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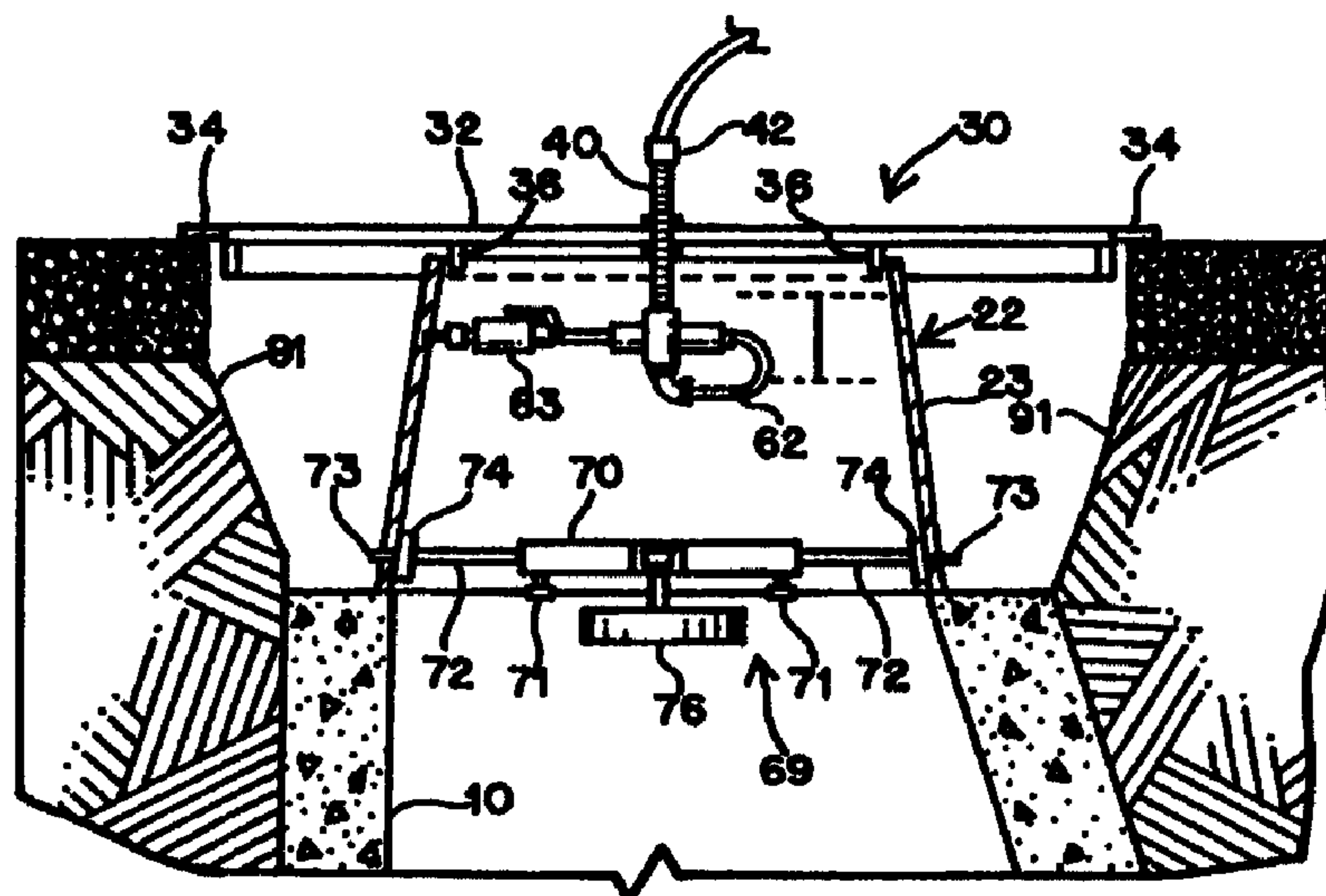
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(54) **ENSEMBLE COLLIER DE REGARD ET PROCÉDE AFFERENT
AVEC PHASE D'EBARBAGE**

(54) **MANHOLE COLLAR ASSEMBLY AND METHOD WITH
TRIMMING STEP**



(57) La présente invention, illustrée par le dessin 3, concerne un système permettant de soulever un couvercle de regard (16) lors de la construction de routes. Le système consiste à placer une forme généralement tubulaire (22) sur un cône de regard se trouvant (10) dans une excavation, le système comprenant également un procédé et un outil (83) d'ébarbage/coupe destinés à ajuster la hauteur de la forme (22). De préférence, l'outil de coupe (83) est disposé à l'intérieur de la forme (22) autour de laquelle il tourne pour découper un anneau de matière dans la partie supérieure de la forme. L'outil de coupe (83) est fixé à une hauteur mesurée par rapport à

(57) The present invention, illustrated in figure (3), provides a system, for raising a manhole ring (16) during the construction of roads, that include placing a generally tubular form (22) on a manhole cone (10) in an excavation, and a method of, and trimming/cutting tool (83) for, adjusting the height of the form (22). Preferably, the cutting tool (83) is positioned inside the form (22) and is rotated around to cut a ring of material off of the top of the form. The cutting tool (83) is set at an elevation, indexed off of the pavement around the excavation, which results in the form being cut to a desired height. The form (22) may include a stabilizing



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la chaussée autour de l'excavation, ce qui permet de couper la forme à une hauteur voulue. La forme (22) peut comprendre un système de stabilisation (69) permettant de retenir la forme (22) en place sur le cône de regard (10). Le système de stabilisation (69) comprend: une masse (76), plusieurs barres (72) de stabilisation et de positionnement de masse, qui se rétractent pour former des bras (70) et sont retenues en place par des vis à oreilles (71). Les extrémités (73) des barres pénètrent dans la paroi de la forme (23). Un cadre de montage en forme de X (30) permet de fixer un outil d'ébarbage sans constituer une obstruction significative pour les mains et la vision de l'opérateur. Le cadre de montage en forme de X comprend un élément circulaire (31), ainsi que des éléments de support (32) en forme de X, une tige (40) et une bague (48). Des pattes (36) de positionnement verticales maintiennent le cadre (30) dans une direction horizontale, la surface de la route étant contiguë à l'excavation (91). L'outil d'ébarbage (83) comprend une meule à rectifier les matrices, la moule étant électrique ou, de préférence, pneumatique et montée sur un bras télescopique (82). Le bras télescopique (82) coulisse à travers le bras oscillant (81).

system (69) for holding the form (22) in place on the manhole cone (10). The stabilizing system (69) comprises: a weight (76), a plurality of stabilizing and weight positioning rods (72), which retract into arms (70), and are held in place by wing screws (71). Ends (73) penetrate through the form wall (23). An X-shaped jig frame (30) secures a trimming tool without significant obstruction to the hands and vision of the operator. The X-shaped jig frame comprises a circular member (31) and an x-shaped support members (32), shaft (40) and bushing (48). Vertical positioning tabs (36) maintain the frame (30) in horizontal orientation with the road surface adjacent the excavation (91). The trimming tool (83) comprises an electric or more preferably a pneumatic die grinder, which is mounted on a telescoping arm (82). The telescoping arm (82) slides through swinging arm (81).

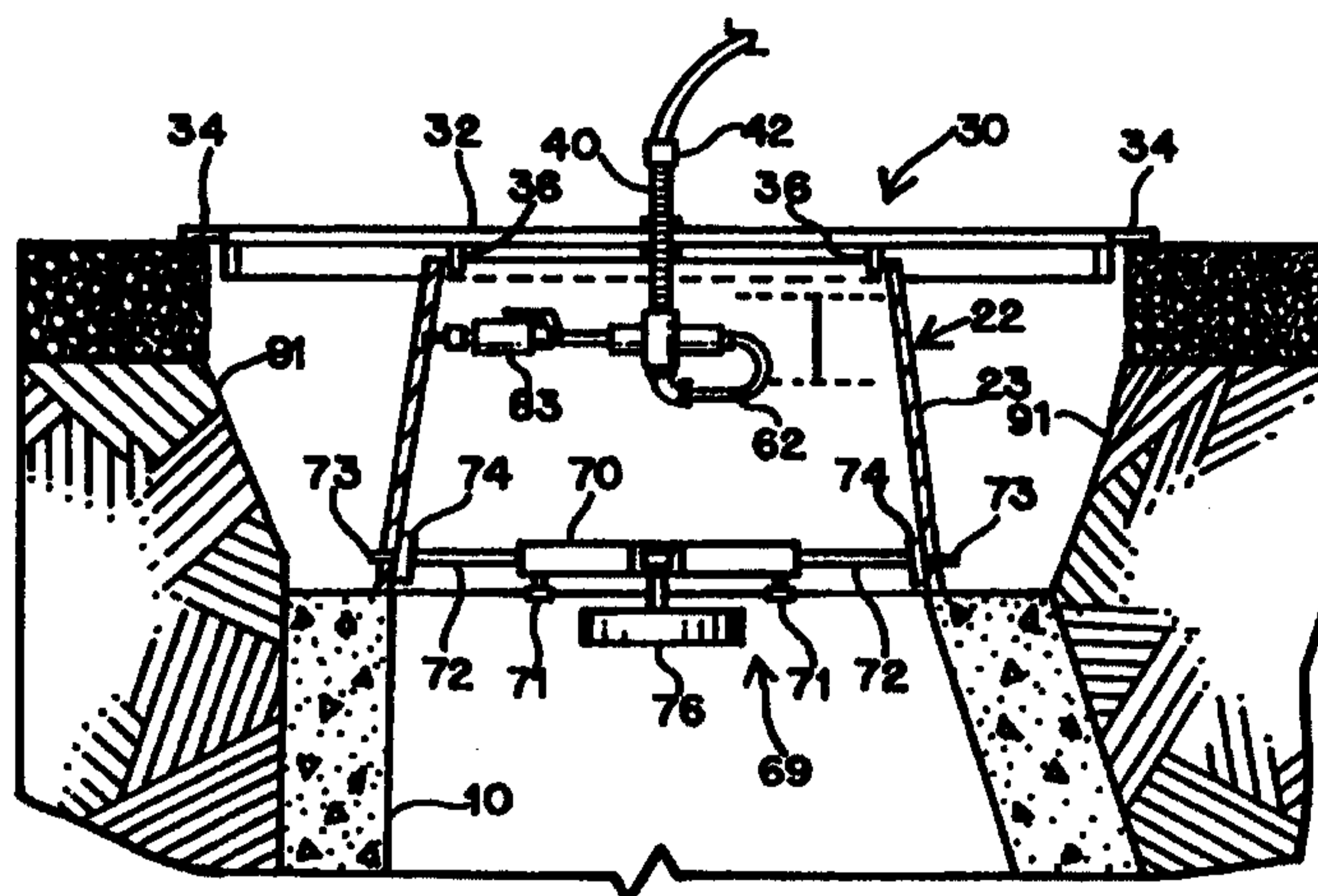
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<p>(21) International Application Number: PCT/US98/26536</p> <p>(22) International Filing Date: 11 December 1998 (11.12.98)</p> <p>(30) Priority Data:</p> <table border="0"> <tr> <td>08/988,870</td> <td>11 December 1997 (11.12.97)</td> <td>US</td> </tr> <tr> <td>09/079,242</td> <td>14 May 1998 (14.05.98)</td> <td>US</td> </tr> <tr> <td>09/173,148</td> <td>15 October 1998 (15.10.98)</td> <td>US</td> </tr> </table> <p>(71)(72) Applicant and Inventor: HINKLE, Vernon, W. [US/US]; 2418 Bishop Circle, Caldwell, ID 83605 (US).</p> <p>(72) Inventor: TENSEN, John, D.; 4th floor, 150 North Capitol Boulevard, Boise, ID 83701 (US).</p> <p>(74) Agent: PEDERSEN, Ken, J.; Pedersen & Company, PLLC, P.O. Box 2666, Boise, ID 83701-2666 (US).</p>		08/988,870	11 December 1997 (11.12.97)	US	09/079,242	14 May 1998 (14.05.98)	US	09/173,148	15 October 1998 (15.10.98)	US	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>
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(54) Title: MANHOLE COLLAR ASSEMBLY AND METHOD WITH TRIMMING STEP



(57) Abstract

The present invention, illustrated in figure (3), provides a system, for raising a manhole ring (16) during the construction of roads, that include placing a generally tubular form (22) on a manhole cone (10) in an excavation, and a method of, and trimming/cutting tool (83) for, adjusting the height of the form (22). Preferably, the cutting tool (83) is positioned inside the form (22) and is rotated around to cut a ring of material off of the top of the form. The cutting tool (83) is set at an elevation, indexed off of the pavement around the excavation, which results in the form being cut to a desired height. The form (22) may include a stabilizing system (69) for holding the form (22) in place on the manhole cone (10). The stabilizing system (69) comprises: a weight (76), a plurality of stabilizing and weight positioning rods (72), which retract into arms (70), and are held in place by wing screws (71). Ends (73) penetrate through the form wall (23). An X-shaped jig frame (30) secures a trimming tool without significant obstruction to the hands and vision of the operator. The X-shaped jig frame comprises a circular member (31) and an x-shaped support members (32), shaft (40) and bushing (48). Vertical positioning tabs (36) maintain the frame (36) in horizontal orientation with the road surface adjacent the excavation (91). The trimming tool (83) comprises an electric or more preferably a pneumatic die grinder, which is mounted on a telescoping arm (82). The telescoping arm (82) slides through swinging arm (81).

MANHOLE COLLAR ASSEMBLY AND METHOD WITH TRIMMING STEP

DESCRIPTION

BACKGROUND OF THE INVENTION5 Field of the Invention.

This invention relates generally to pavement construction and particularly to an improved construction for underground utility access assemblies. More specifically, the invention includes an improved construction for raising the manhole ring and cover to proper elevation, and a process and tool for producing the improved construction.

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Related Art.

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Subterranean utility lines have been employed for many decades and have typically been laid adjacent to or beneath roadways. The need for access to utilities has necessitated the addition of access holes at various points along a utility line. These access holes are commonly called "manholes" and are covered with what is generally known as "manhole covers".

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Manhole covers are generally comprised of cast iron, are circular in configuration, and have a suitable diameter for a particular utility or road construction project, typically, but not restricted to, 12-48 inches. The top surface of a manhole cover is intended to be generally flush with the pavement or road surface, so as to not generate a depression in the road with its resultant myriad of problems. One such problem is unnecessary bumps for traveling vehicles. Another such problem is the creation of locations where water may accumulate and, by the expansive forces created by its freezing, cause discontinuity between the manhole ring and the surrounding pavement. Such discontinuities then perpetuate a destructive process by admitting more water into the surrounding area, which then aggravate the problem by similar subsequent freezing and thawing action. Therefore, a general requirement for both new road construction and reconstruction is that manhole covers be generally flush with the pavement surface.

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In the case of new road construction, current practice is to supply a pre-cast concrete manhole cone 10, also called a "cone section", which is put in place in an excavated hole over the buried utility line at the job site. These concrete manhole cones extend upward from the

buried utility line to usually less than 2 feet below the road surface. This distance between the cone and the road surface allows for installing the manhole ring, onto which the manhole cover is located in its final assembled position, in such fashion as to provide a flush fit between the manhole cover and the road surface. The distance between cone and road surface is greater than the height of the manhole ring, so that there is a space between the top of the concrete cone section and the bottom of the manhole ring that is typically filled with bricks, mortar, cement block, or pre-cast concrete circular grade rings 14 of different thickness grouted in place. After the manhole ring is raised above the cone by these bricks or grade rings to the proper elevation and orientation, concrete 20 is poured around the bricks or grade rings and the manhole ring to form a sealed system extending from the cone to the manhole ring. Because the manhole ring is initially buried with the cone beneath the fresh pavement, and then uncovered and raised into correct position by the grade ring technique, the process of lifting and positioning the manhole ring is called "raising".

In the construction of such prior art systems, difficulty is encountered in the raising process, particularly at the stage where it is desired to make the surface of the manhole ring and cover flush with the final road surface. The difficulty in matching the paved surface is of special concern for construction of new road surfaces. Currently, as discussed above, the pre-cast concrete grade rings are available in varying thickness to allow for custom adjustment as each individual case requires, and these rings are set in grout to obtain the final required height adjustment. Still, the adjustment of a manhole ring location by this technique tends to be inaccurate and time-consuming, and the pre-cast grade rings are costly and cumbersome to use.

It is an object of the present invention, therefore, to alleviate the necessity to use pre-cast concrete grade rings, bricks, or blocks in these constructions. It is a further object of the present invention to reduce the overall cost and difficulty of construction of utility line access systems.

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SUMMARY OF THE INVENTION

The instant invention comprises a forming system to create a concrete collar around the access opening for underground utility maintenance. The forming system comprises a pre-fabricated form, and a trimming assembly for on-site custom trimming of the form to the proper height and orientation, for accurate placement of the manhole ring to be level with the paved road surface. The system permits the installer to construct the support for the manhole ring in one continuous pour, thereby greatly increasing labor efficiency and decreasing material costs. No experimentation or placement of with concrete grade rings is required when using the system of the instant invention.

The concrete form of the invented system comprises a generally tubular, preferably slightly conical, section that is set on a manhole cone that extends upwardly from the particular subterranean utility area that is to be accessed. Preferred embodiments of the concrete form include reinforcement built into the wall and means for securing the form to the manhole cone. The preferred reinforcement may include angular portions which may be corrugations or steps in the wall of the form. The lower end of the preferred form may include a flange or "lower rim" for nailing or otherwise connecting the form to the manhole cone to stabilize the form on the cone.

Once properly installed, the form is generally coaxial with the cone, with the form's lower end resting upon the top surface of the concrete manhole cone. On the top edge of the tubular form, after custom trimming of the form, is rested a manhole ring 16, which serves as the receiving receptacle for a manhole cover later placed thereon. The initial height of the tubular concrete form 22 (prior to custom trimming) is selected so that it extends at least slightly higher than the location where the bottom surface of the bottom flange of the manhole ring 16 is eventually to be. This allows leeway for the custom trimming of the tubular form, preferably using the invented trimming assembly, to a height and orientation that will result in the manhole ring top surface being the same elevation as, and preferably coplanar with, the adjacent asphalt surface.

The invented trimming assembly comprises a support that holds a trimming tool at a proper elevation below the pavement, that is, where the bottom of the manhole ring should be. The trimming assembly comprises means for moving the trimming tool around in a generally horizontal plane at this proper elevation, that is, parallel but below the plane of the

pavement. The trimming tool cutting member, such as a blade or a bit, reaches to contact the form wall and to cut through the form wall to remove a portion of the top of the form at that elevation. Preferably, the trimming tool rotates around an axis in the interior space of the form to cut the form. After the trimming is complete, the trimmer is removed and the
5 manhole ring is repositioned atop the trimmed top edge of the tubular form. Once the ring is in this proper position, concrete is poured around the outside of the invented form, in the space between the pre-cast concrete manhole cone and the top of the manhole ring, to form the concrete collar. After the initial setting of the concrete, the tubular form may be removed in some embodiments, but in the preferred embodiments, where the form is connected to the
10 manhole cone, the form remains in place on the manhole cone to act as a liner on the inside of the manhole collar. When left in place as a liner, the form provides added protection of the concrete collar from corrosive gases.

The principle objects of this invention are to provide an efficient labor and cost-effective method for raising manhole rings to proper position relative to road surfaces, which
15 reduces the total time required for such raising.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective, exploded view of one embodiment of the invented concrete trimming system, in place on an embodiment of the invented form (shown in dashed lines)
20 above a manhole cone.

Figure 2 is a cross-sectional view showing the prior art method of construction using concrete grade rings 14 and grout.

Figure 3 is a cross-sectional view showing the trimmer system embodiment of Figure 1 in position on one embodiment of the invented concrete form, for trimming the form to
25 required height and orientation prior to final positioning of the metal manhole ring.

Figure 4 is a sectional view showing the trimmed form of Figure 3 in place with a manhole ring above it and concrete collar around it according to one embodiment of the invented method of construction.

Figure 5 is an enlarged perspective detail view of the trimmer system embodiment of
30 Figures 1 and 3, showing a depth-adjusting center post as a trimmer tool axis, telescoping swing arm assembly, and a cutting means.

Figure 6 is an enlarged perspective view of a stabilizing/positioner assembly of the form embodiment of Figure 3, including a frame, adjustable rods, support strips, and weight.

Figure 7 is a perspective, exploded view of another embodiment of the invented concrete trimming system, in place on an embodiment of the invented form (shown in dashed lines) above a manhole cone.

Figure 8 is a cross-sectional view showing the trimmer system embodiment of Figure 7 in position on one embodiment of the invented concrete form.

Figure 9 is an enlarged perspective detail view of the trimmer system embodiment of Figures 7 and 8, showing a depth-adjusting center-post, swing arm assembly, and a cutting means which includes a die grinder with a router bit.

Figure 10 is a perspective view of an alternative embodiment of the invented concrete form attached to a manhole cone, with the form including axial protrusions, in a corrugated configuration, for reinforcement of the form.

Figure 11 is a perspective view of an alternative embodiment of the invented concrete form having radial protrusions, in a stepped configuration, for reinforcement of the form.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

According to the instant invention, there are shown in the Figures several embodiments of apparatus and methods for producing a manhole ring perfectly indexed to the adjacent paved road surface. The invention is used to replace cumbersome and inaccurate steps of the conventional technique for raising a manhole ring, which are schematically illustrated in Figure 2.

As mentioned in "Related Art" above, prior to raising a manhole ring either by the conventional technique or by the invented technique, several steps typically are carried out to prepare and pave around the eventual manhole location. These preparation steps, which are described in detail below, may be summarized as: 1) burying a manhole cone, ring and cover in the excavated hole where underground utility access is required, 2) paving over the buried items, and 3) then cutting the pavement to dig out the manhole ring and cover.

In the first preparation step, earthwork serving as the subbase material is provided and compacted to a sub-grade elevation which is below the ultimate paved grade elevation. A precast concrete manhole cone 10 having a metal manhole ring 16 and cover 18 placed atop its opening is provided where underground utility access is required. A layer of base rock

substance, which typically consists of gravel, is then placed over the sub-base material. At this stage, the manhole ring and its cover are buried beneath the base rock.

In the second preparation step, the final asphalt road surface material is placed over the base rock to provide a smooth road surface by means well known to those skilled in the art. The road surface is permitted to fully cool.

After the asphalt paving has cooled, the third preparation step involves locating the manhole rings and covers previously buried by the base rock and asphalt paving, for example, by using metal detectors. A circular section comprising sub-base, base rock and asphalt paving is excavated from the region above and around the manhole ring and cover. This excavation is undertaken to the extent necessary to expose the top surface of the concrete manhole cone 10, the manhole ring, and the cover itself, and is typically about approximately 1 to 6 feet in diameter. The ring and cover are removed out of this excavation from their positions on the cone and set off to the side.

After these three conventional preparation steps are performed, the invented apparatus and methods are used to construct an improved concrete collar to raise the manhole. The invention comprises use of an invented concrete form and trimming the form prior to a single collar-forming concrete pour. The invention preferably includes a means of reinforcing the form against collapse or warping, and a means of stabilizing the form on the manhole cone. Reinforcing and stabilizing means may include the weighted stabilizing system and reinforcing strips portrayed in Figures 3, 6, and 8. The especially-preferred reinforcing and stabilizing means instead include the form having reinforcing structure in the form wall and a flange on the form for direct attachment to the manhole cone, as shown in Figures 10 and 11.

The invented tubular form is comprised of a material that is preferably formed into a wall with the general shape of a tube with a slightly conical shape. The form wall may be a generally smooth, curved conical shape, as portrayed in Figure 1, 3, 4, 7, and 8; an inherently-reinforced shape such as a corrugated or stepped shape, as in Figures 10 and 11; or other shapes. Preferably, the form wall may be molded into a single seamless piece or several fastened pieces. Alternatively, the form wall may be made of a sheet of material rolled into a tube and fastened at its seam by welding, overlapping, using a strip of material located along the seam incorporating suitable fasteners such as rivets, or using other fastening means. The preferred form material is plastic, but other materials may be used, such as wood, metal,

composites, homogenous or layered sheets, screens covered with sheeting may be used, or other materials that are strong enough to support a concrete pour.

Separate Stabilizing and Reinforcing Assembly

5 Figures 3, 6, and 8 illustrate an embodiment in which a separate assembly, stabilizing assembly 69, is used in combination with the form 22, for reinforcing the form wall 23 and helping to anchor the wall in proper position on the cone. Stabilizing system 69 comprises a compression-resistant frame inside the wall 23 and a weight 76 for holding the form in place.

10 The compression-resistant frame comprises a plurality of stabilizing and weight-positioning rods 72 located inside form 22 as shown in Figures 3, 6, and 8. These stabilizing rods, which telescope into arms 70, have ends 73 which extend into or through the wall, or fasten to the wall by other means. The exact location of the stabilizing rods along the height dimension of the tubular form 22 is not extremely critical for purposes of this invention. The function of the rods is to assist in stabilizing the form during the trimming operation and the subsequent setting time of the concrete and this function may be accomplished with the rods being at various heights. The location of the rods is preferably at an effective distance from the lower end of the tubular form for this purpose. The stabilizing rods 72 are housed within the arms 70 which form an x-shaped rigid framework having a clamping means 71 that, when tightened against a portion of a rod 72, holds the rod in a fixed radial length and position. By such means, adaptation to tubular forms 22 of varying diameters is possible by simple adjustment of the length of rod protruding from the x-shaped framework. Alternately, a single stabilizing rod may be used with a straight rectangular or tubular outer framework analogous to arm 70 similarly equipped with clamping means and a sliding or telescoping inner member which is readily adaptable to preferably removably attach to the walls of form 22.

25 Near the outer extremities of the stabilizing rods are preferably semi-circular reinforcing support strips 74 which push on the lower end or "skirt" portion of form 22 to reduce or eliminate the tendency of the tubular form 22 to bow inwards under the forces applied by the concrete having been poured around the form. Thus, the strips 74 preferably are biased against, contact, or are very near the form wall inner surface in the lower half of the form. The strips, rods, and x-shaped framework act to resist compression forces from outside of the form, which might otherwise collapse, bow or warp the form wall.

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From the vertex of the stabilizing frame is hung a weight 76, which is of an amount sufficient to hold the concrete form 22 in place, for example, about 20 pounds. The weight is preferably centered to be coaxial with the form wall and is slightly below the form. The weight may be hung by a strap, chain, wire, or any means, or may be generally integral with the stabilizing frame. The weight assists in holding the concrete form 22 in position during the trimming stage, and may be left in place during the setting of the concrete.

Alternatively, the stabilizing and reinforcing means may be of other designs. The stabilizer system may have other than an x-shaped structure, and may comprise other rings, panels, or reinforcers besides the strips 74, and may include a simple chain or cable attached to the stabilizer from which a weight is suspended. For example, an expandible ring may be inserted into the form to extend generally continuously around the inside surface of the form. The expandible ring may have a chain or cable extending from side to side across the form opening and have a weight hanging from the chain. The expandible ring may have prongs or other protrusions to grip the inside surface of the form 22.

Reinforced-Wall Forms

Instead of a separate assembly for stabilizing and reinforcing the form, the stabilizing and reinforcing means may be as simple as the form being made of very heavy material, or inherently-reinforced material, and/or having a means for attaching or clamping the form wall to the cone. Figures 10 and 11 illustrate especially-preferred examples, described in detail below, which include inherently-reinforced form materials with means for attaching the form to the manhole cone.

In Figure 10, form 122 may be used in the place of smooth-walled form 22 in the invented method of manhole collar construction. Form 122 includes a corrugated-type form wall 123, which features generally flat portions 125 and generally vertical (axial) ribs. The ribs of Figure 10 are angled portions 127, which are V-shaped protrusions spaced around the form wall, preferably about every 2 - 6 inches. The angled portions 127 or other ribs act as reinforcements for the wall, similar to the reinforcement offered by corrugations in corrugated cardboard. Other ribs may be used, for example, rectangular protrusions or rounded protrusions. Further, form 122 includes a flange or lower rim 130 which protrudes radially outward from the bottom end 131 of the wall 123. This lower rim 130 extends generally perpendicularly from the wall 123 to rest generally flat on the top of the manhole cone. Preferably, concrete nails 132 or other fasteners are forced through the lower rim 130 into the

manhole cone, prior to trimming of the form top, to secure the form 122 on the cone. Thus, in the embodiment of Figure 10, the reinforcing and stabilizing means are built-in to the form, and the separate reinforcing and stabilizing assembly 69 is not required.

5 In Figure 11, form 222 may be used in the place of smooth-walled form 22 or form 122 in the invented method of manhole collar construction. Form 222 includes a stepped wall 223, which features radial protrusions that may be described as steps 225 and corresponding risers 227 which, create a form wall stepping inward from a larger diameter at the bottom toward a smaller diameter at the top of the form. This stepped design inherently reinforces the wall 223. Further, form 222 includes lower rim 130 which is nailed or otherwise fastened to the manhole cone. This embodiment, therefore, also includes reinforcing and stabilizing means that are built-in to the form, so that separate reinforcing and stabilizing assembly 69 is not required.

10 Both form 122 and 222, and other designs of inherently-reinforced and directly-attached forms, increase the ease and consistency of form installation and use. After placement of the form 122, 222 on the manhole cone, the form is nailed to the cone with a standard concrete nail driver. The trimming tool holding and indexing structure or "jig," detailed below, is used to trim the top of the form 122, 222, and the manhole ring is placed on the form, and concrete is poured, as in the other embodiments of the invented system. The inherently-reinforced forms 122, 222 remain firmly in place on the manhole cone and resist the compressive forces on the exterior wall 13, that might otherwise cause warping or collapse during trimming and concrete pouring. Forms 122, 222 do so without requiring the steps of placement and removal of the stabilizing assembly 69. Typically, forms 122, 222 remain in place after pouring of the concrete, and, especially with an optional sealant or sealing ring between the lower rim 130 and the manhole cone, the form may become a liner for controlling gas and/or water movement through the manhole collar.

15 The forms 22, 122, 222 of the invented manhole collar assembly method are trimmed by use of a trimming tool that preferably circles around inside the form in a generally horizontal plane (parallel to the pavement) to cut the top of the form at an elevation and orientation that will result in the form being the correct height and orientation to hold the manhole ring upper surface 117, and therefore the manhole cover upper surface 118 level with the top of the surrounding pavement. After placement or nailing of the form 22, 122, 222 on the manhole cone, the trimming is positioned over the form 22.

Trimmer Assembly

The trimmer assembly comprises, in general terms, an upper portion which contacts the pavement surface and a lower portion which holds and includes the cutting means. The trimmer assembly may also be described as comprising a trimming tool with a cutting means and a "trimmer jig frame" which holds, and provides a way to index and adjust the position of, the trimming tool. The jig frame may be said to comprise an outer support for contacting the pavement and an inner support that holds and cooperates with the trimming tool. The preferred jig frame 30 supports the trimmer of this invention in its desired position using an outer support comprising a circular member 31 and an inner support comprising an x-frame 32. The jig frame 30 optionally may be held in position by means of vertical positioning tabs 36, which fit snugly against preferably the inner surface of the tubular form 22, and horizontal exterior tabs 34, which rest upon the flat portions of the finished road top surface that was not removed by the excavation of the approximately 1-to-6-foot section previously mentioned. Such a configuration tends to hold the trimming assembly in a fixed position relative to the excavated hole and to the form 22 for the trimming operation.

The generally X-shaped jig frame 30 is preferred because it is strong, economical to manufacture, and convenient to use. The x-frame 32 allows the operator to swing the trimming tool around its center post axis and watch the trimming tool without significant obstructions to the hands and vision. Alternatively, however, other jig frame shapes may be used, with various radial or ring or other bracing members, and various positioning members for holding the frame in place. Also, alternative rotational means may be used, although the center post system (shaft 40 and bushing 48 assembly) is effective and economical.

The amount of tubular form 22 to be trimmed away by the invented trimmer is readily determined by measuring the critical dimension of the manhole ring 16. These manhole rings conventionally have an upper surface 117 that, after installation, should be flush with the finished road surface and that should hold the cover so that the cover upper surface 118 is also flush with the road surface. The manhole rings have a lower flange 17 and a coextensive lip portion 19 which defines the diameter of the access hole and which is the lowermost portion of the manhole ring itself. The lip preferably projects inside into the top of the custom trimmed tubular form. The distance between the upper surface of the manhole ring and the bottom surface of the flange is called the critical dimension, and is determined by measuring. Then, the bit 84 or other cutting member of the trimming tool is positioned at that

same vertical distance from the portion of the x-frame that is level with the pavement, for example, the bottom surface of tabs 34 that rest on the concrete or the top or bottom surface of the x-frame members 32, depending on which surface is designed to be at the level of the pavement surface. Vertical adjustment of shaft 40, which is accomplished as described in the Trimming Operation section below, is used to position the cutting member at the critical dimension.

The various portions of the invented form stabilizer assembly 69 and the trimming jig frame 30 are preferably constructed of steel or aluminum. However, any materials that are rigid enough to adequately provide stable, stationary support may be used. For example, other metals beside aluminum or steel, various alloys, fiberglass, graphite, etc., could be used. The stabilizer assembly for the form should hold the form stationary and should reinforce the form wall against collapse or warping under the pressure of the poured concrete. The trimming jig frame should hold the trimming tool in proper and accurate position while the trimming operation is being carried out. The jig frame preferably should be designed to remain in stationary relationship to the form, the excavated hole, and the manhole cone.

Various cutting means may be used in accordance with the invention. For example, a grinder, saw, knife, laser, puncture or perforation device, or a burning tool may be used, or any means for removing form wall material from the form near the top of the form. Figures 1, 3 and 5 illustrate a saw as a cutting means, while Figures 7, 8 and 9 illustrate a grinder as a cutting means. Various tools may be envisioned, depending on the material chosen for the form wall material.

In the case when a pneumatic die grinder 83 with router bit 84 is employed, conventional air hoses and connecting means are employed to convey compressed air to the cutting means. Other pneumatic or electrical apparatus may be used to power the trimming tool.

The Specialized Trimmer

Embodiments of the device specifically developed for trimming of the tubular form 22 of this invention are shown in use in Figures 1 and 3, and Figures 7 and 8 and are detailed in Figures 5 and 9. The preferred embodiment of Figure 9 comprises an electric, or more preferably a pneumatic die grinder 83, for example, one manufactured by the Sioux Tools Inc., Sioux City, Iowa, model 1954HP or an equivalent. The grinder 83, including router bit 84 as a cutting member, is mounted on a telescoping arm 82, which slides through swinging arm 81. Swinging arm 81 is the outside tube attached to shaft 40 by means of

bushing/bearing 48, which allows the complete assembly of the swinging arm 81, telescoping arm 82, and die grinder 83 with router bit 84 to rotate concentrically around center post or shaft 40 to trim concrete form 22. An adjustable shaft 40 connects bushing 48 and x-section 32. The adjustable shaft 40 is hollow throughout its length dimension so as to function as a passageway for either compressed air or an electrical wire useful for supplying motive force to the cutting means. The shaft 40 preferably is vertically adjustable up and down and lockable in a desired vertical elevation. For example, adjustable shaft 40 may be threaded on its external surface and mounted to x-frame 32 by means of threaded collar 38 cooperating with shaft 40. Alternatively, the shaft could have a smooth external surface and could cooperate with a mating, lockable collar or other mount. X-frame 32 may be attached to circular portion 31 of the jig frame 30 by various methods, such as welding or other fasteners. Various means may be used to lock the shaft 40 in place, after it is adjusted to the proper location, to prevent it from further rotating to a higher or lower position. A lock nut 44 may be used, for example, or other locking mechanisms.

Preferably, the die grinder 83 is pneumatic and compressed air is conveyed in from the inlet quick-disconnect fitting 42, through the air outlet feed elbow 66, quick-disconnect fitting 64, and short flexible air line 62. Such fittings and hose collectively are means for conveying compressed air to a tool and are well-known to those skilled in the art. Equivalently, when an electric motor is used, wiring is used in an analogous fashion to the compressed air conveyance system by means well known to those skilled in the electrical art. The purpose of the preferred quick-disconnect fittings 42 and 64 is to allow convenience in assembly/disassembly of the device, but such quick-disconnect fittings are not required.

The less preferred trimming assembly embodiment of Figures 1, 3 and 5 includes a pneumatic saw 56 having blade 60 as a cutting member, for example, one manufactured by the Jet Company of Auburn, Washington, model JSG-0519 or an equivalent. Blade 60 is mounted on a swing arm 54 by fastening means such as machine screws and/or brackets and clamps. The swing arm 54 is pivotally mounted by means of a hinge pin 52 to a fixed arm 50 which itself is rotatably mounted to a base plate 46 by means of a suitable coupling 48, which may be either a bushing or a bearing. The adjustable shaft 40 is disposed between base plate 46 and x-frame 32, extends through collar 38' and may be locked by nut 44'.

The Trimming Operation

After determining the depth of the form wall material to be trimmed away, and after locating the jig frame 30 and the tubular form 22 in position as described above, the location of router bit 84 is appropriately adjusted by raising or lowering rotating shaft 40 until the bit is in the desired position. Then the shaft 40 is locked into position. Compressed air is supplied to the die grinder 83 and the operator causes the router bit 84 to contact and cut through the wall of the tubular form 22. The die grinder is rotated about the axis of rotation coinciding with shaft 40 by virtue of coupling 48 until a complete concentric cut has been made about the tubular form 22, resulting in the removal of a ring of material from the top of the form. After the trimming job is complete, the compressed air supply is disconnected and the die grinder assembly together with the jig frame 30 are removed from the form. The section or ring of tubular form 22 which was trimmed away is then removed from the area.

If the manhole ring is placed on the trimmed edge of the form and does not sit at the correct level and/or the correct orientation, then the manhole ring may be removed, the trimming assembly may be repositioned over the form for fine-tuning the form trimmed top edge. The trimming tool may be used to shave off the small amount of material required to correct the level or slant of the trimmed top edge, thereby providing a very accurate, high quality manhole collar and ring assembly.

Manhole Collar Installation

Following removal of the trimmed-away section of the tubular form, the manhole ring 16 is placed atop the tubular form. The preferred measuring and trimming procedure results in the upper surface 117 or "lip" of ring 16 being generally flush with the finished road surface at this stage, but, alternatively, any desired height or depth for the ring may be selected during the measuring and trimming procedure.

Concrete is poured into the space defined by the exposed top surface of concrete manhole cone 10, the outer surface of tubular form 22, the excavation wall 91 produced from the earlier excavation, and the plane of the finished road surface. Such a method allows monolithic pouring of the manhole collar to fill the space conventionally filled with grade rings, and, thus, the invented method provides an increase in efficiency, decrease in production time, better quality control, and savings of resources of significant cost.

Once the poured concrete collar 20' has cured sufficiently, the stabilizing assembly 69 of the form 22, if any, may be removed. At this stage, the form wall 23 also may be removed,

if desired, if the form in use is of the type unconnected to the manhole cone. If the form in use is of the type (Figures 10, 11) that is connected to the manhole cone, the form is left in place on the cone. The manhole cover is then placed in position on the manhole ring to complete the construction, which is illustrated in Figure 4.

5 For purposes of the instant specification and the appended claims, the slightly conical, tubular concrete form may be made of any material suitable for shaping the form that can be cut by any of various cutting, drilling, burning, grinding means, etc. The form wall should be strong enough to withstand, without warping or collapsing, the forces applied during trimming and during concrete pouring, and preferably the wall is reinforced by the shaping of the form
10 by angular or other protrusions inward or outward from the generally cylindrical or conical surface portions of the form, such as illustrated by the examples in Figure 10 and 11.

The form 22 is preferably, but not necessarily, a single, solid, unitary molded or curved and fastened wall, having a substantially perforation-free outer surface, except for, optionally, small perforations for the optional stabilizer rods. A generally tubular and slightly conical
15 shape is preferred, but other shapes may be used, for example, forms with oval or even rectangular outer surfaces. The alternative shapes may be adequate as long as they result in a concrete collar that will support the manhole ring, as long as they provide an outer surface that creates a barrier extending between the cone and the position where the manhole ring will be, and as long as the form leaves an interior space free of concrete for access to the interior of the
20 cone from the manhole ring. The typical form 22 will be between 12 to 48 inches in diameter, but other diameters may also be used.

The form 22 may be made of various plastics, polymers, metal, composites, wood, etc., with the requirements being that: 1) sufficient wall strength be made available by the material or that a reinforcement/stabilizing system inside the form cooperate with the form wall to
25 adequately act as at least a single-use concrete form, and 2) that the top region of the form wall be cuttable, trimmable, tearable, shearable, or otherwise adapted so that incremental portions of the top may be removed to custom-size the height and orientation of the form. A preferred technique for making the form 22 may include molding or otherwise placing a white or other light-colored layer of plastic or other material as the inner surface of the form, which tends to
30 reflect light into the manhole and manhole cone interior space when the manhole cover is removed.

“Height adjustment” means that a ring of material will typically be removed from the top of the form to reduce the height of the form to lower the elevation of the trimmed top edge relative to that of the original form’s top end. “Orientation adjustment” means that one side of the top of the form may be cut (that is, shaved, trimmed, perforated, or ground, for example) to remove slightly more than another side of the form. This orientation adjustment is done to account for the fact that the manhole cone, and therefore the form, may be sitting at an angle in the excavation relative to the pavement, because of slightly tilted manhole cones or slanted pavement due to road or land contours. The trimmed top edge of the form, therefore, may not necessarily be exactly perpendicular to the axis of the form and the cone. Because the upper portion of the invented trimming assembly rests preferably on the top pavement surface, and the axis of the trimming tool is perpendicular to the plane of the upper portion of the trimming assembly, it may be said to be referenced or “indexed” to the pavement surface, so that the trimming tool will rotate around and cut the form in a plane parallel, but below, the plane of the pavement surface near the excavation hole. Therefore, despite angled positions of the cone and form relative to the pavement, the cut resulting from the invented trimmer assembly will properly orient the top edge of the form to receive and support the manhole ring so that the top surface of the manhole ring and the top surface of the manhole cover are parallel with the pavement surface, as well as being at the same elevation as the pavement surface.

The invented system, therefore, does not require bricks, pre-fabricated grade rings, shims, grout or other “building block” pieces stacked up above the cone around the outer surfaces of the form or the manhole ring. The invented system does not require trial-and-error in selecting rings of various thickness or in grouting the rings to build up the structure to an appropriate height. The invented system does not require adjustment of various portions of a form relative to each other or adjustment of a form downward by screwing or sliding all or part of the form down relative to the cone or another part of the form. Rather, the invention uses the pavement surface as the reference to accurately create a form wall, by removing part of the form by trimming the top material of the form, in order to custom fit the form to the particular site for a single monolithic concrete collar pour.

Although this invention has been described above with reference to particular means, materials and embodiments, it is to be understood that the invention is not limited to these disclosed particulars, but extends instead to all equivalents within the scope of the following claims.

CLAIMS

I claim:

- 1 1. A manhole collar construction apparatus comprising:
2 a form for placement on a manhole cone in a manhole excavation, the form having a
3 from wall with a bottom end, a top edge, and an interior space;
4 a trimming assembly having an upper portion for placement on a pavement surface
5 around the manhole excavation and having a lower portion comprising a trimming tool
6 extending down between the top edge and bottom end of the form wall and having a cutting
7 member near the form wall, the cutting member being adapted to contact the form wall and
8 cut the form wall to remove a portion of the top end from the form to create a trimmed top
9 edge of the form.
- 1 2. A manhole collar construction apparatus as in Claim 1, wherein the form has a flange
2 extending generally perpendicularly from the form wall at the bottom end of the form for
3 attachment to the manhole cone.
- 1 3. A manhole collar construction apparatus as in Claim 2, wherein the form wall
2 includes
3 reinforcing protrusions.
- 1 4. A manhole collar construction apparatus as in Claim 1, wherein the trimming
2 assembly upper portion has a plane parallel to the pavement surface, the trimming assembly
3 lower portion has an axis, and the trimming tool is rotatably connected to the trimming
4 assembly and adapted to rotate on the axis in a plane generally parallel to the plane of the
5 upper portion.
- 1 5. A manhole collar construction apparatus as in Claim 4, wherein the lower portion
2 comprises means for raising and lowering the trimming tool within the form interior space.
- 1 6. A manhole collar construction apparatus as in Claim 5, wherein the means for raising

1 and lowering the trimming tool comprises a threaded shaft on which the trimming tool is
2 rotatably mounted.

1 7. A manhole collar construction apparatus as in Claim 1, further comprising a manhole
2 ring resting on the trimmed top edge of the form, and wherein the apparatus comprises no
3 grade rings.

1 8. A method of forming a manhole collar, the method comprising:
2 placing a form on a manhole cone, the form having a bottom end resting on the
3 manhole cone, a top edge extending up toward a plane of a pavement surface, an exterior
4 surface and an interior surface;
5 positioning a trimming assembly over the form and using the trimming assembly to
6 trim the top edge of the form by removing a portion of the form;
7 placing a manhole ring atop said form after trimming of the form top end, the manhole
8 ring having an exterior surface; and
9 pouring concrete around the exterior surfaces of said form and said manhole ring.

1 9. A method as in Claim 8, wherein the trimming assembly comprises an upper portion
2 and a lower portion and the lower portion comprises a trimming tool, wherein the method
3 further comprises measuring a height of a manhole ring, and the step of positioning the
4 trimming assembly over the concrete form comprises placing the upper portion of the
5 assembly on the pavement surface and adjusting the trimming tool to be located at a distance
6 below the pavement surface equal to the height of the manhole ring.

1 10. A method as in Claim 8 further comprising attaching the bottom end of the form to the
2 manhole cone.

1 11. A method as in Claim 9 wherein positioning the trimming assembly comprises placing
2 the trimming tool inside a interior space of the concrete form and using the trimming
3 assembly to trim the top end of the concrete form comprises rotating the trimming tool around
4 in a generally horizontal plane inside the interior space to contact the form and cut the form.

1 12. A method as in Claim 9 which does not comprise placing any concrete grade rings
2 around the exterior surface of the form.

1 13. A method for raising a manhole ring to a desired elevation relative to a pavement
2 surface around a manhole excavation, the method comprising the steps of:

3 providing a tubular form having an outer surface, an upper edge, a lower end, and a
4 height between the upper edge and lower end;

5 placing said tubular form lower end upon an upper surface of a concrete manhole cone
6 in an excavation, so that the tubular form extends a height above the cone and is generally
7 coaxial with the cone;

8 trimming the tubular form with a trimming tool, after said tubular form is on the
9 manhole cone, by cutting the form near the upper edge and removing a portion of the form to
10 produce a tubular form trimmed top edge parallel to and below a pavement surface around the
11 excavation;

12 placing a manhole ring, having a lower flange, an upper surface, and an outer surface,
13 atop said tubular form so that the manhole lower flange rests on and is supported by the
14 trimmed top edge of the tubular form; and

15 pouring concrete around the outer surfaces of said tubular form and manhole ring.

1 14. The method of Claim 13, wherein the tubular form has an interior space, and the
2 process further comprises adjusting the trimming tool to a desired distance below the
3 pavement surface, and wherein the trimming step comprises moving the trimming tool in the
4 interior space in a plane parallel to the pavement surface to cut the form.

1 15. The method of Claim 13, wherein the tubular form has an interior space, and the
2 process further comprises adjusting the trimming tool to a desired elevation below the
3 pavement surface, and wherein the trimming step comprises rotating the trimming tool in the
4 interior space around an axis generally perpendicular to the pavement surface to cut the form.

1 16. The process of Claim 13, wherein the manhole ring has a height between the upper
2 surface and the lower flange, wherein the process further comprises moving the trimming tool
3 to a distance below a pavement surface equal to the height of the manhole ring, and wherein
4 trimming the tubular form comprises producing the trimmed top edge of the form parallel to
5 the pavement surface and below the pavement surface a distance equal to the height of the
6 manhole ring.

1 17. The method of Claim 13, wherein no concrete grade rings are placed in the excavation
2 around the outside surfaces of the manhole ring and the tubular form.

1 18. The method of Claim 13, wherein the trimming tool is a grinder.

1 19. The method of Claim 1, wherein the trimming tool is a saw.

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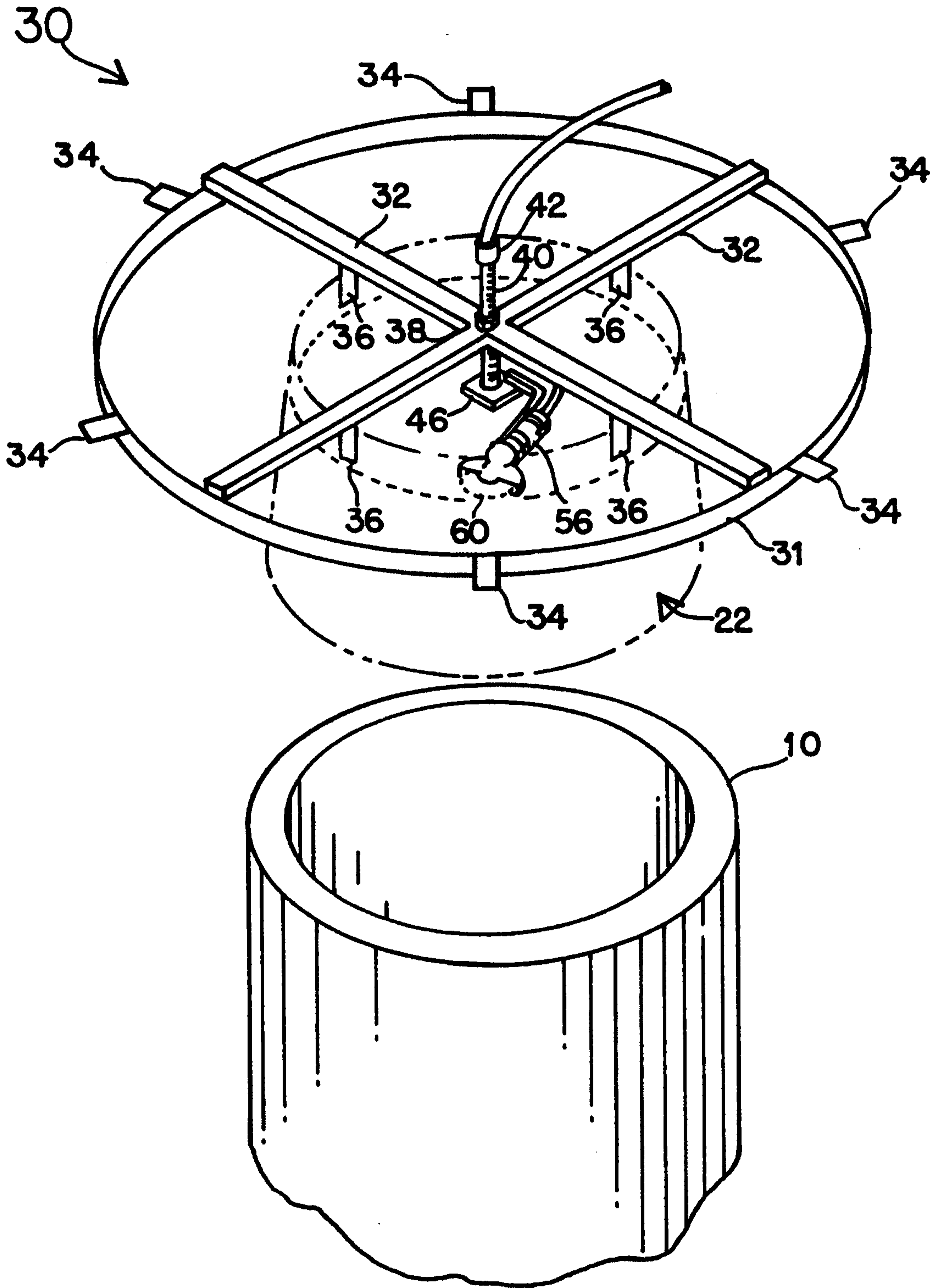
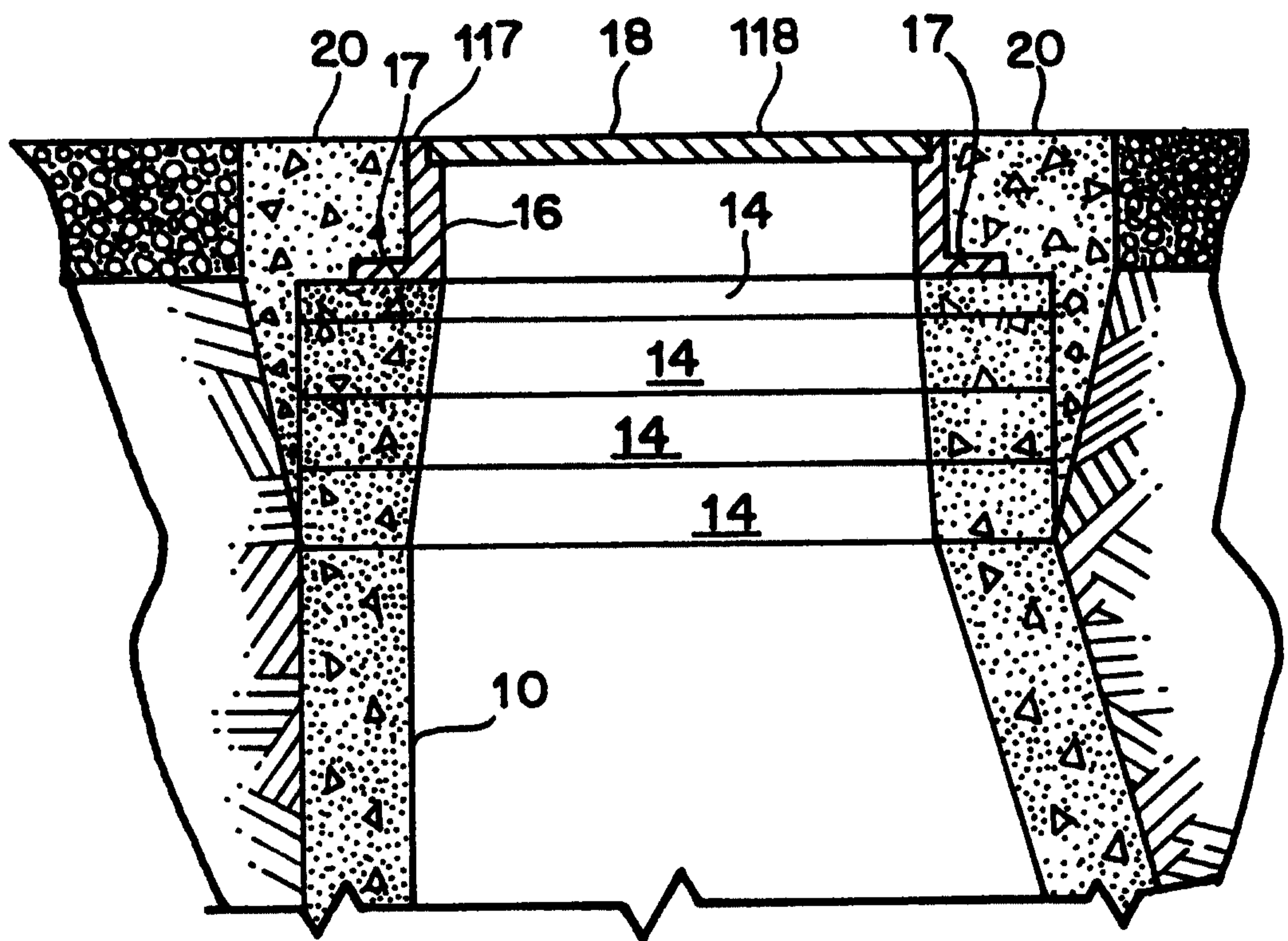


FIG. 1

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PRIOR ART
FIG. 2

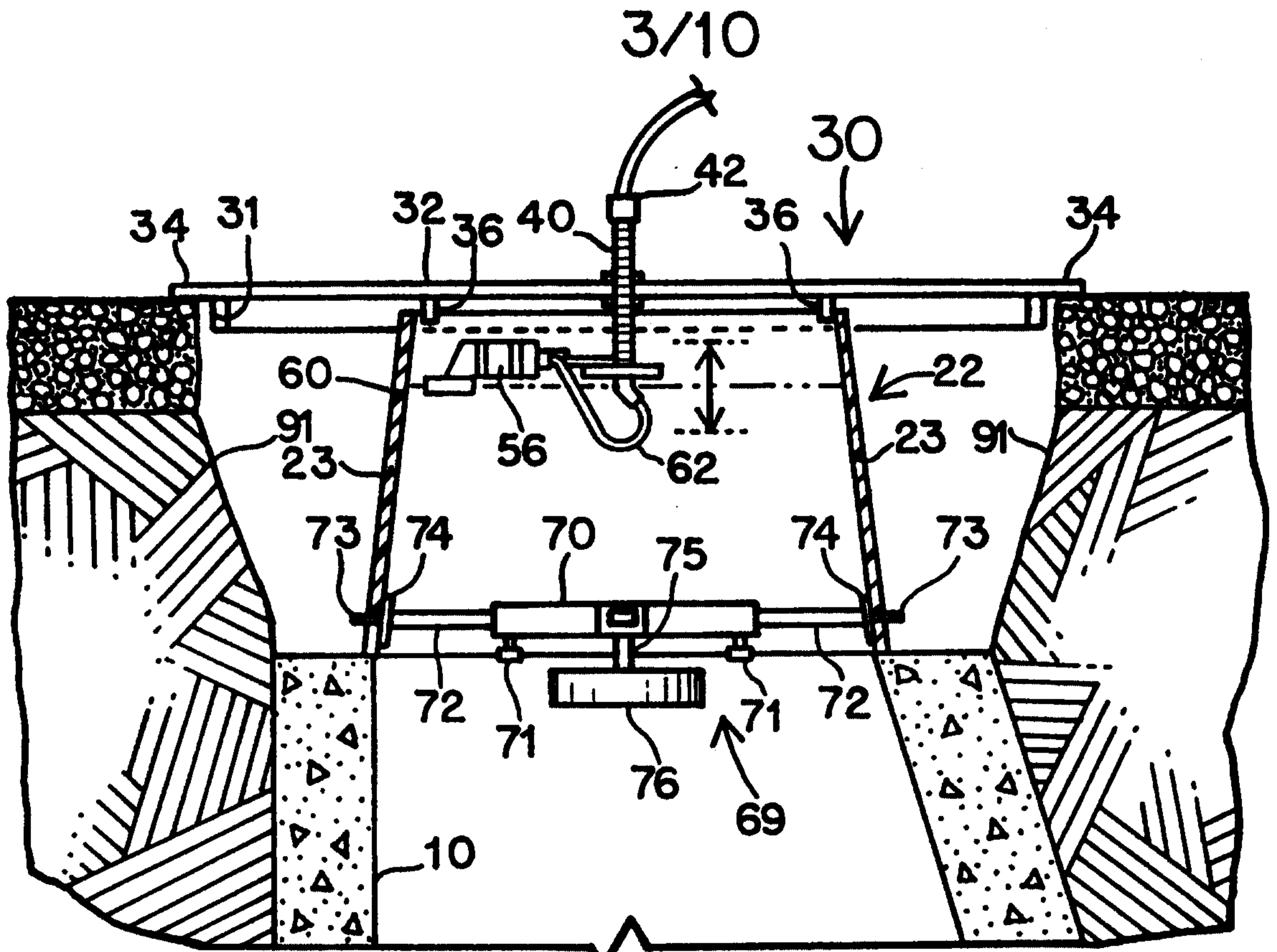


FIG. 3

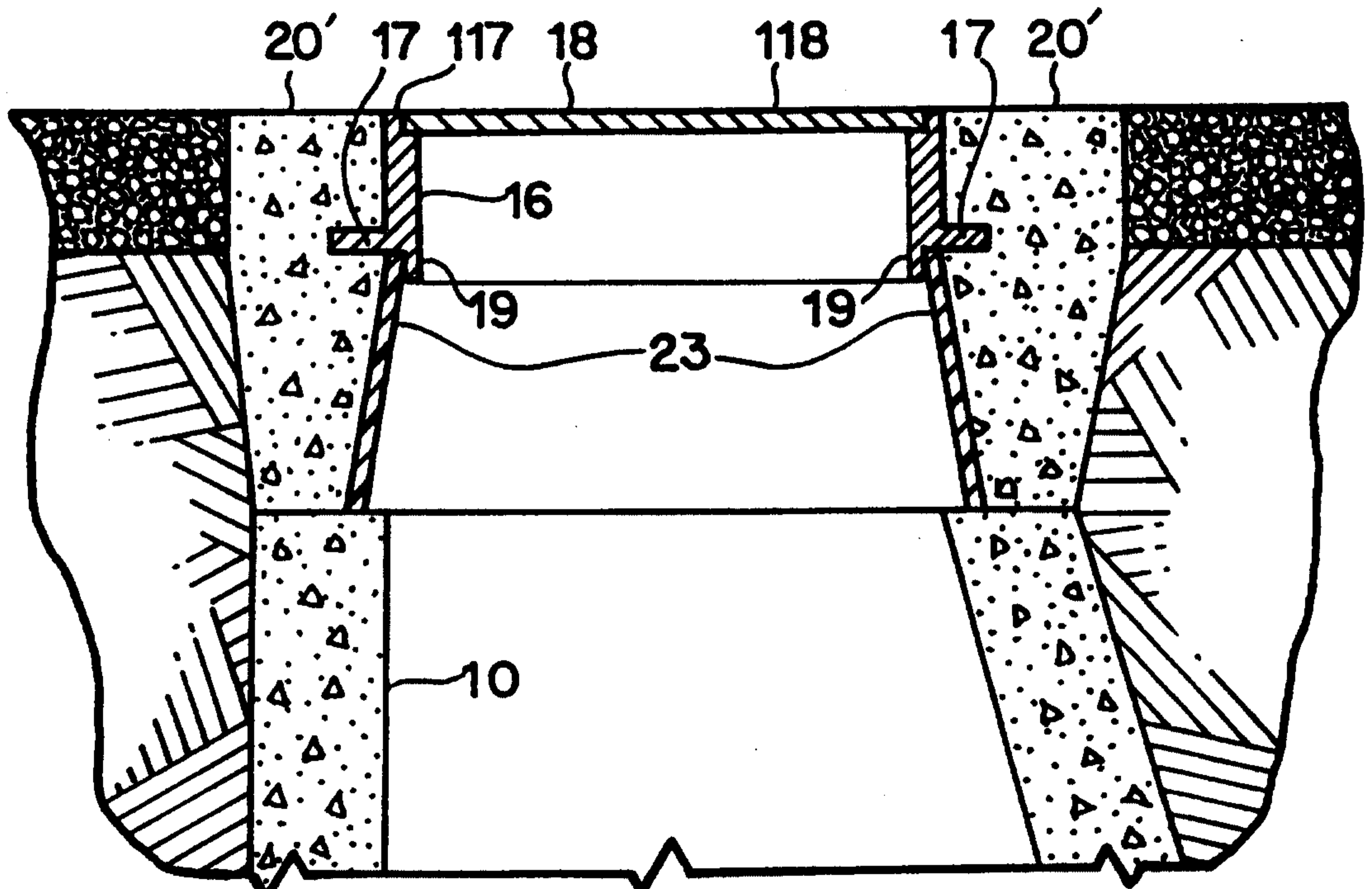


FIG. 4

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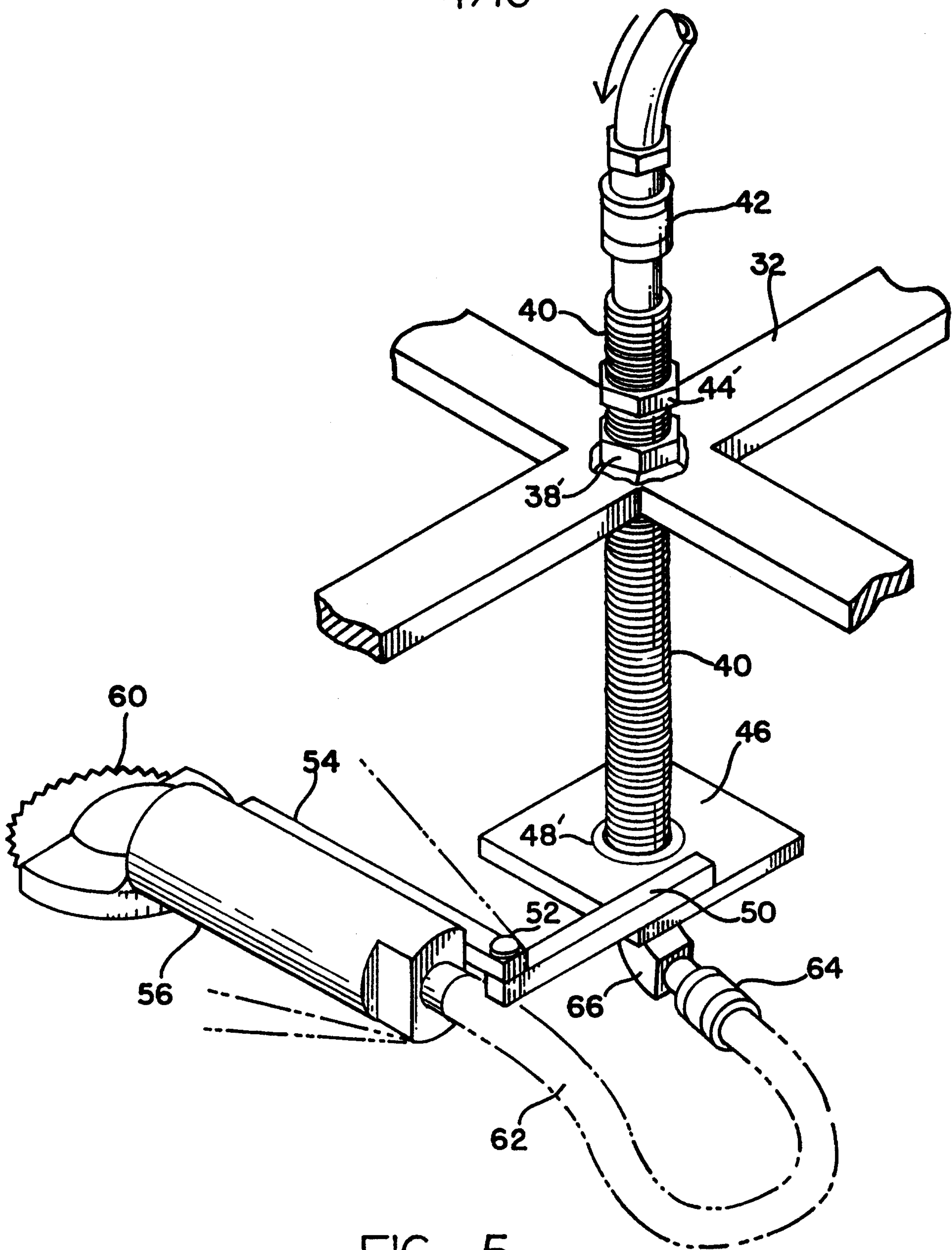


FIG. 5

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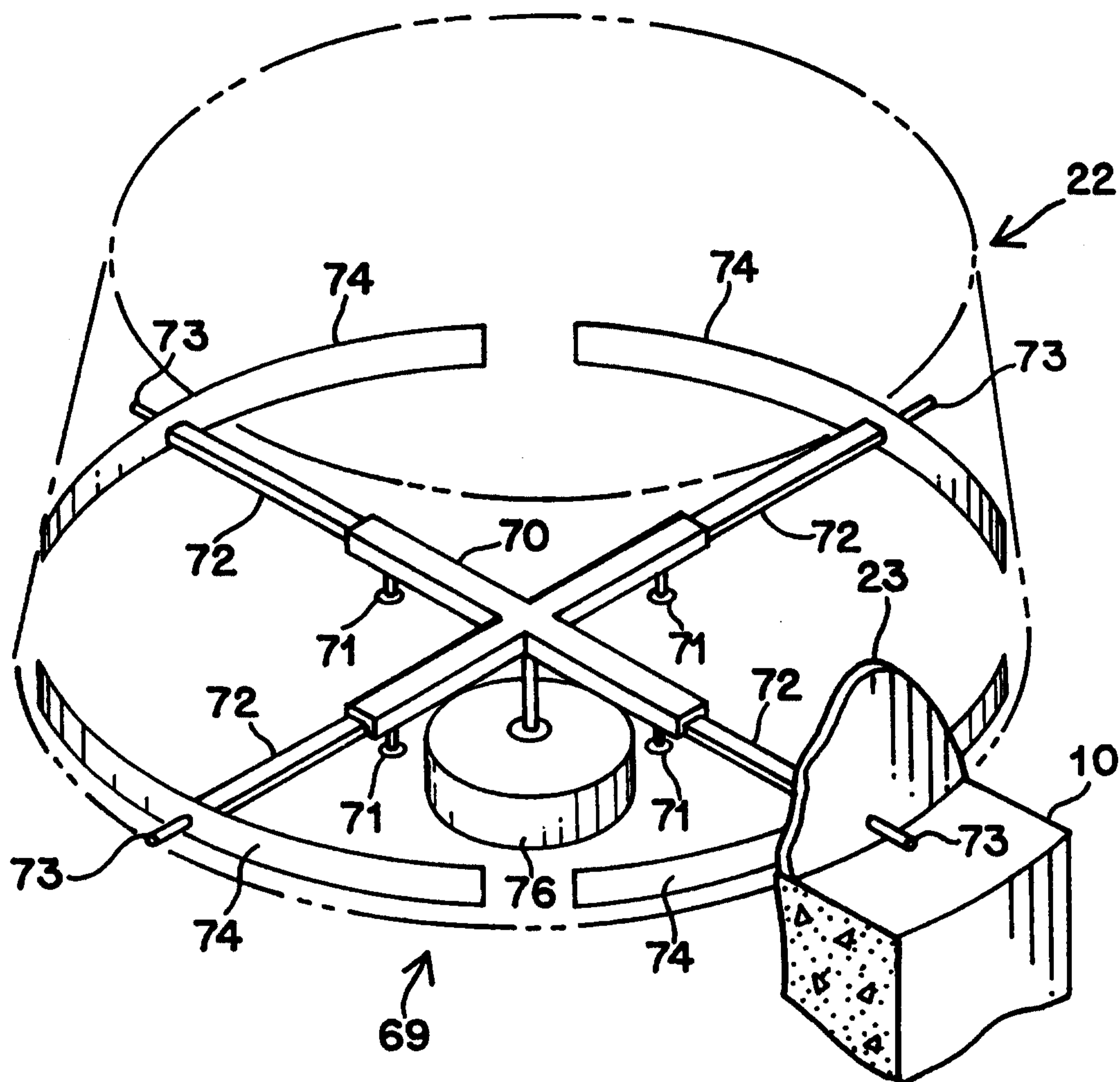


FIG. 6

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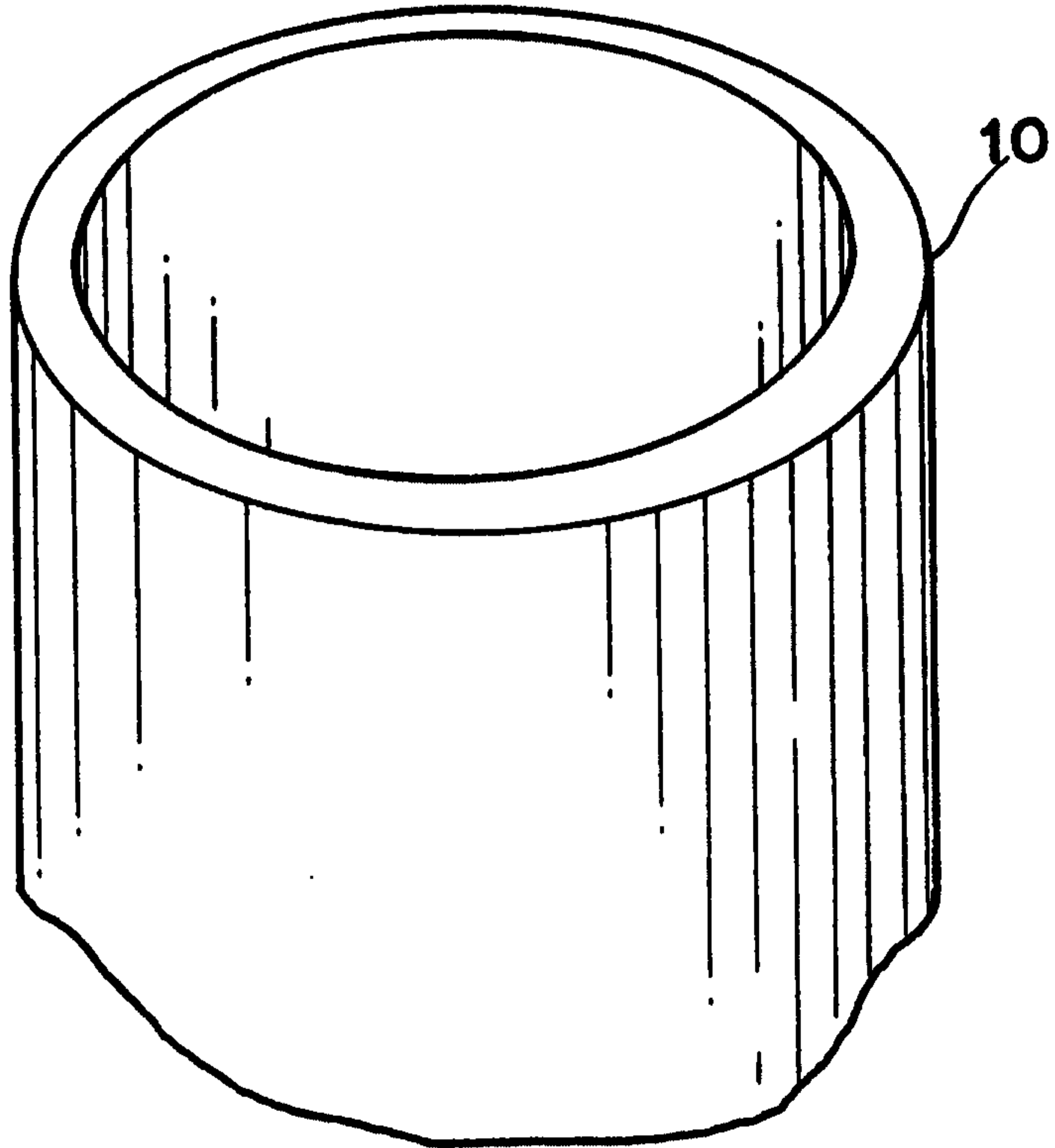
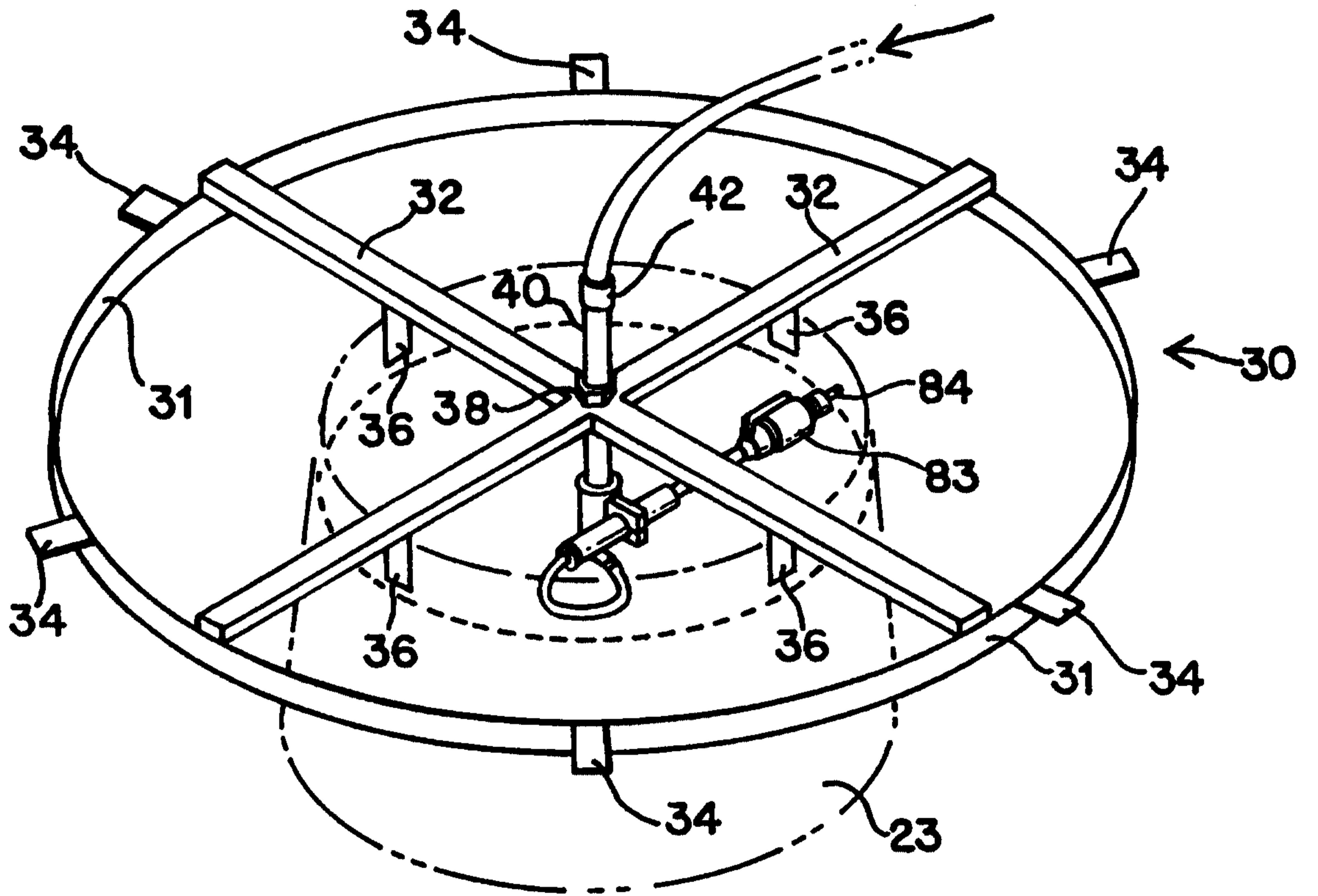


FIG. 7

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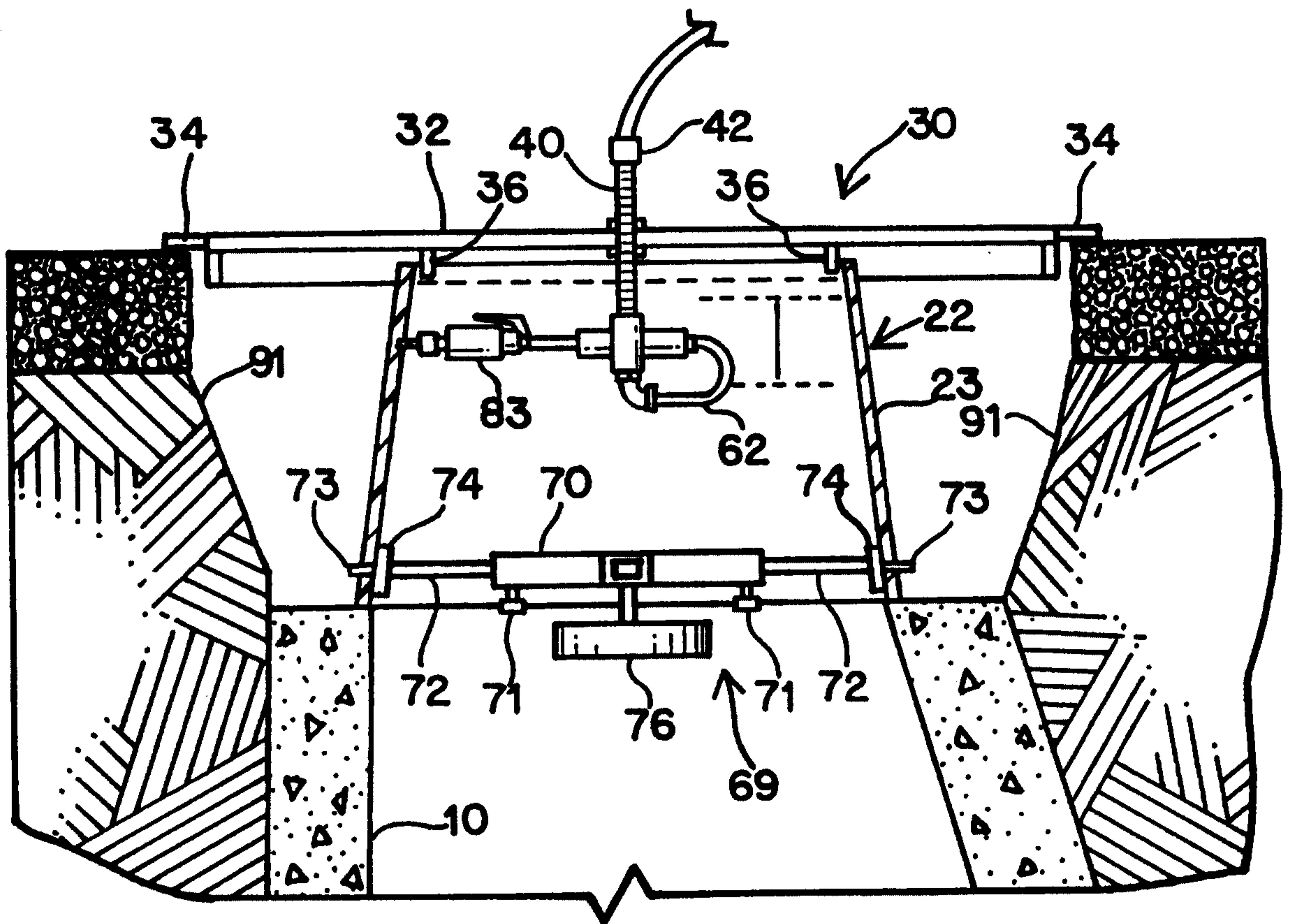


FIG. 8

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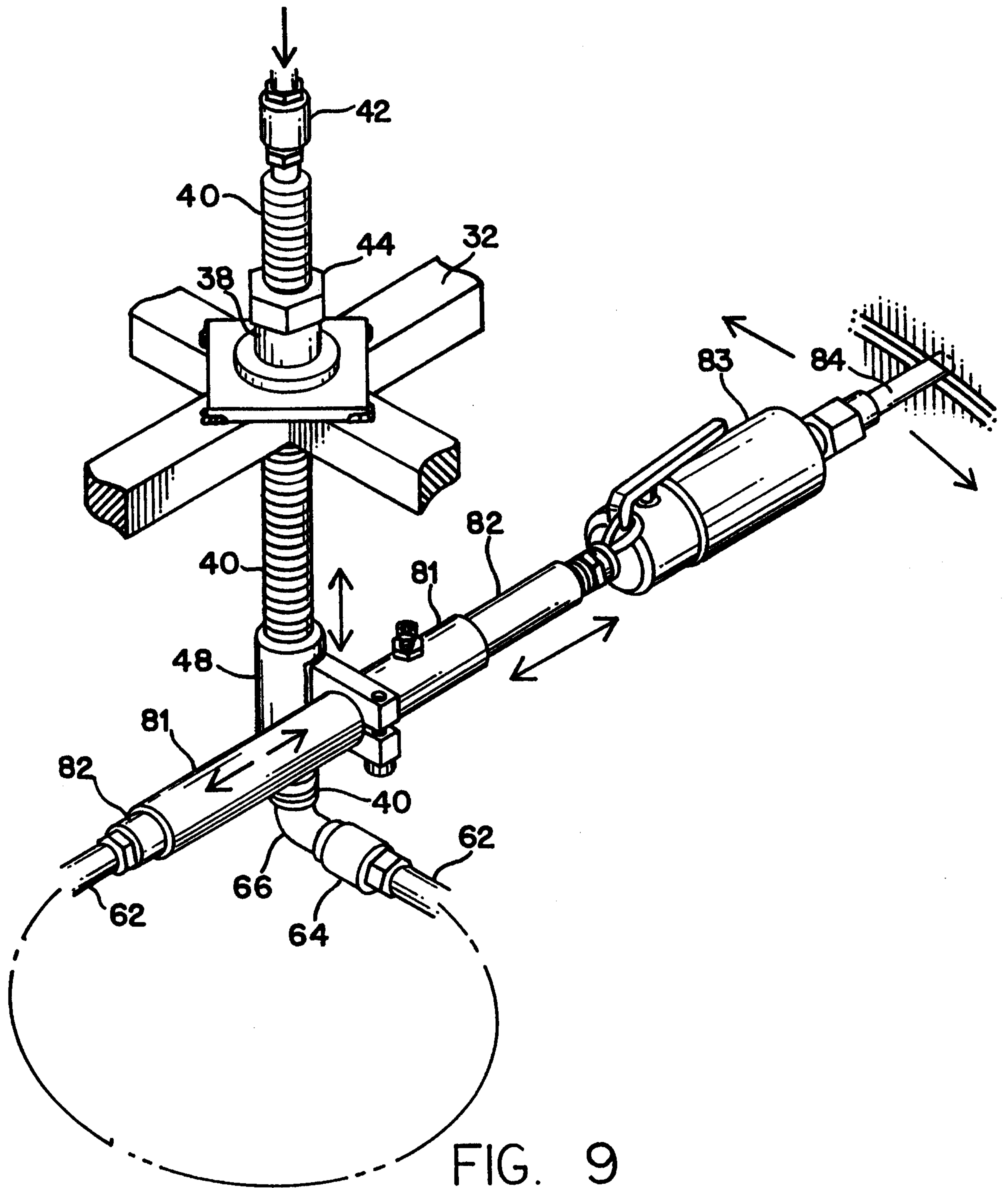


FIG. 9

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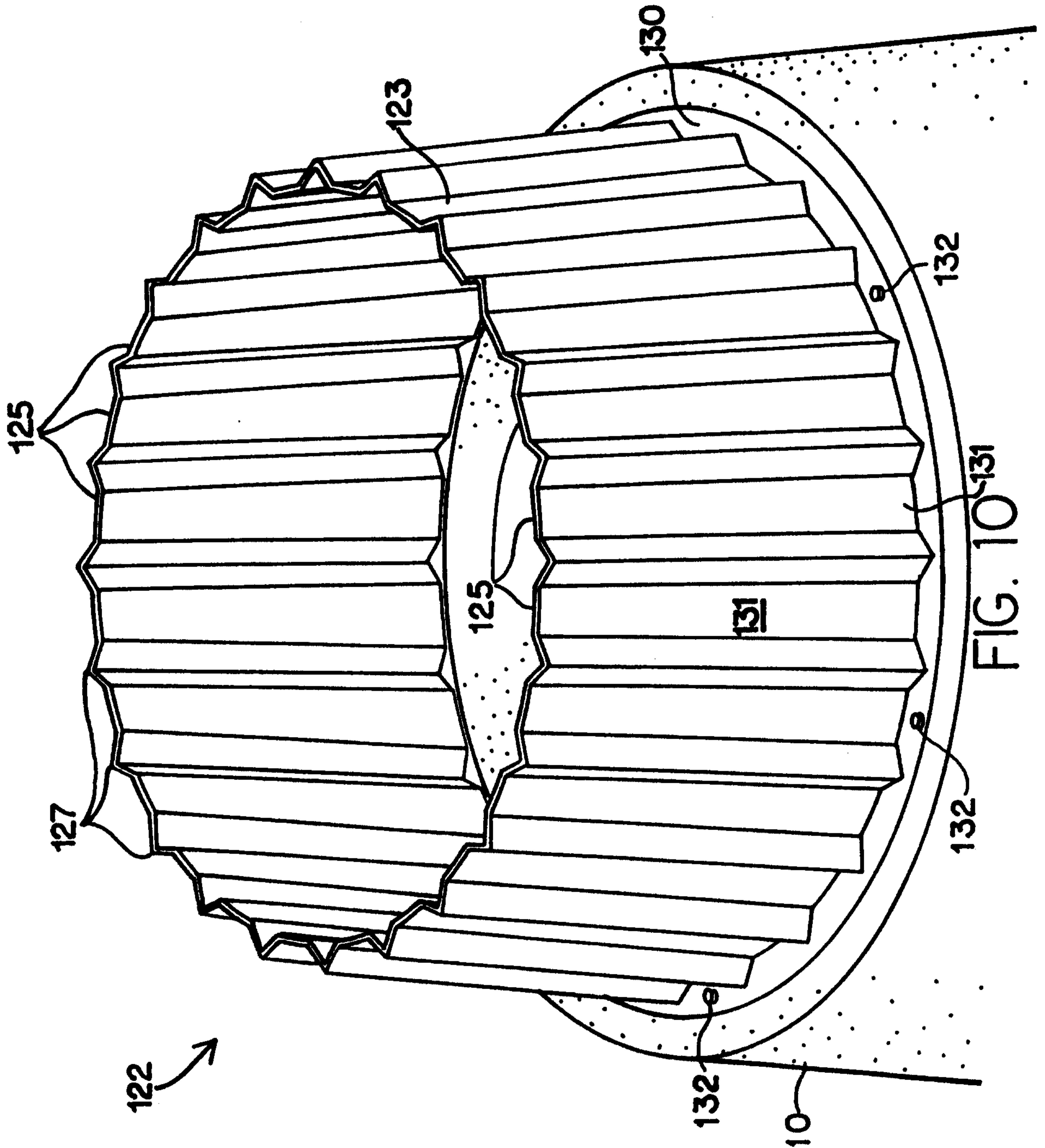


FIG. 10

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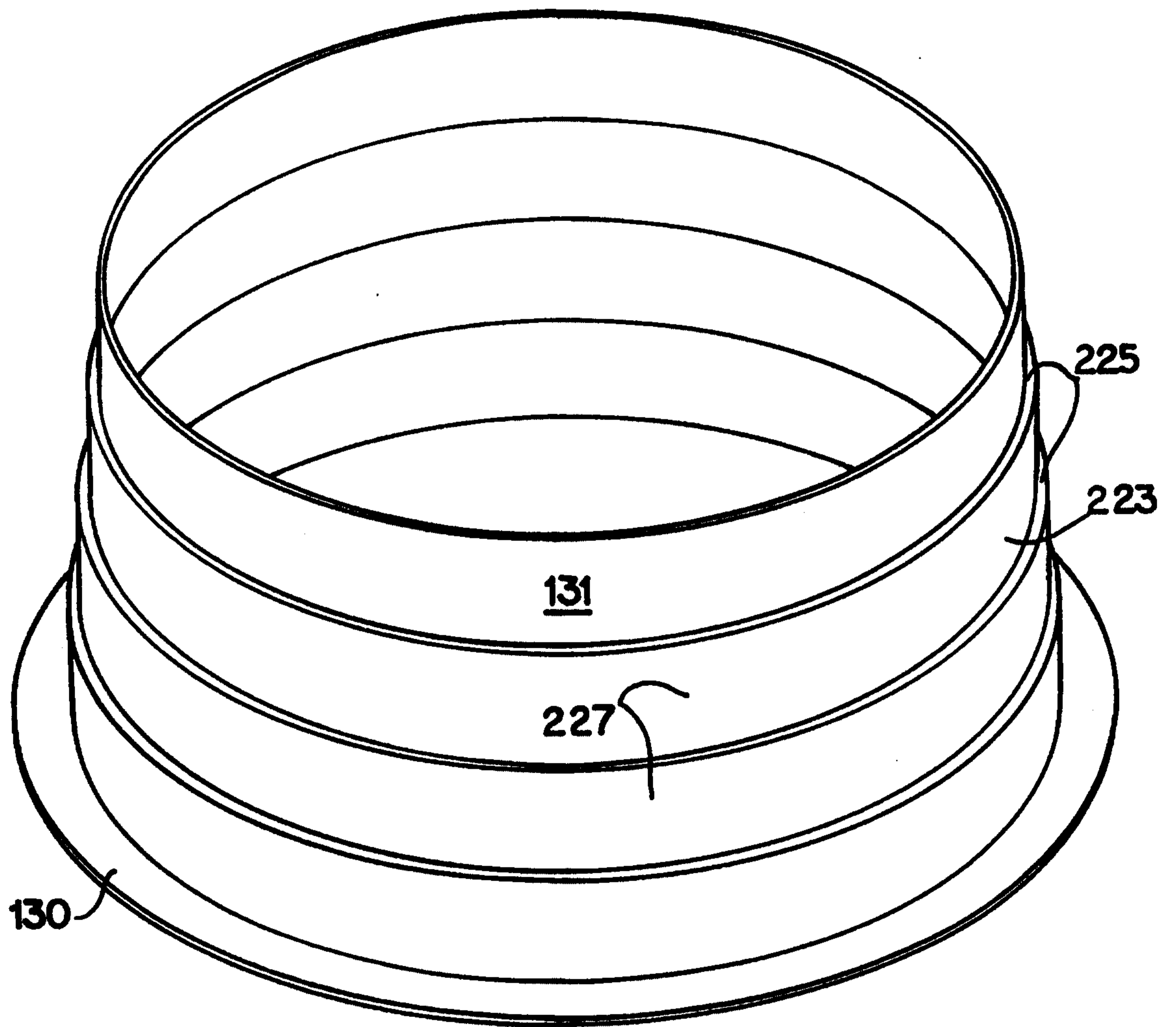


FIG. 11

