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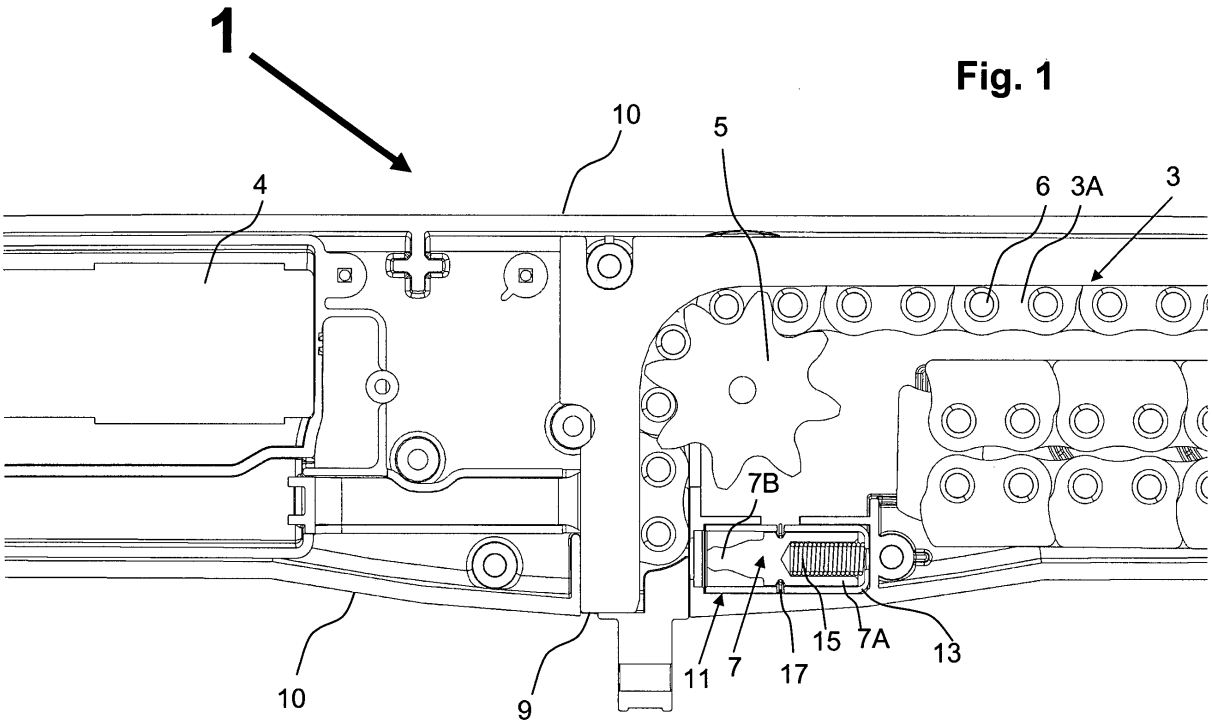
(54) **Improvement to actuators**

(57) An actuator (1, 101) housed inside a casing and having, associated with it, a member (3, 103) movable with a translational movement for connection to a frame or to the like is **characterized in that** it comprises means (7, 107) for selectively blocking said movable member (3, 103), able to operate beyond a predetermined threshold temperature, blocking said movable member (3, 103) by means of interlocking engagement.

Fig. 1



EP 2 141 316 A1

Description

[0001] The invention relates to an actuator, in particular to an actuator having, associated with it, a member movable with a translational movement and generally consisting of a chain or a rack, for connection to a frame or the like.

[0002] More particularly, the invention relates to an actuator intended for fire-prevention systems.

[0003] As is well known, in the case of a "chain actuator", the chain is housed inside a casing which is generally supported by two side arms of a fixing bracket mounted on the frame.

[0004] The chain actuator comprises an electric motor which, by means of gears, engages with and moves a chain.

[0005] The chain has one end which always remains inside the casing, while the other end is fastened to the movable part of the frame which it reaches via an opening in the said casing.

[0006] Owing to the particular form of the casing and the provision of suitable guides, the chain may be wound completely inside the casing occupying a minimum amount of space.

[0007] Depending on the direction of rotation of the motor, the chain causes opening or closing of the window.

[0008] Rack actuators are based on a similar operating principle, except that operation of the motor in both senses, and therefore of the gearing associated with it, causes the displacement in both directions of a linear rack which has one end fixed to a component to be actuated.

[0009] The actuators referred to operate without problems at room temperature, including also particularly hot and humid environments.

[0010] Should the room temperature rise beyond a given threshold, for example in the case of a fire, the closing mechanism of a window must be blocked so as to allow the smoke to escape.

[0011] Moreover, in accordance with the latest regulations, in the event of imminent danger (fire or the like) the windows or more generally the evacuation devices must be blocked in positions determined by a smoke and heat evacuation control unit which causes opening and closing of the windows depending on the direction of the wind.

[0012] For example, if the wind blows from east to west, the control unit will cause closing of the east-facing windows and opening of the west-facing windows.

[0013] The German patent No. 19534614 discloses chain actuators for windows where, in particular temperature conditions, the gearing which moves the chain is blocked by suitable bimetallic blocking means so as to keep the window in the open state and allow the smoke to escape.

[0014] This solution has the main drawback that it allows, if necessary, operation of the window or the like to be blocked in one direction only, in particular in the direction corresponding to closing of the window.

[0015] In the case where there is more than one window to be operated, typically two windows, with this solution it is only possible to block both the windows during closing.

[0016] Moreover, the unidirectional control system does not exclude the possibility of the mechanism being able to be operated in the opposite direction to the blocking direction, something which, among other things, clearly does not comply with the activity stipulated in the abovementioned regulations.

[0017] Finally, it is not possible to cause an immediate reaction of the blocking device when certain unfavourable environmental conditions exist.

[0018] The object of the present invention is to provide an improved actuator so as to overcome the drawbacks of the prior art.

[0019] The abovementioned object is achieved by an actuator housed inside a casing having, associated with it, a member movable with a translational movement for connection to a fixture or the like, in accordance with that described in Claim 1.

[0020] The actuator according to the invention achieves the following advantages with respect to the prior art:

- opening or closing of the windows or evacuation devices depending on the particular emergency conditions and the particular direction of the wind;
- immediate reaction in the event of stoppage;
- the possibility of defining with extreme precision the temperature for activation of the blocking device.

[0021] The characteristic features and further advantages of the invention will emerge from the description, provided hereinbelow, of an example of embodiment thereof provided by way of a non-limiting example with reference to the accompanying drawings in which:

Figure 1 shows schematically a top plan view of a portion of an actuator according to a first embodiment of the invention;
Figure 2 shows a perspective view of a detail of the actuator according to the preceding figures;
Figures 2A, 2B and 2C show different views of the detail according to Figure 2;
Figure 3 shows schematically a top plan view of a portion of an actuator according to a second embodiment of the invention;
Figure 4 shows a perspective view of a detail of the actuator according to Figure 3.

[0022] With reference to the figures, Figure 1 shows a portion of the actuator according to a first embodiment of the invention, in particular a chain actuator.

[0023] The actuator 1 is housed inside a casing having, associated with it, a member movable with a translational movement, in particular a chain 3 for connection to a fixture or the like. The chain 3 is, for example, composed

of a certain number of links 3A which are coupled to each other by means of bushes 6.

[0024] The housing is composed of a box-like body 10, provided with a side opening 9 for allowing the chain 3 to pass outside, and a corresponding cover; in Figure 1 the cover has been removed so as to allow better viewing of the components inside the actuator 1.

[0025] An electric motor 4 transmits a rotary movement to the chain 3, by means of a set of gears, the number of which may vary depending on the design envisaged and only the gearwheel 5 of which, which is the gear of the set furthest from the electric motor 4, is shown in Figure 1; the gearwheel 5 engages with and moves with its teeth the chain 3 which is displaceable inside the casing guided by a metal stud (not shown in the figures) inserted in the first link of the chain which facilitates the travel thereof along at least one slot formed in the bottom of the box 10 or in the opposite chain containing member.

[0026] A cartridge 11 is provided according to the invention inside the box-shaped body 10, opposite the side outlet opening 9, said cartridge 11 comprising suitable blocking means 7 arranged perpendicularly with respect to the chain 3 and designed to block the movement thereof.

[0027] More precisely, the cartridge 11 (shown in greater detail in Figure 2a) consists of an outer container 13 in which the blocking means 7 consist of a single-piece pin preferably operating by means of snap-engagement and composed of a first cylindrical portion 7A and a second portion 7B projecting from the first portion and coaxial therewith. In normal operating conditions, the actuator operates at room temperature whereas, in the event of an increase in temperature, the actuator is designed to operate in any case without problems up to operating temperatures in the region of 90-95°C.

[0028] In the two conditions considered, the electric motor 4 operates the chain 3 which moves so as to transmit to the window an opening or closing movement.

[0029] When the temperature increases and exceeds a predefined threshold value owing, for example, to a fire or the heat produced by combustion fumes, the blocking means 7 block the movement of the chain 3 so as to prevent closing of the window and therefore allow the smoke to escape.

[0030] The blocking action is achieved by means of snap-engagement such that the pin 7B blocks the chain 3 by means of interlocking engagement, being inserted between two bushes 6 of a link 3A or two consecutive links 3A of the chain.

[0031] The threshold value at which the blocking action is triggered lies, according to the invention, between 100°C and 120°C, and more particularly between 105°C and 115°C; the operating temperature cannot be higher than 120°C because 130°C is the temperature at which the plastic guide of the chain 3, and more generally the plastic material from which the actuator is made, starts to soften and lose, consequently, the properties which allow it, in the first case, to guide the chain during the window opening and closing movements and, in the second case, to withstand the load exerted by the weight of the window.

[0032] The snap-engaging means 7B are connected to resilient means 15 which are arranged inside the first cylindrical portion 7A and which bias the abovementioned blocking means 7 towards the chain 3; these means 15 are of the form-memory type, namely they are deformable depending on the temperature and are held in position by retaining means 17 which, in the first embodiment of the invention, consist of a spring clamp or clip and are seated inside a groove 19 formed in the portion 7A and arranged perpendicularly with respect to the longitudinal axis of the blocking means 7. In other words, the retaining means 17 temporarily fix the resilient means 15 inside the blocking means 7.

[0033] A form-memory material has the characteristic property that it may be deformed at a certain temperature and return into its original form when an operating temperature (threshold temperature) characteristic of the material used is reached

[0034] At the threshold temperature the resilient means 15 (consisting, for example, of a compression spring 15) reassume their original form, namely the spring 15 slackens, overcoming the resistance of the retaining means 17, releases the blocking means 7 and pushes the snap-engaging means 7B towards the chain 3 so as to block it.

[0035] The form-memory material is chosen so as not to be activated in normal operating conditions of the actuator nor below temperatures close to 100°C which could be reached in particular transportation or storage conditions.

[0036] According to a variation of embodiment described the retaining means 17 are of the form-memory type together with the resilient means 15 or the retaining means 17 are of the form-memory type while the resilient means 15 are not.

[0037] Once the chain 3 has been blocked in position and the emergency condition terminated, the retaining means 17 retain the blocking means 7 in the blocking position inasmuch as the actuator 1 must be disassembled and the chain 3 released so as to allow normal operation of the actuator and the spring 15 must be retensioned so as to be able to act again if necessary.

[0038] The cartridge 11 may be suitably removed and replaced by another one in the event of wear of the component materials.

[0039] In a second embodiment of the invention, as shown in Figures 3 and 4, an actuator 101 is provided with a rack 103 instead of the chain 3 according to the first embodiment.

[0040] In general the parts of the second embodiment which are similar to those already present in the first embodiment will be indicated by numbers increased by 100.

[0041] In this embodiment also, an electric motor transmits a movement to a series of gears, the last one 105 of which makes contact with a rack 103.

[0042] As for the first embodiment, the resilient means 115 and the retaining means 117 may be either simultaneously or exclusively of the form-memory type.

[0043] The operating conditions are the same as those which govern operation of the chain actuator of the first embodiment of the invention.

[0044] When the temperature increases or exceeds a predefined threshold value owing, for example, to a fire or the heat produced by combustion fumes, the blocking means 107, which are kept biased by resilient form-memory means 115 in the direction of the rack 103 and are held in position by retaining parts 117, block the rack 103 by means of interlocking engagement.

[0045] As for the first embodiment, the blocking action occurs as a result of snap-engagement by means of a pin, denoted by 107B (shown in detail in Figure 4), but in this case having a groove 8 which engages, in the blocked condition, with a tooth 18 of the rack 103.

[0046] The threshold values for triggering of the blocking action coincide with those of the first embodiment.

[0047] Differently from that envisaged for the actuator of the first embodiment, the rack-type actuator is not provided with a cartridge housing the blocking means.

[0048] These means may in any case be replaced where necessary.

[0049] Some of the components according to the invention, namely the chain or rack guide, the gears for transferring the movement from the motor to the chain, etc., are preferably made of plastic or similar materials, therefore resulting in a relatively low overall weight so as to ensure simple assembly, low costs and noiseless operation.

[0050] The load-bearing structure of the machine, namely the housing containing the structural members, the brackets for supporting and mounting on the frame and on the window are made of metallic material which is resistant to the temperatures stipulated in the safety regulations for smoke and heat evacuation systems.

Claims

1. Actuator (1, 101) housed inside a casing and having, associated with it, a member (3, 103) movable with a translational movement for connection to a frame or to the like, **characterized in that** it comprises:

   - means (7, 107) for selectively blocking said movable member (3, 103), able to operate beyond a predetermined threshold temperature.

2. Actuator according to Claim 1, in which said blocking means (7, 107) comprise snap-engaging means (7B, 107B) able to block by means of interlocking engagement said movable member (3, 103), interfering with its translational movement.

3. Actuator according to Claim 2, in which said snap-engaging means (7B, 107B) comprise a pin biased by resilient means (15, 115) in the direction of said movable member (3, 103) and held in position by retaining means (17, 117).

4. Actuator according to Claim 3, in which said resilient means (15, 115) and/or said retaining means (17, 117) are of the form-memory type.

5. Actuator according to one of the preceding claims, in which said member (3) movable with a translational movement comprises a chain (3).

6. Actuator according to Claim 5, in which said pin (7B) blocks the chain (3) by means of interlocking engagement, being inserted between two bushes (6) of a link (3A) or two consecutive links (3A) of said chain (3).

7. Actuator according to one of the preceding claims, in which said blocking means (7) are housed inside a removable cartridge (11).

8. Actuator according to one of the preceding claims, in which said blocking means (7) are arranged perpendicularly with respect to said chain (3).

9. Actuator according to one of the preceding claims, in which said blocking means (7) also comprise a cylindrical portion (7A) which houses the resilient means (15).

10. Actuator according to Claim 9, in which said retaining means are housed inside a groove (19) formed in said portion (7A).

11. Actuator according to Claim 10, in which said groove is oriented perpendicularly with respect to the longitudinal axis of the blocking means (7).

12. Actuator according to one of Claims 1 to 5, in which said member (103) movable with a translational movement comprises a rack (103).

13. Actuator according to Claim 10, in which said pin (107B) has a groove (8) which engages, in the blocked condition, with a tooth (18) of said rack (103).

14. Actuator according to one of the preceding claims, in which said resilient means (15, 115) comprises a compression spring.

15. Actuator according to one of the preceding claims, in which said retaining means (17, 117) comprise spring clamps or clips.

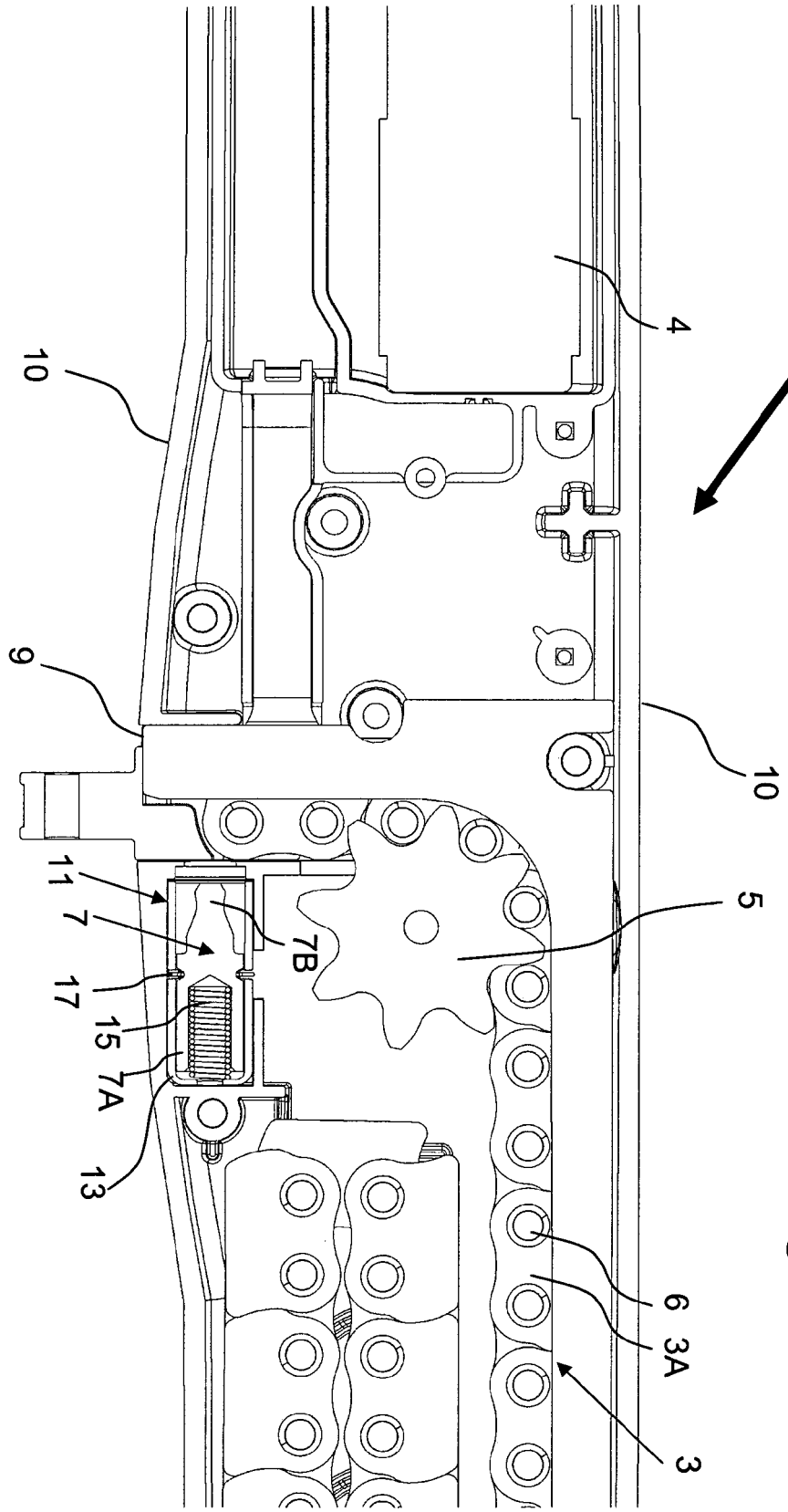
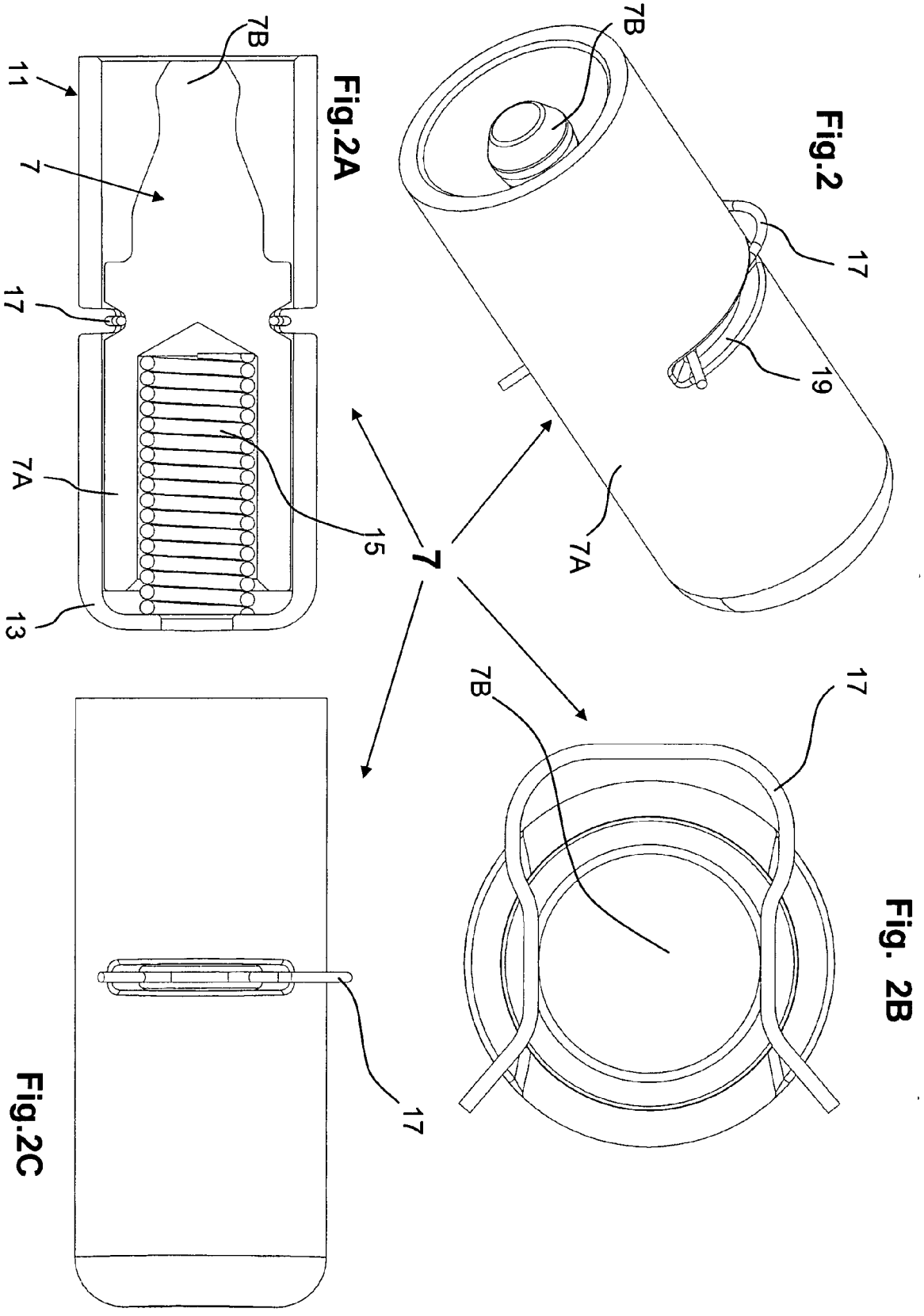


Fig. 1


7B
11
7
17
7A
13
15
7
19
Fig.2A
Fig.2
Fig. 2B
Fig.2C

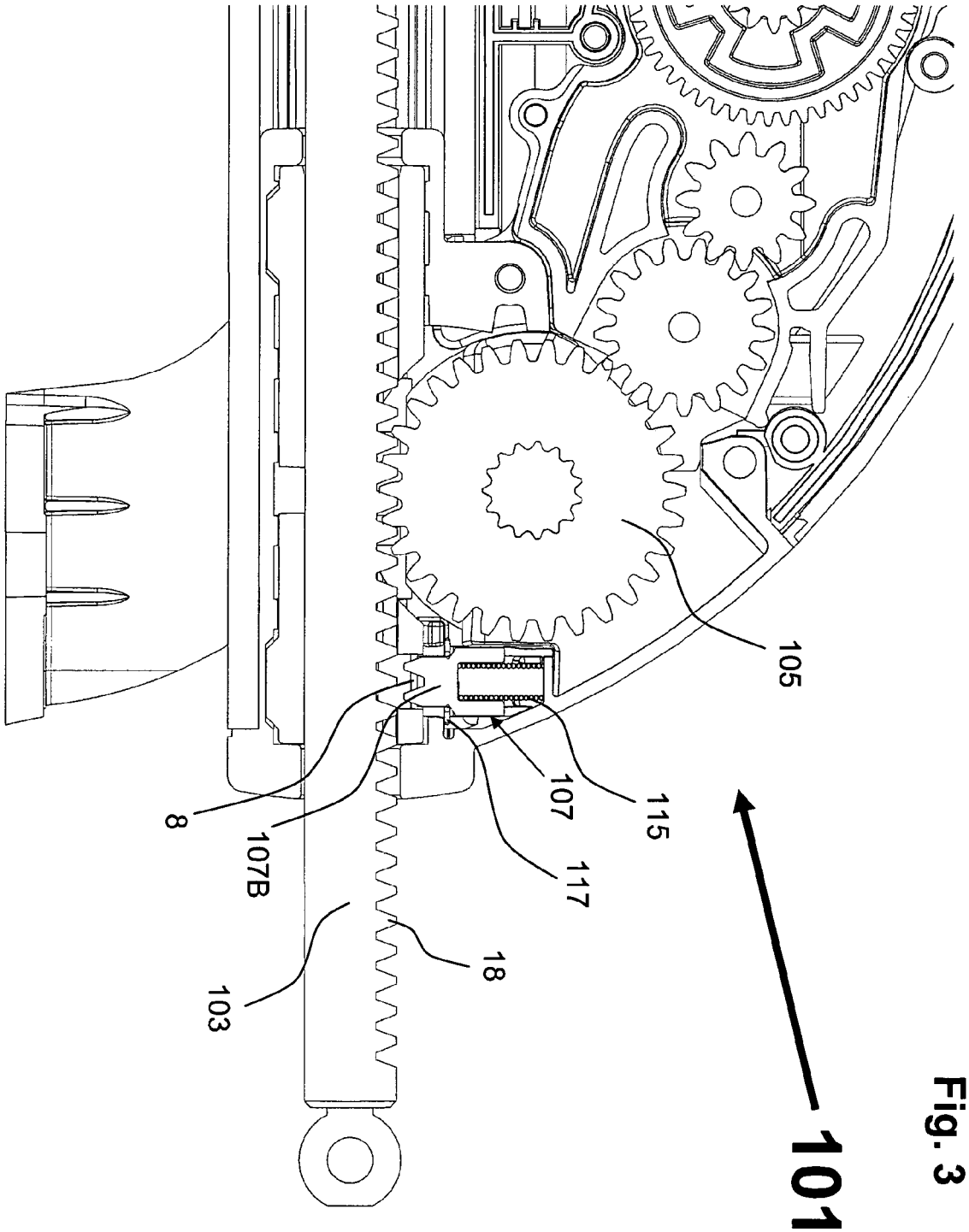


Fig. 3

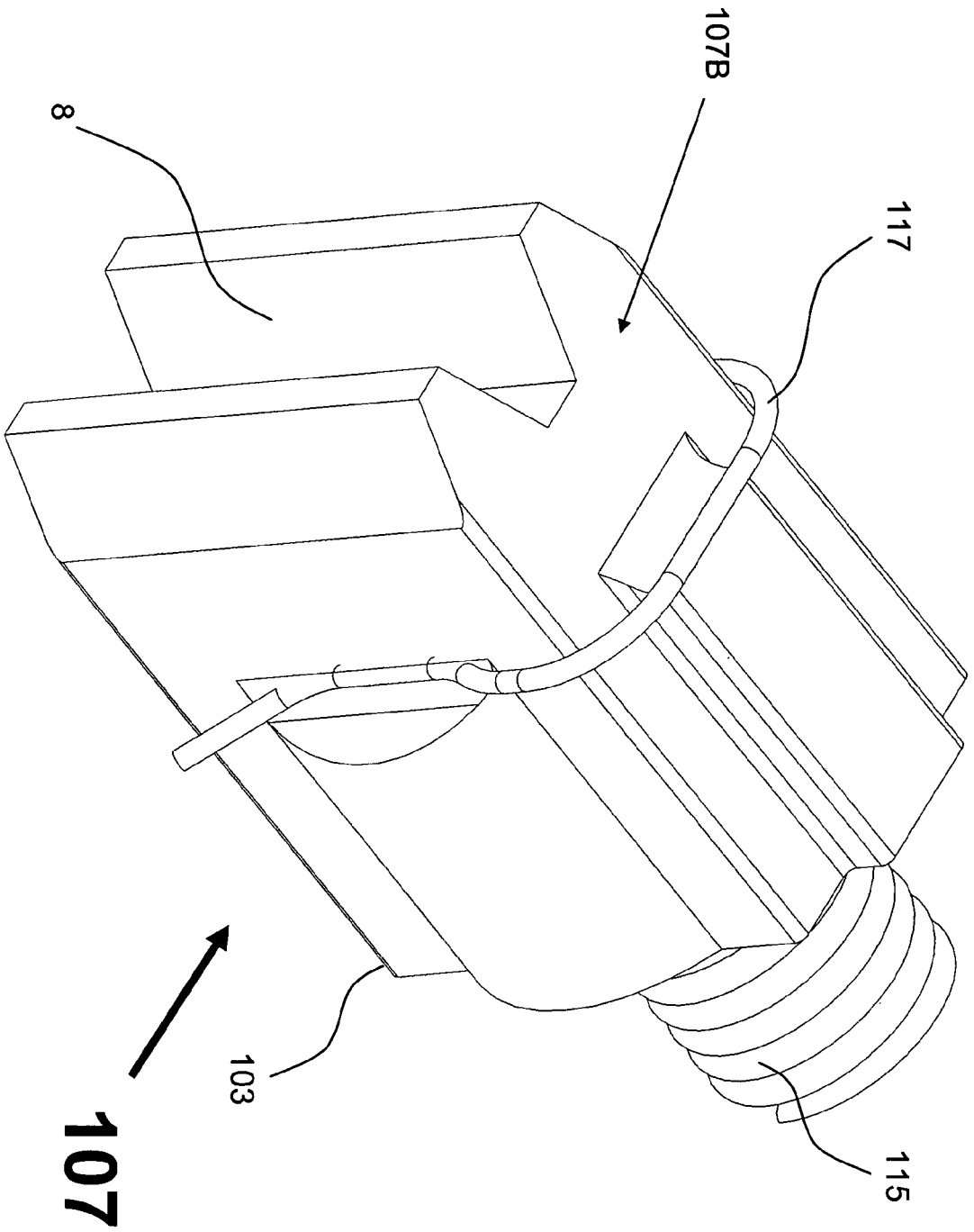


Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5461

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,X	DE 195 34 614 A1 (WINKHAUS FA AUGUST [DE]) 20 March 1997 (1997-03-20) * abstract *	1,4,5, 14,15	INV. E05F15/12 E05F15/20
Y	* column 1, line 55 - column 2, line 27 * * column 3, lines 3-22,31-38 *	2,3,6	
A	* column 4, lines 32-54 * * column 5, lines 13-26 * * column 6, lines 17-62 * * figures 2,3 *	8-11	

X	EP 1 686 227 A (GAGGERO ANNA [IT]) 2 August 2006 (2006-08-02)	1,5	
Y	* abstract * * paragraph [0006] * * paragraph [0010] * * paragraph [0016] * * figures *	2,3,6	

X	EP 1 205 622 A (GSG INT SPA [IT]) 15 May 2002 (2002-05-15) * abstract * * paragraph [0004] * * paragraph [0009] * * paragraphs [0014] - [0024] * * figures *	1,12	

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	5 November 2008	Mund, André

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 42 5461

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
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05-11-2008

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DE 19534614 A1	20-03-1997	NONE	
EP 1686227 A	02-08-2006	NONE	
EP 1205622 A	15-05-2002	NONE	

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

REFERENCES CITED IN THE DESCRIPTION

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