



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.06.2022 Bulletin 2022/23

(51) International Patent Classification (IPC):
E05F 15/627 ^(2015.01)

(21) Application number: **21212058.8**

(52) Cooperative Patent Classification (CPC):
E05F 15/627; E05F 15/611; E05Y 2201/224;
E05Y 2201/234; E05Y 2201/484; E05Y 2201/656;
E05Y 2800/252; E05Y 2800/342; E05Y 2800/414;
E05Y 2800/42; E05Y 2800/676; E05Y 2900/148

(22) Date of filing: **02.12.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **03.12.2020 SM 202000660**
22.12.2020 IT 202000031895

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(54) **SAFETY DEVICE FOR AN ACTUATOR FOR A WINDOW FRAME AND ACTUATOR FOR A WINDOW FRAME COMPRISING IT**

(57) Safety device (10) for an actuator (100) for a window unit where the actuator (100) comprises a frame (11), an actuation member (12) and an operating device fixed to the frame (11) and coupled to the actuation member (12).

In an opening configuration of the window unit the actuation member (12) is extended and in a closing configuration it is retracted.

The safety device (10) comprises:

- a base (13),
- a locking element (14) movable between a rest config-

uration and an operating configuration;

- elastic means (15) for forcing the locking element (14) into the operating configuration;
- a yielding block (16) for retaining the locking element (14).

The yielding block (16), when a predefined temperature is reached, yields so as to allow the locking element (14) to reach the operating configuration and interfere with the actuation member (12) so as to oppose the retraction thereof with respect to the frame 11 and allow the extension thereof.

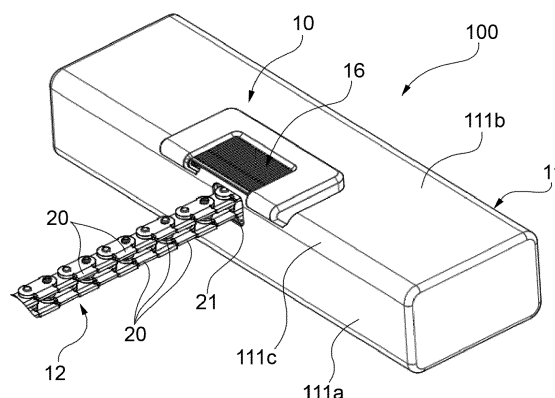


FIG.1

Description

TECHNICAL SECTOR

[0001] The present invention relates to a safety device for an actuator for window units and to an actuator for window units comprising said safety device able to ensure operation thereof in order to open a window unit to which it is connected so as to operate it, especially in the event of a fire and in particular in the case of high temperatures.

[0002] The actuator for a window unit in question may be especially used to actuate natural heat and smoke evacuators (NHSE), i.e. of a window unit, incorporated in a roof of premises and able to be opened so as to favour the evacuation of heat and smoke in the event of a fire.

[0003] The actuator in question allows at the same time both opening operation of the window unit and prevents closing thereof in the event of fire and high-temperature conditions.

PRIOR ART

[0004] Nowadays actuators for window units comprising a frame which can be fixed to a wall or to a fixed part of the window unit, and an actuation member, which may be a chain or a toothed rod having one end which can be fixed to the movable part of the window unit and connected to an operating device fixed to the frame of the actuator, are known.

[0005] The operating device comprises a motor and at least one toothed wheel which meshes with the chain or the toothed rod so as to extend it or retract it with respect to the frame so that, when installed, extension of the actuation member results in opening of the movable part of the window unit with respect to the fixed part thereof.

[0006] In the event of a fire it is necessary to ensure that the window unit may be opened or closed automatically by a control unit.

[0007] A problem widely encountered in the sector of such actuators is that of ensuring the stability of opening of the window unit, so as to allow the dispersion externally of smoke and heat, also in the case of high temperatures, for example as high as 300°C, being reached.

[0008] In fact, when there is an increase in temperature, the parts of the actuator which are conventionally made of plastic, such as the toothed wheel for operating the actuation member and a guide for the chain or the toothed rod or generally a guide or a support tend to soften and then melt with the increased heat and, therefore, are unable to help keep the window unit in an open configuration.

[0009] A conventional solution is known from the patent EP218316 which teaches providing a locking device which is automatically activated when a predefined temperature value is reached, engaging the actuation member so as to prevent any further movement of the latter.

[0010] One drawback of this conventional solution can be associated with the fact that if - when a predefined temperature value is reached with consequent activation of the locking device - the window unit has not reached the fully open condition, it will be preventing from reaching it by the very action of the locking device.

[0011] Furthermore, the locking device is bulky and, since it be housed inside the casing of the actuator, it increases the volume thereof.

[0012] In particular, since the locking device must be arranged between an opening in the casing, through which the actuation member extends and retracts, and the operating device, the actuator has a greater volume precisely in a direction perpendicular to the fixed part of the window unit, reducing the compactness of the window unit or reducing the working travel of the chain or the toothed rod, by an amount equal to its volume, and therefore also reducing its use in environments where the window unit must be installed in confined spaces.

SUMMARY OF THE INVENTION

[0013] The problem underlying the present invention is therefore that of overcoming the drawbacks of conventional solutions and ensuring the complete opening of a window unit in the event of a fire and at the same time preventing closing thereof.

[0014] The task of a safety device and an actuator for a window unit comprising said safety device is therefore that of solving this problem.

[0015] In connection with this task, one object of the invention is to provide an actuator for a window unit which is more compact than the conventional actuators, while ensuring a greater level of reliability and safety in the event of a fire.

[0016] In connection with this task, one object of the invention is to provide a safety device and actuator for a window unit comprising said safety device which does not require external operation for activation thereof in the event of a fire.

[0017] Another object of the present invention is to propose a safety device and an actuator for a window unit comprising said safety device which, at ambient temperatures higher than a predefined temperature value, is able to prevent closing of the window unit, while allowing the opening operation thereof.

[0018] A further object of the invention is to propose a safety device and an actuator for a window unit comprising said safety device which is structurally simple, easy to use and can be easily installed without requiring special skills.

[0019] This task as well as these and other objects which will become clearer below are achieved by a safety device and by an actuator for a window unit comprising said safety device according to the attached independent claims.

[0020] Detailed characteristics of a safety device and an actuator for a window unit comprising said safety de-

vice, according to the invention, are illustrated in the dependent claims. Further characteristic features and advantages of the invention will emerge more clearly from the description of a preferred, but non-exclusive embodiment of a safety device and an actuator for a window unit comprising said safety device according to the invention, illustrated in an embodiment provided solely by way of a non-limiting example in the attached sets of drawings listed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

- Figure 1 shows a perspective view of an actuator for a window unit according to the invention;
- Figures 2a and 2b show a detail relating to a safety device of the actuator according to Figure 1 in corresponding operating configurations;
- Figure 3 shows a side view of the detail according to Figure 2b;
- Figure 4 shows an exploded perspective view of an actuator for a window unit according to the invention.

DETAILED DESCRIPTION

[0022] With particular reference to the attached figures, 10 denotes overall a safety device for an actuator 100 for a window unit which may comprise a fixed part and a movable part which can be moved with respect to the fixed part between an open position and a closed position.

[0023] The actuator 100 comprises:

- a frame 11 which can be fixed to an infrastructure such as a wall or to the fixed part of the window unit for moving the movable part or fixed to the movable part itself which in this case forms the infrastructure;
- an actuation member 12 which can be fixed to the movable part of a window unit or to the wall or fixed part of the window unit if the frame 11 is fixed to the movable part, for moving the movable part with respect to the fixed part of the window unit;
- an operating device, conventional per se and not shown, which is fixed to the frame 11, coupled to the actuation member 12 and configured to move the latter between a closing configuration and an opening configuration;
- a safety device 10.

[0024] For example, the operating device may comprise an electric motor which is fixed to the frame 11 and which, for example, by means of a reduction gear, also fixed to the frame 11, operates a toothed wheel which is pivotably mounted on the frame 11 and which meshes with the actuating member which may comprise, for example, a toothed wheel so as to form a rack actuator or a chain for example of the track type.

[0025] The frame 11 may also comprise a guide inside which the actuation member slides and, if the latter comprises a chain, also a compartment inside which the actuation member may be housed, being wound back onto itself, in a manner conventional per se.

[0026] In the opening configuration, the actuation member 12 is extended with respect to the frame 11 and in the closing configuration the actuation member 12 is retracted with respect to the frame and optionally at least partially wound back or in any case housed inside the frame so that, when the actuator 100 is in operation it can be operated so as to displace the movable part of the window unit between the closed position and the open position by means of operation of the actuation member 12 between the closing configuration and the opening configuration, respectively.

[0027] The safety device 10 comprises:

- a base 13 which can be fixed to the frame 11;
- a locking element 14 connected to the base 13 movably between a rest configuration, shown by way of example in Figure 2a, and an operating configuration, shown by way of example in Figure 2b;
- elastic means 15 connected to the base 13 and to the locking element 14 so as to force the locking element 14 into the operating configuration;
- a yielding block 16 fixed to the base 13 so as keep the locking element from reaching the operating configuration.

[0028] The yielding block 16 is sensitive to the temperature in such a way that, when a predefined temperature is exceeded, the yielding block 16 yields so as to allow the locking element 14 to reach the operating configuration.

[0029] The predefined temperature is a temperature lower than a critical temperature at which the operating device is negatively affected in terms of its capacity to ensure a fixed position of the actuation member.

[0030] For example, this critical temperature may be a temperature at which softening of the components of the operating device, such as the guide and/or the toothed wheel for operation of the actuating member, occurs, said components, following this softening, being no longer able to keep the actuation member stationary, for example tending to allow closing of the window unit under the weight of the movable part thereof.

[0031] The safety device 10 and/or the actuation member 12 is/are configured so that, following incorporation thereof in the actuator 100, in the operating configuration, the locking element 14 interferes with the actuation member 12 so that, following interference of the locking element 14 with the actuation member 12, the locking element 14 opposes a movement of the actuation member 12 from the operating configuration into the closing configuration without opposing an opposite movement from the closing configuration into the opening configuration.

[0032] In this way, a safety device 10 incorporated in

an actuator 100, according to the present invention, for example in the case of a fire, also when the predefined temperature is exceeded, where the locking element 14 assumes the operating configuration, the actuator 100 may continue to open the window unit by means of the actuation member until it is completely open or for as long as the operating device withstands the rising temperature, the actuation member 12 being unable to return into the closed configuration as a result of the locking element, should the operating device fail.

[0033] In other words, the locking element 14, when it is in the operating configuration, is clamped against the actuation member 12 if the latter tends to retract towards the frame 11, preventing it from doing so, but on the other hand does not prevent extension of the actuation member 12 from the frame.

[0034] In this way a greater reliability and safety of an actuator, according to the present invention, is obtained, said actuator being used to actuate natural heat and smoke evacuators.

[0035] For the sake of constructional and operational simplicity, the locking element 14 may be connected to the base 13 rotatably about a rotation axis A between the rest configuration and the operating configuration.

[0036] The base 13 may comprise at least one hinging seat 17 which can be engaged by the locking element 14 which has at least one pin 18 rotatably coupled inside the hinging seat 17 so as to define the rotation axis A.

[0037] The elastic means may comprise at least one torsion spring which may be wound around a pin 18 and have one end which engages the locking element so as to push it into the operating configuration.

[0038] For compactness of the safety device, the locking element 14 may be shaped so as to extend mainly in two directions so as to assume a plate-like or flat shape.

[0039] Moreover, the locking element 14 may have a first edge 141 which can be movably fixed to the base 13 and a second edge 142, opposite to the first edge 141, which has a recess which defines a locking seat 19 adapted to engage the actuation member 12 of the actuator 100.

[0040] The base 13 has a niche B which houses the locking element 14 when it is in the rest configuration.

[0041] The yielding block 16 may be fixed to the base 13 so as to cover the niche B in order to retain the locking element 14 in the latter.

[0042] The yielding block 16 may be made of polymeric material able to yield at a temperature ranging preferably between 100°C and 120°C so as to allow the locking element 14 to reach the operating configuration.

[0043] Obviously, it is possible for example to envisage yielding blocks 16 made of different materials, each having a different yielding temperature so as to allow adjustment of the temperature at which the safety device 10 is activated, thereby making it adaptable to different applicational requirements.

[0044] The actuation member 12 may extend along a direction of extension C and has projecting elements 20

which project transversely with respect to the direction of extension C.

[0045] The locking element 14 may have a locking seat 19 configured to engage the projecting elements 20.

[0046] The locking element 14 may be connected to the frame 11 in such a way that

- following operation of the actuation member 12 so as to move from the closing configuration into the opening configuration, the actuation member 12 slides with respect to the locking element 14,
- following operation of the actuation member 12 so as to move from the opening configuration into the closing configuration, the actuation member 12 is clamped by means of at least one of the projecting elements 20 against the locking element 14 which locks it, opposing this movement.

[0047] The frame 11 has an opening passage 21 crossed by the actuation member 12 along a passage direction where the rotation axis A is transverse and preferably perpendicular to the passage direction.

[0048] The locking element 14 may be configured in such a way that in the operating configuration the locking seat 19 faces the opening passage 21 with respect to the passage direction so as to interfere with the actuation member 12.

[0049] The frame 11 comprises a casing 111 having a first face 111a and a second face 111b, adjacent to the first face 111a which has the opening passage 21.

[0050] The second face 111b has at least one flat portion and preferably is flat, where in the rest configuration the locking element 14 is folded down onto the second face 111b and in particular onto its flat portion so as to minimize the volume of the actuator 100 in a direction perpendicular to the flat portion.

[0051] The rotation axis A preferably is parallel to a corner edge 111 which joins the first face 111a to the second face 111b.

[0052] The yielding block 16 may comprise a weakened portion 161, which is for example thinner or has slits, and an engaging portion 162.

[0053] The weakened portion 161 may be configured to cover and/or retain the locking element when it is in the rest configuration and to soften and/or yield at the aforementioned predefined temperature.

[0054] The engaging portion 162 may be configured to be coupled with the base 13 so as to retain against the latter the weakened portion against the action of the elastic means.

[0055] In particular the engaging portion 162 may have a form complementing the base 13 so as to be coupled by means of elastic deformation, for example by means of snap-engagement, with the said base 13.

[0056] The yielding block may be configured to cover completely the base 13 and the locking element 14 so that they are not visible.

[0057] It can therefore be understood how a safety de-

vice and/or an actuator comprising said safety device, according to the invention, achieve the task and the pre-set objects, ensuring complete opening of a window unit in the event of a fire and at the same time preventing closing thereof.

[0058] With a safety device according to the invention it is possible to provide an actuator for a window unit which is more compact than the conventional actuators, while ensuring a greater level of reliability and safety in the event of a fire.

[0059] A safety device and actuator for a window unit comprising said safety device according to the invention do not require external operation for activation thereof in the event of a fire.

[0060] Another object of the present invention is to propose a safety device and an actuator for a window unit comprising said safety device which, at ambient temperatures higher than a predefined temperature value, prevents closing of the window unit, while allowing the opening operation thereof.

[0061] A safety device and an actuator for a window unit comprising said safety device according to the invention is moreover structurally simple, easy to use and can be easily installed without requiring special skills.

[0062] Therefore a safety device according to the present invention may be easily incorporated in an actuator which is already installed, allowing the safety and functionality thereof to be increased.

[0063] The invention thus devised may be subject to numerous modifications and variations, all of which fall within the scope of protection of the attached claims.

[0064] Moreover, all the details may be replaced by other technically equivalent elements.

[0065] Where the operational characteristics and the techniques mentioned are followed by reference numbers or symbols, these reference numbers or symbols have been assigned with the sole purpose of facilitating understanding of the description and said claims and consequently they do not limit in any way the interpretation of each element which is identified, purely by way of example, by said reference numbers or symbols.

Claims

1. Safety device (10) for an actuator (100) for a window unit where said actuator (100) for a window unit comprises:

- a frame (11) which can be fixed to an infrastructure;
- an actuation member (12) for operating a window unit;
- an operating device fixed to said frame (11) and coupled to said actuation member (12) and configured to move the latter between a closing configuration and an opening configuration; wherein in said opening configuration said ac-

tuation member (12) is extended with respect to said frame (11) and in said closing configuration said actuation member (12) is retracted with respect to said frame (11);

wherein said safety device (10) comprises:

- a base (13) which can be fixed to the frame (11);
- a locking element (14), connected to said base (13) movably between a rest configuration and an operating configuration;
- elastic means (15) connected to said base (13) and to said locking element (14) so as to force said locking element (14) into said operating configuration;
- a yielding block (16) fixed to said base (13) so as to keep said locking element (14) from reaching said operating configuration;

wherein said yielding block (16) is sensitive to the temperature in such a way that when a predetermined temperature is exceeded said yielding block (16) yields so as to allow said locking element (14) to reach said operating configuration;

wherein, said safety device (10) is configured in such a way that, following its incorporation in said actuator (100), in said operating configuration, said locking element (14) interferes with said actuation member (12) in such a way that, following an interference of said locking element (14) with said actuating member (12), said locking element (14) opposes a movement of said actuating member (12) from said opening configuration into said closing configuration without opposing a movement from said closing configuration into said opening configuration.

2. Safety device (10) according to claim 1, wherein said locking element (14) is connected to said base (13) rotatably about a rotation axis (A) between a rest configuration and an operating configuration.

3. Safety device (10) according to the preceding claim, wherein said base (13) comprises at least one hinging seat (17) for said locking element (14) which has at least one pin (18) rotatably coupled in said hinging seat (17) so as to define said rotation axis (A).

4. Safety device (10) according to one of the preceding claims, wherein said locking element (14) extends mainly in two directions so as to assume a plate-like shape and has a first edge (141) which can be movably fixed to said base (13) and a second edge (142), opposite to the first edge (141), which has a recess which defines a locking seat (19) adapted to engage the actuation member (12) of said actuator.

5. Safety device (10) according to one of the preceding claims, wherein said base (13) has a niche (B) which houses said locking element (14) when it is in said rest configuration; wherein said yielding block (16) is fixed to said base (13) so as to cover said niche (B) in order to retain said locking element (14) in the latter.
6. Safety device (10) according to one of the preceding claims, wherein said yielding block (16) is made of polymeric material able to yield, so as to allow said locking element (14) to reach said operating configuration, at a temperature of between 100°C and 120°C.
7. Actuator for a window unit, wherein said window unit comprises a fixed part and a movable part which is movable with respect to said fixed part between an open position and a closed position; said actuator comprises:
- a frame (11) which can be fixed to an infrastructure;
 - an actuation member (12) for operating a window unit;
 - an operating device fixed to said frame (11) and coupled to said actuation member (12) and configured to move the latter between a closing configuration and an opening configuration; wherein in said opening configuration said actuation member (12) is extended with respect to said frame (11) and in said closing configuration said actuation member (12) is retracted with respect to said frame (11);
- said actuation member (12) further comprising a safety device (10) according to one of claims 1 to 6;
- wherein, in said operating configuration, said locking element (14) interferes with said actuation member (12);
- wherein said actuation member (12) and/or said locking element (14) are configured in such a way that, following an interference of said locking element (14) with said actuation member (12), said locking element (14) opposes a movement of said actuation member (12) from said opening configuration into said closing configuration without opposing a movement from said closing configuration into said opening configuration.
8. Actuator according to claim 7, wherein said actuation member (12) extends along a direction of extension (C) and has projecting elements (20) which project transversely with respect to said direction of extension (C); said locking element (14) has a locking seat (19) configured to engage said projecting elements (20), said locking element (14) being connected to said frame (11) in such a way that
- following operation of said actuation member (12) so as to move from said closing configuration into said opening configuration, said actuation member (12) slides with respect to said locking element (14),
 - following operation of said actuation member (12) so as to move from said opening configuration into said closing configuration, said actuation member (12) is clamped by at least one of said projecting elements (20) against said locking element (14) which locks it, opposing this movement.
9. Actuator according to claim 8, wherein said frame (11) has an opening passage (21) crossed by said actuation member (12) along a passage direction where said rotation axis (A) is transverse and preferably perpendicular to said passage direction; wherein said locking element (14) is configured in such a way that in said operating configuration said locking seat (19) faces said opening passage (21) with respect to said passage direction so as to interfere with said actuation member (12).
10. Actuator according to claims 8 and 9, wherein said frame (11) comprises a casing (111) having a first face (111a) and a second face (111b), adjacent to said first face (111a) which has said opening passage (21); said second face (111b) having at least one flat portion; wherein in said rest configuration said locking element (14) is folded down onto said flat portion so as to minimize the volume of said actuator in a direction perpendicular to said flat portion.

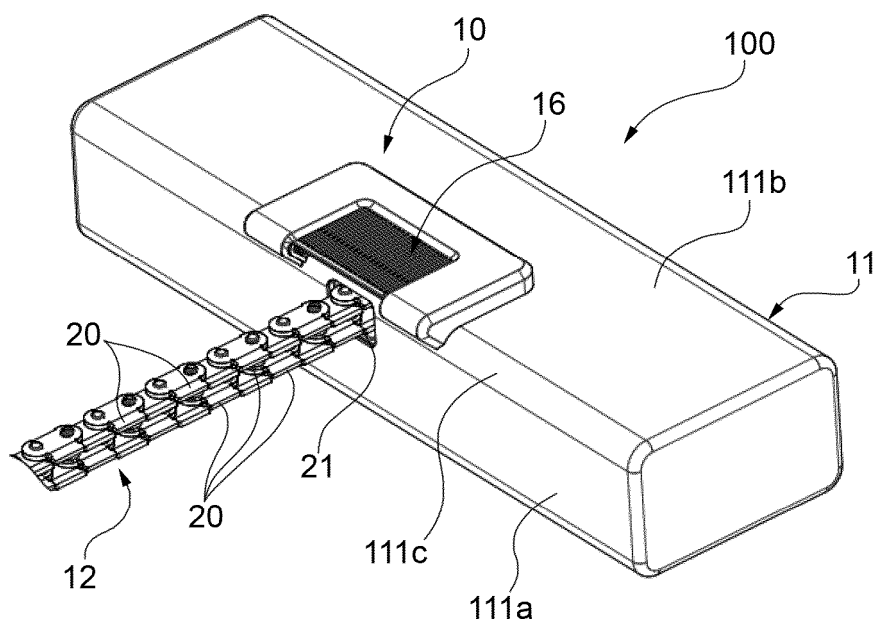


FIG. 1

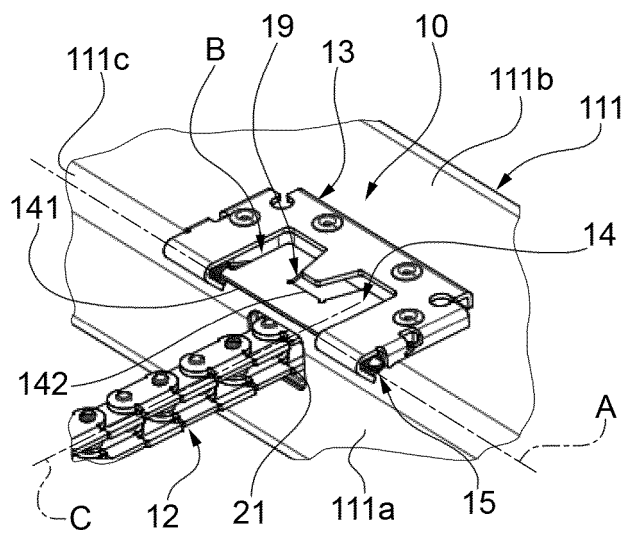


FIG. 2a

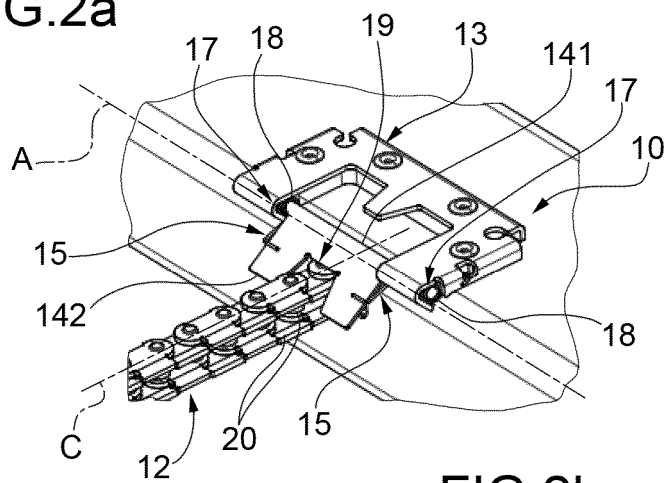
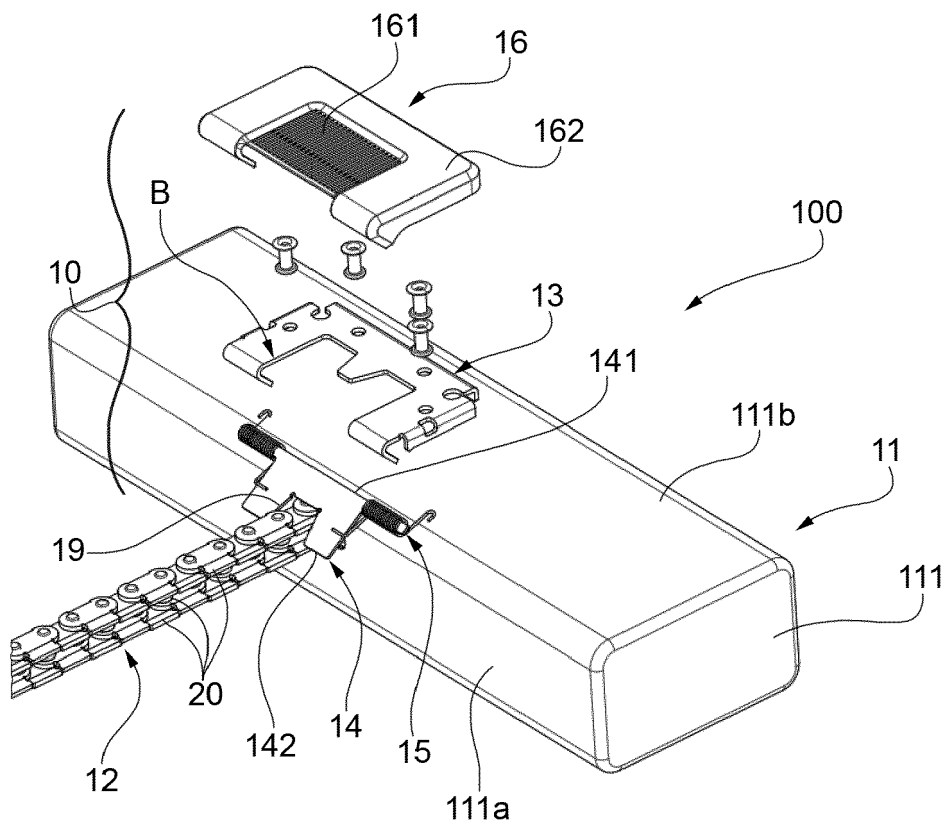
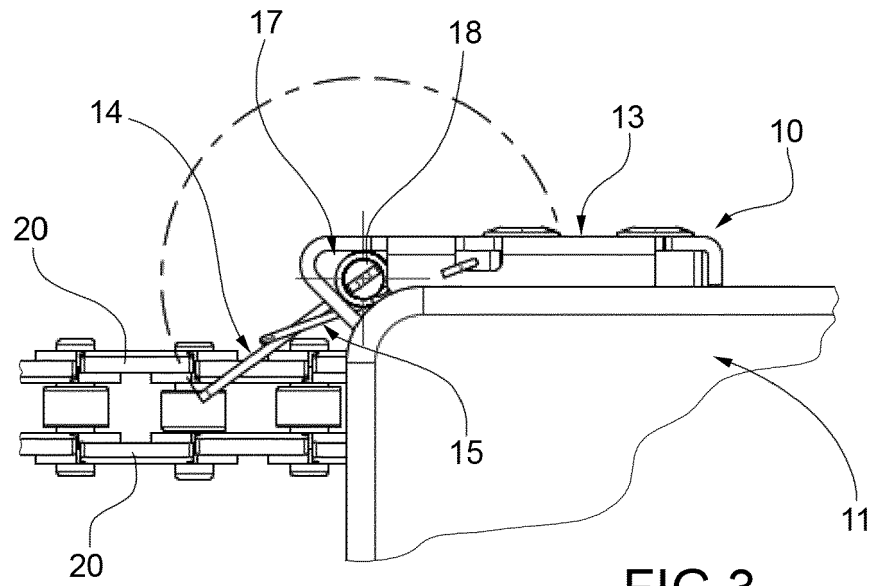


FIG. 2b





EUROPEAN SEARCH REPORT

Application Number

EP 21 21 2058

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 195 34 614 A1 (WINKHAUS FA AUGUST [DE]) 20 March 1997 (1997-03-20)	1, 2, 7	INV. E05F15/627
A	* column 5, line 47 - line 53; figure 2 * * column 6, line 54 - line 62 * -----	3-6, 8-10	
X, D	EP 2 141 316 A1 (NEKOS SRL [IT]) 6 January 2010 (2010-01-06) * the whole document * -----	1, 7, 8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) E05F
Place of search The Hague		Date of completion of the search 14 April 2022	Examiner Viethen, Lorenz
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 21 2058

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14-04-2022

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	DE 19534614	A1	20-03-1997	NONE

15	EP 2141316	A1	06-01-2010	NONE

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