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[54] **TRENCH DUCT**
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E04f 17/08
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220/55 N, 3.4, 3.7, 3.8; 174/48, 101

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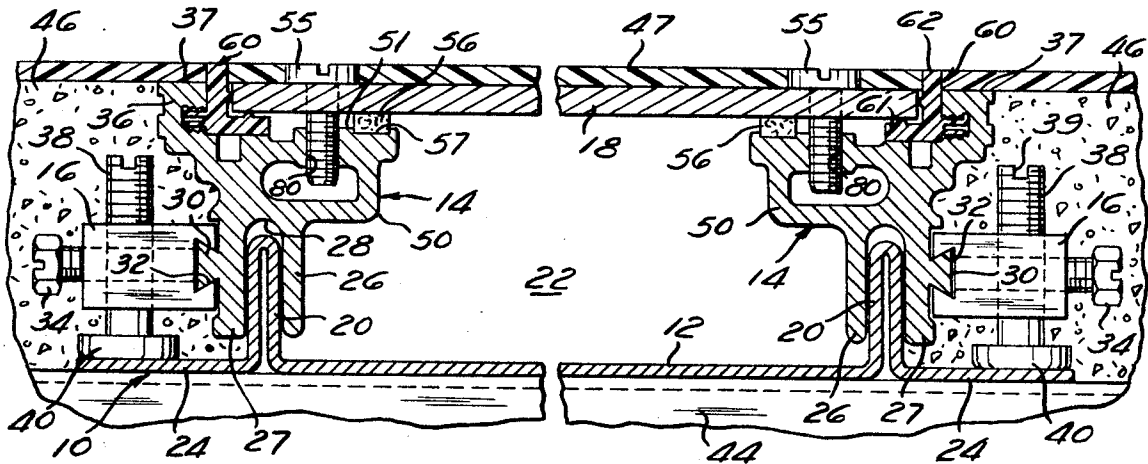
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ABSTRACT: An underfloor electrical trench duct has a bottom channel member with adjustable height side rails and a removable cover plate. A reversible trim strip which snaps into different grooves in the side rails provides a moisture seal between the cover plate and the side rails during construction and in the finished floor as well as a decorative trim strip between the covering on the cover plate and that on the surrounding floor. The cover plate fastening arrangement includes a fastener slot extending the length of each side rail for receiving cover plate fasteners at any point along the length of a duct section.



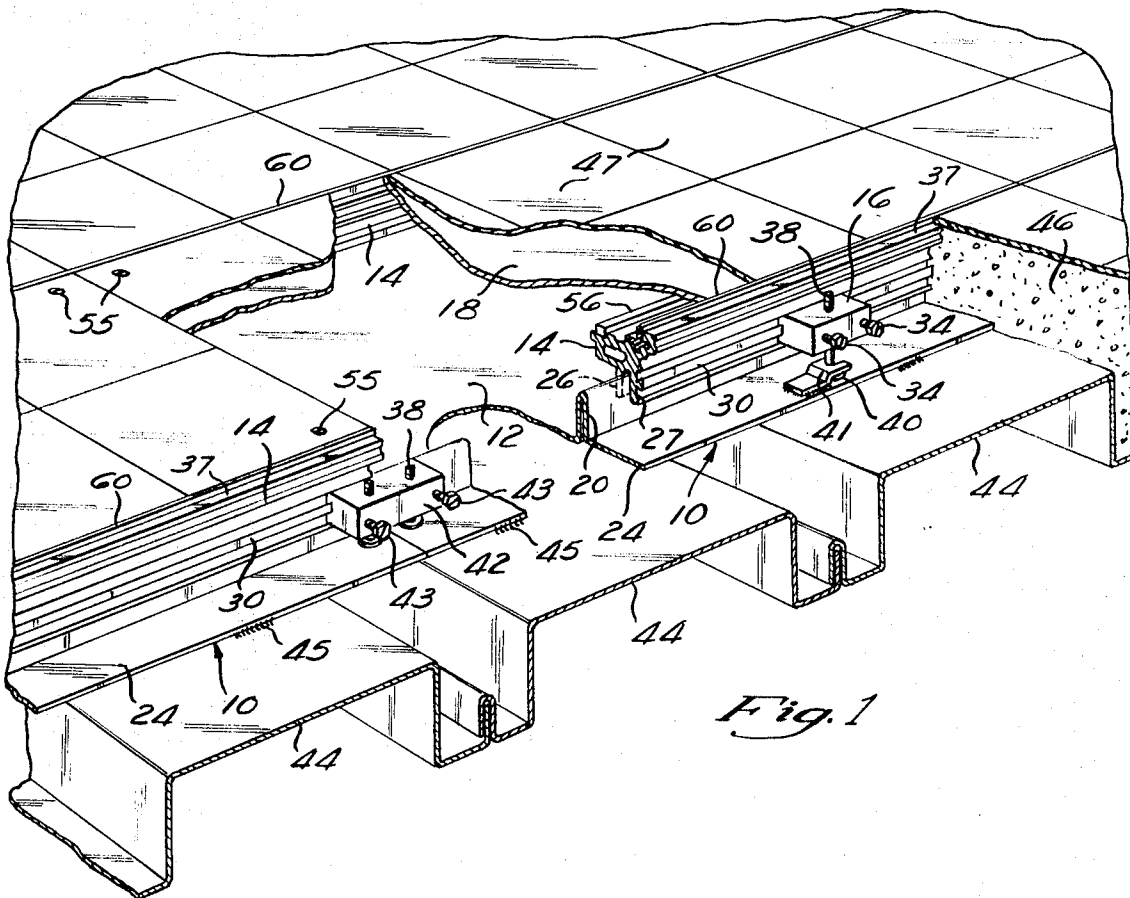


Fig. 1

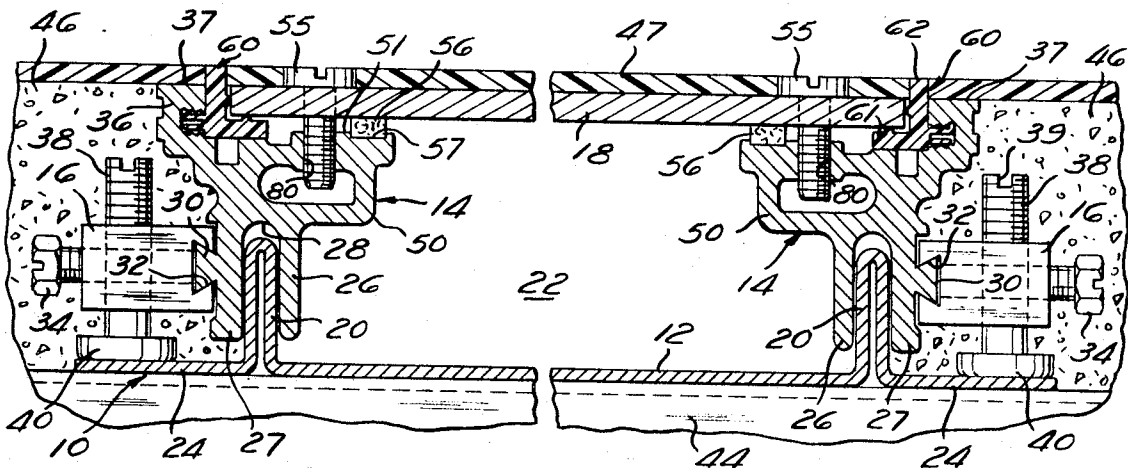
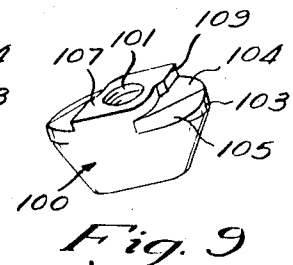
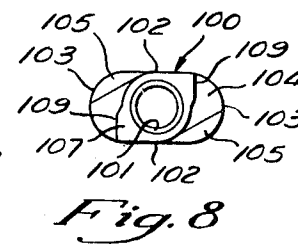
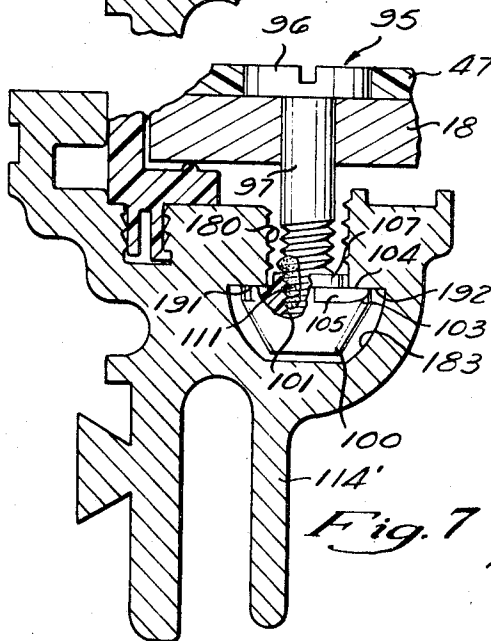
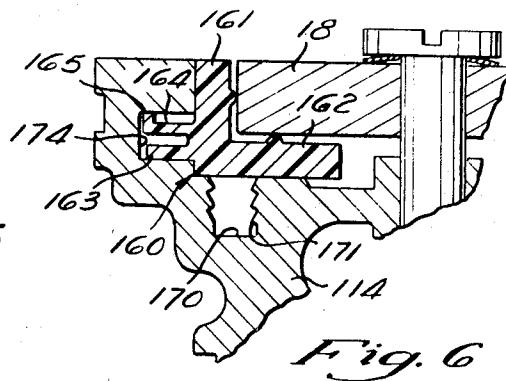
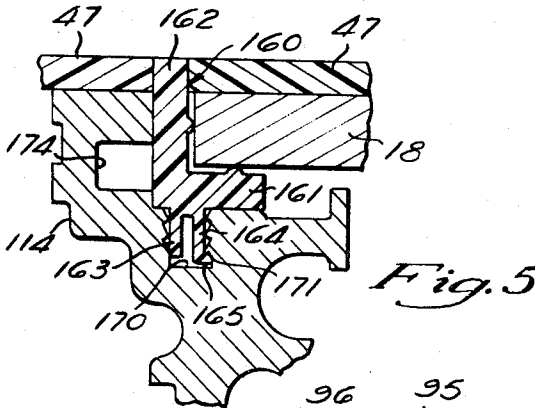
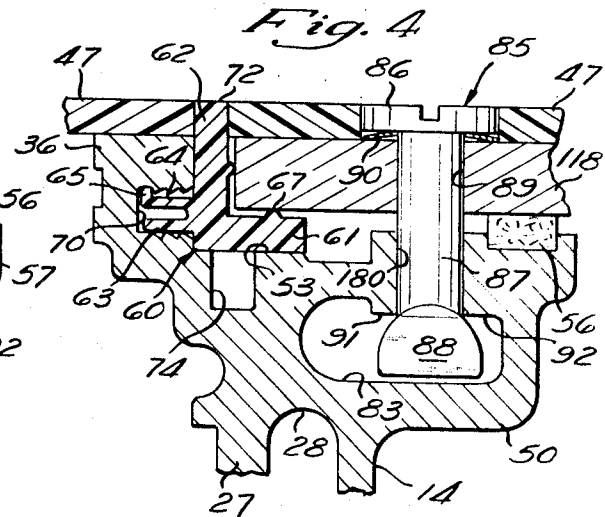
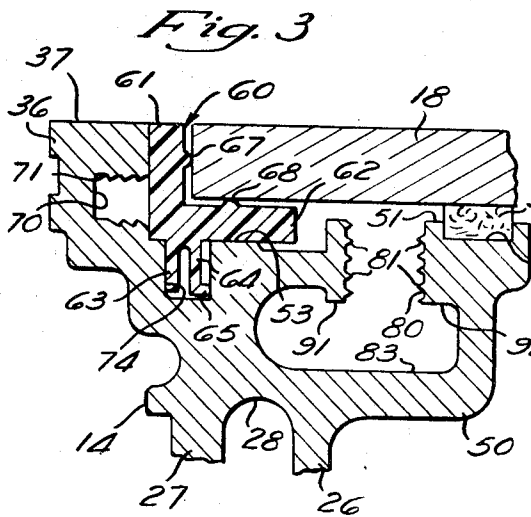


Fig. 2

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TRENCH DUCT

The present invention relates generally to electrical trench duct for underfloor installation and more particularly to cover plate fastening and trim strip arrangements for such trench duct.

Underfloor electrical trench duct is used to provide a covered conduit raceway in the floor of a building. Generally the conduit receiving raceway is formed by embedding a channel member in a concrete floor during the construction of the floor. The channel member below the surface of the floor and the raceway is covered over by removable cover plates which lie flush with and form a portion of the finished floor. Access to the electrical cable is provided at any point along the length of the trench duct by removing these cover plates. In accordance with building safety requirements, all portions of the trench duct must be grounded. Therefore, when metallic channel members and cover plates are used means must be provided to establish a positive electrical connection between the cover plate and the channel members.

Generally screw-type fasteners are used to secure the cover plates to the channel members. However, in the heretofore available trench duct assemblies, it has been necessary to align accurately the fastener holes in the cover plate with similar holes in the channel members. Since these holes are not always aligned during manufacture, it is often necessary to plug the existing holes and drill new ones during installation, particularly if the cover plate and channel members are mixed before installation. If this special assembly work is not done, there by be a poor ground connection between the cover plate and the channel members and moisture may leak past the cover plate into the conduit raceway.

In such installations the floor is usually covered with a suitable floor covering such as linoleum, floor tile or carpet. To separate the floor covering on the concrete floor from that on the cover plate, decorative trim strips are provided along the edges of the cover plate. These trim strips are often reversible so that when the concrete floor is poured and screeded around the assembled trench duct section, the trim strip is positioned with the decorative edge within the trench duct. After the floor is finished, the trim strip is reversed so that the decorative edge extends above the surface of the screed lips so as to be flush with the surface of the floor covering.

The present invention overcomes the various foregoing and other problems by providing the cover plate with fasteners which engage open fastener slots running the entire length of the channel side members. The fastener slots are so arranged that the cover plate fasteners can be engaged within the slots at any point along the length of duct sections. With this cover plate fastening arrangement the problems of aligning the fastener holes in the cover plate with similar small holes in the channel member is eliminated. Thus, a cover plate of any length can be tightly secured to the channel member at any point along the length of the duct section or it may be positioned to span the juncture between abutted duct sections.

To facilitate the use of screw-type fasteners to secure the cover plate to the channel members, the walls of the fastener slots are provided with parallel ridges spaced apart a distance substantially equal to the thread pitch of the fastener. Each fastener slot expands into an enlarged fastener trough at a point below its opening and can accommodate shoulder engaging fasteners such as quarter turn or special lugged fasteners as well as screw-type fasteners.

The reversible trim strip of the present invention is constructed to provide a first seal inwardly of the fastener trough and a second seal outwardly of the cover plate fasteners in both the screeding and in the finished floor positions. This second seal is accomplished by making the trim strip of resilient material and of such a configuration that a portion of the trim strip extends beneath the cover plate in both trim strip positions. The trim strip of the present invention also includes a resilient locking means which locks the trim strip to

the channel member when the trim strip is assembled with its decorative edge exposed above the surface of the cover plate.

The foregoing and other additional features and advantages of this invention will become apparent from the following detailed description of several preferred embodiments as shown in the drawings in which:

FIG. 1 is a perspective view with parts broken away illustrating an underfloor trench duct installation embodying the present invention;

FIG. 2 is a partially broken cross-sectional view of the installation of FIG. 1;

FIG. 3 is a fragmentary cross-sectional view of the side rail, cover plate, and trim strip as assembled during the concrete screeding operation;

FIG. 4 is a fragmentary cross-sectional view showing the assembly of FIG. 3 with the trim strip reversed and the decorative tile in place on the floor and cover plate and illustrating the use of a quarter turn fastener anchoring the cover plate;

FIG. 5 is a fragmentary cross-sectional view illustrating a modified form of the side rail and trim strip with the decorative floor covering in place;

FIG. 6 is a fragmentary cross-sectional view showing the modified trim strip of FIG. 5 as positioned during the screeding operation;

FIG. 7 is a fragmentary cross-sectional view illustrating a modified fastening arrangement;

FIG. 8 is a plan view of the lug portion of the fastener illustrated in FIG. 7; and,

FIG. 9 is a perspective view of the lug illustrated in FIGS. 7 and 8.

Referring to the drawings in greater detail, FIG. 1 illustrates an underfloor trench duct installation embodying the present invention. As shown in greater detail in FIG. 2, each trench duct section 10 includes a base channel 12, a pair of side rails 14, side rail adjusting blocks 16, and a cover plate 18 resting on the side rails 14.

The base channel 12 is preferably formed from a unitary sheet of metal and has along the edges upwardly extending folded sidewalls 20 of double thickness defining the conduit raceway 22 and a pair of integral flanges 24 extending outwardly from the sidewalls 20. The side rails 14 are preferably extruded from a ductile material such as aluminum. A pair of legs 26 and 27 extend downwardly on each side rail to provide an axially extending recess 28 for slidably receiving the wall 20 of the base channel 12. The outer wall 27 of each side rail includes a horizontally projecting dovetail-shaped flange 30 which is slidably received within a mating dovetail-shaped recess 32 in the adjusting block 16. The sliding dovetail connection between the adjusting blocks 16 and the side rails 14 allows the adjusting blocks 16 to be positioned at any point along the length of the side rails 14. The adjusting blocks are locked in place on the dovetail flange 30 by locking screws 34 and serve to support the side rails at an adjusted position above the base channel.

The uppermost portion of the side rail 14 forms a screed lip 36 having an upper surface 37. The height of the surface 37 relative to the floor of the raceway 22 is adjusted by turning and adjusting screw 38 threadedly received within the adjusting block 16. The upper end of the adjusting screw 38 is notched at 39 to receive a screwdriver while the lower end is provided with a flanged foot 40 for engaging the upper surface of the base channel flange 24. As shown in FIG. 1 the flanged foot 40 may be received within a forked retaining clip 41 secured to the base channel flange 24. The clip retains the foot 40 in engagement with the channel 24 to prevent upward movement of the side rails 14 away from the base channel 12.

The underfloor duct system is installed by arranging a number of assembled trench duct sections 10 with their ends abutted in the desired ducting configuration. Connecting blocks 42 spanning the junction between the abutting ends of the sections 10 and clamped to the dovetail by screws 43 are used to secure the adjacent ends of the trench duct sections together. The adjusting blocks 16 are positioned at the junction of the sections 10 to support the side rails 14 at an adjusted position above the base channel 12.

length of each trench duct section 10 and locked in position by the locking screws 34. The adjusting screws 38 are turned to adjust the height of the screed lips 36 by raising or lowering the side rails with respect to the base channel. When the system is mounted on a cellular steel floor, after the trench duct sections 10 have been aligned, connected and adjusted, they are secured to the floor cells 44 by tack welds 45 at various points along the flanges 24. Concrete 46 is then poured around the trench duct sections 10 and screeded level with the screed lip surface 37 to form the floor. After the concrete has hardened a floor covering such as the floor tiles 47 may be applied over the concrete 46 and the upper surface of cover plate 18.

Referring again to FIG. 2 it will be seen that the intermediate portion of each side rail 14 has an enlarged portion 50 forming a ledge projecting inwardly into the raceway 22. The upper surface 51 of the ledge provides support for the cover plate 18. The cover plate 18 is secured to the enlarged portion 50 by suitable fasteners such as screws 55 as will be described in greater detail hereinafter. A first or inner seal is provided between the cover plate and side rail 14 inwardly of the fastener 55 by a gasket 56 disposed in a groove 57 in the enlarged portion 50. The gasket 56 may be of any suitable compressible material such as cork or rubber.

A reversible trim strip 60 provides a second or outer seal between the cover plate 18 and side rail 14 at a point outwardly of the fastener 55. The trim strip 60 is preferably of a resilient synthetic plastic material such as vinyl and includes a first leg 61 and a second and longer leg 62 joined together at right angles along their edges. A pair of resilient tongues 63 and 64 extend perpendicular to leg 62 generally opposite the shorter leg 61. Legs 61 and 62 are provided with deformable raised sealing beads 67 and 68 along the midpoints of their inner sides which are adapted to be engaged and deformed by the cover plate 18 to form a seal therewith. The one tongue 64 is provided with a locking barb or lip 65 which snaps behind an axially extending ridge 71 to lock the trim strip in place when the tongues 63 and 64 are received within a horizontal groove or recess 70 in the screed lip 36 as shown in FIG. 4. When the trim strip 60 is positioned with its decorative edge 72, separating the floor covering on the cover plate from that on the floor, the sealing bead 67 and a portion of leg 61 are deformed between the cover plate and a raised portion 53 on the surface 51 to form a second moisture seal between the cover plate and the side rail.

As best shown in FIGS. 3 and 4 the trim strip 60 is reversible to facilitate screeding the concrete to the screed lip 37 without damaging the trim strip. FIG. 3 shows the trim strip 60 and cover plate 18 as they are assembled during the pouring and screeding operations. For this operation the trim strip 60 is assembled in the side rail as shown in FIG. 3 with the shorter leg 61 disposed vertically, the longer leg 62 extending beneath the cover plate 18 and the resilient tongues 63 and 64 disposed with a smooth walled vertical groove 74 in the side rail 14. Since the free end of the shorter leg 61 lies flush with the screed lip surface 37, a substantially smooth area is provided on top of the trench duct to facilitate the screeding operation.

FIG. 4 shows the trim strip 60 as assembled in the reversed position within the side rail 14 with the floor covering 47 in place. Prior to the installation of the floor covering 47 the cover plate 18 is taken off and the trim strips are removed and either turned end for end or transferred to the other side of the channel and rotated to a position wherein the end or decorative edge 72 of the longer leg 62 projects upwardly and the resilient tongues 63 and 64 face the groove 70. The trim strip 60 is locked in this position by pressing the resilient tongues 63 and 64 into the horizontal groove 70 beneath the screed lip 36 until the barb 65 catches behind a ridge 71. When the trim strip is locked in place the decorative edge 72 projects slightly above the screed lip surface 47 covering the thickness of the floor and the shorter leg 61 extends beneath the cover plate 18. Tightening of the cover plate fasteners causes the sealing bead 67 to be deformed by the cover plate 18 forming the second seal.

FIGS. 5 and 6 illustrate a modified trim strip arrangement having short and long legs 161 and 162 similar to legs 61 and 62 wherein the resilient tongues 163 and 164 extend perpendicular to the shorter leg 161 and the ridged locking groove or recess 170 is disposed vertically in the side rail 114. FIG. 6 illustrates the trim strip 160 as installed during the pouring and screeding operation with the resilient tongues 163 and 164 disposed horizontally in the smooth horizontal recess 174.

With the ridged locking recess 170 disposed vertically in the side rail 114, the modified trim strip arrangement has an advantage over the trim strip arrangement shown in FIGS. 2 through 4. Should the trim strip 160 stick to the cover plate 18 as might occur from softening of the trim strip or if tile cement flows into the opening between the cover plate and trim strip, both the cover plate and trim strip can be removed as a unit by exerting enough upward pull on the cover plate to flex the resilient tongues 163 and 164 and disengage the locking barb 165 from the ridges 171. Thus, the trim strip is not damaged as might be the case where the tongues extend into a horizontal groove or recess.

FIGS. 2 and 3 illustrate the cover plate fastening arrangement using a screw-type fastener 55. To eliminate the problems involved in aligning a series of fastener holes in the side rails 14, each side rail is provided with an upwardly opening fastener slot 80 extending the entire length of the side rail. The lower end of the slot 80 flares out into a closed trough 83 having horizontal shoulder portions 91 and 92 adjacent the lower end of the slot 80. The trough 83 also functions to catch and retain small amounts of moisture and dirt which might leak past the trim strip 60 before it reaches the raceway 22. The vertical walls of the slot 80 are provided with a plurality of axially extending ridges 81 having a vertical spacing or pitch equal to the pitch of the threads on the screw fastener 55. While screw fasteners with a circular cross section may be used, it has been found that screw fasteners having a substantially triangular cross section will produce a swaging action with the ridged wall of the slot 80 and assure a positive electrical connection between the cover plate 18 and the side rail 14.

Because the open fastener slots extend the entire length of the side rails, cover plates of any length to be tightly secured to the side rails at any point along the length of the trench duct sections without regard to the location of fastener holes in the side rails and without precise lengthwise location of the cover plate holes. The fastener slots also permit the cover plate to be installed across the abutting ends of adjacent duct sections, if desired, to strengthen the joint between adjacent duct sections.

FIG. 4 illustrates a modified form of cover plate fastener arrangement using a type of quarter turn fastener 85 rather than a screw. The quarter turn fastener 85 comprises a head 86, a shaft 87 and a flattened lug portion 88 on the lower end of the shaft. The quarter turn fastener 85 is installed by inserting it through an elongated opening 89 in the cover plate 118, turning it until the lug portion 88 parallels with the walls of the slot 180 and then depressing the head 86 against the action of a spring washer 90 and turning it until the lug 88 is locked beneath the shoulders 91 and 92 of the trough 83. When the quarter turn fastener 85 is securely locked in the fastener slot, the spring washer 90 is flattened against the top of the cover plate 118 and the top of the head 86 is flush with the top of the floor tile 47. The spring washer 90 maintains a constant upward force on the lug 88 which tends to resist the tendency of the lug 88 to work its way itself out from under the shoulders 91 and 92. However, should the lug become disengaged from the shoulders 91 and 92 the spring washer 90 will cause the head 86 to rise above the surface of the tile 47, thus giving a visual indication that the fastener has become disengaged. If desired, the quarter turn fastener can be used in combination with screw fasteners since the screw fastener provides a more positive grounding connection between the cover plate and the side rail.

FIG. 7 illustrates an alternative fastener arrangement for securing the cover plate to the side rails 114'. The fastener in-

the opening in the cover plate and having a head 96 on the upper side of the cover plate arranged to be rotatably driven for tightening the fastener. At its other end, the fastener has a nut or lug 100 having a threaded bore 101 to receive the threaded end of the screw 97. The nut 100 has relatively narrow sides 102 defining a width less than the width of the slot 180 and rounded ends 103 which give the nut a length slightly greater than the width of the trough 183. The upper surface 104 of nut 100 is generally flat and arranged to make abutting engagement with the shoulders 191 and 192 at the junction of the trough 183 and slot 180 and to facilitate rotation of the nut to bring the upper surface in contact, the nut has opposite edges formed with sloping cam surfaces 105. Around the threaded bore 101 is raised center boss 107 extending between the sides 102 and having locking side surfaces 109 at generally right angles to the sides 102 so that the boss 107 has a diagonal width greater than the width of the slot 180.

To assemble the fastener 95, the screw is passed through the opening in the cover plate and the nut 100 is threaded on the end of the screw. It is only necessary to start the nut on the screw, after which the cover plate can be assembled on top of the trench with the nut turned in the direction so that it can pass through the fastener slot 180. When this is done, the screw is then rotated and the nut 100, because of its frictional engagement with the threads on the screw, will tend to turn with the screw. To increase this friction and produce an increased tendency for the nut to turn with the screw, it may be desirable to coat the screw threads with a locking material such as a thin coating of nylon as shown at 111 over a small portion of the screw threads to produce the locking action in the well-known manner.

The rotation of the nut 100 proceeds only until one of the ends 103 abuts against the inner wall of the trough 183 which prevents further rotation of the nut so that continued turning of the screw 97 threads the nut onto the screw. This continues until the top surface of the center boss 107 is brought into contact with the shoulders 191 and 192 at the bottom end of the slot 180. At this point, the screw is backed off slightly and the releasing action then causes the nut to rise up slightly and allow the center boss 107 to enter the slot 180. At this point, when the screw 97 is again tightened the nut will rotate until the locking surfaces 109 abut the sides of the slot 180 and slight continued rotation of the screw 97 then brings the upper surface 104 into contact with the shoulders 191 and 192. When this is done, the fastener is completely tightened and the cover plate held in place.

When it is necessary to loosen the cover plate, the screw 97 is rotated in the opposite direction and because of the locking effect of the nylon coating 111, the nut 100 will be rotated with the screw with no relative movement between them until the nut is in a position with the sides 102 parallel to the slot 180 so that the nut can be withdrawn and the cover plate removed. When the cover plate is then reinstalled, upon rotating the screw 97 in a tightening direction, the cam surfaces 105 will aid the nut to rotate with the upper surface 104 in abutting contact with the shoulders 191 and 192 until further rotation is stopped by the engagement of the locking surface 109 with the sides of the slot 180. Since this requires a relatively small amount of revolution, less than one quarter turn, it can be seen that after the nut has been properly positioned on the screw the screw need be rotated only a relatively small amount to both release and secure the cover plate in position, and this rotation need produce no relative movement between the screw and the nut.

While several embodiments of this invention have been shown and described in detail, it is recognized that other modifications and rearrangements will readily occur to those skilled in the art upon a full understanding of this invention and may be resorted to without departing from the scope of the invention as defined in the claims.

What we claim is:

1. An underfloor duct comprising a channel member having a bottom wall portion and upstanding sidewall portions, a side

rail member mounted on each side of said channel member adjacent said sidewall portions for adjustable movement above said bottom wall portion and a cover plate supported by and secured to said side rail members a spaced distance above said bottom wall portion to define with said side rail members and said channel member a closed duct, each of said side rail members having a screed lip portion extending upwardly outwardly of the cover plate to define a screed surface at the upper end thereof, each of said side rail members having a support portion with an upper surface below said screed surface extending into said duct beneath said cover plate to support said cover plate with its top surface substantially coplanar with said screed surface, fastener means to secure said cover plate to said side rail members, each of said side rail members having a first horizontal slot in said screed lip below said upper surface, each side rail member having a second vertical slot between said support portion and said screed lip extending below said upper surface of said support portion, and a reversible trim strip member having first and second legs adjoined together along their edges and extending at right angles to each other, one of said legs being longer than the other leg, said trim strip including a tongue portion extending normal to one of said legs adjacent the other leg whereby said trim strip may be installed in said side rail member in two positions, whereby said tongue is in said first horizontal slot when one of said legs projects upwardly between said screed lip portion and said cover plate with the other leg extending between said cover plate and said support portion, and when said trim strip is in the other position, said tongue portion extends into said second vertical slot with said other leg extending upward between said screed lip portion and said cover plate and said one leg extending between said cover plate and said support portions.

2. An underfloor duct as set forth in claim 1 wherein at least one of said slots is provided with an inwardly projecting ridge on the sidewall thereof and said tongue portion of said trim strip comprises first and second resilient tongues spaced apart from each other, with at least one of said tongues having a laterally projecting lip operable to engage said ridge with a snap action to retain said trim strip in position with said tongue portion within said slot.

3. An underfloor duct as set forth in claim 1 wherein said tongue portion is in said first horizontal slot when the longer of said legs extends vertically upward between said screed lip and said cover plate.

4. An underfloor duct as set forth in claim 1 wherein said tongue portion is in said second vertical slot when the longer of said legs extends vertically upward between said screed lip and said cover plate.

5. An underfloor duct comprising a channel member having a bottom wall portion and upstanding sidewall portions, a side rail member mounted on each side of said channel member adjacent said sidewall portions for adjustable movement above said bottom wall portion and a cover plate supported by and secured to said side rail member a spaced distance above said bottom wall portion to define with said side rail members and said channel member a closed duct, said side rail members having a uniform cross section throughout their length, each of said side rail members having a screed lip portion extending upwardly outwardly of the cover plate to define a screed surface at the upper end thereof, each of said side rail members having a support portion with an upper surface below said screed surface extending into said duct beneath said cover plate to support said cover plate with its top surface substantially coplanar with said screed surface, said support portion being provided with a groove opening onto the surface of the support portion, said groove terminating at its lower end in a trough portion of greater width than said groove and defining substantially horizontal shoulders adjacent the junction with said groove, fastener means engageable with said cover plate and extending into said groove to secure said cover plate to said side rail members, each of said side rail members having a first horizontal slot in said screed lip below said upper surface of said support portion, and a second vertical slot between said support portion and said screed lip extending below said upper surface of said support portion, and a reversible trim strip member having first and second legs adjoined together along their edges and extending at right angles to each other, one of said legs being longer than the other leg, said trim strip including a tongue portion extending normal to one of said legs adjacent the other leg whereby said trim strip may be installed in said side rail member in two positions, whereby said tongue is in said first horizontal slot when one of said legs projects upwardly between said screed lip portion and said cover plate with the other leg extending between said cover plate and said support portion, and when said trim strip is in the other position, said tongue portion extends into said second vertical slot with said other leg extending upward between said screed lip portion and said cover plate and said one leg extending between said cover plate and said support portions.

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with a portion of said first slot being at least above the upper surface of said support portion, each side rail member having a second vertical slot between said support portion and said screed lip extending below said upper surface of said support portion, and a reversible trim strip member having first and second legs adjoined together along their edges and extending at right angles to each other, one of said legs being longer than the other leg, said trim strip including a tongue portion extending normal to one of said legs adjacent the other leg whereby said trim strip may be installed in said side rail

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member in two positions, whereby said tongue is in said first horizontal slot when one of said legs projects upwardly between said screed lip portion and said cover plate with the other leg extending between said cover plate and said support portion, and when said trim strip is in the other position, said tongue portion extends into said second vertical slot with said other leg extending upward between said screed lip portion and said cover plate and said one leg extending between said cover plate and said support portion.

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