(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 372 028 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.10.2011 Bulletin 2011/40

(51) Int Cl.:
E02D 29/14 *(2006.01)*

(21) Application number: **11002561.6**

(22) Date of filing: **29.03.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **01.04.2010 IT VI20100092**

(71) Applicant: **S.a.pro. S.r.l.**
36013 Piovene Rocchette (VI) (IT)

(72) Inventor: **Celadon, Giampietro**
36030 Dueville (VI) (IT)

(74) Representative: **Ziliotto, Tiziano**
Studio Ziliotto
Contrada Porta S. Lucia, 48
36100 Vicenza (IT)

(54) **Closing device for manholes**

(57) The present invention concerns a closing device for manholes/traps and the like, comprising a frame and a cover associated with the frame. Said device comprises mutual thrusting means between the cover and the frame.

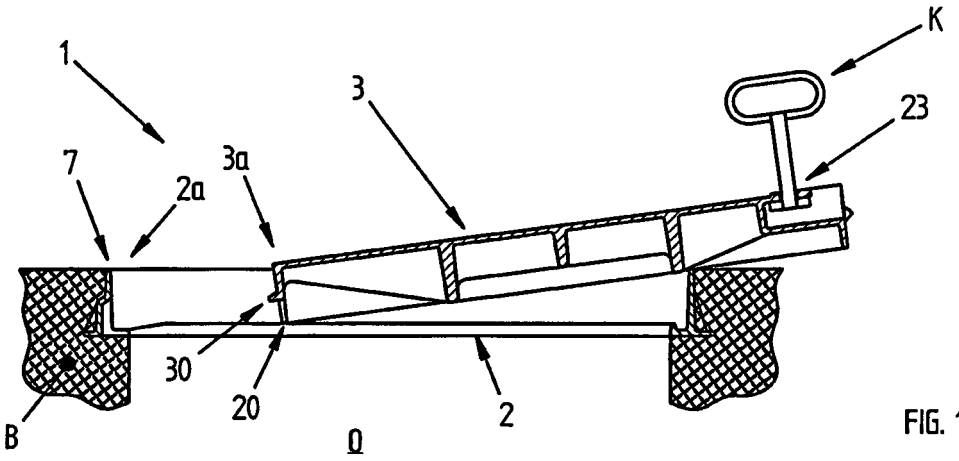

FIG. 13

EP 2 372 028 A1

Description

[0001] The present invention concerns a closing device for manholes/traps.

[0002] In particular, it concerns a closing device for manholes/traps situated along roadways.

[0003] Roads are characterized by the presence of various types of manholes/traps, for example city water system manholes, rainwater traps, sewer system inspection manholes or electric and telephone line manholes.

[0004] Said manholes/traps have a closing device at the top, which is usually square, rectangular or round in shape, and is constituted by a frame that is well anchored to the manhole and by a cover associated with and resting on the frame.

[0005] The cover is therefore removably associated with the frame and when necessary it can be removed in order to inspect the inside of the manhole.

[0006] For this purpose, the cover is provided with means that are suited to make it easier to lift it, for example using adequate tools like a lever or a spanner, so that the cover can be grasped and completely removed from the frame.

[0007] In other closing devices of known type, one or more hinges are interposed between the frame and the cover, and the latter is opened with a rotational movement around said hinges.

[0008] The closing devices, as already explained, are usually positioned along roadways and for this reason they are subjected to continuous and high stress due to the passage of motor vehicles, even heavy ones like trucks, buses, etc.

[0009] For this purpose, closing devices are made using materials with special mechanical characteristics in order to ensure high rigidity and high resistance to wear. A commonly used material is cast iron, laminar or preferably spheroidal graphite cast iron.

[0010] A drawback posed by said closing device is due to the above mentioned continuous stress to which they are subjected, and in particular to the impacts of the cover against the frame caused by the passage of motor vehicles. Over time, said impacts cause the wear of the parts in contact with each other, or even the breakage of the cover or the frame.

[0011] A first known solution to this problem is represented by the interposition of a rubber gasket, normally in neoprene, between the frame and the cover that, when the motor vehicles run over the cover, absorbs the shocks and avoids direct contact between the parts and consequently prevents them from wearing out or breaking.

[0012] This solution, however, poses some drawbacks.

[0013] A first drawback is represented by the fact that the gasket wears out over time, as it is subjected, too, to continuous stress and pressure exerted by the cover.

[0014] This requires a periodical inspection and if necessary the replacement of the gasket, which also involves the related costs.

[0015] The delayed replacement of the gasket may furthermore damage the closing device itself, as the gasket does not serve its useful function and the cover can move and hit against the frame until causing the breakage of the cover, frame, or hinges, if provided.

[0016] The main object of the present invention is therefore to solve the problems that characterize the known solutions.

[0017] In particular, it is one object of the present invention to provide a closing device that is more resistant to stress than the devices belonging to the known art.

[0018] It is another object of the present invention to provide a closing device that lasts longer than the devices of known type.

[0019] It is a further object of the present invention to provide a closing device that needs less maintenance than the devices of known type.

[0020] It is another object of the present invention to provide a closing device that is simpler than the devices of known type.

[0021] The present invention is based on the general consideration that it is advisable to provide closing devices in which the cover and the frame are thrust against each other reducing the clearance between them as much as possible.

[0022] According to a first embodiment, the object of the present invention is a closing device according to claim 1, that is, a closing device for manholes/traps and the like, comprising a frame and a cover associated therewith and comprising means for exerting a mutual thrusting action between said cover and said frame. Advantageously, when the cover is associated with the frame the clearance between the parts is reduced and therefore also the impacts of the cover against the frame are reduced when motor vehicles run over the manhole/trap.

[0023] Further embodiments of the present invention are described in detail in the dependent claims.

[0024] The thrusting means preferably operate in two directions between the cover and the frame.

[0025] Advantageously, between the cover and the frame there is no clearance, neither in the vertical nor in the horizontal direction.

[0026] The thrusting means are preferably associated with the cover and comprise at least one elastically yielding element in the shape of an elastic tab, which is produced together with the cover in a single piece.

[0027] Advantageously, the closing device does not need any additional elements, like gaskets, and the closing and opening operations are simplified.

[0028] Even more preferably, the thrusting means are arranged in three separate areas between the cover and the frame, in order to define a thrusting plane of the cover towards the frame.

[0029] Advantageously, the three thrust areas guarantee a stable and firm support for the cover when it rests on the frame.

[0030] The cover and the frame preferably have a parallelogram shape and the three areas belong to two op-

posite sides of the parallelogram.

[0031] A portion of the cover is preferably in direct contact with a corresponding portion of the frame.

[0032] Advantageously, there is no clearance between the cover and the frame and there are no mutual impacts between the parts when motor vehicles run over the cover. Still advantageously, it is not necessary to add shock absorbing elements like gaskets between the cover and the frame.

[0033] The device preferably comprises aid means suited to house special tools, for example levers or spanners, used to move the cover.

[0034] Further objects, advantages and characteristics, as well as embodiments of the present invention are defined in the claims and will be illustrated below by means of the following description with reference to the attached drawings. In particular:

- Figure 1 shows a plan view from above of the frame of a closing device according to a first embodiment of the present invention;
- Figure 2 shows a plan view from below of the frame shown in Figure 1;
- Figure 3 shows a sectional view according to plane I-I of the frame shown in Figure 1;
- Figure 4 shows a sectional view according to plane II-II of the frame shown in Figure 1;
- Figure 5 shows a sectional view according to plane III-III of the frame shown in Figure 1;
- Figure 6 shows a sectional view according to plane IV-IV of the frame shown in Figure 1;
- Figure 7 shows a plan view from above of the cover of a closing device according to the first embodiment of the present invention;
- Figure 8 shows a plan view from below of the cover shown in Figure 7;
- Figure 9 shows a sectional view according to plane V-V of the cover shown in Figure 7;
- Figure 10 shows a sectional view according to plane VI-VI of the frame shown in Figure 7;
- Figure 11 shows a sectional view of a detail of the cover shown in Figure 7;
- Figure 11 a shows a view of the detail shown in Figure 11;
- Figure 12 shows a sectional view of another detail of the cover shown in Figure 7;
- Figure 12a shows a view of the detail shown in Figure 12;
- Figures from 13 to 17 show the closing steps of the device according to the first embodiment of the invention;
- Figures 15a, 16a, 17a and 17b show sectional views of enlarged details during some operating steps illustrated in the corresponding Figures 15, 16 and 17;
- Figures from 18 to 21 show the opening step of the device according to the first embodiment of the invention;
- Figure 19a shows a sectional view of an enlarged detail of the operating step illustrated in Figure 19;
- Figure 22 shows a second embodiment of the closing device that is the subject of the invention;
- Figure 23 shows a plan view from above of the frame of a closing device according to a third embodiment of the present invention;
- Figure 24 shows a plan view from above of a cover that can be associated with the frame shown in Figure 25;
- Figure 25 shows a variant embodiment of the detail shown in Figure 12a;
- Figure 26 shows a sectional view according to plane VII-VII of the detail shown in Figure 25;
- Figure 27 shows a plan view from above of a variant embodiment of the cover shown in Figure 7.

[0035] Although the present invention is described below with reference to its embodiments illustrated in the drawings, the present invention is not limited to the embodiments described below and illustrated in the drawings. On the contrary, the embodiments described and illustrated herein clarify some aspects of the present invention, the scope of which is defined in the claims.

[0036] A first embodiment of the closing device 1 according to the present invention is described here below with reference to Figures from 1 to 21.

[0037] In the drawings, the closing device 1 is shown while used to close an opening O delimited by an edge B (as shown for example in Figures from 13 to 17). Said edge B can represent the upper portion of a concrete street manhole and the opening O the area to be inspected. It is evident, however, that the edge B may be constituted by the road surface or in general by a ground area where there is an opening O to be inspected.

[0038] Furthermore, the closing device 1 that is described here below is of the solid type, meaning that it is suited to cover the opening O completely and in a substantially tight manner. However, according to variant embodiments of the invention, the closing device can be partially open, for example it can be of the grid type suitable for collecting rainwater.

[0039] The closing device 1 comprises a frame 2 and a cover 3.

[0040] The frame 2 and the cover 3 have a matching and substantially square shape. Variant embodiments of the invention may have different shapes, known especially in the applications for street manholes, for example rectangular or round.

[0041] The frame 2 is anchored to the edge B in a fixed manner, according to techniques that are known in the sector.

[0042] The frame 2 is shown with reference to Figures from 1 to 6.

[0043] The frame 2 comprises four edges 2a, 2b, 2c and 2d, two of which, 2b and 2d, are specular and identical to each other.

[0044] The cross section of the edges 2a-2d is substantially in the shape of an upturned T, as shown in the

sectional views of Figures 3 and 4. In three of the four edges, 2b, 2c and 2d, this cross section features, in a direction towards the centre of the frame 2, a raised portion 5 defining a substantially U-shaped area 6 suited to accommodate the cover 3, as is better illustrated below. The first edge 2a is not provided with said raised portion, as shown in Figure 4.

[0045] The profile of the edges is shaped at the level of three areas 7, 8 and 9 of the frame 2.

[0046] In particular, a first shaped area 7 is defined at the centre of the first edge 2a and, as can be observed in the detail shown in cross section in Figure 5, is provided with a first upper surface 10 that is substantially vertical and substantially parallel to a vertical reference axis V that intersects at right angles the plane defined by the frame 2, a second substantially rectilinear and inclined surface 11 and a third lower vertical surface 12. The inclination angle Al of the second surface with respect to the axis V is 60°.

[0047] In the following part of the description, reference is often made to the vertical axis V that must be understood as a reference axis that intersects at right angles the plane defined by the frame 2 with reference to the frame 2, or as a reference axis that intersects at right angles the plane defined by the cover 3 with reference to the cover 3.

[0048] The second and third shaped areas 8 and 9, equal to each other, are defined in the edge 2c facing the edge 2a where there is said first shaped area 7 and are located in proximity to the side ends of the edge 2c. Said shaped areas 8, 9 are substantially equal to the first shaped area 7 and each of them, as shown in Figure 6, is provided with a first upper surface 13 that is substantially vertical and substantially parallel to the axis V, a second substantially rectilinear and inclined surface 14 and a third lower vertical surface 15. The inclination angle A2 of the second surface 14 with respect to the axis V is 45°.

[0049] The cover 3 is shown with reference to Figures from 7 to 12.

[0050] The cover 3 comprises four edges 3a, 3b, 3c and 3d, two of which, 3b and 3d, are specular and identical to each other.

[0051] The four edges 3a-3d are defined by a side surface 20 that is substantially vertical and substantially parallel to the axis V, which substantially defines the cover 3, as shown in Figure 8 and in the sectional view of Figure 9. In addition to the side perimeter surface 20, the cover 3 is provided with further internal vertical walls 21 forming ribs that give the cover 3 a higher structural rigidity. Said ribs 21 are present in the lower part of the cover 3, to be understood as the part that faces the opening O when the cover 3 is installed on the frame 2. The upper part of the cover 3 is provided with a plurality of projections 22, whose height is in the order of a few millimetres, with suitable shape and orientation, thanks to which the cover 3 shows the desired characteristics in terms of grip and noise when the wheels of motor vehicles pass over it.

[0052] Always on the upper part of the cover 3 there is a shaped hole 23 for the insertion of an opening key K, while in proximity to the third edge 3c there is an opening 24 that occupies partially the side surface and partially the upper part of the cover 3 in order to allow the insertion of the tip of an opening lever L, as better illustrated below and as visible for example in Figure 18.

[0053] At the level of three areas 27, 28, 29 of the edges of the cover 3 (Figure 8), aligned with the three shaped areas 7, 8, 9 of the frame 2 when the cover 3 is installed on the frame 2 itself, there are tab-shaped projecting elements 30, 31, 32. The three shaped areas 7, 8, 9 of the frame 2 constitute, as is better illustrated below, seats suited to accommodate the corresponding three tabs 30, 31, 32.

[0054] In particular, a first tab 30 is defined at the centre of the first edge 3a between two open areas 30a and 30b created in the edge 3a, as shown in Figure 11a in the view of the first area 27 of the edge 3a. As can be better observed in the sectional view of the detail of Figure 11, the first tab 30 is provided with a first upper surface 33 that is substantially vertical and substantially parallel to the axis V and a second surface 34 that is substantially rectilinear and inclined and extends towards the outside with respect to the first upper surface 33. The inclination angle B1 of the second surface 34 with respect to the axis V is 120°.

[0055] Two tabs 31, 32, equal to each other, are defined in the edge 3c facing the edge 3a where there is said first tab 30 and are located in proximity to the side ends of the edge 3c. Each one of said tabs 31, 32 is defined between two open areas 31a, 32a and 31b, 32b created in the edge 3c, as shown in Figure 12a in the view of the areas 28, 29 of the edge 3c. Each tab 31, 32, as can be better observed in Figure 12, is provided with a first upper surface 35 that is substantially vertical and substantially parallel to the axis V, a substantially rectilinear and inclined second surface 36 that extends towards the outside with respect to the first upper surface 35 and connected to it through a rectilinear section 37, a substantially rectilinear and inclined third surface 38 and a fourth lower surface 39 that is substantially vertical and substantially parallel to the axis V.

[0056] The inclination angle B2 of the second surface 36 with respect to the axis V is equal to 135° and the inclination angle B3 of the third surface 38 with respect to the axis V is equal to 45°.

[0057] The three tabs described, 30, 31, 32 are made together with the cover 3 in a single piece, in particular the whole cover 3 is made of spheroidal graphite cast iron of type GS500-7, and they are elastically yielding thanks to the respective open areas 30a and 30b, 31a, 32a and 31b, 32b, in particular they are yielding in the direction towards the centre of the cover 3 (indicated by the arrow C in Figures 11 and 12).

[0058] Figures from 13 to 17 show the sequence of the closing steps of the device 1 of the invention, with the coupling of the cover 3 to the frame 2.

[0059] The movements of the cover 3 are carried out by the operator by means of a key K to be introduced in the shaped hole 23 provided in the cover 3.

[0060] In the first step (Figure 13) the cover 3 is made slide on the frame 2 while resting it on the side perimeter surface 20 of the first edge 3a where the first tab 30 is provided. The cover 3 is then pushed until the first edge 3a comes into contact with the first edge 2a of the frame 2 and the first tab 30 comes into contact with the first shaped area 7 (Figure 14). From this position, the cover 3 is lowered towards the frame 2 with a rotational movement (Figure 15). In the intermediate position shown in Figure 15 and better illustrated in the detail of Figure 15a, the second and the third tab 31, 32 of the third edge 3c come into contact, with their third inclined surface 38, with the first upper surface 13 of the corresponding shaped area 8, 9 of the frame 2. The inclined surface 38 and the elasticity of the tab 31, 32 determine a movement of the tab 31, 32 towards the centre of the cover 3, as shown in Figure 16a, and its sliding movement along the first upper surface 13 of the shaped area 8, 9 as the cover 3 is lowered. This sliding step continues until the lower part of the side perimeter surface 20 of the third edge 3c of the cover 3 rests on the U-shaped area 6 suited to accommodate the third edge 3c of the frame 2 (Figure 17 and Figure 17b). The key K is then removed from the shaped hole 23 (Figure 17). In this condition, as shown in the detail of Figure 17b, the second inclined surface 36 of the tab 31, 32 comes against the second inclined surface 14 of the shaped area 8, 9 of the frame 2. Analogously, as shown in Figure 17a, in the opposite edge 3a the second inclined surface 34 of the first tab 30 rests against the second inclined surface 11 of the first shaped area 7 of the frame 2.

[0061] Therefore, the three tabs 30, 31 and 32, in said closed position of the cover 3, determine, thanks to their elasticity, a thrusting action of the cover 3 against the frame 2. More particularly, as shown in Figures 17a and 17b, the inclination of the contacting surfaces of the tab 30, 31, 32 on one side and of the shaped area 7, 8, 9 on the other side, determine a corresponding inclined thrusting force Fs. Said thrusting force Fs can be divided into a first vertical thrust component Fv along the direction V and a second horizontal thrust component Fo that substantially lies on the plane defined by the cover 3.

[0062] The thrust component Fv acts on the cover 3 so as to maintain it in contact with the frame 2 in a stable manner, in particular the side perimeter surface 20 of the cover 3 is maintained firmly and directly resting on the U-shaped area 6 suited to accommodate the frame edges.

[0063] Advantageously, along the vertical direction V there is no clearance between the cover 3 and the frame 2 and when motor vehicles pass over the cover 3 there are no mutual impacts in that direction V between the cover 3 and the frame 2. In this way the mutual wear of the parts and the risk of breaking them are reduced. Analogously, the horizontal thrust component Fo acts on the cover 3 so as to keep it in contact with the frame 2 in a stable manner, in particular along the horizontal direction O between the two opposite edges 2a, 2c and 3a, 3c. Along said vertical direction O, therefore, there is no clearance between the cover 3 and the frame 2, and when motor vehicles run over the cover 3 there are no mutual impacts in that direction O between the cover 3 and the frame 2. This further reduces the mutual wear of the parts and the risk of breaking them.

[0064] The extent of the thrusting force Fs and its division into the two components Fv and Fo depends, on one side, on the elasticity characteristics of the materials used for making the tabs and, on the other side, on the inclination angles A1, A2, B1, B2 of the inclined surfaces in contact with the tabs 30, 31, 32 and the shaped areas 7, 8, 9.

[0065] Furthermore, the three shaped areas 7, 8, 9 and the corresponding tabs 30, 31, 32 are advantageously arranged on the edges of the frame 2 and of the cover 3, so as to be arranged at the vertices of a hypothetical triangle and to define a thrusting plane of the cover 3 towards the frame 2.

[0066] However, in alternative embodiments of the invention, a different number of shaped areas and tabs can be provided, and they can be arranged along different areas of the respective edges.

[0067] According to a construction variant of the embodiment of the invention described above, furthermore, only the second and the third tab 31, 32 may be elastically yielding, while the first tab 30 may be substantially rigid and thus serve only as a resting surface.

[0068] Again, the inclinations A1, A2, B1, B2 of the inclined surfaces may be such that one of the components Fv and Fo may substantially prevail over the other, and one of them may even be equal to zero.

[0069] In the Figures from 18 to 21 the opening steps of the device 1 described above are shown in sequence.

[0070] The first steps, Figures 18 and 19, include the insertion of the tip of a lever L in the opening 24 in the cover 3 and its rotation to lift the corresponding edge 3c of the cover 3 from the frame 2. During said steps, the second and the third tabs 31, 32 are pushed towards the centre of the cover 3 thanks to their elasticity and thanks to the sliding movement of their inclined surfaces 36 on the inclined surfaces 14 of the shaped areas 8, 9 (Figures 19 and 19a). When the cover 3 is partially lifted, as shown in Figure 20, the key K is introduced in the shaped hole 23 in the cover 3 and therefore the cover 3 is slided completely out of the frame 2 (Figure 21).

[0071] Figure 22 shows a sectional view of a variant embodiment of the closing device 100 of the invention.

[0072] Said variant embodiment differs from the embodiment described above in that the cover 103 cannot be completely removed from the frame 102 but is hinged to it with an edge 103a, that is, the edge opposite the edge 103c that is lifted in order to open the device 100.

[0073] As shown in the figure, the cover 102 can be rotated around a hinge 110 and is provided, analogously

to the embodiment described above, with one pair of elastic tabs 131, 132 on the opposite edge 103c. The elastic tabs 131, 132 produce the same thrusting action described above, the prevailing action of the vertical thrust component Fv of the cover 103 towards the frame 102 being in this case advantageous, as the hinge 110 is in itself an element that locks the cover 3 to the frame 102 in the horizontal direction O. A horizontal thrust component Fo, however, makes it possible to recover any clearance of the hinge 110.

[0074] Figures 23 and 24 schematically show the frame 202 and the cover 203 of a further variant embodiment of a closing device 200 according to the invention that differs from the first embodiment described above in that the three shaped areas 207, 208 and 209 and the corresponding three tabs 230, 231 and 232 are arranged on three separate edges 202a, 202c and 202d, 203a, 203c and 203d of the frame 202 and of the cover 203, respectively.

[0075] As in the first embodiment of the invention, the three shaped areas 207, 208 and 209 and the corresponding three tabs 230, 231 and 232 are advantageously arranged at the vertices of a hypothetical triangle to define a thrusting plane of the cover 203 towards the frame 202.

[0076] Said variant embodiment, in addition to reducing any clearance along the vertical direction V and a horizontal direction O between two opposite edges, makes it possible to reduce any clearance also in a second horizontal direction 01, perpendicular to the horizontal direction O, thanks to the horizontal thrust component of the third tab 232.

[0077] Figures 25 and 26 show a possible variant embodiment of the tabs of the cover of the closing device that is the subject of the invention.

[0078] In particular, they show a possible variant embodiment of the tabs 31, 32 of the first embodiment described in particular with reference to Figures 12 and 12a and defined in the third edge 3c of the cover.

[0079] As shown in Figure 25, each one of the tabs 331, 332 that are equal to each other or even equal and specular to each other, is defined by an open area 331a, 332a provided in the third edge 3c. Each tab 331, 332, as better illustrated in Figure 26, has a substantially rectilinear and inclined surface 336 that extends towards the outside, a substantially rectilinear and inclined surface 338 and a substantially vertical lower surface 339.

[0080] The function of the inclined surfaces 336 and 338 of said variant embodiment corresponds to the function of the second surface 36 and of the third surface 38, respectively, of the first embodiment described above.

[0081] In particular, the inclined surface 338, together with the elasticity of the tab 331, 332 obtained thanks to the presence of the open area 331a, 332a, makes it possible to couple the cover with the frame. The inclined surface 336 together with the elasticity of the tab 331, 332 obtained thanks to the presence of the open area 331a, 332a determines the inclined thrusting force Fs between the cover and the frame when they are coupled with each other and the device is closed. Furthermore, the inclined surface 336 and the elasticity of the tab 331, 332 facilitate the removal of the cover from the frame.

[0082] Figure 27 shows a possible embodiment of a cover 303 according to the invention, in which at the level of the area 327 of the first edge 303a there is a tab 30 of the type described with reference to Figures 11 and 11a, while at the level of the areas 328 and 329 of the third edge 303c there are two corresponding tabs 331 and 332 of the type described with reference to Figures 25 and 26.

[0083] According to a variant embodiment of the invention, the elastic tabs can be provided on the frame instead of on the cover, and consequently the shaped areas will be on the cover instead of on the frame.

[0084] In other mixed solutions, some elastic tabs can be provided on the frame and some on the cover.

[0085] Again, in further variant embodiments of the closing device the elastic tabs may be produced in the shape of inserts of a different material associated with the cover or with the frame, depending on whether the embodiment desired has the tab on the cover or on the frame.

[0086] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, the invention makes it possible to provide closing devices that are highly resistant to stress, last longer and need less maintenance than the devices of known type.

[0087] Still advantageously, the proposed solution makes it possible to open/close the device by taking action on the cover without lifting it against gravity, making it slide on the frame. This makes it possible to reduce the physical stress of the operator during said manoeuvres and to comply with Italian law 626.

[0088] While the present invention has been described with reference to the particular embodiments shown in the figures, it should be noted that the present invention is not limited to the specific embodiments illustrated and described herein; on the contrary, further variants of the embodiments described herein fall within the scope of the present invention, which is defined in the claims.

Claims

1. Closing device (1, 100, 200) for manholes/traps and the like, comprising a frame (2, 102, 202) and a cover (3, 103, 203, 303) associated with said frame (2, 102, 202), **characterized in that** it comprises mutual thrusting means (30, 31, 32; 131, 132; 230, 231, 232; 331, 332) between said cover (3, 103, 203, 303) and said frame (2, 102, 202).

2. Device (1, 100, 200) according to claim 1), **characterized in that** said thrusting means (30, 31, 32; 131, 132; 230, 231, 232; 331, 332) act according to two directions (V, O, O1) between said cover (3, 103, 203, 303) and said frame (2, 102, 202).

3. Device (1, 100, 200) according to claim 1), **characterized in that** said thrusting means (30, 31, 32; 131, 132; 230, 231, 232; 331, 332) act according to a single direction between said cover (3, 103, 203, 303) and said frame (2, 102, 202).

4. Device (1, 100, 200) according to any of the preceding claims, **characterized in that** said thrusting means (30, 31, 32; 131, 132; 230, 231, 232; 331, 332) are associated with said cover (3, 103, 203, 303).

5. Device (1, 100; 200) according to any of the claims from 1) to 3), **characterized in that** said thrusting means are associated with said frame (2, 102,202).

6. Device (1, 100, 200) according to any of the preceding claims, **characterized in that** said thrusting means comprise at least one elastically yielding element (30, 31, 32; 131, 132; 230, 231, 232; 331, 332).

7. Device (1, 100, 200) according to claim 6), **characterized in that** said elastically yielding element comprises an elastic tab (30, 31, 32; 131, 132; 230,231,232;331,332).

8. Device (1, 100, 200) according to claim 6), **characterized in that** said elastically yielding element (30, 31, 32; 131, 132; 230, 231, 232; 331, 332) is made together with said cover (3, 103, 203, 303) or said frame (2, 102, 202) in a single piece.

9. Device according to claim 6), **characterized in that** said elastically yielding element is constituted by an insert associated with said cover or said frame.

10. Device (1, 100, 200) according to claim 6), **characterized in that** it comprises at least one seat (7, 8, 9) suited to accommodate said at least one elastically yielding element (30, 31, 32; 131, 132; 230, 231; 232; 331, 332).

11. Device (1, 100, 200) according to claim 10), **characterized in that** said seat (7, 8, 9) is provided in said frame (2, 102, 202).

12. Device (1, 200) according to any of the preceding claims, **characterized in that** said thrusting means (30, 31, 32; 230, 231, 232; 331, 332) are arranged in three separate areas (7, 8, 9; 207, 208, 209) between said cover (3, 203, 303) and said frame (2, 202) suited to define a thrusting plane of said cover (3, 203, 303) towards said frame (2, 202).

13. Device (1, 100, 200) according to claim 12), **characterized in that** said cover (3, 203, 303) and said frame (2, 202) have a parallelogram shape and said three areas belong to two opposite sides of said parallelogram.

14. Device (1, 100, 200) according to any of the preceding claims, **characterized in that** at least one portion (20) of said cover (3, 103, 203, 303) is in direct contact with at least one portion (6) of said frame (2, 102, 202).

15. Device (100) according to any of the preceding claims, **characterized in that** it comprises hinge means (110) between said cover (103) and said frame (102).

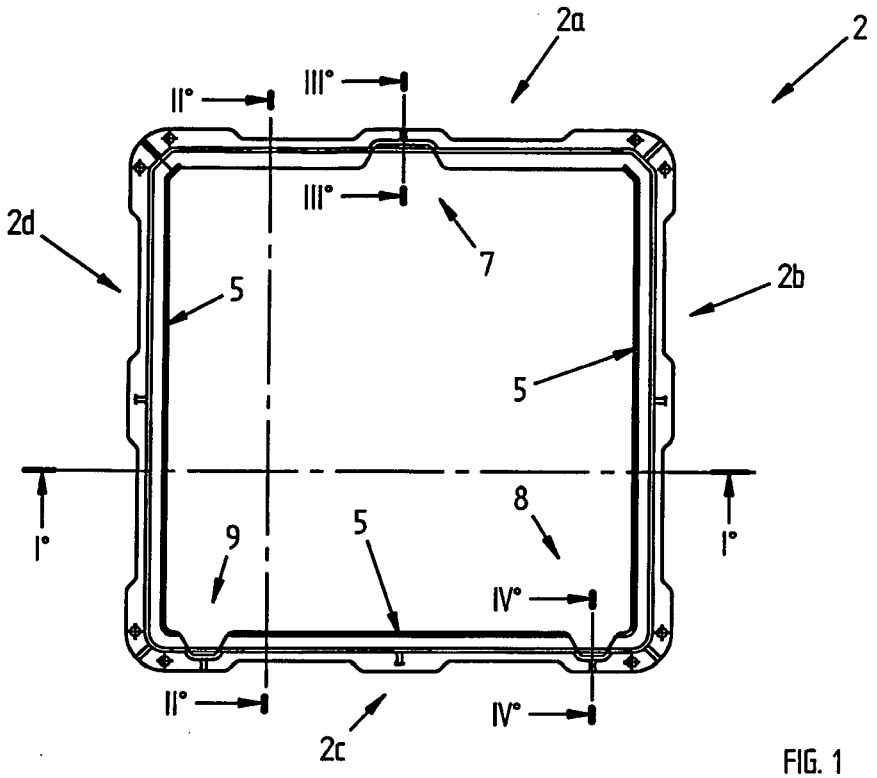

FIG. 1

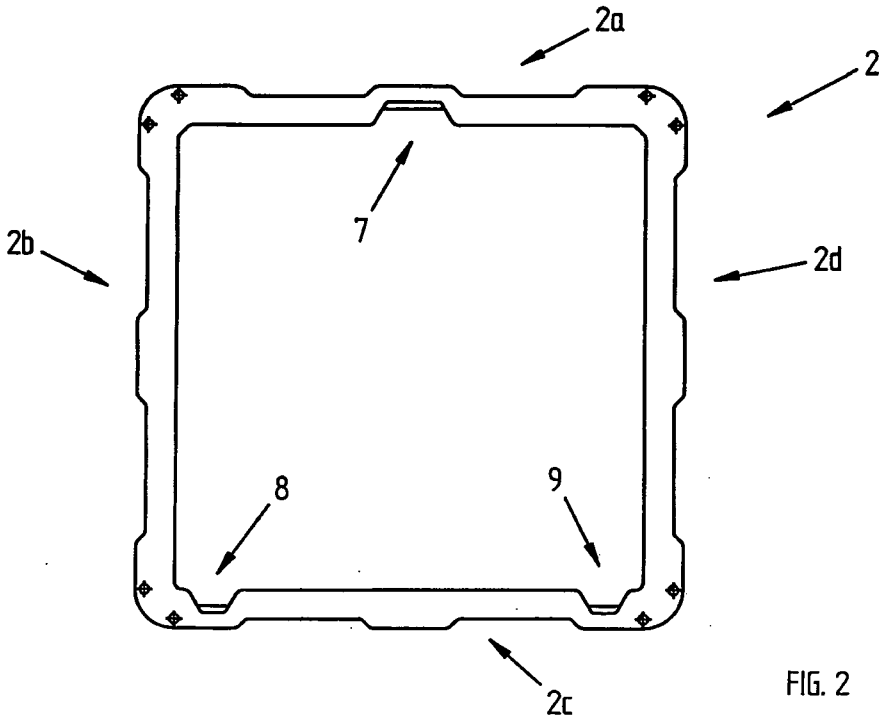

FIG. 2

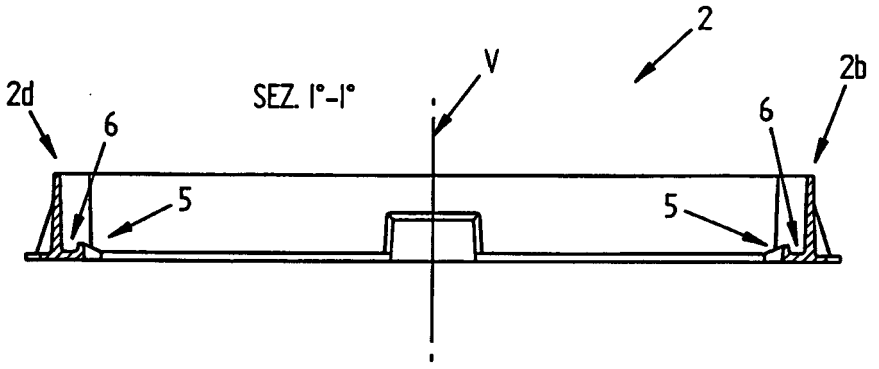

FIG. 3

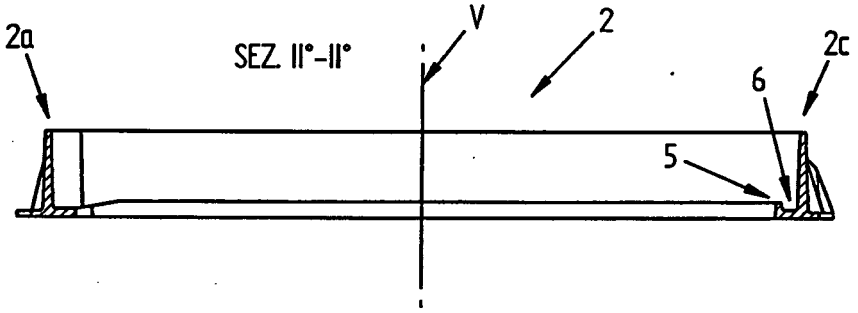

FIG. 4

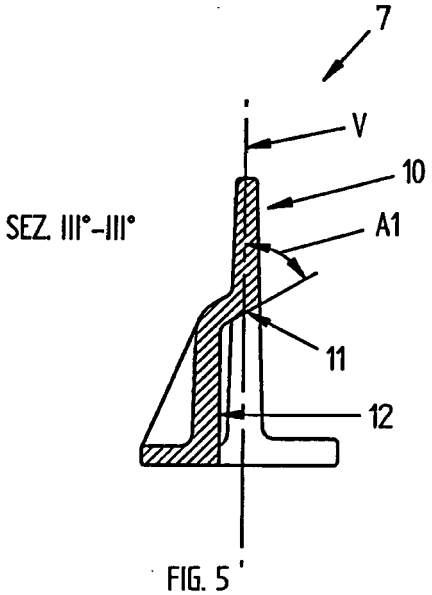

FIG. 5

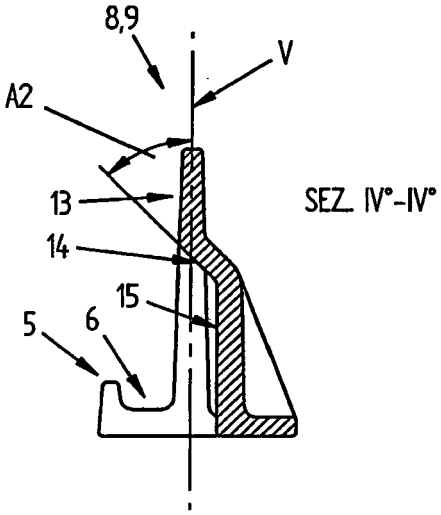

FIG. 6

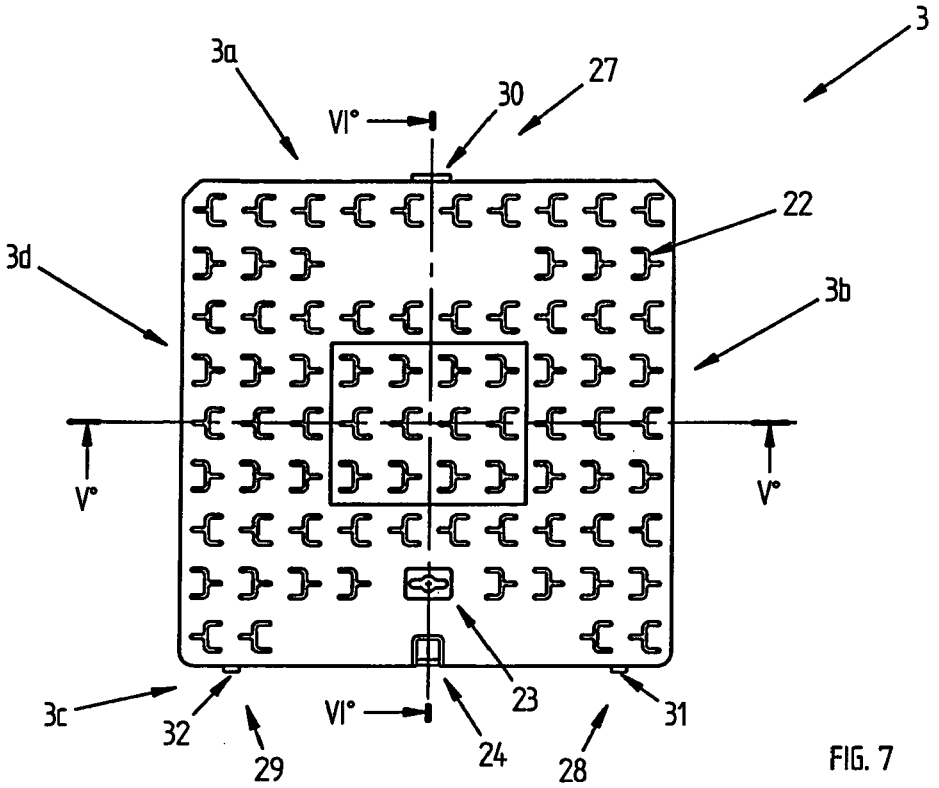
3
3a
27
30
VI°
22
3d
3b
V°
V°
3c
32
29
VI°
24
23
28
31

FIG. 7

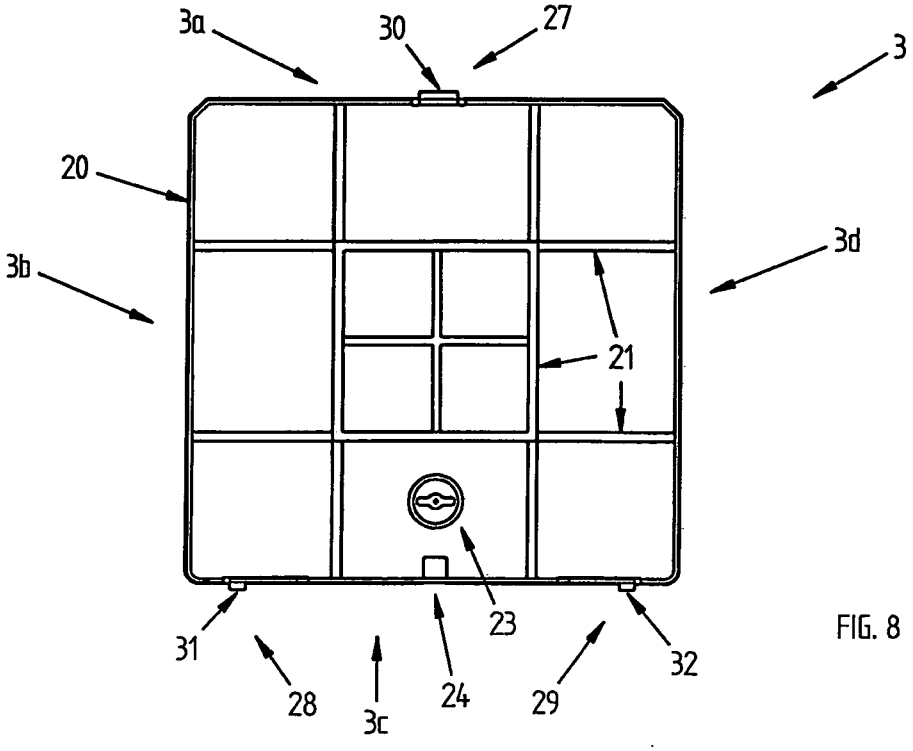
3a
30
27
3
20
3b
3d
21
23
31
28
24
3c
29
32

FIG. 8

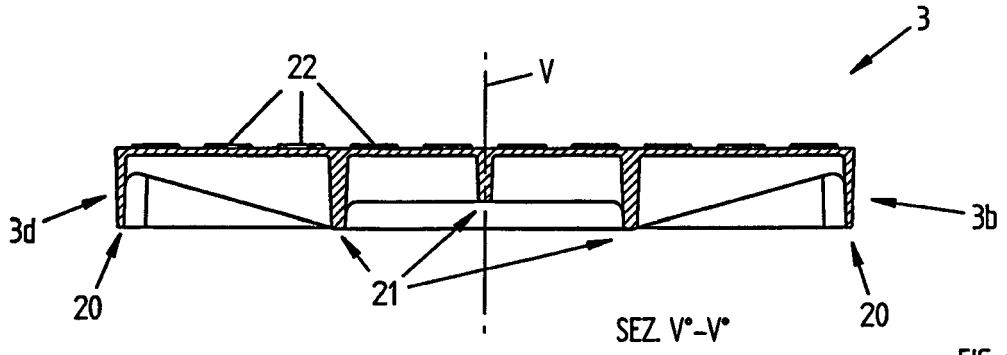

FIG. 9

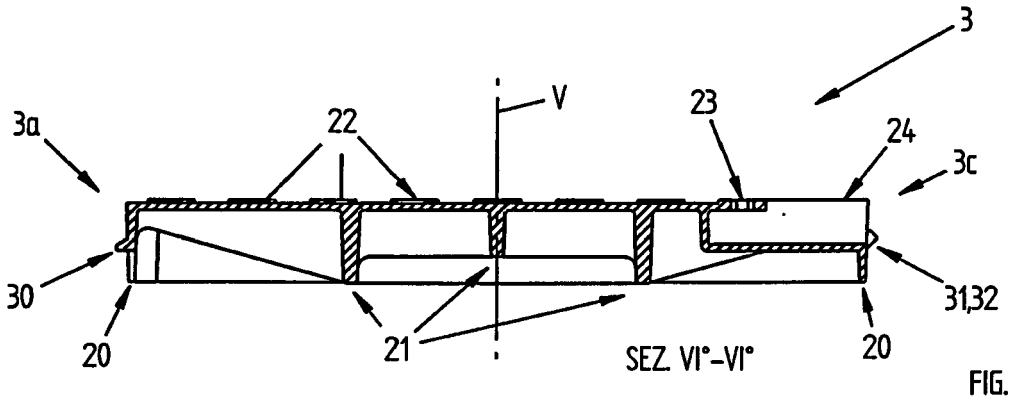

FIG. 10

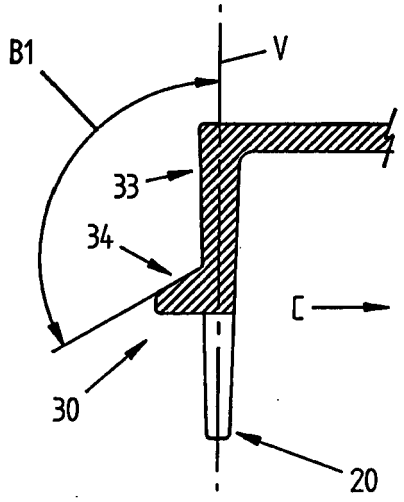

FIG. 11

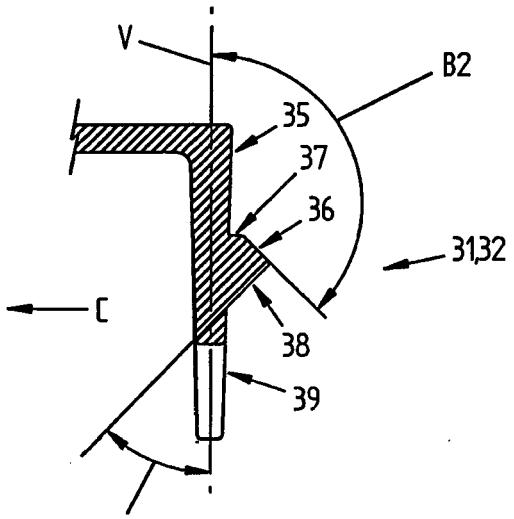

FIG. 12

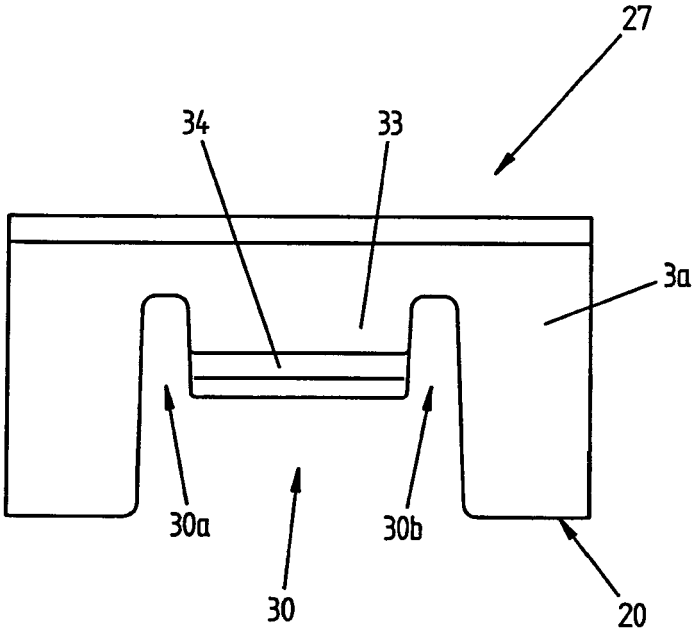

FIG. 11a

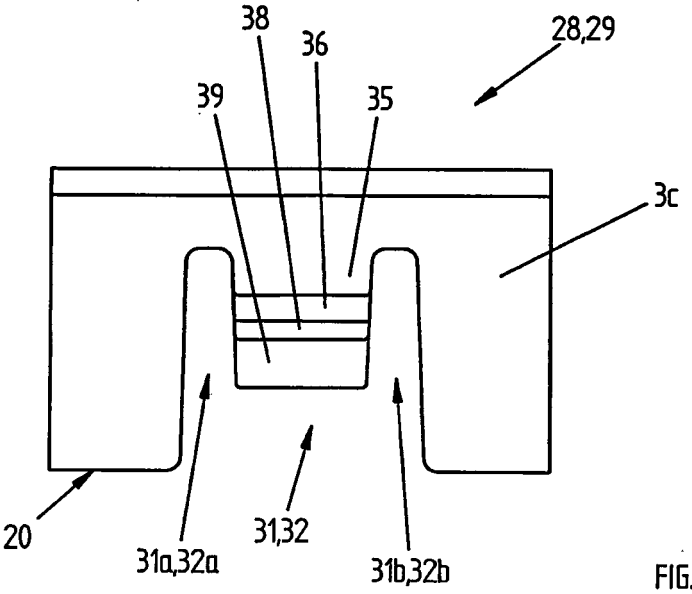

FIG. 12a

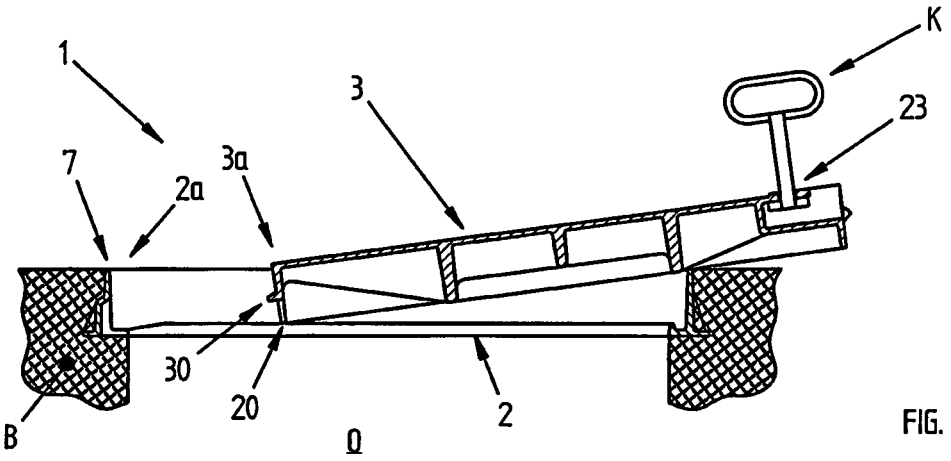

FIG. 13

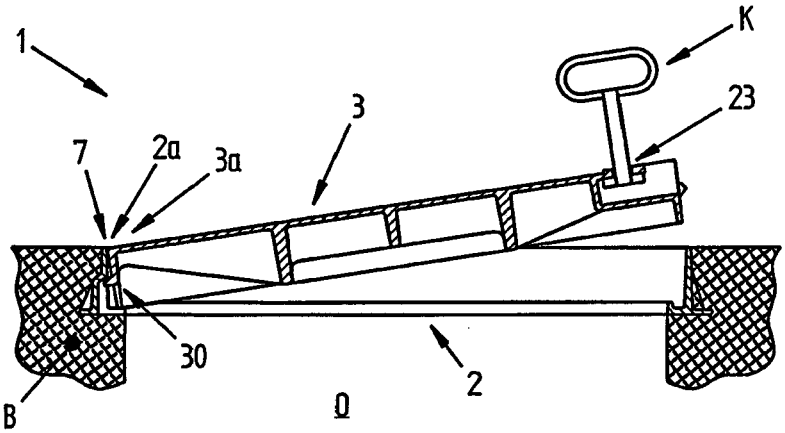

FIG. 14

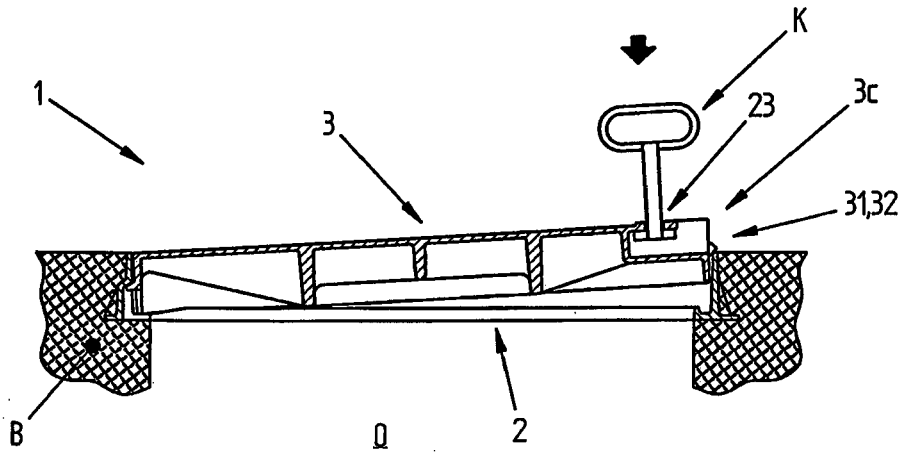

FIG. 15

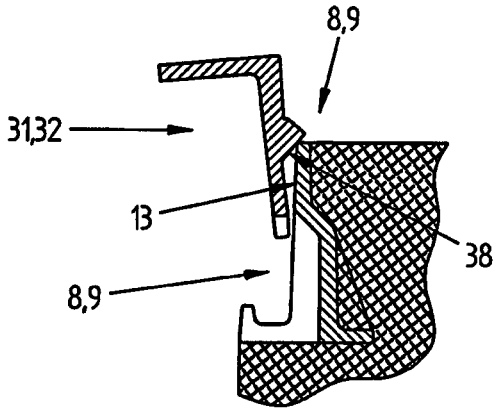

FIG. 15a

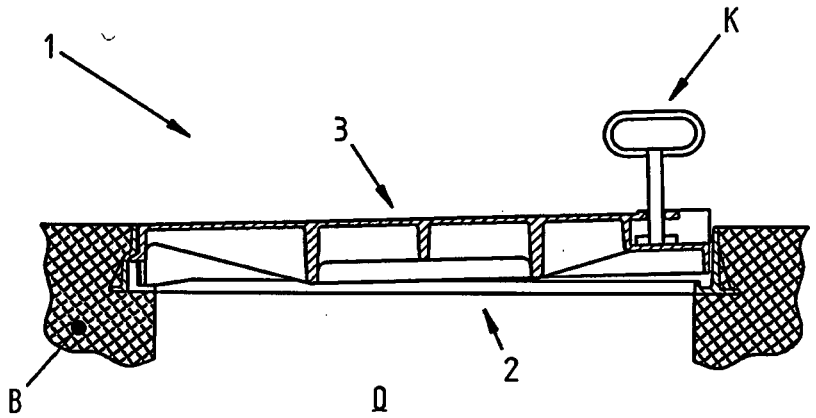

FIG. 16

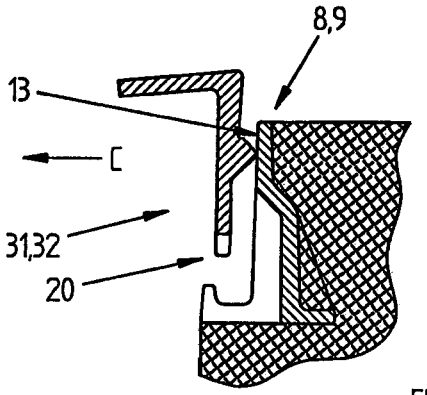

FIG. 16a

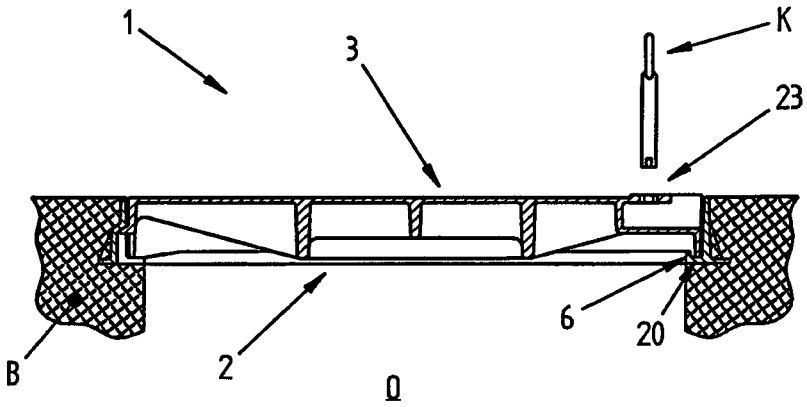

FIG. 17

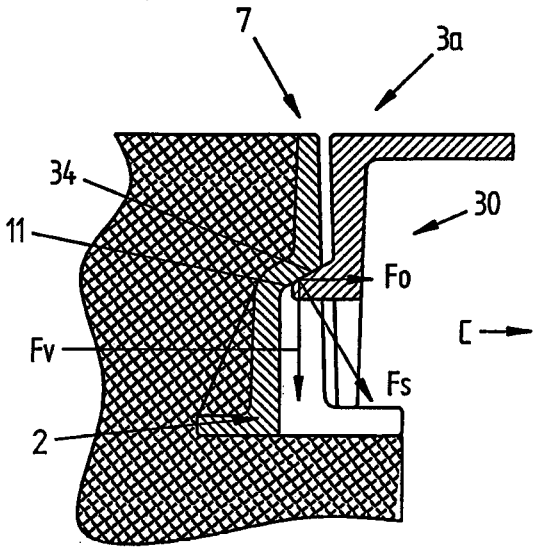

FIG. 17a

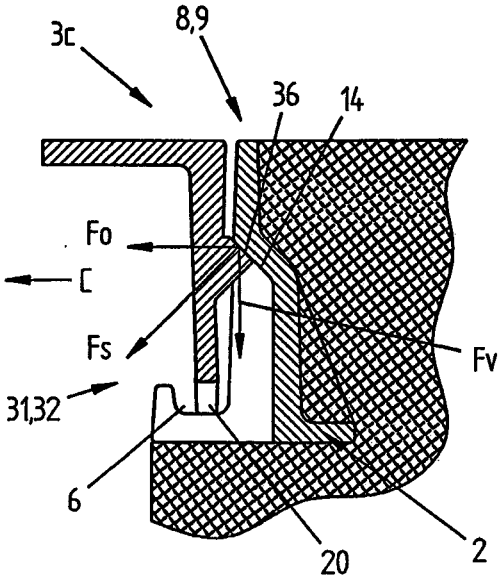

FIG. 17b

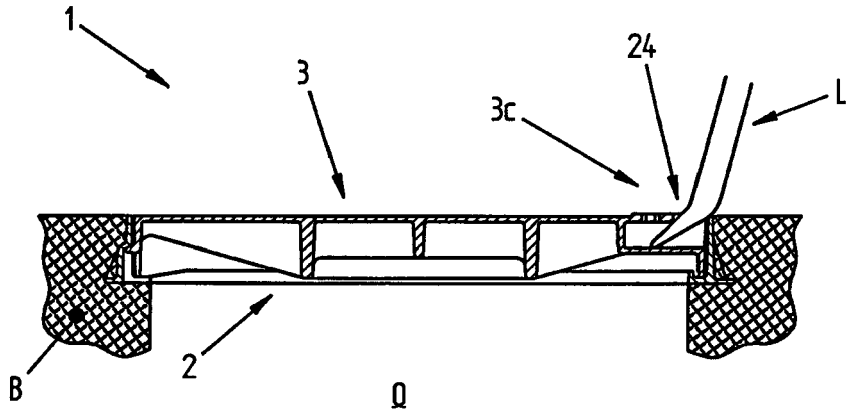

FIG. 18

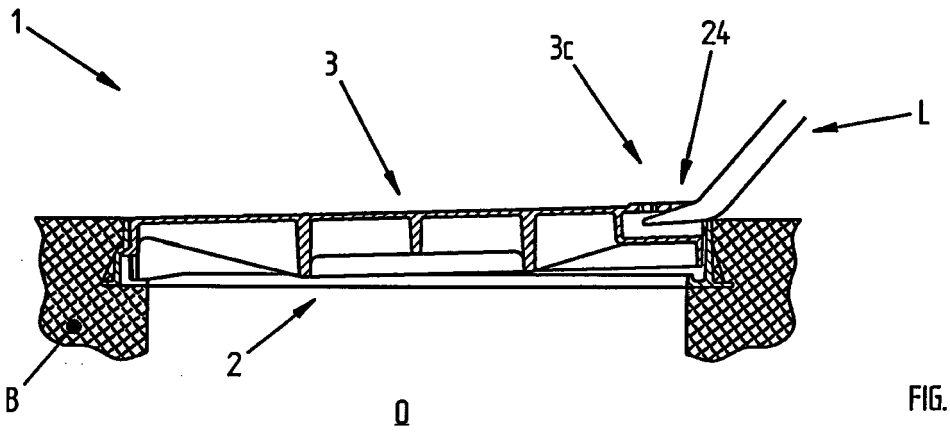

FIG. 19

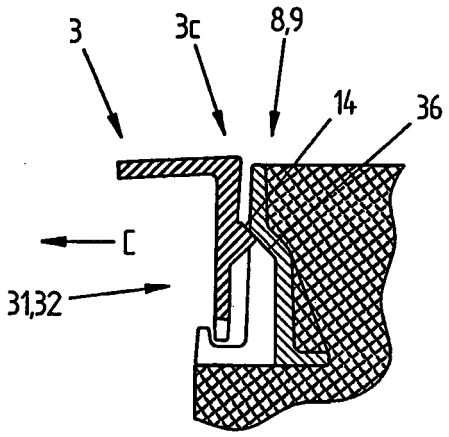

FIG. 19a

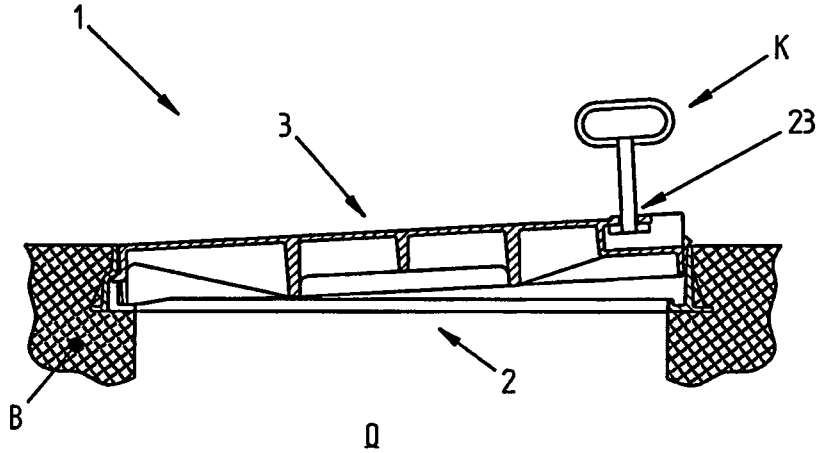

FIG. 20

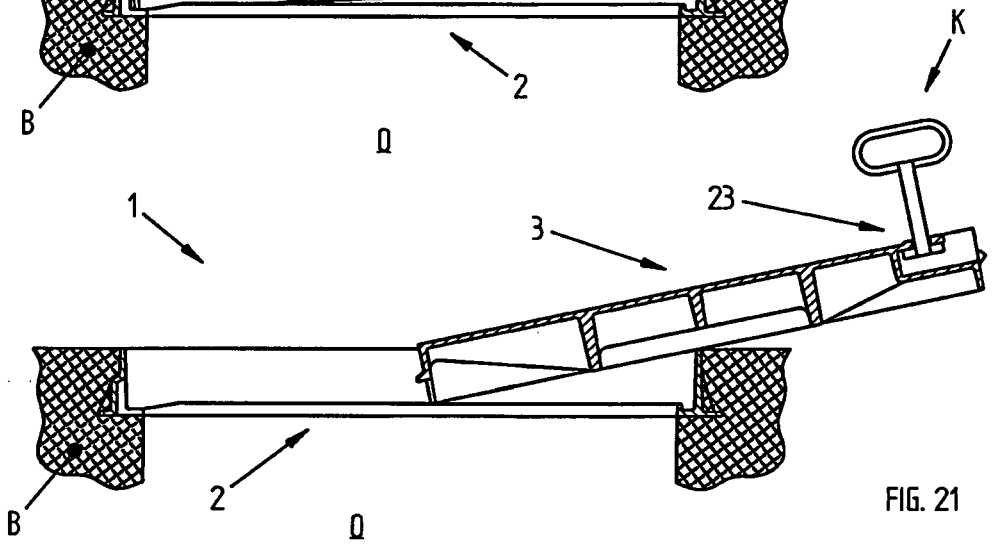

FIG. 21

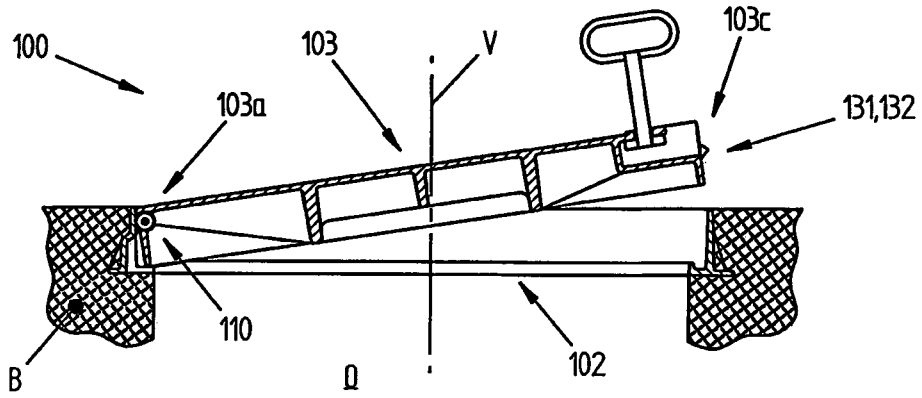

FIG. 22

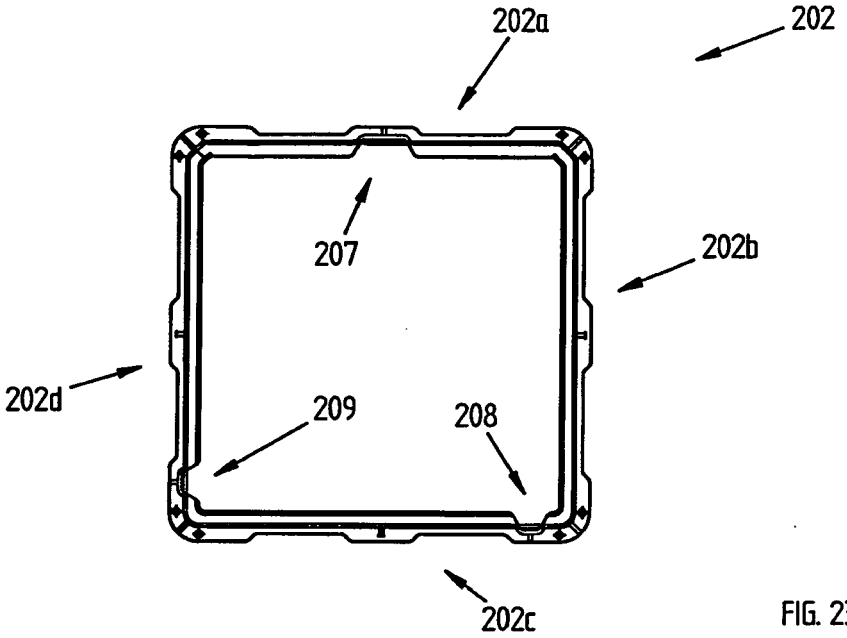
202a
202
207
202b
202d
209
208
202c

FIG. 23

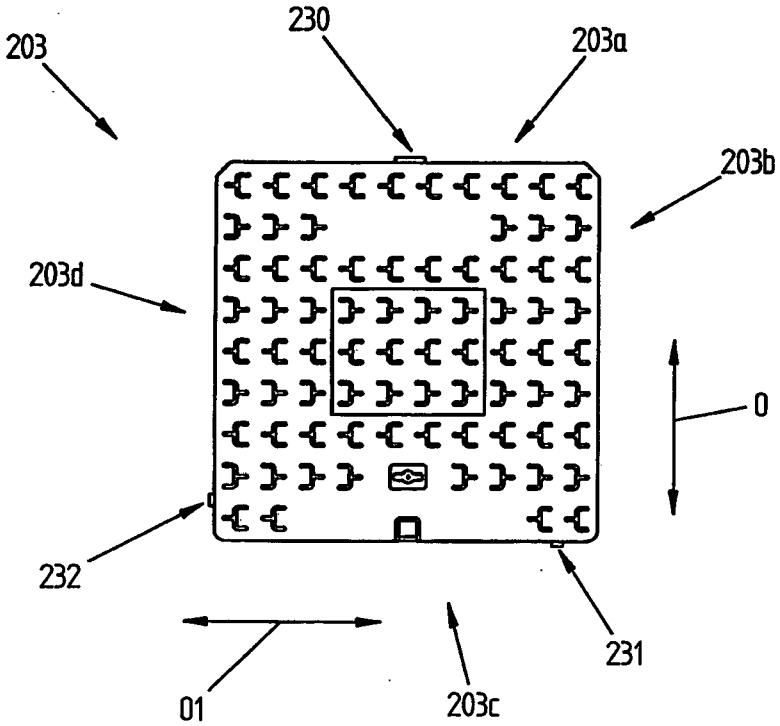
230
203
203a
203b
203d
O
232
231
O1
203c

FIG. 24

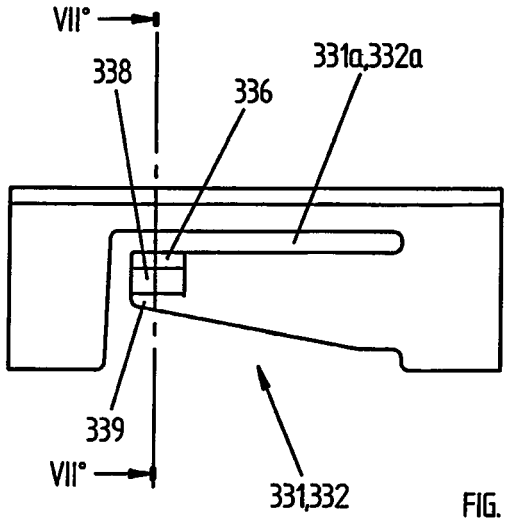

FIG. 25

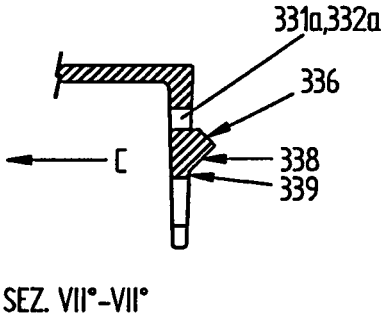

FIG.26

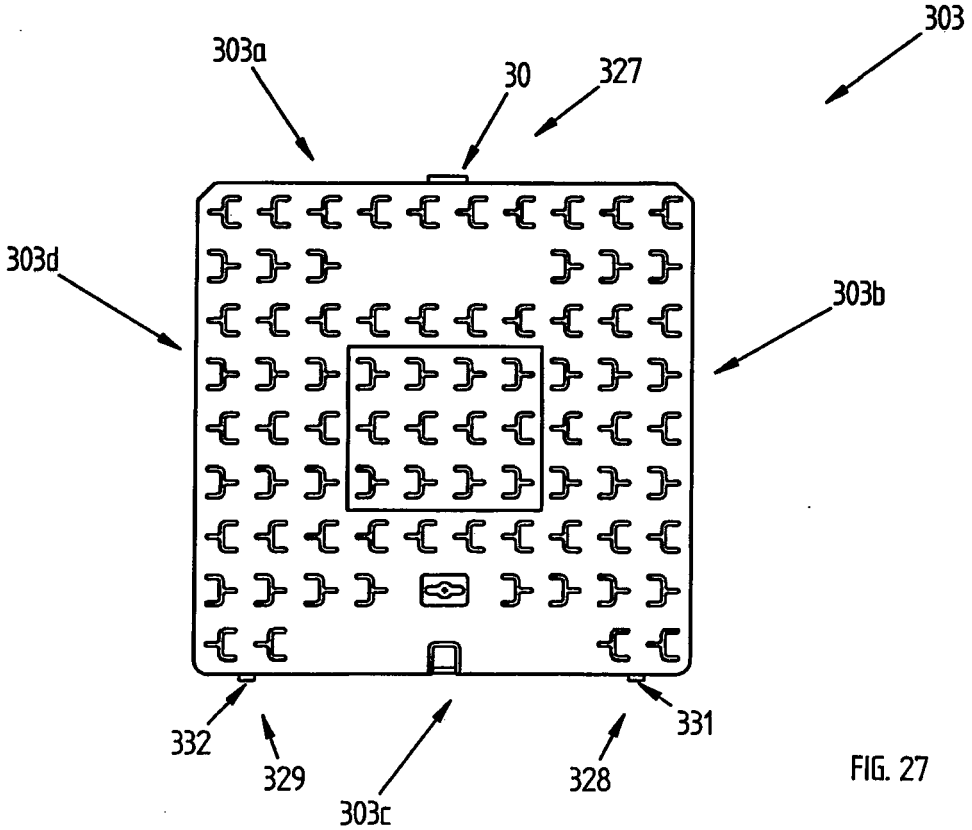

FIG. 27

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 00 2561

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 720 770 A1 (LEGRAND RENE [FR]) 8 December 1995 (1995-12-08) * page 2, line 14 - page 3, line 30; figures 1-4 *	1-8, 12-14	INV. E02D29/14
X	EP 1 972 723 A2 (SILMAR S R L [IT] FIGLI DI ENZO ROSSI S P A [IT]) 24 September 2008 (2008-09-24)	1-5	
A	* paragraph [0032] - paragraph [0050]; figure 1 *	6-14	
X	WO 91/00942 A1 (VON ROLL AG [CH]) 24 January 1991 (1991-01-24) * page 2 - page 6; figures 1b, 2a, 3, 4, 5 *	1,3-5	

TECHNICAL FIELDS SEARCHED (IPC)

E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 May 2011	Geiger, Harald

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 00 2561

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-05-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2720770 A1	08-12-1995	NONE	
EP 1972723 A2	24-09-2008	NONE	
WO 9100942 A1	24-01-1991	AT 96485 T	15-11-1993
		AU 636355 B2	29-04-1993
		AU 5746890 A	06-02-1991
		BR 9006850 A	06-08-1991
		CA 2035884 A1	12-01-1991
		CH 678639 A5	15-10-1991
		DD 296520 A5	05-12-1991
		DE 59003244 D1	02-12-1993
		DK 0433410 T3	27-12-1993
		EP 0433410 A1	26-06-1991
		ES 2045927 T3	16-01-1994
		IE 902501 A1	13-02-1991
		PT 94666 A	30-11-1992
		US 5340232 A	23-08-1994

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82