view taken along line 16-16 in FIG. 13 when the other
end of the end caps is secured to the other opposite end of the ramp; and
FIG. 17 is an enlarged sectional view taken along line 17-17 in FIG. 13 and
partially broken away for drawing simplification.
FIG. 18 is a sectional view of an end cap assembly used to join a pair of
extendable channel units.

Corresponding reference characters indicate corresponding parts through the
several views of the drawings. The exemplifications set out herein illustrate the
preferred embodiments of the invention in several forms thereof and such
exemplifications are not to be construed as limiting the scope of the disclosure or the
scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to FIGS. 1-3, there is illustrated in one form of the
invention a method of assembling an extendable channel unit such as molding unit
21 along a wall 23 of a room with respect to a preselected reference surface 25
associated with the wall, with the channel unit having a conductor 22 therein.
Reference surface 25 may be defined by a floor or the top edge of a floor molding or
the like for instances associated with wall 23. A mounting device 27 for extendable
channel unit 21 may be formed of a resinous material, such as plastic or the like for
instance having the desired strength and resilient characteristics. Other known
materials may be used, such as wood, metal, composites, etc. The mounting device
27 includes a mounting section 29 and an integrally formed separable reference
section 31 depending therefrom with the reference section having a distal end 33
arranged in preselected spaced apart relation from the mounting selection.

Reference section 31 is connected to mounting section 29 by a pair of laterally
spaced apart arms 35, and the arms each have notches 37 providing predeterminently
weakened areas therein to enhance separation of the reference section from the
mounting section, as further discussed hereinafter. A pair of vertically spaced-apart
mounting flanges 39, 41 extended from mounting section 29 terminating in enlarged gripping ends or ledges 43, respectively. A mounting opening or hole 45 spaced between the mounting flanges is provided through the mounting section. To complete the description of mounting device 27, a cylindrical extension 47 is concentrically arranged about mounting hole 45 so as to be spaced between mounting flanges 39, 41, and the cylindrical extension terminates in an annular surface 49.

In the practice of the aforementioned assembly method, mounting device 27 is associated in a preselected position along wall 23 by placing the engaging mounting section 29 of the mounting device against the wall. During the placement of the mounting section, distal end 33 of reference section 31 is seated or otherwise abutted against reference surface 25, as best seen in FIGS. 1 and 2. It may be noted that the seating of reference section 31 with reference surface 25 spaces or locates mounting section 29 in predetermined position on wall 23 in spaced relation with the reference surface. When mounting device 27 is disposed in its preselected position on wall 23, as discussed above, a screw 51 is passed through mounting hole 45 and cylindrical extension 47 into threaded or mounting relation with wall 23 with a head 53 of screw 51 being disposed in abutment with annular surface 49 on the cylindrical extension, as best seen in FIG. 2. The abutment of screw head 51 with annual surface 49 in response to the threaded engagement of screw 50 with wall 23 effects the securement of mounting device 27 in its preselected position to the wall. While screw 50 is disclosed herein securing mounting device 27 to wall 25, it is contemplated that various other means, such as an adhesive or a nail or the like for instance, may be utilized to effect the securement of the mounting device to the wall.

Subsequent to the securing of mounting devices 27 to wall 23 in the manner discussed hereinabove, reference section 31 of the mounting device may be separated or otherwise disassociated from mounting section 29. In order to effect the separation of reference section 31 from mounting section 29, the reference section may be manually moved to cause arms 35 thereof to be snapped or otherwise broken away from the mounting section generally at the purposely weakened notches 37, as seen in FIG. 3. It may be noted that the separation of reference section 31 from mounting section 29 may occur prior to or subsequent to
the mounting of extendable molding unit 21 to the mounting section, as discussed in detail hereafter.

Extendable molding unit 21 may be mounted or otherwise secured or associated with the mounting section so as to extend generally along the wall in preselected spaced apart relations with reference surface 25, as discussed in detail hereafter and as best seen in FIG. 3. Extendable molding unit 21 may be formed or molded from a desired resin material, such as a plastic or the like for instance having the required strength and dielectric characteristics, and the extendable molding unit is provided with a generally elongate conduit 55 in which conductor 22 is in part contained. The conduit has an elongate base wall 57 integrally interposed between a pair of elongate sidewalls 59, 61. Base wall 57 defines with opposite sidewalls 59, 61 a pair of opposite retaining grooves 63, 65 with the opposite sidewalls respectively terminating in a guide ledge or edge 67, and another groove or land 69 is provided in the base wall intermediate the retaining grooves. A cover wall 71 is spaced apart from base wall 57 and integrally formed between opposite sidewalls 59, 61 thereof to create at least in part a chamber 73 in which is contained conductor 22. Albeit not shown in FIG. 3 for purposes of drawing simplicity and brevity of disclosure, it may be noted that grooves 63, 65, 69 in base wall 57 extend lengthwise across conduit 55.

To effect the mounting engagement of extendable molding unit 21 with mounting device 27 secured in its predetermined position on wall 23, conduit 55 of the extendable molding unit may be manually located to laterally align the open ends of retaining grooves 63, 65 with flanges 39, 41 of the mounting device. Thereafter, the conduit 55 may be laterally moved to slidable receive gripping ledges 43 on mounting flanges 39, 41 within retaining grooves 63, 65, in base wall 57. When gripping ledges 43 are so slidable received within retaining grooves 63, 65, it may be noted that extendable molding unit 21 is generally laterally relatively movable along wall 23 with respect to mounting device 27, and it may also be noted that the gripping edges are arranged in association with guide ledges 67 on conduit opposite sidewalls 59, 61 thereby to obviate undesired displacement of molding unit 21 from the mounting device in a rightward direction as viewed in FIG. 3. To complete the above desired method of assembling extendable molding unit 21 with mounting
device 27, it may be further noted that opposite sidewall 61 on the molding unit is
predeterminedly spaced apart from reference surface 25.

With reference in general to the drawings and recapitulating at least in part
with respect to the foregoing, extendable molding unit 21 in one form of the invention
is provided a pair of telescopically arranged elongate conduits or conduit members
5 55, 75 (FIGS. 4 and 5) extendable or movable with respect to each other and
defining therein expandable chamber 73 (FIGS. 5 and 6). Conductor 22 is disposed
in and extends across chamber 73 and interconnected between opposed ends of
45 conduits 55, 75. The conductor includes a section 77 arranged to accommodate a
change in length of the chamber 73 resulting from the relative extension of the
conduits (FIG. 5). The terms "expandable" and "extension" are used herein in
shortcut form to refer to both an increase in dimension (expansion) and the
reciprocal decrease in dimension (contraction), and repetitions thereof.

More particularly and with specific reference to FIGS. 4-6, conduit 75 may be
formed of any known material, for example a resin material such as a plastic or the
like having the desired strength and dielectric characteristics, as mentioned above
with respect to conduit 55. Conduit 75 is shaped or otherwise configured to be at
least in part reciprocally received in conduit 55, and best seen in FIG. 6. Conduit 75
has a pair of opposite sidewalls 79, 81, slidably arranged with opposite sidewalls 59,
61 of conduit 55. A cover wall 83 on conduit 75 is integrally interposed between
opposite sidewalls 79, 81 thereof, and cover wall 83 is slidably arranged with cover
110 wall 69 on conduit 55. Conduit 75 is also provided with a base wall 85 spaced
opposite cover wall 83 and integrally interposed between opposite sidewalls 79, 81.
Base wall 85 is slidably arranged with base wall 57 on conduit 55. Base wall 85 on
115 conduit 75 is provided with a land 87 having opposite edges 89, 91, and the land 87
is slidably arranged with a wall on intermediate groove or land 70 of base wall 57 on
conduit 55 while the opposite edges of the land are slidably and guideably contained
between opposed sidewalls respectively 95, 97 of grooves 63, 65 in base wall 57 on
160 conduit 55. A pair of opposite ledges 90, 92 is also provided on base wall 85 being
interposed between opposite side edges of land 87 and opposite sidewalls 79, 81 of
conduit 75 respectively. In the light of the foregoing, it may be noted that conduit 55,
75 are configured to be slidably arranged with each other thereby to provide the
telescopic association or arrangement and the extendable movement of the conduits
between their respective retracted and extended positions. A seal 100 may be disposed between conduit members 55, 75 to restrict the ingress of water or other fluid between the conduit members and into chamber 73. Seal 100 is illustrated as a flexible member such as a rubber gasket attached to conduit 55 and making sliding/sealing contact with conduit 75, although other configurations and locations may be used for various applications.

Referring now to FIGS. 5 and 7, a closure member 99 for conduit 55 includes a wall or plug 101 with an inner end or end portion 103 seated in the leftward end of the conduit against displacement therefrom as seen in FIGS. 5, 7 and 10, and if desired inner end portion 103 may be fixedly secured within the leftward end of the conduit by suitable adhesive means, such as by gluing or the like for instance. A sheath or shroud 105 integral with closure wall 101 extends generally opposite inner end portion 103 exteriorly of conduit 55, and an abutment or shoulder 107 on wall 101 extends between the inner end portion thereof and the sheath or sheathing. Shoulder 107 is seated or otherwise abutted against the leftward end of conduit 55, and the sheathing extends in protective relation about an exterior connector or female connector 109 provided on a terminal 111 mounted in wall 101 of closure member 99 so as to extend there through into chamber 73. It may be noted that sheathing 105 is provided with a configuration complimenting that of conduit 55 wherein an outer peripheral surface 109a of the sheathing defines extensions of the above described walls of conduit 55 as may be seen in FIGS. 4, 5, and 7. To complete the description of closure member 99, terminal 111 has an interior end 113 disposed within chamber 73, and the interior end 113 of the terminal is conductively interconnected with one end of conductor 22.

Conduit 75 is also provided with a closure member 115 which includes a wall or plug 117 having an inner end or end portion 119 seated in the rightward end of the conduit against displacement therefrom, as seen in FIG. 5 and 8, and if desired the inner end portion 119 may be fixedly secured within the rightward end of the conduit by suitable adhesive means, such as an adhesive, set screw, or the like. Sheath or shroud 121 integral with wall 117 extends therefrom generally opposite inner end portion 119 exteriorly of conduit 75, and an abutment or shoulder 123 on wall 117 extends between inner end portion thereof and sheath or sheathing 121. Shoulder 123 is seated or otherwise abutted against the rightward end of conduit 75 and
extends in protective relation about an exterior connector or male connector end 125 provided on a terminal 127 mounted in wall 117 of closure member 115. It may be noted that sheathing 121 is provided with a peripheral configuration complementary to that of conduit 75. Furthermore, it may also be noted that the peripheral configurations of sheathing 105, 121 on closure members 99, 115 are predetermined so as to be able to interfit with each other, as further discussed hereinafter. Terminal 127 has an interior end 129 disposed within chamber 73, and the terminal interior end is conductively interconnected with the other opposite end of conductor 22.

With the opposite ends of conductor 22 conductively interconnected with interior ends 113, 129 of terminals 111, 127, it may be noted that a generally central or intermediate section 131 of conductors 22 may be arranged in a generally sinuous configuration, as indicated generally at 133 and at best seen in FIG. 5. Thus, in response to manual relative movement of conduits 55, 75 from their retracted positions, as seen in FIG. 4, into their extended positions, as seen in FIG. 5, it may be noted that the sinuous configuration 133 at the generally central sections 131 of conductor 22 is conjointly moveable with the conduits so as to extend the effective length of the conductor and accommodate the extension of the conduits into their extended position.

While conductor 22 as illustrated herein as a coaxial cable, it is contemplated that extendable molding unit 21 may be provided with various different types of conductors within the scope of the invention, such various different types of conductors including, but not limited to, a signal transmitting conductor, a power transmitting conductor, a telephone cable, a fiber optic cable, or a ribbon cable, and combinations thereof, for instance. Appropriate shielding may be provided within the device to isolate conductors susceptible to interference. Of course, different types of conduits or cable respectively require different types of terminals; therefore, while male and female terminals 111, 127 are shown in the extendable molding unit, various different types of terminals required to terminate the aforementioned various types of conductors may be utilized within the scope of the present invention.

Furthermore, it is anticipated that extendable molding units 21 may be provided in various lengths and be interconnected so as be utilized in rooms of various different sizes. Various exterior shapes, materials, colors and textures may also be provided for decorative purposes.
As seen in FIG. 4, conduit 75 is provided with an abutment or retainer 132 secured by suitable means, such as an adhesive or integrally formed or the like for instance, to land 87 on base wall 85 of the conduit with the abutment 132 being spaced adjacent opposite side edge 91 of land 87. The abutment is shown in dotted lines in FIG. 4 being predeterminedly spaced apart from the end of conduit 55 when conduits 55, 75 are in the retracted position thereof. Thus, it may be noted that abutment 132 on conduit 75 is movably or slidably received within a groove in base wall 57 of conduit 55. Further, another abutment or retainer 134 is provided within the groove being secured by suitable means, such as an adhesive or the like for instance, to base wall 57 of conduit 55 so as to extend into abutting engagement with abutment 132 of conduit 75. Albeit not shown for purposes of drawings simplification and brevity of disclosure, it may be noted that abutment 132 on conduit 75 is movable toward abutting engagement with abutment 134 of conduit 55 upon the relative movement of conduits 55, 75 from the retracted position thereof, as seen in FIG. 4, toward the extended position thereof, as seen in FIG. 5. To complete the description of extendable molding unit 21, it may be noted that the above-discussed engagement of abutment 132, 134 not only retains conduit 75 against displacement from conduit 55 but also defines the most extended position of the conduits. Thus, during assembly of extendable molding unit 21, conduit 75 is preferably slid into conduit 55 from the location of closure end 99 (left to right in FIG. 4) before closure end 99 is installed. Alternatively, retainer 132 may be formed to have one tapered surface and a degree of compressibility, such as being formed of an elastomer or being spring-actuated, so that it can be moved past retainer 134 in one direction to insert conduit 75 into conduit 55, and also to restrict its movement past retainer 134 in the opposed direction to function as a stop defining the extended position of unit 21.

As illustrated in FIG. 9, an alternative conductor 135 having an intermediate section 137 with a plurality of expansible or extendable coils 139 therein is provided in expansible chamber 73 between conduits 55, 75; however, for the purposes of drawing simplifications, the conductive interconnection of conductor 135 with terminals 111, 127 of conduit 55, 75 is omitted. However, it may be noted that the respective manual movements of conduit 55, 75 from their retracted position to their extended position would effect the conjoint extension of extendable coils 139 in
conductor 135 to accommodate the extension of conduits 55, 75 into the extended position thereof within the scope of the present invention. The spring constant of the extendable coils 139 may be selected to be sufficiently high to ensure that the length of conductor 135 is retracted to a desired shorter length upon the movement of unit 21 to its retracted length, as shown in FIG. 4, and also to be sufficiently low so that an undesired amount of spring-back of the unit 21 is not encountered when handling the unit 21 during installation.

With reference again in general to the drawing and recapitulating at least in part with respect to the foregoing, there is illustrated in one form of the invention a method of assembling a plurality of extendable molding units 21 to define a wiring system 143 along at least one surface 145 of a room 147 (FIGS. 10 and 11). Each extendable molding unit 21 includes a pair of relatively extendable conduits members 55, 75 telescopically arranged with respect to each other and each having a closed end or closure member 99, 115 with a conductor conductively connected between the closed ends, and an extendable section 133 in the conductor (FIGS. 4-6). Conduit pairs 55, 57 are arranged in end-to-end relation along surface 145 of room 147 (FIG. 11) and at least some of the conduit pairs are extended generally end-wise thereof upon their arrangement in the end-to-end relation thereof (FIGS. 4 and 5). Extension of conductor section 77 of the at least some conduit pairs 55, 75 is effected when the conduit pairs are extended generally end-wise thereof (FIG. 5), and conductors 22 of the conduit pairs of each extendable molding unit are interconnected in continuous conductive relation with each other.

More particularly and with specific reference to FIG. 10, there is shown a plurality of extendable molding units 21 arranged in end-to-end relation with each other to interconnect female and male terminals 111, 127 in conduits 55, 75 in conductive relation. As previously mentioned, outer peripheral surface 105a of sheathing 105 on closure member 99 is predeterminately configured to define an extension of the outer periphery of conduit 55. Inner peripheral surface 141 provided on sheathing 105 is predeterminately configured to form a slideway and slidably receive outer peripheral surface 125a of sheathing 121 on closure member 115 of conduit 95, which in turn is predeterminingly configured to form a slide to be received in said slideway when a pair of extendable molding units 21 are arranged in end-to-end relation with each other.
In the practice of the above mentioned assembly method, a plurality of extendable molding units 21 are arranged or otherwise disposed in end-to-end relation along the at least one surface 145, and at least some of the conduit pairs 55, 75 are extended generally end-wise into their extended positions upon the arrangement of extendable molding units 21 into the end-to-end relation thereof; as seen in FIG. 10. Further is also seen in FIG. 10, extendable molding units 21 arranged in the end-to-end relation thereof are illustrated in box form for the purpose of drawing simplification and brevity of disclosure.

To accommodate the end-to-end arrangement of extendable molding units 21 along surface 145 of room 147, conduit 55 of each extendable molding unit is secured or otherwise disposed in a preselected position on the surface. In order to effect the aforementioned securing of conduit 55 to surface 145, mounting devices 27, as discussed in detail above and as seen in FIGS. 1-3, may be positioned or otherwise mounted in pre-selected positions along surface 145, and conduit 55 of each extendable molding device 21 is mounted to the mounting devices, as seen in FIG. 3. For the purpose of drawing simplification, mounting devices 27 are diagrammatically shown as boxes in dotted outline in FIG. 11. To effect the aforementioned releasable mounting of conduit 55 of each extendable molding unit 21, such conduits 55, 75 are respectively received in sliding relation on mounting devices 27 which accommodates the aforementioned extension of conduits 55, 75 of each extendable molding unit 21 arranged in the end-to-end relation thereof. In other embodiments, the conduits may be configured to snap onto the mounting devices, then to slide laterally into a desired position. It may be noted that upon aforementioned extension of conduit pairs 55, 75 of at least some of the extendable molding units 21 arranged in the end-to-end relation thereof, female and male connectors 109, 125 on terminals 111, 127 in adjacent ones of conduit pairs 55, 75 are interconnected in conductive relation as the conduit pairs are arranged in their end-to-end relation generally concurrently with the above discussed end-to-end arrangement of extendable molding units, as seen in FIG. 10. While mounting devices 27 are utilized in conjunction with conduits 55 of extendable molding units 21 as set out in the discussion relating this method of assembling the extendable molding units in end-to-end relation, it is contemplated that various other mounting
devices and/or attachment points on the molding units 21 may be utilized with the extendable molding units within the scope of the invention.

When conduits 55, 75 of extendable molding units 21 are extended, i.e. manually moved from the retracted position to the extended position thereof, as previously discussed and as seen in FIG. 4 and 5, it may be noted that the sinuous arrangement 133 in section 131 of conductor 22 is conjointly movable with the conduits thereby to extend the effective length of conductor 22 which serves to accommodate the extensions of conduits 55, 75 in respective ones of extendable molding units 21 in their end-to-end relation. Furthermore, when extendable molding units 21 are associated in the end-to-end relation thereof, it may be noted that conduits 55, 75 in adjacent ones of the extendable molding units 21 are interconnected with each other which effects the interconnection of conductors 22 in each of the extendable molding units in a continuous conductive relation with each other. As seen in FIG. 11, a signal or power outlet 149 for wiring system 143 is provided on wall 145 of room 147, and a jumper conductor or cable 151 is interconnected in conductive relation between outlet 149 and extendable molding units 21 in the end-to-end relation thereof on wall 145. A power or signal operated unit or device 153 is schematically illustrated in box form in room 147, and to complete the description of this assembly method, another jumper conduit or cable 155 for wiring system 143 is interconnected in conductive relation between device 151 and extendable molding units 21. In this manner, the device of the present invention may be used to provide connectivity for Internet, cable TV, phone, video, games, computers and peripherals, IP addressable devices, high-speed data transmission, etc., to satisfy the increasing demand for such signals into existing spaces and into buildings under renovation or construction. A decorative cover 152 having an exterior shape configured to match the exterior shape of conduit 55 may be installed over the exposed portions of conduit 75 in order to provide an aesthetically more pleasing appearance to the assembly. Corner pieces may be provided to interconnect units 21 mounted on intersecting surfaces; i.e. a ninety degree bend piece 157 to fit around corner 150 of FIG. 11. Piece 157 includes three legs for interconnecting two horizontal runs 21 and one vertical run 158 of extendable molding units. Furthermore, corner units may be configured to fit into an inside corner (as shown) or around an outside corner. Vertical run molding unit 158
is illustrated as being disposed along a corner of two walls 145 of a room. While the geometry for such a location may be different than the embodiment of horizontal run molding unit 21, one skilled in the art may appreciate that the aspects of mounting, interconnection, extendibility, etc. described above likewise may be advantageously applied to this embodiment.

One skilled in the art may appreciate that the present device and method may be used to extend a conductor along any wall, floor or ceiling of a room, around windows and doors, along corners, etc. The architectural style of the exterior portions of the device may be selected to be aesthetically pleasing for each of these arrangements. However, when extending a conductor across a floor, one must consider not only aesthetics but also safety and convenience. In particular, the conduits must not pose a tripping danger, they must not prevent movement by a person in a wheelchair or other mobility device, and they must provide mechanical protection for the conductor against the weight of a person or mobility device.

Accordingly, in one form of the invention there is illustrated a method of assembling a ramp device 157 including a pair of ramp or closure end caps 159, 161, a generally elongate ramp 163 having a pair of opposite ends 165, 167 and a plurality of extendable molding units 21 to define a part of a wiring system 169 along a floor such as across a doorway 171 (FIG. 12). The ramp device 157 may be designed to be compliant with the American with Disabilities Act (ADA). Extendable molding units 21 respectively include a pair of extendable conduits 55, 75 telescopically arranged for relative movement and each having a closed end defined by closure, members 99, 115 with a conductor 22 conductively connected between the closed ends, and the conductor having an extendable section 131 (FIGS. 4-6 and 10). In the practice of this method, conduit pairs 55, 75 of each extendable molding unit 21 are extended, and extendable section 133 of conductor 22 conductively connected between closure members 99, 115 of each conduit pair 55, 75 is extended upon the occurrence of the extensions of the conduit pairs of each extendable molding unit, (FIG. 4). Extended conduit pairs 55, 75 of each extendable molding unit 21 is arranged or otherwise received in end-to-end relations within elongate ramp 163 (FIGS. 10 and 12), and end caps 159, 161 are secured to opposite ends 165, 167 of the elongate ramp against displacement therefrom, respectively, when the extended conduit pairs of each extendable molding unit is arranged within the elongate ramp.
Upon the securement of end caps 159, 161 to elongate ramp 163, the end caps are engaged or otherwise abutted with respective ones of the extended conduit pairs 55, 75 in the elongate ramps and adjacent to the end caps (FIGS. 15 and 16), as described in detail hereinafter.

Elongate ramp 163 may be integrally formed of a suitable resin material, such as a plastic or the like for instance and molded or cut to any desired length. Elongate ramp 163 includes a base 173, a pair of opposed ramp sections 175, 177 engaged with the base, a central section 179 spaced above the base and interposed between the opposed ramp sections, and channel 181 bisects the base and is defined between the central section and the opposed ramp sections, as seen in FIGS. 15 and 16. Furthermore, each of base 173, opposed ramp sections 175, 177, central sections 179 and channel 181 extend between opposite ends 165, 167 of elongate ramp. Opposed ramp sections 175, 177 respectively, provide a pair of opposite sidewalls 183, 185 for channel 181, and central section 179 provides a base wall 187 for the channel interposed between the opposite sidewalls thereof. As previously mentioned, channel 181 bisects base walls 173 of elongate ramp 163; therefore, the channel is provided with an open end 189 between opposite sidewalls 183, 185 and spaced opposite base wall 187. A pair of retaining flanges 191, 193 are integrally formed with base wall 187 of channel 181 extending thereinto adjacent opposite sidewalls 183, 185 and connecting with opposite ends 165, 167 of elongate ramp 163 thereby to form a pair of opposed mounting grooves 195, 197 between opposite ends 164, 167 of the elongate ramp, and the retaining flanges respectively terminate in guide ledges 199, 201 extending into mounting grooves 195, 197.

Extendable molding units 21 are arranged in end-to-end relation in elongate ramp 163, and in such end-to-end relation, opposite sidewalls 59, 61 of conduit 55 are slidably and guideably engaged with opposite sidewalls 183, 185 of channel 181. Further, guide ledges 67 of opposite sidewalls 59, 61 on conduit 55 extend into opposite grooves 195, 197 in elongate ramp 163 with guide ledges 67 slidably and guidably engaged with guide ledges 199, 201 and it may be noted that the engagements between guide ledges 67, 199, 201 retain conduit 55 against displacement from elongate ramp 163 through open end 189 of channel 181. Thus, as each extendable molding unit 21 is received in the aforementioned end-to-end relation thereof in channel 181 of elongate ramp 163, conduit 55 thereof is slidably
arranged with the elongate ramp within channel 181 against displacement through 
open end 189 thereof. It may be noted that each extendable molding unit 21 has its 
conduits 55, 75 in the extended position thereof upon the reception of each 
extendable molding unit 21 in channel 181 of elongate ramp 163, and it may be 
5 further noted that adjacent ones of such extendable molding units are conductively 
interconnected, as illustrated in FIG. 10 and as discussed in detail hereinbefore.

Since end caps 159, 161 are of like construction each having the same 
component parts, the ends cap shown in FIG. 14 is indicated by both reference 
numbers 159, 161 but only end cap 159 is described hereafter; however, the like 
10 components of the end cap 161 are indicated by the addition of a sub-reference 
umeral “a”, and it may be noted the end caps each have a peripheral configuration 
complementary to that of elongate ramp 163.

End cap 159 is provided with a body 203 having a closures face 205 with a 
peripheral configuration complementary to opposite end 165 of elongate ramp 163, 
and a peripheral flange 207 is integrally formed with the body so as to extend in a 
direction away from the closure face. Body 203 is provided with a pair of integral 
formed, spaced apart, opposed generally C-shaped extensions or abutments 209, 
211 which extend beyond closure face 205 generally perpendicular thereto, 
respectively, and each C-shaped extension includes a sidewall 213 interposed 
20 between a pair of spaced apart end flanges 215, 217 which extend generally 
perpendicular from the sidewall. An opening 219 extends through body 203 
intermediate sidewalls 213 of C-shaped extensions 209, 211, respectively, so as to 
intersect with closure face 205, and a notch 221 is provided through peripheral 
flange 207 generally above opening 219 through the body. To complete the 
25 description of end cap 159 a pair of interference fit cylindrical protrusions 223 are 
integrally formed with body 203 being spaced from sidewalls 213 of opposed C- 
shaped extensions 209, 211, respectively, so as to extend beyond closure face 205, 
and a plurality of barbs 225 are peripherally spaced about each cylindrical protrusion 
extending lengthwise thereof and intersecting with the closure face.

When end cap 159 is secured or mounted to elongate ramp 163, closure face 
205 of end cap 159 is abutted against opposite end 165 of the elongate ramp in 
closing relation therewith. To retain end cap 159 against displacement from 
elongate ramp 163, barbs 225 on cylindric protrusion pair 223 of end cap 159 are
forced into interfering fit engagement within a pair of complementary openings or apertures 227 provided therefore in ramp sections 175, 177 of the elongate ramp, as seen in FIG. 17. The apertures extend through the elongate ramp intersecting with opposite ends 165, 167 thereof, respectively. To establish the interfering fit between barbed protrusion pair 223 and aperture pair, it is necessary to exert an applied force onto body 203 of end cap 159. Other methods of attachment may be used in other embodiments.

It may be noted that opposed C-shaped extensions 209, 211 on closure face 205 of end cap 159 are entered into channel 181 upon the above discussed securement of end cap 159 to elongate ramp 163, and the sidewalls 213 of the opposed C-shaped extensions are slidably arranged with opposite sidewalls 183, 185 of channel 181 and arranged in abutting or locating engagement with the free end of closure member 99 on conduit 55 of extendable molding unit 21 disposed in the channel adjacent end cap 159. End flanges 215, 217 of opposed C-shaped extensions 209, 211 are also arranged in abutting or locating engagement with the free end of closure member 99, and in response to the abutment of the C-shaped extensions with the closure member, at least conduit 55 of extendable molding unit 21 adjacent end frame 159 is spaced or located in channel 181 farther away from opposite end 165 of ramp 163 and away from closure face 205 of end frame 159.

Further, the movement, of conduit 55 in channel 181 may effect the relative movement of conduit 55 from its extended position with respect to its associated conduit 57.

Prior to the securement of end frame 159 to elongate ramp 163, jumper conduit 229 may be secured in conductive relation to exterior connector 109 of terminal 111 in closure member 99 and strung or otherwise passed through opening 219 in body 203 of end cap 159, thereby to in part be arranged exteriorly of elongate ramp 163 upon the above discussed securement of end cap 159 thereto.

When end cap 161 is secured or mounted to elongate ramp 163, closure face 205a of end cap 161 is abutted against opposite end 167 of the elongate ramp in closing relations therewith. To retain end cap 161 against displacement from elongate ramp 163, barbs 225a on cylindric protrusion pairs 222 of end cap 161 are forced into interfering fit engagement with elongate apertures 227 provided therefore in ramp sections 175, 177 of the elongate ramp, as seen in FIG. 17, and as
previously mentioned. The apertures extend through the elongate ramp intersection with opposite ends 165, 167, respectively. It is also necessary to exert an applied force onto body 203a of end cap 161 to establish the interference fit between barbed protrusions 222 and apertures 227.

As seen in FIG. 16, it may be noted that opposed C-shaped extensions 209a, 211a on closure face 205a of end cap 161 are entered into channel 181 upon the above discussed securement of end cap 161 to elongate ramp 163, and the sidewalls 213a of the opposed C-shaped extensions are slidably arranged with opposite sidewalls 183, 185 of channel 181. It may be further noted that opposed upper and lower end flange 215a, 217a on opposed C-shaped extensions 209a, 211a are arranged in supporting or locating engagement with closure member 115 on conduit 75 of extendable molding unit 21 adjacent end flange 161 secured to elongate ramp 163. More particularly, opposed lower end flanges 217a on opposed C-shaped extensions 209a, 211a on closure face 205a of end cap 161 are respectively arranged in supporting or locating engagement or relation with cover wall 83 of conduit 75, and upper end flanges 215a on the opposed C-shaped flanges are respectively slidably and guidably receives in supporting or locating relation with opposite ledge 90, 92 on closure member 115, respectively. Therefore, it is believed the above discussed supporting or locating association of opposed C-shaped extensions 209a, 211a on end cap 161 with closure member 115 of conduit 75 would at least alleviate any undesired floppy movement, i.e. up and down movement as well as sidewise movement of conduit 75 with respect to its cooperating conduit 55 in the aforementioned extendable molding unit 21 adjacent end cap 161 as viewed in FIG. 16, at least when conduit 55, 75 are in the extended position thereof.

Prior to the securement of end cap 161 to elongate ramp 163, jumper conduit 231 may be secured in conductive relation to exterior connector 125 of terminal 127 in closure member 115 and strung or otherwise passed through opening 219a in body 203a of end cap 161 thereby to be in part arranged exteriorly of elongate ramp 163 upon the above discussed securement of end cap 161 thereto.

It is believed that extendable molding unit 21 may be associated in end-to-end relation mounted to a wall of a room or in ramp devices 157, as discussed above, without employing professional installers since no cutting or custom tools are required thereby resulting in lower installation costs. It is also believed that the
exterior of extendable molding units 21 may be provided with various different decors, colors, materials, etc. Furthermore, it is also believed that the extendable molding units 21 arranged in end-to-end relation lend themselves to either vertical or horizontal placement along or on any surface, as well as providing simple removal from such placement.

The installation and removal of molding units 21 in end-to-end relation as illustrated in FIG. 11 may be facilitated by the incorporation of the end cap assembly 240 illustrated in sectional view in FIG. 18. End cap assembly 240 includes cooperating male and female end caps 242, 244. End caps 242, 244 include respective distal ends 246, 248 configured for installation on opposed ends of conduits 75, 55 respectively of FIG. 4. End caps 242, 244 may be affixed to the opposed ends of conduits 75, 55 with an adhesive such as an epoxy or solvent or by other appropriate means. Molding units 21 are then joined in end-to-end relation by inserting male end cap 242 of one molding unit 21 partially into female end cap 244 of an adjoining molding unit 21 to form the assembly of FIG. 21. Male end cap 242 includes a protruding member 250 disposed at an end of a flexible member 252 that provides a spring bias to the protruding member 250. The spring bias allows protruding member 250 to be displaced by female end cap wall member 254 as male end cap 242 is inserted into female end cap 244, and further allows protruding member 250 to spring outwardly into an opening 256 formed in wall member 254 once the end cap assembly 240 is assembled into its fully assembled position joining adjacent molding units 21 in end-to-end relation. The protruding member 250 and opening 256 together function as a snap feature maintaining a compressive restraining force across terminals 111, 127 (not shown in FIG. 18) thereby ensuring the integrity of the connection between conductors of adjoined molding units 21. The forces needed to join and to separate the male and female end caps 242, 244 may be affected by the selection of the spring bias of flexible member 252 and the angle of slope provided on protruding member 250 relative to respective edges 258, 260 of wall member 254. In one embodiment, the forces are designed to maintain a desired degree of compressive force for securing the joining of terminals 111, 127 while still permitting the end cap assembly 240 to be manually pulled apart during a disassembly process. Female cap 244 may further include opposed guide ledges
configured to make sliding contact with gripping ledges 43 of mounting device 27.

The extendable channel unit of the present invention may be provided without conductor 22 and terminals 111, 127 and mounted on a surface 23 to function as a raceway for the subsequent installation of conductor 22. To facilitate such later installation of conductor 22, the configuration of closure members 99, 115 may be selected to provide a relatively large opening for the passage of conductor 22 with or without terminals 111, 127.

From the foregoing, it is apparent that a novel and improved extendable molding unit 21, novel and improved methods of assembly of such molding units along a surface, and a novel and improved method of assembly of a ramp device utilizing such molding unit 21 have been presented. It is contemplated that various changes as to the precise arrangements, configurations and connections of the components employed in such extendable molding unit, as well as the precise order of the steps of such methods, may be made by those having ordinary skill in the art without departing from the spirit of the invention or form the scope thereof as set out in the claims which follow.
CLAIMS

WE CLAIM AS OUR INVENTION:

1. An extendable channel unit comprising:
   a pair of telescopically arranged conduit members relatively extendable with
   respect to each other and defining an expandable chamber therein; and
   a conductor disposed between said conduit members and across said
   chamber, said conductor including a section arranged to accommodate a change in
   length of the chamber during relative extension of said conduit members.

2. The extendable channel unit of claim 1, wherein the conduit members
   comprise a mounting structure; and further comprising a mounting device affixable to
   a surface and cooperatively associated with said mounting structure for retaining the
   channel unit adjacent the surface.

3. The extendable channel unit of claim 2, wherein the mounting device
   further comprises a mounting section and a reference section, the reference section
   shaped to position the mounting section a predetermined distance from a reference
   surface.

4. The extendable channel unit of claim 3, wherein the mounting section
   and reference section are interconnected by a weakened section to facilitate the
   removal of the reference section after the mounting section is affixed to the surface.

5. The extendable channel unit of claim 1, wherein said section of said
   conductor comprises a generally sinuous arrangement of said conductor within said
   chamber.

6. The extendable channel unit of claim 1, wherein said section of said
   conductor comprises a plurality of expandable coils arranged in said conductor within
   said chamber.
7. The extendable channel unit of claim 1, wherein said conduit members comprise a pair of conductive terminals, an interior end of each terminal disposed within said chamber and respectively conductively interconnected with opposite ends of said conductor, and an exterior end of each terminal arranged exteriorly of said chamber.

8. The extendable channel unit of claim 7 wherein said conduit members comprise a respective pair of closure members secured to opposed ends of said conduit members and defining therewith said chamber, said conductive terminals being mounted on and extending through said closure members.

9. The extendable channel unit of claim 8, wherein said closure members comprise a pair of open ended sheathings extending in spaced relation about said terminals, respectively.

10. The extendable channel unit of claim 9, further comprising a pair of end caps attached to said sheathings, said end caps comprising:
    a male end cap comprising a protruding member disposed at an end of a biasing flexible member;
    a female end cap comprising a wall member defining an opening conforming to said protruding member.

11. The extendable channel unit of claim 9, further comprising:
    one of said open ended sheathings comprising an inner peripheral surface having a configuration defining a slide-way; and
    the other of said open ended sheathings comprising an outer peripheral surface having a configuration complementary to the configuration of said inner peripheral surface so as to define a slide conforming with said slide-way.

12. The extendable channel unit of claim 1, wherein said conduit members comprise a pair of spaced abutments arranged to engage with each other to limit displacement of said conduit members in their telescopic arrangement in response to the relative extension of said conduit members.
13. The extendable channel unit of claim 1, further comprising an elongate ramp comprising a channel for receiving the conduit members.

14. The extendable channel unit of claim 1, further comprising a seal disposed between the conduit members for restricting an ingress of fluid into the expandable chamber.

15. An extendable channel unit assembly for receiving and securing a conductor along a surface, the extendable channel unit comprising:
   a mounting device affixable to the surface and comprising a flange extending away from the surface;
   an outer conduit comprising an outer base wall, a pair of opposed outer sidewalls extending from the outer base wall, and an outer cover wall extending between the outer sidewalls, the outer conduit further comprising a guide member conforming with the flange to slidably secure the outer conduit onto the mounting device; and
   an inner conduit slidably arranged at partially within the outer conduit and comprising an inner base wall, a pair of opposed inner sidewalls extending from the inner base wall, and an inner cover wall extending between the inner sidewalls to define a chamber for receiving the conductor.

16. The extendable channel unit assembly of claim 15, further comprising a first abutment attached to the outer conduit and a second abutment attached to the inner conduit, with engagement of the first and second abutments defining a most extended position of the channel unit assembly.

17. The extendable channel unit of claim 15, further comprising a cover disposed over a first of the pair of telescopically arranged conduit members, the cover comprising an exterior surface conforming with an exterior surface of a second of the pair of telescopically arranged conduit members.
18. A method of assembling an extendable channel unit and a mounting device along a wall of a room with respect to a reference surface associated with the wall, the mounting device having a mounting section and a separable depending reference section with a distal end arranged in predetermined spaced apart relation from the mounting section, the method comprising the steps of:

associating the mounting section of the mounting device with the wall;

seating the distal end of the separable depending reference section against the reference surface during the associating step to arrange the mounting section in a desired predetermined position;

securing the mounting section to the wall in the predetermined position;

mounting the extendable channel unit to the mounting section with the extendable channel unit extending along the wall and with the extendable channel unit being in predetermined spaced apart relation from the reference surface; and

separating the reference section from the mounting section subsequent to the securing step.

19. The method of claim 18, wherein the mounting step further comprises interconnecting the channel unit in sliding association with the mounting section, and further comprising extending the extendable channel unit to a desired length along the wall.

20. The method of claim 19, wherein the channel unit contains a conductor and wherein the mounting step further comprises conjointly extending an extendable section of the conductor to accommodate the extension of the channel unit.
21. A method of assembling a plurality of extendable channel units to define a wiring system along at least one surface of a room, each extendable channel unit including a pair of relatively extendable conduit members telescopically arranged with respect to each other and each having a closed end with a conductor conductively connected between the closed ends, and an extendable section in the conductor, the method comprising the steps of:

arranging the plurality of extendable channel units in end-to-end relation along a surface;

extending at least some conduit pairs generally end-wise thereof during the arranging step;

effecting the extension of the conductor extendable sections of the at least some conduits pairs in response to the extending step; and

interconnecting the conductors of the plurality of extendable channel units in continuous conductive relation with each other upon the occurrence of the extending step.

22. The method of claim 21, further including a plurality of mounting devices, and further comprising positioning the mounting devices at selected positions on the surface and releasably mounting one conduit of each conduit pair to the mounting devices, respectively.

23. The method of claim 22 wherein the releasably mounting step includes receiving the one conduit of each conduit pair in sliding relation on the mounting devices to accommodate the extension of the at least some conduit pairs during the extending step.
24. The method of claim 22, wherein the mounting devices each comprise a mounting section and a reference section interconnected by a weakened section, and further comprising the steps of:

- positioning the reference section adjacent a reference location on the surface to arrange the mounting section in a desired position;
- securing the mounting section to the surface in the desired position;
- mounting the channel units to the mounting section; and
- separating the reference section from the mounting section at the weakened section.

25. The method of claim 22, wherein the surface is a floor, and further comprising:

- providing an elongate ramp device comprising a channel extending between a pair of opposed ends of the elongate ramp for receiving the extendable channel units;
- disposing a channel unit within the channel and extending the channel unit to accommodate a length of the channel; and
- arranging the ramp device along the floor to provide mechanical protection for the conductor.

26. The method of claim 21, further comprising interconnecting adjacent extendable channel units with a snap connection upon the occurrence of the extending step.
FIG. 10

FIG. 11
FIG. 14

FIG. 15
FIG. 16

FIG. 17