United States Patent

[11] 3,618,702

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[54] **LADDER SYSTEM FOR INSTALLATION IN MANHOLES**
17 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **182/93,** 182/178, 182/206
[51] **Int. Cl.** **E06c 9/04**
[50] **Field of Search** 182/206, 93, 90, 92, 129, 178; 52/20, 184

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ABSTRACT: An improved ladder system provides individual ladder sections that can be installed in a manhole made up of individual casing sections. The ladder sections include anchoring elements so that they can be easily installed relative to a casing section in such a way that adjacent casing sections will lock the ladder sections in place. Also, the casing sections and ladder sections are constructed so that installation can be made without any penetration of the casing sections or of the completed assembly.

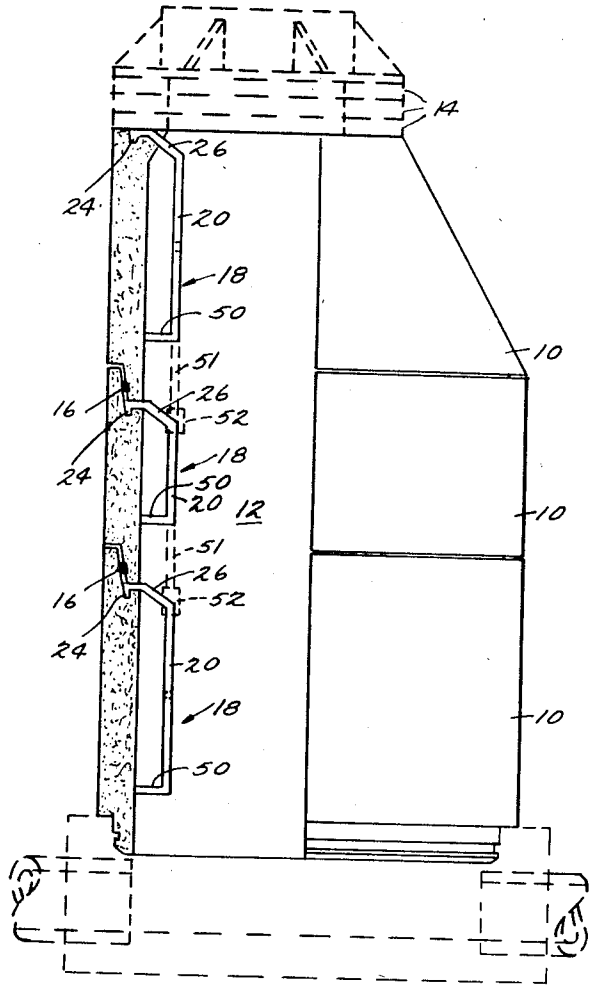
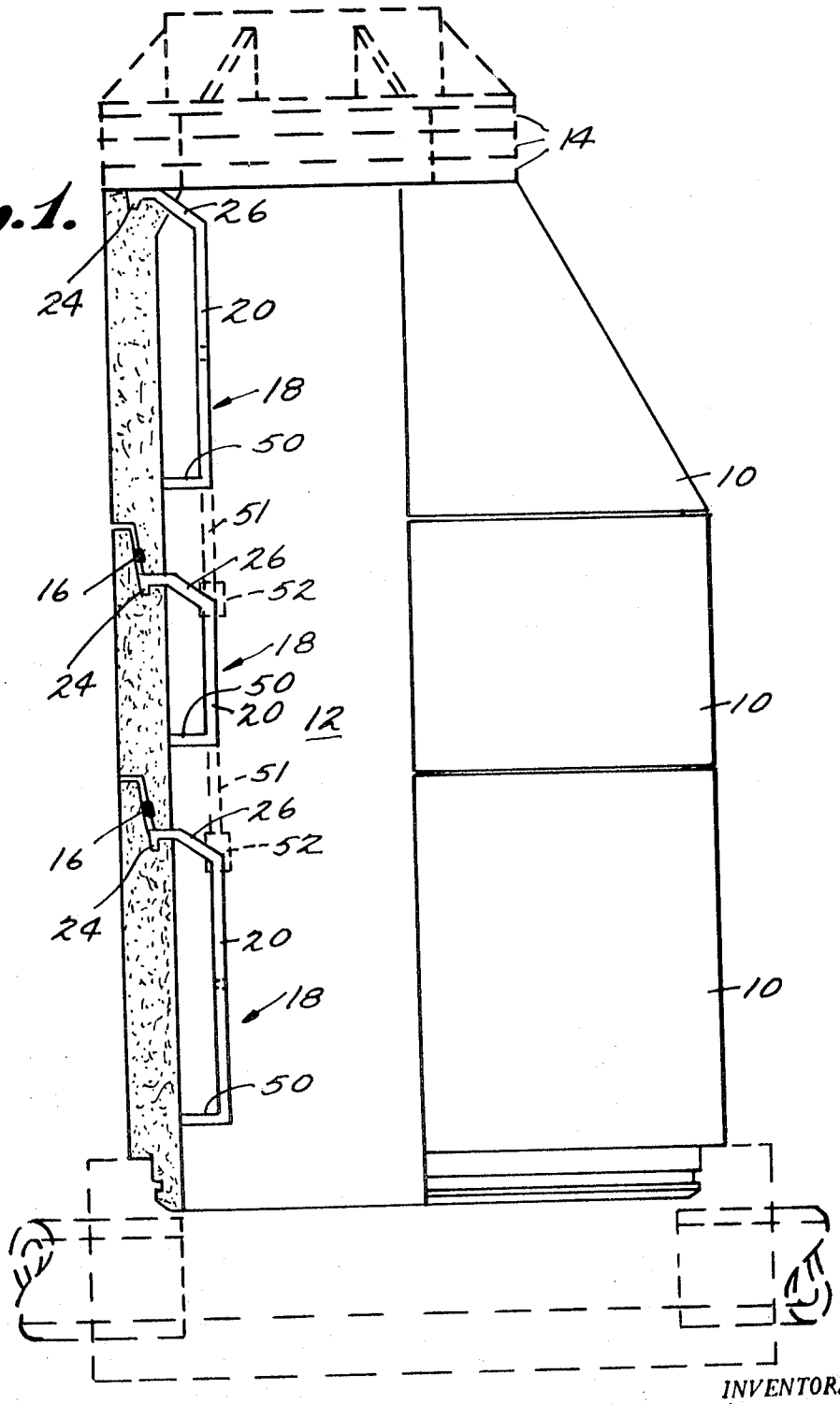
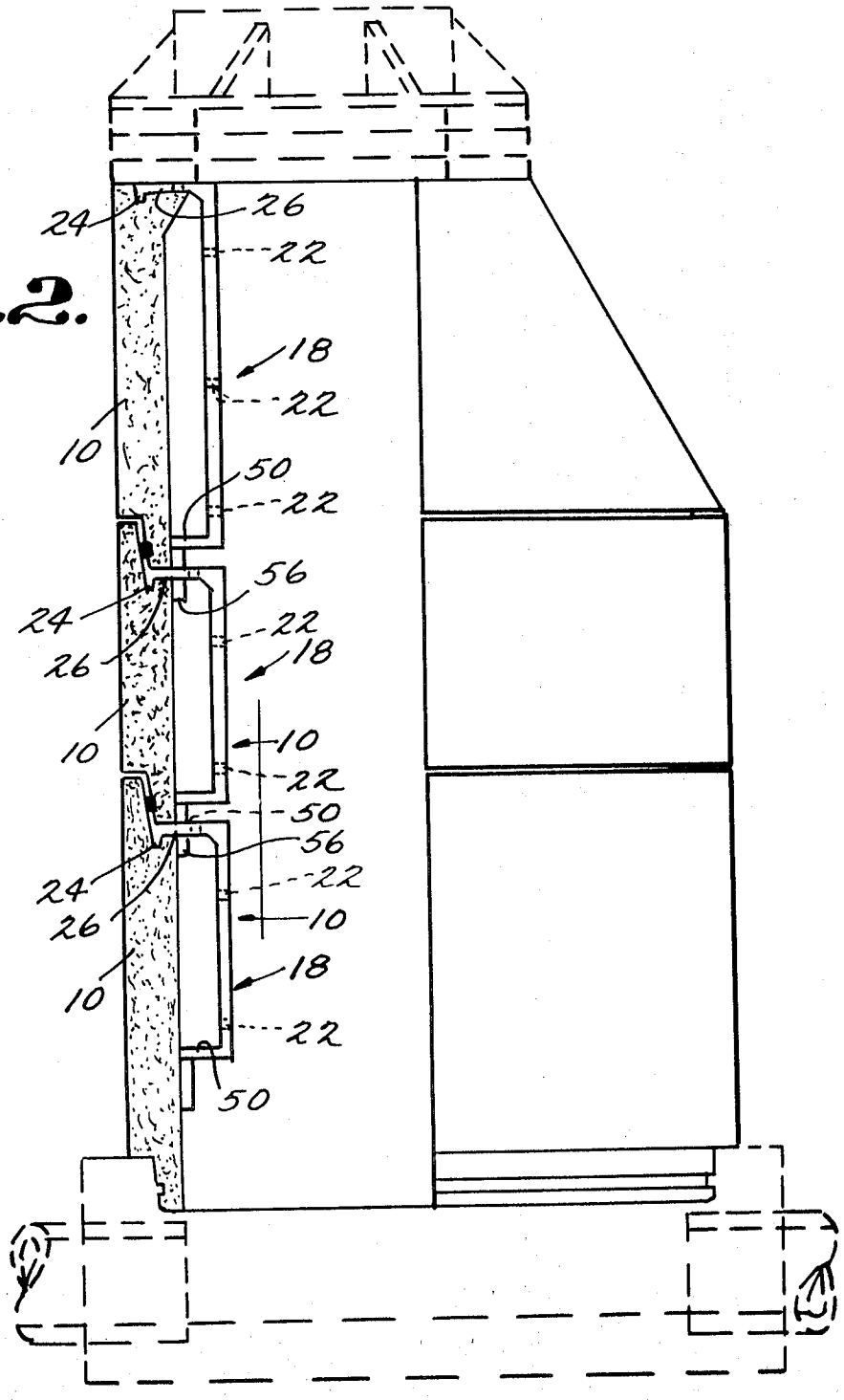


Fig. 1.



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Fig. 2.



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Fig. 3.

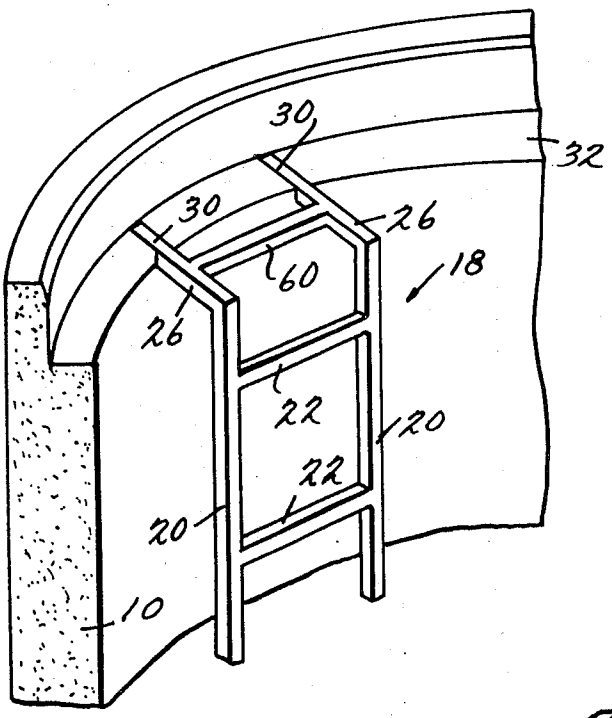


Fig. 9.

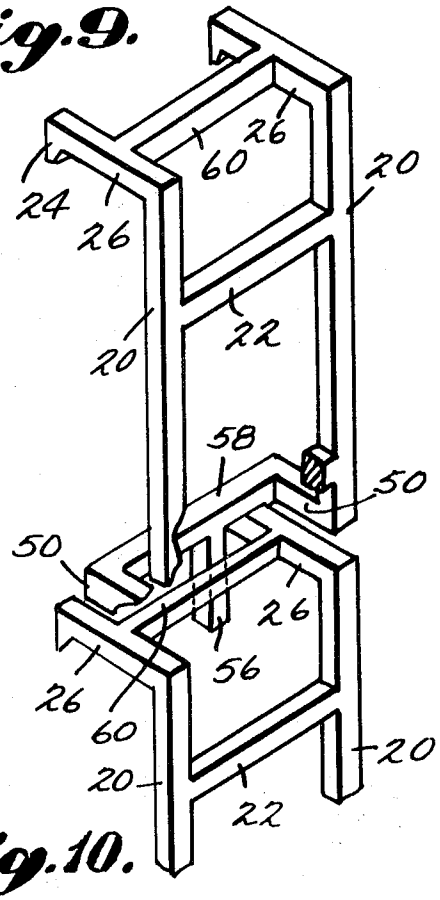


Fig. 4.

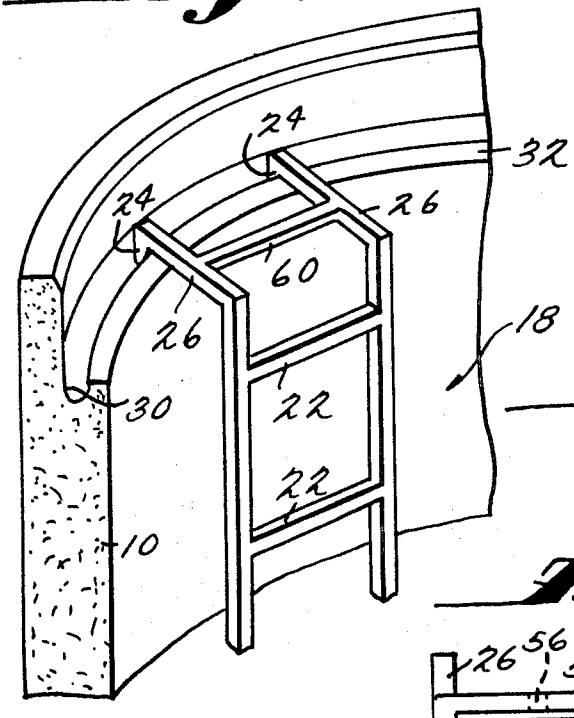


Fig. 10.

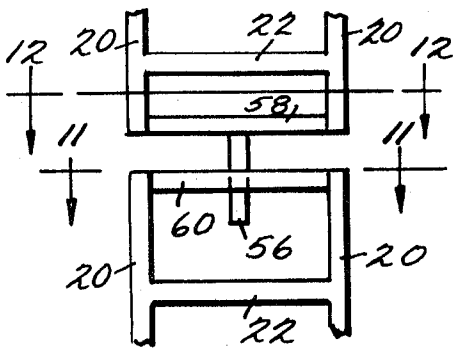


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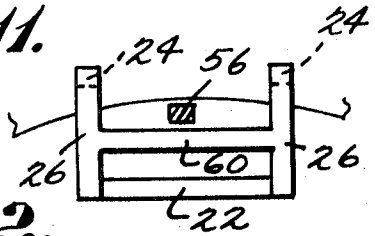
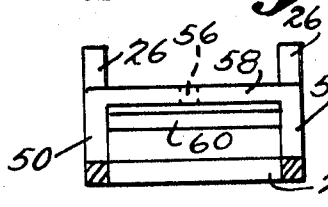


Fig. 12.



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Fig. 5.

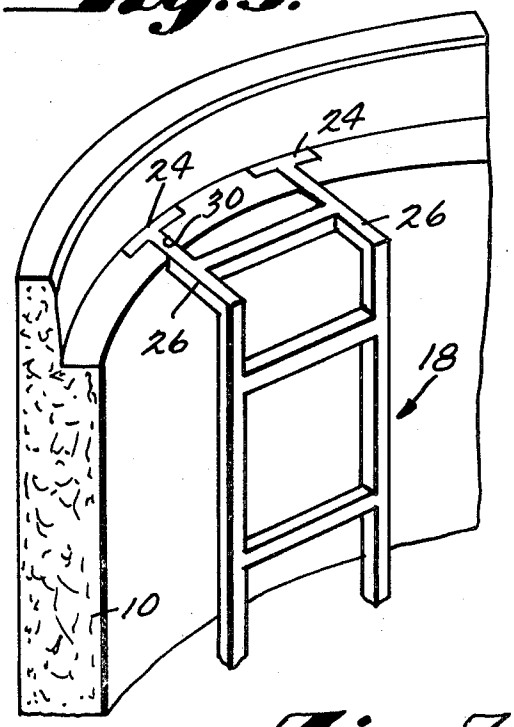


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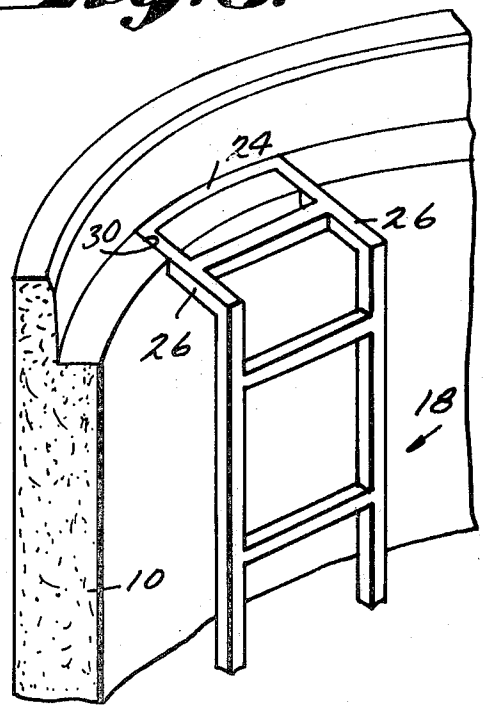


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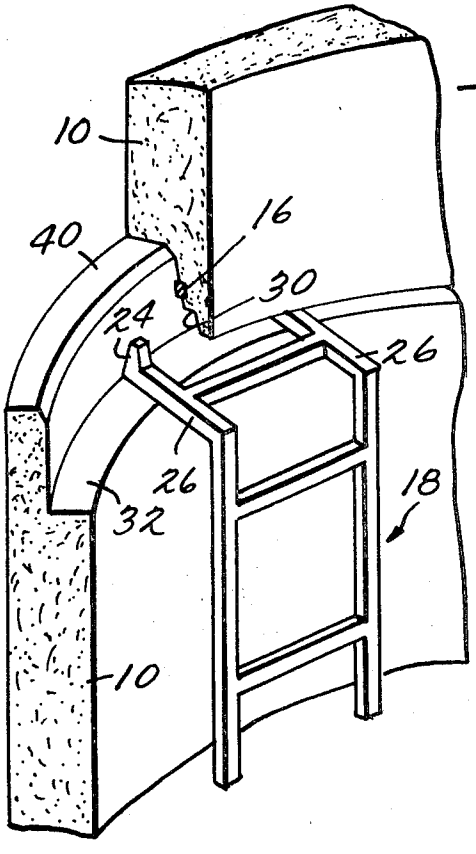
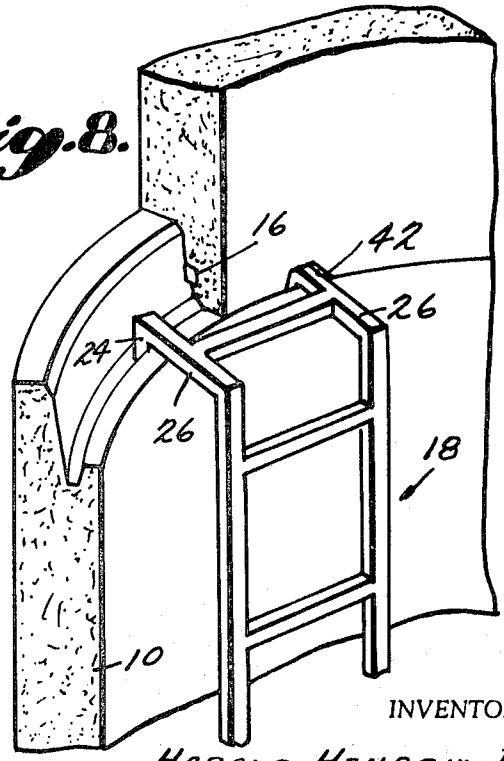


Fig. 8.



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LADDER SYSTEM FOR INSTALLATION IN MANHOLES

BACKGROUND AND BRIEF DESCRIPTION OF INVENTION

This invention relates to an improved system for installing vertical ladders in vertically disposed passageways defined by a plurality of circular casing sections. The invention is especially concerned with a safe ladder system that can be easily installed in a manhole so that the ladder system is locked in place without penetrating the casing structure making up the manhole.

It is known to construct sewer manholes, and similar vertically disposed passageways, from casing sections which are generally cylindrical in form and which can be mated to one another to define a continuous passageway therein. In a typical street or sewer manhole construction, a number of cylindrical casing sections are placed one upon another to define the desired depth of passageway, and some form of ladder construction is added to the manhole so that access into and out of the manhole is available. Generally, present day practice provides for a placing of steps in a manhole casing either after the casing is in place or while it is being formed. Either practice presents certain difficulties because the placement of steps, either at a plant or at a field location, can result in damage to a manhole casing and leakage through the casing wall. Typical arrangements for placing steps or ladders into manholes are illustrated in U.S. Pat. Nos. 1,712,510 and 2,965,195.

Unlike prior practices and constructions, the present invention provides for an onsite installation of individual ladder sections into a manhole without a requirement for penetration of the manhole casing or any danger of damage to the casing. In addition, the ladder system of the present invention provides for a firm locking of individual ladder sections into a manhole so that there is no danger of collapse or disassembly of ladder sections making up the ladder system. The ladder system of this invention eliminates any need for installation of ladder sections or steps in casing sections at the time of manufacture, and yet, it permits a ready installation of ladder sections into a manhole casing at a field site and under field working conditions.

In accordance with the invention, individual ladder sections are formed in such a way that they include anchoring members located at their upper ends for being received in a recess formed into an upper end of each casing section. Several forms of anchoring means are possible, and each one provides for a firm placement of a ladder and its rungs or steps relative to a manhole casing. By receiving the anchoring means of the ladder sections into a recess formed into an end portion of each casing, there is no need for penetration of the casing itself. This permits a stacking of casing sections in a sealed relationship to one another without danger of leakage at the anchoring points for the ladder system. In addition, the anchoring system fixes the vertically disposed ladder in a desired position spaced away from the inner wall of the casing without a requirement for separate spacing pins or other devices to be installed. Preferably the recess which is formed into the upper end of each individual casing section is continuous about the entire circumference of a casing section so that individual ladder sections may be placed anywhere around the interior wall of the casing during assembly of the casing and the ladder system.

The individual ladder sections of the present invention generally include a pair of vertical legs spaced apart with ladder rungs interconnected therebetween, and they are provided with horizontally disposed extensions of the upper ends of each of their vertical legs. The horizontally disposed extensions carry anchoring elements at their terminal ends, and the anchoring elements are constructed to be received within a recess formed into an end of one casing section with which the ladder will be received for installation. The recess may be formed in a lower end of an upper casing section, or in an upper end of an associated casing section, to which an individual ladder section is secured. In addition, each ladder section includes an attaching means at its lower end for securing the ladder section to a next lower ladder section when a plurality of such sections are assembled together within a casing assembly. In a preferred form of the invention, the attaching means comprises a downwardly extending element which can be engaged behind a horizontally disposed element of a next adjacent lower ladder section without any pins or other fastening devices to secure the engagement. This arrangement permits a certain amount of variance in vertical alignment between vertical ladder sections so that field site installations do not have to be concerned with precise alignment of each section with all remaining ladder sections.

Various configurations for the ladder sections are possible, and the ladder sections can be made of steel, cast iron, aluminum, or even certain synthetic resins which are molded or formed to the desired shape and configuration. Other materials may be used if desired. The individual casing sections which make up the manhole may be provided with various forms of recesses or pockets to accommodate the ladder sections of this invention.

Other advantages and features of the invention will also become apparent in the detailed discussion below, and in that discussion reference will be made to the accompanying drawings as briefly described below.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an elevational view, partly in cross section, of a sewer manhole with a ladder system installed in accordance with this invention;

FIG. 2 is a view similar to FIG. 1, showing a ladder system, in accordance with this invention, which provides for an interlocking of adjacent ladder sections without a requirement for fastening or securing devices;

FIG. 3 is a perspective view of a portion of a ladder section and its associated casing section, showing discrete recesses in the casing section for receiving anchoring means of the ladder section;

FIG. 4 is a view similar to FIG. 3, but showing an alternative recess means in the form of a continuous groove formed in an upper end of a casing section for receiving the anchoring means of a ladder section;

FIG. 5 is a view similar to FIG. 3, showing an alternative anchoring arrangement for a ladder section;

FIG. 6 is another view similar to FIG. 3, showing another alternative for anchoring a ladder section;

FIG. 7 is a view similar to FIG. 3, but showing the relationships of two casing sections and a ladder section when the anchoring means of the ladder section is received into a recess of an upper casing section;

FIG. 8 is a view similar to FIG. 7, but showing an alternative anchoring relationship for two casing sections and a ladder section;

FIG. 9 is a perspective view of one complete ladder section, partly broken away for clarity, with a part of a next lower ladder section for showing an interlocking or attaching arrangement between two ladder sections;

FIG. 10 is a front elevational view taken on lines 10 — 10 of FIG. 2 to show a preferred attaching means at a lower end of one ladder section for being engaged by an upper end of a next adjacent ladder section;

FIG. 11 is a horizontal plan view, partly in section, as seen on lines 11 — 11 of FIG. 10; and

FIG. 12 is a view similar to FIG. 11, but taken on line 12 — 12 of FIG. 10.

DETAILED DESCRIPTION OF INVENTION

In FIGS. 1 and 2, a typical manhole construction is shown as being made up of a plurality of casing sections 10 which are stacked upon each other in mating relationships to form a vertically disposed passageway 12 within the assembly of casing structures. In the illustrated embodiment, the manhole is con-

structed over a sewer line, and the upper end of the manhole would represent ground or street level. The top part of the installation is finished with one or more layers of brickwork at 14, and a cover is installed over the entire assembly. In the illustrated embodiment, the casing sections 10 are constructed to be assembled together in a sealed relationship with sealing gaskets 16 installed between mating ends of the casing sections.

FIGS. 1 and 2 also illustrate the installation of a ladder system within a manhole. The ladder system is made up of a number of individual ladder sections 18, and the individual ladder sections may vary in length and number of rungs to fit the individual casing sections with which they are associated. As shown more clearly in the remaining drawings, each ladder section is generally provided with a pair of spaced legs 20 having rungs 22 interconnected between the legs to form a rigid structure. The individual ladder sections 18 may be formed or molded as unitary structures, or the rungs 22 may be secured to leg elements 20 by known assembly techniques. Each ladder section is provided with an anchoring means 24 at its upper end so that the ladder section may be anchored and spaced relative to the manhole casing without the use of additional spacing elements and without penetrating the casing itself. Generally, the anchoring means of each ladder section are carried by horizontally disposed extensions 26 of each of the upright legs 20 of the individual ladder sections. In the context of this specification and its claims, reference to vertical and horizontal planes or dispositions are intended to describe constructional features in their fully assembled conditions in typical installations of the type shown in FIGS. 1 and 2. Also, it should be apparent from an examination of FIG. 1 that reference to horizontally disposed extensions 26 includes extensions which are not completely horizontal in plane but which are angled away from the vertical planes of the legs 20. The horizontally disposed extensions 26 function (1) to define a spacing of the main part of each ladder section away from the inner wall of a casing and (2) to carry the anchoring means 24 for being received in recess means provided in the casing sections.

FIGS. 3 through 8 illustrate a number of embodiments for anchoring the individual ladder sections relative to associated casing sections. However, these various embodiments are intended to be only exemplary of what can be done with the system of the present invention, and other arrangements and configurations will become apparent to those skilled in this art. In the FIG. 3 arrangement, the two anchoring means for the ladder section 20 cannot be seen because they are concealed within discrete pockets 30 formed downwardly into a ledge 32 at an upper end of a casing section 10. The anchoring means for the FIG. 3 arrangement would be in the form of downwardly depending elements extending from the horizontally disposed extensions 26 (see elements 24 in FIGS. 1 and 2, for example).

FIG. 4 shows a preferred arrangement wherein a recess means 30 is formed into an upper end of a casing section 10 so as to extend continuously around the entire casing section without interfering with the sealing lip of the casing section. The continuous recess means 30 is in the form of a groove formed into a ledge 32. This arrangement permits placement of a ladder section 18 at any desired position about the inner wall of a casing section. Also, it eliminates any need for careful alignment of stacked casing sections during installation of a manhole and ladder system at a field location.

FIGS. 5 and 6 illustrate alternative anchoring means 24 which comprise laterally extending elements connected to, or integral with, the horizontally disposed ladder extensions 26. It can be seen that the anchoring means extend in horizontal planes and are received in recess means 30 which are shaped to fit the shape of the anchoring means. However, the recess means 30 could be in the form of a continuous groove, as in the FIG. 4 embodiment, with radially extending slots for receiving the horizontally disposed extensions 26 of the individual ladder sections.

FIG. 7 illustrates an embodiment wherein the anchoring means of each ladder section comprise upwardly extending portions 24 that are received in a recess means 30 formed at the lower end of a casing section 10 placed above the actual position of the ladder section. In this embodiment, the horizontally disposed extensions 26 rest on the ledge 32 of a lower casing section, and the upper casing section 10 is shaped so as to mate with and rest on an upper lip 40 of the lower casing section. The recess means 30 is formed as a continuous groove into the lower lip of the upper casing section which is illustrated. As with the other embodiments of this invention, the sealing lip portions of the casing sections are not weakened or disturbed by the anchoring arrangement.

FIG. 8 shows an arrangement which is similar to that shown in FIG. 4, but further illustrates the relationship of an upper casing section relative to a lower casing section in a completed assembly. The upper casing section may be shaped in the manner shown for the FIG. 7 embodiment or it may be provided with radially extending slots or recesses 42 for straddling the horizontally disposed extensions 26 of a lower ladder section 18.

It can be seen from FIGS. 1 through 8 that all embodiments of the invention provide for an anchoring, spacing, and locking of each ladder section in place in the completed installation. There is no need for modification or finishing of casing sections at the building site because each casing section functions to lock a lower ladder section in place by merely stacking the casing section on the previously installed section. The uppermost ladder section is locked in place by the brickwork 14 which is placed over the upper end of the manhole to bring the top up to a desired grade level.

FIGS. 9 through 12 illustrate a further feature of the present invention which provides for an attaching, or interlocking, of adjacent ladder sections relative to one another. It can be seen in FIGS. 1 and 2 that each ladder section includes lower horizontally disposed extensions 50 which function to space the lower end of each section away from the inner wall of the casing assembly. However, in order to obtain a firm and safe installation of the ladder sections, it is necessary to fix the positions of their lower ends so that they cannot work away from the inner casing wall during normal use. This can be done by interconnecting the lower end of each ladder section with the upper end of a next adjacent ladder section by coupling elements 51 and sleeves 52 of the type shown in phantom in FIG. 1 (the sleeves being designed to embrace an upper part of a ladder section and the coupling elements being extensions or attachments to upper ladder sections that can be secured to the sleeves). However, it is preferred that the arrangement shown in FIGS. 9 through 12 (and also in FIG. 2) be utilized for ease of assembly and manufacture. This arrangement provides for at least one downwardly extending attaching element 56 for each of the ladder sections. As shown in FIG. 9, the downwardly extending element 56 is formed with, or attached to, a crossbar element 58 secured between the lower horizontal extension elements 50. The downwardly extending element 56 is of such a dimension as to be received in engagement by an upper portion of a lower ladder section in an assembly. FIG. 9 shows a preferred arrangement wherein a horizontally disposed bar 60 is interconnected between the upper horizontally disposed elements 26 of a ladder section in such a position as to substantially limit or prevent any radial movement of the downwardly extending element 56 relative to the casing wall. On the other hand, it can be seen that the downwardly extending element 56 can be selectively placed laterally (or from side to side) relative to a lower ladder section with which it is engaged, and this permits a desired amount of misalignment between upper and lower ladder sections in an installation of a plurality of such ladder sections in a manhole. This is a desirable feature because it is nearly impossible to precisely align separate ladder sections in the field for tying them together with known fastening devices and other extension members.

Thus, this invention provides for a useful ladder system which is safe, easily manufactured, and easily installed. Although specific embodiments have been described, it will be appreciated that additional embodiments and variations can be designed and constructed in accordance with the teachings of the basic invention described herein.

What is claimed is:

1. A ladder system for installation in a generally vertically disposed passageway defined by a plurality of casing sections which can be mated together in a stacked relationship, comprising the combination of:

individual ladder sections which can be secured to the casing section to form a ladder system within the passageway defined by said casing sections, each of said ladder sections having anchoring means at an upper end for hanging the ladder section from the upper edge of a casing section said anchoring means comprising a pair of horizontally disposed extensions of vertical legs of a ladder section, with a further horizontally disposed element interconnecting the terminal ends of the horizontally disposed extensions,

individual casing sections which include upper and lower ends that can be mated with one another in stacked relationships to form a continuous casing assembly defining a generally vertically disposed passageway, and including in the casing assembly individual casing sections having recess means formed in one of their ends for receiving the anchoring means of individual ladder sections, said recess means being formed into the individual casing sections so as to communicate with the interior space of the casing assembly without penetrating through to the exterior of the casing assembly at any point.

2. The ladder system of claim 1 and including sealing means for sealing the mated casing sections relative to one another.

3. The ladder system of claim 1 wherein each ladder section includes attaching means at its lower end for attaching the ladder section to a next lower ladder section in an assembly of such ladder sections in a casing.

4. The ladder system of claim 3 wherein said attaching means of each ladder section includes at least one downwardly depending element which can be engaged with a portion of a next lower ladder section.

5. The ladder system of claim 1 wherein each ladder section includes

a pair of spaced legs with rungs interconnected therebetween,

means for spacing the spaced legs away from the interior wall of a casing in which the ladder section is installed, and

attaching means at a lower end of each section for securing the ladder section to a next lower ladder section in an assembly of such ladder sections in a casing.

6. The ladder system of claim 5 wherein said attaching means comprises at least one downwardly depending element extending below the lower end of the ladder section for being engaged by a portion of a next lower ladder section in an assembly of such sections.

7. The ladder system of claim 6 wherein said downwardly depending element is positioned to be in close proximity to, or in contact with, the interior wall of a casing assembly when the ladder assembly is installed within the casing assembly.

8. The ladder system of claim 7 wherein said downwardly depending element is engaged by a horizontally disposed element carried by an upper end portion of a next lower ladder section, said horizontally disposed element being generally parallel to the rungs of the ladder and positioned to interconnect a pair of horizontally disposed extensions of the legs of the ladder.

9. The ladder system of claim 1 wherein said recess means of each casing section comprises a continuous recess formed into the upper end of each casing section so as to permit placement of a ladder section and its anchoring means at any position about the circumference of the casing section.

10. The ladder system of claim 1 wherein said recess means of each casing section is formed into a ledge portion defined at the upper end of the casing section so that portions of a ladder section can rest on the ledge when installed in the casing section with the anchoring means received into the recess means.

11. The ladder system of claim 10 wherein said recess means comprises a continuous groove.

12. The ladder system of claim 10 wherein said recess means comprises discrete formations for receiving the anchoring means of a ladder section in mating relationship.

13. The ladder system of claim 10 wherein the lower end of each casing section is shaped to mate with the ledge portion formed at the upper end of a next adjacent lower casing section in an assembly of such casing sections.

14. The ladder system of claim 13 wherein the lower end of each casing section includes recesses for straddling a ladder section installed on a next adjacent lower casing section.

15. The ladder system of claim 14 wherein said anchoring means comprises a horizontally disposed element which interconnects the terminal ends of said horizontally disposed extensions of each ladder section.

16. A ladder system for installation in a generally vertically disposed passageway defined by a plurality of casing sections which can be mated together in a stacked relationship, comprising the combination of:

individual ladder sections which can be secured to the casing section to form a ladder system within the passageway defined by said casing sections, each of said ladder sections having anchoring means at an upper end for hanging the ladder section from the upper edge of a casing section, and each of said ladder sections further having an attaching means at its lower end for attaching the ladder section to a next lower ladder section in an assembly of such ladder sections in a casing, said attaching means including at least one downwardly depending element which can be engaged with a portion of a next lower ladder section,

individual casing sections which include upper and lower ends that can be mated with one another in stacked relationships to form a continuous casing assembly defining a generally vertically disposed passageway, and including in the casing assembly individual casing sections having recess means formed in one of their ends for receiving the anchoring means of individual ladder sections, said recess means being formed into the individual casing sections so as to communicate with the interior space of the casing assembly without penetrating through to the exterior of the casing assembly at any point.

17.

A ladder system for installation in a generally vertically disposed passageway defined by a plurality of casing sections which can be muted together in a stacked relationship, comprising the combination of:

individual ladder sections which can be secured to the casing section to form a ladder system within the passageway defined by said casing sections, each ladder section including a pair of vertical legs spaced apart with ladder rungs interconnected therebetween, and with a horizontally disposed extension at the upper end of each vertical leg, and each of said ladder sections having anchoring means secured to said horizontally disposed extensions for hanging the ladder section from the upper edge of a casing section, said anchor means comprising horizontally disposed elements connected at angles to each of said horizontally disposed extensions,

individual casing sections which include upper and lower ends that can be mated with one another in stacked relationships to form a continuous casing assembly defining a generally vertically disposed passageway, and including in the casing assembly individual casing sections having recess means formed in one of their ends for receiving the anchoring means of individual ladder sections, said recess means being formed into the individual casing sections so

as to communicate with the interior space of the casing assembly without penetrating through to the exterior of the casing assembly at any point.

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