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(54) Functioning mechanism for sliding doors

(57) This mechanism consists of: a support (3) which can be moved in a lengthways direction, a motor (4), an actuator (6) linked to the movable support (3) and having side ramps (61), thrust components (8) which move the actuator towards the operative position, a movement receiver (7) linked to the sliding door (1) with a central cavity

(71) for housing the actuator (6), outer ramps (72) for the automatic interlocking of the actuator (6) in the central cavity (71) and ramps which face each other (73) on opposing sides of the central cavity (71) for the automatic dislocation of the actuator (6) in the event of a door (1) blockage.

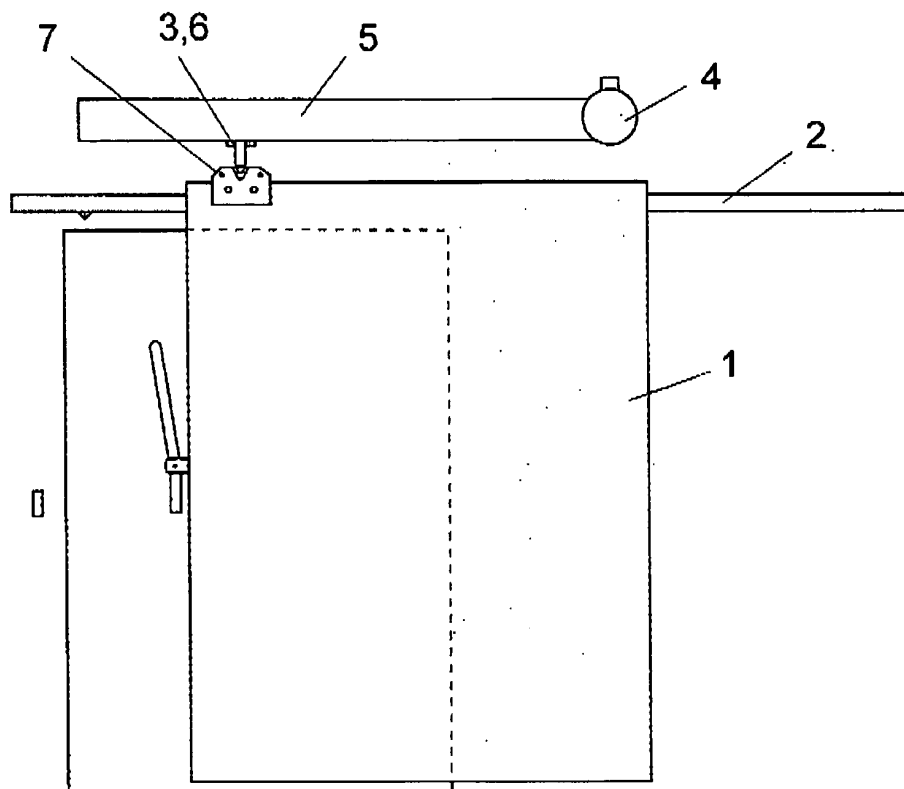


Fig. 1

EP 2 194 219 A1

Description

Purpose of the invention.

[0001] A mechanism for the functioning of sliding doors, of the type which include: a support capable of lengthways movement for opening and closing the door, a motor which powers the lengthways movement of the movable support and an actuator whose movement is linked to the moveable support in a lengthways direction. There is also a movement receiver, linked to the sliding door and featuring a central actuator housing cavity and outer ramps for guiding the actuator to the central cavity when the actuator moves lengthways and reaches the movement receiver at any stage of the doors range of motion.

Precursors to the invention.

[0002] The registered patent ES 2 071 568 B1, by the same inventor (IGLESIAS BALLESTER) should be mentioned as a precursor to this invention. The patent describes the opening and closing mechanism for doors and especially for sliding doors on fridge units.

[0003] This mechanism pulls the door closed through the pulling components linked to it, which are activated by a motor device, which also allows the manual movement of the door when the motor device is disconnected; with the special characteristic that the pulling components are bound to a transmission component activated by the motor, and are designed to be housed in the coupling component attached to the door, with the coupling components creating a trajectory which causes the total disconnection of the pulling components and the door's coupling components, when it is near to the closed position.

[0004] In the mechanism described in the aforementioned patent ES 2 071 568 B1, the door's supporting connector piece features a connecting ramp at least in one of its extremes, allowing the entry of the pulling components, when said connecting piece is at any point in the range of motion.

[0005] Therefore, the objectives of the aforementioned patent are: firstly to ensure that the pulling components are released from the inner frame when the door moves towards the closed position, which is achieved through a change in the trajectory of the pulling components at said end point of the range of motion and, in addition, to allow the pulling components to connect with the inner door frame at any point in its range of motion, which is achieved through upwardly inclined ramps located at opposite extremes of the inner door frame and the activation of these pulling components via a flexible transmission unit facilitated by a turnbuckle, so that the pulling components pass over the side ramps and become secured in the inner door frame.

[0006] In the aforementioned mechanism, once the pulling components are secured in the inner door frame,

said components remain in the secured position until the door reaches the point at which said pulling components depart from their trajectory and become free of the inner door frame.

[0007] This means that if the door becomes jammed during its motorised movement, the pulling components and the motor will be overexerted, which may cause a serious breakdown.

Description of the invention

[0008] The opening and closing mechanism for sliding doors, being of the aforementioned type and including: a support capable of lengthways movement for opening and closing the door, a motor which powers the lengthways movement of the movable support, an actuator whose movement is linked to the moveable support in a lengthways direction. They also have a movement receiver, linked to the sliding door and featuring a central actuator housing cavity and outer ramps for guiding the actuator to the central cavity when the actuator moves lengthways and reaches the movement receiver at any stage in the door's range of motion. There is also a built in system which automatically disconnects the actuator and the door movement receiver when the actuator is overexerted beyond certain pre-established limits, for example due to the movement of the door being jammed, irrespective of the stage of the door's range of motion.

[0009] For this purpose, and in accordance with the invention, the actuator may be mounted on the moveable support and adjusted between an upper operating position which causes the lengthways motion of the door movement receiver to be intercepted, and an inoperative lowered position in which it passes over the movement receiver. Additionally, the actuator is set in the upper operating position by thrust components. Furthermore, the sliding door movement receiver features ramps which face each other on opposing sides of the central cavity which cause the transverse movement of the actuator towards the inoperative position. This overrides the resistance of the actuator thrust components, and the emergence of the actuator from the movement receiver cavity when said actuator is moved in a lengthways direction and the door is disabled from moving in the lengthways direction of the actuator.

[0010] These mechanical characteristics of the invention allow, as mentioned, for the actuator which causes the sideways movement of the door to be freed from the movement receiver when the door becomes jammed during its movement, avoiding breakdowns in the various parts of the mechanism.

[0011] According to the invention, the motor is direct drive and does not have a clutch.

[0012] In one embodiment of the invention, the actuator consists of an immobilised turn lug on the moveable support which has ramps at its end facing the ramps of the movement receiver, resulting in a thinner section of the lug towards its far end. These ramps allow the con-

nection and disconnection of the lug from the door's movement receiver.

[0013] According to the invention, the movement receiver consists of removable doorstops for selectively blocking at least one of the internal cavity ramps, with said doorstops preventing contact between the actuator and the ramp or blocked ramps and the detachment of the actuator towards the corresponding doorstop. These doorstops are mounted on the movement receiver to secure the thrust of the actuator on said receiver in one or in both directions of the door's movement, irrespective of its opening direction (to the right or the left).

[0014] In one embodiment of the invention, the mechanism, consists of sensors linked to the actuator for the detection of aspects of its working conditions, such as movement or pressure, the sending of corresponding signals to the motor, and the modification of the motor's operational setting. These sensors allow, therefore, for the motor's working conditions to be adjusted, avoiding possible overexertion and breakdowns.

[0015] According to the invention, the component which thrusts the actuator into place consists of an adjustable tension spring mounted on a moveable support.

[0016] Finally and in accordance with the invention, the central part of the actuator has a transverse bolt on which a rolling component is mounted, which can be moved along a guide located over a recess, for the housing of said rolling component in the door's closed position.

Description of the figures.

[0017] To complement the existing description and in order that the characteristics of the invention may be understood, this descriptive report is accompanied by a series of diagrams in which, for illustrative rather than definitive purposes, the following are represented:

- Figure 1 shows an elevated schematic view of the sliding door, specifically for a fridge unit, provided for the working mechanism of the door.
- Figure 2 shows a detailed elevated frontal view of an example of the embodiment of the movable support separated by a vertical plane, and a view of the actuator in which the actuator thrust components can be seen, represented in this case by an adjustable tension spring.
- Figure 3 shows an elevated view of the movement receiver, as mounted on the sliding door.
- Figures 4, 5, 6 and 7 show a series of elevated views of the actuator and the receiver, during the lengthways movement of the actuator when the door is jammed, demonstrating the freeing of the actuator from the movement receiver.
- Figure 8 shows a perspective view of the mechanism with a door stop mounted on the movement receiver and blocking one of the ramps of the interior cavity, in which the actuator is located.
- Figure 9 shows an elevated view of the mechanism

with two doorstops mounted on the movement receiver, blocking the ramps of the inner cavity.

- Figure 10 shows a sectional elevated view of the moveable support with the actuator position sensor.
- Figure 11 shows a profile view of the moveable support and of the actuator with a transverse bolt, on which a rolling component is located, which can be moved along a fixed guide.

10 Preferred embodiment of the invention.

[0018] In the embodiment example shown in figure 1 a sliding door (1) is shown mounted on a lengthways guide (2) along with the working mechanism of the invention, which comprises a support (3), which can be moved in a lengthways direction, connected to a motor (4) activated by a linear movement transmitter (5), with an actuator (6) being mounted on said movable support (3), with which it moves in a lengthways direction and transmits said lengthways movement to a movement receiver (7), which is linked to the sliding door (1).

[0019] The actuator (6) is mounted on a moveable support (3) and can be moved between an upper operating position which causes the lengthways motion of the sliding door (1) movement receiver (7) to be intercepted, and an inoperative position in which it passes over the movement receiver (7). In the example shown, the actuator (6) is represented by a prismatic immobilised turn lug on the moveable support, which has two side ramps (61) which face each other near its extreme.

[0020] Thrust components (8) act on the actuator (6), keeping it in the upper operating position, and are represented by a spring whose tension is controlled by a rear cover (81) screwed onto the upper or lower part of the movable support (3).

[0021] In figure 3 the receiver (7) can be seen fixed to the sliding door as shown in Figure.1. Said receiver (7) has a central cavity (71) for housing the actuator (6), two outer ramps (72) and two ramps (73) on opposing sides of the central cavity (71). The outer ramps (72) of the receiver unit (7) and the ramps (61) of the actuator (6) allow the actuator to access the inner cavity (71) when it reaches the receiver (7) of the sliding door (1) in its lengthways movement, causing the transmission of the actuator's movement (6) to the sliding door (1), as shown in Figure 4.

[0022] If the sliding door (1) is jammed during its movement, as shown in the figure (5), contact between the conflicting ramps, (73 and 61) of the receiver (7) and the actuator (6) will immediately cause the actuator to move towards the inactive position, overriding the resistance of the thrust components (1) and the movement of the actuator (6) over the receiver (7) as shown in figure 6, and the disconnection between these parts as is shown in the figure (7).

[0023] This automatic decoupling of the actuator (6) in the event of a door blockage allows the use of a direct drive motor (4), at a lower cost than declutching motors.

[0024] As shown in figures 8 y 9, the receiver (7) of the sliding door (1) has removable doorstops (9) that are independently attached to the receiver, so in the event that one or both of the ramps (73) of the inner cavity (71) need to be blocked, the automatic dislocation of the actuator can be avoided (6) and its linear movement to the receiver (7) in a selected direction can be ensured, specifically from right to left in the example shown in figure 8, or in both directions as shown in figure 9.

[0025] With the characteristics described, the mechanism allows the addition of other accessory components, such as a sensor (10) represented schematically in figure 10, which is able to determine how certain aspects of the mechanism are working, such as thrust pressure or the position of the actuator in its movement (6), and based on this can send a signal which changes the motor's (4) work rate. A roller component (12) which is linked to the actuator (6) by a transverse bolt (11) can also be added as shown in figure 11, and is supported by a fixed guide (13) positioned for selected parts of the door's trajectory, for example in the closing section, where the doors of fridge units must be dislocated from the closed position and the actuator must operate at a high work rate without becoming dislocated from the movement receiver.

[0026] With the nature of the invention having been sufficiently described, as well as an example of its preferred embodiment, it is stated for pertinent purposes that the shape, size and specifications of the components described may be modified, as long as this does not alter the essential characteristics of the invention as set out in the subsequent claims.

Claims

1. The opening and closing mechanism for sliding doors, of the type which include: a support (3) capable of lengthways movement for opening and closing the sliding door (1), a motor (4) which powers the lengthways movement of the movable support (3), an actuator (6) whose movement is linked to the moveable support (3) in a lengthways direction. There is also a movement receiver (7) linked to the sliding door (1) featuring a central actuator, (6) housing cavity (71) and outer ramps (72) for guiding the actuator (6) to the central cavity (71) when the actuator (6) moves lengthways and reaches the movement receiver (7) at any stage of the door's range of motion. The design is **characterised by** the fact that the actuator (6) may be mounted on the moveable support and adjusted between an upper operating position which causes the lengthways motion of the door movement receiver (7) to be intercepted, and an inoperative lowered position in which it passes over the movement receiver (7). The design also incorporates thrust components (8) which act on the actuator (6), keeping it in the upper operating position, and the sliding door (1) movement receiver (7)

has ramps which face each other (73) on opposing sides of the central cavity (71), which cause the transverse movement of the actuator (6) towards the inoperative position, overriding the resistance of its thrust components (8). This also causes the actuator (6) to leave the receiver (7) cavity (71) when said actuator (6) is moved lengthways and the door is prevented from moving in the actuator's lengthways direction (6).

2. Mechanism, according to claim 1, **characterised by** the motor (4) being of direct drive and without a clutch.
3. Mechanism, according to claim 1, **characterised by** the actuator (6) having an immobilised turn lug on the moveable support which has ramps (61) at its end facing the ramps (72, 73) of the movement receiver (7), resulting in a thinner section of the lug towards its free end.
4. Mechanism, according to any of the previous claims, **characterised by** the movement receiver (7) having removable doorstops (9) for selectively blocking at least one of the ramps (73) of the inner cavity (71), with said doorstops (9) preventing contact between the actuator (6) and the ramp or blocked ramps (73) and the detachment of the actuator (6) towards the corresponding doorstop (9).
5. Mechanism, according to any of the previous claims, **characterised by** having at least one sensor (10) linked to the actuator (6) for detecting aspects of its working conditions (6), such as movement or pressure, sending the corresponding signals to the motor (4), and adjusting the motors operational settings.
6. Mechanism, according to any of the previous claims, **characterised by** the thrust components (8) which move the actuator (6) towards the operative position, which consist of a spring mounted on the movable support.
7. Mechanism, according to claim 3, **characterised by** the actuator (6) having a transverse bolt (11) in its central area, on which a rolling component (12) is mounted, which can be moved along a fixed guide (13) in specific parts of the door's trajectory, disabling the doorstop (9) from being concealed (performing a similar action to the doorstop (9)).

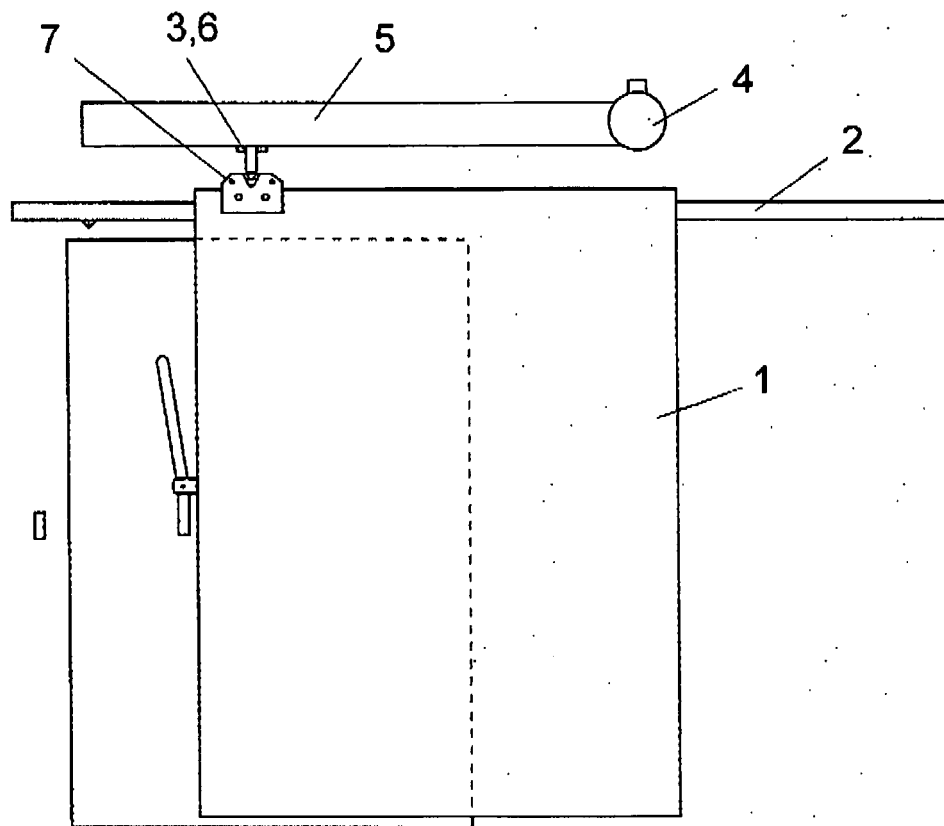


Fig. 1

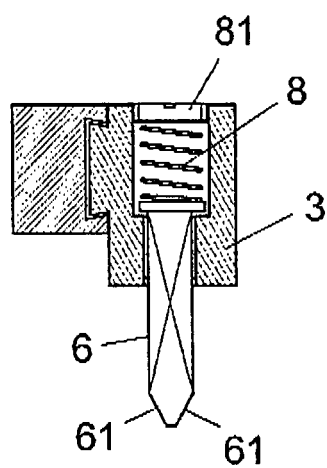


Fig. 2

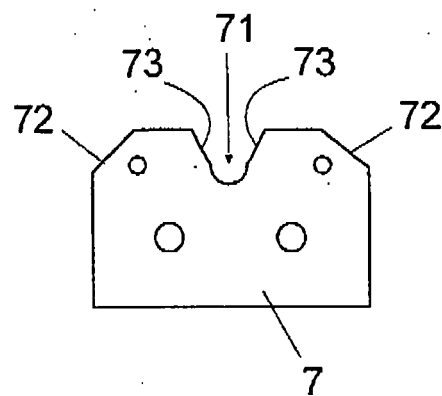


Fig. 3

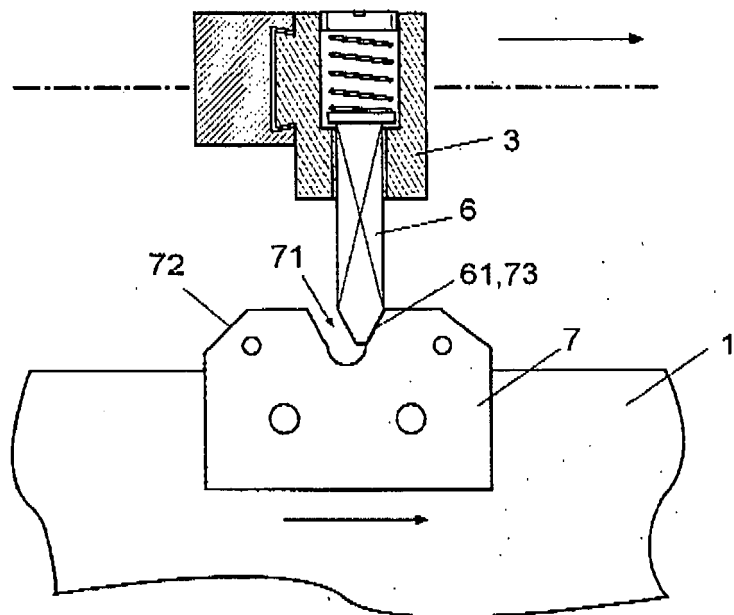


Fig. 4

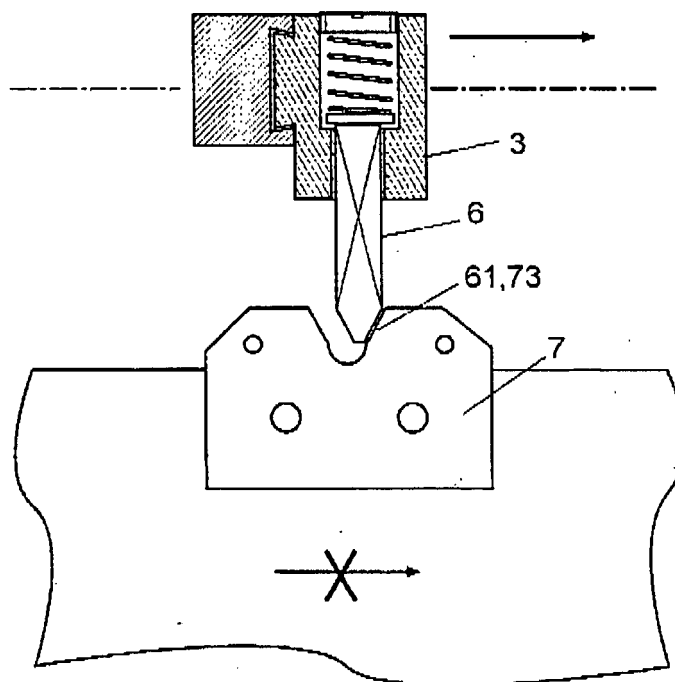


Fig. 5

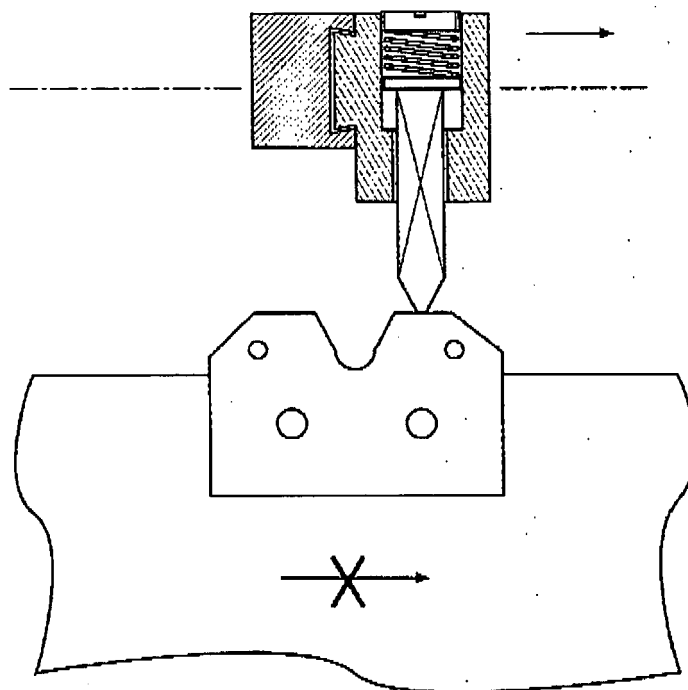


Fig. 6

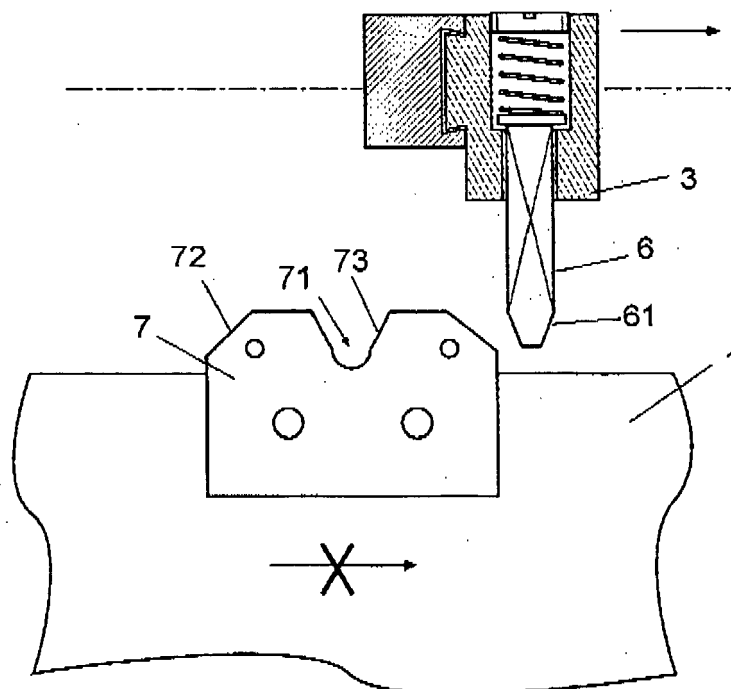


Fig. 7

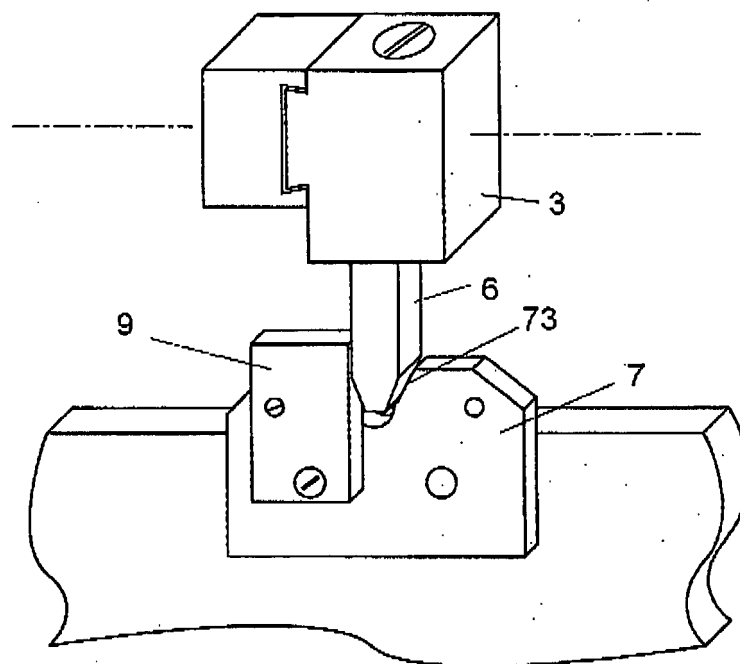


Fig. 8

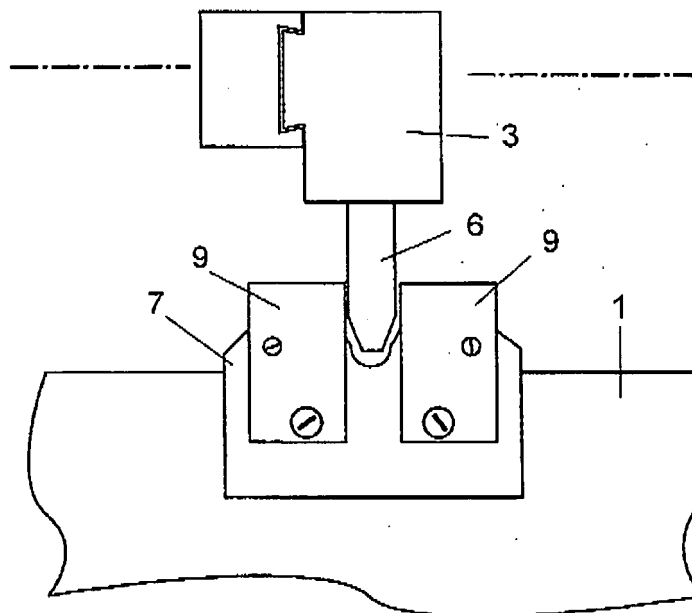


Fig. 9

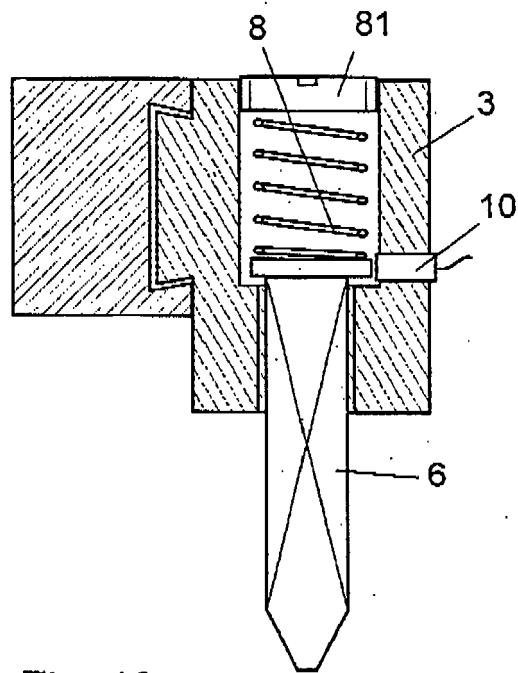


Fig. 10

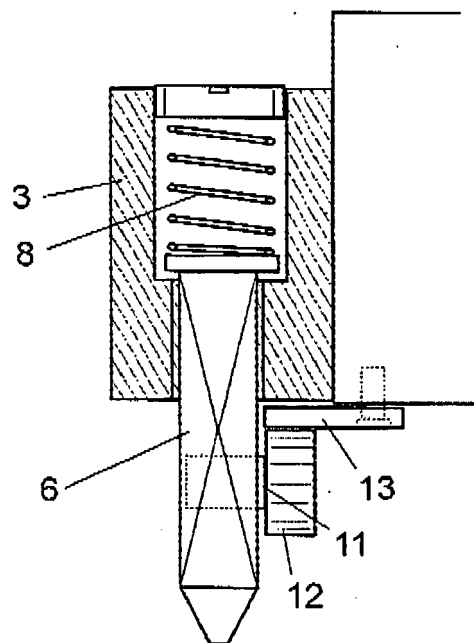


Fig. 11



EUROPEAN SEARCH REPORT

Application Number
EP 08 02 1159

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	ES 2 071 568 A2 (IGLESIAS BALLESTER MIGUEL ANGE [ES]) 16 June 1995 (1995-06-16) * figures 1,2 *	1	INV. E05F15/14
A	EP 1 918 494 A (DORMA GMBH & CO KG [DE]) 7 May 2008 (2008-05-07) * paragraph [0018]; figures 1-3 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		27 April 2009	Guillaume, Geert
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			

 3
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 02 1159

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The members are as contained in the European Patent Office EDP file on
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27-04-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
ES 2071568	A2	16-06-1995	NONE	

EP 1918494	A	07-05-2008	DE 102006051896 A1	08-05-2008

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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