

(19)



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(11)

EP 0 792 991 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

03.09.1997 Bulletin 1997/36(51) Int Cl.⁶: **E05F 15/12**(21) Application number: **97610004.0**(22) Date of filing: **20.02.1997**

(84) Designated Contracting States:

**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

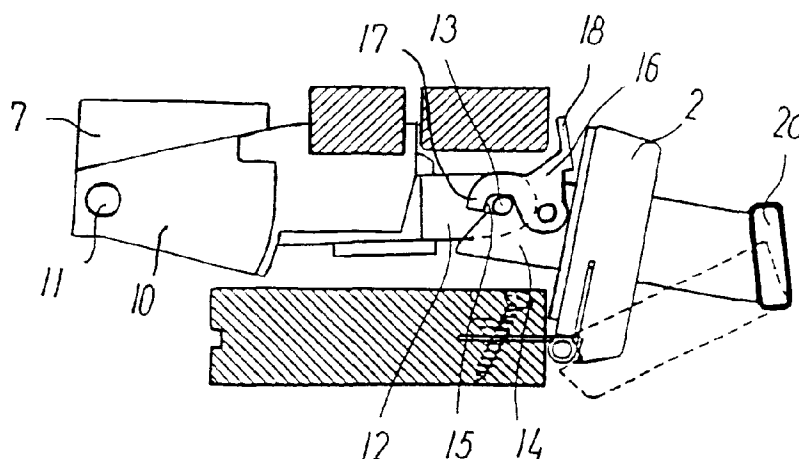
Designated Extension States:

AL LT LV RO SI(30) Priority: **01.03.1996 DK 232/96**(71) Applicant: **V. KANN RASMUSSEN INDUSTRI A/S
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(54) **A coupling device for connecting an electrical window operator device with an operating member as well as an electrical operator device for use together with such a coupling device**

(57) The invention relates to a coupling device for connecting an electrical operator device for opening and closing a window and comprising an operating member (2) for a locking mechanism, which coupling device comprises a first coupling element (8) designed for releasable engagement with a second coupling element (9) mounted on said operating member, the coupling device being characteristic in that said coupling elements comprise a pin or tap member (13) substantially transverse to the push element and a recess (15) for receiving

said pin or tap member (13). Said pin or tap member and recess are designed and adapted to each other in such a way that the pin and tap member in a position of the pivotal operating member (2) corresponding to activation of the locking mechanism when the window is closed, may be guided in and out of the recess (15), but in a, in relation thereto, swung-out position of the operating member (2) corresponding to release of the locking mechanism, is prevented from passing out through the recess (15) by a spring-loaded member (16).

**FIG. 2e****EP 0 792 991 A1**

Description

The present invention relates to a coupling device for connecting an electrical operator device for opening and closing a window with an operating member for a locking mechanism, which operating member is pivotally mounted on the window, the operator device comprising a housing connected with the main frame structure opposite said operating member, and a push element extending from there in the direction of the frame, the effective length of which push element may be increased or reduced for opening and closing, respectively, of the window, in which the coupling device comprises a first coupling element connected with the free end of the push element, said coupling element being designed for releasable engagement with a second coupling element mounted on said operating member, said coupling elements comprising a pin or tap member substantially transverse to the push element and a recess for receiving said pin or tap member, said pin or tap member and recess being adapted to each other in such a way that, in a first position of the pivotal operating member corresponding to activation of the locking mechanism when the window is closed, the pin and tap member may be guided in and out of the recess, but in a, in relation thereto, swung-out position of the operating member corresponding to release of the locking mechanism, is retained in the recess.

Windows having a frame pivotal about an axis are to a wide extent used as roof windows. Such windows are to an increasing extent becoming automatized, i.e. opening and closing of the pivotal frame is performed by means of an electrical operator device and a corresponding push element.

WO 95/04204 discloses a coupling device of the type mentioned by way of introduction for connecting an electrical operator device with an operating member, which makes an automatic or manual operation of a window possible without the need of technical aids or without the need of a separate release element. Moreover, the operation may in a possible case of emergency easily be changed from automatic to manual operation, both when the window is closed and when it is open.

This coupling device comprises two coupling elements, one of which coupling devices being designed as a male part with a head portion and the other as a female part with a recess for receiving the male part. The design of the male part and the female part necessitates a comparatively high precision in manufacture. Moreover, a possible wear on the parts may cause a reduced functioning, such that the efficiency of and the safety in keeping the two coupling elements connected is reduced.

As a further development of this known coupling device the object of the present invention is to provide a coupling device, in which the coupling elements may be manufactured with wider tolerances, so that possible wear becomes of correspondingly less importance.

In view of this the coupling device according to the invention is characterized in that said retainment results from actuation of a spring-loaded member caused by the swing-out movement of the operating member, said spring-loaded member being blocked in said first position, the operator device being guided such that the pin or tap member and the recess, are disengaged from each other in said first position.

According to the invention the retainment of the coupling elements in the connected condition is made in a simple way, so that the window may be operated both manually and automatically, and so that, when the window is open, it will be easy to change from automatic to manual operation, for instance in case of an emergency.

Moreover, the use of a spring-loaded member which in a swung-out position of the operating member prevents the pin or tap from passing through the recess, has the effect that the tolerance of the coupling elements is considerably increased, which markedly improves the functioning of the coupling device over a longer period of use, the importance of a possible wear being considerably reduced.

Moreover, the invention relates to an electrical operator device for opening and closing a window and for use together with a coupling device, which operator device comprises a housing connected with the main frame structure of the window and a push element extending from there in the direction of the frame in driving connection with a driving motor accommodated in the housing with accompanying motor control circuit. To prevent the push element of the operator device from moving too far in the opening direction in a situation, in which the two coupling elements of the coupling device are disengaged from each other, for instance due to the fact that the window or the flap has already been opened manually, such an operator device according to the invention is characteristic in that the motor control circuit is adapted through sampling of the motor current to actuate the motor to return the push element to its starting position, when the push element is set to move in the opening direction, the two coupling elements being disengaged from each other.

Further advantageous details and features of the invention appear from the dependent claims.

In the following the invention is described in detail by means of examples of embodiments of a coupling device and an operator device according to the invention and with reference to the drawing, in which

Fig. 1 is a perspective view of a window with a coupling device and an electrical operator device according to the invention,

Fig. 2a-2e are sectional views of the coupling device, which show the course of event when opening the window,

Fig. 3 is a schematic block diagram of a drive motor with accompanying motor control circuit in the elec-

trical operator device, and

Fig. 4 is a diagram of the motor current for illustrating the functioning of the motor control circuit.

Fig. 1 shows a section of a window with a window frame 1 pivotal about an axis and having an operator device in the form of a ventilation flap 2, which extends over the major part of the frame width and is pivotally hinged to the frame by means of hinges 3. The frame 1 closes against the main frame by means of a locking mechanism (not shown in detail). The ventilation flap 2 has two open-positions, one being a ventilation position, in which the frame is locked, and the other one being an extreme position, in which the locking is released and the frame is free to be opened. In the explanation given below, no distinction has been made between these two positions, as opening of the window and solely opening of the flap 2, respectively, are performed in the same way and exclusively depend on the locking of the frame 1 to the main frame 4, and the flap 2 to the frame 1, respectively. An operator device in the form of an operator generally indicated by 5 is pivotally mounted at the top member of the main frame 4, said operator comprising a drive motor for moving a push element 6, which in the embodiment shown is a power transmitting chain, but which may also for instance be a rigid push arm. The push element 6 is connected with a first coupling element 8, which is designed for releasable engagement with a second coupling element 9 mounted on the flap 2.

Fig. 2a-2e are sectional views of the coupling device during a course of event in which one coupling element is getting closer to the second one, fixedly engages the former and the ventilation flap 2 is moved. The completely open position of the flap 2 is indicated by dot-dash lines in Fig. 2a-2e. The operator 5 and its housing 7 is suspended by means of a fixture 10 fastened on the main frame 4, such that the housing may pivot around two pins 11, which are in flush and the axes of which are parallel with the axes of the hinges 3. In the embodiment shown, the first coupling member is designed as a U-shaped fixture 12 with a pin 13 in connection with the chain end protruding from the housing, whereas the second coupling element comprises a recess 15 designed for engagement with the pin 13 and provided in a fixture 14, which is fixedly mounted on the flap 2 in the vicinity of the locking mechanism or between two locking mechanisms in case of very wide frames. The fixture 14 is shown in dot-dash lines in the places, where it covers other parts of the coupling device in order to make the figures more distinct. The housing 7 is influenced by a spring, such that the pin 13 in the closed position of the window is always held in a position which is just opposite the opening of the recess 15 in the fixture 14. The cross-section of the pin 13 is preferably circular.

A pivotal, spring-loaded member 16 is connected with the fixture 14, said member having a first hook-shaped arm 17 and a second arm with a lip 18 in the form of a sheet protruding perpendicularly from one side

of the arm, and which in the closed position of the flap 2 is clamped between the flap 2 and the frame 1. In the closed position, the opening in the recess 15 on the stationary part of the fixture 14 is free, and the window may here be operated in two different ways, viz. manually or automatically. The manual operation may take place by means of an operating handle 2a. The member 16 is spring-loaded such that when the operating handle 2 is opened, it will turn anti-clockwise, due to the fact that the lip 18 of the second arm, as a consequence of the turning of the flap, is no longer held between the flap 2 and the frame 1.

By automatic operation of the window with closed flap and frame, Fig. 2a, the motor starts advancing the chain, and the pin 13 is guided into the recess 15 of the fixture 14, Fig. 2b. When the chain is further advanced, the pin 13 will get into abutment with the bottom of the recess, Fig. 2c, and the flap 2 will start opening, Fig. 2d, whereby the clamping of the lip 18 between the flap 2 and the frame 1 will be released, and the spring-loaded member 16 will move such that the first hook-shaped arm 17 moves towards a position, in which the arm 17 closes the opening of the recess 15, the pin 13 being thus held. When the flap 2 has been opened so much that the lip 18 no longer touches the flap 2, Fig. 2e, the hook-shaped arm 17 and the recess 15 hold the pin 13, and this holding position of the arm 17 is maintained during the continued movement of the chain towards maximum opening.

Closing of the window takes place by reversed movement. When the chain is driven back into the housing, the frame 1 is moved towards the closed position, and the position of the ventilation flap 2 and the turning of the spring-loaded member 16 may be determined such that the hook-shaped arm 17 will not open the recess 15 for passage of the pin 13 until a sealing pressure, if any, against the frame 1 has been overcome and the flap 2 has swung back to its locking position, which in a manner known per se may take place by means of springs in the locking mechanism. Hereby, the pin 13 is released, and the chain may freely be driven in place in its innermost position, where the chain in a manner known per se is stopped by disconnecting the current to the motor.

By manual operation in the closed position of the window and the flap, in which the opening of the recess 15 is free, the flap or the window is opened by pulling of the operating grip 2a, Fig. 2a. During the opening the spring-loaded member 16 will be turned, the lip 18 no longer being held between the flap 2 and the frame 1, and the hook-shaped arm 17 will turn down in front of the recess 15. As the chain is in its innermost position, the pin 13 is positioned opposite the recess 15, and the window may be opened freely.

In a position, in which the pin 13 is in engagement with the fixture 14, the frame is released from the chain by moving, for instance by a finger, the lip 18 towards the frame, whereby the hook-shaped arm 17 is moved

such that it no longer closes the opening of the recess 15, and the pin 13 is released. After such a release of the chain the easiest will be to let the motor withdraw the chain, and after closing of the window it is once more ready for either manual or automatic operation.

In the block diagram in Fig. 3 a motor guide circuit 19 has been outlined, said circuit being adapted to actuate the drive motor, here indicated by 20, to movement of the push element in the opening or closing direction or to remain in the position in question. The control circuit samples the current consumption of the drive motor and uses it for actuating the drive motor to a possible movement of the push element, which will be explained below.

Fig. 4 shows in a diagram the motor current by opening of the window or the flap as a function of the distance of the push element from the closed position. By movement of the push element the current consumption of the drive motor is sampled. By advancing of the push element the idling current is first measured, corresponding to the movement of the push element, until the pin 13 gets into abutment with the bottom of the recess 15, Fig. 2c. The current consumption sampled then increases, the push element encountering a higher physical resistance if the push element has got into abutment with the bottom of the recess, i.e. that the window or the flap has not been opened manually. When the sampled current consumption has reached a predetermined value, for instance twice the idling current, the motor control circuit allows the push element to continue its opening movement. If the current consumption of the motor does not exceed this predetermined value in the course of a predetermined period, for instance a few seconds, the motor control circuit induces the motor to return the push element to its starting position, such that the push element does not continue its movement, if the two coupling elements have not engaged each other. If the two coupling elements have engaged each other, the control circuit actuates the drive motor to continue the movement of the push element, whereby the window or the flap is opened, until the sampled current consumption exceeds another predetermined value corresponding to the opening of the window or the flap. Then the push element is reversed slightly to relieve the drive motor.

By closing of the window the drive motor is actuated to pull the push element inwards, which happens by a substantially constant current consumption. When the current consumption exceeds a predetermined value, corresponding to the window being closed, the control circuit actuates the motor to reverse the push element slightly to relieve the drive motor.

Claims

1. A coupling device for connecting an electrical operator device for opening and closing a window with an operating member (2) for a locking mechanism,

which operating member is pivotally mounted on the window, the operator device comprising a housing (7) connected with the main frame structure opposite said operating member, and a push element (6) extending from there in the direction of the frame, the effective length of which push element may be increased or reduced for opening and closing, respectively, of the window, in which the coupling device comprises a first coupling element (8) connected with the free end of the push element, said coupling element being designed for releasable engagement with a second coupling element (9) mounted on said operating member, said coupling elements comprising a pin or tap member (13) substantially transverse to the push element and a recess (15) for receiving said pin or tap member (13), said pin or tap member and recess being adapted to each other in such a way that, in a first position of the pivotal operating member (2) corresponding to activation of the locking mechanism when the window is closed, the pin and tap member (13) may be guided in and out of the recess (15), but in a, in relation thereto, swung-out position of the operating member (2) corresponding to release of the locking mechanism, is retained in the recess (15), **characterized** in that said retainment results from actuation of a spring-loaded member (16) caused by the swing-out movement of the operating member, said spring-loaded member being blocked in said first position, the operator device being guided such that the pin or tap member (13) and the recess (15), are disengaged from each other in said first position.

2. A coupling device according to claim 1, **characterized** in that the pin or tap member (13) is connected with the push element, and in that the recess (15) is positioned in a fixture (14) which is connected with said operating member.
3. A coupling device according to claim 1 or 2, **characterized** in that the pin or tap member (13) has a circular cross-section.
4. A coupling device according to claim 1, 2 or 3, **characterized** in that pin or tap member (13) is positioned transversely in a U-shaped fixture (12) at the chain end protruding from the housing.
5. A coupling device according to any of the preceding claims, **characterized** in that the spring-loaded member (16) comprises a first hook-shaped arm (17) and a second arm with a lip (18) in the form of a sheet which protrudes perpendicularly from one of the sides of the arm and which in said first position of the operating member is clamped between the flap (2) and the frame (1).
6. A coupling device according to claim 5, **character-**

ized in that the spring loaded member (16) is induced to turn by a spring force at the swinging of the operating member (2) from said first to said second position, in which said clamping of the lip (18) of said second arm is released.

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7. An electrical operator device for opening and closing of a window and for use together with a coupling device according to any of the preceding claims, which operator device comprises a housing connected with the main frame structure of the window and a push element (6) extending from there in the direction of the frame in driving connection with a driving motor accommodated in the housing with accompanying motor control circuit, **characterized** in that the motor control circuit is adapted through sampling of the motor current to induce the motor to returning of the push element to its starting position, when the push element is actuated for movement in the opening direction, the two coupling elements being released from each other.
8. An operator device according to claim 7, **characterized** in that the housing (7) of the operator device is pivotally mounted relative to the main frame structure (4).
9. An operator device according to claim 7 or 8, **characterized** in that the push element (6) is a power transmitting chain.
10. An operator device according to claim 7 and 8, **characterized** in that the push element (6) is a substantially rigid push arm.

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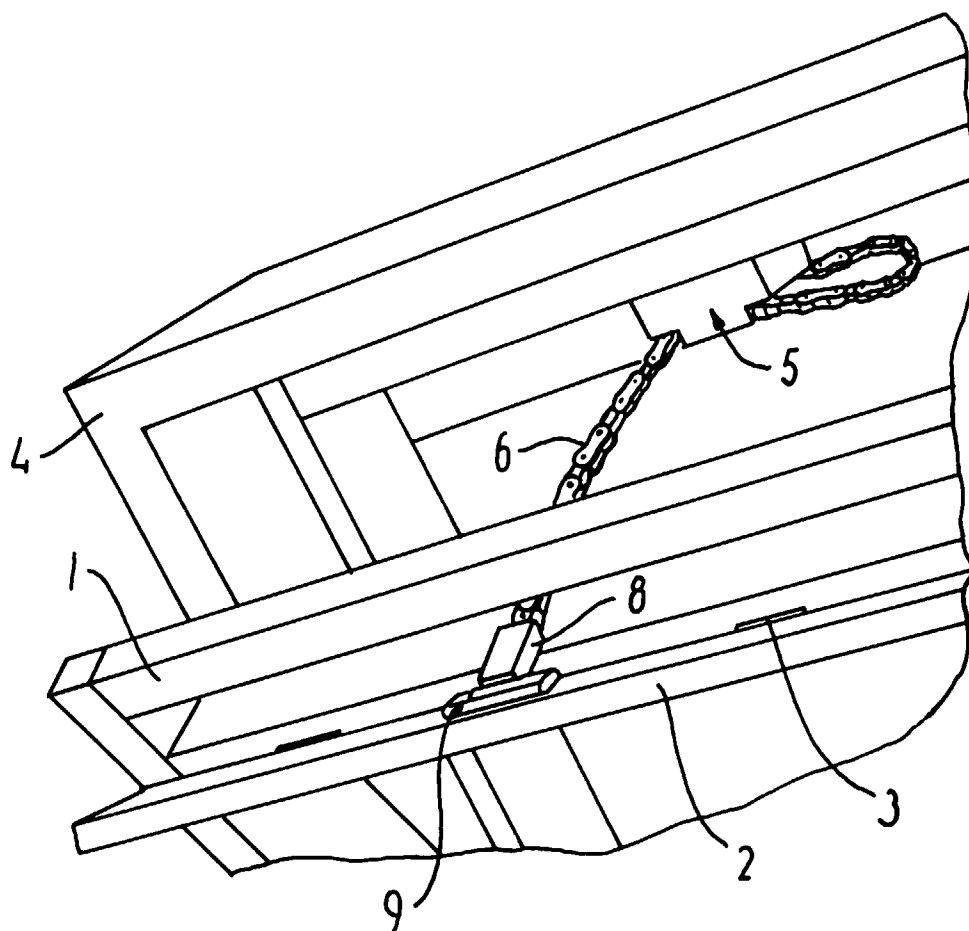


FIG. 1

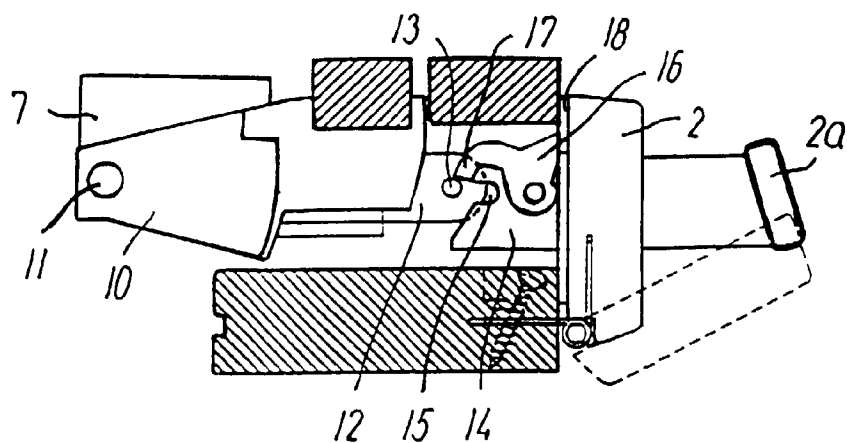


FIG. 2a

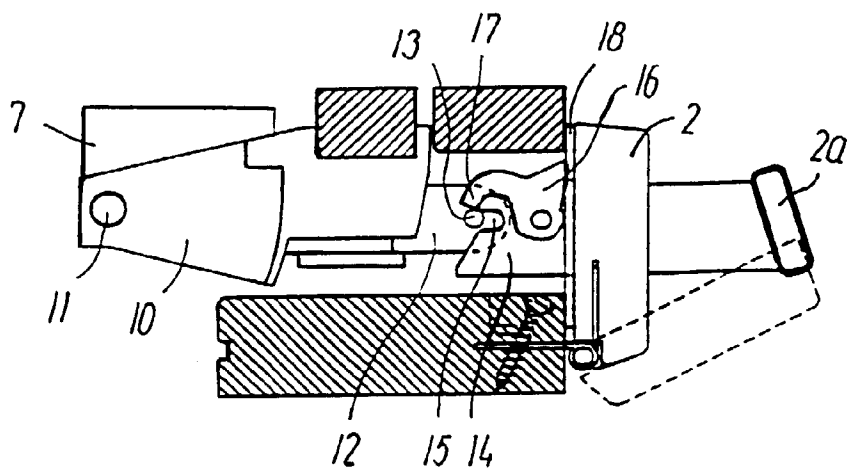


FIG. 2b

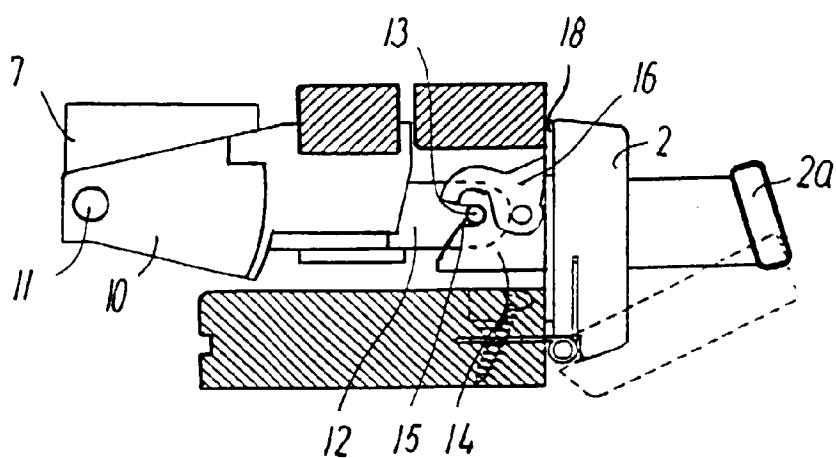


FIG. 2c

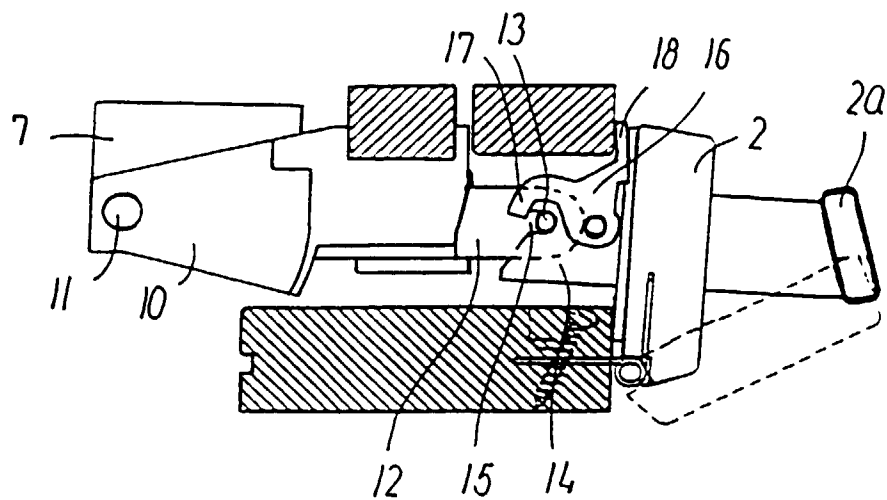


FIG. 2d

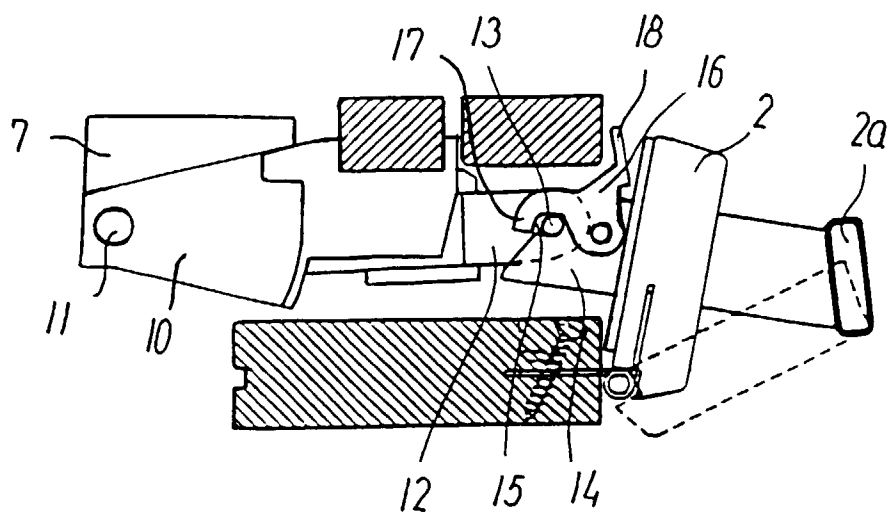


FIG. 2e

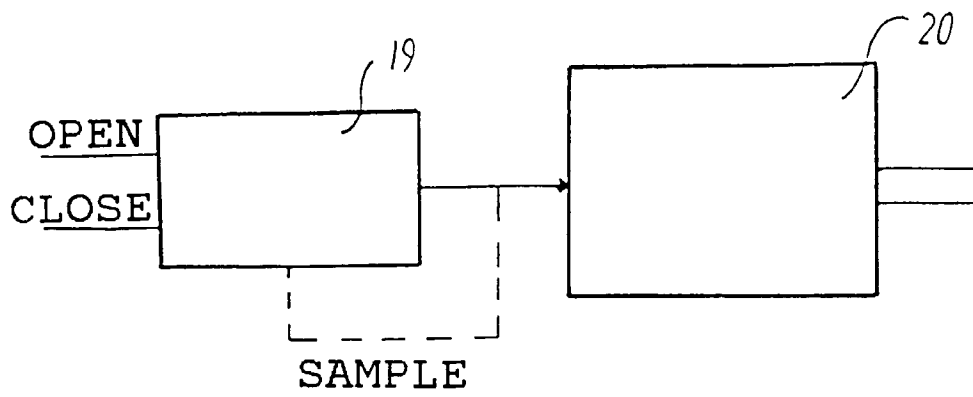


FIG. 3

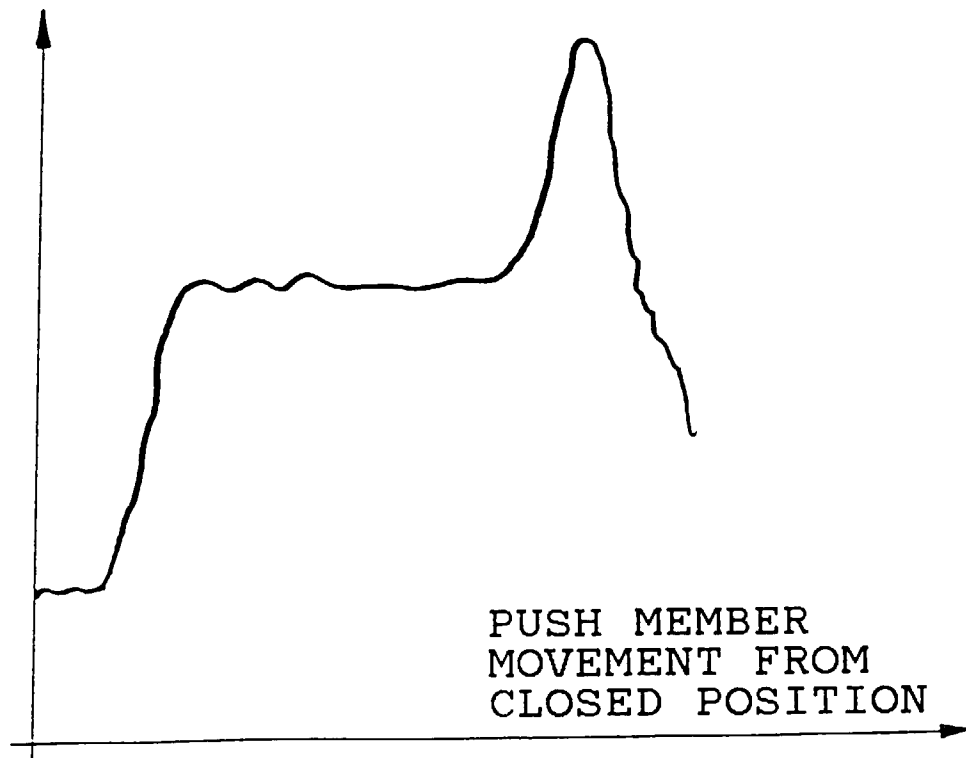


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 97 61 0004.0

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.6)
A	WO 9504204 A1 (V. KANN RASMUSSEN INDUSTRI A/S), 9 February 1995 (09.02.95) -----		E05F 15/12
			TECHNICAL FIELDS SEARCHED (Int. Cl.6)
			E05F
The present search report has been drawn up for all claims			
Place of search STOCKHOLM		Date of completion of the search 20 May 1997	Examiner WENDENIUS CHRISTER
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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