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(54) **CLAMPING APPARATUS AND APPARATUS FOR USE IN ERECTING TEMPORARY GUARD
RAILS**

**KLEMMVORRICHTUNG UND VORRICHTUNG FÜR DEN EINSATZ BEI DER ERRICHTUNG EINES
PROVISORISCHEN SCHUTZGELÄNDERS**

**APPAREIL DE SERRAGE ET APPAREIL A UTILISER POUR ERIGER DES GARDE-CORPS
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EP 1 765 533 B1

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Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present disclosure relates to temporary guard rail systems disposed at the peripheral edge of a structure such as an elevated floor slab. The present invention relates to a clamping apparatus according to claim 1 that can be used, inter alia, in the erection of such a temporary guard rail system.

DESCRIPTION OF PRIOR ART

[0002] In the construction industry, commercial, industrial and multi-unit residential buildings are typically constructed with a framework of steel girders. The framework for the various floor levels as formed, concrete floor slabs are poured so that the workmen on the project have floor support upon which to perform their task. Since the floor slabs are poured before the building walls are constructed, it is important to create some type of perimeter guard at the edges of the floor slabs to prevent workers from inadvertently falling off the edge of a floor slab without realizing they are near the edge. Additionally, perimeter guard rails, to meet certain governmental standards, have to have a toe board that generally abuts the top surface of the slab so as to prevent tools and construction materials from falling off the edge of the slab onto workers below.

[0003] For many years temporary guard rails forming perimeter guards for floor slabs in a multi-story building or the like have been provided by installing temporary stanchions or posts at spaced intervals around the perimeter of an elevated floor slab. The posts or stanchions provide vertical supports to which horizontal guard rails can be attached to form the temporary guard rail around the perimeter of the floor slab.

[0004] Typical of systems used in constructing temporary guard rails or other perimeter guard constructions are those disclosed in U.S. Patent Nos. 3,863,900; 3,995,833; 5,029,670; 6,585,080; and 6,679,482.

[0005] In U.S. Patent No. 5,560,588 there is disclosed a support for a temporary guard railing that comprises a base adapted to be removably attached to a floor surface, e.g., the surface of a slab, and support walls upstanding from the base and defining between them an inwardly opening socket for receipt of a post. At least one pair of parallel rail guide flanges are adjoined to the base and project laterally outwardly with respect to one of the support walls whereby a rail such as a 50.8 mm x 101.6 mm (2 inch x 4 inch) can be received between the rail guide flanges. The support disclosed in U.S. Patent No. 5,560,588 has found widespread success in the construction industry, particularly, in use in forming temporary guard rails around wooden floors, stairs and the like. Further, while the support system disclosed in U.S.

[0006] Patent No. 5,560,588 can be employed with concrete slabs, stairs and the like, it suffers from the disadvantage that in such circumstances holes must be drilled into the concrete slab in order to mount the support. This is time consuming and furthermore requires, in many cases, that the drill holes be patched once the temporary guard rail system is removed.

[0007] Aside from erecting temporary guard rails along the peripheral edges of floor slabs, stairs and the like, clamp assemblies that can be used to clamp along the peripheral edge of a slab, stairs, or similar structure, have a wide variety of uses in addition to being used in the construction of a temporary guard rail.

[0008] US 3 756 568 A discloses an apparatus according to the preamble of claim 1.

SUMMARY OF THE INVENTION

[0009] The present invention provides an apparatus for clamping a structure at its edge, according to claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The embodiments of figures 17, 18 and 21 to 23 form part of the invention according to the claims.

[0011] The embodiments of figures 1 to 16, 19, 20 do not form part of the invention according to the claims.

Fig. 1 is a plan view of a portion of a guard rail system constructed using the apparatus of the disclosure.

Fig. 2 is an elevational view of the guard rail system shown in Fig. 1.

Fig. 3 is an elevational view, partly in section, taken along the lines 3-3 of Fig. 2.

Fig. 4 is a cross-sectional view taken along the lines 4-4 of Fig. 3.

Fig. 5 is a cross-sectional view taken along the lines of 5-5 of Fig. 3.

Fig. 6 is a cross-sectional view taken along the lines of 6-6 of Fig. 3.

Fig. 7 is an elevational view, partly in section, showing a portion of the second clamping assembly used in the apparatus depicted in Fig. 3.

Fig. 8 is a top, plan view of an embodiment shown in Fig. 9.

Fig. 9 is a view similar to Fig. 7 showing a portion of the second clamping assembly used in the apparatus of the disclosure.

Fig. 10 is an elevational view, partly in section, showing another embodiment of the clamping apparatus.

Fig. 11 is a view taken along the lines 11-11 of Fig. 10.

Fig. 12 is an elevational view, partly in section, showing still another embodiment of the clamping apparatus.

Fig. 13 is an elevational view, partly in section, showing another embodiment of the clamping apparatus.

Fig. 14 is a view taken along the lines 14-14 of Fig. 13.

Fig. 15 is an elevational view of another embodiment

of the clamping apparatus.

Fig. 16 is a view taken along the lines 16-16 of Fig. 15.

Fig. 17 is an elevational view of an embodiment of the clamping apparatus of the present invention.

Fig. 18 is a view taken along the lines 18-18 of Fig. 17.

Fig. 19 is an elevational view of another embodiment of the clamping apparatus.

Fig. 20 is a view taken along the lines 20-20 of Fig. 19.

Fig. 21 is an elevational view of another embodiment of the clamping apparatus of the present invention and

Fig. 22 is a view taken along the lines 22-22 of Fig. 21.

Fig. 23 is a partial, elevational view showing a modification of the clamping apparatus shown in Figs. 21 and 22.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0012] As used herein, the term "structure," "structural members" or any variation thereof, with which the apparatus of the present invention would be used, is intended to mean a slab, concrete or otherwise, a parapet, a stair, or for that matter, any structural body that has a peripheral edge or edges and that has opposed surfaces, e.g., top and bottom, which can be engaged by the clamping apparatus of the present invention in a compressive type engagement.

[0013] Referring then to Figs. 1 and 2, a temporary guard rail system employing the apparatus of the present disclosure is shown. A slab shown generally as 10, which could be the floor of a multi-story structure, has a peripheral edge 12. Spaced at intervals along the peripheral edge 12 are a series of clamping apparatuses shown generally as 14 and described more fully below. A temporary guard rail system comprising generally vertically, upwardly extending support posts 16, supported by clamping apparatus 14, toe boards 18, mid rails 20, and top rails 22 extends around the periphery 12 of the slab 10. Although, as shown, the temporary rail is comprised of wood, e.g., 50.8 mm x 101.6 mm's (2 inch x 4 inch 's) and the like, it will be recognized that it could be made of steel, aluminum or other materials, if desired.

[0014] Turning now to Fig. 3, there is shown in greater detail an embodiment of the clamping apparatus of the present disclosure. Clamping apparatus 14 comprises a stanchion 17 having a front surface 18 and a back, opposed surface 20, surface 20 being provided with a series of apertures 22 spaced longitudinally therealong. At its lower end, stanchion 17 is welded to a first clamping assembly shown generally as 24, which can conveniently comprise a pair of side support plates 26 to which, in turn, is welded a plate or pad 28 that extends laterally outwardly from support plates 26.

[0015] While first clamping assembly 24, as shown, is fixedly attached to stanchion 17, it will be appreciated that provision could be made to have clamping assembly 24 slidably moveable along stanchion 17.

[0016] There is also a second clamping assembly shown generally as 30 that basically comprises two main components, 30A and 30B. Component 30A is comprised of a collar formed by spaced first and second plates 32 and 34, which are attached to a rib 36 welded therebetween, rib 36 being adjacent front surface 18 of stanchion 17. A second rib 38, spaced from rib 36, is welded to plates 32 and 34, plates 32, 34 and ribs 36 and 38 serving to form a collar that is slidably mounted on stanchion 17. Stanchion 17 is provided at its upper end with a stop 19 that prevents the collar from being inadvertently removed or slipping off when the apparatus is being moved from job site to job site. Rib 38 carries a fixed dog 40, which as shown in Figs. 3 and 6, is received in one of the apertures 22. Plates 32 and 34, together with attached cross-member 42, form a frame extending outwardly from back surface 20 of stanchion 17. Welded to the underside of cross-member 42 is a threaded nut 44 in which is threadably received a bolt 46.

[0017] Turning now to component 30B of second clamping assembly 30, and as best seen with respect to Figs. 3, 4 and 5, there is a second collar formed by a generally U-shaped member having a first leg 50, a second leg 52, legs 50 and 52 being interconnected by a web 54. Legs 50 and 52 are welded to a top or bearing plate 56, portions of legs 50 and 52, web 54 and the edge of bearing plate 56 adjacent surface 20 of stanchion 17 forming a collar slidably moveable on stanchion 17. Legs 50 and 52 are also welded to a support plate 58 that extends laterally outwardly away from stanchion 17, i.e., in a direction away from surface 20. Effectively, the portion of legs 50 and 52 welded to support plate 58 and bearing plate 56 form a second frame which is longitudinally movable, relative to stanchion 17, with the collar formed by legs 50 and 52, web 54 and bearing plate 56.

[0018] As best seen in Figs. 3, 4 and 5, support plate 58 comprises a generally rectangular portion 60 and a generally trapezoidal portion 62. Support plate 58 is provided with a series of bores 63, four of such bores being in the rectangular portion 60 of support plate 58 and one of said bores 63 being in the generally trapezoidal portion 62 of support plate 58.

[0019] Secured to support plate 58 is a holder, shown generally as 70, in which is removably positioned post 16. Holder 70 comprises a base 72 in which are four holes 74 which are in register with the four holes 63 in support plate 58. Base 72 of holder 70 is connected to support plate 60 by means of nut/bolt assemblies 75. The heads of nut/bolt assemblies 75 are provided with projections 76 that are generally sharp or roughened surface and that can bite into the top surface 10A of slab 10. In like fashion, similar nut/bolt assemblies 75 that are received through the bore in the trapezoidal portion 62 of support plate 58 have a similar projection that likewise can bite into the surface 10A of slab 10. It will be understood that rather having biting projections on the heads of the nut bolt assemblies 75, it is possible to provide the underside or bottom surface of support plate 58 with in-

tegral projections or a roughened surface which would accomplish the same function. Further, nut/bolt assemblies could be dispensed with in lieu of four threaded studs welded to support plate 58, i.e., the nuts would be received on the threaded studs.

[0020] It will also be understood that while support plate 58, when such projections are present, will not lie directly against the surface 10A of slab 10, it is closely adjacent such that when the clamping assembly clamps slab 10 therebetween, support plate 58 is effectively operatively compressively engaged with the surface 10A of slab 10. Accordingly, any reference to support plate 58 being "adjacent" or "closely adjacent" to surface 10A is intended to take into account a spacing or standoff between support plate 58 and surface 10A occasioned by the thickness of the heads of the connector 75 and/or any projections, etc. that are integrally formed on the bottom surface of support plate 58.

[0021] Returning to the construction of holder 70, there are four upstanding support walls 77, 78, 80 and 82, which are attached to base 72. Adjoining base 72 and projecting laterally outwardly from support wall 76 are a pair of rail guide flanges 84 and 86 which, as seen in Figs. 4 and 5, are dimensioned so as to receive a toe board, generally a 50.8 mm x 101.6 mm (2 inch x 4 inch), therebetween. In like fashion, a pair of guide flanges 90 and 92 adjoin base 72 and project outwardly laterally from support wall 80 in generally parallel alignment with flanges 84 and 86. A second toe board 94 is received in the space between flanges 90 and 92 in the manner described above with respect to toe board 88. As can be seen in Figs. 4 and 5, there are also rail guide flanges, essentially the same as flanges 84, 86 and 90, 92, that are attached to base 72, are orthogonal to flanges 84, 86, 90 and 92 and that project laterally outwardly from support walls 78 and 82. As seen in Fig. 5, a pair of the rail guide flanges form a channel for receiving the end of bearing plate 56 distal stanchion 17 to which is attached abutment 57 that abuts wall 82 of holder 70. Basically holder 70 is essentially as described in U.S. Patent No. 5,560,588. In any event, as can be seen with reference to Fig. 3, when holder 70 is secured to support plate 58 by means of nut/bolt assemblies 75 and with plate 28 of clamping assembly 24 engaging surface 10B of slab 10 and support plate 58, via projections 76, engaging surface 10A of slab 10, when dog 40 is received in the appropriate aperture 22 and bolt 46 tightened against bearing plate 56, support plate 58 will be effectively compressively urged against surface 10A. In this respect, and as noted, while the heads of nut/bolt assemblies 75 and projections 76 may prevent direct contact between support plate 58 and the surface 10A of slab 10, support plate 58 is effectively operatively compressively engaged against slab 10. Because holder 70 is secured to support plate 58 as described above, holder 70 is effectively clamped to slab 10 without the need for drilling holes in slab 10.

[0022] Figs. 8 and 9 depict a slightly different embod-

iment of component 30A of second clamping assembly 30. In this regard, plate 32A and a corresponding, spaced plate 34A are interconnected by means of elongate teeth 100 and 102, plates 32A and 34A, together with teeth 100 and 102 forming a collar that is slidably moveable on stanchion 17A, tooth 100 being positioned to engage back surface 20A of stanchion 17A, tooth 102 being positioned to engage front surface 18A of stanchion 17A. As can be seen, when screw 46 is tightened into nut 44 and urged compressively against bearing plate 56, because of the angle alpha at which the teeth 101 and 102 are disposed, component 30A will be cocked as nut 46 is tightened against bearing plate 56, causing teeth 100 and 102 to bite into surfaces 20A and 18A, respectively.

[0023] Turning now to Figs. 10, 11 and 12, there are shown modified embodiments of the present disclosure. With reference first to Fig. 10, the embodiment shown therein differs from the embodiments shown in Fig. 3 in that instead of the holder 70 described with reference to the embodiment shown in Fig. 3, there is a socket forming member 120 secured to support plate 58A and side plates 50A and 52A, socket forming member 120 forming a socket 122 in which is received a pair of 50.8 mm x 101.6 mm 's (2 inch x 4 inch 's) 124 and 126, 50.8 mm x 101.6 mm 's (2 inch x 4 inch 's) 124 and 126 cooperating to form a vertical post to which can be attached side rails 128 and 130 by suitable fasteners such as nails, screws or the like. Additionally, there is a channel 132 formed by an L-shaped bracket 134 of support plate 58A. Received in channel 132 is a toe board 136. As can also be seen, particularly in Fig. 11, there are two nut/bolt assemblies 75A that are received in section 62A of support plate 58A, the nut/bolt assemblies with projections 76A being positioned such that they are on either side of a line passing through the long axis of bolt 46. Accordingly, as bolt 46 is tightened, the force transmitted to support plate 58A is more evenly distributed ensuring good compressive engagement between support plate 58A and surface 10A.

[0024] Referring now to Fig. 12, there is shown a slightly modified embodiment of the apparatus of the present disclosure shown in Figs. 10 and 11. The embodiment of Fig. 12 differs from that shown in Figs. 10 and 11 in that instead of the upward post being formed by two 50.8 mm x 101.6 mm 's (2 inch x 4 inch 's) 124 and 126, received in a socket 122, there is a metal post 140 that is welded to support plate 58A and has secured thereto a series of L-shaped brackets 142 and 144 in which can be received generally horizontally extending side rails 146 and 148, respectively.

[0025] Turning now to Figs. 13 and 14, there is shown still another embodiment of the apparatus of the present disclosure. In the embodiment shown in Figs. 13 and 14, the stanchion 17A serves as the upright post or support for the horizontal rail members to form the temporary guard rail. As can be seen, stanchion 17A is comprised of a fixed section 160 and a moveable section 162, section 162 being telescopically received over section 160

although it could be received telescopically in section 160 or otherwise be attached to be slidably moveable with respect to section 160. Section 160 has a series of longitudinally spaced holes 164, the holes 164 being on opposite faces or surfaces of fixed section 160 and being in register with one another. There are also holes 165 in the lower portion of section 160 to accommodate dog 40 as described above with respect to Fig. 3. Moveable section 162 is provided with first and second holes 166 in opposed faces of moveable section 162. When holes 166 are in register with

one of the sets of holes 164 in fixed section 160, a pin 170 can be inserted so as to prevent relative longitudinal movement between fixed section 160 and moveable section 162. As seen, a cotter key 172 can be inserted to prevent the inadvertent removal of pin 170. In this manner, stanchion 17A can be adjusted to the desired height to form the upright post of a temporary guard rail system so as to take into account slabs of varying therebetween.

[0026] As can be seen from Fig. 13, fixed section 162 has a plurality of vertically spaced collars 173 and 175 in which are received side rails 174 and 176. Secured to side plates 50B and 52B, and to support plate 58B are a series of spaced flanges forming channels 180, 182 and 184. Channels 180, 182 and 184 are dimensioned so as to receive toe boards 186, 188 and 190, respectively. As best seen with Fig. 13, the toe boards are notched as at 192 to insure the bottom edge of toe boards, is closely adjacent surface 10A of slab 10 to prevent tools or other objects from falling off of slab 10 onto workers below.

[0027] Referring now to Figs. 15 and 16, there is shown an embodiment of the present disclosure suitable for use in clamping to the edge of a structural member having non-parallel spaced surfaces and/or spaced surfaces wherein one or more of the surfaces is at an angle to the horizontal. As shown, the apparatus shown in Figs. 15 and 16 can be used in conjunction with the support or post holder 70 described with respect to Fig. 3 to erect a temporary rail on a preformed concrete stair.

[0028] The stairs, shown generally as 200 has a series of treads 202, which are generally horizontally disposed and interconnected by risers 204. The underside 206 of the stair 200 is at an angle to the horizontal and hence at an angle to the treads 202. The clamping apparatus has a stanchion 208 at the lower most end of which is attached a first clamping assembly comprised of side braces 210 and 212 to which are welded a pad 214, pad 214, as shown, being engageable with surface 206 of stairs 200. As in the case of the previous embodiments of the present invention, the clamping assembly has a support plate 216 to which is attached holder 70 in the same manner as described above with respect to the embodiment of Fig. 3. Support plate 216, in turn, is attached to a back plate 218 and a spaced, front plate 220, plates 218 and 220 extending upwardly from support plate 216. As best seen in Figs. 15 and 16, plates 218 and 220 are spanned by and connected to a series of bearing plates 222, 224 and 226 (Fig. 15). Bearing plates

222, 224 and 226, as seen in Fig. 15, form a trapezoidal structure.

[0029] As can also be seen, back plate and face plate 218 and 220 are connected to support plate 216, such that any compressive force urged against any of bearing plates 222, 224 and 226 is transferred to support plate 216. Plates 218 and 220 have registering bores in which is journaled a shaft 228. One end of shaft 228 is connected to a collar 230, which is slidably mounted on stanchion 208. Since shaft 228 is rotatably journaled in plates 218 and 220, collar 230 and hence stanchion 218 are rotatable relative to support plates 222, 224 and 226 or support plate 216. A collar 240 similar to component 30A shown in Fig. 3 is also slidably mounted on stanchion 208 and carries a threaded bolt 242 that is received in a threaded receptacle 244 attached to collar 240. As shown, bolt 242 can be tightened against bearing plate 222 with the result that pad 214 and support plate 216 will compressively engage surface 206 and tread 202. To enhance the compressive engagement, support plate 216 is provided with upturned flanges 216A and 216B of one of which, 216A, nests in the corner between the tread 202 and the riser 204. As can be seen in Fig. 15, the apparatus disclosed in Fig. 15 and 16 can be used on either side of a stair to form a temporary guard rail. For example, if the apparatus were attached to the opposite side of the stair from that shown in Figs. 15 and 16, bearing plate 226 will be engaged by bolt 242. Likewise, the apparatus shown in Figs. 15 and 16 can be used on a slab that has generally parallel upper and lower surfaces and in that event, bearing plate 224 would be engaged by bolt 242. Once the clamping apparatus and holder 70 are in place, a temporary guard rail along the stair 200 can be erected, for example, by using two 50.8 mm x 101.6 mm's (2 inch x 4 inch 's), 260 and 262 received in holder 70 and attached by nails or the like to hand rails 264.

[0030] It will also be appreciated that the apparatus shown in Figs. 15 and 16 can be used with the embodiments shown in Figs. 10 and 12. In this regard, a socket forming member such as member 120 could be welded to support plate 216, as per Fig. 10, or a post 140 such as shown in Fig. 12 could be welded to support plate 216, in both cases the socket forming member and post also being secured, if desired, to the back plate 218.

[0031] Referring now to Figs. 17 and 18, there is shown an embodiment of the present invention suitable for use in clamping the edge of a structural member having non-parallel, spaced surfaces and/or spaced surfaces wherein one or more of the surfaces is at an angle to the horizontal. The apparatus shown in Figs. 17 and 18 can be used in conjunction with the support or post holder 70 described with respect to Fig. 1 to erect a temporary rail on a preformed concrete stair or other such structure.

[0032] The clamping apparatus shown in Figs. 17 and 18 includes a stanchion 300 at the lower most end of which is attached a first clamping assembly shown generally as 302, clamping assembly 302 being substantially

the same as the first clamping assembly shown in Figs. 15 and 16. The clamping apparatus also includes a support plate 308, having an upturned flange 309. Attached to support plate 308 is a back plate 310 and a spaced front plate, plates 310 and 312 extending upwardly from support plate 308. Plates 310 and 312 are spanned by and connected to an arcuate bearing plate 314 forming an arcuate bearing surface 316. Since back plate 310 and front plate 312 are connected to support plate 308, any compressive force urged against arcuate surface 316 of arcuate bearing plate 314 is transferred to support plate 308. As in the case of the embodiment shown in Figs. 15 and 16, the stanchion 300 is rotatably journaled in back plate 310 and front plate 312 such that stanchion 300 can be rotated to accommodate differing angles between the treads 202 and the underside 206 of stair 200. The clamping apparatus shown in Figs. 17 and 18, like the clamping apparatus shown in Fig. 10, includes a post 318 conveniently formed by a piece of square tubing which is welded to support plate 308 as shown at 320. Pivotal attached to plates 318 by a series of pins 320 received in holes in plates 318 are spaced U-shaped members 322 forming an upwardly opening channel for receipt of a rail member 324. Since U-shaped members 322 can be rotated relative to post 318, the rails 324 can be oriented at proper angle relative to the stairs 200 or other structure.

[0033] As can be seen, flange 309 cooperates with post 318 to form an upwardly open channel for receipt of the toe board in the event the clamping apparatus is used on a structure having generally parallel upper and lower surfaces.

[0034] Turning now to Figs. 19 and 20, there is shown yet another embodiment of the present disclosure for use with stairs or structures having non-parallel upper and lower surfaces to which the clamp is attached. The clamping apparatus shown in Figs. 19 and 20 has a stanchion 400 to the lower end of which is pivotally attached a jaw member 402 which forms a first clamping assembly. Jaw member 402 includes a section of box tubing 404 which, as seen in Fig. 20, is pivotally attached to the lower end of stanchion 400 by means of a shaft 406. Jaw member 402 also includes a laterally extending gripping member 408 attached to box tubing 404, member 408 being conveniently formed by a piece of angle iron, gripping member 408 having what can be generally referred to as a knife edge 410. The term "knife edge" as used herein is intended to include not only a sharp edge but also edges that may not be sharp but which forms an elongate, relatively narrow bearing surface such that any compressive force applied is concentrated along the narrow path defined by the edge.

[0035] The clamping apparatus of Figs. 19 and 20 also includes at least one U-shaped member 412 which is secured to a shaft 414 which in turn is received in registering slots 416 in stanchion 400. One end of shaft 414 is rigidly attached to U-shaped member 412, while the other end which extends through stanchion 400 is thread-

ed to receive a nut 418. Accordingly, U-shaped member 412 can be rotated to any orientation relative to stanchion 400. Additionally, U-shaped member 412 can be adjusted longitudinally along the length of post 400. The net result allows a rail 420 to be oriented relative to the stairs 200 at the proper disposition both as to height above the stairs 200, an angularly with respect to the treads 202.

[0036] It will be appreciated with respect to the clamping apparatus shown in Figs. 19 and 20 that because jaw member 402 can pivot, knife edge 410 can be positioned to engage the underside 206 of stair 200 over a wide range of angles of the underside surface 206 relative to tread 202. Accordingly, it will be recognized that when the support plate 422 is urged against a tread 202, edge 410 will grippingly engage the underside 206 of stair 200 and because of the small bearing area of edge 410, a concentrated compressive force will be exerted on the underside 206 of stairs 200.

[0037] Turning now to Figs. 21 and 22 there is shown yet another embodiment of the clamping apparatus of the present invention for use with a structural member having non-parallel spaced surfaces and/or spaced surfaces wherein one or more of the surfaces is at an angle to the horizontal. The clamping apparatus shown in Figs. 21 and 22 is substantially the same as that shown in Figs. 17 and 18 with the exception that instead of a metal post 318 as shown in Figs. 18 and 18, a rectangular socket 500 is formed by a series of upwardly extending plates attached to support plate 502. Socket 500 forms a receptacle for a pair of 50.8 mm x 101.6 mm's (2 inch x 4 inch's) 504 and 506 to which can be nailed rails 508 to form a guard rail along the edge of stairs 200 or the edge of a structural member having non-parallel spaced surfaces. It will be appreciated that the operation of the clamping apparatus shown in Figs. 21 and 22 is substantially the same as that shown in Figs. 17 and 18 which in turn is substantially the same as that shown in Figs. 15 and 16 with the exception that the bearing plate 314 is arcuate and forms an arcuate bearing surface 316 which ensures direct point contact with tightening bolt 510 against surface 316 over a wide range of angles.

[0038] As also seen in Fig. 22, one wall of the socket 500 is provided with a hole 520 such that nails, screws or the like, indicated as 522, could be passed through a toe board 524 such that the toe board 524 would be secured to the 50.8 mm x 101.6 mm's (2 inch x 4 inch's) 506 when the clamping apparatus is used on a structure with an upper surface that is substantially horizontal or when the upper and lower surface are parallel.

[0039] Fig. 23 shows a variation of the clamping apparatus shown in Figs. 21 and 22 wherein the lower clamping assembly shown generally as 600 includes a laterally extending gripping member 602 formed conveniently by a piece of angle iron, the gripping member 602 having a knife edge, as that term is described above, which engages the bottom surface 206 of the stairs 200. As described above with respect to the embodiment in Figs. 19 and 20, the knife edge 604 provides an elongate but

narrow bearing area ensuring that a concentrated compressive force will be exerted on the underside 206 of stairs 200 when the stairs 200 are clamped between the upper and lower clamping assemblies of the clamping apparatus.

[0040] As discussed above, it will be appreciated that in any of the embodiments shown in Figs. 15-22, a holder shown generally as 70 in Figs. 3, 4 and 5 could be secured to the support plate, the holder serving the same purpose as described above with respect to the embodiments shown in Figs. 3, 4 and 5.

[0041] With respect to the embodiment shown in Figs. 21 and 22, it will be apparent to those skilled in the art that any type of socket forming member could be secured to the support plate such that the socket could be sized and shaped to accommodate not only two 50.8 mm x 101.6 mm 's (2 inch x 4 inch 's) as described above, but a square metal tube, a round metal tube, a fiberglass rod or tube, etc. Further, although in Figs. 21 and 22 the socket is shown as abutting the front plate of the housing upon which the arcuate bearing plate is mounted, it will be appreciated that the socket could be freestanding and spaced from the front plate. Thus, as described with respect to the embodiments shown in Figs. 21 and 22 or in any other embodiment where a socket could be conveniently used, any size or shape of socket can be employed such that any size and shape of rod out of a variety of materials can be removably positioned in the socket. It will also be appreciated that in cases where a metal, removable tube is received in the socket, the socket could include registering bores on opposed faces such that a holding pin could be placed through the registering bores as well as registering bores in the metal tube or the like to prevent the tube from being dislodged. It will also be appreciated that provision could be made, if desired, to affix a toe board to any shape or type of tube or post whether it be metal, wood, fiberglass, etc. when the clamping apparatus was used on a structure having opposed, generally horizontal surfaces. While in the embodiments described above and shown in the drawings, the rail or railing, e.g., rail 420, is shown as being wood, e.g., a 50.8 mm x 101.6 mm (2 inch x 4 inch), it will be understood that the railing could be of metal, fiberglass, reinforced plastics, etc.

[0042] The foregoing description illustrates selected embodiments of the present invention, which is displayed in Fig. 17, 18 and 21 to 23.

Claims

1. An apparatus for clamping an edge of a structure, said structure having opposed surfaces, said apparatus comprising:

- a stanchion (300);
- a first clamping assembly (302 / 600) attached to said stanchion (300); and

- a second clamping assembly selectively, slidably moveable longitudinally along said stanchion (300), said second clamping assembly including a first collar slidably moveable on said stanchion (300), said first collar including a first frame attached to said first collar, said second clamping assembly including a support plate (308 / 502) extending laterally outward in a direction away from said stanchion (300),

characterized in that

said second clamping assembly further comprising a force imparting assembly attached to said first frame and an arcuate bearing plate (314) spaced from and connected to said support plate (308 / 502), said second clamping assembly further including a second collar slidably moveable, relative to said first collar, on said stanchion (300), said second collar being positioned between said first collar and said first clamping assembly (302 / 600), and a second frame (310, 312) attached to said second collar, said second collar being rotatably journaled on said second frame (310, 312), said second frame (310, 312) comprising said support plate (308 / 502) and said arcuate bearing plate (314), said support plate (308 / 502) being positioned closely adjacent one of said opposed surfaces of said structure when said structure is clamped between said first and second clamping assemblies, said force imparting assembly acting on said arcuate bearing plate (314) to compressively urge said support plate (308 / 502) into operative, compressive engagement with said one of said opposed surfaces of said structure.

2. The apparatus of claim 1 comprising a metal post (318) secured to said support plate (308 / 502), said metal post (318) forming a generally vertical support for a temporary guard rail system.
3. The apparatus of claim 2 comprising at least one vertically spaced L-shaped bracket attached to said metal post, said bracket forming an upwardly opening channel for receipt of a transversely disposed rail.
4. The apparatus of claim 3 wherein said L-shaped bracket is rotatably attached to said metal post.
5. The apparatus of claim 2 wherein said support plate (308) includes an upwardly extending flange (309), said flange (309) cooperating with said metal post (318) to form an upwardly opening channel for receipt of a toe board.
6. The apparatus of claim 1 including a socket (500) secured to said support plate (502) for receiving a removable post.
7. The apparatus of claim 6 wherein said post compris-

es a pair of 50.8mm x 101.6 mm 's (2 inch x 4 inch 's) (504, 506).

8. The apparatus of claim 6 wherein said post comprises a removable metal post.
9. The apparatus of claim 8 wherein said post comprises a cylindrical metal tube.
10. The apparatus of claim 8 wherein said post comprises square metal tubing.

Patentansprüche

1. Vorrichtung zum Festklemmen einer Kante einer Struktur, wobei die Struktur gegenüberliegende Flächen hat, wobei die Vorrichtung aufweist:

- eine Stütze (300);
- eine an der Stütze (300) befestigte erste Klemmanordnung (302 / 600); und
- eine zweite Klemmanordnung, die selektiv in Längsrichtung entlang der Stütze (300) gleitend beweglich ist, wobei die zweite Klemmanordnung eine erste Klemmschelle enthält, die gleitend auf der Stütze (300) beweglich ist,

wobei die erste Klemmschelle ein an der ersten Klemmschelle befestigtes Rahmengestell enthält, wobei die zweite Klemmanordnung eine Tragplatte (308 / 502) enthält, die sich seitlich nach außen in einer Richtung weg von der Stütze (300) erstreckt, **dadurch gekennzeichnet, dass** die zweite Klemmanordnung weiter eine kraftübermittelnde Anordnung, die am ersten Rahmengestell befestigt ist, und eine bogenförmige Lagerplatte (314) in Abstand zu und verbunden mit der Tragplatte (308 / 502) aufweist, wobei die zweite Klemmanordnung weiter eine zweite Klemmschelle, die bezüglich der ersten Klemmschelle gleitend auf der Stütze (300) beweglich ist, wobei die zweite Klemmschelle zwischen der ersten Klemmschelle und der ersten Klemmanordnung (302 / 600) positioniert ist, und ein zweites Rahmengestell (310, 312) enthält, das an der zweiten Klemmschelle befestigt ist, wobei die zweite Klemmschelle auf dem zweiten Rahmengestell (310, 312) drehbar gelagert ist, wobei das zweite Rahmengestell (310, 312) die Tragplatte (308 / 502) und die bogenförmige Lagerplatte (314) aufweist, wobei die Tragplatte (308 / 502) nahe neben einer der gegenüberliegenden Flächen der Struktur positioniert ist, wenn die Struktur zwischen der ersten und der zweiten Klemmanordnung festgeklemmt ist, wobei die kraftübermittelnde Anordnung auf die bogenförmige Lagerplatte (314) einwirkt, um die Tragplatte (308 / 502) unter Druck in einen wirksamen Druckeingriff mit der einen der gegenüberliegenden

Flächen der Struktur zu drängen.

2. Vorrichtung nach Anspruch 1, die einen an der Tragplatte (308 / 502) befestigten Metallpfosten (318) aufweist, wobei der Metallpfosten (318) eine allgemein senkrechte Abstützung für ein provisorisches Schutzgeländersystem bildet.
3. Vorrichtung nach Anspruch 2, die mindestens eine am Metallpfosten befestigte senkrecht angebrachte L-förmige Halterung aufweist, wobei die Halterung einen nach oben offenen Kanal zur Aufnahme eines quer angeordneten Geländers bildet.
4. Vorrichtung nach Anspruch 3, wobei die L-förmige Halterung drehbar am Metallpfosten befestigt ist.
5. Vorrichtung nach Anspruch 2, wobei die Tragplatte (308) einen sich nach oben erstreckenden Flansch (309) enthält, wobei der Flansch (309) mit dem Metallpfosten (318) zusammenwirkt, um einen nach oben offenen Kanal zur Aufnahme eines Bordbretts zu bilden.
6. Vorrichtung nach Anspruch 1, die eine an der Tragplatte (502) befestigte Hülse (500) zur Aufnahme eines entfernbaren Pfostens aufweist.
7. Vorrichtung nach Anspruch 6, wobei der Pfosten ein Paar von 50,8mm x 101,6 mm (2 Inch x 4 Inch) (504, 506) aufweist.
8. Vorrichtung nach Anspruch 6, wobei der Pfosten einen entfernbaren Metallpfosten aufweist.
9. Vorrichtung nach Anspruch 8, wobei der Pfosten ein zylindrisches Metallrohr aufweist.
10. Vorrichtung nach Anspruch 8, wobei der Pfosten ein Vierkant-Metallrohr aufweist.

Revendications

1. Appareil pour serrer un bord d'une structure, ladite structure ayant des surfaces opposées, ledit appareil comprenant :
 - un montant (300) ;
 - un premier ensemble de serrage (302/600) fixé audit montant (300) ; et
 - un second ensemble de serrage mobile de manière sélective et coulissante longitudinalement le long dudit montant (300), ledit second ensemble de serrage comprenant un premier collier mobile de manière coulissante sur ledit montant (300), ledit premier collier comprenant un premier cadre fixé audit premier collier, ledit second

ensemble de serrage comprenant une plaque de support (308/502) s'étendant latéralement vers l'extérieur dans une direction s'éloignant dudit montant (300),

caractérisé par le fait que ledit second ensemble de serrage comprend en outre un ensemble d'application de force, fixé audit premier cadre, et une plaque d'appui arquée (314) espacée de et reliée à ladite plaque de support (308/502), ledit second ensemble de serrage comprend en outre un second collier mobile de manière coulissante, par rapport audit premier collier, sur ledit montant (300), ledit second collier étant positionné entre ledit premier collier et ledit premier ensemble de serrage (302/600), et un second cadre (310, 312) fixé audit second collier, ledit second collier étant tourillonnée de manière rotative sur ledit second cadre (310, 312), ledit second cadre (310, 312) comprenant ladite plaque de support (308/502) et ladite plaque d'appui arquée (314), ladite plaque de support (308/502) étant positionnée de manière étroitement adjacente à l'une des desdites surfaces opposées de ladite structure lorsque ladite structure est serrée entre lesdits premier et second ensembles de serrage, ledit ensemble d'application de force agissant sur ladite plaque d'appui arquée (314) pour pousser en compression ladite plaque de support (308/502) en engagement de compression fonctionnel avec l'une desdites surfaces opposées de ladite structure.

2. Appareil selon la revendication 1, comprenant un poteau métallique (318) fixé à ladite plaque de support (308/502), ledit poteau métallique (318) formant un support généralement vertical pour un système de garde-corps temporaire.
3. Appareil selon la revendication 2, comprenant au moins une équerre en forme de L espacée verticalement fixée audit poste métallique, ladite équerre formant un canal s'ouvrant vers le haut pour la réception d'un rail disposé transversalement.
4. Appareil selon la revendication 3, dans lequel ladite équerre en forme de L est fixée de manière rotative audit poteau métallique.
5. Appareil selon la revendication 2, dans lequel ladite plaque de support (308) comprend une bride s'étendant vers le haut (309), ladite bride (309) coopérant avec ledit poteau métallique (318) pour former un canal s'ouvrant vers le haut pour la réception d'une plinthe.
6. Appareil selon la revendication 1, comprenant une douille (500) fixée à ladite plaque de support (502) pour recevoir un poteau amovible.

7. Appareil selon la revendication 6, dans lequel ledit poteau comprend une paire de 50,8 mm x 101,6 mm (2 pouces x 4 pouces) (504, 506).

8. Appareil selon la revendication 6, dans lequel ledit poteau comprend un poteau métallique amovible.

9. Appareil selon la revendication 8, dans lequel ledit poteau comprend un tube métallique cylindrique.

10. Appareil selon la revendication 8, dans lequel ledit poteau comprend une tubulure métallique carrée.

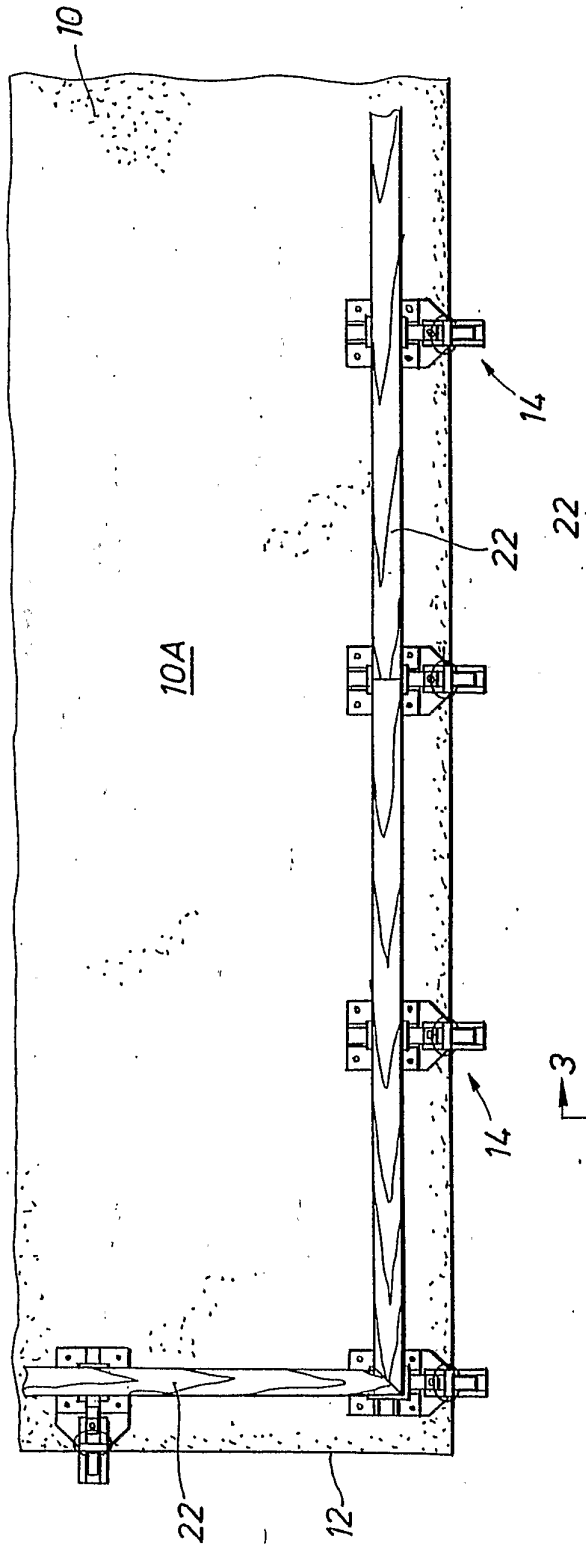


FIG. 1

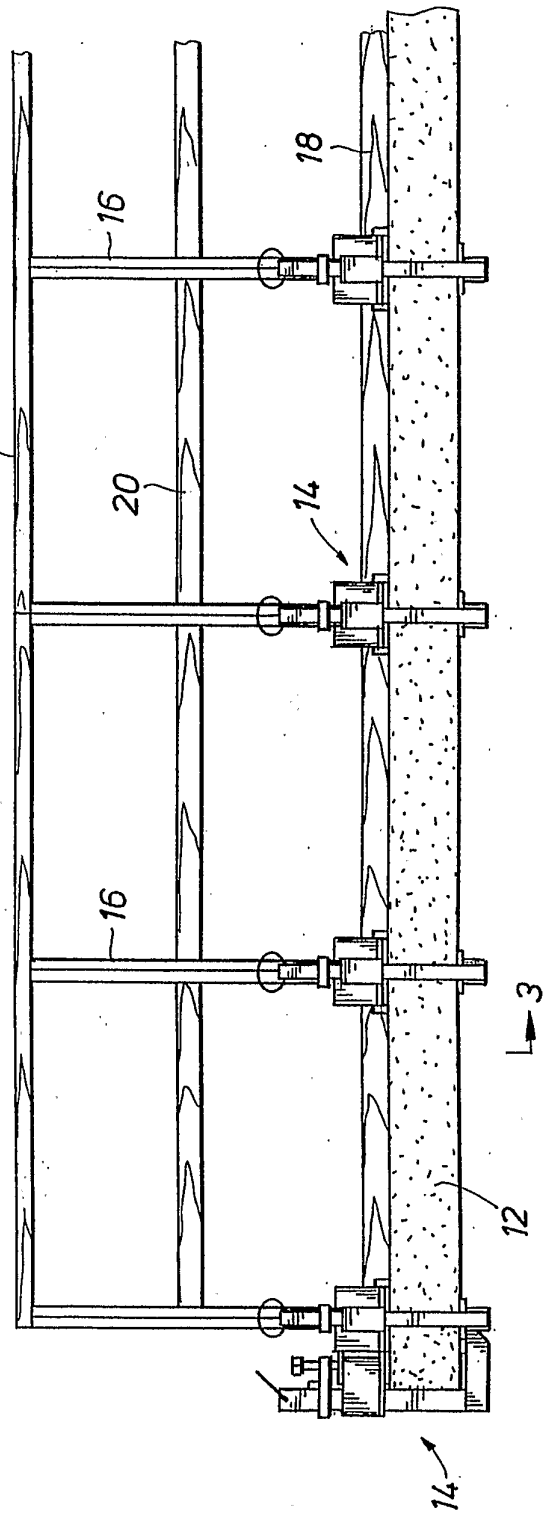


FIG. 2

FIG.3

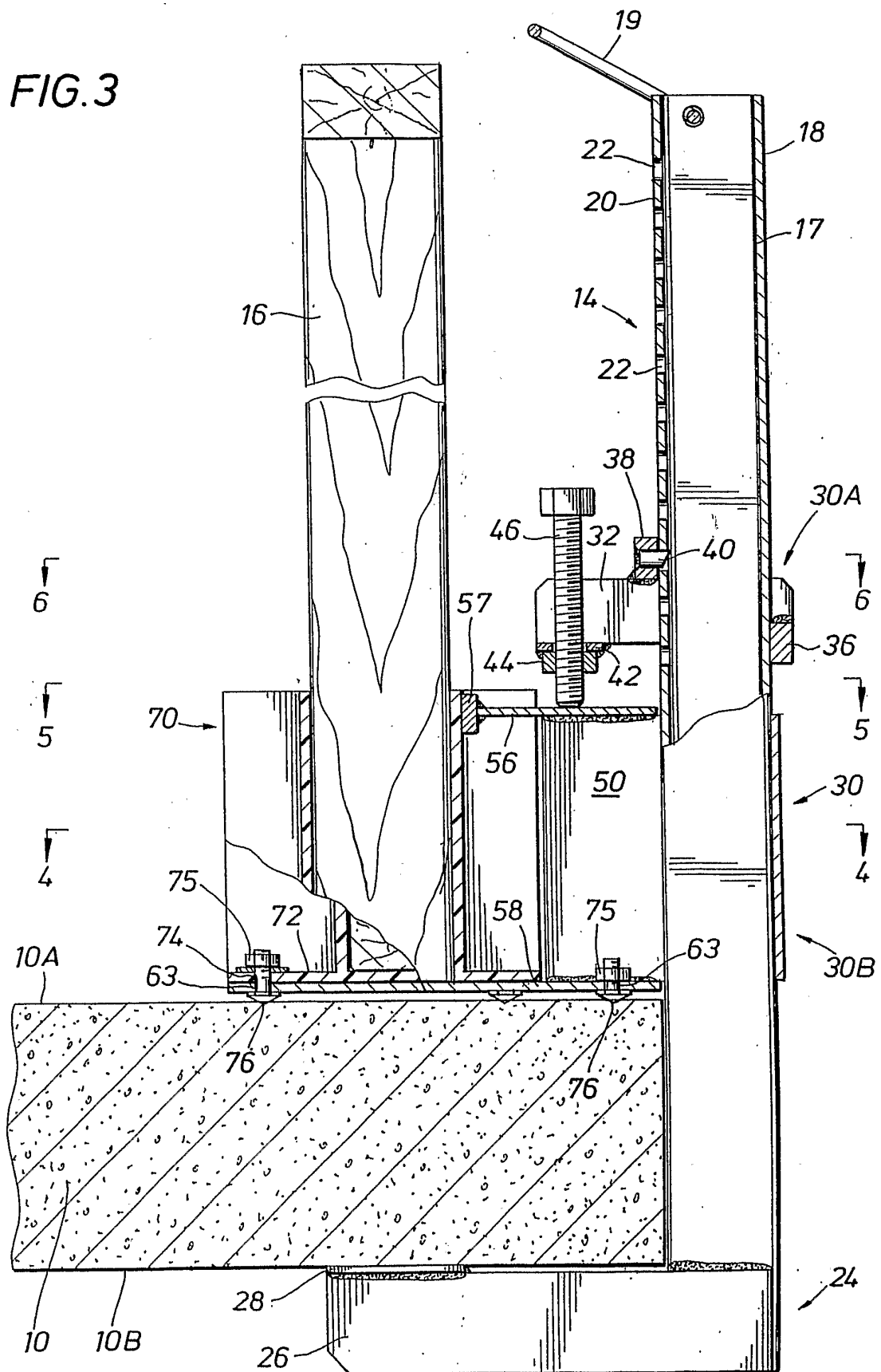


FIG. 4

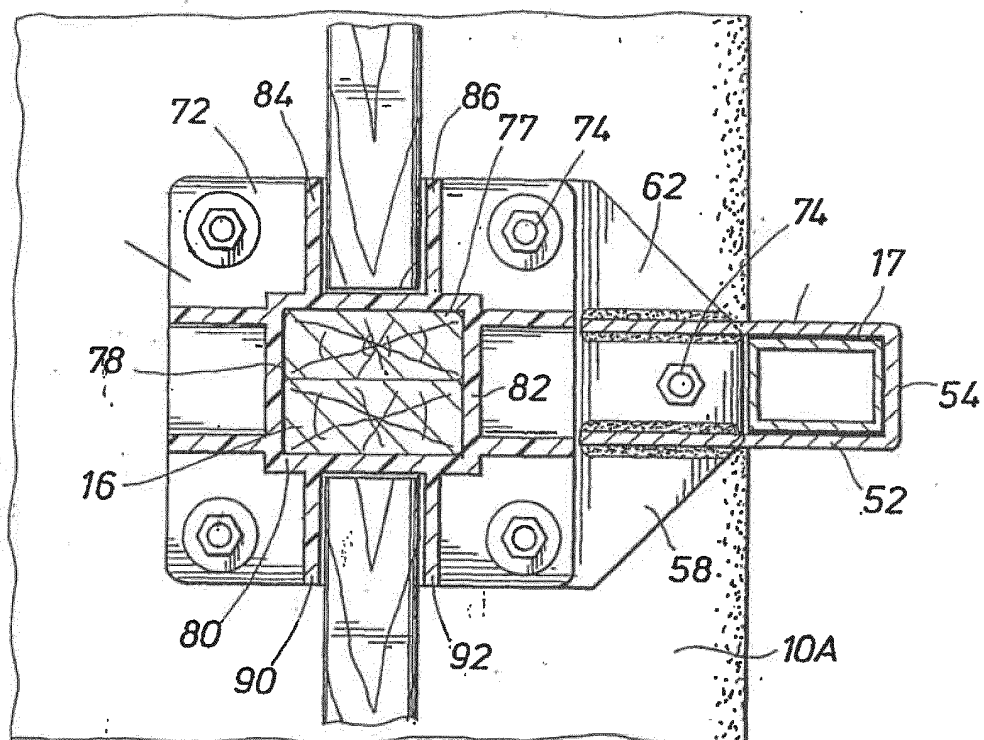
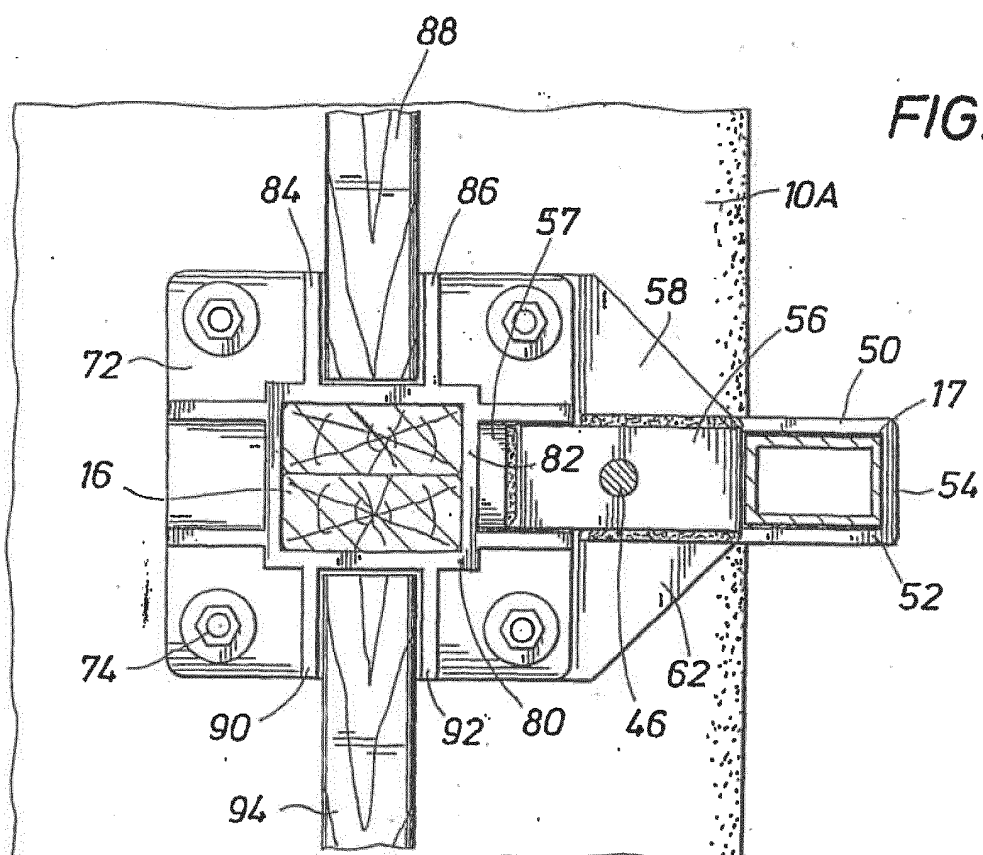
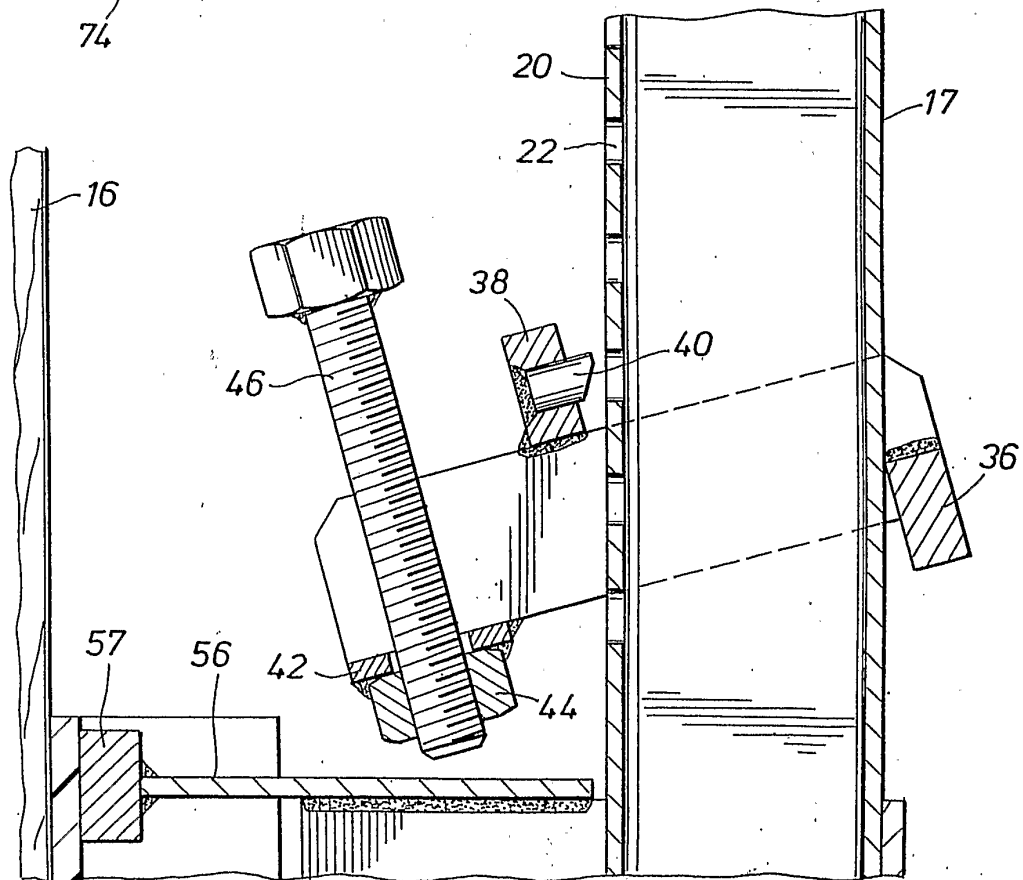
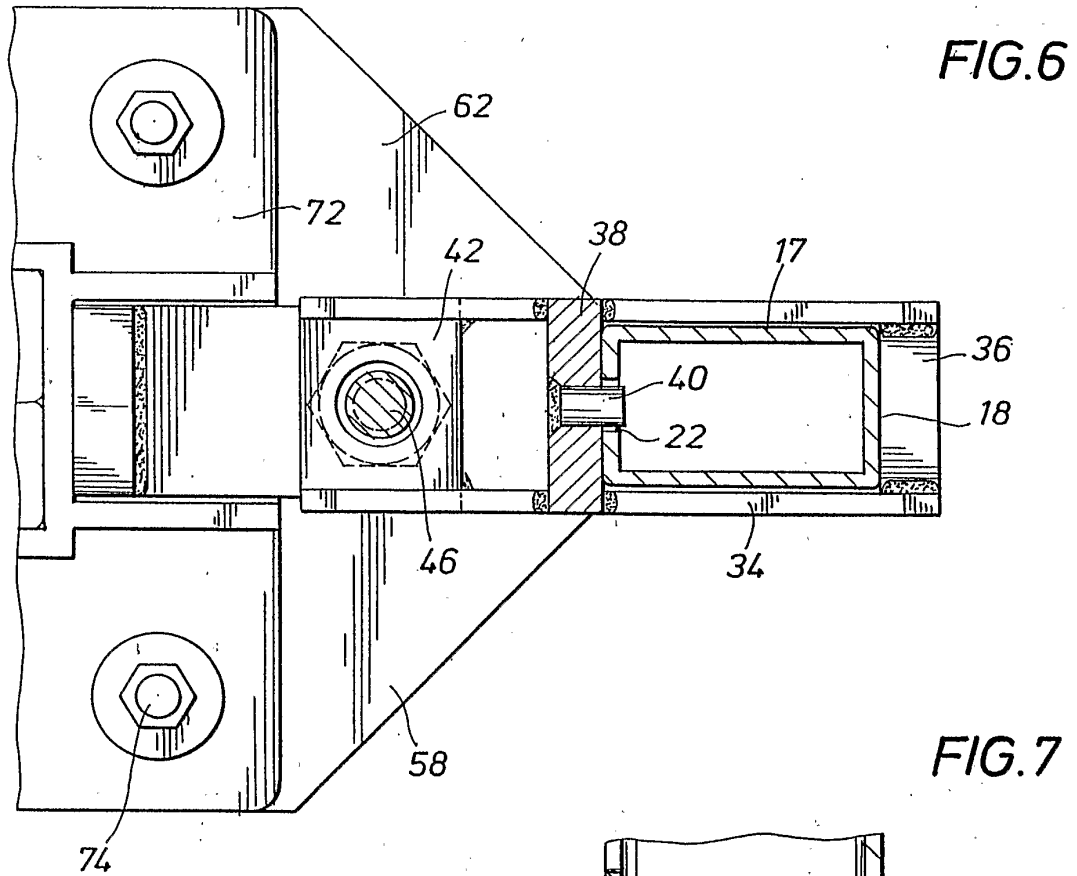


FIG. 5





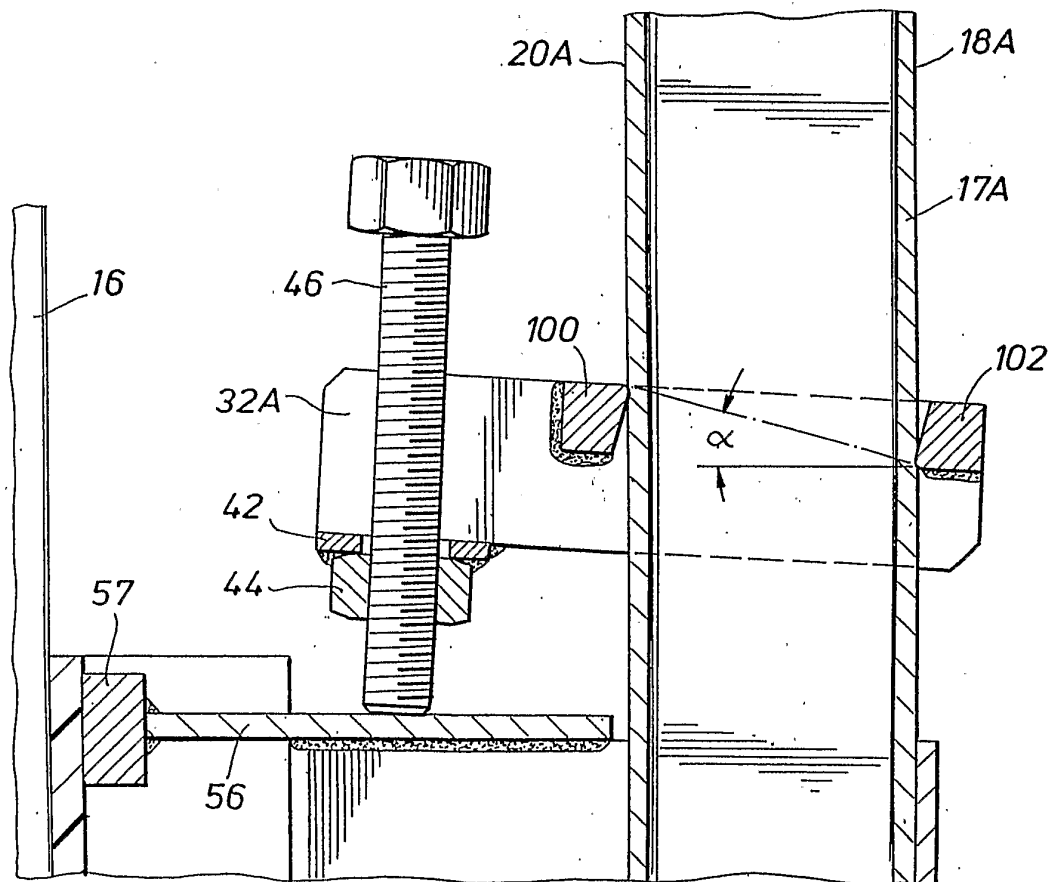
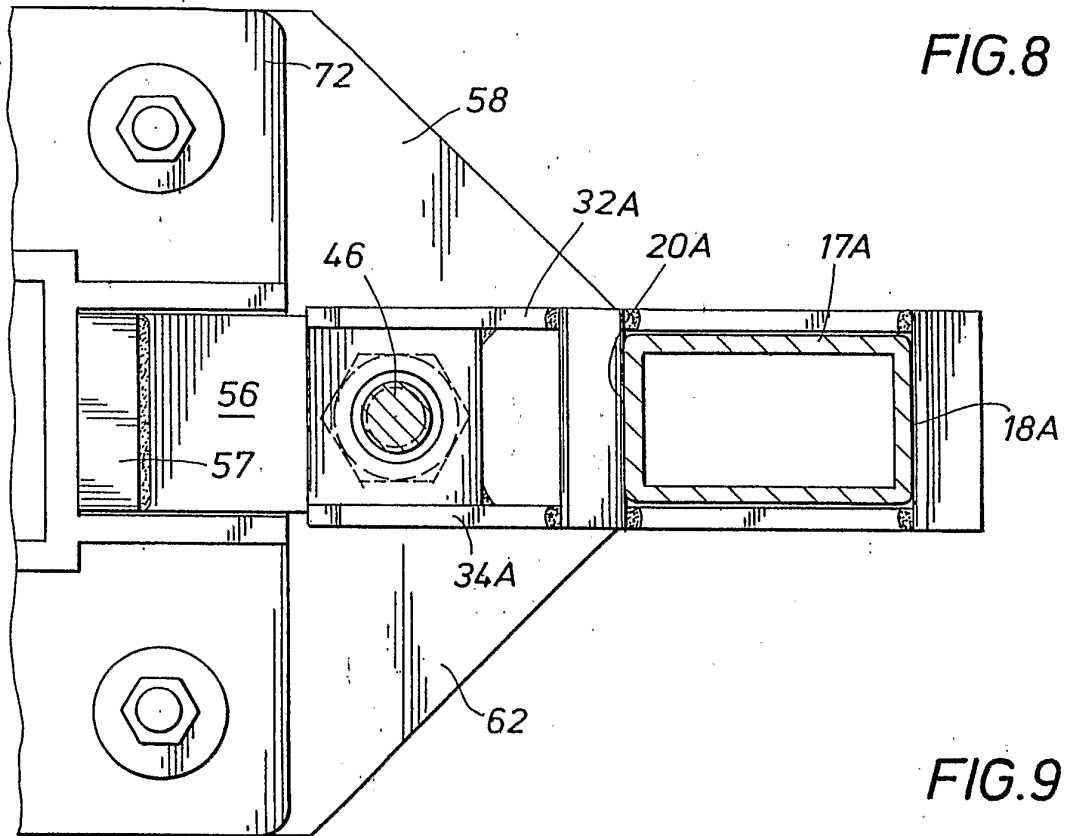


FIG. 10

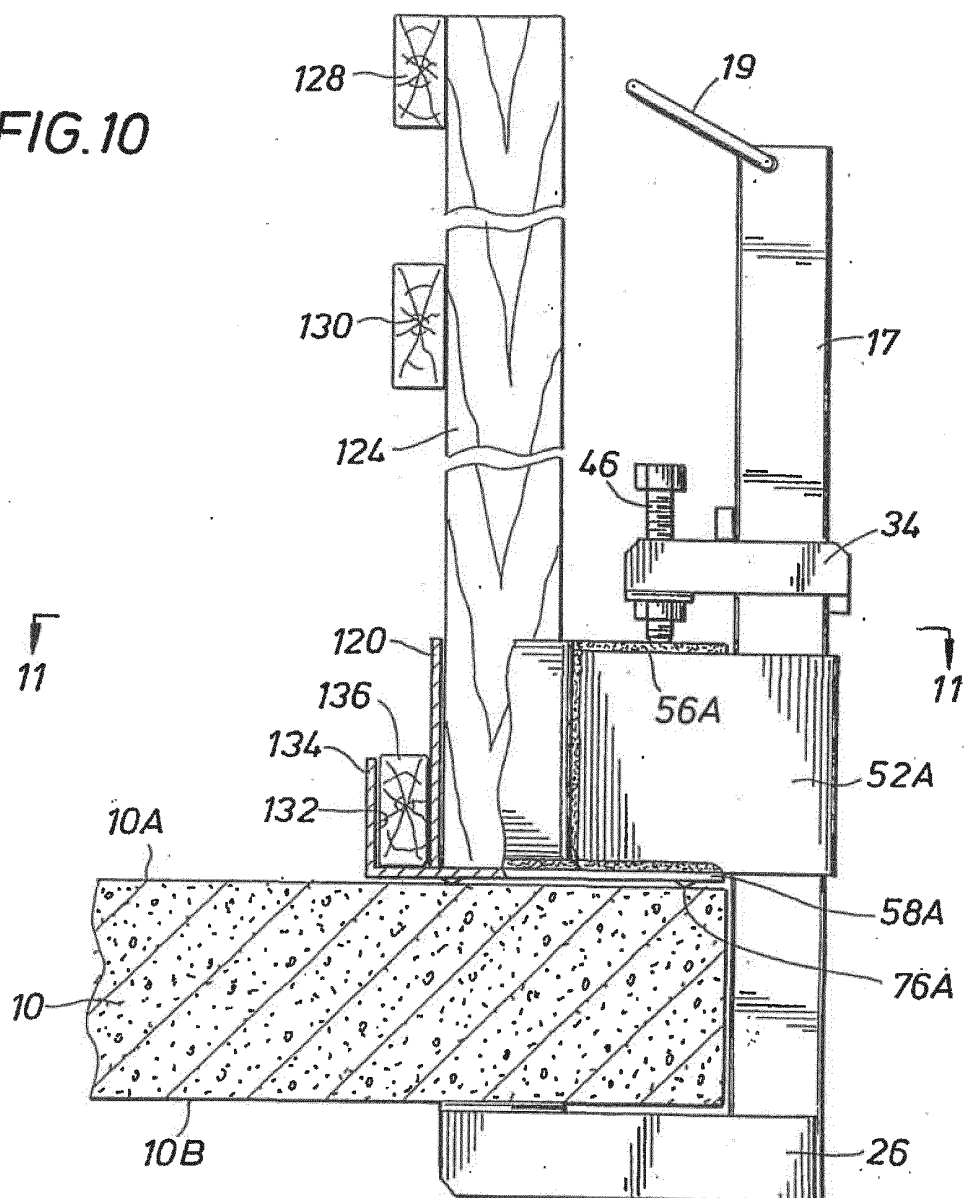


FIG. 11

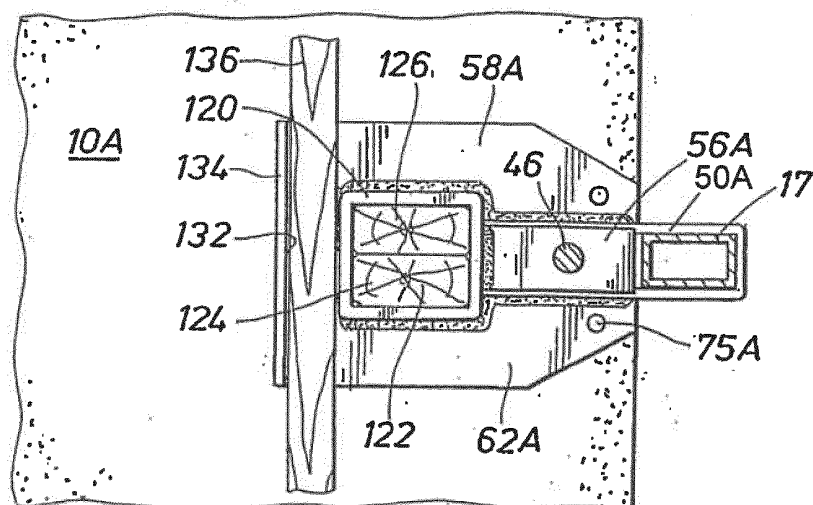


FIG.12

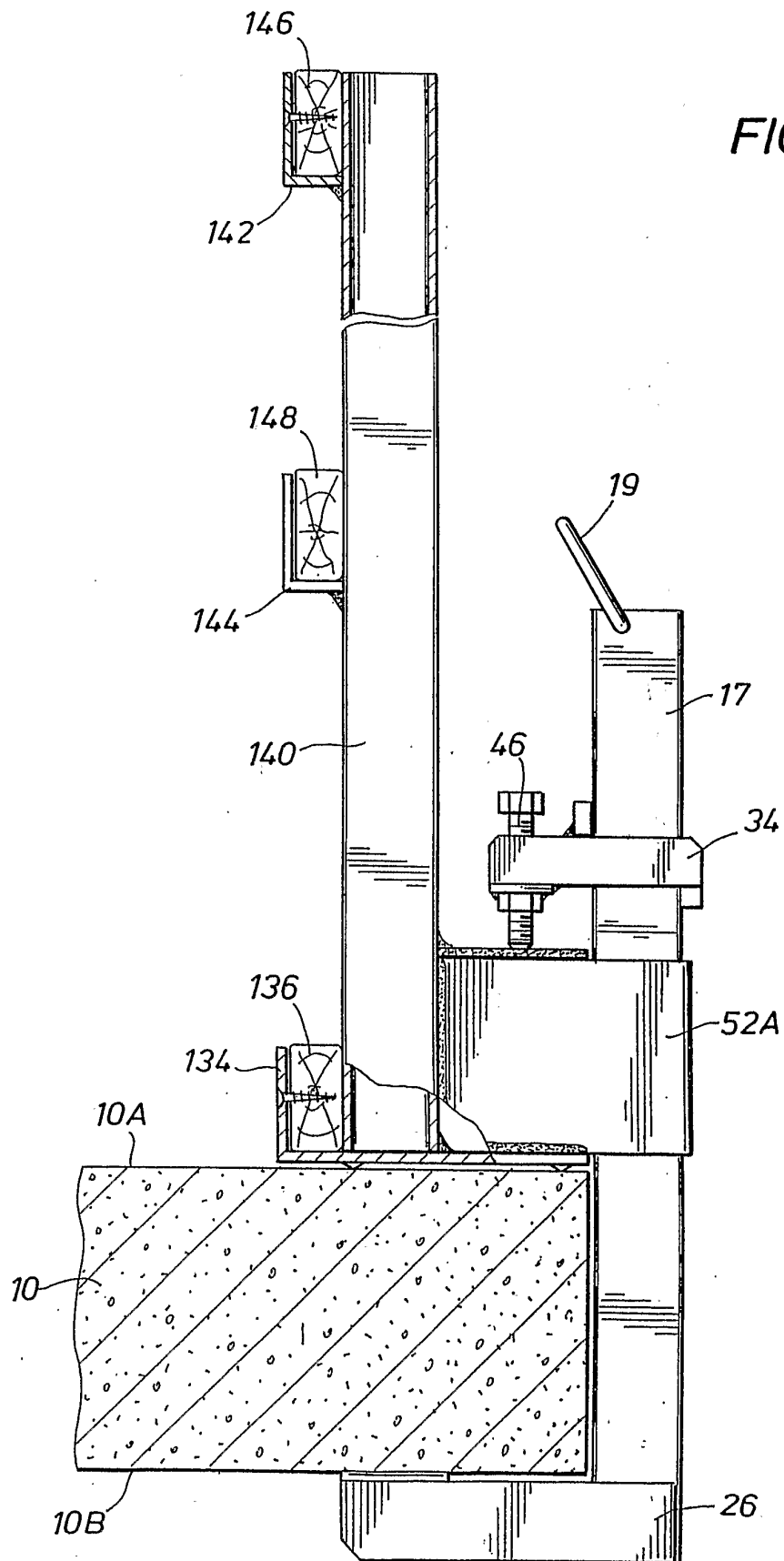


FIG. 13

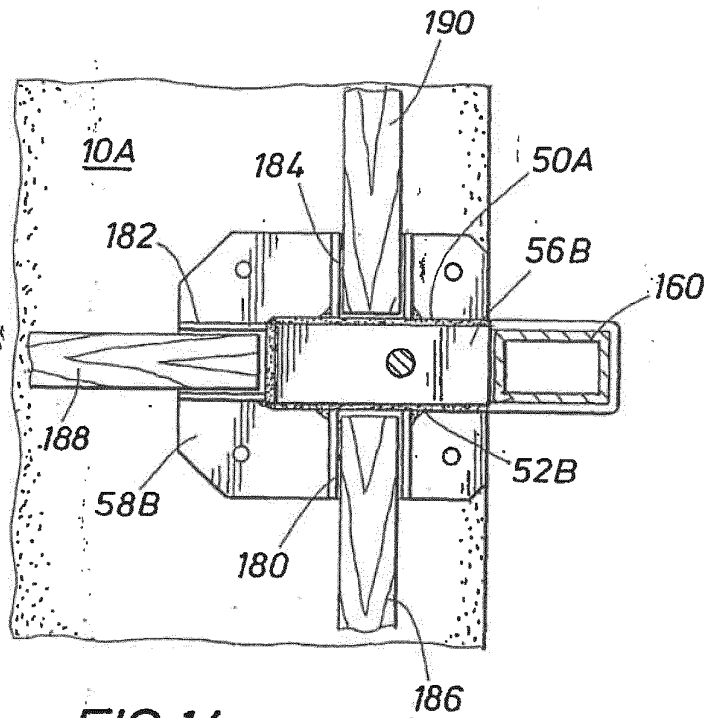
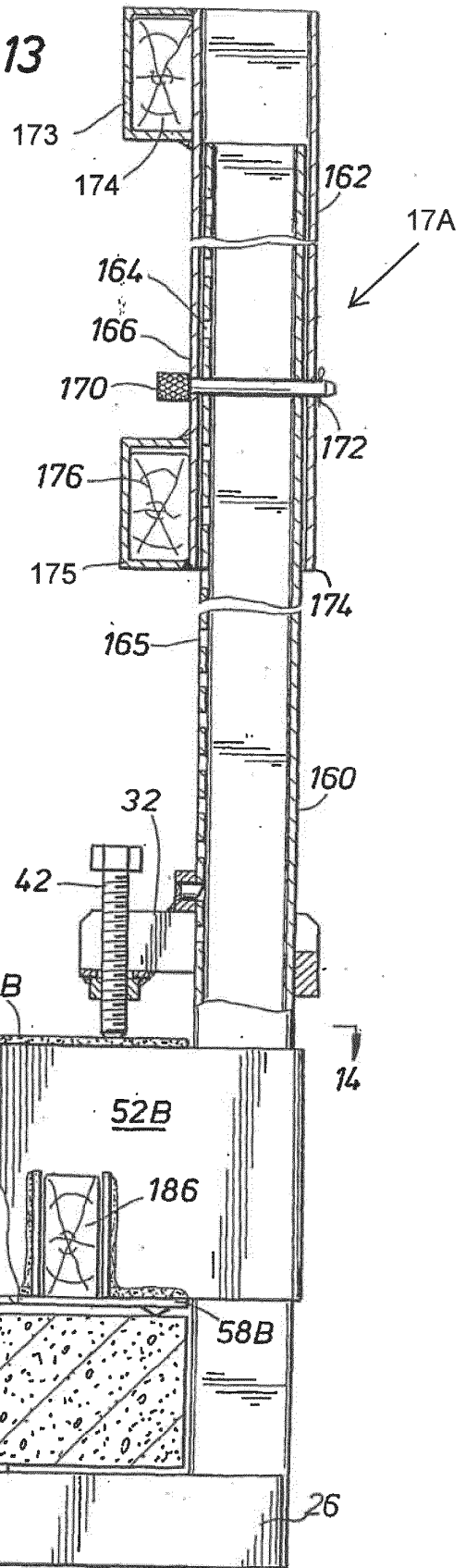
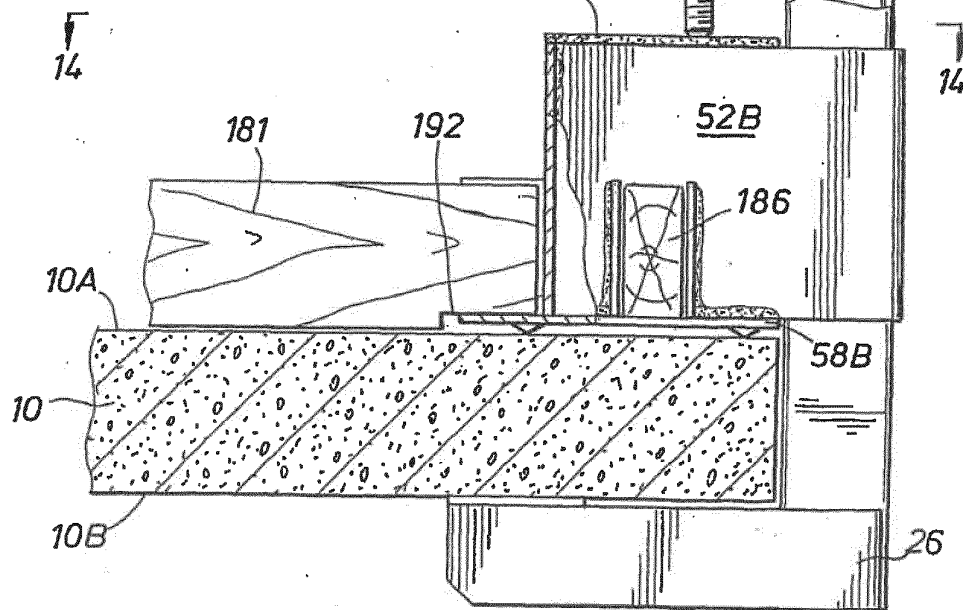


FIG. 14



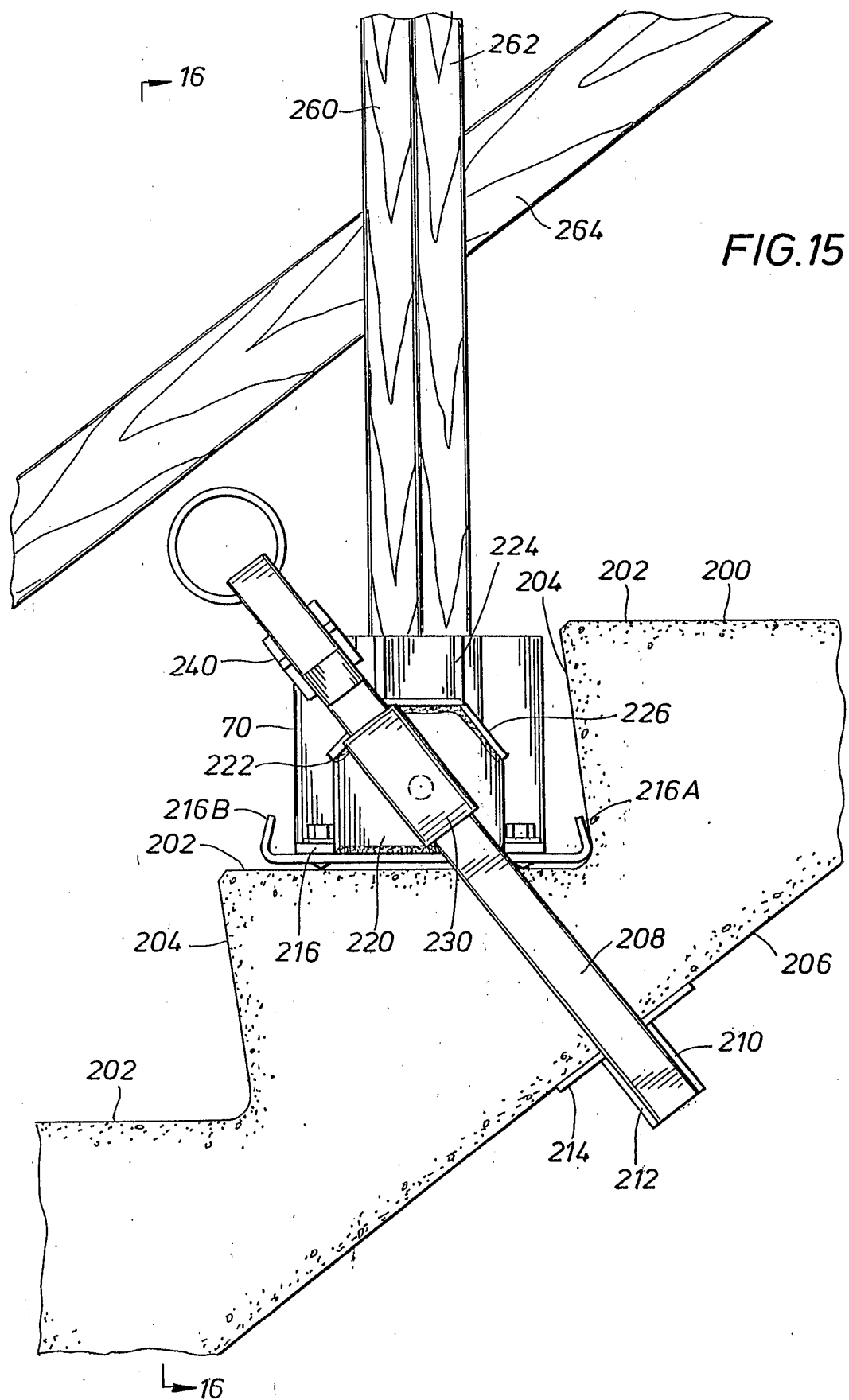
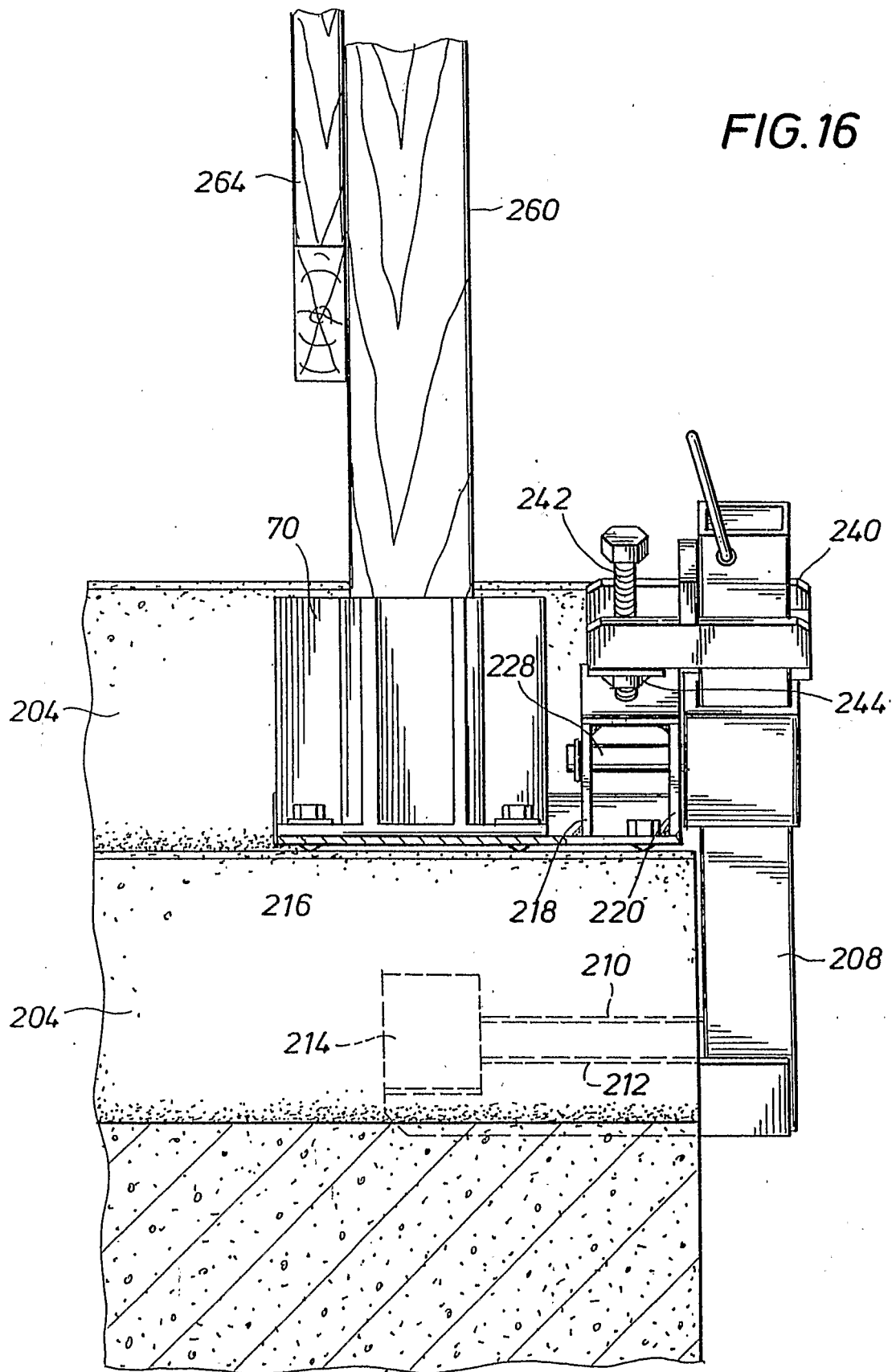


FIG. 16



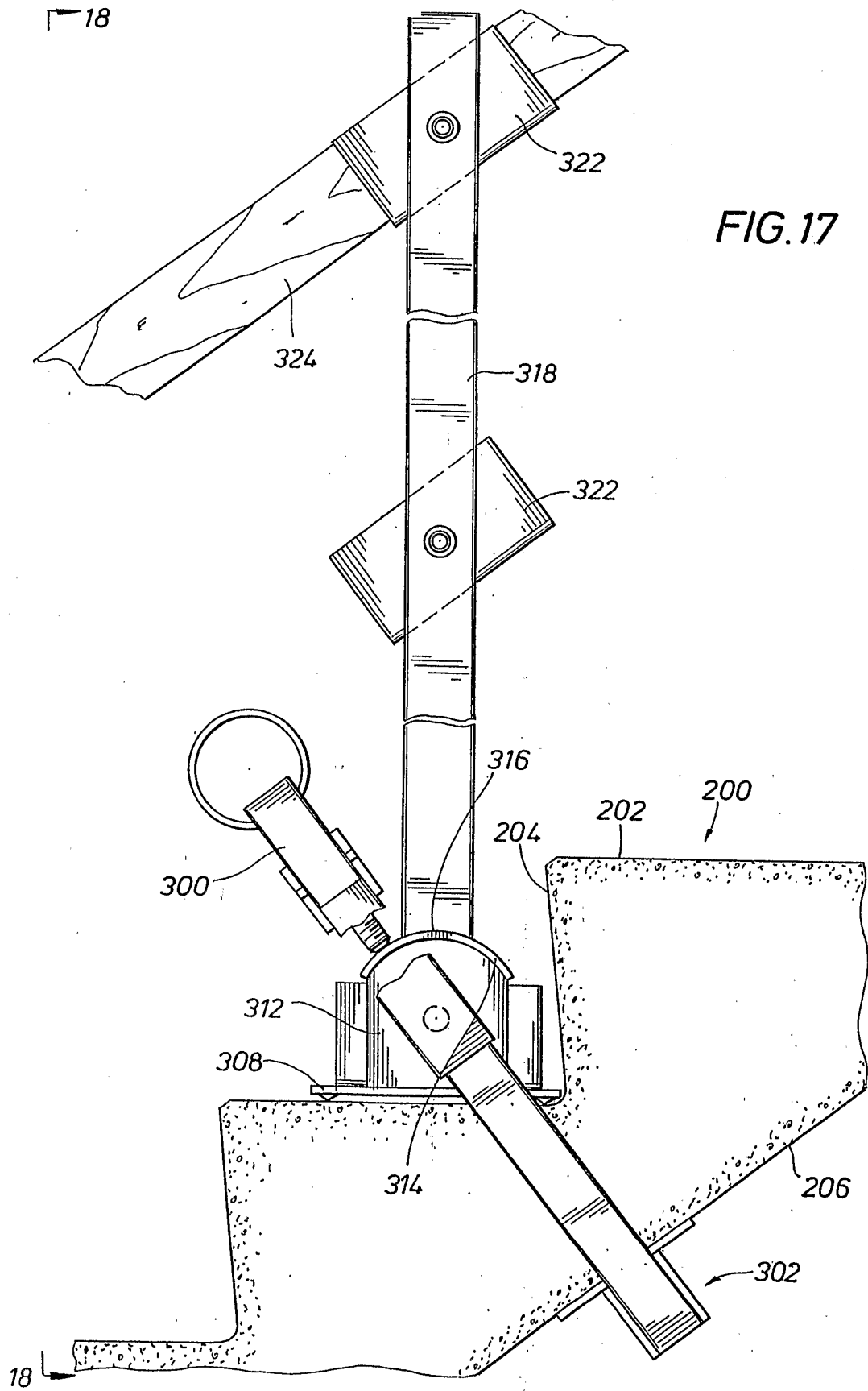
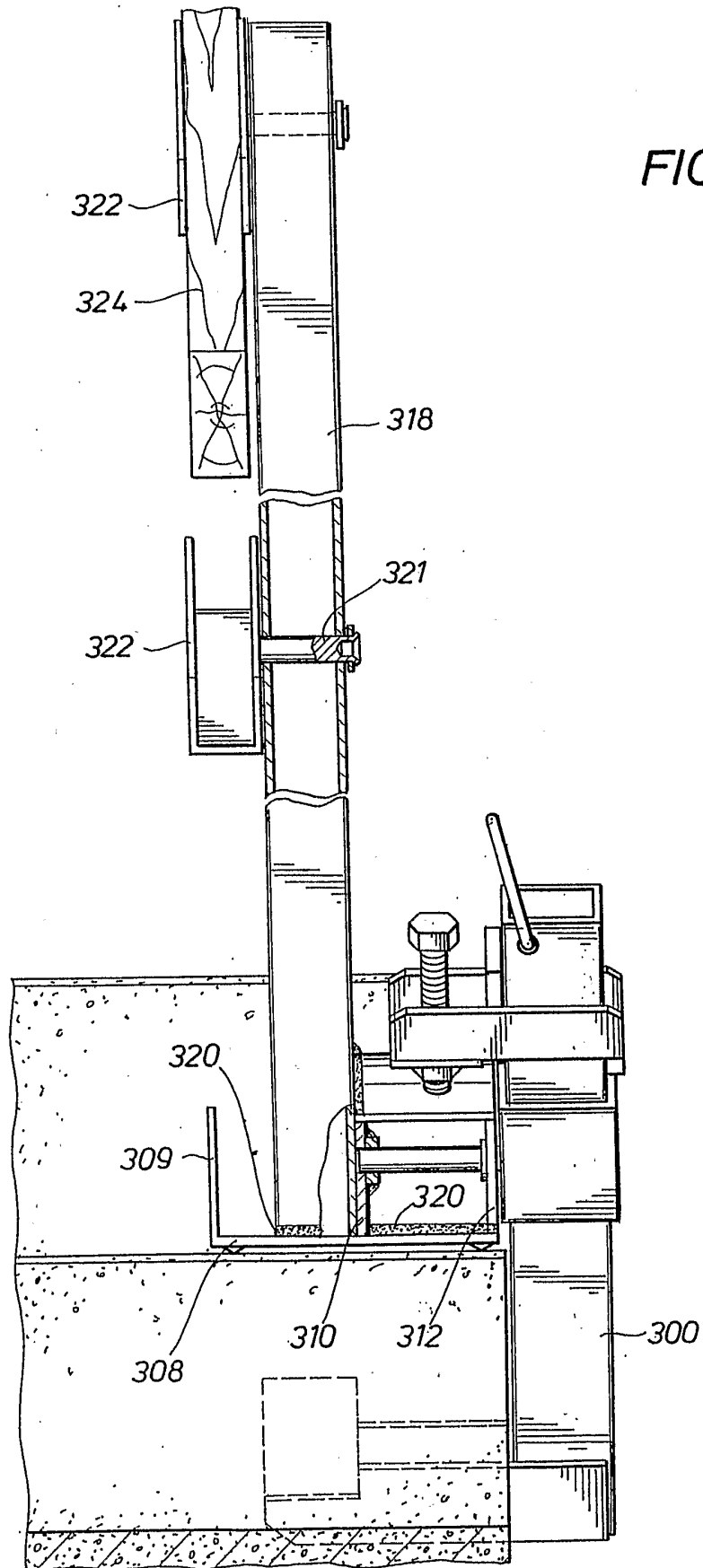


FIG. 18



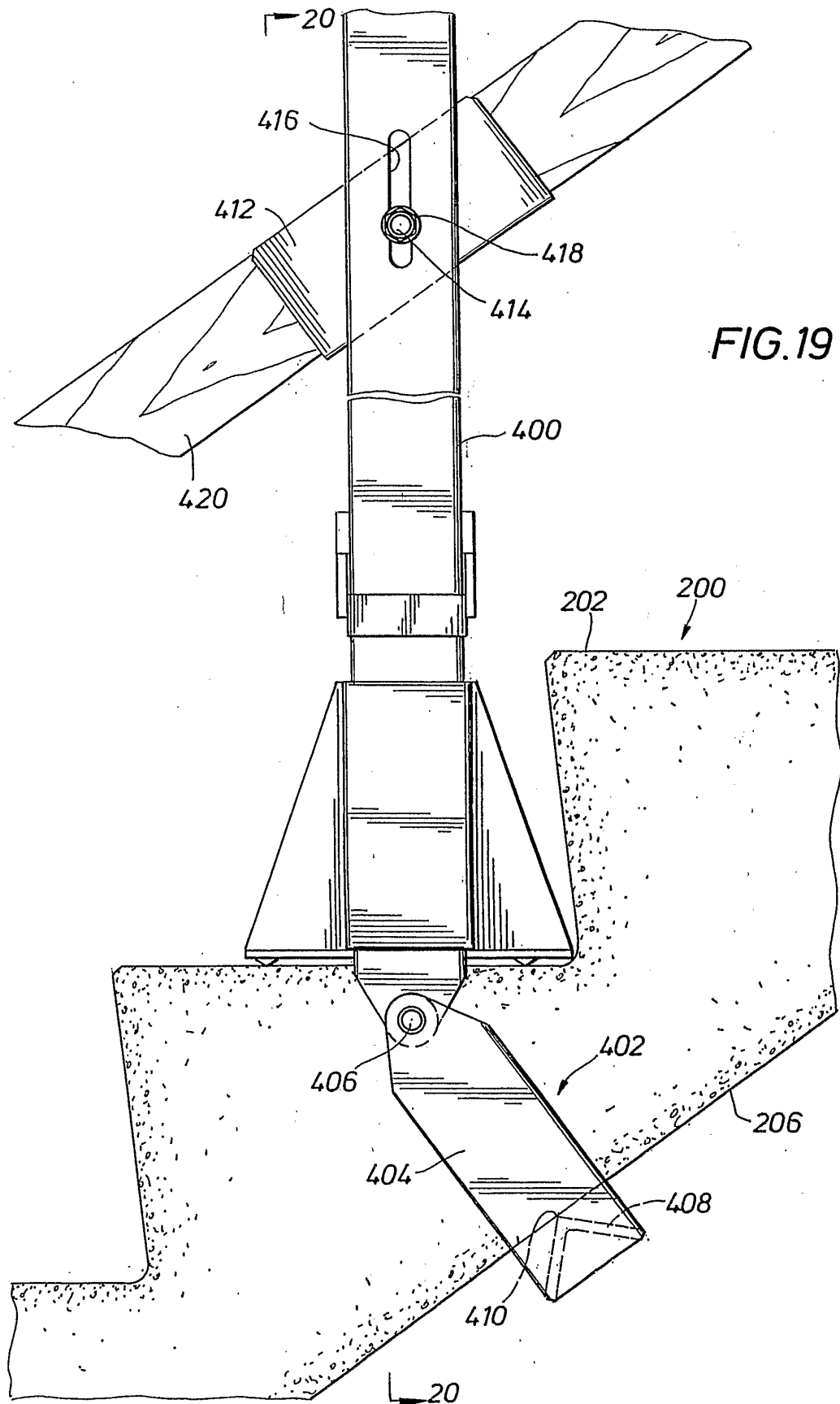
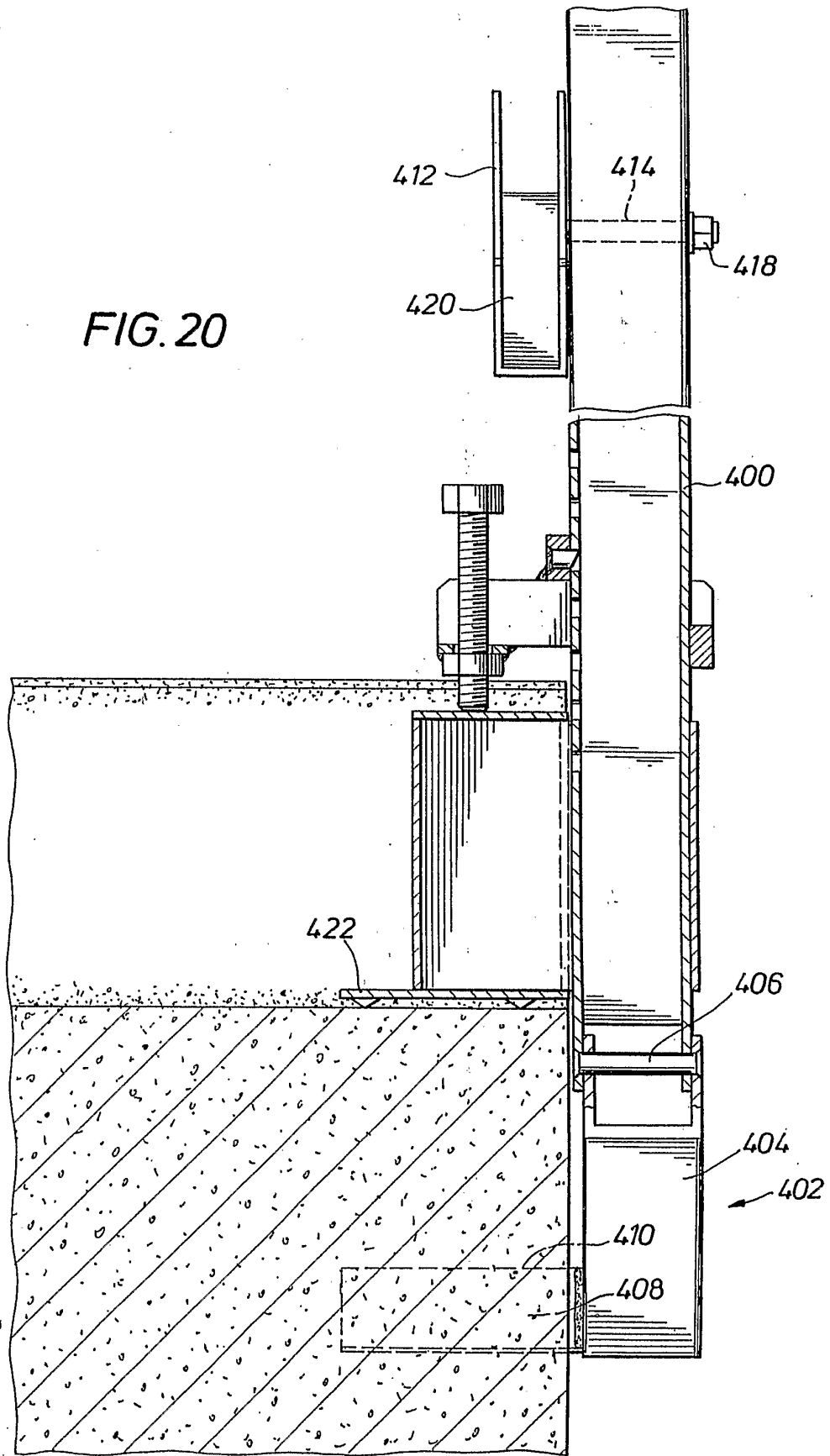


FIG. 20



22

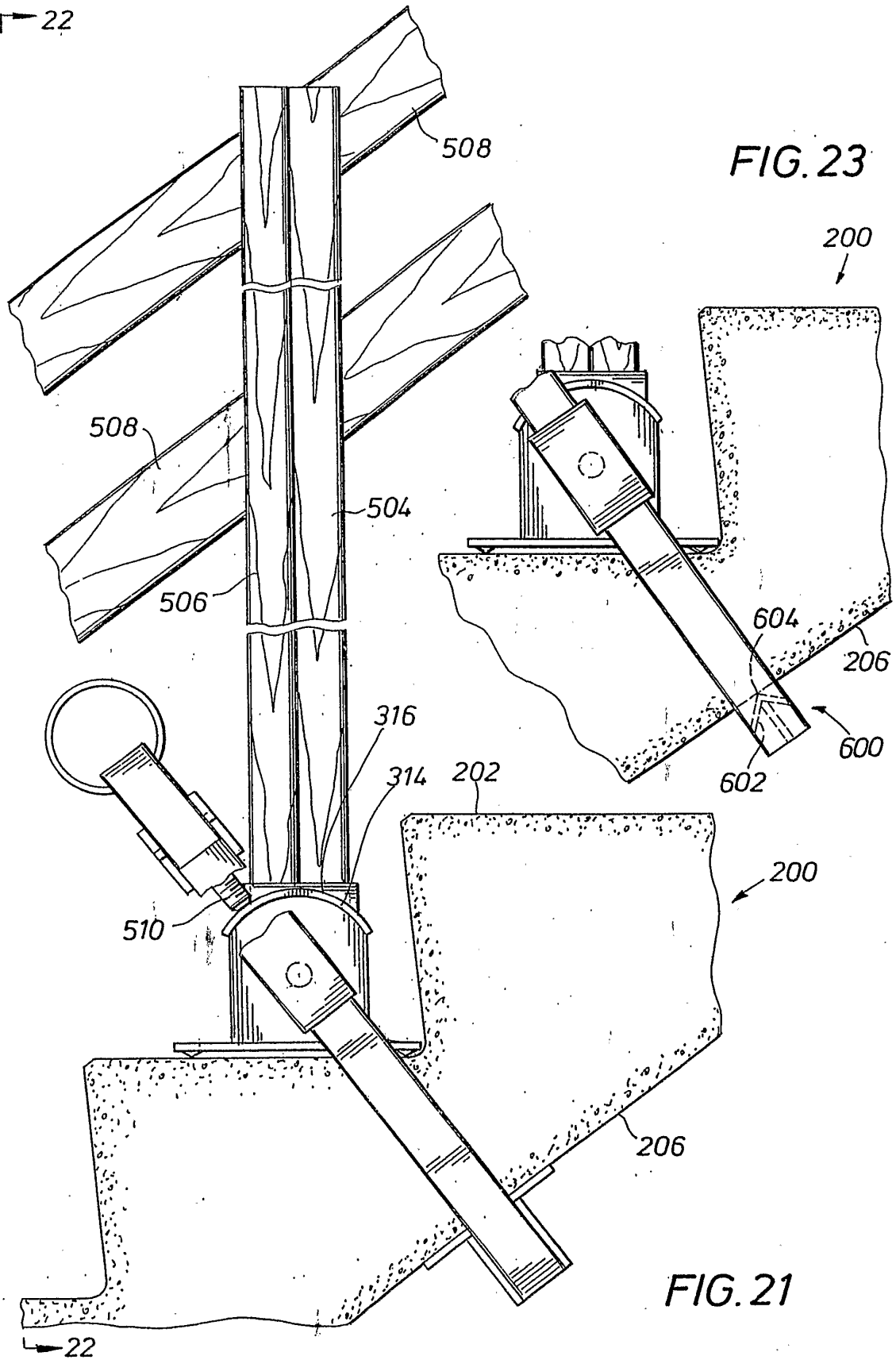
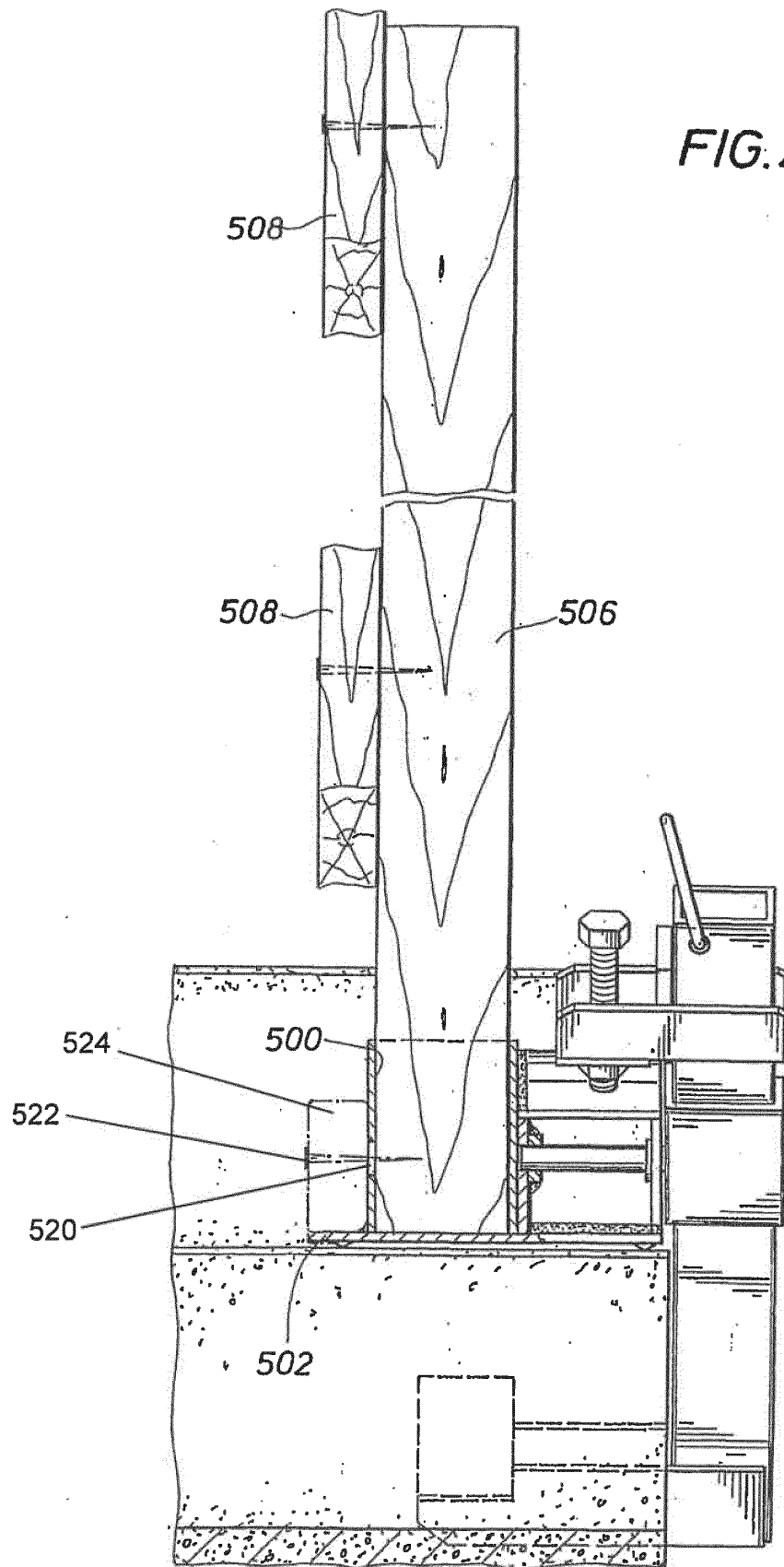


FIG. 22



REFERENCES CITED IN THE DESCRIPTION

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