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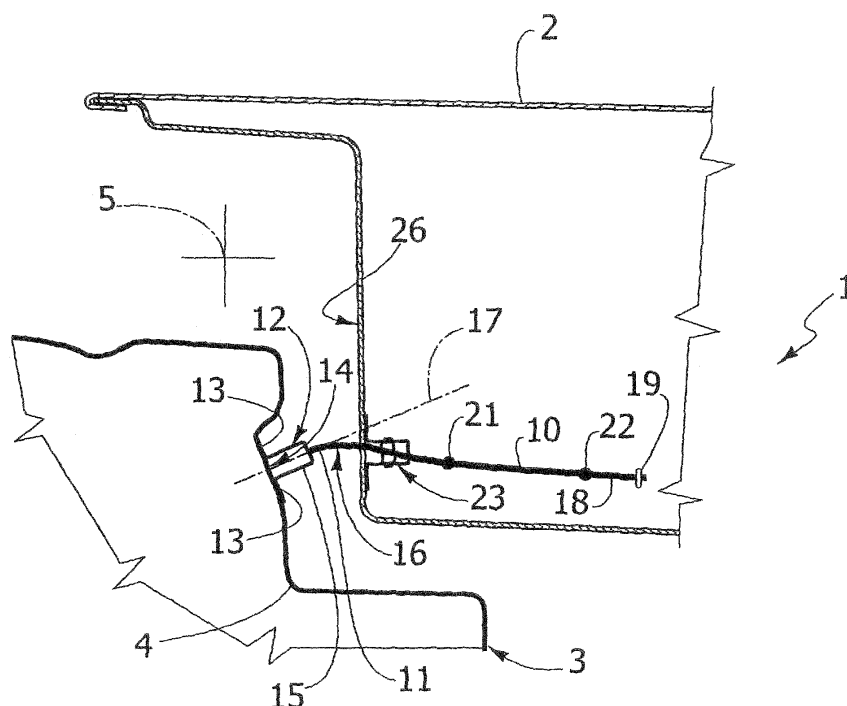
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(54) **Device for holding open a side door of a vehicle**

(57) A device (1) for holding open a side door (2) of a vehicle (3) has a stranded cable (10), one end (11) of which is fixed either to the door (2) or to a doorpost (4) of the vehicle (3); the other is fixed either to the door (2) or the doorpost (4) and has a retaining device (23) provided with a retaining seat (37) passed through by the cable (10); the door is held in an intermediate open position when the retaining seat (37) is engaged by an external protuberance (21,22) of the cable (10) and leaves such position when an opening or closing torque greater than a pre-set threshold is exerted.

vided with a retaining seat (37) passed through by the cable (10); the door is held in an intermediate open position when the retaining seat (37) is engaged by an external protuberance (21,22) of the cable (10) and leaves such position when an opening or closing torque greater than a pre-set threshold is exerted.

FIG. 1



Description

[0001] This invention relates to a device for holding open a side door of a vehicle.

[0002] There are known solutions for holding open a door of a motor vehicle that comprise a rigid rod which is hinged at one end to the doorpost and has an intermediate section that slides between two rollers mounted on the door. The rollers are pushed by respective calibrated springs against opposite edges of the rod, one of which has one or more recesses. These recesses, when engaged by the corresponding roller, define the position of the door in respective intermediate opening positions.

[0003] In order to move the door from these positions, an opening or closing torque must be exerted so as to overcome the pre-loading of the springs and thus disengage the roller from the recess.

[0004] These known solutions are far from satisfactory since they require a relatively large number of components, particularly as regards the means of connection to the doorpost and to the door. Furthermore, the above-described known solutions are relatively cumbersome and expensive and impose undesired restrictions on the design of the door's other components (for example as regards the position and vertical sliding of the door's side window), due to the presence of the rollers, the rigid rod and the springs.

[0005] The aim of this invention is to create a device to hold open a side door of a vehicle, which provides an easy and inexpensive solution to the above-mentioned problems.

[0006] According to this invention, a device is provided to hold open a side door of a vehicle, such device comprising:

- an elongated element;
- connecting means to connect one end of the said elongated element to either the door or a doorpost of the said vehicle;
- retaining means that can be fixed either to the said door or the said doorpost, passed through by the said elongated element, and co-operating with a contoured portion of the said elongated element in order to hold open the said door in a releasable manner in an intermediate open position;

characterised in that the said elongated element comprises a stranded cable extending through the said retaining means, and in that the said connection means are fixing means.

[0007] The invention shall now be described with reference to the accompanying drawings, which show a non-limiting embodiment thereof, in which:

- Figure 1 is a schematic plan view of a preferred embodiment of the device for holding open a side door of a vehicle according to this invention, while the said door is in a closed position;

- Figures 2 to 4 are similar to Figure 1 and show the door in two intermediate open positions and in one completely open position respectively;
- Figure 5 is a side view of a component of the device shown in Figures 1-4;
- Figure 6 is a section along Line VI-VI of Figure 5.

[0008] In Figure 1, 1 shows a device for holding open a side door 2 of a vehicle 3 (partially illustrated).

[0009] The door 2 is hinged in a way not shown to a doorpost 4 of the vehicle 3 so as to rotate about an axis 5 that is substantially vertical between a closed position (Figure 1) and a completely open position (Figure 4). The device 1 is capable of holding the door 2 in two positions (Figures 2 and 3), which are intermediate between the completely open and closed positions.

[0010] With reference to Figures 1 to 4, the device 1 comprises an elongated element which, according to the invention, comprises a flexible cable 10 made up of strands (in particular steel strands) and has one end 11 fixed to the doorpost 4. The fixing is achieved by means of a terminal element 12, which comprises two perforated lugs 13 connected by means of screws (not shown) to a face 14 of the doorpost 4; and an intermediate tubular portion 15 secured to the end 11. In other words, the cable 10 is connected to the doorpost 4 without any hinge or joint, since the shape of the cable 10 automatically adapts itself, by elastic flexion, to the position of the door 2 about the axis 5, forming a loop 16.

[0011] The axis 17 of the portion 15 is perpendicular to the face 14: the cable 10 assumes a substantially straight path along the axis 17 when the door is in a reference position which is intermediate between the completely open and closed positions. Thus the loop 16 has a concavity which faces towards the passenger compartment when the door 2 is closed (Figure 1) and faces outwards when the door 2 is completely open (Figure 4). Thanks to its own elasticity, the cable 10 tends naturally to return to a straight configuration, and so exerts an elastic action to rotate the door 2 towards the said reference position. This elasticity could be used to facilitate the opening and/or closing of the door 2, arranging the above-mentioned reference position at an appropriate angle in relation to the closed position.

[0012] In particular, this reference position corresponds to half of the total angle of rotation and coincides substantially with the intermediate open position shown in Figure 2.

[0013] Also according to the accompanying Figures, the cable 10 has a free end 18, which is opposite the end 11 and bears a stop head 19, secured to the end 18 and defining the end of travel for the completely open position of the door 2.

[0014] The cable 10 has a cylindrical section, which is constant except for two intermediate portions 21 and 22. Portions 21, 22 have respective protuberances of a substantially spherical shape, are spaced apart longitudinally along the cable 10 and are defined, in particular, by an

additional amount of material.

[0015] Portions 21, 22 co-operate with a retaining device 23 to hold the door 2 in the two intermediate open positions shown in Figures 2 and 3. The device 23 comprises a connecting body 24, which is made of pre-stressed steel and comprises two perforated lugs 25 fixed by means of screws (not shown) to a face 26 of the door 2 oriented towards the face 14. The body 24 has an intermediate box-portion, which extends inside the door 2 along an axis 29 perpendicular to the face 26.

[0016] With reference to Figures 5 and 6, the portion 28 comprises two walls 30, which are parallel and spaced apart and have respective pairs of slots 32 which make the walls 30 elastically yielding in a direction 33 perpendicular to the walls 30 and the axis 29. Inside the portion 28, the walls 30 have respective plugs 35, which are connected to the walls 30 in fixed positions, for example by push- or bayonet-fitting. The plugs 35 have respective recesses, which are symmetrical to each other in relation to a supporting surface of the plugs 35 and define a passage 36 along the axis 29. This passage 36 is engaged in a sliding manner by the cable 10 and comprises a retaining seat 37 that is substantially complementary to the shape of the portions 21, 22. The plugs 35 are preferably made of an elastically yielding material and axially hold the cable 10 when the portions 21, 22 engage in the seat 37. The portions 21, 22 come out of the seat 37 when the door 2 is subjected to an opening or closing torque that exceeds a pre-set threshold. For example, the plugs 35 and the walls 30 are designed so as to exert a retaining load along the axis 29 which corresponds to a pre-set closing torque threshold on the door 2 of approximately 40 Nm.

[0017] When the portion 21 engages in the seat 37, the door 2 is in the intermediate open position nearest the closed position (Figure 2): the axes 17 and 29 substantially coincide, so the cable 10 behaves substantially like a rigid rod that slides axially in the seat 37. In fact, a closing torque on the door 2 in this position causes a compression along the axis 29 on the cable 10: the number and diameter of the strands and the diameter of the cable 10 are designed so that the cable 10 remains substantially rigid when a closing torque is applied so as to overcome the retaining force exerted by the device 23.

[0018] When the portion 22 engages in the seat 37, however, the door 2 is in the intermediate open position closest to the completely open position (Figure 3). Closing the door 2 causes a compression along the axis 29 which tends further to flex the cable 10 and, therefore, to accentuate the concavity of the loop 16, as schematically illustrated by the dotted lines in Figure 3 (the same consideration also applies when closing from the completely open position in order to make the portion 22 engage in the seat 37). The number and diameter of the strands, the diameter of the cable 10, the distance between the portion 22 and the end 11, and the retaining force exerted by the device 23 along the axis 29 are designed as explained, on the one hand, to limit the flexion

and thus the curvature of the cable 10 when the door 2 is closed from a position close to this intermediate open position, so as to enable the portion 22 enter/leave the seat 37 when the above-mentioned pre-set threshold is exceeded; and on the other hand, to allow the cable 10 to flex sufficiently when the door 2 is opened completely, so as to avoid the use of a hinge or a joint at the element 12.

[0019] By way of example, for a retaining force corresponding to a pre-set closing torque threshold of approximately 40 Nm, a cable 10 can be chosen having a diameter of 6 millimetres, with seven strands and seven wires for each strand, and with protuberances of the portions 21, 22 having a diameter of approximately 9-10 millimetres. For example, the distance between the end 11 and the portion 22 could be approximately 140 mm.

[0020] The door 2 opens completely until the head 19 enters into the portion 28 and abuts axially against the plugs 35: the head 19 is shaped so that it cannot enter the passage 36, so as to define the opening limit of the door 2.

[0021] According to a variation not shown, a guide is provided to guide the end 18 on exiting the portion 28 inside the door 2 during the closing movement of the door 2: the characteristics and positioning of this guide are determined depending on the space available inside the door 2 (for example depending on whether any reinforcing ribs and/or runners for the windows of the door 2 are present).

[0022] From the above, it seems clear that the use of flexible stranded cables fixed to the doorpost 4 enables the known solutions having rigid rods or levers to be simplified as it allows the hinges that connect these rods or levers to the doorpost to be eliminated. Furthermore, the strands that make up the wire 10 are flexible so the end 18 does not constitute a rigid restriction inside the door 2 when the door 2 is closed. In particular, it is possible to guide the end 18 so as to make it bend and slide into a position which does not interfere with the other internal components of the door 2. In other words, this solution gives greater freedom in the design of the internal components of the door 2.

[0023] Furthermore, the protuberances of the portions 21, 22 and the plugs 35 do away with the presence of moving bodies, such as retaining rollers and pre-loaded springs, and reduce the production and assembly times and costs of the device 23. By reducing the number of components, the weight of the device 1 in comparison to known solutions can also be reduced and it is therefore easier to handle during fitting onto the vehicle.

[0024] It is also possible to eliminate the traditional and expensive seals that protect the door 2 from dust and replace them with a suitable and simple sponge element positioned at the entrance of portion 28 and passed through by the cable 10.

[0025] Lastly, from the above it is clear that the device 1 described can be modified and varied without departing from the scope of protection of the invention.

[0026] In particular, the holding of the door 2 in the intermediate opening positions could be achieved by using elements other than the plugs 35 shown by way of example and/or by using retaining seats of shapes other than the spherical seat 37.

[0027] The stranded cable 10 could possibly have a covering; in this case the holding of the door 2 in the intermediate opening positions could be achieved by protuberances or recesses made directly in such covering.

[0028] Lastly, in a manner paralleling that described above, the end 11 could be fixed to the door 2 and the device 23 could be mounted on the doorpost 4 (in this case, however, draining any water that entered from the doorpost 4 through the device 23 could be somewhat complicated).

Claims

1. Device (1) to hold open a side door (2) of a vehicle (3), such device comprising:

- an elongated element;
- connecting means (12) to connect one end (11) of the said elongated element either to the door (2) or a doorpost (4) of the said vehicle (3);
- retaining means (23) that can be fixed either to the said door (2) or the said doorpost (4), passed through by the said elongated element, and co-operating with a contoured portion (21,22) of the said elongated element in order to hold open the said door (2) in a releasable manner in an intermediate open position;

characterised in that the said elongated element comprises a stranded cable (10) extending through the said retaining means (23), and **in that** the said connection means are fixing means (12).

2. Device according to claim 1, **characterised in that** the said contoured portion (21, 22) comprises a protuberance in a fixed relative position along the said stranded cable (10) and **in that** the said retaining means (23) comprise a retaining seat (37) to house the said protuberance in a releasable manner.

3. Device according to claim 2, **characterised in that** it comprises two plugs (35) arranged opposite each other and having respective recesses, which define a passage (36) engaged in a sliding manner by the said stranded cable (10) and comprising the said retaining seat (37).

4. Device according to claim 3, **characterised in that** the said plugs (35) are mounted on respective walls (30) made elastically yielding by means of respective openings (32).

5. Device according to claim 3 or 4, **characterised in that** the said plugs (35) are made of an elastically yielding material.

6. Device according to any of claims 2 to 5, **characterised in that** the said retaining seat (37) is a spherical seat.

7. Device according to any of claims 2 to 6, **characterised in that** the said stranded cable (10) has two protuberances spaced apart to define respective intermediate open positions.

8. Device according to any of the preceding claims, **characterised in that** it comprises a guide to guide a sliding free end (18) of the said stranded cable (10) on exiting the said retaining means (23).

9. Vehicle (3) comprising:

- a doorpost (4);
- a side door (2) hinged to the said doorpost (4) to rotate about a substantially vertical axis (5) between a completely open position and a completely closed position;
- a device (1) made according to any of the preceding claims.

10. Vehicle according to claim 9, **characterised in that** the said stranded cable (10) assumes a straight path when the said door (2) is in an intermediate position between the said completely open and closed positions.

11. Vehicle according to claim 10, **characterised in that** the said stranded cable (10) assumes a straight path when the said door (2) is in a central position between the said completely open and closed positions.

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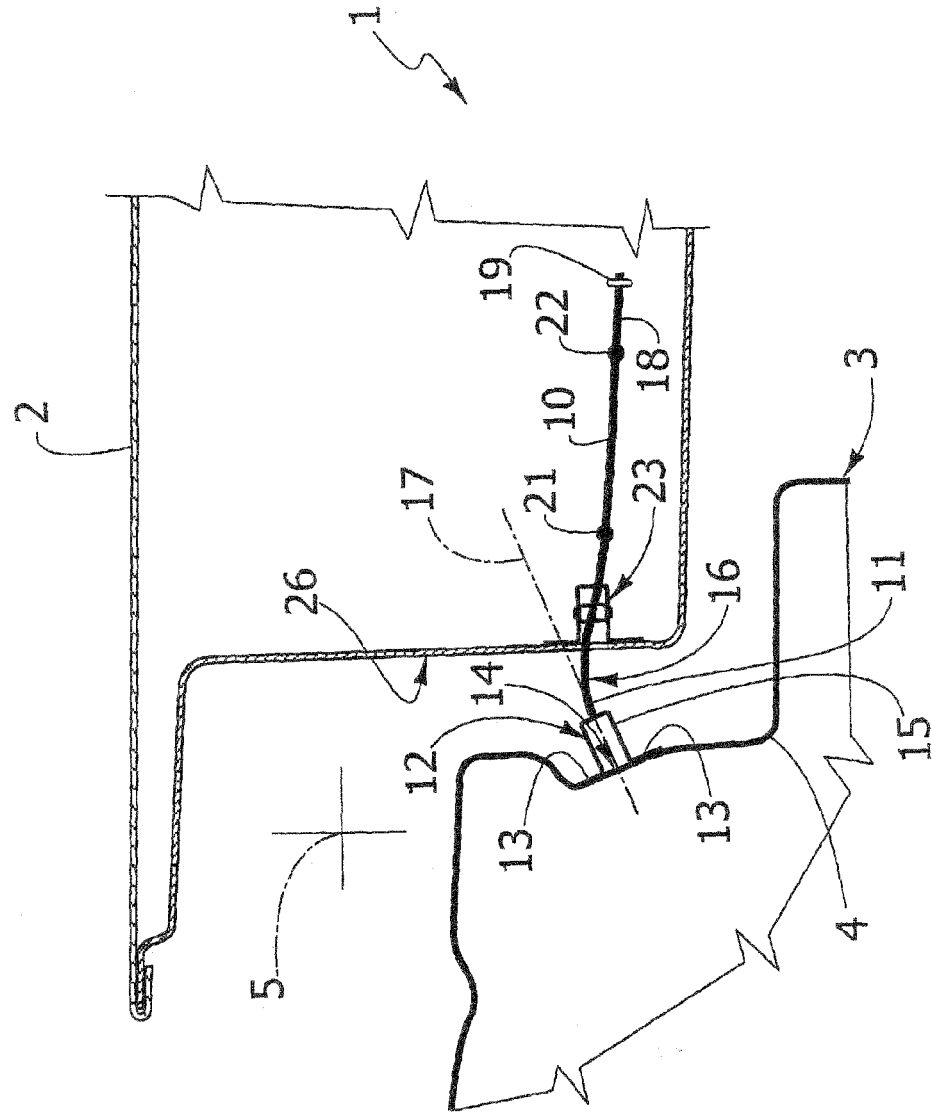


FIG. 2

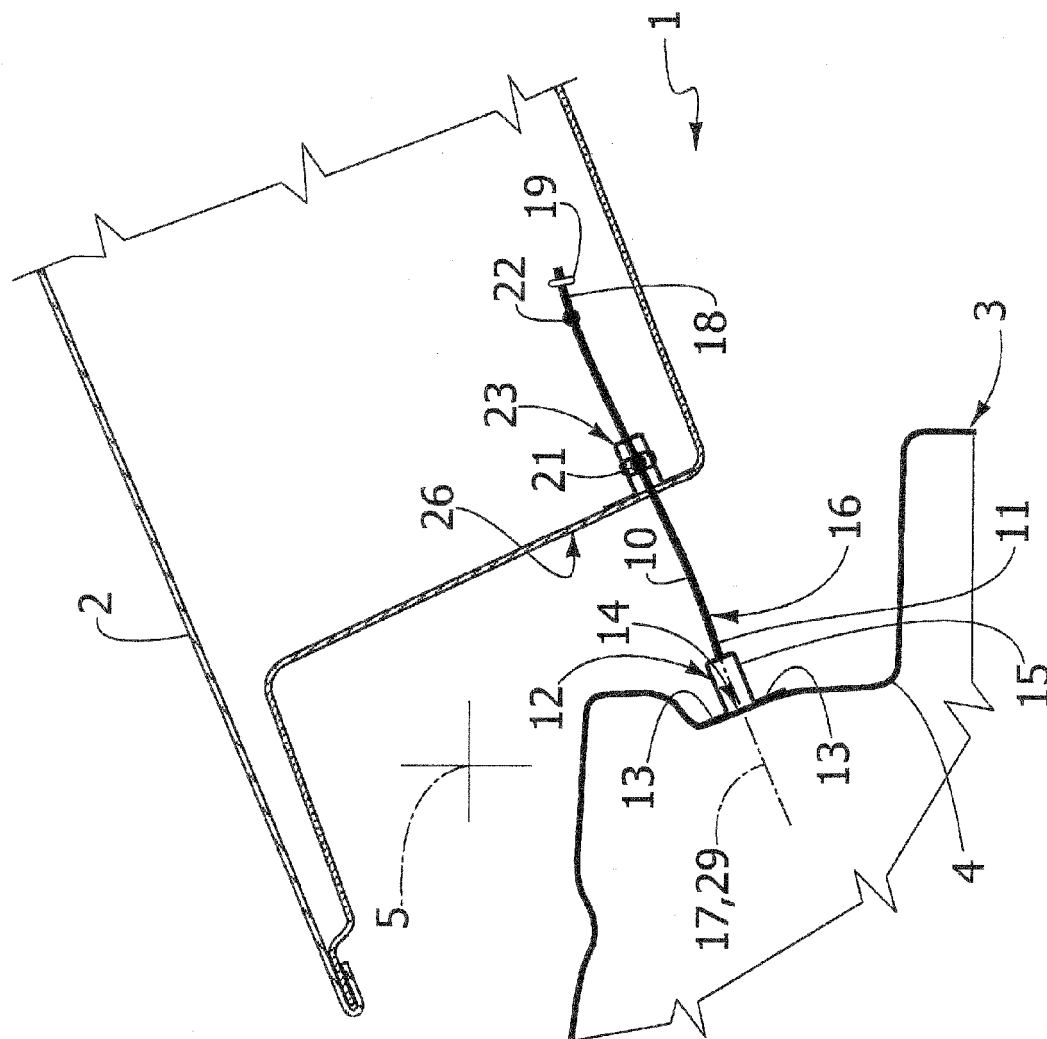


FIG. 3

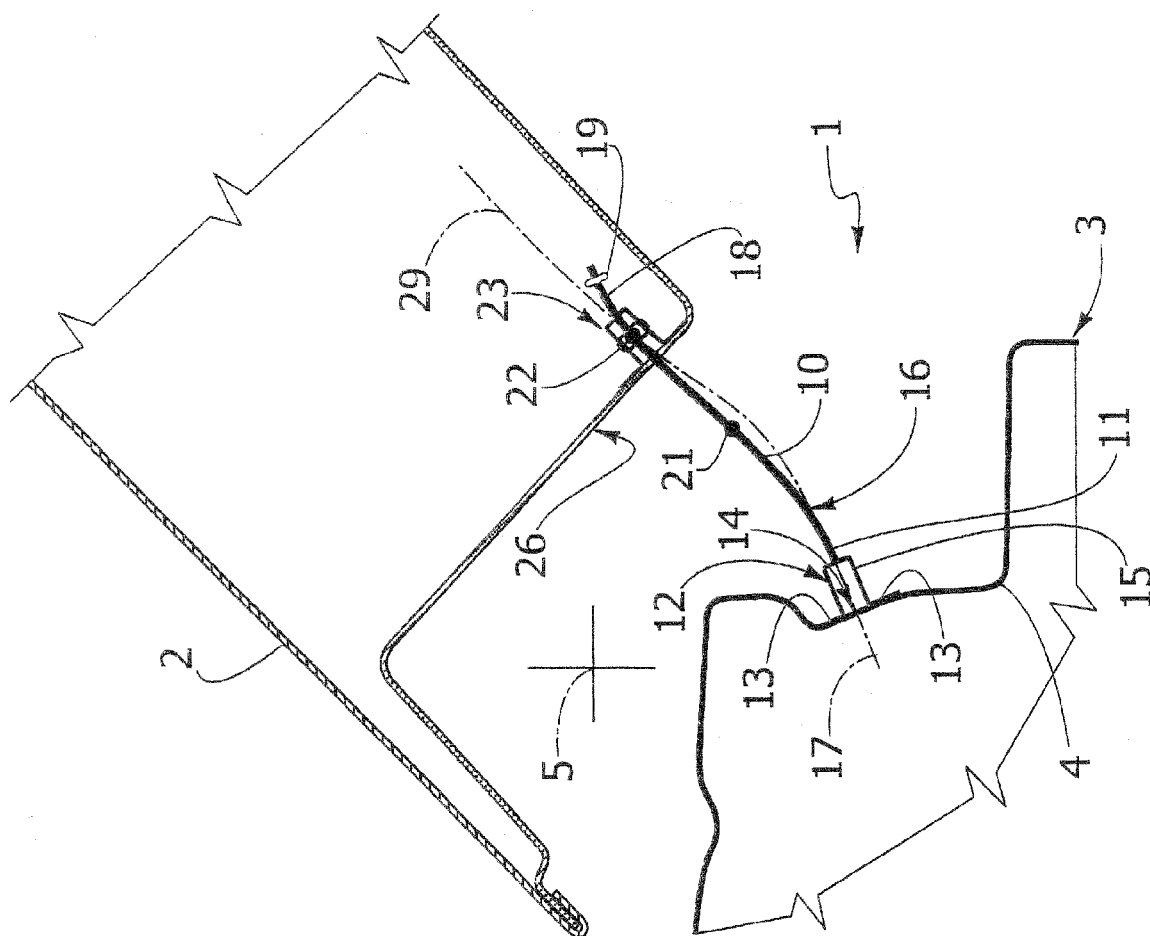


FIG. 4

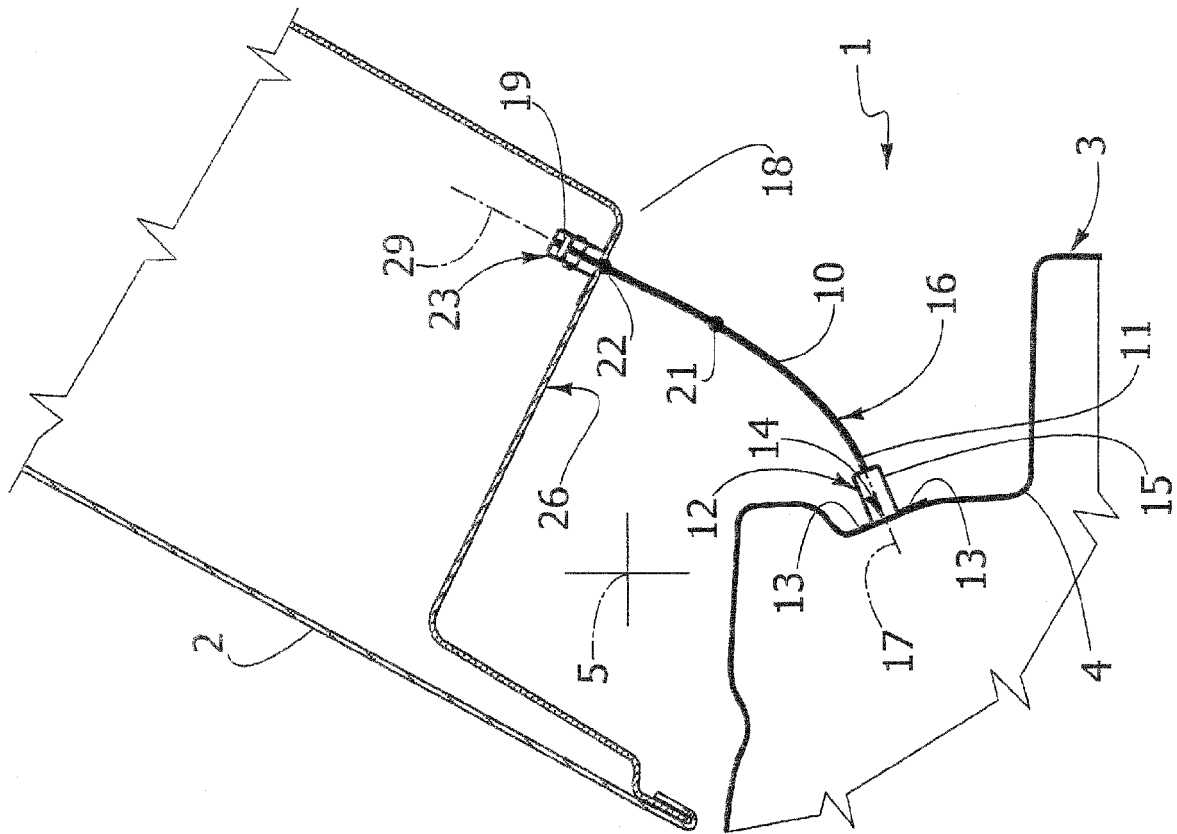


FIG. 5

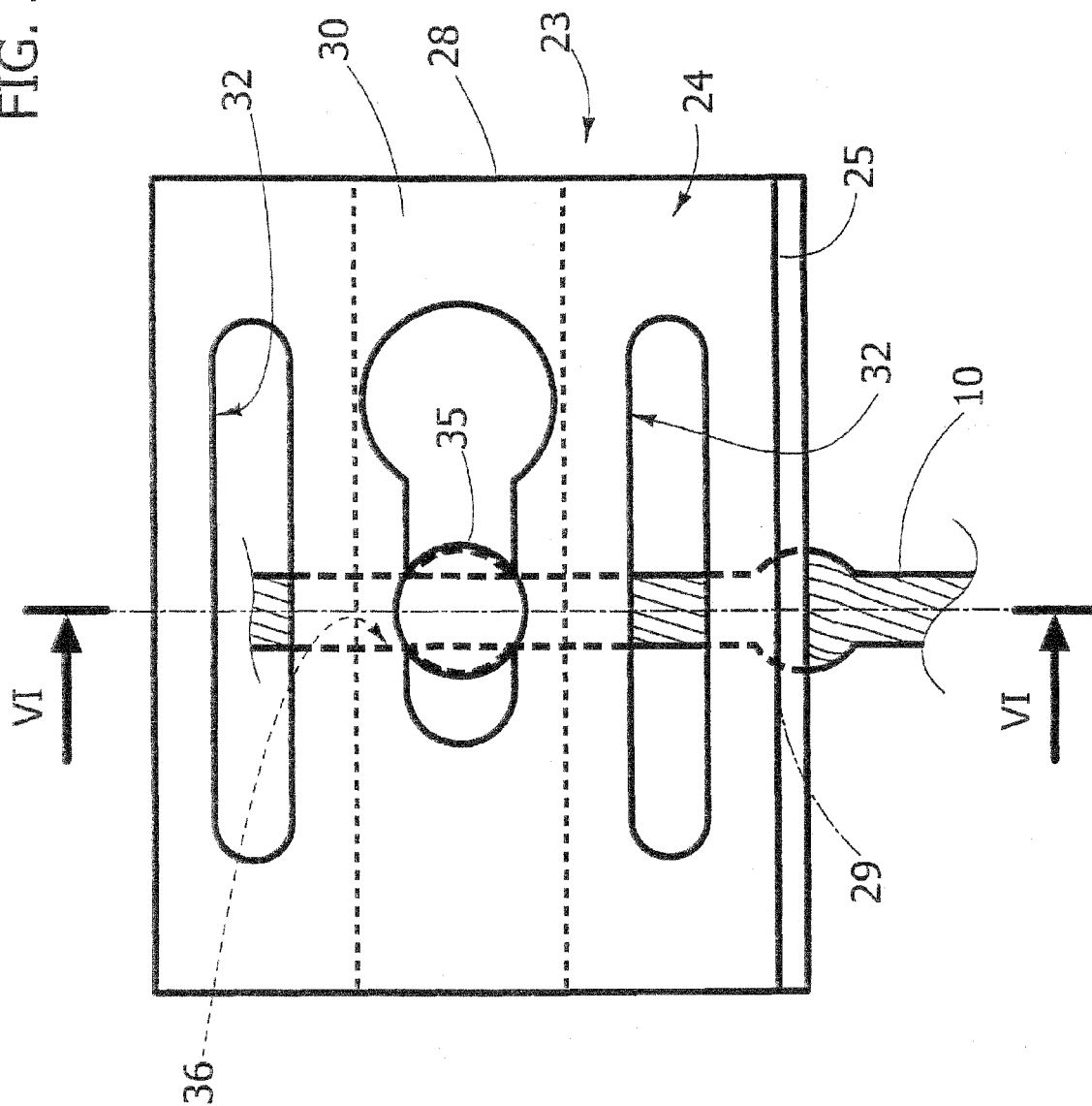
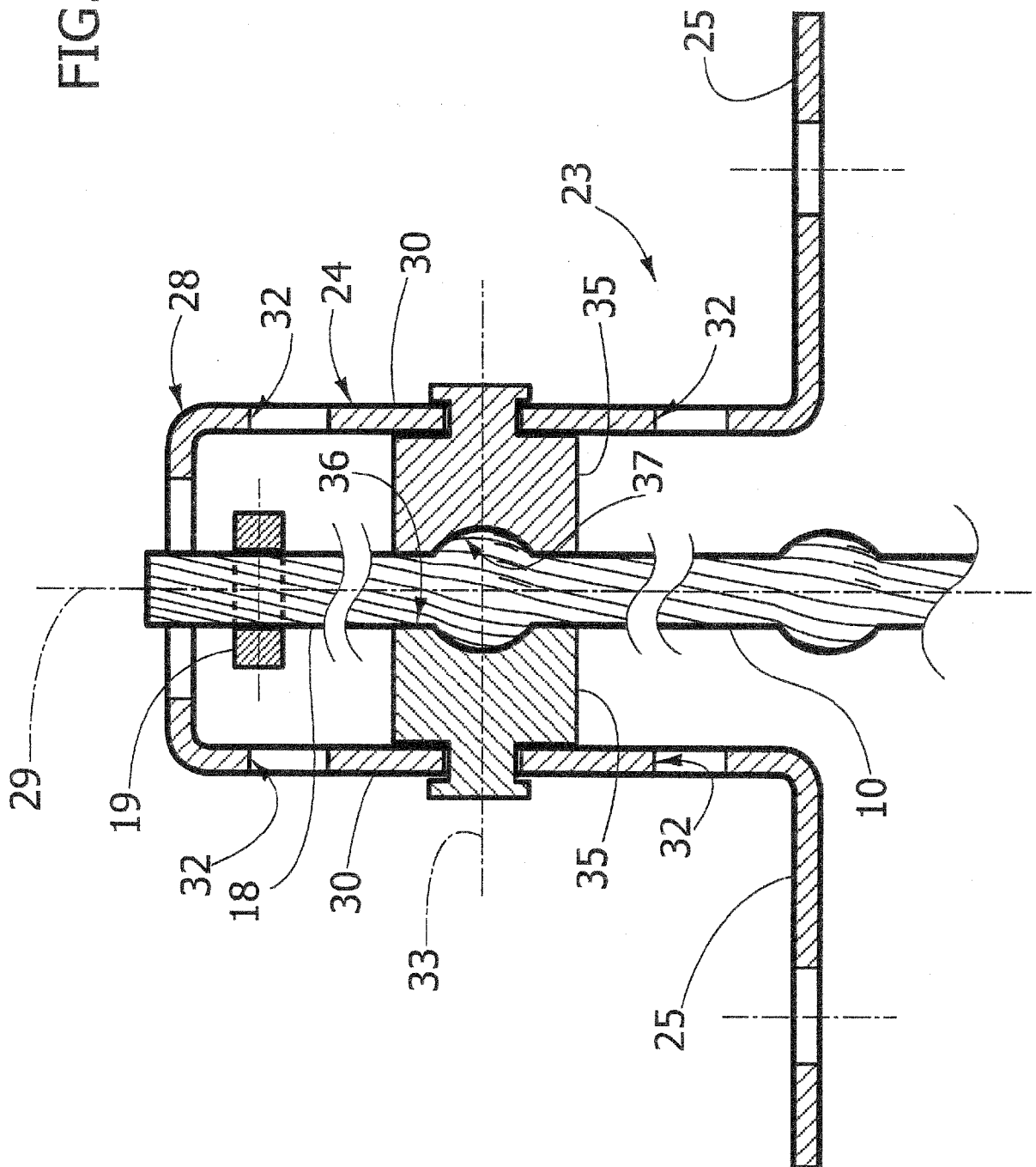


FIG. 6





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 4118

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Place of search The Hague		Date of completion of the search 1 September 2008	Examiner Perez Mendez, J
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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