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(71) Applicant: **Ballan S.p.A.**
35010 Villa del Conte PD (IT)

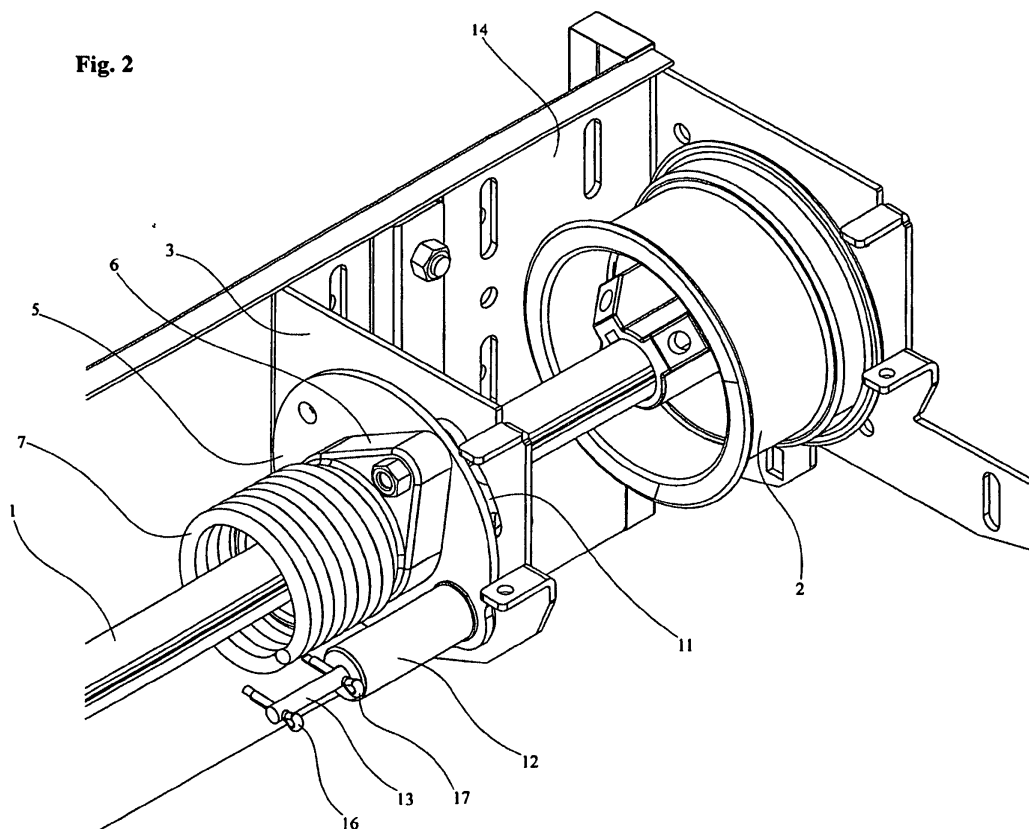
(72) Inventors:
• **Ballan, Giuseppe**
35010 Villa del Conte PD (IT)
• **Ballan, Genesio**
35010 Villa del Conte PD (IT)

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(54) **Anti-dropping safety device for sectional doors with balancing spring**

(57) It is a safety device to prevent the dropping of the sectional door leaf as a consequence of the rupturing of the torsion balancing spring. The device is supported by the swinging plate positioned, with reference to the plate fixed to the door frame, on the opposite side of the plate integral with shaft of the sectional door leaf. The device active element is a stem, lodged in a seat integral with the swinging plate with an axial placement

parallel to the shaft. As a consequence of the rupturing of the torsion spring, the stem supported by the swinging plate in correspondence with the special slot of the plate fixed to the door frame, goes through it and continuing its stroke enters the first cavity of the plate integral with the shaft just facing it, locking such plate and thus locking the shaft integral with it, and as a consequence preventing the dropping of the sectional door.



Description

[0001] The patent relates to anti-drop safety devices for sectional doors.

[0002] The use of torsion springs coiling the wire-winding shaft to balance the weight of the sectional door leaf is well known.

[0003] Such springs are secured to one end of the shaft and on the other end to a plate integral with the door frame.

[0004] The springs are pre-charged in such way that the maximum torsion value is reached when the leaf of the door is lowered, meaning that it is closed. The opening of the door is made easier because the weight of the same is almost completely balanced by the spring's torsion charge.

[0005] When the door leaf is completely lifted the spring has a lower pre-charging torsion.

[0006] As said, springs can potentially rupture with serious consequences especially for those who are maneuvering the door leaf, and thus differently accomplished mechanisms are known to prevent the door leaf from dropping, locking its descent in extremely limited spaces.

[0007] The best known methods are those of interposing, between the plate integral with the door frame (hereinafter called fixed plate) and the end of the spring that was secured to said fixed plate, a further plate linked to the fixed plate with the option of a limited arc of rotation defined by the width of a slot in one of the two plates within which a shank going through said slot crossing the slot located to the other of the two plates can move.

[0008] Said plate (hereinafter called swinging plate to facilitate the description) to which the end of the pre-charged torsion spring is secured, is turned to the spring's torsion direction of rotation and with the available shank stroke within the end of the slot.

[0009] If the spring is not pre-charged, as is the spring itself should it rupture, said swinging plate is in its resting position and the shank is positioned in the initial part of the slot with the entire stroke available.

[0010] Integral with the shaft and positioned near the two plates above is located a third plate involved in its outer perimeter or near the perimeter in a coaxial position in relation to the shaft or its gearing or a sequence of anyhow configured slots or holes.

[0011] The principle to be put into practice is that if the spring ruptures, the third plate integral with the shaft is caught up by a device brought by the fixed plate that will snap open so as to link it to the fixed plate.

[0012] The device brought by the fixed plate, designed to act onto the plate integral with the shaft, on a ruptured spring or a spring not pre-charged to a certain torsion value, lies on the same plane as the plate and moves on that plane.

[0013] The signal to the device to trigger to lock the fixed plate to the plate integral with the shaft supporting the door leaf (and thus to stop the door leaf descent) is

given by the swinging plate that, as a consequence of the spring rupturing, is brought back to its resting position by the recoil that the spring rupturing causes.

[0014] The swinging plate can be equipped with a recalling spring that, in the event of torsion spring rupturing through the rupturing recoil of the said torsion spring, facilitates bringing the said swinging plate back to its resting position.

[0015] The function of the swinging plate, given the position it acquires with the pre-charged spring in relation to the fixed plate, is that of operating with the locking devices getting them caught on the plate integral with the shaft of the door leaf.

[0016] When the rupturing of the torsion spring takes place the swinging plate, that is not any more pushed by said torsion spring, because of the recoil caused by the rupturing of said torsion spring, rotates backwards leaving its current position to go back to the initial resting position.

[0017] The complete repositioning of the swinging plate into its resting position can be ensured by a recalling spring, if needed.

[0018] At the same time the swinging plate reaches its resting position, as the operation of the said plate finishes, the locking devices move against the plate integral with the shaft of the sectional door leaf, getting caught in an adequate space of the said plate. As a consequence, the shaft is locked and thus the sectional door leaf is stopped as well.

[0019] The devices that act on the same plane as the standard position of the shaft of the sectional door leaf are usually based on the principle of the pawl that operates in the perimeter teeth of the circular plate integral with the said shaft.

[0020] One of the drawbacks caused by the devices that exploit the principle of the pawl, besides the high cost of their structural making, that requires the use of special materials, is due to the fact that such devices are supported by projected pins secured to the fixed plate.

[0021] Another drawback caused by the devices using the principle of the pawl is due to the excessive length of the projecting pins supporting such said devices that, being designed to catch onto the wheel integral with the shaft of the sectional door leaf to lock it, must overcome the thickness of the swinging plate positioned between the fixed plate and the plate (the circular disk) integral with the shaft of the door leaf. Because of the size of the said projecting, the pins undergo great shearing and flexing stresses.

[0022] Such devices, from their position of inactivity, to insert in the spaces of the gearing of the plate (disk) integral with the shaft, start rotating approaching the periphery of said disk integral with the shaft. Before managing to completely enter the cavity of a gear, the devices undergo a strong impact, which is distributed almost entirely over their ends, both pertaining to the devices and to the gearing of the wheel integral with the shaft.

[0023] This involves the arising of serious stresses so that, theoretically, a sudden yielding or rupturing of the concerned parts could occur.

[0024] The main aim of this invention is to overcome the drawbacks described above and improve the effectiveness and safety.

[0025] This aim is achieved by designing the devices for locking the plate (circular disk) integral with the shaft of the door leaf, - that trigger following the rupturing of the torsion spring- as simple construction type, rather cheap and at the same time highly reliable, departing from a design based on the principle of the pawl, which is too expensive and unsafe.

[0026] Another aim is fulfilled through a device design such that once the same has triggered there is no need for the replacement of many parts or even the replacement of most of the device, but just the replacement of the locking element easily and cheaply.

[0027] This aim is further fulfilled by designing the locking devices that, instead of being supported by the fixed plate which remains insensitive to the impact generated by the rupturing of the torsion spring, are supported by the swinging plate that is affected by the recoil generated by the rupturing of the spring and that transmits such recoil to the devices, which, owing to their design, are more effective.

[0028] Preferably, as shown in an example in this patent, the swinging plate, instead of being mounted between the fixed plate and the plate (disk) integral with the shaft of the door leaf, is placed on the outside while now the fixed plate is mounted in the intermediate position.

[0029] The special position of the swinging plate as said above is fundamental for enacting this patent.

[0030] This allows for the locking device of the plate integral with the shaft of the door leaf to be supported by the swinging plate and to act axially in a direction parallel to the leaf shaft and to consist in a stem sliding in a special seat integral with the swinging plate.

[0031] Following the rupturing of the torsion spring, the swinging plate, no longer kept in its current position, swings, getting in the opposite position and inserts the end of the stem, which is compelled to come out by a spring, in correspondence with a slot on the fixed plate.

[0032] The stem, once it has crossed the slot, touches the plate integral with the leaf shaft and gets inserted axially into the first cavity facing it.

[0033] The plain construction of the unit and the sturdiness of a strong stem inserting into the cavity of the plate (disk) integral with the door leaf shaft is evident, and even more so with the following descriptions and drawings.

[0034] As above said, it is advantageous for the stem seat to be integrally supported by the swinging plate because the sliding of the stem coming out of its seat is facilitated by the recoil that the said swinging plate undergoes because of the rupturing of the spring.

[0035] The concurrence of said recoil to the operation

of the stem is definitely useful as the stem, which has remained inactive for a long time, (i.e. equal to the last- ing in operation of the sectional door leaf) could have undergone initial rusting and jamming due to the polymerization of the lubricating grease used at the time of its assembly.

[0036] Another advantage attained by this patent is that the stem can be partially extracted from its seat to be deactivated even when the torsion spring is not pre- charged or is not mounted or is broken.

[0037] A further advantage is due to the fact that in case of operation of the patent device, the job is limited to the replacement of the stem, unlike the devices pro- duced according to the principle of the pawl for which, in case of deterioration, it is necessary to replace the whole device.

[0038] The above assumptions are further cleared by the examination of the enclosed drawing Tables.

[0039] Figure 1 axonometrically shows the exploded diagram of the parts making up the safety device.

[0040] Figure 2 axonometrically shows the assem- bled device seen from the swinging plate side and with the stem deactivated.

[0041] Figure 3 axonometrically shows the assem- bled device seen in from the front.

[0042] Figure 4 axonometrically shows the device seen from the side of the wheel integral with shaft of the door leaf.

[0043] Figure 5 axonometrically shows the device seen from the side of the plate (geared disk) integral with the shaft of the door leaf with the stem inserted into a cavity in the periphery gearing of the above- mentioned plate integral with the shaft.

[0044] The part of the door frame where the above- described device is located is not represented in the fig- ure.

[0045] In Figure 1 the shaft 1 of sectional door leaf is represented and lined up, but not mounted, the drum 2 for the winding of the door operation wire is also shown. Plate 3 can be noted, which is to be fixed to the door frame 14 (which is not represented here); plate 4 can be seen (geared disk), which is to be fitted to the shaft 1 so as to be integral with it.

[0046] On its periphery, plate 4 is concerned as if it were a gearwheel by a sequence of the cavities 15. The function of the cavities is to be engaged to stem 13 to lock the plate 4 they belong to.

[0047] The fixed plate 3 can be noticed, neutrally crossed by shaft 1 configured as a right angle dihedral to be fixed to frame 14 (which is not represented here).

[0048] Plate 3 is equipped with two curved configuring slots coaxial with shaft 1 and intended for the crossing of the ends of the stems 10 perpendicularly fixed to the swinging plate 5.

[0049] Plate 3 is equipped with slot 18, which is as far from the shaft axis as the distance of stem 13 from the same axis of shaft 1, brought from the tubular seat 12 integral with the swinging plate 5.

[0050] Plate 5, through the threaded extensions 8 of the stems 10 and the nuts 9, is made integral with bracket 6. The said bracket 6 is connected to the end of spring 7 opposed to the end fixed to shaft 1. In the figure of spring 7 only some coils are represented.

[0051] Figure 2 shows the assembled device seen from the swinging plate 5 side. You can notice plate 3 fixed to the door frame 14; you can also note drum 2 mounted and keyed on shaft 1.

[0052] You can note bracket 6 (connected to one end of spring 7) which is integral with the swinging plate 5. Plate 4, configured as a geared wheel, is not in view.

[0053] You can partially see one of the slots 11 of the fixed plate 3, within which the ends of the stems 10 integral with the swinging plate 5 can slide. The tang of stem 13 is partially extracted from its seat 12 and is kept in place by an auxiliary safety pin 17 to balance the pre-charging force of the spring (not visible).

[0054] Figure 3, that shows almost frontally the device, allows to point out the order of the reciprocal positioning of the swinging plate 5 and of the plate 4 integral with shaft 1 with respect to the central fixed plate 3.

[0055] Figure 4, which shows the device seen from the side of plate 4 integral with shaft 1, highlights the coupling modes of the ends 10 of the stems integral with the swinging plate 5 in the slots 11 of the fixed plate 3. Furthermore, you can note the correspondence of the lining up of slot 18, through which stem 13 has to slide, with a cavity of wheel 4.

[0056] Figure 5 shows the enlargement of the coupling that takes place between stem 13, which has crossed slot 18 of the fixed plate 3 and has entered a cavity 15 of plate 4, locking it. This coupling is obtained in the case the torsion spring is ruptured or is not pre-charged, so that the swinging plate 5 is positioned in its resting placement and the ends 10 of its stems are in the slots 11 of the fixed plate 3 from the opposite side of the pre-charged torsion spring 7 and stem 13, which has returned into position, is resting onto the fixed plate body.

Claims

1. A Anti-drop safety device for sectional doors with a balancing spring (7) including a plate (4) orthogonally placed with reference to the axis of shaft (1) configured as a gearwheel with cavities (15) distributed along the periphery, keyed to the shaft (1) and facing a plate (3) crossed by a neutral coupling of shaft (1) and fixed to the door frame (14), the fixed plate (3) supports the plate (5) letting it swing, onto which the end, opposite to the one fixed to the shaft (1), of the torsion spring (7) coiling around the above mentioned shaft (1), the swinging plate (5), as a consequence of the rupturing of the spring (7), rotating around the shaft (1) passes from its working position to its resting position, featured by the fact

that, as a consequence of the said rotation of the plate (5), a locking device (13) pushed by a pre-charged spring axially slides parallel to the shaft axis so that it links the plate (3) fixed to the door frame (14) to plate (4) integral with shaft (1), thus locking the rotation of the shaft (1) and the descent of the door leaf.

2. Anti-drop safety device for sectional doors with balancing spring according to claim 1, featured by the fact that the locking element of plate (4) integral with the door shaft is supported by the swinging plate (5) connected with one end of the torsion spring (7).
3. Anti-drop safety device for sectional doors with balancing spring according to claim 1 featured by the fact that the device supported by the swinging plate (5) consists in a seat (12) integral with the said swinging plate (5) inside which a stem (13) is lodged together with a pre-charged spring pushing the stem (13) to slide toward the outer part facing the fixed plate (3).
4. Anti-drop safety device for sectional doors with balancing spring according to one of the preceding claims, featured by the fact that the seat (12) supported by the swinging plate (5) and thus stem (13) linked to said seat (12) has an axial positioning parallel to the shaft of the door (1).
5. Anti-drop safety device for sectional doors with balancing spring according to one or more of the preceding claims, featured by the fact that following the rupturing of the balancing spring (7) the free end of stem (12) is brought by the swinging plate (5) in correspondence with a hole (18) on the fixed plate (3) so that stem (12), pushed by the spring acting on the inner end, freely bypasses hole (18) and inserts in one of the cavities (15) facing it, of plate (4) integral with shaft (1) of the door.
6. Anti-drop safety device for sectional doors with balancing spring according to one of the preceding claims, featured by the fact that stem (13), being lodged in seat (12) brought by the swinging plate (5), undergoes the same recoil of the swinging plate (5) due to the rupturing of the balancing spring (7), so that it is facilitated into coming out, overcoming the possible rusting or jamming due to the polymerization of the lubricating grease due to the long stasis it has undergone, dating back to the door setting to operation.
7. Anti-drop safety device for sectional doors with balancing spring according to one of the preceding claims, featured by its plain construction made by a tubular cylindrical seat (12) welded to the swinging plate (5), by a stem (13) equipped with a rear low-

ered tang to mount the pushing spring and with a catch safety pin (16).

8. Anti-drop safety device for sectional doors with balancing spring according to one of the preceding claims, featured by the fact that stem (13) can be deactivated by extracting a portion of the tang (overcoming the spring's further pre-charge) already protruding from the rear of the tubular cylindrical seat (12) ending with a crown head, and locking it by a safety pin (17) or other corresponding means, so that its opposite end will not protrude beyond the plane of the swinging plate (5) facing the fixed plate (3). 5 10 15
9. Anti-drop safety device for sectional doors with balancing spring according to one of the preceding claims, featured by the fact that the swinging plate (5) is equipped with a recalling spring, which performs the same function as the recoil inflicted to the swinging plate (5) by the rupturing of the torsion spring (7), and that triggers also in the case the reaction deriving from the rupturing of the torsion spring (7) does not act on said swinging plate (5) to bring it back to its resting position. 20 25
10. Anti-drop safety device for sectional doors with balancing spring according to one or more of the preceding claims, featured by the fact that, as a consequence of the triggering, and following deterioration of the device, the only necessary replacement is that of the locking element, since the seat it is located into will not be worn or deteriorated, as the forces it is subject to, given the very limited projecting, are relatively restricted. 30 35 40 45 50 55

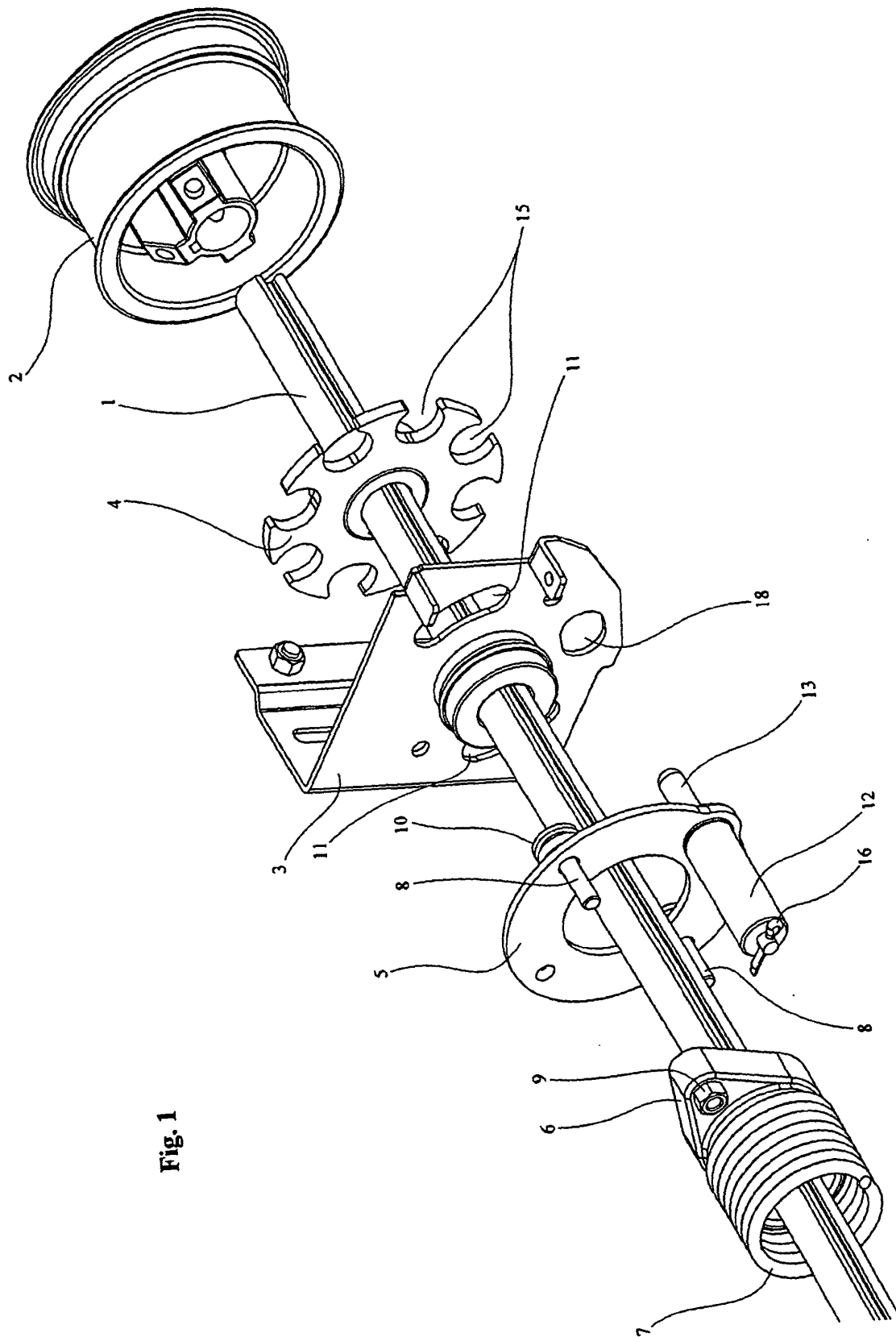


Fig. 1

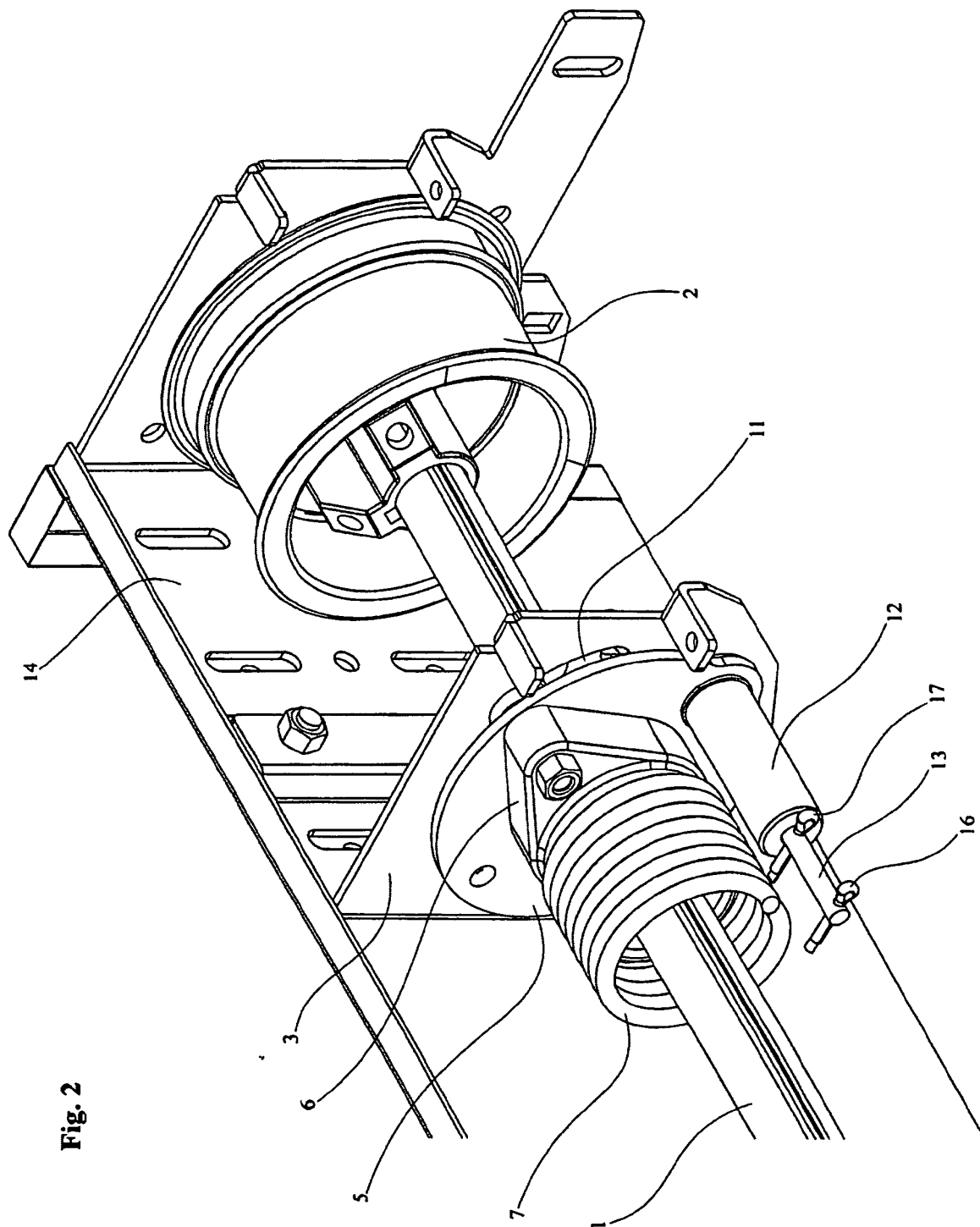
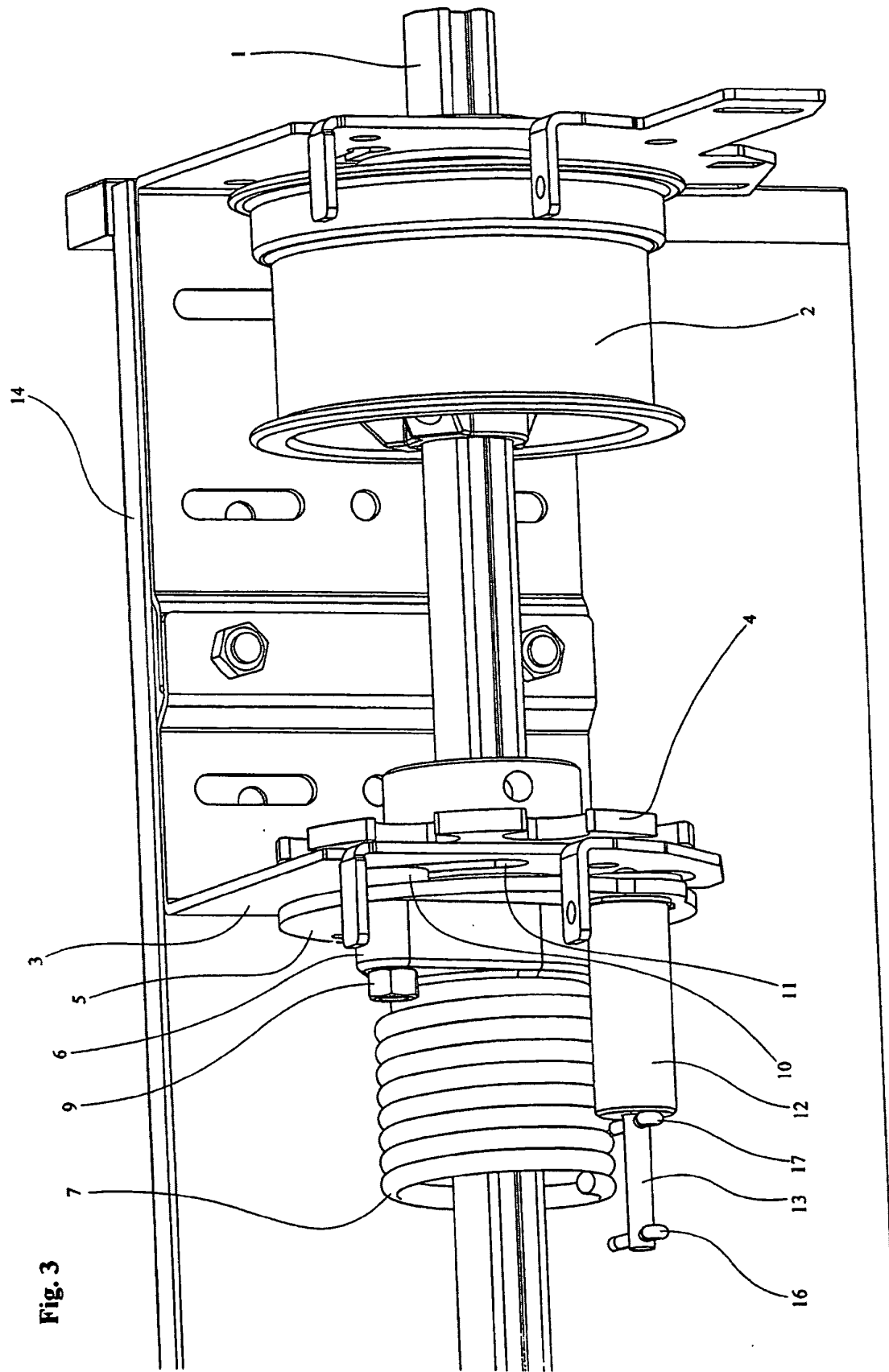
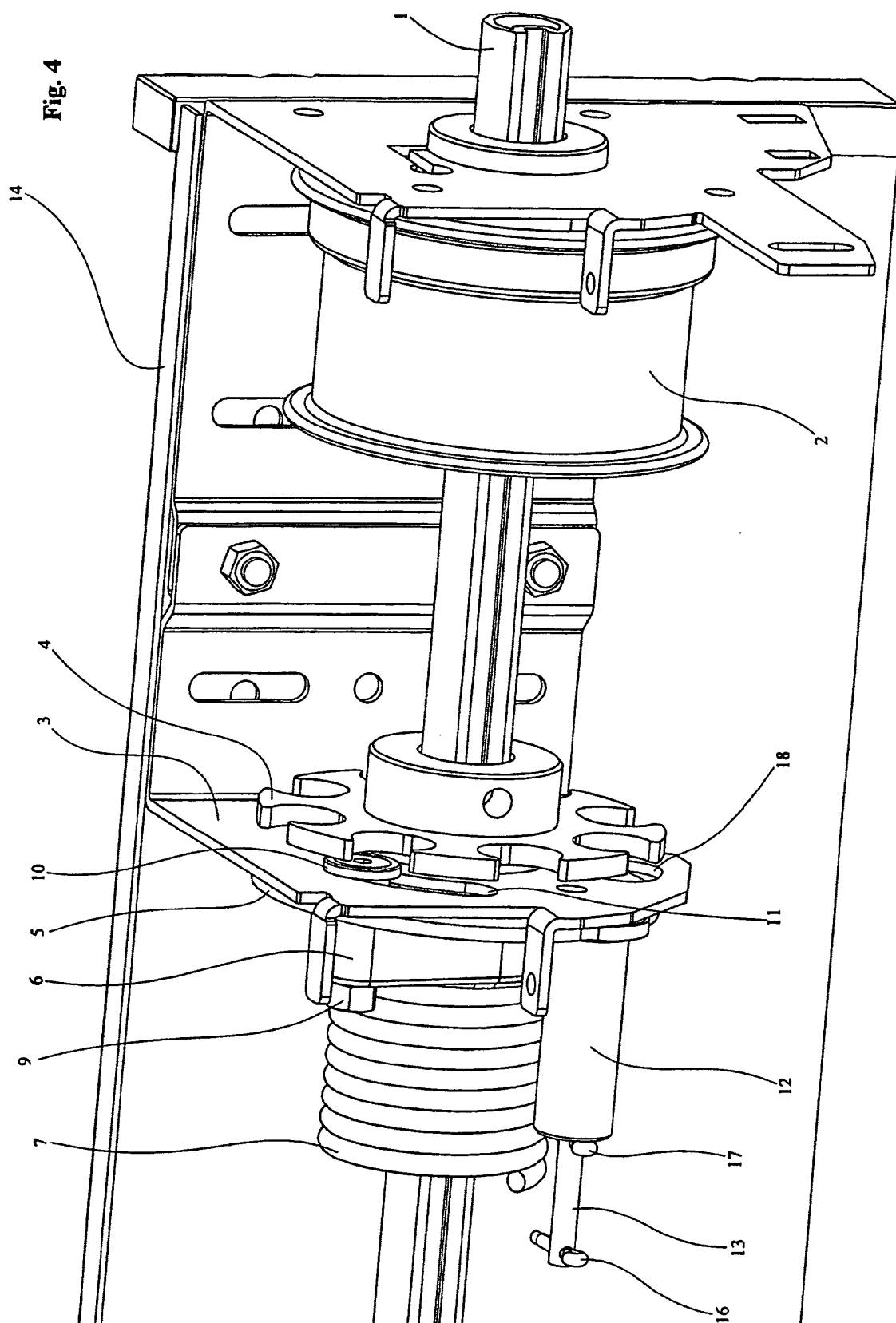
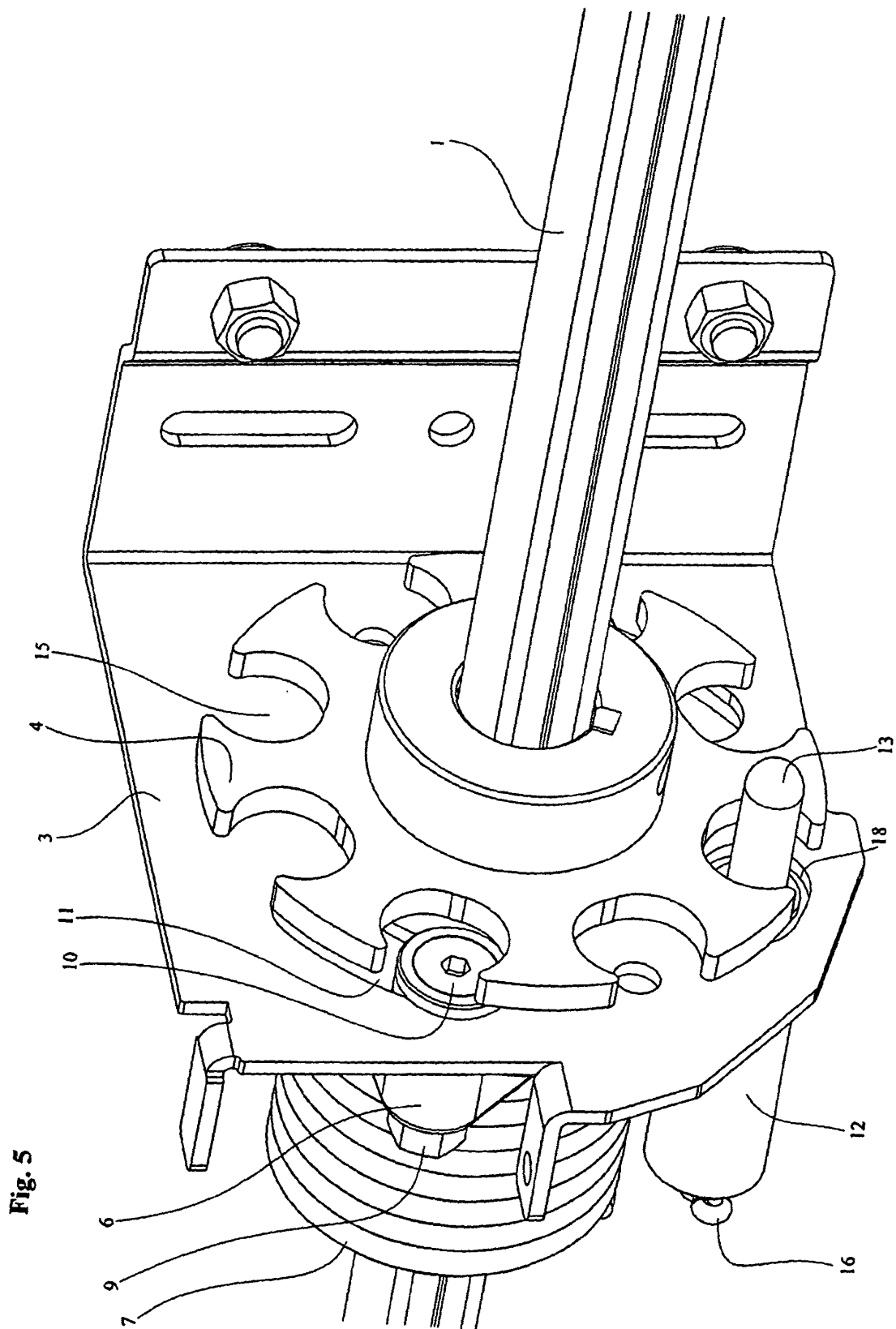


Fig. 2









European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 00 6431

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Y	* page 6, line 13 - page 10, line 2; claims 1-3; figures 1-3 *	1-10	E05D13/12 E06B9/84

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 18 June 2004	Examiner Balice, M
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			

EPO FORM 1503 03/02 (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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