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Remarks:

Amended claims in accordance with Rule 137(2)
EPC.

(54) Control pedal for the electrical or electronic control of an actuator of a motor vehicle

(57) Control pedal for the electrical or electronic control of an actuator of a motor vehicle, the control pedal comprising in combination: a) a supporting structure; b) a pedal arm; c) means for creating a hysteresis, mounted at the end that is above the axis (A), made up, among

other things, by a pair of inserts (19,20), which can be translated, as a result of the rotation of the pedal, in seats (23,24) made in the top end (4) of the arm (2), which project therefrom and are designed to exert a thrust against the walls of the supporting structure (25).

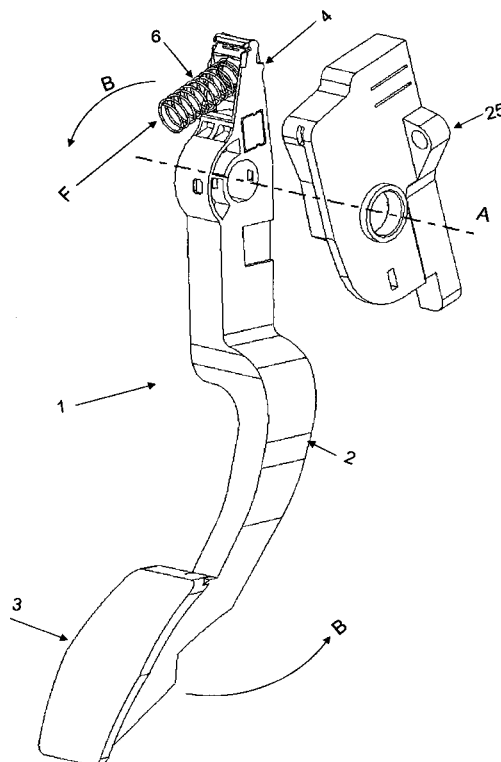


Fig. 1

EP 2 053 483 A1

Description

[0001] The present invention relates to a control pedal for the electrical or electronic control of an actuator mounted on a motor vehicle, for example, the throttle valve of a fuel-injection system in an internal-combustion engine, said control pedal being provided with a mechanical device for the creation of a hysteresis. Said device is designed to simulate the feel of reactivity of a control pedal, coupled mechanically to its actuator.

[0002] The known art envisages, for instance, that, for the throttle valve of a fuel-injection system in an internal-combustion engine, the actuation is effected via a mechanical connection. The most recent technique has replaced this mechanical connection with a control device controlled either electrically or electronically.

[0003] In the actuation of a mechanical control, it is necessary to overcome a resistance represented by the force of friction of the cable that connects the pedal to the actuator, possibly added to the thrust of a spring mounted thereon. Said force transmits to the driver a functional "feel" and allows him to establish the position of the pedal also on the basis of the reactive thrust to be overcome. In the case of an electrical or electronic control of the actuator, such a thrust of reaction comes to be totally lacking, and hence, in order to restore this feel, which is important for the purposes of good drivability of the vehicle, it is necessary to employ a device, connected to the pedal, which creates said feel that can be commonly defined as "hysteresis effect". This effect is in fact desirable in order to obtain a return thrust or an adequate resistance to depression on the control pedal, which will enable the pedal to be kept for a long time in a given position, without the variations that otherwise would certainly be present.

[0004] Such a resistance is generally obtained, in the known devices, via the friction created between two surfaces in mutual contact, pushed one against the other by the force of one or more springs that work in compression and the thrust of which increases in proportion to the displacement of the pedal to which the device is connected.

[0005] The main defect of these devices lies in the fact that the springs used must be calibrated springs that have the possibility of varying the thrust as their compression varies. The cost of production of said springs is consequently relatively high if it is intended to achieve levels of performance that are stable over time. Such a device is illustrated, for example, in the patent No. US-A-6,360,631.

[0006] The purpose of the present invention is to provide a device for the creation of a hysteresis in a pedal control of a motor vehicle that will overcome the aforesaid drawback and at the same time will present a low cost.

[0007] The above and other purposes are achieved by the present invention, the subject of which is a device for the creation of a hysteresis in a pedal control of a motor vehicle that presents the characteristics specified in

Claim 1.

[0008] Further characteristics and advantages will emerge clearly from the ensuing description, with reference to the attached plates of drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a front perspective view of a control pedal of a motor vehicle provided with the device according to the invention;
- Figure 2 is an enlarged side view, partially in cross section, of the device according to the invention, mounted on the top end of the pedal illustrated in Figure 1;
- Figure 3 is an enlarged perspective view from beneath and in cross section of the top terminal part of the pedal of Figure 1, provided with the device according to the invention; and
- Figure 4 is a rear perspective view of the terminal part of the pedal illustrated in Figure 2.

[0009] With reference to the figures, designated as a whole by 1 is a pedal for controlling an actuator mounted on a motor vehicle and made of plastic material, said pedal being designed to control the actuator via an electrical or electronic control system (not illustrated), i.e., without there being necessary a mechanical connection, for example, via a Bowden cable.

[0010] The pedal is pivoted in A with its arm 2, and when pressure is exerted on the top surface 3, it turns in the direction of the arrow B. The top end 4 of the arm 2 projects beyond the axis A and is designed to compress at least one spring 6, set between said end and a fixed part of the motor vehicle (not illustrated); in some cases it is advisable to use a number of springs set alongside one another or set coaxially. The spring 6 on the end 4 rests in a seat 7 obtained by moulding in the top part of a lever 8 made of plastic material, hinged by snap-action with its rounded top end 10 in a seat 11 made in the top edge 12 of the end 4 so that it can rock within the arm 2 of the pedal 1. The bottom part 15 of the lever 8 is shaped like a wedge with triangular cross section and with the thin end of the wedge facing in the direction indicated by the arrow F of the thrust of the spring 6. The two inclined walls 16 and 17 rest exerting thrust against the inclined walls of two inserts 19 and 20, which have a longitudinal section substantially shaped like a right triangle, with the inclined walls set normal to the plane of sliding of the seats 23 and 24 and facing one another. Said inserts are withheld by snap-action coupling 21 and are able to slide and are guided by grooves 22 in two seats 23 and 24 of corresponding shape, made in the side walls of the arm 2 of the pedal 1. The two inserts have dimensions such as to project laterally from the arm 2 and to come to rest against the internal walls, which face them, of a support 25, on which the pedal 1 rotates about the axis A, so that said inserts slide on the internal walls during actuation of the pedal 1.

[0011] Operation of the device according to the inven-

tion is described in what follows.

[0012] When the pedal 1 is operated, the top end 4 that turns in the direction of the arrow B, compresses the spring 6, which in turn discharges its thrust on the lever 8. The lever 8, by rocking, tends to displace towards the outside of the arm 2, via the wedge 15, which pushes, with the walls 16 and 17, the two inserts 19 and 20. The two inserts then push, with the walls external to the arm 2, against the internal walls of the body 25, creating a resistance by friction to the displacement of the pedal, the so-called hysteresis. The larger the stroke of the pedal, the greater the thrust of the spring on the lever 8 and, consequently, the greater the thrust of the inserts, which are pushed apart by the wedge 15, against the walls of the support 25, with corresponding increase in the resistance opposed to advance of the pedal.

[0013] When the pedal 1 is released, the thrust on the inserts decreases gradually until it becomes of no effect, so that the pedal does not return by snap action into the position of rest, but maintains a certain graduality in the displacement, which contributes to improving the feel of the driver.

[0014] Of course, the shape and size of the components of the device according to the invention may vary, without thereby departing from the sphere of protection of the present invention.

[0015] Furthermore, the means for creating the hysteresis may be positioned either above the axis of rotation of the pedal, as in the example illustrated, or else under said axis, according to the design requirements, without departing from the sphere of protection of the invention.

[0016] Also the materials forming the various parts described previously may be chosen, apart from plastic ones, from amongst any of the ones available to the designer.

Claims

1. A control pedal for the electrical or electronic control of an actuator of a motor vehicle, comprising in combination: a) a supporting structure (25); b) a pedal arm (2) made so that the end opposite to the one having the resting surface for the foot will project above the axis of rotation of the pedal itself, so as to turn, on the axis of rotation (A), in the direction opposite to that of the resting surface (3) during actuation of the pedal against the action of at least one elastic means (6); c) means for creating a hysteresis, mounted, on the end above the axis (A), **characterized in that** said means for creating a hysteresis are made up, among other things, of a pair of inserts (19, 20), which can be translated as a result of the rotation of the pedal, in seats (23, 24) made in the top end (4) of the arm (2), which project therefrom and are designed to exert a thrust against the walls of the supporting structure (25).

2. The control pedal according to Claim 1, **characterized in that** the two inserts (19, 20) have a longitudinal section substantially shaped like a right triangle, with the inclined walls set normal to the plane of sliding of the seats (23, 24), which face one another and are designed to co-operate slidingly with the walls (16, 17) of the bottom end (15) of a wedge-shaped lever (8) with triangular cross section set between them, for displacing from a position in which they are close to one another, to a position in which they are set at a distance apart from one another, as a result of the advance of the lever (8) between them.
3. The control pedal according to Claim 1, **characterized in that** the two inserts (19, 20) are withheld with a snap-action coupling (21) in the respective seats (23, 24).
4. The control pedal according to Claim 1, **characterized in that** the two inserts (19, 20) are guided in the respective seats (23, 24) by grooves (22).
5. The control pedal according to Claims 1 and 2, **characterized in that** the lever (8) is hinged by snap-action with its top end rounded (10) in a seat (11) made in the top edge (12) of the end (4), so that it can rock within the arm (2) of the pedal (1).
6. The control pedal according to Claims 1 and 2, **characterized in that** the lever (8) is provided with a seat (7) designed to receive the elastic means (6).
7. The control pedal according to Claim 1, **characterized in that** the elastic means is a helical spring (6).
8. The control pedal according to Claim 1, **characterized in that** the means for creating a hysteresis are positioned above the axis of rotation (A) of the pedal (1).
9. The control pedal according to Claim 1, **characterized in that** the means for creating a hysteresis are positioned under the axis of rotation (A) of the pedal (1).

Amended claims in accordance with Rule 137(2) EPC.

1. A control pedal for the electrical or electronic control of an actuator of a motor vehicle, comprising in combination: a) a supporting structure (25) ; b) a pedal arm (2) made so that the end opposite to the one having the resting surface for the foot will project above the axis of rotation of the pedal itself, so as to turn, on the axis of rotation (A), in the direction opposite to that of the resting surface (3) during actuation

ation of the pedal against the action of at least one elastic means (6); c) means for creating a hysteresis, mounted, on the end above the axis (A); said means for creating a hysteresis are made up, among other things, of a pair of inserts (19, 20), which can be translated as a result of the rotation of the pedal, in seats (23, 24) made in the top end (4) of the arm (2), which project therefrom and are designed to exert a thrust against the walls of the supporting structure (25); the control pedal is **characterized in that** the two inserts (19, 20) have a longitudinal section substantially shaped like a right triangle, with the inclined walls set normal to the plane of sliding of the seats (23, 24), which face one another and are designed to co-operate slidingly with the walls (16, 17) of the bottom end (15) of a wedge-shaped lever (8) with triangular cross section set between them, for displacing from a position in which they are close to one another, to a position in which they are set at a distance apart from one another, as a result of the advance of the lever (8) between them.

2. The control pedal according to Claim 1, **characterized in that** the two inserts (19, 20) are withheld with a snap-action coupling (21) in the respective seats (23, 24).

3. The control pedal according to Claim 1, **characterized in that** the two inserts (19, 20) are guided in the respective seats (23, 24) by grooves (22).

4. The control pedal according to Claim 1, **characterized in that** the lever (8) is hinged by snap-action with its top end rounded (10) in a seat (11) made in the top edge (12) of the end (4), so that it can rock within the arm (2) of the pedal (1).

5. The control pedal according to Claim 1, **characterized in that** the lever (8) is provided with a seat (7) designed to receive the elastic means (6).

6. The control pedal according to Claim 1, **characterized in that** the elastic means is a helical spring (6).

7. The control pedal according to Claim 1, **characterized in that** the means for creating a hysteresis are positioned above the axis of rotation (A) of the pedal (1).

8. The control pedal according to Claim 1, **characterized in that** the means for creating a hysteresis are positioned under the axis of rotation (A) of the pedal (1).

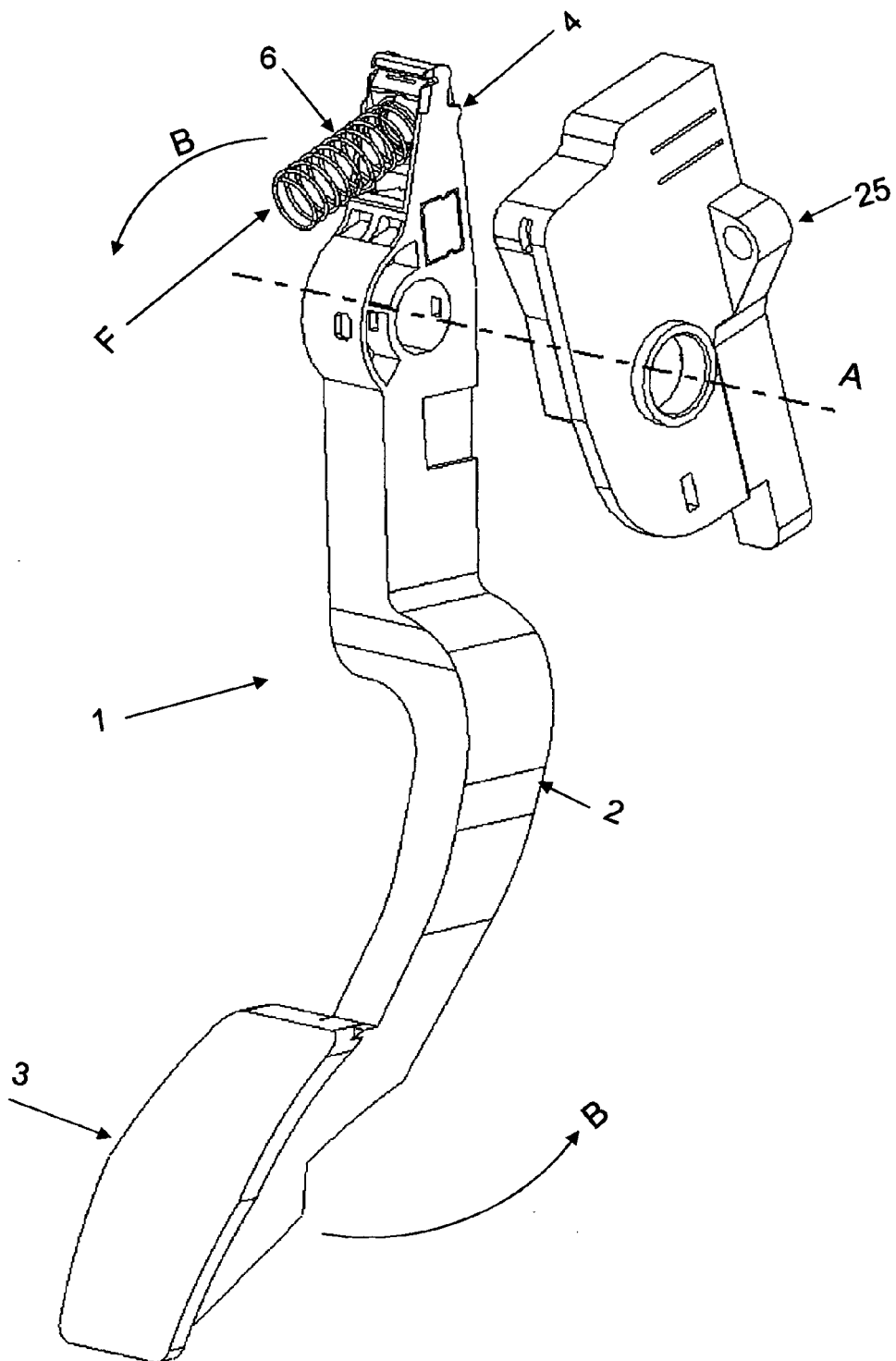


Fig. 1

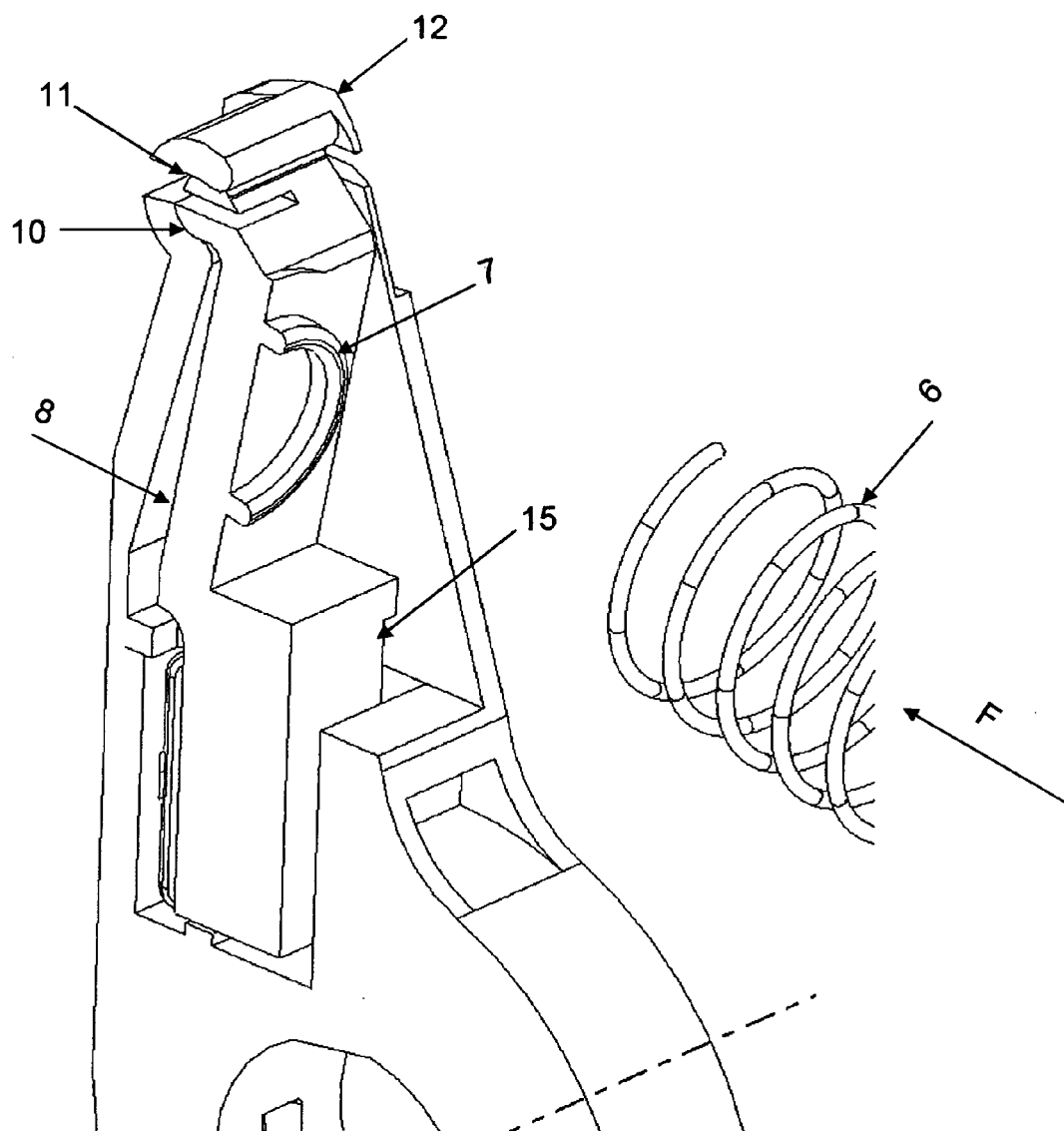


Fig. 2

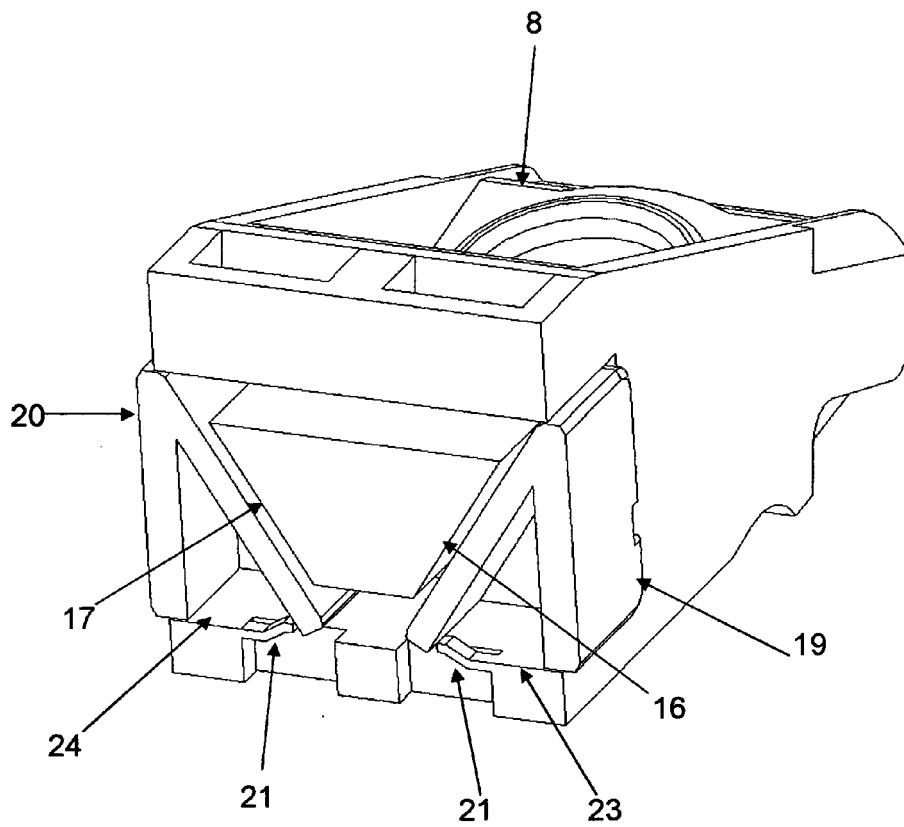


Fig. 3

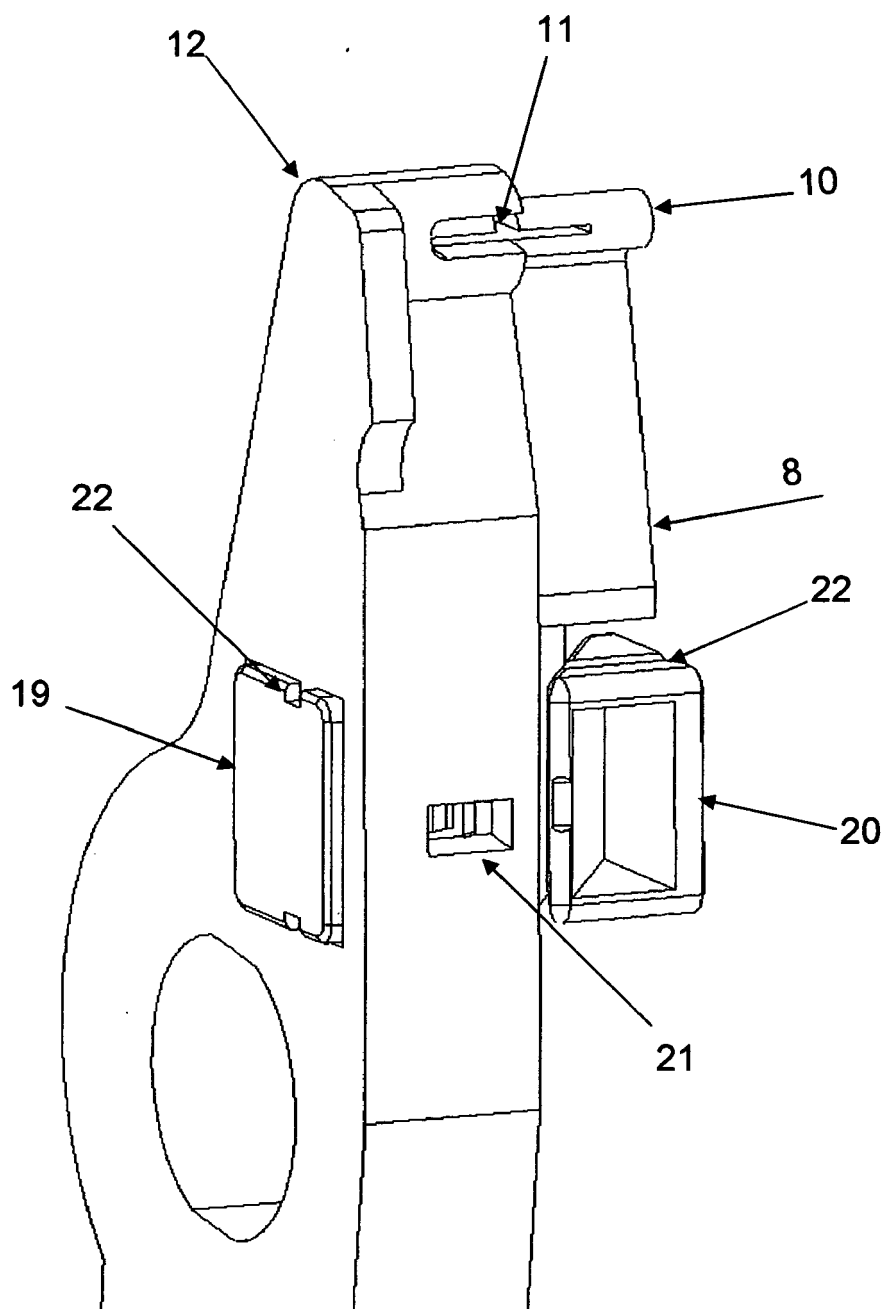


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 2157

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Place of search The Hague		Date of completion of the search 11 March 2008	Examiner Popescu, Alexandru
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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