METHOD AND APPARATUS FOR CLOSURE CONTROL

A method and apparatus for control of closures such as windows and doors. The control is achieved using a fluidic medium. The control mechanism (20) is concealed in a frame (F) with which the closure (S) is mounted. The control mechanism can be a linear actuator (20) coupled by an arm (39) to an arm (13a) of a window stay (10). Remotely controlled solenoid valves (V) within the frame (F) operate the linear actuator (20). A port (32) of the frame (F) is removable to permit access to the linear actuator (20) which is housed in a housing (33) formed as part of frame (F).
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METHOD AND APPARATUS FOR CLOSURE CONTROL

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for closure control.

Closures, eg doors and in particular windows in domestic buildings have traditionally been opened and closed by physical effort applied by the person opening or closing the closure. With doors and windows, this will typically also involve the operation of a lock, latch, fastener or the like when opening the door/window from a closed position. In the case of a window, a latch, fastener or the like may need to be separately operated upon fully closing the window. For doors through which access needs to be restricted, eg an external door the user will generally need to operate some locking mechanism to effect secure locked closure of the door.

It is, however, known to provide operating mechanisms for certain types of doors and windows whereby no physical effort is required on the part of the user other than, say, operate a push button or switch. For example, it is known to operate garage, commercial and large industrial doors by electric
motors. For up and over garage type doors, the motor generally drives a chain which pulls or pushes a carriage coupled to a linkage connected to the door. A more direct connection between the motor and door is possible for curtain (roller) type doors. Despite attempts by manufacturers to render such operators quiet in operation the operators remain noisy due to mechanical noise from the chain(s) linkage etc, reduction gear boxes and general motor noise.

Windows which are difficult to access, eg skylights can also be actuated by an electric motor as the motive power for a window operator. Once again, however, despite the best efforts of manufacturers a motorised window operator is noisy in operation.

Commercial buildings will often include in high traffic areas, eg a principle access/egress doorway, a sliding door which is automatic in operation. Yet again, however, the door(s) will be driven by an electric motor and a series of chains, gear wheels, linkages, etc. Noise is therefore also a factor in the operation of the door.

A further factor associated with such operators for doors and windows is the obtrusive nature of the operator. For example, with a motorised window operator there is not only the operator which projects from the window frame (or adjacent thereto) but also a motor drive. This is not an
aesthetically pleasing sight, especially if a plurality of separate windows in a building are driven by motorised window operators. Garage door operators especially rely on a bulky operator which is readily visible and of unsightly appearance.

Even if the operator can be hidden away, eg with motorised sliding doors, special structural allowance needs to be made in order to accommodate what is largely a bulky mechanism. This is possible in larger commercial/industrial buildings but generally not in domestic situations. In any event, the cost of such motorised door drive mechanisms render them impractical for a domestic dwelling.

Security is now a high priority requirement with buildings especially domestic dwellings due for example to the ever increasing instances of unauthorised entries. A high percentage of domestic break-ins arise from opportunistic crime where someone observes and then uses an unlocked or only partially latched door or window as the point of entry. The unlocked nature of the closure can result simply from an oversight on the part of the building occupier.
SUMMARY OF THE INVENTION

An object of the present invention is to provide an apparatus for operating a closure which is quiet in operation and visually not obtrusive.

A further object of the present invention is to provide a method of closure control which provides for easy and effective operation of a closure or closures.

Yet a further object of the present invention is to provide a method of closure control which can provide improved security.

Broadly in one aspect of the invention there is provided apparatus for operating a closure characterised in that the operative drive to open and/or close the closure is fluidic.

According to one form of the invention the apparatus includes a linear actuator. The fluidic medium for operating the linear actuator can be hydraulic or pneumatic. In one form of the invention the hydraulic drive is provided by water under pressure. This can be derived from a mains pressure water supply. When the actuator is pneumatic the pressurised air can be supplied by an on demand compressor preferably including a pressure reservoir.
The linear actuator does not need to be double acting. In one form of the invention the linear actuator can be arranged to provide an opening drive to the closure with the closure being closable by biasing means such as, for example, a counter weight, spring or separate device which can be fluidic controlled.

A preferred form of the invention includes locking or latching means which automatically locks/latches a closure upon the apparatus returning the closure to a closed state. The apparatus can further include indicator means to indicate the closure is in a closed and locked/latched state. The indicator means can be positioned remote from the closure.

According to a second broad aspect of the invention there is provided a method of closure control comprising operating a fluidic controlled operator to cause the closure to open and/or close.

In a preferred form of the invention a plurality of closures are controlled by a fluidic operated apparatus, there being at least one control means which can return all closures in an open state to a fully closed state.
BRIEF DESCRIPTION OF THE DRAWINGS

In the following more detailed description of preferred embodiments of the invention reference will be made to the accompanying drawings in which:-

Figure 1 is a perspective view of one form of apparatus according to the present invention,

Figure 2 is a longitudinal section of the apparatus shown in Figure 1,

Figure 3 is a cut away illustration of a second form of apparatus according to the present invention used in conjunction with a window sash mounted in a window frame,

Figure 4 is a cross-sectional elevation of part of the window frame shown in Figure 3,

Figure 5 is a part length view of a window frame member in conjunction with a linear actuator and window stay,

Figure 6 is a similar view to Figure 5 but with a cover piece of the frame removed,
Figure 7 is a further view of the arrangement shown in Figures 5 and 6 but from a reverse angle and with the frame sections removed, and

Figure 8 is an end view of the arrangement shown in Figure 5 but with the window sash S in a closed position in frame F.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

The present invention is based on the discovery that fluidic control of closures provides a quiet effective means of applying an opening, closing or both actions to a closure. Also, apparatus under fluidic control can be provided in a form which is able to be located in a confined cavity such as within a door or window frame or within the confines of a wall or surround adjacent the closure. A fluidically controlled closure is particularly suited for a domestic dwelling as concealment is possible within the constraints of normal building construction and normal operation of the invention is not compromised.

Apparatus under fluidic control does not suffer from the noise which is associated with motorised drive units. Also, a plurality of windows and doors can be readily controlled from a central control means.
Furthermore, in some applications the fluidic control operators are sequence controlled such that a fluidic operated locking/latching means can be employed for security. As a result, it is believed that conventional mechanical latches, fasteners and locks will not be required for locking or latching the closure in a closed position. Further handles for pulling/pushing/sliding the closure may not be required.

Accordingly, conventional hardware fittings to enable a user to impart a push/pull/slide action to a closure and to lock/latch the closure closed will not be required thereby offsetting at least in part the cost of the fluidic control apparatus.

According to one form of the invention the apparatus includes a linear actuator. This can be single or double acting. The linear actuator is provided with mounting means whereby it can be mounted in the cavity of the door or window frame F or be part of the frame (eg as shown in Figures 1 and 2 of the drawings). The body of the actuator can be fixed in position and the piston rod coupling to the movable closure or vice versa.

In a conventional manner fluid supply lines are connected from a pressurised fluid supply source. The pressurised
fluid can be water under pressure and will generally be mains supply. The water fittings can be of a convention form (eg similar to those found on home irrigation fittings) that enable them to be placed anywhere as required on a lineal length.

Alternatively, a small air compressor can be employed. Pressure control means can be provided including a pressure reservoir or pressure accumulator/tank. The level of demand at any one time and speed of operation of the linear actuator is such that a small compressor of the type typically used as a tyre pump will be sufficient. This can, however, be located in an area of the building where noise is not a critical factor, eg a garage.

Where water or other hydraulic medium is used the closure may not require a separate locking/latching mechanism as compression of fluid in the actuator will not be possible. This can thereby be used to prevent opening of the closure. However, as will be described, a locking/latching mechanism can be provided within the closure frame or the wall/surround adjacent the closure. This can be driven by a second (small) linear actuator which under sequence control operation in the case of closing will be activated after the closure has reached the closed position and will be activated to a release position before the window is opened.
The apparatus includes an operating mechanism, generally a push button, switch or even a proximity sensor adjacent the closure. For doors the operating mechanism could include a code, magnetic strip or other actuated switching device. The operating mechanism for doors could include a time delay whereby the door stays open for a period of time before closing.

With a window, the operating mechanism can be operable to control the degree to which the window is open. The control mechanism could, for example, include a pair of switches, a toggle switch or the like whereby the user can select movement in an opening or in a closing direction.

The closure does not need to be movable in both directions by the fluidic controlled actuator. For example, the closing action could be via a spring bias such as used for door closing devices. For a sliding door a counterweight movable within the frame cavity or wall cavity could apply a closing action. The linear actuator would thus be provided with exhaust means operative after the actuator has moved to a position representing a fully open position. In the case of water being used as the fluid medium the exhaust could be to waste but more preferably to storage such as a toilet cistern. A closed loop system could also be used.
With projected hung windows the linear actuator can be pivotally mounted at each end to the sash and frame of the window. It can form part of the window hinges (commonly terms window stays) as shown in the drawings or a staying system thereby replacing a conventional peg in the hole or other form of hardware for holding the window in an open position. The presence of the linear actuator can obviate the need for friction hinges/stays thereby enabling simpler and less costly hinges/stays to mount the sash with the frame. The inherent fluid deadlocking feature ensures the window is locked under pressure in any position.

While each closure can be individually operable via a switching device adjacent the closure a central control means can be provided. This is useful in providing central control locking of all closures. The central control can include a master operating button, switch, infrared sensor or transmitter or the like which when activated causes all controlled windows and doors to close and latch/lock. The user can thus be assured that the building is securely closed. If a closure does not fully close this can be indicated by a suitable indicator on the control housing.

In a more sophisticated form of the invention the central locking function can when completed activate an alarm system. Alternatively activation of an alarm system can activate the master control of the closure system possibly with a delay on
the door adjacent the alarm activation panel/switch sufficient to permit egress through the door.

Safety measures are provided in the event of a closure closing/opening onto an obstruction, eg a part of a person's body like a hand, arm, torso, etc. Pressure sensing means will sense an obstruction to movement thereby ceasing operation of the linear actuator or causing it to reverse the direction of operation. This could be accompanied by, say, an audible warning.

As illustrated in the drawings the fluidic controlled actuator can be located within the frame member F of a door or window though in the drawings there is shown a window mounting arrangement.

In this form of the invention, the frame member F includes (preferably formed integrally in the extruded frame) a longitudinally extending cavity C. A slot S is cut into one wall W of the frame member F.

Mounted with the frame member F in a substantially conventional manner is a window stay 10. The window stay can take various forms but in the example illustrated in Figures 1 and 2 the window stay 10 is of a so-called sliding two bar configuration. The window stay, therefore, includes a frame mounting plate 11 and a sash mounting plate 12 between which
extends an arm 13 pivotally coupled at 14 and 15 to the respective frame mounting plate 11 and arm 12. The pivot couplings can be low friction or so-called “no-friction” joints.

The arm 12 is further pivotally coupled at 16 to a sliding carriage 17. The carriage 17 is mounted for sliding movement by a profiled edge 18 of the frame mounting plate 11. A stay of this type is, for example, described in our New Zealand patent specification 196672 and British patent specification 2095743.

The length of the slot S routed in wall W is of sufficient length to accommodate the stay activation. This is determined by the extent of movement of the sliding carriage 17 which as shown is coupled (by, for example, an extension of the rivet 16a of rivet joint 16) to the distal end of the piston rod 19 of the linear actuator 20. As shown, a slot 11a in mounting plate 11 aligns with slot S in the frame F to facilitate coupling of the carriage 17 to piston rod 19.

The piston rod 19 is coupled to a piston 21 which slidingly locates in the cavity C. End seals 22 and 23 are spaced apart at appropriate locations within the cavity C using, for example, external screws (not shown). Water fittings (not shown) of conventional form are then connected at the appropriate positions to the length of the cavity C between
the seals 22 and 23. The water lines to these fittings can also pass within the hollow interior of the frame F.

Therefore, in a relatively straightforward yet effective manner a linear actuator (in this case water driven) is located integrally within the frame F to provide the motive force for the window stay 10. The operator mechanism is thus concealed. The window also opens and closes normally as the operator mechanism does not compromise the operation of the window stay.

Referring now to Figures 3 to 8 of the drawings there is shown a second form of the invention. According to this embodiment the linear actuator 20 is once again located within the frame of the window but is formed as a separate unit.

Figure 4 of the drawings shows in cross-section the frame F of the window and the associated sash section S. The frame F is formed in three parts, namely, a base part 30, an insert part 31 and a cover part 32. Base part 30 and insert part 31 combine to form an annular cavity 33 in which the linear actuator 20 is located. In Figure 3 the cover part 32 is absent from the sill part of the frame F while the leading vertical part of the frame is shown without base part 30 and insert part 31 in the interests of clarity. As shown, cover
part 32 forms the inner part of the frame F and the internal surround of the frame.

The sash S is mounted to the frame F via a window stay 10. As shown in Figures 3 and 5 the window stay includes a sash plate 12 and a pair of arms 13a and 13b which extend through an open-sided slot 32a formed in flange 45 of cover part 32. Arm 13b is pivotally coupled at pivot 16 to the sash plate 12. Arm 13a is coupled via pivot 15 to the sash plate 12 though the pivot 15 is slidingly engaged with an elongate slot 12a in the sash plate 12. Arms 13a and 13b are pivoted together in their length by pivot 34.

Figure 6 is a view similar to that shown in Figure 5 but with the cover piece 32 removed. This reveals the frame plate 11 which is fixed by mechanical fasteners which pass through various of the openings 35 and into the insert 31. The frame plate 11 has an elongate slot 36 which is curved towards one end as is clearly shown in Figure 6. A pivot coupling 37 slidingly engages in slot 36 and couples arm 13a to the frame plate 11. A fixed pivot 14 couples arm 13a to the frame plate 11. The position of pivot 14a is offset to a line through the straight portion of slot 36.

Figure 7 of the drawings depicts from a reverse direction to Figures 3, 5 and 6 the window stay 10 and the linear actuator 20 with the window stay shown in the fully closed position.
This drawing shows the pivot 37 extending through to a coupling 38 with a generally L-shaped arm 39. The bottom leg 40 of the L-shaped arm 39 extends through an elongate longitudinally extending slot 41 in the body 42 of the linear actuator 20. Body 42 can be a PVC liner which will protect against galvanic action. The leg 40 fits into a receiving cavity 43 of a piston member 44 which is slidingly engaged within the body 42 of the linear actuator 20. The piston member 44 is shown at the limit of its movement where the window stay is fully closed.

As will be apparent from Figure 7, the piston member 44 is of a length such that throughout its full extent of travel it covers off slot 44. End caps or bungs (not shown) close off the liner 42 either side of the piston member to form the enclosed hydraulic chamber which must necessarily exist for piston member 44 to reciprocate within.

As the piston member 44 moves in the direction of the arrow A arm 39 moves relative to the sash plate 11 so that sliding pivot 37 moves along the slot 36 resulting in relative movement between arms 13a and 13b to thereby move the sash plate 12 to its fully open position. Stopping the movement of piston member 44 at any point in its travel enables an end user to readily adjust the degree of openness of the sash S relative to frame F.
As shown in Figure 4 the cover piece 32 has a leg 45 with a return 46 which engages in a slot 47 in the insert 31. A screw 48 (eg a self-tapping screw) engages through facia portion 49 of cover 32 thereby removably locking the cover piece 32 onto the remainder of the frame F. Other mechanical means to lock cover piece 32 in place can of course be employed.

As mentioned previously the sash can be locked into the closed position by virtue of an hydraulic action or by a locking device. Figure 3 of the drawings depicts an example of a linear actuator controlled multi-point locking device 50. This is only by way of example as other known locking arrangements could be used.

Device 50 in the illustrated form (which is only by way of example) included a shroud or housing 51 into which a small linear actuator (not shown) can be located in a manner, for example, as described in relation to actuator 20. The housing 51 is fixed to insert part 31 and thus is located in the cavity 52 formed when cover part 32 is located in place. Its cavity 52 of the oppositely disposed frame members in which the window stay frame mounting plate 11 is located.

A lock bar 53 is slidingly located adjacent to housing 51. This lock bar 53 is coupled by coupling 54 to the piston rod of the linear actuator. Thus as the piston rod extends and
retracts the lock bar 53 is moved between locking and unlocking positions. The lock bar 53 has "L" shaped latch members 55 which engage in openings in a latch plate (not shown) carried by sash S in a conventional multi-point locking arrangement. Thus once the latch members 55 become located in the openings the lock bar 53 can slide into its locking position so that the distal ends of the latch members engage behind the latch plate and thereby lock the sash against opening motion.

In an alternative arrangement the solenoid can be single acting. Thus it can control the unlatching function. A spring loaded arrangement can achieve the latching.

Figure 3 shows solenoid valves V which are part of the hydraulic circuit for controlling respectively the actuator 20 and the actuator of the lock device 50. These valves driven by a 24 volt supply function to direct fluid H to the required sides of the pistons in the actuators to drive the actuator in the desired direction of travel. Solenoid valves also control exhaust flow H'. The hydraulic plumbing and control is in accordance with conventional techniques known to persons skilled in such art.

The cover piece 32 covers the frame mounting plate 11 and portions of the lengths of arms 13a and 13b. However, for maintenance purposes this cover piece 32 can readily be
removed by unscrewing screw 48 (eg as shown at the sill side of the frame in Figure 3). This not only enables access to the frame mounting plate 11 but also to achieve removal of the insert piece 31 thereby providing access to the linear actuator 20 and fluid medium fittings, solenoid valves V fluid medium lines and the 24 volt supply lines and connections. Thus, despite the fact that the linear actuator is housed within the frame F the linear actuator can be readily accessed for maintenance, replacement or other purposes.

As shown in Figure 3, lines L will normally be routed to a switch box B. This switch box can, as explained herein, be connected back to a main or central control unit U.

It will be appreciated by those skilled in the art that this embodiment of the invention is once again by way of example. It will be readily apparent that modified forms of frame construction and window stay configurations can be used to achieve the objectives of the present invention. The invention is therefore not limited to the configurations of frame, mounting of linear actuator and window stay as illustrated in the two forms described herein and shown in the drawings.

While the drawings are orientated in such a way that the frame member and associated stay appears to be vertically
orientated as, for example, in an awning application, the invention is also applicable to casement applications. In a casement application, it will generally be the case that the linear actuator will be double acting. In an awning application, however, a single acting linear actuator could be possible with biasing means to move the window to or from an open position though means would be provided for overriding the biasing means (eg by locking or isolating the biasing effect) at a selected degree of openness of the window sash.

As mentioned above, the invention is open to modification. For example, with sliding window sashes a single acting actuator 20 could be located in the top frame sections to drive the sash in one direction (eg an opening direction). Another actuator in the sill side of the frame can then control the closing action. Such an arrangement obviates the need for a large cylinder. Also, it ensures that operation of the sliding sash to its full extent of travel is achieved.

The linear actuator 20 can be arranged to drive the short arm of a four bar window stay. Other options are to drive the sash directly, ie independent of the support hinges/window stays. Drive could also be imported to the sash via alternative hinging arrangements to those disclosed herein. For example, a sash could be mounted in the frame by simple butt hinges. A separate arm coupled to the linear actuator
could be used to control movement of the sash and provide the required staying action to hold the stay in an adjusted open position.

In its simplest form, the invention provides a fluidic controlled actuator located within a closure to effect opening and/or closing thereof. The actuator is preferably located at least partially within the closure frame or area immediately surrounding the closure. An actuation button, switch, remote control mechanism or the like located at or near the closure enables a user to effect opening/closing of the closure.

While the specific description herein of the two different embodiments shows the invention used for control of a window sash, this is only by way of example. The same technique can be used for control of door closures.

As the skilled person will appreciate from the foregoing, more complex arrangements of control can be employed to control a plurality of closures. Such arrangements include a central control to facilitate "central locking" of all controlled closures in the building or part of the building. For example, the control could be for only external doors.

The use of fluidic control not only provides compact apparatus which can be housed out of sight but one which is
quiet in operation. Also, the cost is anticipated as being viable due to reduction in other conventional pieces of hardware no longer being required. The positive driving effect which is achieved by using actuators on both sides of a window sash can result in better and more even control.
CLAIMS:

1. Apparatus for operating a closure characterised in that the operative drive (20) to open and/or close the closure (S) is fluidic.

2. Apparatus as claimed in claim 1 wherein the operative drive includes at least one linear actuator (20).

3. Apparatus as claimed in claim 2 wherein the fluid medium is hydraulic or pneumatic.

4. Apparatus as claimed in claim 3 wherein the fluid medium is water under pressure.

5. Apparatus as claimed in claim 4 wherein the water is derived from a mains water supply.

6. Apparatus as claimed in claim 2 wherein the linear actuator (20) is pneumatic with pressurised air supplied by an on demand compressor.

7. Apparatus as claimed in claim 6 further including an air pressure reservoir.

8. A closure arrangement including a closure member (S), a frame (F), the closure member movably mounted with the
frame by at least one mounting device (10), a linear actuator (20), a fluidic medium supply coupled to the linear actuator, the linear actuator coupled to the closure member(s) and a control mechanism to control flow of the fluid medium relative to the linear actuator such that the linear actuator can move the closure member (S) relative to the frame (F).

9. The arrangement of claim 8 wherein the linear actuator (20) is concealed substantially within the frame (F).

10. The arrangement of claim 8 or 9 wherein the linear actuator (20) is drivingly engaged with a drive transfer (10) connected with the closure member (S).

11. The arrangement of claim 10 wherein the drive transfer (10) forms at least part of the or a said mounting device.

12. The arrangement of claim 10 wherein the drive transfer (10) is coupled to the or a said mounting device.

13. The arrangement of any one of claims 8 to 12 wherein the frame (F) includes a housing (33) for receiving a linear actuator (20).
14. The arrangement of claim 13 wherein the frame (F) includes a removable portion (31) which when removed provides access to said linear actuator (20).

15. The arrangement of any one of claims 8 to 14 wherein the frame (F) includes a cavity (52) in which at least in part is located a latching device (50) said latching device being driven by a linear actuator.

16. The arrangement of claim 15 wherein the linear actuator of the latching device (50) is operatively coupled to a latching member (53), said closure member (S) having a latch receiving member with which the latching member (53) is engageable when the closure (S) is in a closed position.

17. The arrangement of any one of claims 8 to 14 wherein the or each linear actuator (20) is connected to a source of fluid medium via a control means, the control means being arranged such that the linear actuator can be driven to move the closure member (S) in a direction of opening or closing.

18. The arrangement of claim 17 wherein a linear actuator of a latching device (50) which is at least partially concealed within the frame (F) is coupled to the source of fluid medium.
19. The arrangement of any one of claims 8 to 18 wherein the fluid medium is water.

20. The arrangement of claim 19 wherein the water source is a mains water supply.

21. The arrangement of any one of claims 8 to 20 wherein the linear actuator (20) is single acting, the closure member (S) being moveable in a direction opposite to that which the closure member can be driven by the linear actuator by biasing means.

22. The arrangement of any one of claims 8 to 21 wherein the frame (F) includes a section (C) which forms a body of said linear actuator (20), a piston (21) being slidingly located in said frame section (C) and coupled by a coupler (19) to the or a said mounting device (10).

23. The arrangement of claim 17 wherein the control means includes a plurality of solenoid valves (V) located within said frame (F).

24. The arrangement of any one the claims 8 to 23 wherein the frame is a window frame (F) and the closure member is a window sash (S), the mounting device being a hinge or stay (10).
25. The arrangement of claim 24 wherein the hinge or stay (10) includes at least one sliding pivot (16) which is coupled to the linear actuator (20).

26. The arrangement of any one of claims 8 to 23 wherein the frame (F) is a door frame and the closure member (S) is a door, the mounting device being a hinge or sliding track and roller mechanism.

27. A building construction including a plurality of closure arrangements as claimed in any one of claims of 8 to 14.

28. A building construction as claimed in claim 27 including a central control unit arranged to cause all of the closure members (S) to simultaneously or sequentially move to a closed or open position.

29. A building construction as claimed in claim 27 or 28 wherein the or each linear actuator (20) of each closure arrangement is connected to a source of fluid medium via a control means (V), the control means (V) being arranged such that the linear actuator (20) can be driven to move the closure member (S) in a direction of opening or closing.
30. A building construction as claimed in any of claims 26 to 29 wherein the fluid medium is water.

31. A building construction as claimed in claim 30 wherein the water source is a mains water supply.

32. A building construction as claimed in claim 30 or 31 wherein each closure arrangement includes exhaust means said exhaust means being connected to waste or a water collection means.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 99/00218

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl: E05F 15/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E05F 15/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT: (E05F 15/02 or E05F 15/04 or E05F 15/06 or E05F 15/08) and (water or liquid or window)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>DE 3126788 A (WEBER) 27 January 1983 entire document</td>
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<td>FR 2615237 A (AMGAR) 18 November 1988 entire document</td>
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[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" Document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified).

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such
combination being obvious to a person skilled in the art
document member of the same patent family

"Y" document member of the same patent family

"&" document member of the same patent family

Date of the actual completion of the international search 21 February 2000

Date of mailing of the international search report 25 FEB 2000

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INTERNATIONAL SEARCH REPORT

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<td>3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)</td>
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<td>1. Claims 1-7 directed to an apparatus for operating a closure comprising a fluidic operative drive.</td>
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<td>2. Claims 8-32 directed to a closure arrangement including a closure member, a linear actuator, a fluidic medium supply and a control mechanism.</td>
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<td>2. X As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.</td>
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<td>3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:</td>
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<td>4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:</td>
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Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.
INTERNATIONAL SEARCH REPORT  
Information on patent family members

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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END OF ANNEX