

Description

The present invention relates to an apparatus for controlling pivoted closing systems, the latter encompassing systems with one or more wing, such as doors, street doors, gates and the like, as well as systems of the mobile barrier type, equipped with drive means for opening and closing movements.

In such closing systems, one or two wings, or a barrier, are made to rotate about an axis which is vertical for wing systems and horizontal for barrier systems, by corresponding actuators whose configuration varies according to the type of closing system used.

In the case of wings, that is to say, for driving street doors, doors or gates, linear actuators are used, i.e.: actuators with at least one element whose length may vary depending whether the wing is open or closed.

Two types of such actuators are currently available: with hydraulic or electromechanical control, with worm screw and volute.

To drive mobile structures pivoted on a horizontal axis, such as barriers, a motor connected by a chain or similar transmission means to a set of toothed wheels is envisaged, the final toothed wheel acting upon a shaft at the barrier pivoting axis.

In both types of pivoted closing systems, with wings or barriers, a mobile structure is used which rotates about a pivoting axis on the structure itself usually covering an angle of 90°. For this reason, the system drive means are activated, during opening and closing operations, for a period of time which corresponds to the movement of the mobile structure between two end positions, separated by an angle which corresponds to the structure's travel about the pivoting axis.

In order to guarantee the correct operation of pivoted closing systems, the most accurate identification possible of the periods of activation of the drive means is required, so as to stop the gate or barrier at its end position.

The following devices are amongst those envisaged to stop the drive means on the closing systems: mechanical, electromechanical or electronic clutches, able to cut off the power supply to the motor when there are variations in motion, that is to say, when the mobile closing structure stops because it has reached the end positions.

Other closing systems envisage not only the clutch, but also timed motor activation in accordance with an average period of movement of the mobile closing structure.

For wing closing systems, in which the wing closing and opening operations are determined by linear actuators, devices which detect the degree of extension of the actuators themselves are envisaged, so as to check wing positioning.

Such devices consist, for example, of microswitches positioned on the arm of electromechanical actuators.

In systems involving hydraulic actuators, by-pass valves may be envisaged, to check, by means of pressure variations, the completion of wing closing or opening operations.

In some cases, the servo controls for wing closing systems are equipped to operate rapidly at intermediate angles and slowly at the start and end of the opening movement, so as to prevent the moving structure from jolting or being struck: for this purpose, in the case of electromechanical actuators, a pair of microswitches is envisaged on a bar which is fixed to the actuator assembly and extends parallel with the worm screw whose interception determines a variation in the motor control speed, this being a function of the angle selected for low speeds. These microswitches must have electrical contacts which are connected to the rear of the motor, at the point where it is attached to the fixed part of the fitting (of suitable size, with space for the passage of the necessary cables, etc.).

For hydraulic actuators, end of travel damping occurs by throttling the hydraulic flow at the two ends of the actuator travel: to obtain slowing, the actuator must cover its entire travel, since there is a mechanical link between slowing and the length of the actuator, defined by the position of the throttling at the said ends.

The aim of the present invention is to overcome the afore-mentioned disadvantages with an apparatus for controlling pivoted closing systems, such as means for the activation of the mobile closing structure drive means, two cam elements, whose active profile lies parallel with the structure's axis of rotation, attached to a support which is fixed to the axis itself and separated by an angle which is determined according to the preset value, and cam element interception means, fixed to the mobile structure, which interact with the cam elements in a direction parallel with the axis, and may have at least two configurations, so as to allow the drive means to pass from a first to a second speed.

An apparatus made according to the present invention may be applied to newly manufactured or installed opening systems, or can be fitted to pre-existing opening systems by means of simple modifications.

The technical features of the present invention, in accordance with the said aims, are clearly described in the claims herein and the advantages of the invention are more clearly shown in the detailed description below, with reference to the accompanying drawings which illustrate an embodiment by way of example only, and in which:

- figures 1 and 2 are schematic illustrations of two possible applications of the present invention on closing systems which pivot, respectively, on a vertical and a horizontal axis;
- figures 3 and 4 are a schematic side view and plan view of a possible embodiment of the present invention, connected to a closing system which envisages a linear actuator for wings;

- figures 5 and 6 are, respectively, a perspective view and a plan view of a possible embodiment of the present invention;
- figure 7 is a schematic illustration of a possible embodiment of the present invention, connected to a barrier closing system pivoted on a horizontal axis;
- figure 8 is a schematic side view with some parts cut away and others shown in cross-section of a possible embodiment of the present invention, connected to a closing system with linear actuator for wings.

With reference to the accompanying drawings, an apparatus for controlling the movement of pivoted closing systems, indicated as a whole by the numeral 1, may be used on systems consisting of a mobile structure 2 which pivots about an axis X.

Figure 1 is a schematic representation of an opening system for a door with two wings 2, pivoted on respective vertical axes X.

In the embodiment shown in figure 2, the mobile structure is represented by a barrier 2, pivoted on a horizontal axis X.

The width of the mobile structure corresponds to the gap L of an entrance or passage.

The structure is fitted with drive means 4, connected to the structure by transmission means 6 suited to the type of movement: a linear actuator is envisaged for a wing closing system, whilst flexible connections such as chains combined with toothed wheels are envisaged for a barrier closing system.

The transmission means 6 are not described in detail in this text, since they do not concern the object of the present invention.

The drive means 4 are controlled by controls 1' which act upon the drive means' power supply circuit, so that the mobile structure 2 can be set at a first I and second II end position, separated by an angle corresponding to a preset value α (normally 90°), said end positions corresponding to the closure or opening of the entrance or passage L.

The connection between the drive means 4 and the controls 1' is illustrated schematically only in the embodiment in figure 3. The embodiment in figure 8 shows the terminals 4' for connection to the drive means.

In figures 1, 2 and 7 the said end positions are denoted by I and II and the structures set in those positions are denoted 2' and 2''.

The controls 1' consist of two cam elements 11 and 12, whose active profile lies parallel with the axis X (denoted X12 in the accompanying drawings).

The cam elements 11 and 12 are attached to a support 10 which is fixed to the axis itself, and are separated by an angle α' which is a function of the preset value α which defines the angle between the two end positions I and II of the mobile structures 2 (the said value α' coincides with α in the examples).

Interception means 13 for the cam elements 11 and

12 are also envisaged, said means being secured to the mobile structure 2 and interacting with the cam elements in a direction X13 parallel with the axis X, and having at least two configurations, so as to allow the drive means 4 to pass from a first to a second speed.

The interception means 13 may consist of at least one switch, set so that it is triggered in a direction parallel with the axis X, which will be vertical for wing systems and horizontal for barriers pivoted on a horizontal axis.

As regards the apparatus with a vertical axis X, with reference to the illustrations in figures 3, 5 and 8, the switch 13 may act directly upon the cam elements, as shown in the embodiments in figures 3 and 5, or by means of a connecting lever 13', as shown in figure 8.

An apparatus in which the cam elements are attached to the structure 2 and the interception means are attached to the axis X or a fixed point with respect to the said axis, is technically equivalent.

The passage of the interception means 13 from one configuration to another, that is to say, their activation, determines a variation in the speed of rotation of the mobile structure 2.

Such a variation may consist in a variation from a higher speed to a lower speed, or the stoppage of the drive means 4.

If the drive means 4 are stopped, the second speed is zero.

Various alternatives are possible in the variation between two different speeds which are not zero.

A first system envisages timer means 5, positioned between the controls 1' and drive means 4, and designed to disable the drive means after a preset time, following activation of the timer means by the interception means 13.

In this case, the mobile structure 2 is moved over a given angle at a first speed, then, following activation of the interception means 13 (by their interaction with one of the two cam elements 11, 12), the drive means pass to a second speed, lower than the first, and after a preset time are stopped by the timer means 5.

Therefore, the mobile structure 2 is first slowed (to the second speed) and then stopped; these being the deceleration phases when opening and closing the mobile structures.

Alternatively, as is better shown in figures 5 and 6, the cam elements 11, 12 may have an active profile H11, H12 with double height $11 - 11'$, $12 - 12'$, so that they interact twice with the interception means 13, which may consist of two switches or a switch with three positions. At the first interaction the drive means 4 pass from the first to the second speed; at the second interaction the drive means are disabled.

As is better illustrated in figure 6, one of the cam elements 12 is attached to the support 10 by fixing means which can be inserted in a circular seat 14; in practice, a kind of slot 14 is envisaged on the support, 10 said slot extending with a curved circumference in

which the cam element 12 can be stably positioned on configurations separated from the other (fixed) element 11 by various angles, depending on the afore-mentioned preset value α .

When the mobile structure 2 is a wing, as in figures 1, 3 and 4, and the said axis is vertical, the support 10 is keyed to a vertical supporting pin 7, parallel with the axis X and attached to a corresponding base 70, which may be set on the ground or at a fixed point with respect to the axis X, e.g.: a section of wall, or a fixed part of the opening system.

When the mobile structure 2 is a barrier and the said axis is horizontal, as shown in figures 2 and 7, the support 10 is keyed to a horizontal pin 7, which coincides with the axis X. In this case, the transmission means consist of a first toothed wheel 18, driven by the motor 4, and a second toothed wheel 10' bearing the support 10 and connected to the first toothed wheel by a chain 19. The mobile structure 2 consists of a barrier 2, rigidly connected to a rod 22, connected in such a way that it may rotate, to a connecting rod 23, pivoted on the first toothed wheel 18.

In its home position, the connecting rod 23 is vertical and the end pivoted on the first toothed wheel 18 is connected to the wheel 18 at a low point, diametrically opposite the point occupied when the barrier 2 is raised in the open position II, so as to avoid unwanted raising of the barrier in position I when the motor is disabled.

The present invention, thus designed for the said objects, may be subject to numerous variations, all encompassed by the original design concept, and all components may be replaced with technically equivalent parts.

Claims

1. An apparatus for controlling pivoted closing systems, said systems consisting of a mobile structure whose extension corresponds to the gap of an entrance or passage, and drive means which are connected to the structure by transmission means; said structure pivoting at one end about an axis of rotation; said drive means being controlled by controls which act upon the drive means' power supply circuit, so that the mobile structure can be set in a first and second end position, separated by an angle with a preset value and corresponding to the opening and closure of the said gap, the apparatus being characterised in that the controls consist of two cam elements (11, 12), whose active profile lies parallel with the said axis (X), said elements being attached to a support (10) secured to the axis and separated by an angle (α) which is a function of the said preset value (α), and cam element interception means (13), attached to the mobile structure (2), said means interacting with the cam elements in a direction parallel with the axis (X) and having at

least two configurations, so as to allow the drive means (4), when activated, to pass from a first to a second speed.

2. The apparatus as described in claim 1, characterised in that either the first or second speed is zero.
3. The apparatus as described in claim 1, characterised in that the first and second speeds are not zero and the second speed is lower than the first, timer means (5) being envisaged, connected to the controls (1') and drive means (4), said timer means being activated by interception means (13), and being designed to disable the drive means (4) after a given period of time.
4. The apparatus as described in claim 1, characterised in that the first and second speeds are not zero and the second speed is lower than the first, timer means (5) being envisaged between the controls (1') and the drive means (4), the timer means being designed to disable the drive means (4), the speed being varied from the said second speed to zero after a preset period of time and corresponding to the opening and closing deceleration ramps.
5. The apparatus as described in claim 1, characterised in that the first and second speeds are not zero and the second speed is lower than the first, said cam elements (11, 12) having an active profile (H11, H12) with double height (11 - 11', 12 - 12'), so that they interact twice with the interception means (13), first causing the drive means (4) to pass from the first to the second speed, and secondly causing the speed to pass to zero.
6. The apparatus as described in claim 1, characterised in that one of the cam elements (12) is attached to the support (10) by fixing means which can be inserted in a circular seat (14) in which one of the cam elements (12) is stably positioned on configurations in which it is separated from the other cam element by various angles, depending on the said preset value (α).
7. The apparatus as described in claim 1, where the mobile structure is a wing and the said axis is vertical, characterised in that the support is keyed to a vertical supporting pin (7), parallel with the axis (X).
8. The apparatus as described in claim 1, where the mobile structure is a barrier and the said axis is horizontal, characterised in that the support (10) is keyed to a horizontal pin (7) which coincides with the axis (X).

FIG 1

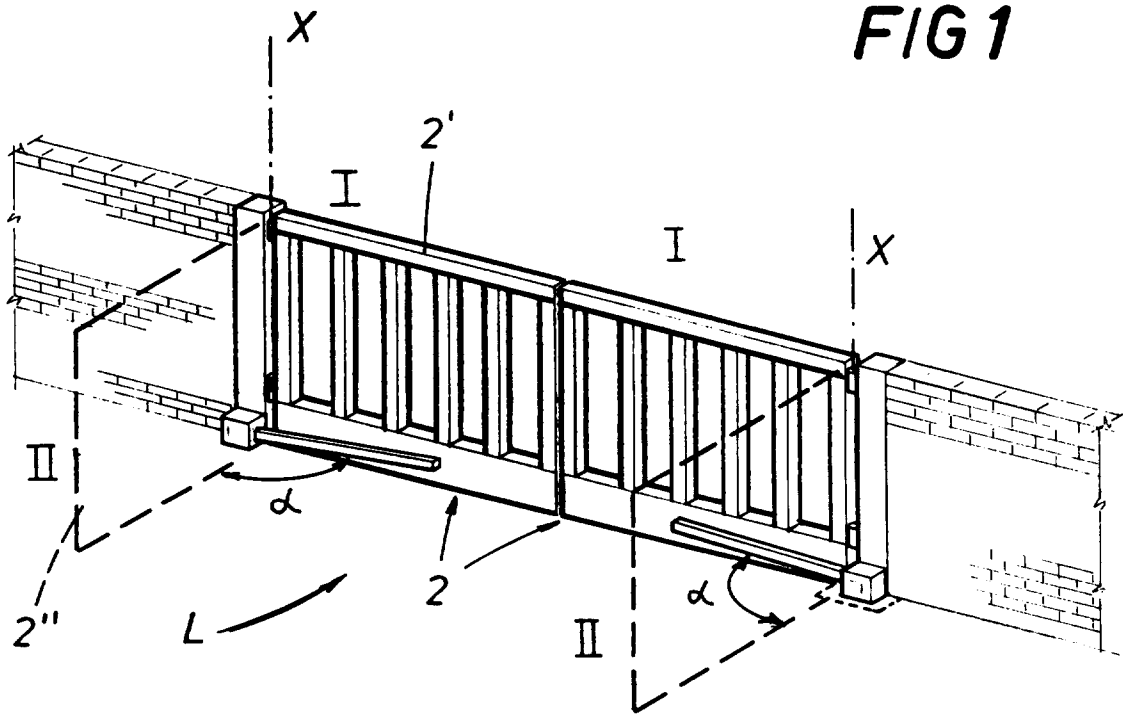
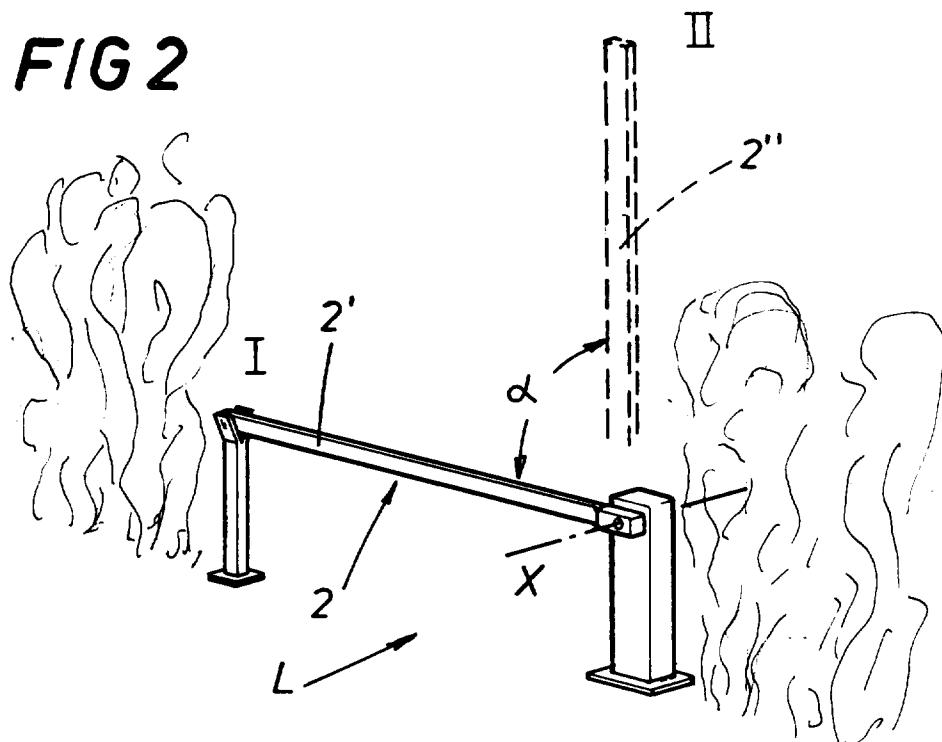


FIG 2



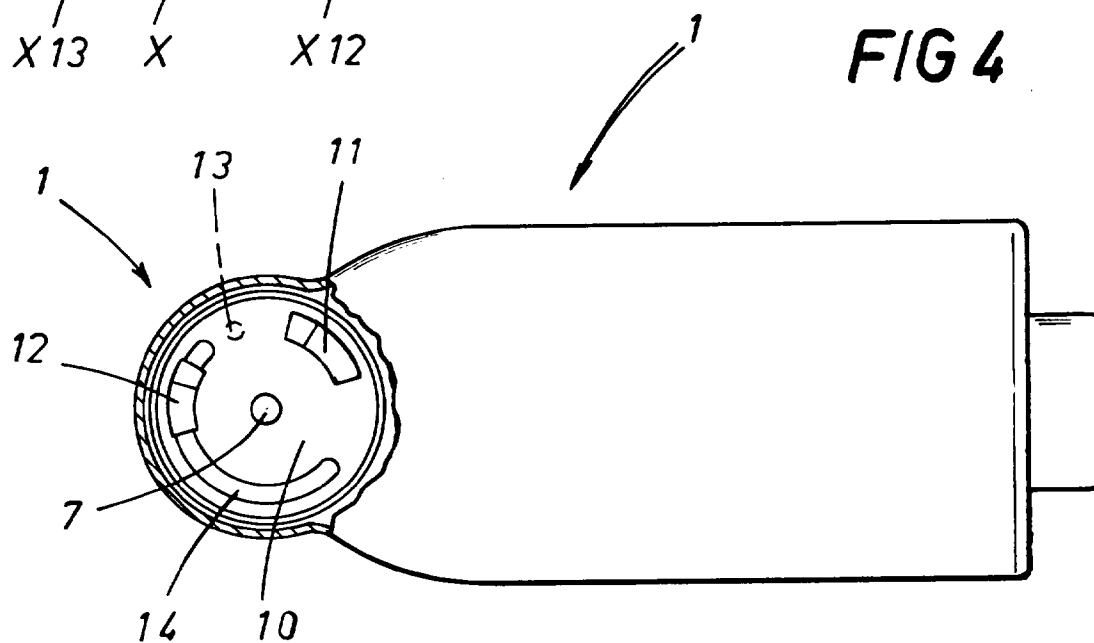
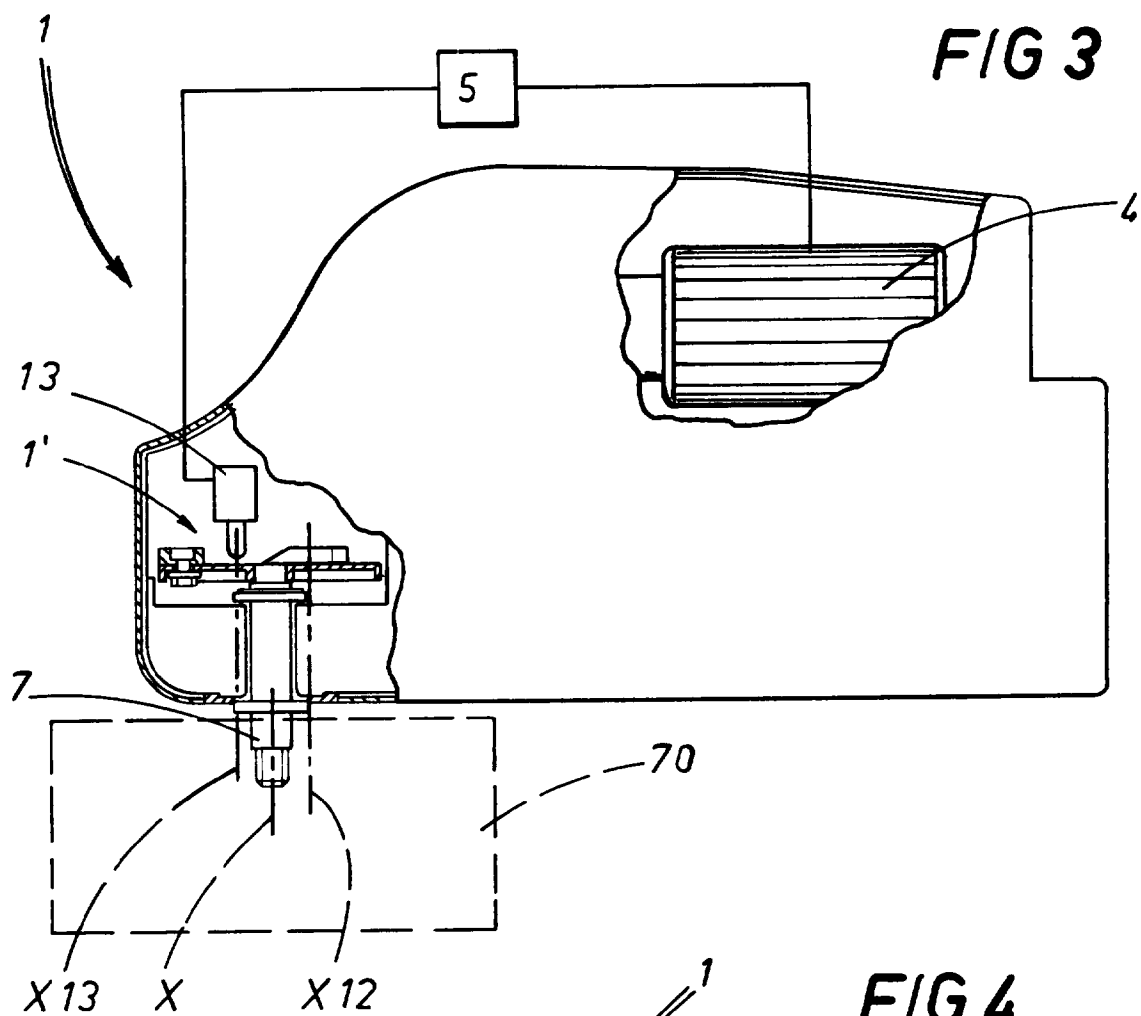


FIG 6

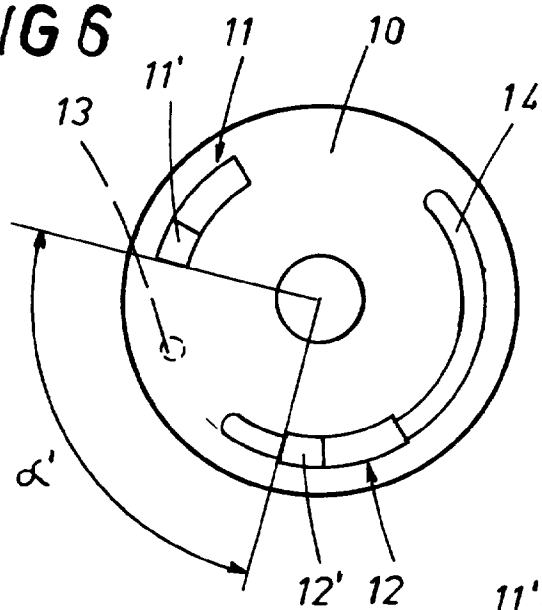


FIG 5

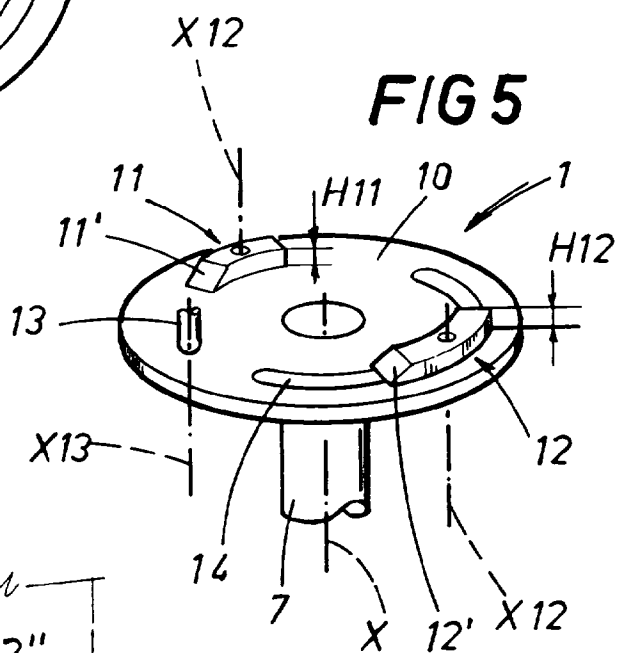
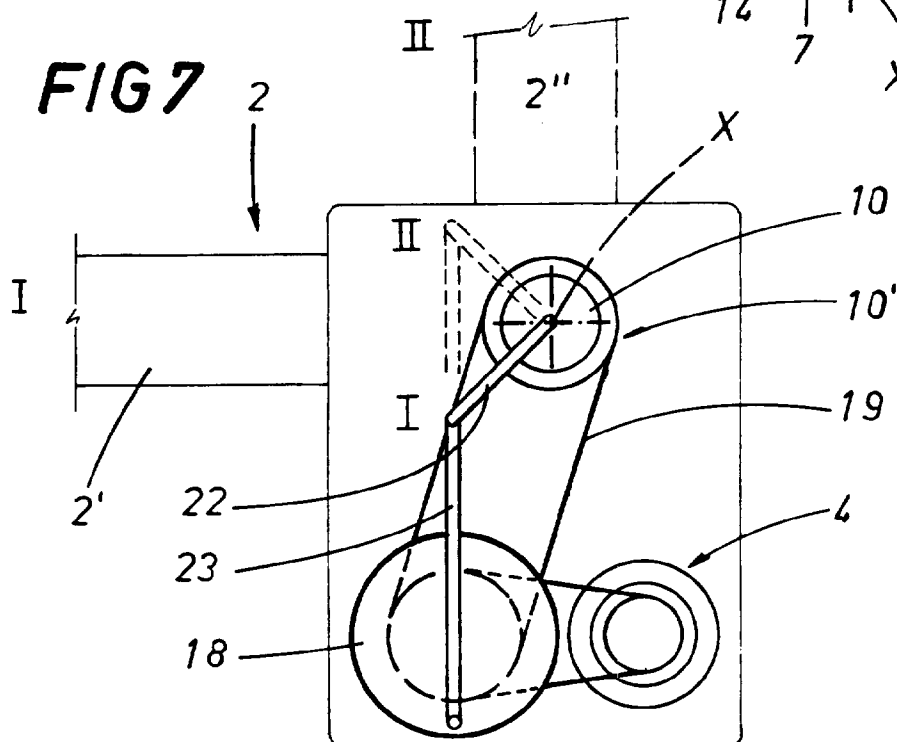
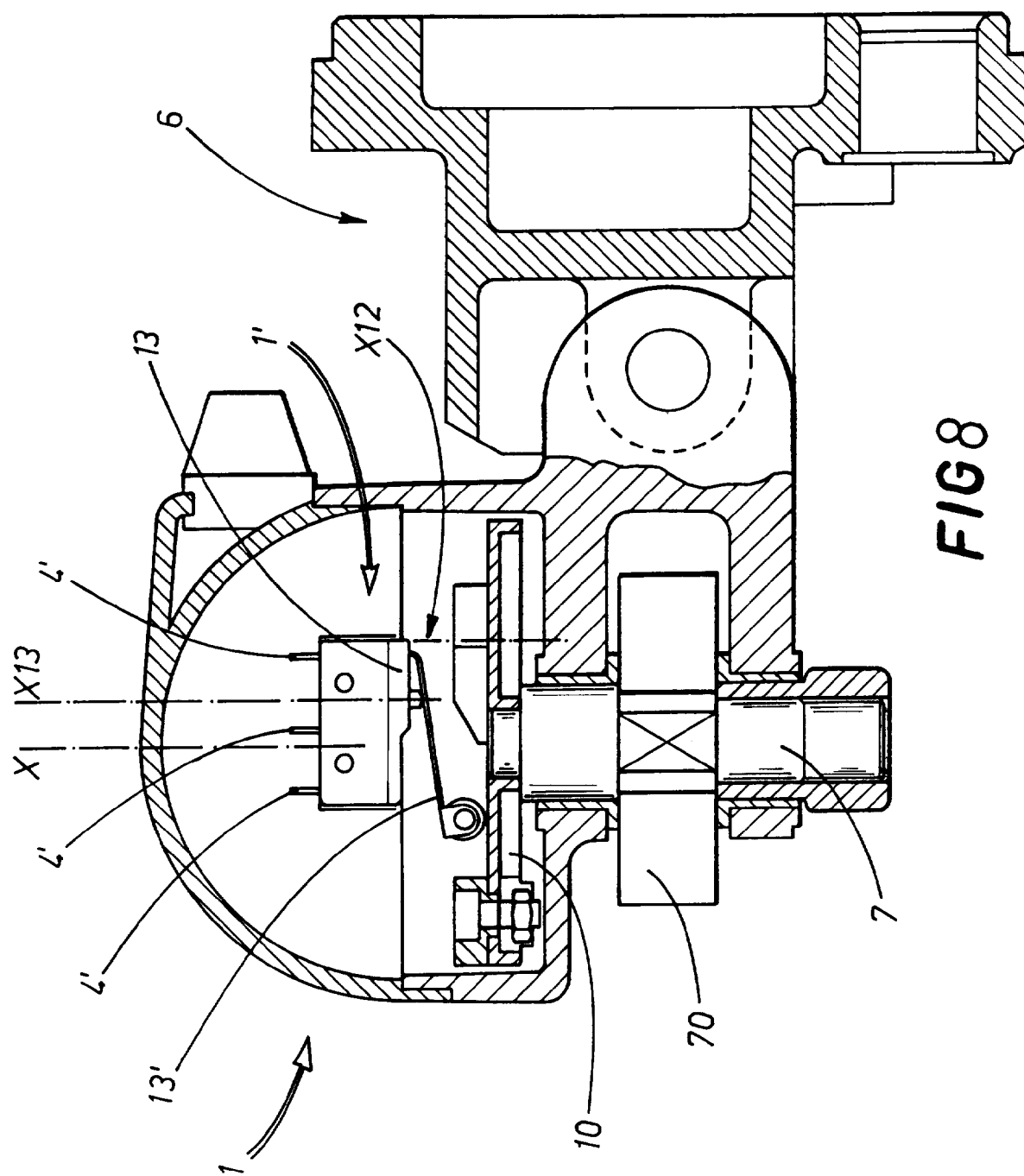


FIG 7







European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 95 83 0480

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US-A-5 101 595 (RHOADES) * column 2, line 28 - line 36 * * column 2, line 43 - line 60; figures 2,4 *	1,2,7 5,8	E05F15/12 E01F13/06
Y	--- US-A-3 526 820 (SHECKELLS) * column 7, line 3 - line 9; figures 1,2 *	5	
Y	--- US-A-4 658 543 (CARR) * abstract * * column 3, line 16 - line 24; figure 3 *	8	
A	--- DE-A-33 08 684 (HANS HEYNAU GMBH) * page 8, line 30 - page 9, line 9; figures 2,3 *	1,7	
A	--- GB-A-2 265 180 (SHUN-CHENG HO) * abstract *	3,4	
A	--- GB-A-2 020 734 (THE STANLEY WORKS) * page 9, line 120 - line 129; figures 2,4 *	6	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E05F E01F
Place of search THE HAGUE		Date of completion of the search 21 February 1996	Examiner Van Kessel, J
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	

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