United States Patent [19]

Trimble

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[45] **Apr. 24, 1973**

[54] **FORM FOR MANHOLES AND THE LIKE**

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[52] **U.S. Cl.** **249/144,** 249/1, 249/184, 425/DIG. 126

[51] **Int. Cl.**.....**B22c 9/24**

[58] **Field of Search**.....249/144, 142, 160, 249/163, 165, 168, 169, 119, 122, 125, 126, 11, 12, 173, 1, 184; 25/124, 130 A, DIG. 26

[56] **References Cited**

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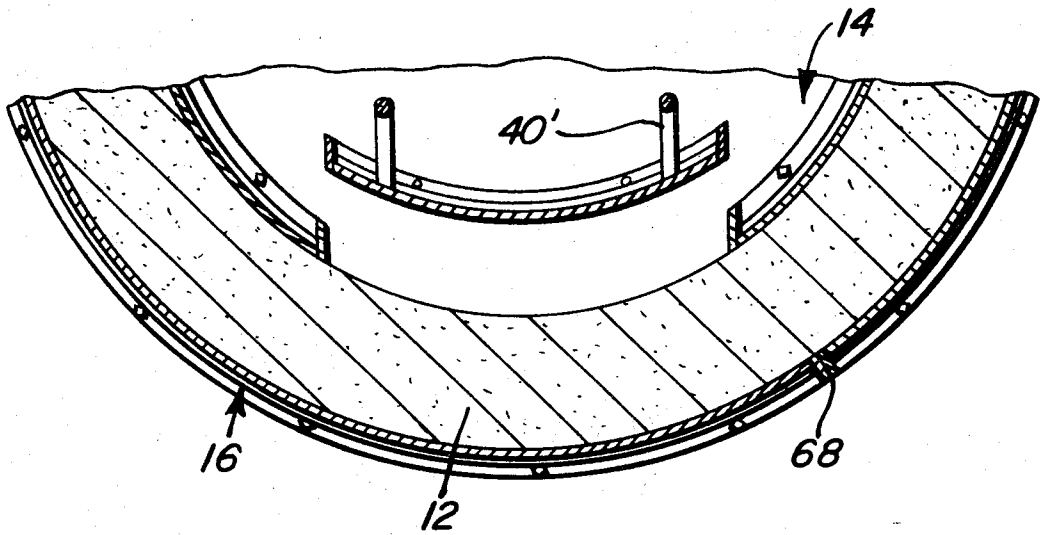
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[57] **ABSTRACT**

A steel sectional form including inner and outer shells, each formed of components which can be readily assembled for reception of a concrete pour and subsequently disassembled for reuse. The inner shell, which is to be removed through the formed manhole, incorporates key panels for facilitating its disassembly and step gates for enabling the mounting of internal steps as desired subsequent to an initial setting of the concrete.

3 Claims, 9 Drawing Figures



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3 Sheets-Sheet 1

FIG. 1

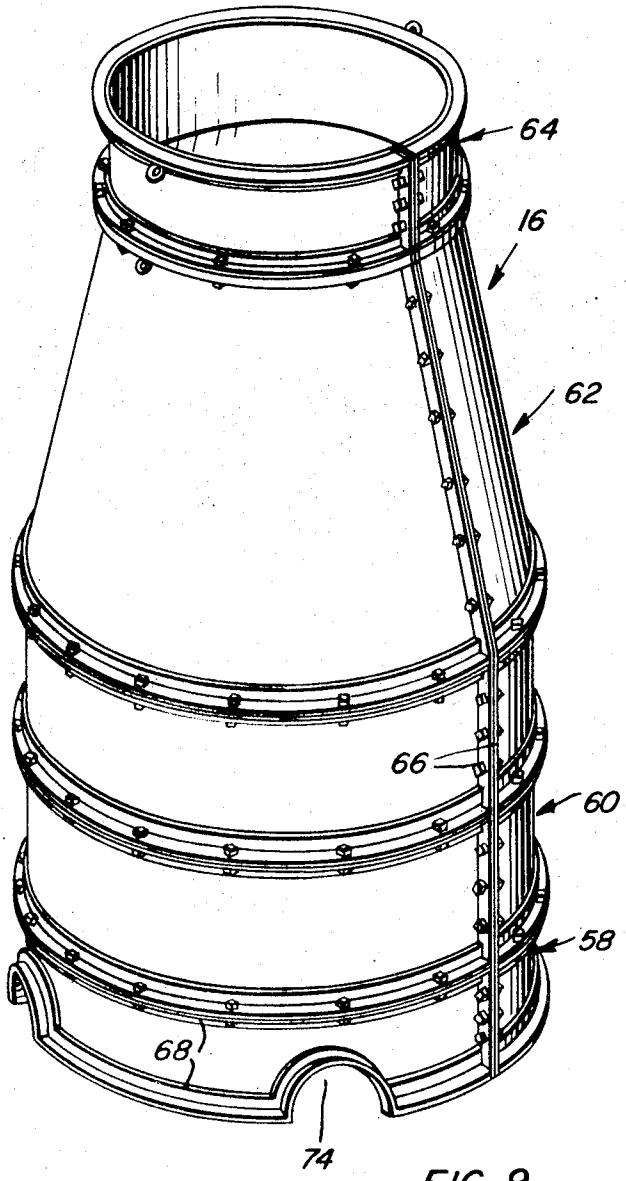


FIG. 2

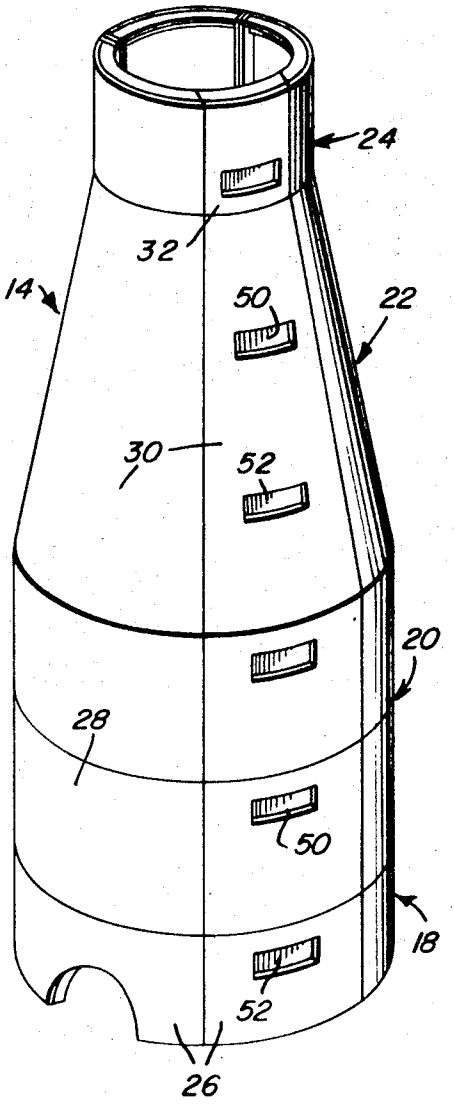
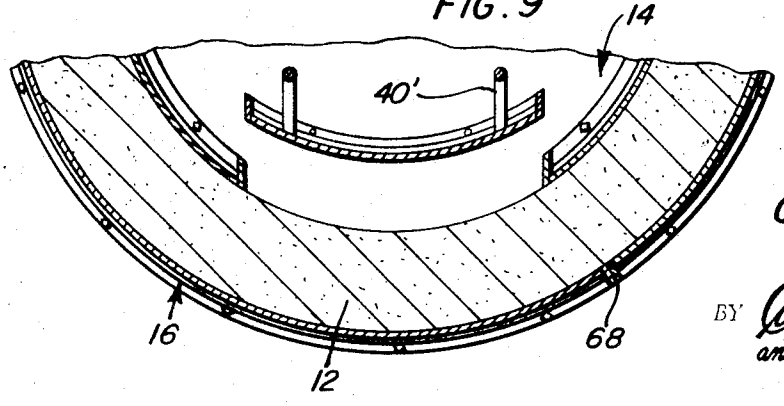


FIG. 9



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FIG. 3

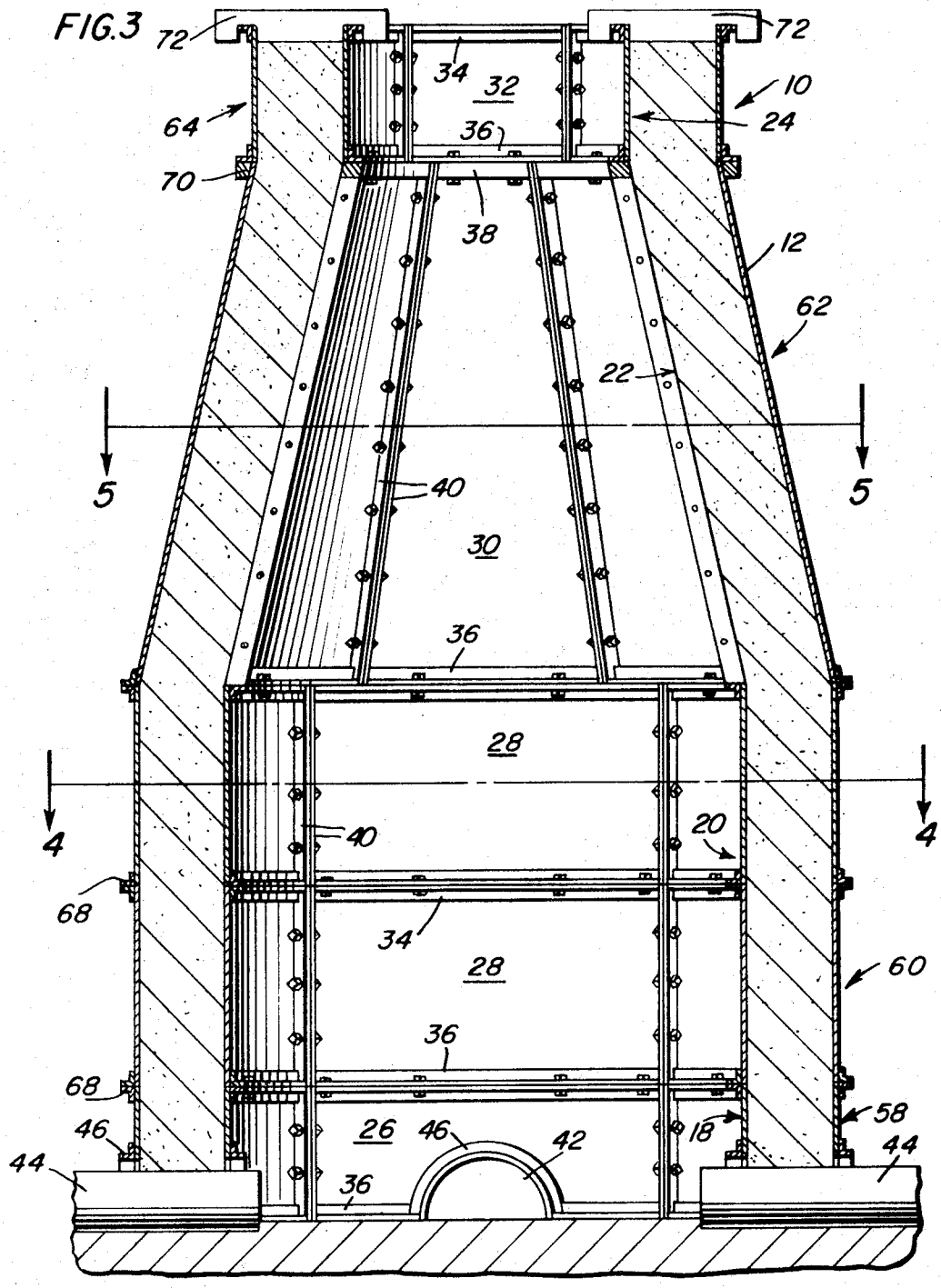
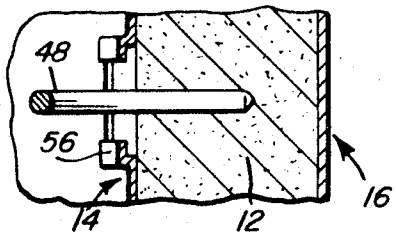


FIG. 8



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FIG. 4

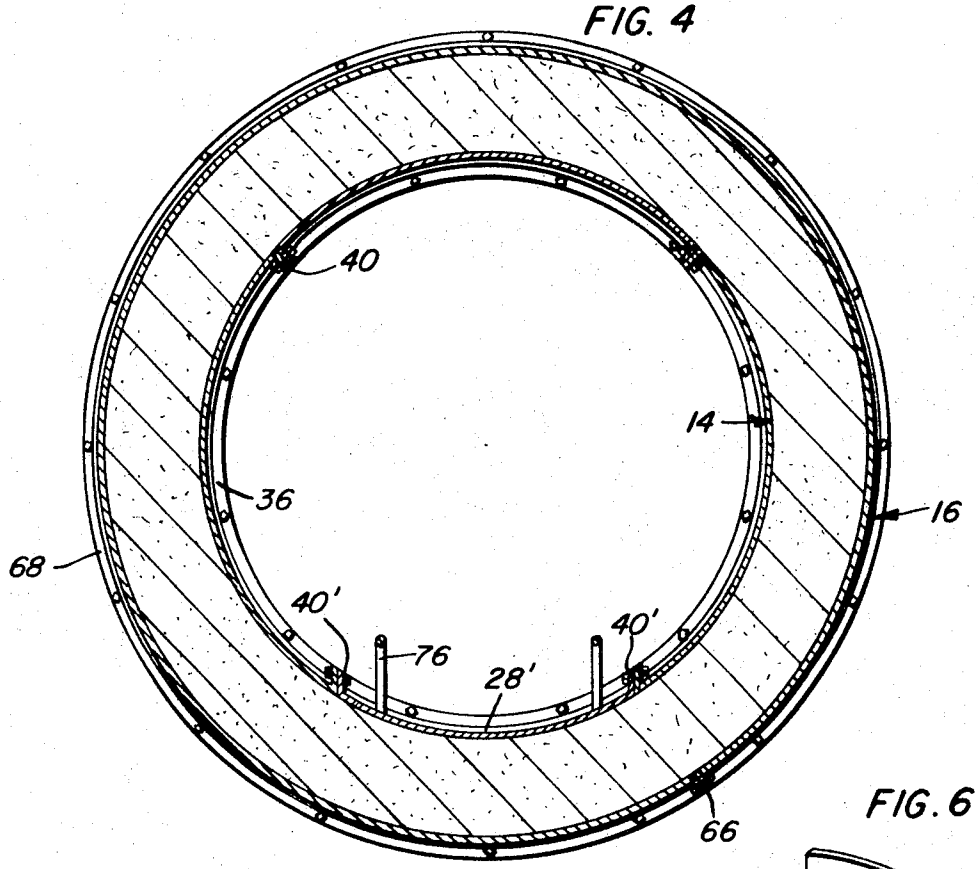


FIG. 6

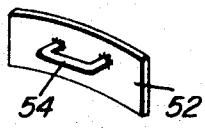


FIG. 5

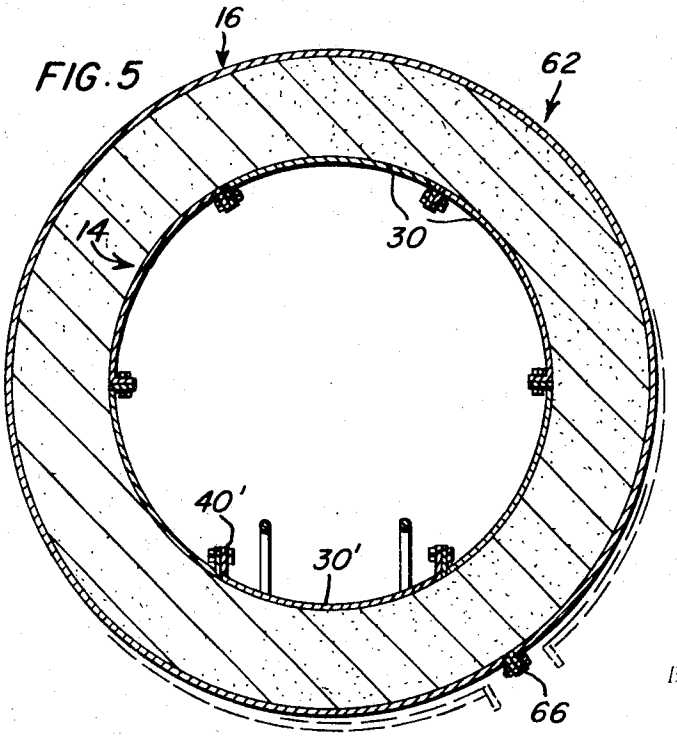
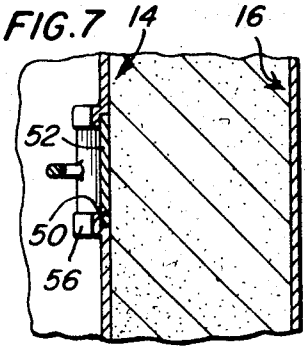


FIG. 7



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FORM FOR MANHOLES AND THE LIKE

The present invention generally relates to equipment for the forming of concrete structures and, while adaptable for use in the formation of sewage pump stations, storm cellars, and the like, is primarily intended for use in the forming of manholes.

It is an intention of the instant invention to provide a form which allows for a rapid in situ forming of a homogeneous poured concrete manhole direct at and about the communicating sewer lines. In conjunction therewith, a sectional form is utilized which is both readily assembled and disassembled directly at the site and which utilizes components so constructed whereby variations in the size of the structure being formed can be conveniently effected.

The assembly and disassembly of the form, and in particular the inner shell which must be internally dismantled and removed through the formed manhole, is facilitated by the utilization of key panels which have the opposed vertical edges thereof so defined as to greatly simplify the insertion and removal thereof. In addition, all of the individual components are reinforced completely about the peripheries thereof and adapted for edge bolted or clamped connection to the adjoining components in providing a structurally stable form for the reception of the poured concrete.

The instant invention also provides for the mounting of internal steps within the completed manhole through a unique arrangement of gate closed openings which enable a positioning of the steps subsequent to an initial setting of the concrete.

These together with other objects and advantages which will become subsequently apparent residue in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of the outer shell;

FIG. 2 is a perspective view of the inner shell;

FIG. 3 is an enlarged vertical cross-sectional view through the assembled and positioned form;

FIG. 4 is a cross-sectional view taken substantially on a plane passing along lines 4—4 in FIG. 3;

FIG. 5 is a cross-sectional view taken substantially on a plane passing along line 5—5 in FIG. 3;

FIG. 6 is a perspective view of the step gate;

FIG. 7 is a cross-sectional detail illustrating the step gate in position during a concrete pour;

FIG. 8 is a cross-sectional detail illustrating the gate removed and a step inserted; and

FIG. 9 is a cross-sectional detail illustrating the manner in which the key panel assembles and disassembles.

Referring now more specifically to the drawings, reference numeral **10** is used to generally designate the form comprising the instant invention, with the poured concrete structure formed thereby being designated by reference numeral **12**. The form **10**, when assembled, includes an inner shell **14** and an outer shell **16**.

The inner shell **14** is formed in four primary sections, the base section **18**, the middle or filler section **20**, the cone section **22**, and the top or extension section **24**.

Each of the sections is formed of a plurality of arcuate components which combine to define a generally cylindrical closure. The components of the base section

18 are designated by reference numeral **26**. The components of the middle or filler section **20** are designated by the reference numeral **28**; the cone section components by reference numeral **30**, and the extension or top section components by reference numeral **32**. The section components are similar in that each is peripherally reinforced completely thereabout. This peripheral reinforcing consists of top and bottom full length angle members **34** and **36** welded to the base, middle and top components, each being oriented so as to provide a horizontally directed flange for seated engagement against similar flanges on the vertically adjacent components. The cone components **30** include a welded angle member **36** along the lower edge thereof. However, the upper edge, rather than being provided with an angle member such as **34**, is reinforced by a rectangular bar **38** welded thereto and likewise providing a flat upper bearing surface. The opposed vertical edges of each of the components are reinforced, along the full length thereof, by inwardly projecting flat bars **40** welded therealong and combining with the upper and lower reinforcing members to provide the aforementioned reinforcement completely about the periphery of the individual components. The vertical reinforcing members **40**, as well as all of the horizontal reinforcing members other than the top member **34** of the extension section **24** and the bottom member **36** of the base section **26**, are provided with circumferentially spaced bolt holes therethrough for the reception of clamping bolts in locking the adjacent components to each other when assembling the form **10**. Alternatively, appropriate clamping members other than bolt and nuts can be used if so desired.

As will be appreciated from the drawings, all of the components other than the cone components **30** are of a substantially rectangular configuration arcuately formed so as to combine with similar components in providing the desired cylindrical shape. The cone components **30**, due to the truncated configuration to be formed thereby, are each in the nature of a truncated triangle with the opposed vertical edges thereof converging upwardly. The upper and lower dimensions of the cone section **22** and the components **30** thereof is of course determined by the size of the top and filler sections **24** and **20** with the cone section **22** forming a smooth transition area therebetween. With regard to the filler section **20**, it will be noted that this section, in the illustrated form **10**, includes two tiers. The number of tiers provided will depend on the height desired for the finished manhole and can vary as required. The basic modular construction of the form enables a ready insertion or removal of one or more complete tiers.

Each of the sections **18**, **22** and **24**, as well as all of the tiers in the middle section **20** include, as one of the panels or components, a key panel designated in the drawings by a priming of the associated panel reference numeral. For example, the panel in the cone section is designated by reference numeral **30'** with the key panel in the filler or middle section being indicated by reference numeral **28'**.

Referring to FIGS. **4**, **5** and **9** in particular, it will be appreciated that while the basic panels which comprise the individual section have the vertical edge flanges **40** thereof radially orientated relative to the cylindrical form of the shell, the edge flanges **40'** of the associated

key panels are orientated parallel to each other and to a center line which bisects the corresponding key panel. As previously indicated, one such key panel is associated with each section or section tier. Further, in order to properly accommodate the key panel, the adjacent edge flange of each of the two adjoining panels for each key panel is also orientated parallel to the aforedescribed center line so as to accommodate the key panel edge flanges **40'** flush thereagainst. This provision of parallel cooperating edge flanges both directly on the key panel and on the adjacent edges of the adjoining panels enables a simplified mounting of the key panel subsequent to a positioning of the remaining associated panels, and by the same token, allows a proper internal disassembly of each of the sections through a simple initial inward sliding of the key panel subsequent to a removal of the fixing bolts or clamps. FIG. **9** is of interest in illustrating the key panel outwardly shifted from its installed position.

For ease of assembly, it is contemplated that the key panel **28'** of the cone section **22** follow an arc of approximately 60° with the cone being completed with three additional panels **28**, each following an arc of approximately 100°. The key panels associated with the remaining sections are also to follow an arc of 60° with the completion of each section utilizing five additional panels each also following an arc of **60** degrees to define the desired cylindrical form.

As noted in FIGS. **2** and **3**, the base section **18** is to include, within appropriate ones of the panels **26**, arcuate downwardly directed recesses **42** which span and accommodate the pipelines **44** over which the manhole is to be constructed. These recesses **42** are edge reinforced by appropriately formed angle members **46** welded to the panel **26** thereabout.

The completed manhole is to be provided with a series of vertically spaced steps **48** to allow access to the interior thereof. In order to provide for the mounting of the steps **48** without requiring an elaborate modification of the basic form work for the accommodation of the steps during the pour and setting of the concrete, at least one panel in each section or tier, including base section **18** is provided with a horizontally elongated opening **50** therein which is temporarily closed by an overlying gate **52** arcuately curved so as to follow the curvature of the corresponding panel. This gate **52**, incorporating a manipulating inwardly projecting handle **54** thereon, is slidably retained by upper and lower edge retaining offset edges or rail portions **56** which can either be directly formed from the panel as illustrated or provided by welding short angle irons to the inner face of the panel both above and below the opening **50**. It is contemplated that each gate **52** be slightly longer than the corresponding opening **50** whereby the opposed ends of the gate **52** will bear on the inner face of the panel to the opposite ends of the opening **50** and thus cooperate with the rails **56** in retaining the gate **50** in a manner whereby the opening **50** is sealed during the pouring operation. Once the pour has sufficiently hardened or obtained an initial set, the gates **52** are slid laterally to expose the pour through the opening **50** and the individual steps **48** merely forced into the slightly yieldable concrete. The concrete, at this stage, while accommodating the inward forcing of the step or rung-like member, possessing sufficient rigidity so as to maintain the step in position during the completion of the setting without further supports being required.

As will be appreciated, the sections and tiers can be circumferentially shifted relative to each other so as to, if so desired, stagger the steps. Any circumferential shifting of the sections, if bolted connections are used, will of course be limited by the spacing of the bolt holes. Further, in order to facilitate an assembly of the panels of the sections, it is contemplated that the panels for each section be sequentially numbered.

Referring now specifically to the outer shell **16**, it will be noted that this shell **16** is formed of an equal number of sections and tiers as the inner shell **14** so as to directly cooperate therewith. For example, the illustrated outer shell includes a base section **58**, a two tier middle or filler section **60**, a cone section **62** and a top or extension section **64**.

The outer shell **16** is of equal height with the inner shell **14** and of the same configuration, differing therefrom only in a greater circumference so as to, when positioned about the inner shell **14**, define an internal space therebetween completely thereabout for reception of the pour **12**.

Each section and tier of the outer shell **16** is preferably of one piece in a basically cylindrical configuration, the cone section of course being more in the nature of a truncated conical member as illustrated. The opposed ends of each section and tier are reinforced by vertical bars or plates **66** welded along the full height thereof, these bars **66** having bolt holes therein for the accommodation of bolts utilized to interlock the two ends of each section in the assembled cylindrical position of the outer shell **16**. In addition, the remainder of the periphery of each section and tier is reinforced by the welding thereto of full length angle members **68**, each oriented with a horizontally projecting flange for a bolting or clamp locking thereof to an adjoining tier or section. Of course the bottom flange of the base section **58** need not incorporate the bolt holes, nor need such holes be provided in the top flange of the top or extension section **64**. The only exception to the use of an angle edge reinforcing member is about the top of the cone section **64** where a rectangular bar **70** is welded to the section edge as will be best appreciated from FIG. **3**. It will of course be appreciated that all of the edge reinforcing angles and bars on the outer shell **16** are outwardly directed so as to provide for a smooth interior for the reception of the pour. By the same token, the previously described edge reinforcing members on the inner shell **14** are of course inwardly directed. The sections and tiers of the outer shell **16** are, as is of the case with the inner shell, preferably constructed of **16** gauge metal or the like, the particular strength of the metal used depending upon the particular size of the structure being formed. The outer sections and tiers, each being formed of one piece, are to be slightly flexible or resilient in nature whereby, upon a sufficient setting of the concrete pour **12** to enable a removal of the form, each section and tier can be unbolted and the ends thereof separated sufficiently so as to free the section or tier from the concrete and enable a vertical removal thereof. The individual panels of the inner shell, initially disassembled by first removing the associated key panels, are removed one at a time through the open upper end of the formed manhole.

In order to maintain the assembled relationship of the inner and outer shells, spacing blocks can be provided between the lower ends thereof peripherally thereabout and the upper ends maintained properly spaced by appropriate spacer bars **72** orientated at circumferentially spaced points about the upper end of the form **10**. Such spacer bars, noted in FIG. **3**, will incorporate a pair of downwardly directed notches longitudinally spaced from each other for the accommodation of the upper edges of the inner and outer shells **14** and **16** at the desired opening.

In assembling the form **10**, depending upon the particular size thereof, the shells can be assembled adjacent the hole and subsequently lowered into position by overhead lift equipment engaged with the shells or lift eyes thereon. Alternatively, the two shells can be assembled directly in the hole. Further, as previously indicated, any number of middle or filler tiers can be utilized. Further, the height of each tier, as well as the height of each section can vary depending upon the particular nature of the finished structure. The top or extension section is particularly desirable when it is necessary to adjust the height of the form to a finished grade line. Thus, by using extension sections of different heights, a basic form can be accommodated to similar installations where the only difference is variations in ground level requiring relatively small height adjustments at the upper end of the form. Incidentally, it will of course be appreciated that the base section **58** of the outer shell **16** also includes edge reinforced downwardly directed pipe accommodating recesses **74**. These recesses can be selectively closed or opened by pipe gates depending on whether or not the particular recess is to be used. Further, inserts can be provided to vary the size of the recesses for the accommodation of pipes of different sizes. Furthermore, while not mentioned supra, in order to facilitate a removal of the key panels, as an initial step to disassembling the inner liner, each key panel is provided with a pair of inwardly projecting handgrips **76** which, upon an unbolting or unclamping of the key panel, can be easily grasped for a straight inward pulling of the key panel.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desirable to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. A form for manholes or the like comprising, when assembled, an inner shell and an outer shell, said inner shell extending to the full height of the structure being formed and including a plurality of vertically stacked sections, each inner shell section comprising a plurality of individual rigid panels edge interlocked to define a generally cylindrical configuration, said panels being selectively releasable from the adjoining panels for removal, said outer shell including a plurality of vertically stacked sections corresponding in number and height to the inner sections, each outer section being formed into a generally cylindrical configuration, the generally cylindrical configuration of each outer shell section being of a greater internal diameter than the corresponding inner shell section and being positioned thereabout in circumferential outwardly spaced relation thereto to define an internal forming area, each inner shell panel including reinforcing members welded thereto completely about the periphery thereof and defining inwardly projecting securing flanges completely about each panel, each outer shell section being formed of a single continuous member peripherally reinforced completely thereabout by reinforcing which defines outwardly projecting peripheral mounting flanges including a pair of vertical end flanges boltable together to form the outer shell section into a cylindrical configuration surrounding the inner shell, both the inner shell and the outer shell including a base section, a middle section and an upper cone section releasably interlocked to each other, the panels of each inner shell section including a key panel for facilitating both a positioning and removal of the panels of the section, said key panel including opposed vertical edges with the edge reinforcing thereon projecting parallel to both each other and a center line which bisects the key panel and the circular configuration defined by the section, the adjacent edge reinforcing on the two panels which adjoin the key panel of the section being similarly orientated so as to abut along the key panel vertical edge reinforcing along the full length thereof whereby a direct inward withdrawal of the key panel can be effected as an initial step in the disassembly of the inner shell section, the vertical edge reinforcing on the remaining panels of each section, as well as the opposed vertical edges of the two adjoining panels, being radially directed relative to the circular configuration defined by the section.

2. A form for manholes or the like comprising, when assembled, an inner shell and an outer shell, said inner shell extending to the full height of the structure being formed and including a plurality of vertically stacked sections, each inner shell section comprising a plurality of individual rigid panels edge interlocked to define a generally cylindrical configuration, said panels being selectively releasable from the adjoining panels for removal, said outer shell including a plurality of vertically stacked sections corresponding in number and height to the inner sections, each outer section being formed into a generally cylindrical configuration, the generally cylindrical configuration of each outer shell section being of a greater internal diameter than the corresponding inner shell section and being positioned thereabout in circumferential outwardly spaced relation thereto to define an internal forming area, each inner shell panel including reinforcing members welded thereto completely about the periphery thereof and defining inwardly projecting securing flanges completely about each panel, each outer shell section being formed of a single continuous member peripherally reinforced completely thereabout by reinforcing which defines outwardly projecting peripheral mounting flanges including a pair of vertical end flanges boltable together to form the outer shell section into a cylindrical configuration surrounding the inner shell, the panels of each inner shell section including a key panel for facilitating both a positioning and removal of the panels of the section, said key panel including opposed vertical edges with the edge reinforcing thereon projecting parallel to both each other and a center line

which bisects the key panel and the circular configuration defined by the section, the adjacent edge reinforcing on the two panels which adjoin the key panel of the section being similarly orientated so as to abut along the key panel vertical edge reinforcing along the full length thereof whereby a direct inward withdrawal of the key panel can be effected as an initial step in the disassembly of the inner shell section, the vertical edge reinforcing on the remaining panels of each section, as well as the opposed vertical edges of the two adjoining panels, being radially directed relative to the circular configuration defined by the section.

3. A form for manholes and the like comprising, when assembled, an inner shell and a surrounding outwardly spaced outer shell, said inner shell including a plurality of vertically stacked sections, each inner shell section comprising a plurality of individual panels edge interlocked to define a generally cylindrical configuration, said panels being selectively disassemblable for removal, said panels including opposed vertical ends with flange-like edge reinforcing along the full length thereof, the panels of each section including a key panel, said key panel including opposed vertical edges with the edge reinforcing thereon projecting parallel to both each other and a center line which bisects the key panel and the circular configuration defined by the section, the adjacent edge reinforcing on the two panels which adjoin the key panel of the section being similarly oriented so as to abut along the key panel vertical edge reinforcing along the full length thereof whereby a direct inward withdrawal of the key panel can be effected as an initial step in the disassembly of the inner shell section, the vertical edge reinforcing on the remaining panels of each section, as well as the opposed vertical edges of the two adjoining panels, being radially directed relative to the circular configuration defined by the section.

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