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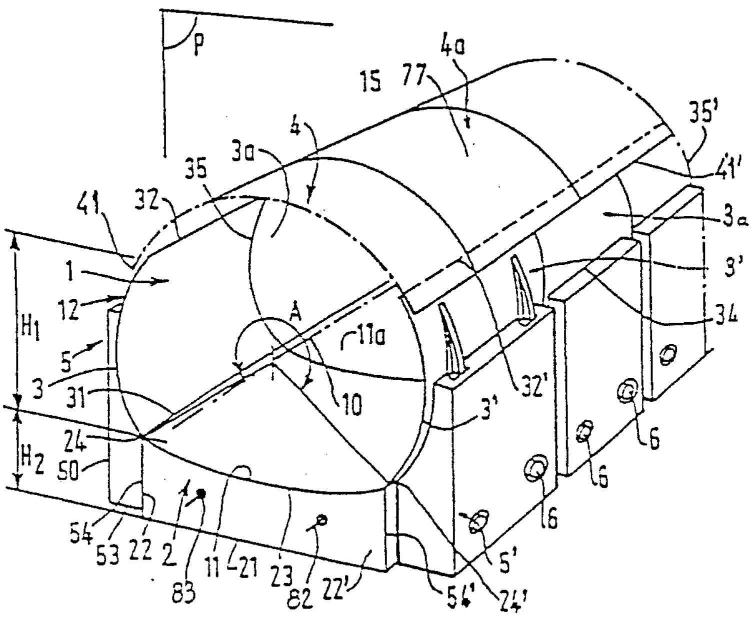
(54) Title: Conduit For The Circulation Of Fluid

(57) Abstract:

A pipe for circulating pressurized fluid comprises a tubular enclosure (1) with a thin wall (1) secured to a rigid support slab (2) of a moulded material. According to the invention, the upper part (12) of the enclosure (1) consists of, as seen in cross section, at least three lateral thin wall segments, two lateral segments (3, 3') each extending between a lower side (31) and an upper side (32) and at least one enclosure-closing upper segment (4) connected to the upper sides (32, 32') of the lateral segments (3, 3'). Each lateral thin wall segment (3, 3') is associated with a rigid support element (5, 5') of a moulded material secured at its base to the corresponding side of the slab (2) and comprises an inner face (51, 51') oriented towards the enclosure (1) having a profile matching with that of the lateral segment and on which the latter is applied. The inner face (51, 51') extends from the level of the upper face (23) of the slab (2) up to a level (H2) sufficient to maintain the rigidity of the lateral segment along all its height (H1) so as to prevent flattening.



(56) Documents Cited: GB-A-2 174 472; FR-A-935 451; US-A-2 702 564

The invention relates to the construction of conduits with very wide sections in particular for the transport of a fluid under high pressure which may, for example, exceed ten bars. The invention applies especially to the construction of forced conduits for hydroelectric stations, water supply and sewage circuits, but may also apply to the transport of gas under pressure, for example towards gas pipe-lines or to urban heating systems.

In general, a wide section conduit is formed by an extended tubular enclosure which may be made in moulded material such as concrete or in metal. If the conduit has to resist high internal pressure it is advantageous for its construction to be in metal as it may then be made of relatively light, easy to handle juxtaposed panels which may be welded together to form a closed tubular casing with, generally, a circular section, and which resists particularly well against tensile stress generated by the application of internal pressure.

Forced conduits used in hydroelectric installations are generally made in this way.

However, the conduit must, normally, be laid on the ground, generally using spaced supports and, while it has good resistance properties when subjected to internal pressure, on the other hand it has a propensity to distort when there is no pressure, during assembly or even simply in the event of reduced pressure. Such distortion leading to an oval shape of the conduit is an impediment particularly during assembly of the different panels which, in order to avoid such

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distortion, must normally be mounted on a template of the desired section before being soldered.

The risk of distortion is even higher with very wide sections, for example of several square metres. Tubular components in reinforced concrete can be used which offer the advantage of keeping their shape when laid on the ground and banked, but for wide sections such components are heavy and cumbersome. Also, circular section conduits which simply rest on their lower surface exert considerable localised stress on the ground which may, through a boring effect, lead to differential subsidence and therefore disturbances. Also, it is difficult to make joints between adjacent components that are sufficiently leakproof to withstand very high pressure.

To solve such problems, the inventor has already described, in Patent FR-A-2,685.304 the construction of mixed conduits made of a metal tubular enclosure having a cross-section that is circular shaped on one part with a substantially level lower part which is applied and fixed on a slab in reinforced or prestressed concrete. In this manner such a conduit combines the advantages of metal construction and concrete construction since the metal circular part is only subjected to tensile stress and may therefore be made of a relatively thin wall, whereas the lower part is applied to the slab which can be designed to withstand flexion stresses thus generated and which, also, distributes load over a wide surface area which reduces the stresses applied to the ground and risks of subsidence.

Patent FR-A-2.685.304 describes several particularly advantageous methods of construction.

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This type of conduit fully withstands internal stresses exerted, in service, by the fluid transported even under very high pressure. However, it may be also be subjected to external stresses exerted, for example, by the filling under which the conduit is buried or simply by atmospheric pressure when internal pressure is reduced or cut off.

For better resistance against external stresses, document FR-A-2.685.304 proposes giving the conduit a half-round shape. However the diameter of such a conduit is evidently double the diameter of a circular section conduit for the same flow rate. The conduit passage and consequently the width of the trench in which it is laid are therefore increased.

As indicated in patent FR-A-2.685.304 it is possible in certain cases to approximate a circular section as far as possible to cover a sector of more than 180° whose area, for example, may reach three quadrants for example, the width of the concrete slab thereby being reduced.

However, by increasing the sector covered by the circular part, the risk of distortion is also increased especially of the side panels during assembly so that it is difficult to align these panels for welding, the use of a template being necessary in practice.

Also, this conduit must be placed on dug foundations whose levelling is not very precise. On-site handling and banking operations must be simplified as much as possible.

Also, even when the conduit is in service mere reduction in internal pressure or even a mere

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hollowing effect may cause collapse of the metal part under the embankment load.

The invention brings a solution to such problems with a new method of construction which remedies the described disadvantages while maintaining the advantages of the known art.

The invention therefore relates to the construction of a conduit for the transport of fluid under internal pressure comprising, generally, a tubular enclosure for fluid circulation limited by a thin wall applied on a rigid base slab in moulded material, said enclosure being comprised of juxtaposed panels mounted along their adjacent sides and comprising, in its cross- section, a lower part applied and fixed to the rigid slab and a incurved arch-shaped upper part connecting to the lower part along two lateral sides fixed on the slab, said slab comprising an upper surface for fixing the tubular enclosure , a lower surface resting on the ground and two side surfaces.

In accordance with the invention the upper part of the enclosure, in its cross-section, is formed of at least three segments of thin wall respectively two lateral segments each extending from a lower side to an upper side, and at least one upper segment closing the enclosure connecting to the upper sides of the lateral segments and each lateral segment of thin wall is joined to a rigid supporting element in moulded material fixed at its base to the corresponding side of the slab and extending upwards, each support element comprising an inner surface for application to the lateral segment having a profile conjugate with the latter and extending from the level of the upper surface of the slab to a level that is sufficient to maintain the rigidity of said lateral segment over its entire height without any risk of collapse even under the weight of the upper segment and in the absence of internal pressure.

In particularly advantageous manner the thickness of the thin wall is determined in relation to its ability to withstand both tensile stresses generated by the application of internal pressure and external forces exerted by trench filling or atmospheric overpressure. The height of the upper sides of the lateral segments is determined so that the upper segment spanning said upper sides may be constituted of a single, sufficiently rigid panel so that there is no risk of its collapse under its own weight when mounted on said side segments.

Under a preferable method of construction each support element, below the level of the upper surface of the slab and on the side of the latter, is limited by an inner lateral surface of which at least one part is applied against at least one corresponding part of the opposite lateral surface of the slab, said lateral surfaces having conjugated profiles.

Both support elements are advantageously placed on the ground either side of the slab each by means of a base with a level lower surface of sufficient width to enable said element to stand upright before being joined to the slab.

According to another advantageous provision of the invention, the two support elements placed either side of the slab are joined to the latter either by anchor pegs or by prestress cables passing through sheaths provided inside the support elements and the slab during casting following a profile that is substantially parallel to that of the corresponding parts of the enclosure, said prestress cables after tightening being stayed on support surfaces provided during casting on the support elements at the end-point of said sheaths.

To achieve leakproof assembly between the metal panels, the facing lateral edges of each lateral segment and the lower segment of the thin wall are separated a certain distance from the joint plane leaving a space either side of the latter into which a φοιντ–χοωερ is placed that is welded, after mounting, to the lateral segment and the lower segment so that the continuity of the enclosure wall is restored.

According to another advantageous characteristic the upper segment of thin wall closing the enclosure at the top is of greater width than the distance between the upper parts of the lateral segments so that it overlaps the latter over a certain distance and two lines of welding are made, after assembly, on both the inner and outer surfaces of thin wall along the upper edges respectively of each lateral segment and upper segment.

Other advantageous characteristics are the subject of the subclaims.

But the invention will be better understood with the following description of certain particular methods of construction given by way of illustration and shown in the appendixed drawings.

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Figure 1 is a general, perspective view of a length of conduit in accordance with the invention.

Figure 2 is a cross-section view of such a conduit under a preferable method of construction.

Figure 3 is a detailed perspective view of a transverse assembly joint.

Figure 4 and Figure 5 are detailed cross-section views showing other methods of joint assembly between a support element and the slab.

Figure 6 is a cross-section view of another method of construction of the conduit.

In Figure 1 is shown a length of conduit according to the invention which comprises, generally, a metal tubular enclosure 1 fixed onto a rigid slab in reinforced concrete 2 comprising a level lower surface 1, two lateral surfaces 22, 22′, and an upper surface 23.

The enclosure is laid on a levelled, compressed surface which may, for example be the bottom B of a trench C, the enclosure being covered by filling material after construction.

The tubular enclosure 1 is limited by a thin metal wall, fully closed in its cross section, which comprises a lower part 11 applied to the upper surface 23 of slab 2 and an upper part 12 of cylindrical shape centred on a longitudinal axis 10.

The lower part 11 which runs between the two lateral edges 24, 24′ of slab 2 is level or slightly incurved. The upper part 12, in its cross section, covers a circular area and extends between the two lateral edges 24, 24′ at an angle A of more than 180°.

The metal tubular enclosure 1 is made of juxtaposed panels soldered along their adjacent sides, which, normally, in cross-section, cover four segments of wall, respectively one lower segment 11 extending the length of slab 2 between the two lateral edges 24,24′ of said slab, and three segments 13,13′,14 constituting the upper part 12 of the enclosure, respectively two lateral segments 3, 3′ and an upper segment 4.

Each lateral segment 3, 3′ rises vertically between a lower edge 31 extending the length of the corresponding lateral edge 24 of the lower part 11, and an upper edge 32, located at a height H1 above said lateral edge 24.

The upper element 4 covers an arch whose span is slightly greater than the distance between the upper edges 32, 32′ of lateral segments 3, 3′ so that the end 41,41′ of the upper segment 4 overlap over a certain distance the ends 32, 32′ of lateral segments 3, 3′.

The upper segment 4 therefore forms a metal dome resting on the two lateral segments 3, 3′ which may be suspended from a leverage bar either by clips that fix onto lateral edges 41,41′ or by hooks hooked onto anchor points provided for this purpose on the metal dome.

However, the height H1 of the upper ends 32 of the lateral segments 3 is determined so that the distance D between the lateral ends 41, 41′ of the dome is sufficiently short to avoid excessive distortion of the latter under its own weight taking into account the type of metal which constitutes the metal wall, its thickness and its rigidity.

In accordance with the major characteristic of the invention, each lateral segment 3, 3′ is applied to a support element 5,5′ made of an extended length of reinforced and/or prestressed concrete that can be placed adjacent to slab 2 and comprises an incurved surface 51 whose profile is conjugate with that of lateral segment 3 which can therefore be applied and fixed to support element 5 along the whole length of surface 51. The latter extends over the major part of the length of lateral segment 3 from its lower end 31. In this manner, only a short length 33 of lateral segment 3 rises upwards from the upper end level 52 of support element 5 and as far as the upper end 32 of element 3. The height H2 of the support surface 51 is determined in such manner as to maintain the rigidity of the lateral segment 3 over its entire height, the length of the overhanging end 33 being sufficiently short so that it does not distort even under the weight of the upper dome 4.

If required, support clamps 34 in the shape of incurved corner-bars could be bolted onto the upper surface 52 of support element 5 to maintain the rigidity of the end 33 of lateral segment 3.

With this method of construction slab 2, like the support elements 5, 5′, is made of prefabricated parts placed end to end. The segments of thin wall 3,11 may be joined, during casting, to the parts in concrete 5,2 which are advantageously flat cast. Each metal surface 3,11 therefore constitutes the casting base and is fitted with projecting anchor points 17 which are sunk in the concrete during casting. After casting, the concrete element fitted with the corresponding metal surface is inverted to constitute slab 2 or placed upright to constitute a support element 5, 5′.

Such a conduit may be constructed as work advances in successive lengths, in the following manner:

- incurved elements of thin wall are cut and shaped covering respectively at least four segments of the circumference of the tubular enclosure 1, respectively two lateral segments 3, a lower segment 11 and an upper segment 4,

- in advance, and in required numbers, are prepared two types of prefabricated elements in reinforced concrete which are each fitted on one surface with a segment of thin wall constituting one-off shuttering embedded in the concrete, respectively elements of slab 2 in reinforced concrete covered by a lower segment 11, and support elements 5 having an incurved surface covered by a lateral segment 3,

- these prefabricated elements having been delivered on-site in required numbers to build a new length of conduit to continue the part already built, an element of slab 2 is positioned on the laying surface B with two support elements 5, 5′ aligning them with the corresponding elements of the part already laid and by applying one against the other the facing lateral surfaces of support elements 5 and slab 2,

- welding is carried out both between the segments 11, 3, 3¢ of the length which has just been laid along the lower sides 31, 31′ and upper sides 32,32¢, and, in the transverse junction plane P, between each segment 3, 11 of the new length and the corresponding segments 3a, 11a of the part already laid, along their adjacent sides.

- the upper segment of wall 4 is placed on the upper ends 32, 32′ of lateral segments 3, 3′ and said upper segment 4 is soldered longitudinally to lateral segments 3, 3′ and transversely to the upper segment of the part already laid.

Preferably each support element 5 rests directly on the ground on its level surface 53 and is provided, below the application surface 51 of segment 3 with a support surface 52 which is applied against the corresponding lateral surface 22 of slab 2.

The application of support elements 5 against slab 2 can be made, for example, by means of a number of pegs 6 passed through openings 60 provided in the lower part of support elements 5,5′ whose ends 61 screw into threaded bores 62 made of inserts which are embedded during casting to the sides of slab 2. But it is also possible to use rods crossing through the entire unit formed by slab 2 and the two support elements 5.

In the simplest method of construction shown in Figure 1, the two lateral surfaces 22, 22′ of slab 2 are level as are the support surfaces 52,52′ of support elements 5, 5′.

Figure 2 shows a more improved method of construction in which the lateral surfaces 22, 22′ of slab 2 and the conjugate surfaces 52, 52′ of support elements 5 have a staggered profile comprising, in its central part, inclined or horizontal surfaces, respectively 25,55 which interlock to prevent relative movement of the support elements in relation to the slab.

It will be noted that the staggered surfaces 22, 52 may advantageously be reinforced by metal walls which serve as one-off shuttering and assure the perfect application of the two conjugate surfaces one on another and, also, avoid deterioration risks during handling of prefabricated components.

With the above provisions, the support elements 5, 5′ are perfectly held in place by interlocking with the sides of slab 2, with no risk of displacement in relation to the latter which creates favourable welding conditions for assembly with lateral segments 3, 3′ and the lower segment 11 of the thin wall.

To improve this junction, it is advantageous to terminate the lower edge 31 of each lateral segment 3, 3′ and the opposite edge 11′ of lower segment 11 a certain distance away from either side of joint plane Q between the slab and the support element, in such manner as to leave two aligned slots 36,16 of substantially similar thickness to that of the thin wall in which a φοιντ–χοωερ 7 is placed made of a metal strip of the same thickness and angled to form two wings 71,72 connecting tangentially to respectively the lower end of lateral segment 3 and the corresponding end of lower segment 11 of the thin wall.

As indicated in Figure 2, the two sides 36,37 of the slot may be made of cranked parts provided along the ends facing the thin wall segments 3, 11.

In this way each joint-cover 7 assures the continuity of the metal wall the only inward projection being welding lines 73,73′ made between the lateral edges of joint-cover 7 and the inner edges of the cranked parts, respectively 36,16 of lateral segment 3 and lower segment 11.

Along the transverse joints 35 between the adjacent elements, the metal segments may be welded end to end. In particular, as shown in Figure 1, the support element in concrete 5 need not necessarily cover the entire length of the corresponding metal wall 30 and the latter may therefore extend beyond the ends to facilitate welding.

But it is also possible, as shown in Figure 3, to provide cranked parts 37 37a on the ends opposite adjacent segments 3,3a,11, 11a to limit a slot in which is placed a joint-cover strip 77. Said strip may be placed on the outside to facilitate its assembly or on the inside like the longitudinal strips 71 if it is wished to avoid projecting parts inside the conduit

To avoid cross welding it is possible to stagger the transverse joint planes both between lateral segments 3, 3a and between upper segments 4, 4a and lower segments 11, 11a.

It is to be noted that the application one on another of lateral surfaces 22,52 of the slab and support elements may only be made through one part 22a,52a of these surfaces in which openings are provided for pegs 6 with interpositioning of a compressible gasket 64 surrounding the peg.

Each peg 6 is preferably perpendicular to application surfaces 22a,52a as shown in Figure 2. However, it may be advantageous , in certain cases, to incline peg 6 in relation to application surfaces 22a, 52a as shown in Figure 4.

To lighten slab 2 and to improve its resistance to flexion stresses generated by the

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application of internal pressure, it is advantageous to subject it to transverse prestress.

In this case, pegs 6 serve essentially for the provisional maintaining of support elements 5 which are definitively joined to slab 2 by prestress cables 8 which surround the lower part of the conduit by passing through sheaths 80 in-built during casting in slab 2 components and support elements 5 and which connect tangentially in joint planes. Each prestress cable 8 is fitted with an anchor head 81 which is stayed on a corresponding surface 57 provided on the outer side of support element 5 perpendicular to the direction of the cable at the exit of the latter

Also, sheaths 83 parallel to axis 10 of the conduit may be provided in slab 2 and, if necessary, in support elements 5 to allow the passage of cables 82 which, after tightening, join together adjacent conduit lengths with overall longitudinal prestress providing , in particular, for better resistance to differential subsidence.

On the upper part, as previously indicated, each dome 4 element merely offers a width that is greater than the distance between the upper ends 32, 32′ of lateral segments 3, 3′ so that it overlaps the latter, and welding lines 74,75 are made on the inside along edges 32, 32′ and lateral segments 3, 3′, and on the outside along edges 4, 4′ of dome 4.

To improve the stability of support elements 5 it may be advantageous to provide the latter, at their base, with shoe-shaped parts which extend outwards to widen the lower surface 53 of each element 5.

Also, such shoes improve the stability of support element 5 by preventing it from falling outwards before it is banked.

Needless to say the invention is not restricted to the details of the methods of construction which have just been described by way of simple illustration, other variants may be contemplated which do not extend beyond the protection limits defined by the claims.

For example, in another method of construction using the so-called "confined concrete" technique, each slab 2 component is limited on all its surfaces by a closed metal wall covering not only upper surface 11, but also lower surface 21 and lateral surfaces 22 so as to constitute a hollow caisson which is filled with concrete under slight overpressure to compensate withdrawal. In this case the reinforcements may dispensed with as they are replaced by the walls of the caisson.

But slab 2 may also be cast on-site, as work progresses, between two shutterings or else between internal surfaces 52, 52′ of support elements 5, 5′. In this case, the lower part 11 of the metal wall may be made of cut segments which are applied to the concrete before it is set. The previously cast concrete slab may also be provided with hollow spaces filled with mortar into which are inserted anchor parts welded to the lower surface of each wall segment 11, filling cement then being injected between the metal segment and the upper surface 23 of the slab to assure interlocking and the transmission of pressure forces.

In such a case, for example, after constructing a certain length of conduit and preparing a levelled laying surface for its continuation, firstly support elements 5, 5′ are positioned fitted respectively with lateral segments 3, 3′ aligning them with the part already laid and the adjacent lateral segments are welded along their transverse edges 35. Then the ironwork of slab 2 is placed in position, and, when applicable, the prestress sheaths that are placed in line with the corresponding sheaths provided in side elements 5, 5′• The concrete slab is then cast in which is embedded lower segment 11. The prestress cables are then positioned and tightened and, the different elements being properly applied, segment 11 is welded along its transverse edge 15 to segment 11a of the part already laid and along its lateral edges to edges 31 of the lateral segments 3, 3′.

Dome 4 can then be positioned and welded to dome 4a already in position and to lateral segments 3, 3′.

Also, the staggered profile of lateral surfaces 22, 52, of slab 2 and of support elements 5, 5′ can be inverted as shown in Figure 4, slab 2 in this case being fitted with lower rims 26 which pass under the upper rims 56 of support element 5. With this configuration it is possible when building a new length of conduit to position firstly one or several slab components to continue the part already laid by connecting them to the latter, possibly, with prestress bars and then laying the required number of support elements 5, 5¢ either side of the slab to constitute a reference construction line.

As indicated in Figure 5, the lateral edges facing each support element 5, 5′ and slab 2 may be covered by corner protections , which constitute one-off shuttering and on which are welded ends 31, 11′ of wall segments 3, 11 which are terminated at a certain distance from joint plane Q to provide the two sides 36,16 with a slot in which the joint-cover 7 is placed.

Also, it may be advantageous , in particular to reduce the width of trench C, to mount pegs 6 from inside the conduit as shown in Figures 5 and 6.

In this case, to construct a new length of conduit the two support elements 5, 5′ are first positioned in line with the corresponding components of the part already laid. Support elements 5, 5′ are fitted with lower rims 54 in which were embedded inserts 62 with inner threading.

After placing joints 64 at the outlet of each insert 62, slab components 2 are laid which interlock between support elements 5 5′ and which have openings 60 in line with inserts 62.

Pegs 6 are then placed in position whose head 63, which may be a screw, is housed in a slot 27 provided in the upper surface of slab 2.

After tightening pegs 6, joint-cover 7 is placed in position and welded to corner protections 28,58.

It will be noted that, in the event of strong landslide risks, upper segments 4 may be mounted on lateral segments 3, 3′ as soon as slab 2 components are laid so that on-site workers may be protected during peg fixing and joint welding operations.

According to another advantageous characteristic shown in Figure 6 the passage openings 60 of pegs 6 cross entirely through slab 2 and support elements 5. After placing prefabricated components in position, it is possible to make boreholes in the ground in which tie-rods 6′ of long length are embedded. Such provision may be used for example in the event that the conduit passes through underground water and there is a risk that the ballast effect provided by support elements 5, 5′ and slab 2 does not sufficiently compensate for Archimede's thrust.

As Figure 6 also shows, it is also possible for slab 2 to be less thick than lateral surfaces 52 of support elements 5, 5′ so that slab 2 does not rest on the ground but only on support elements 5, 5′ by means of upper rims 26a. The profile of slab 2, in cross-section, in this case need only be designed so that it may, taking into ironwork, be able to withstand flexion stresses applied by lower segment 11 subjected to the pressure prevailing within the enclosure.

The reference signs inserted after the technical characteristics given in the claims are given solely for the purpose of a better understanding of the latter and are not in any way restrictive.

CLAIMS

1. Conduit for the circulation of fluid under internal pressure comprising, generally, a tubular enclosure (1) limited by a thin wall (1) fixed on a rigid base slab (2) in moulded material, said enclosure (1) being comprised of a number of juxtaposed panels mounted along their adjacent sides, and comprising, in its cross-section, a lower part (11) applied and fixed to the rigid slab (2) and an upper part (12) incurved in an arch-shape which connects to the lower part (11) along two lateral sides (31, 31') for fixture on the slab, said slab comprising an upper surface (23), a lower surface (21) and two lateral surfaces (22, 22').

characterized in that the upper part (12) of the enclosure (1) is comprised of, in its cross section, at least three segments of thin wall, respectively two lateral segments (3, 3') each extending from a lower side (31) to an upper side (32) and at least one upper segment (4) closing the enclosure (1 connecting to the upper sides (32,32') of lateral segments (3,3') and in that each lateral segment of thin wall (3,3') is joined to a rigid support element (5,5') in moulded material fixed at its base to the corresponding side of slab (2) and rising to the top of each support element (5,5') comprising an inner surface (51,51') facing the enclosure (1) having a profile conjugate with that of the lateral segment and on which the latter is applied, said inner surface (51, 51') extending from the level of the upper surface (23) of slab (2) as far as level (H2) of sufficient height to maintain the rigidity of said lateral segment over its entire height (H1) without risk of collapse even under the weight of upper segment (4) and in the absence of internal pressure.

2. Conduit under pressure according to claim 1, characterized in that the thickness of the thin wall (1) is determined in relation to the ability of the latter simply to withstand tensile forces generated by the application of internal pressure, and in that height (H1) of upper sides (32, 32') of lateral segments (3,3') is determined so upper segment (4) spanning said upper sides may be comprised of a single panel sufficiently rigid to avoid the risk of collapsing under its own weight when mounted on lateral segments (3,3').

3. Conduit under pressure in accordance with either of claims 1 and 2 characterized in that both support elements (5,5') are laid on the ground either side of slab (2) each by means of a base with a level lower surface (53).

4. Conduit under pressure in accordance with any of claims 1 to 3, characterized in that each support element (5,5') is limited, below the level of the upper surface (23) of slab (2) and on the side of the latter by an inner lateral surface (52) of which at least part (52a) is applied against at least one corresponding part of the opposite lateral surface (22) of slab (2), said lateral surfaces (22) of the slab and (52) of support elements (5) having conjugate profiles.

5. Conduit under pressure in accordance with claim 4 characterized in that each support element (5, 5') is combined with means (6,8) of joining support elements (5,5¢) to slab (2) by applying one to another at least corresponding

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parts (52a,22a) of conjugate lateral surfaces (52,22).

6. Conduit under pressure in accordance with claim 5 characterized in that the means of joining the two support elements (5,5′) to slab (2) are comprised of a number of transverse prestress cables passing through aligned sheaths (81) provided inside support elements (5) and slab (2) during casting and following a profile substantially parallel to that of the corresponding parts of the enclosure, said prestress cables (8) being stayed, after tightening, on stay surfaces (57′) provided on the support element during casting at the exit of said sheaths (81).

7. Conduit under pressure in accordance with claim 5 characterized in that the means (6) of joining support elements (5,5′) to slab (2) are comprised of a number of pegs (6) running transversely as far as the conjugate application parts (52a, 22a) of said lateral surfaces and distributed over the length of each element (5), each peg (6) being stayed at one end (63) on support element (5) and at the other end (61) on slab (2), or inversely.

8. Conduit under pressure in accordance with claim 7, characterized in that each interlocking peg (6) passes through a line of openings provided in support element (5) and slab (2) and comprises an inner end (61) embedded in slab (2) and a stay head (63) stayed on support element (5) or inversely.

9. Conduit under pressure in accordance with claim 8, characterized in that tie pegs (6) are positioned from the outside each being

supported by its head (63) on the outer lateral surface (50) of support element (5).

10. Conduit under pressure in accordance with any of claims 4 to 9, characterized in that the conjugate lateral surfaces (52) (22) of each support element and slab (2) have a staggered profile providing, along said conjugate lateral surfaces (52) (22), respectively projecting and recessed parts which interlock.

11. Conduit under pressure in accordance with claim 10, characterized in that conjugate lateral surfaces (52) of support elements (5) and (22) of slab (2) comprise, in their central part, an application part (52a) (22a) forming an angle of less than 45° with the horizontal line.

12. Conduit under pressure in accordance with either of claims 10 and 11 characterized in that the internal lateral surface (52) of each support element (5) comprises, at its base, a lower projecting rim (54) which inserts below a corresponding rim (25) provided in the upper part of the corresponding lateral surface (22) of slab (2).

13. Conduit under pressure in accordance with claim 12 characterized in that slab (2) has a thickness of less than the distance between the lower part (11) of wall (1) and ground (B) and is supported, by its upper rims (25), on two surrounding support elements (5,5').

14. Conduit under pressure in accordance with any of claims 10 to 13, characterized in that the tie pegs (6) are placed from within the inside of the enclosure (1) and cross through the application parts (52a, 22a), each tie peg (6)

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being supported by its head (63) on the upper surface (23) of slab (2).

15. Conduit under pressure in accordance with claim 14 characterized in that tie pegs (6) are extended so that they reach the bore-holes provided in the underlying ground and are embedded in it.

16. Conduit under pressure in accordance with any of the above claims characterized in that the lower edge (35) of each lateral segment (3) of thin wall and the corresponding lateral edges (11′)of the lower segment (11) applied to slab (2) are separated over a certain distance from joint plane (Q) between the support element (5) and slab (2) leaving, either side of said joint plane (Q), a slot covered by a joint-cover (7) which is welded, after mounting, to lateral segment (3) and lower segment (11) in such manner as to restore the continuity of the inner surface of the enclosure.

17. Conduit under pressure in accordance with claim 16 characterized in that the ends (35) opposite each lateral segment (3) and (11′) lower segment (11) are provided with cranked parts (36,16) limiting the slot in which the joint-cover is placed (7).

18. Conduit under pressure in accordance with any of the above claims characterized in that the upper segment (4) of thin wall closing the enclosure at the top is of greater width than the distance between the upper ends (32, 32′) of lateral segments (3,3′), so that it overlaps the latter over a certain distance, two lines of welding (74,75) being made after assembly on both surfaces respectively inner and outer of thin wall

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along the ends, respectively, of each lateral segment (3) and upper segment (4).

19. Method of construction of a conduit for the transport of fluid laid on a levelled, compressed surface (B) made of a tubular enclosure limited by a thin wall and fixed on a rigid base slab in moulded material characterized in that :

- incurved components of thin wall are cut and shaped covering respectively at least four segments of the circumference of the tubular enclosure (1), respectively two lateral segments (3), a lower segment (11) and an upper segment (4),

- in advance and in required numbers are made two types of prefabricated elements in reinforced concrete each fitted on one surface with a segment of thin wall constituting one-off shuttering embedded in the concrete, respectively slab elements (2) in reinforced concrete covered by a lower segment (11), and support elements (5) having an incurved surface covered by a lateral segment (3),

- these prefabricated elements having been delivered on-site in required numbers to construct a new length of conduit to continue the part already laid, on the laying surface (B) are positioned a slab element (2) and two support elements (5,5') positioning them in line with the corresponding elements of the part already laid and applying one to another the facing lateral surfaces of support elements (5) and slab (2),

- welding is made both between segments (11,3,3') of the length that has already been laid, along the lower (31,31') and upper (32,32') sides and, in the transverse junction plane (P) between each segment (3,11) of the new length of conduit and the corresponding segments (3a,11a) of the part already laid along their adjacent sides,

- the upper segment of wall (4) is mounted on upper ends (32,32') of lateral segments (3,3') and said upper segment (4) is welded longitudinally to lateral segments (3,3') and transversely with the upper segment of the part already laid.

20. Method in accordance with claim 19 characterized in that both support elements (5, 5') are placed firstly on the laying surface either side of the longitudinal axis of the conduit and positioned in line with the corresponding elements of the part already laid, then the slab element (2) is placed between said support elements (5,5').

21. Method of construction of a conduit for the transport of fluid laid on a levelled, compressed surface (B) and comprising a tubular enclosure limited by a thin wall and fixed on a rigid base slab in moulded material characterized in that :

- incurved elements of thin wall are cut and shaped covering respectively at least four segments of the circumference of the tubular enclosure (1), respectively two lateral segments (3), a lower segment (11) and an upper segment (4),

- in advance and in required numbers are made support elements (5,5') prefabricated in reinforced concrete each having an incurved surface on which is applied and embedded a lateral segment of thin wall (3) constituting one-off shuttering,

- these prefabricated elements having been delivered in required numbers on-site to construct a new length of conduit to continue the part already laid, on the laying surface (B) are placed support elements (5,5′) positioning them in line with the corresponding elements of the part already laid,

- support elements (5,5′) thus being laid and aligned over a certain distance, a corresponding length of slab (2) is cast between the lateral surfaces (52,52′) of support elements (5,5′) and on said slab (2) are embedded the required number of lower segments (11) of thin wall,

- welding is carried out between segments (11,3, 3′) of the length of conduit just laid, along the lower (31,31′) and upper (32, 32′) sides and, in the transverse junction plane (P), between each segment (3,11) of the new length and the corresponding segments (3a, 11a) of the part already laid along their adjacent sides,

- the upper segment of wall (4) is mounted on the upper ends (32, 32′) of lateral segments (3, 3′) and said upper segment (4) is welded longitudinally to lateral segments (3,3′) and transversely to the upper segment of the part already laid.

22. Method in accordance with any of claims 19 to 21 characterized in that in the event of landslide risks the upper segment (4) is first mounted on ends (32,32′) of lateral segments (3, 3′), then all welding operations are made inside the enclosure (1) thus closed.

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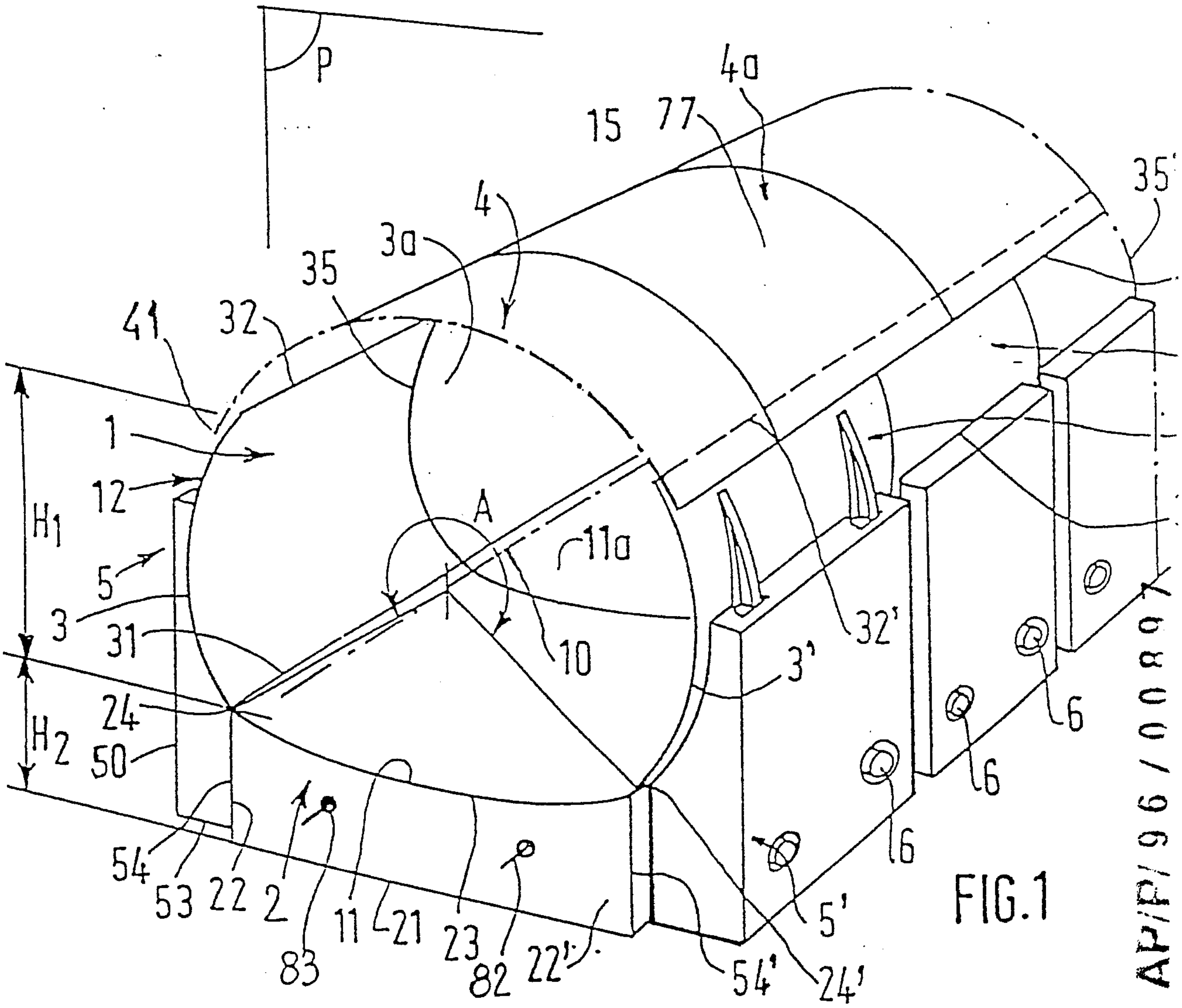

FIG.1

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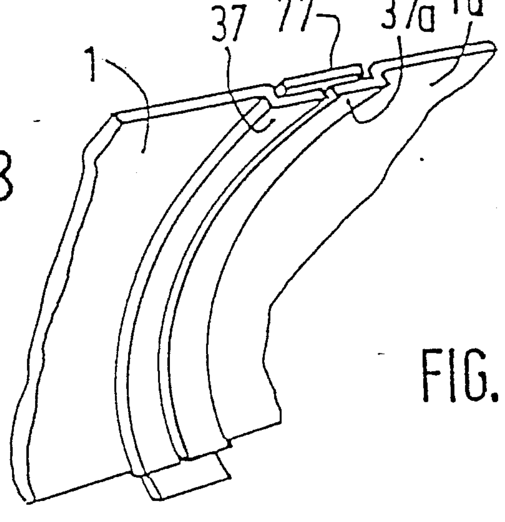


FIG.3

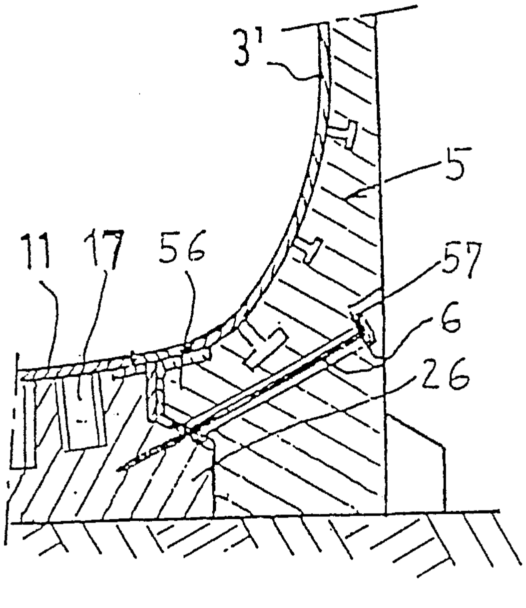


FIG.4

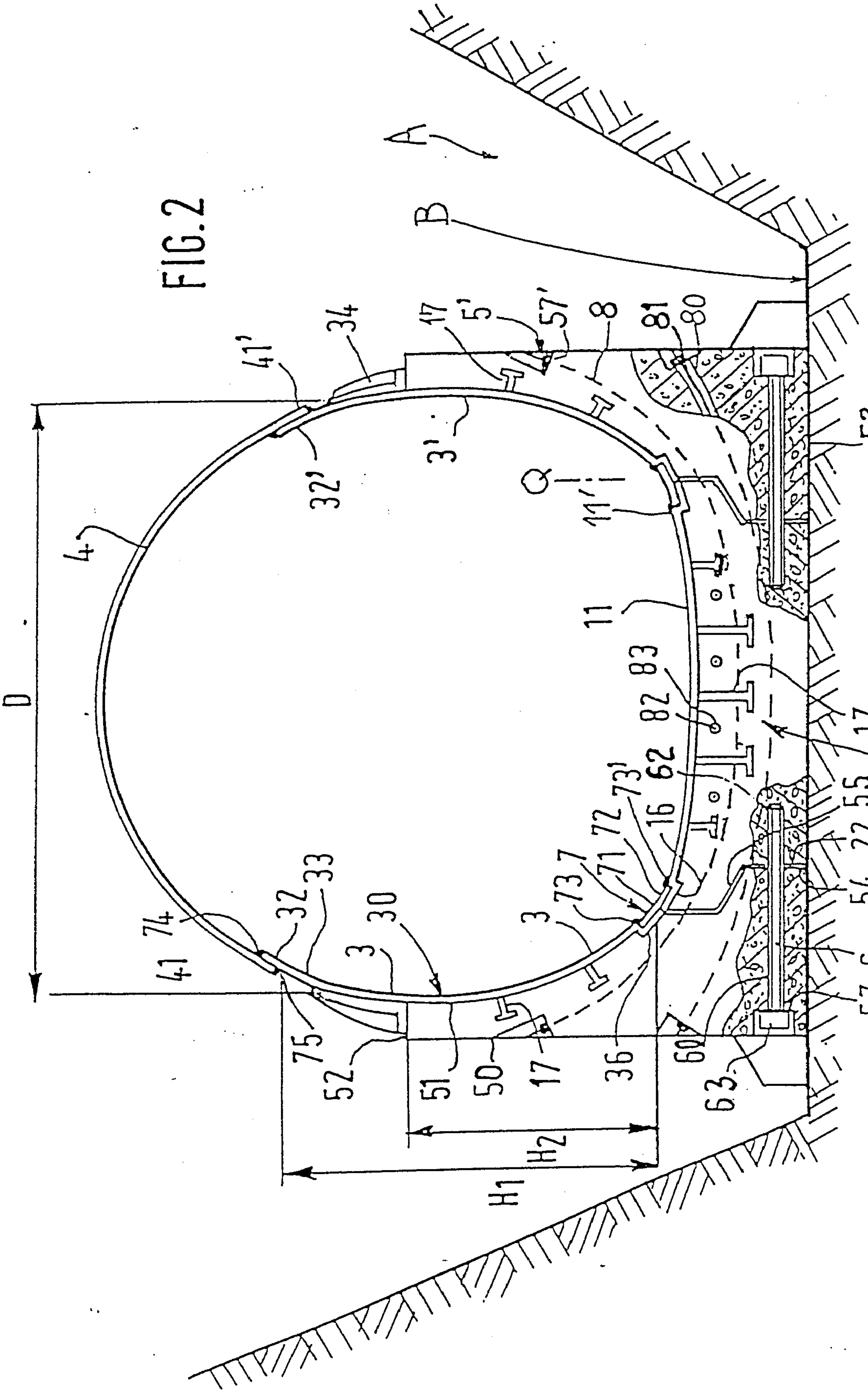

A
B
D
H1
H2
Q
2
3
3'
4
5'
6
8
11
11'
16
17
22
30
32
32'
33
34
36
41
41'
50
51
52
53
54
55
57
57'
60
62
63
71
72
73
73'
74
75
80
81
82
83

FIG. 2

FIG.5

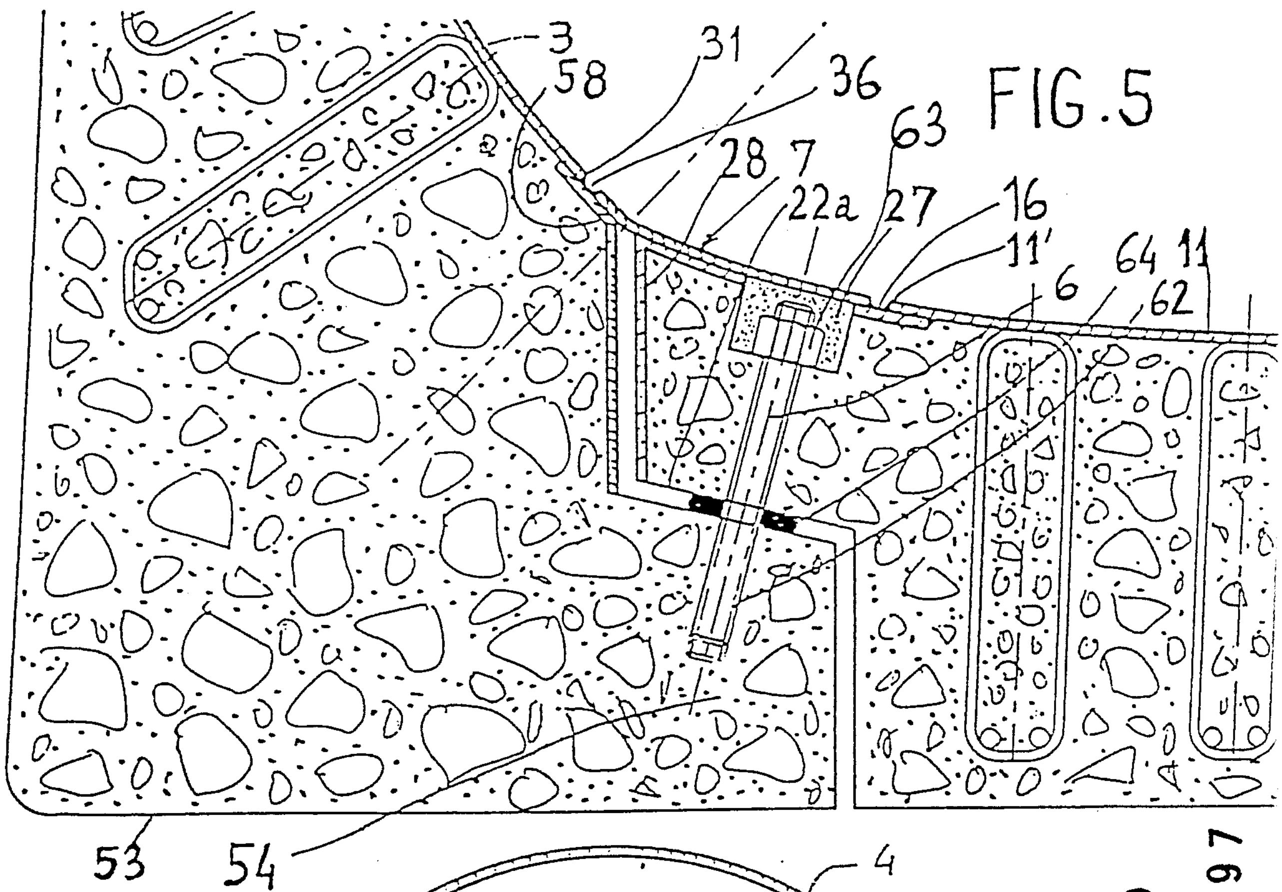
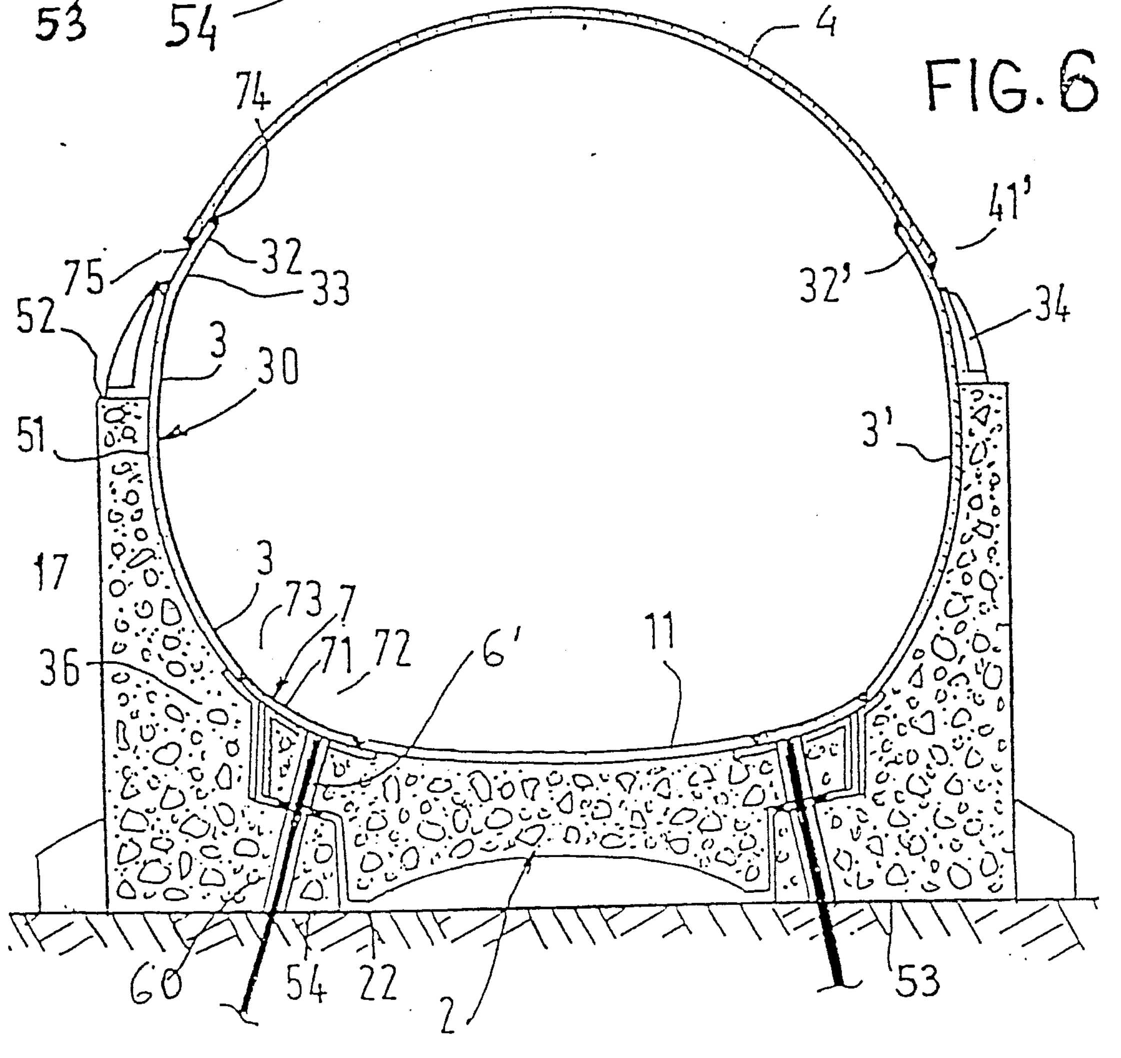

3
58
31
36
63
28
7
22a
27
16
11'
6
64
11
62
53
54

FIG.6


4
74
41'
75
32
33
32'
34
52
3
30
51
3'
17
3
73
7
71
72
6'
11
36
60
54
22
2
53