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(54) Access shaft structure

(57) An access structure comprises a bottom portion (6), for location underground and a headpiece (18), for location substantially at ground level. The bottom portion (6) and headpiece (18) can only be connected together directly or indirectly with a single relative orientation. The headpiece (18) is provided with indicia means (26) for indicating a condition of the bottom portion (6) and/or a condition of some other component directly or indirectly connected to the bottom portion (6).

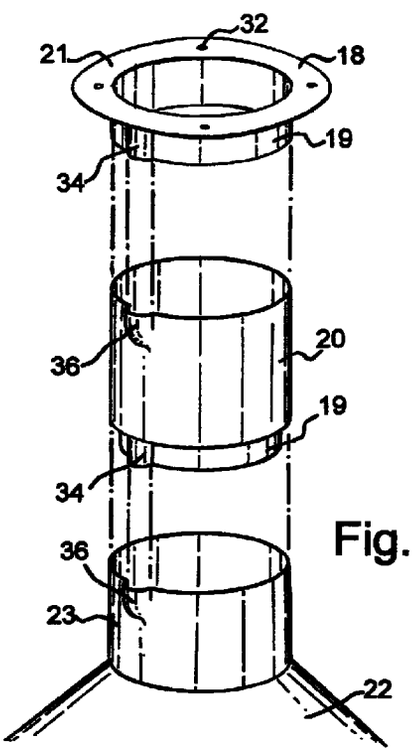

Fig. 4

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Description

[0001] The present invention relates to an access structure. More particularly, but not exclusively, the invention relates to an access structure for use in a sewerage or storm-water network.

[0002] In recent years, it has become commonplace to construct manholes and other access structures from a number of modular components. This practice provides manufacturing benefits, since smaller components are normally easier to manufacture. It also facilitates storage and shipping and provides flexibility at the point of installation.

[0003] Some known modular access structures comprise a shaft formed from a series of axial shaft sections. A typical such structure is shown in Figure 1. Here it can be seen that a shaft 4 is formed from a number of discrete shaft sections 20, which are assembled one-upon-another to form a shaft having an appropriate depth. The shaft is connected to a discrete chamber module 6, which has a main outlet 8 and a branch feed 10. The top of the shaft is provided with a headframe 12 which serves as a seat for a cover 14.

[0004] It should be noted that the headframe 12 is of a rectangular configuration, whereas the shaft 14 is of a generally circular cross-section. The shaft has a circular cross-section because this provides the best possible resistance to compressive forces, by virtue of its hoop strength. However, a rectangular configuration is preferred for the headframe, because this enables it to be installed in close abutment with the surrounding architecture, which is normally comprised of flat surfaces. In Figure 1, for example, it can be seen that the headframe 12 is set against a wall 16.

[0005] For a number of reasons, the subterranean pipework 8, 10 will not always be aligned in a manner that ideally corresponds with the surface-level architecture. Therefore, it is known for the headframe 12 to be capable of rotation about the axis of the shaft. This enables the headframe 12 to be set against any local surface-level architecture, whilst maintaining the ideal orientation of the chamber 6 relative to the subterranean pipework 8, 10.

[0006] Although such a modular structure provides numerous benefits, it does suffer from one significant drawback. Because it has, by its very nature, been assembled from a number of components, it is quite commonly not clear how these components are arranged from the viewpoint of a person standing on the ground surface. In particular, the orientation of the pipework 8, 10 will not be readily apparent from the surface level. One consequence of this is that a person not in possession of appropriate plans will often need to resort to a physical subterranean inspection before the orientation of the local pipework can be understood. If a large network of subterranean components is being investigated, several such inspections will need to be made and this can be extremely time-consuming.

[0007] The present invention sets out to provide a modular access structure which can accurately indicate the orientation and configuration of subterranean components at surface level.

[0008] According to a first aspect of the present invention, there is provided an access structure comprising a bottom portion, for location underground, and a headpiece, for location substantially at ground level, wherein the bottom portion and headpiece can only be connected together directly or indirectly with a single relative orientation, the headpiece being provided with indicia means for indicating a condition of the bottom portion and/or a condition of some other component directly or indirectly connected to the bottom portion.

[0009] Such an arrangement enables a person standing at the surface to determine the condition of underground components by making reference to the indicia provided on the headpiece. Because the headpiece can only assume a single orientation relative to the bottom piece, there is no danger of the information provided on the headpiece from being corrupted if it is removed and subsequently re-installed in the access structure.

[0010] The access structure may further comprise a shaftpiece adapted to be connected intermediate the said bottom portion and the said headpiece, wherein the shaftpiece can only be connected to the bottom portion with a single relative orientation and can only be connected to the headpiece with a single relative orientation.

[0011] One or more additional shaftpieces may be provided, the or each said additional shaftpiece being adapted to be connected intermediate the said headpiece and the bottom portion, to form a shaft in conjunction with the said shaftpiece; wherein the or each said additional shaftpiece is adapted to be connected to any of the headpiece, bottom portion, shaftpiece or an additional shaftpiece with only a single relative orientation.

[0012] The headpiece may comprise a radial flange and, in use, the indicia means may be provided on a generally upwardly facing surface of the said flange. The flange may be provided with an aperture and the indicia means may be plugged into the aperture when the access structure is assembled. Preferably, the flange is provided with a plurality of apertures and the indicia means may be plugged into any one of the apertures when the access structure is assembled. A plurality of indicia means may be provided.

[0013] In one preferred embodiment, the or each said indicia means comprises an indicia plate provided with a rearwardly projecting lug.

[0014] Preferably, each one of the headpiece, the bottom portion and any present shaftpiece is provided with at least one of an axially extending skirt and an axially opening complementary mouth, each mouth being adapted to receive each skirt axially and accommodate it in a close-fitting relationship.

[0015] In a particularly preferred embodiment, the or each said skirt is provided with a radially outwardly pro-

jecting member on a radially outer surface thereof and the or each said mouth is provided with a complementary radially outwardly extending recess on a radially inner surface thereof, the or each projecting member and the or each recess being adapted to key together when the or each said skirt is inserted into a respective mouth.

[0016] The or each said projection may take the form of an axially extending rib and the or each said recess may take the form of an axially extending channel.

[0017] The access structure may further comprise a head frame for a cover, the said head frame being adapted to be fitted about the headpiece in use and be capable of rotation relative thereto.

[0018] These and other preferred features of the first aspect of the invention are set out in the appended claims.

[0019] Access structures are often subjected to fairly substantial axial loads or loads having a axial component, when in use. Such axial loads can be particularly damaging and can lead to serious faults in underground drainage networks.

[0020] The present invention also sets out to provide an access shaft which will not be damaged, when experiencing such loads.

[0021] According to a second aspect of the invention there is provided an access structure comprising an access shaft, wherein the said access shaft may be axially compressed upon application of a predetermined component of axial compressive force.

[0022] With such an arrangement, the shaft can axially compress, so as to absorb compressive axial load components without being damaged.

[0023] Preferably, the shaft is formed from a plurality of shaft sections which assume a first relative axial configuration until the said predetermined axial force component is experienced and which assume a second relative axial configuration after the axial force component has been applied.

[0024] One of the said shaft sections may comprise a mouth and another of the said shaft sections may comprise an axially extending skirt which can be received within, and move axially within, the said mouth. Preferably, the said mouth is provided with a radially projecting lug on a radially inner surface thereof. Preferably, the radially inner surface of the said mouth comprises a plurality of the said radially inwardly projecting lugs. These may be situated at regular angular intervals about the perimeter of the mouth.

[0025] The shaft may be provided with a head frame, the said headframe being adapted to be axially fixed relative to an uppermost axial end thereof and anchored within a surface portion of the ground during use.

[0026] By such an arrangement, the shaft can be constructed to compress upon the application of a relatively great axial force as a consequence of ground movement, but not compress as a consequence of the application of a relatively smaller axial force as a consequence of, for example, a vehicle travelling over the structure.

[0027] In use, the flanges may be removed prior to assembly of the structure, so that the overall height of the assembly can be adapted to the local requirements during installation, or the compression characteristics can be modified.

[0028] These and other preferred features of the second embodiment of the invention are set out in the appended claims.

[0029] An embodiment of the invention will now be described, by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective schematic view of a modular access structure;

Figure 2 is a plan view of a headframe and associated components forming part of a first embodiment of the invention;

Figure 3 is an indicia plug forming part of an embodiment of the present invention;

Figure 4 shows a headpiece, a shaft section and a chamber roof piece, together forming part of an embodiment of the present invention;

Figure 5 is a schematic perspective view of the headframe of Figure 2;

Figure 6 is a view corresponding to Figure 4, but showing an alternative embodiment of the present invention;

Figure 7 is a view corresponding to Figures 4 and 6, but showing a still further embodiment of the invention;

Figures 8, 9 and 10 respectively show three alternative indicia plugs in accordance with the present invention; and

Figures 11, 12 and 13 show an embodiment of a shaft in accordance with a second aspect of the invention in three different conditions.

[0030] The general structure of the described first embodiment of the present invention is the same as that of Figure 1. Hence, the generality of the structure will not be described again.

[0031] Referring to Figures 2 to 5, it will be seen that the headframe 12 of the first embodiment is formed from a rectangular base 13 surrounded by four perpendicularly upstanding peripheral walls 15. The centre of the base 13 is provided with a circular aperture 24 having a radius R.

[0032] The aperture 24 serves to accommodate a

headpiece 18. The headpiece 18 comprises an annular radially extending flange 21 integrally formed with a depending cylindrical skirt 19, which is joined with the flange 21 about its radially innermost periphery. Once assembled, the skirt 19 extends downwardly through the aperture 24 in the headframe 12 and the radial flange 21 rests on the upper surface of the base 13 of the headframe 12.

[0033] Referring to Figure 4, it will be seen that an axially extending and radially projecting rib 34 is provided on a radially outer surface of the depending cylindrical skirt 19 of the headpiece 18. Figure 4 also shows a shaft section 20 and it will be noted that the lower end of the shaft section 20 is provided with a depending cylindrical skirt 19 identical to the one provided on the headpiece 18. The upper end of the shaft section 20 has an internal diameter only slightly greater than that of the headpiece skirt 19 and is provided with an axially extending groove 36, which extends radially into its radially inner wall surface. The groove 36 has a configuration complementary to that of the rib 34 provided on the skirt 19 of the headpiece 18. During assembly, the skirt 19 of the headpiece 18 is inserted into the upper end of the shaft section 20 and the rib 34 is accommodated in the groove 36. The rib projects sufficiently far in the radial direction that the skirt 19 will not fit inside the shaft section unless the rib 34 and the groove 36 are properly aligned. This arrangement ensures that the headpiece 18 can only be assembled with one circumferential orientation relative to the shaft section.

[0034] The roof 22 of the chamber 6 is provided with an upstanding cylindrical wall 23 having a configuration identical to that of the upper portion of the shaft section 20. Consequently, the skirt 19 of the shaft section can be axially inserted into the upstanding wall 23 in exactly the same manner as the skirt 19 of the headpiece can be inserted into its own upper end. This ensures that the shaft section 20 can only be assembled with one orientation relative to the roof 22 of the chamber 6.

[0035] It will be apparent that, by virtue of the single available orientational relationship between the headpiece 18 and the shaft section 20 and the similar single orientational relationship possible between the shaft section 20 and the chamber 6, the headpiece 18 can only be given a single orientation relative to the chamber 6 once the components are assembled together.

[0036] In practice, more than one shaft section 20 will often be installed between the roof 22 of the chamber 6 and the headpiece 18. However, since all of the sections are provided with an identical rib 34 and groove 36, there will only ever be one possible relative orientation between two connected components and, hence, the headpiece 18 will always assume the same orientation relative to the chamber 6 in the assembled access structure.

[0037] It will be noted that the radius R of the aperture 24 provided in the base 13 of the headframe 12 is slightly larger than distance r (shown in Figure 2), which is the sum of the radius of the radially outer surface of the wall 19 and the additional radial projection x conferred by the rib 34. Hence, the headframe 12 will still always be capable of rotation about the depending skirt 19, regardless of the existence of the rib 34. Because the head frame 12 rotates relative to the headpiece 18, it can be orientated to conform with local surface architecture, without disturbing or conflicting with the orientation of the headpiece 18.

[0038] The radial flange 21 of the headpiece 18 is provided with a series of axially extending bores 32. In the embodiment shown, four of these bores are provided, at 90° circumferential intervals. In practice, more or fewer of these could be present. Each bore 32 is configured to receive the lug 29 of an indicia plug 26 (shown in Figure 3). Each indicia plug 26 comprises an indicia plate 28 and its lug 29 depends from the rear of this. The lug 29 comprises a generally cylindrical shank 31 and a bullet nose 30.

[0039] The indicia plate is fitted to the headpiece 18 by push-fitting the lug 29 into an appropriate one of the bores 32. The bore and lug can be configured to make it virtually impossible to remove the indicia plug 26 from the headpiece 18, once it has been fitted. In practice the lug may be configured such that it is necessary to hammer each indicia plate into its respective bore 32.

[0040] The upper surface of the indicia plate carries information relating to the configuration of the subterranean components. For example, it may comprise an arrow and the legend "inlet". This could, by its position on the headpiece 18 and its orientation, indicate the circumferential location of the inlet pipe and the feed direction. The indicia plugs may comprise other useful information relating to, for example, the diameter, jetting pressure limits, depth or gradient of the feed or outlet pipes, or even the distance to and direction of the next access structure in the network.

[0041] By providing the single assembly configuration between the headpiece 18 and the chamber 6, even if the headpiece 18 is removed from the top of the structure at some future date and subsequently re-fitted, there will be no danger of losing the information encoded in it, because it can only be replaced in its original position.

[0042] Although the above embodiment includes a shaft section 20 between the headpiece 18 and the chamber 6, in some cases it will be necessary to fit the headpiece directly to the chamber. Even in this case, the invention will still be capable of providing the described advantages, because the orientational relationship between the two will still be fixed and the headpiece will still be able to provide useful information.

[0043] Figure 6 shows a second embodiment of an access structure in accordance with the invention. This structure differs from the structure of Figure 4 in that the shaft section 20 and roof piece 22 each comprise three axially extending channels 36, each having a generally semi-circular cross-section and a fourth axially extend-

ing channel 36a, which has a generally triangular cross-section. Correspondingly shaped, co-operating channels are provided on the skirts 19. The channels provided on the skirts have a radially outer size which is slightly smaller than the radially inner dimension of the channels provided on the body portions of the shaft 20 and roof piece 22. In use, the components are assembled together in the same way as the embodiment of Figure 4, however relative circumferential alignment is achieved by virtue of the fact that the triangular channels provided on the skirts 19 must be fitted within a corresponding triangular channel 36a provided on a shaft section 20 or roof piece 22, or axial insertion cannot be achieved. Thus, only one relative circumferential orientation is possible between assembled components.

[0044] Although three semi-circular channels and one triangular channel have been used in this embodiment, may other variations are possible: for example, three square-section channels and one rectangular-section channel could be used.

[0045] Figure 7 shows a variation upon the arrangement of Figure 6. Here it will be seen that all of the channels have the same shape: they are all semi-circular. However, one set of channels 35a, 36a has a larger radius than the other three sets of channels 35, 36. Hence, even though the channels have the same basic shape, only one circumferential alignment is possible.

[0046] It should also be noted that, in the arrangement of Figure 7, two bores 32 are provided at each angular location. This provides greater flexibility as to the amount of information that can be provided regarding the subterranean structure.

[0047] Figures 8, 9 and 10 show three alternative embodiments of indicia plugs 26.

[0048] The plug of Figure 8 has a round head 28. The bullet nose 30 of the plug of Figure 3 is, in this case, replaced by a series of longitudinal projections 33, set at regular angular intervals about the perimeter of the shank 31. These longitudinal projections 33 deform, so as to secure the plug 26 in place within a bore 32.

[0049] Figure 9 shows a further indicia plug 26. This has a generally similar configuration to the plug of Figure 8, but the longitudinal projections 33 are replaced by annular projections 37.

[0050] Figure 10 shows a further indicia plug 26. This has a shank 31 identical to the plug of Figure 9, but it lacks a head 28. In this case, information is provided upon the indicia surface 27 at the upper end of the shank 31.

[0051] Figures 11, 12 and 13 show part of a shaft of an access structure in accordance with the second aspect of the invention.

[0052] Referring to Figure 11, it will be seen that the shaft is formed from three shaft sections 120. These are connected together in generally the same fashion as the shaft sections of the first aspect of the invention. That is to say, each shaft section 120 is provided with a depending skirt 119, which fits within the upper end of a shaft section 120 or roof piece (not shown) situated below.

[0053] Each shaft section 120 is provided with a ring seal 122 about the radially inner surface of the mouth of the shaft section 120. This is compressed when the skirt 119 of a shaft section 120 is inserted into the mouth. In Figure 11, it can be seen that the ring seals 122 in the lower two shaft sections 120 have been compressed in this manner.

[0054] The mouth of each shaft section 120 is provided with a series of radially-inwardly projecting lugs 124, which are situated at regular angular intervals about the perimeter of the shaft section 120 mouth. As can be seen in Figure 11, the lugs 124 are strong enough to support the higher parts of the shaft structure, when the shaft structure does not experience an axial load.

[0055] Figure 12 shows the shaft structure of Figure 11 after the application of a predetermined axial compression force. It will be immediately apparent that the lower two sets of lugs 124 have broken and allowed the shaft to be axially compressed. In this manner, the shaft structure can accommodate an axial load without being damaged.

[0056] Figure 13 shows the shaft sections 120 of Figure 11, but in a condition where the lugs of the lower two shaft sections 120 have been removed prior to assembly of the shaft structure. By doing this, the shaft structure can be made to have a relatively short axial length at the installation stage. By choosing to remove the lugs from only a certain number of the shaft sections 120, the height of the assembly can be chosen with ease. Alternatively, by removing only some of the lugs 124 within a given shaft section 120 or number of sections 120, the resistance of the shaft to axial compressive load can be varied. This has the effect of enabling the compression characteristics of the shaft structure to be set at the installation stage. If more lugs are removed: the shaft can be compressed more easily. If fewer lugs are removed, a relatively greater compressive force will be required before the lugs snap and the shaft can be compressed.

[0057] Although three shelf sections 120 are shown, more or fewer could be used. The appropriate number will depend upon the intended length of the shaft.

[0058] If the access structure is to be used in a roadway, the topmost shaft section 120 can be secured, either directly or via a headframe, to a pad of concrete. If this is done, the shaft will experience compression as a consequence of axial forces applied by the roadway, but not as a consequence of axial forces applied by vehicles travelling over the roadway.

[0059] Although one particular type of compression mechanism has been illustrated, others are possible and the invention is not constrained to the use of skirts, mouths and lugs.

[0060] Many further modifications and variations will suggest themselves to those versed in the art upon

making reference to the foregoing illustrative embodiment, which is given by way of example only and which is not intended to limit the scope of the invention, that being determined by the appended claims.

Claims

1. An access structure comprising a bottom portion, for location underground, and a headpiece, for location substantially at ground level, wherein the bottom portion and headpiece can only be connected together directly or indirectly with a single relative orientation, the headpiece being provided with indicia means for indicating a condition of the bottom portion and/or a condition of some other component directly or indirectly connected to the bottom portion.

2. An access structure according to Claim 1, further comprising a shaftpiece adapted to be connected intermediate the said bottom portion and the said headpiece, wherein the shaftpiece can only be connected to the bottom portion with a single relative orientation and can only be connected to the headpiece with a single relative orientation.

3. An access structure according to Claim 2, further comprising one or more additional shaftpieces, the or each said additional shaftpiece being adapted to be connected intermediate the said headpiece and the bottom portion, to form a shaft in conjunction with the said shaftpiece; wherein the or each said additional shaftpiece is adapted to be connected by any of the headpiece, bottom portion, shaftpiece or an additional shaftpiece with only a single relative orientation.

4. An access structure according to any preceding claim, wherein the headpiece comprises a radial flange and, in use, the indicia means is provided on a generally upwardly facing surface of the said flange.

5. An access structure according to Claim 4, wherein the flange is provided with an aperture and the indicia means can be plugged into the aperture when the access structure is assembled.

6. An access structure according to Claim 5, wherein the flange is provided with a plurality of apertures and the indicia means can be plugged into any one of the apertures when the access structure is assembled.

7. An access structure according to Claim 5 or 6 comprising a plurality of indicia means, each of which can be plugged into the said aperture or any one of the said apertures.

8. An access structure according to any one of Claims 5 to 7, wherein the or each said indicia means comprises an indicia plate provided with a rearwardly projecting plug.

9. An access structure according to any preceding claim, wherein each one of the headpiece, the bottom portion and any present shaftpiece is provided with at least one of an axially extending skirt and an axially opening complementary mouth, each mouth being adapted to receive each skirt axially and accommodate it in a close-fitting relationship.

10. An access structure according to Claim 9, wherein the or each said skirt is provided with a radially outwardly projecting member on a radially outer surface thereof and the or each said mouth is provided with a complementary radially outwardly extending recess on a radially inner surface thereof, the or each projecting member and the or each recess being adapted to key together when the or each said skirt is inserted into a respective mouth.

11. An access structure according to Claim 10, wherein the or each said projection takes the form of an axially extending rib and the or each said recess takes the form of an axially extending channel.

12. An access structure according to any preceding claim, further comprising a head frame for a cover, the said head frame being adapted to be fitted about the headpiece in use and capable of rotation relative thereto.

13. An access structure according to Claim 12, wherein the head frame comprises an aperture and at least part of the headpiece extends through the said aperture.

14. An access structure substantially as hereinbefore described with reference to Figures 2 to 5 of the accompanying drawings.

15. An access structure comprising an access shaft, wherein the said access shaft may be axially compressed upon application of a predetermined component of axial compressive force.

16. An access structure according to claim 15, wherein the shaft is formed from a plurality of shaft sections which assume a first relative axial configuration until the said predetermined axial force component is experienced and which assume a second relative axial configuration after the predetermined axial force component has been applied.

17. An access structure according to Claim 16, wherein one of the shaft sections comprises a mouth and

another of the shaft sections comprises an axially extending skirt, which can be received within, and move axially within, the said mouth.

18. An access structure according to Claim 17, wherein the said mouth is provided with a radially projecting lug on a radially inner surface thereof.

19. An access structure according to Claim 18, wherein the radially inner surface of the said mouth comprises a plurality of the said radially inwardly projecting lugs.

20. An access structure according to Claim 19, wherein the said lugs are situated at regular or angular intervals about the perimeter of the mouth.

21. An access structure according to any one of Claims 15 to 20, wherein the shaft comprises a headframe which is adapted to be axially fixed relative to an uppermost axial end thereof and anchored within a surface portion of the ground during use.

22. An access structure substantially as hereinbefore described with reference to Figures 11 to 13 of the accompanying drawings.

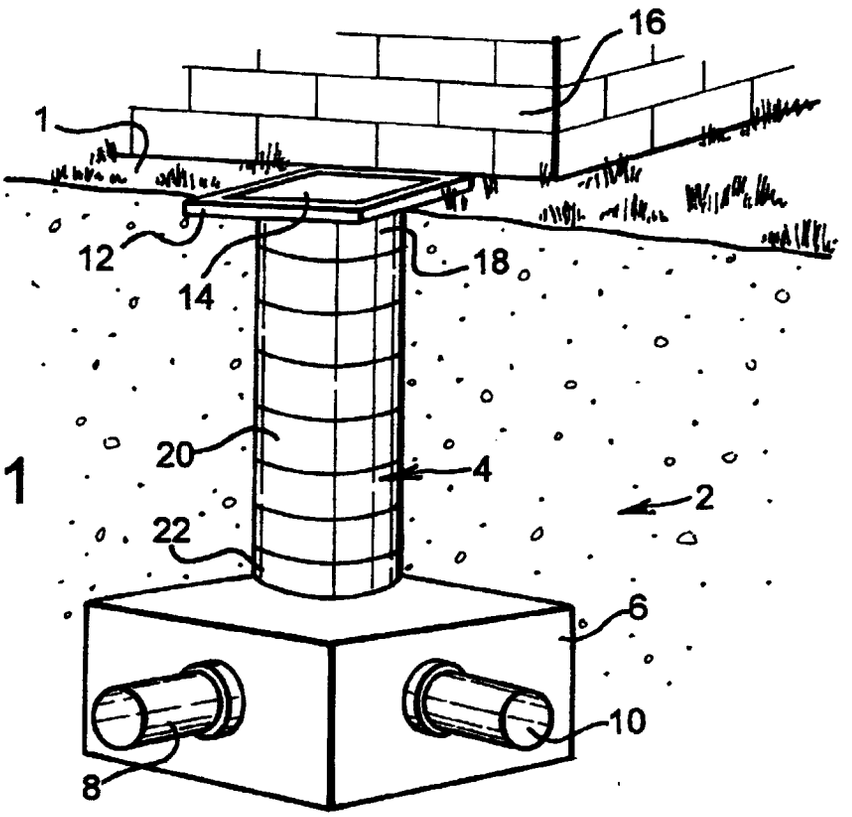

Fig. 1

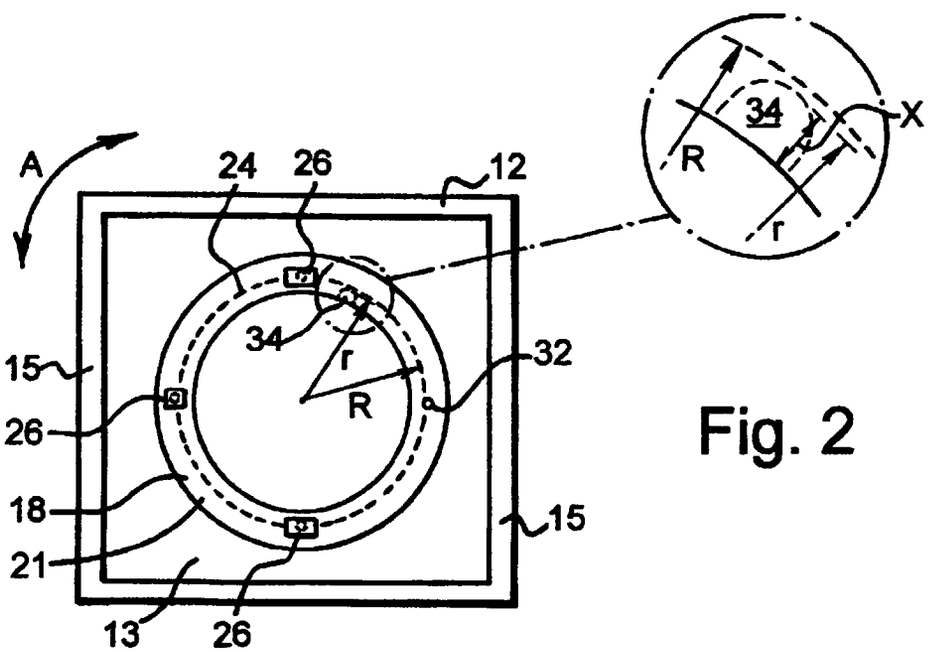

Fig. 2

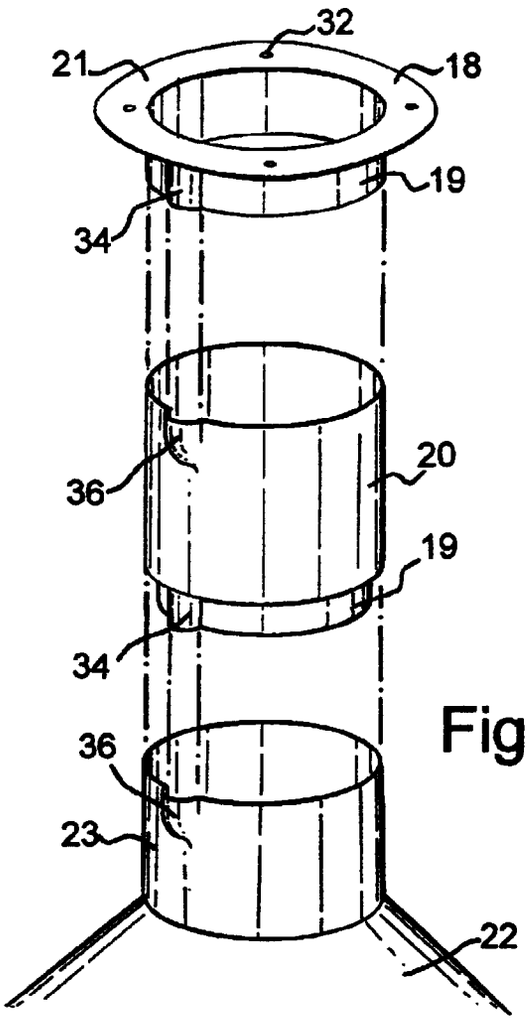

Fig. 4

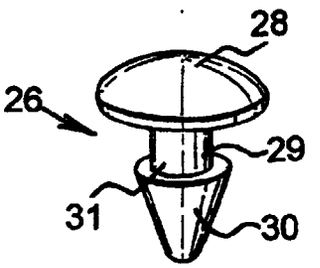

Fig. 3

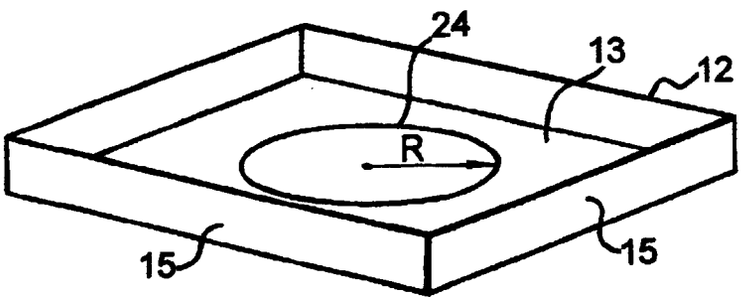

Fig. 5

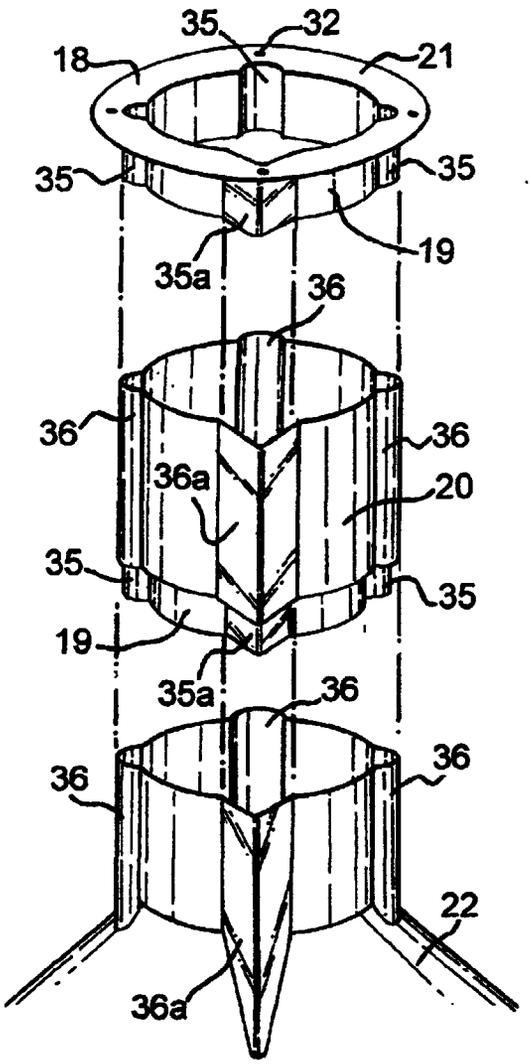

Fig. 6

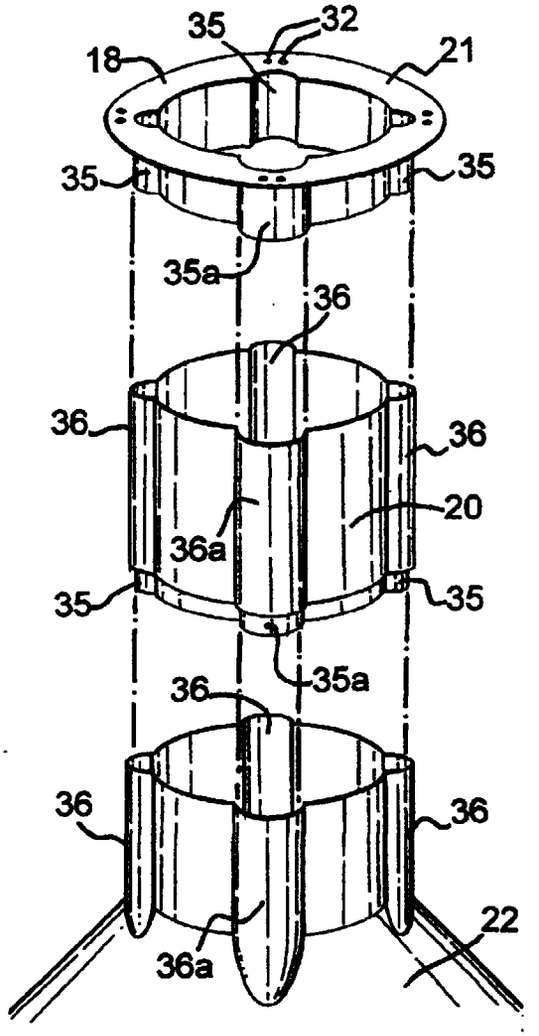

Fig. 7

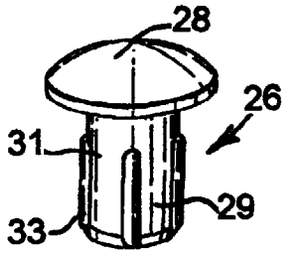

Fig. 8

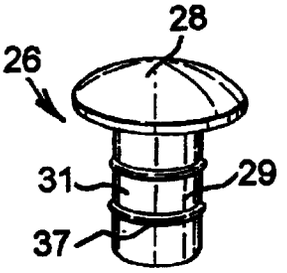

Fig. 9

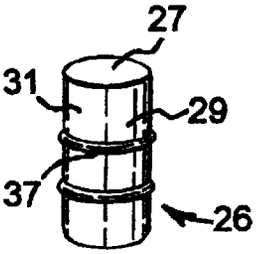

Fig. 10

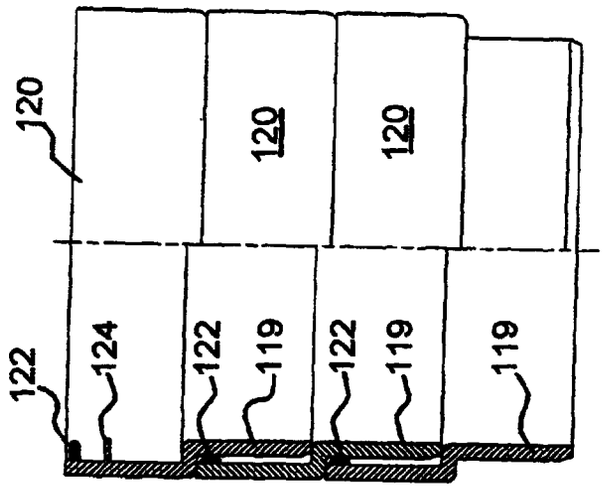

Fig. 13

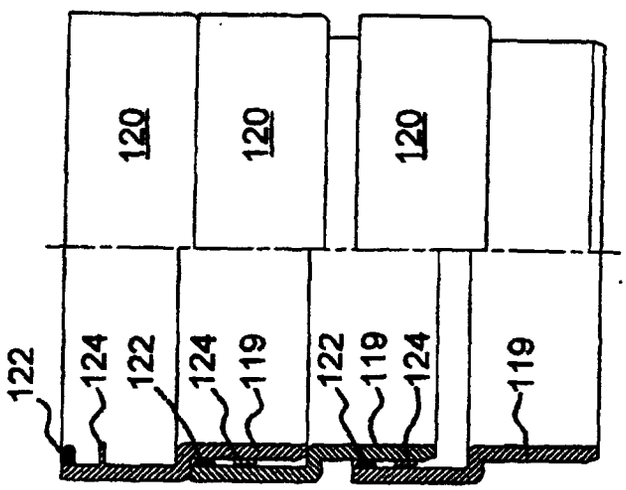

Fig. 12

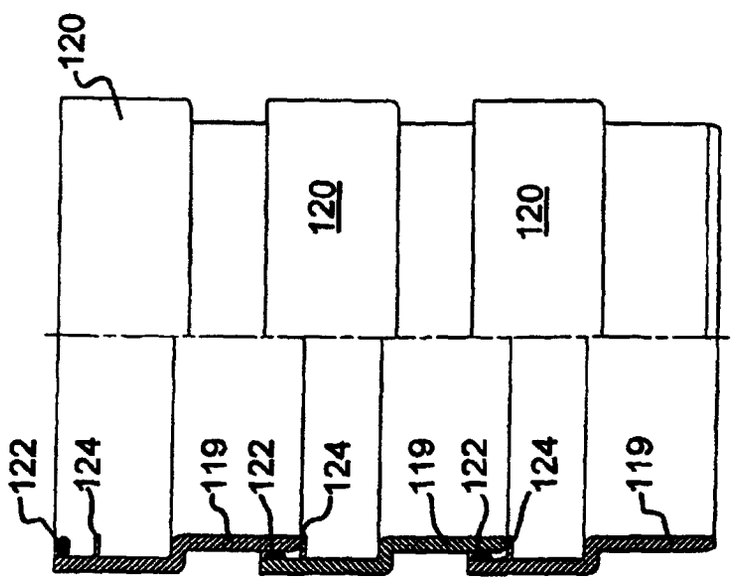

Fig. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 2797

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 July 1999	Blommaert, S

CATEGORY OF CITED DOCUMENTS

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