



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**16.05.2007 Bulletin 2007/20**

(51) Int Cl.:  
**E05F 15/14<sup>(2006.01)</sup> E05F 17/00<sup>(2006.01)</sup>**

(21) Application number: **06122247.7**

(22) Date of filing: **13.10.2006**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL BA HR MK YU**

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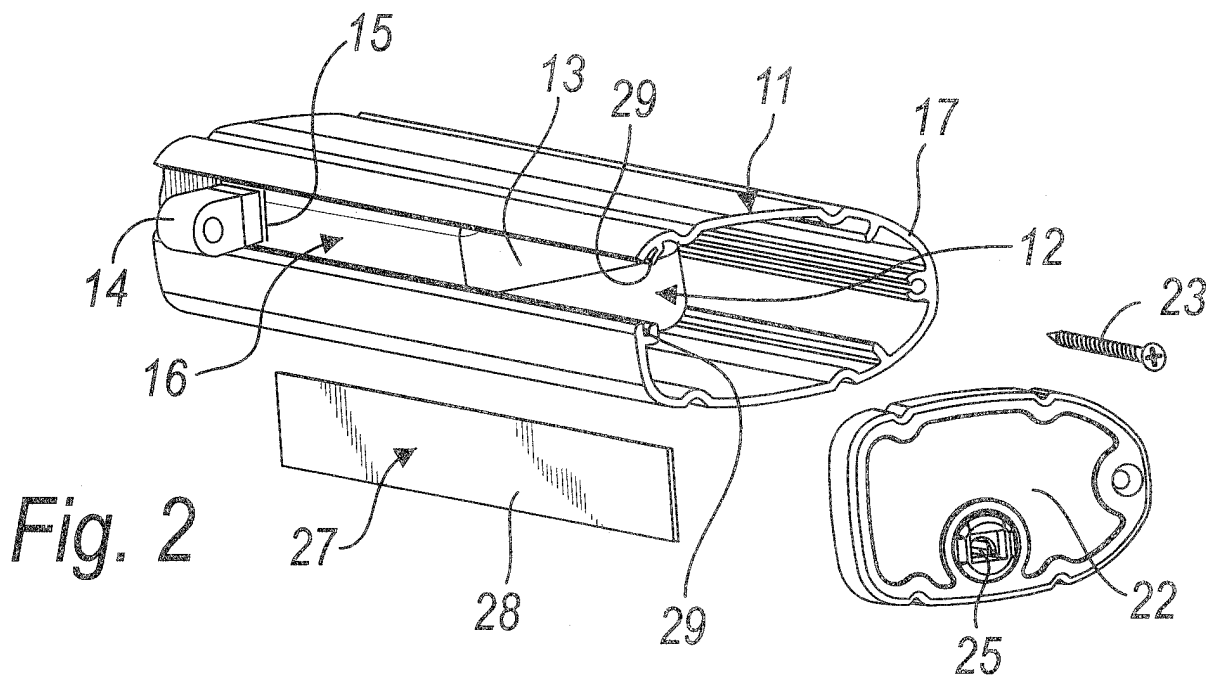
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(30) Priority: **10.11.2005 IT PD20050088 U**

(54) **Chain-drive actuator assembly**

(57) A chain-drive actuator assembly, particularly for moving large doors or windows, comprising an outer enclosure (11) which is predominantly longitudinally elongated and inside which two similar single-chain actuators (12) are aligned at a preset distance, each actuator having the outer working end (14) of the respective chain

preset so as to pass through an opening (16) provided in the outer enclosure (11). The single-chain actuators (12) are associated with means (33) for their simultaneous actuation. The outer enclosure (11) has a supporting and covering function for the two single-chain actuators (12).



**Fig. 2**

## Description

**[0001]** The present invention relates to a chain-drive actuator assembly particularly but not exclusively for moving large doors or windows.

**[0002]** As it is known, in various fields of application and particularly in the field of doors and windows, chain-drive actuators have long been used which allow effective movement of door and window parts, especially of the tilting type.

**[0003]** Among the various constructive types of known chain-drive actuators, the most widely used ones are those that comprise substantially a containment box which accommodates motor means, usually constituted by an electric motor, which is connected to a reduction unit, which in turn is mated, by means of a gear, to a guided chain which protrudes with a working end from the box-like body.

**[0004]** In the case of chain-drive actuators for large doors or windows, multiple thrust points are required to open and support them; for these reasons, twin-chain actuators are used.

**[0005]** In practice, these twin-chain actuators have an elongated containment box, which contains motor means connected to two separate reduction units, which in turn are mated to corresponding chains which are mutually spaced by a preset distance.

**[0006]** The containment box is formed internally so as to accommodate directly all the reduction mechanisms, the guides for the chains and the electric motors.

**[0007]** Such twin-chain actuators, therefore, are products that are certainly more complex and expensive than single-chain actuators, since they require a larger and more complex containment box.

**[0008]** Since twin-chain actuators are to be applied to large doors or windows, they must be designed according to standardized measurements of the distance between the chains: wider doors or windows have elongated containment boxes in which the distance between the chains is suitable for correct force balancing.

**[0009]** It is therefore evident that manufacturers of twin-chain actuators must provide a range of actuators of various sizes, with the evident industrial costs that arise from the design and manufacture of a plurality of complex products which are mutually different, albeit only in terms of dimensions.

**[0010]** The aim of the present invention is to solve the problems linked to the production of known types of twin-chain actuator.

**[0011]** Within this aim, an object of the present invention is to provide a chain-drive actuator assembly that allows to reduce production and inventory costs with respect to known types of twin-chain actuator.

**[0012]** Another object of the present invention is to provide a chain-drive actuator assembly that can be installed and maintained easily.

**[0013]** Another object of the present invention is to provide a chain-drive actuator assembly that is structurally

simple.

**[0014]** This aim and these and other objects, which will become better apparent hereinafter, are achieved by a chain-drive actuator assembly, particularly for moving large doors or windows, characterized in that it comprises an outer enclosure which is predominantly longitudinally elongated and inside which at least two similar single-chain actuators are aligned at a preset distance, each actuator having the outer working end of the respective chain preset so as to pass through an opening provided in said outer enclosure, said at least two single-chain actuators being associated with means for their simultaneous actuation, said outer enclosure having a supporting and covering function for said at least two single-chain actuators.

**[0015]** Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a top view of an actuator assembly according to the invention;

Figure 2 is an exploded view of a portion of an actuation assembly according to the invention;

Figure 3 is a transverse sectional view of an actuation assembly according to the invention;

Figure 4 is a view of an end portion of an actuation assembly according to the invention;

Figure 5 is a diagram of the electrical connection of an actuation assembly according to the invention.

**[0016]** It is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

**[0017]** With reference to the figures, a chain-drive actuator assembly according to the invention is generally designated by the reference numeral 10.

**[0018]** The chain-drive actuator assembly 10 comprises an outer enclosure 11, which is predominantly longitudinally elongated and inside which two similar single-chain actuators 12 are aligned at a preset distance.

**[0019]** The outer enclosure 11 has a supporting and covering function for the single-chain actuators 12, which are substantially identical and of a known type.

**[0020]** For example, each one is constituted by a containment box 13, inside which there are motor means (not shown in the figures), which are connected to a reduction unit, which in turn is mated by means of a gear which meshes with a guided chain which has a working end 14 preset so as to pass through a corresponding opening 15 formed in the containment box 13.

**[0021]** Each single-chain actuator 12 has the outer working end 14 of the chain preset so as to pass through an opening 16 formed in the outer enclosure 11.

**[0022]** In particular, the outer enclosure 11 is constituted by an extruded body 17 (made for example of aluminum) having an open transverse profile, from the two

end portions 18 of which the two single-chain actuators 12 are inserted respectively.

**[0023]** The open portion of the transverse profile of the extruded body forms along the extruded body 17 the opening 16, which is thus longitudinal and from which the outer working ends 14 of the chains of the single-chain actuators 12 protrude.

**[0024]** At the two end portions 18 of the extruded body 17 there are two complementarily shaped closure plugs 22, which also are associated by insertion and locked on the extruded body 17 by means of screws 23.

**[0025]** Each closure plug 22 is provided with a through hole 25.

**[0026]** Depending on the side on which the wiring for powering and controlling the actuators 12 is to exit, a closure plug or a grommet is associated with the through hole 25.

**[0027]** Means 27 for covering the opening 16 in the regions that are not occupied at the outer working ends 14 of the chains of the single-chain actuators 12 are associated with the extruded body 17 and are constituted by plates 28 made of plastic material, which are fixed on the internal portions of the edges of the opening 16 and are in particular inserted in mutually opposite slots 29 formed on the edges of the opening 16.

**[0028]** Each single-chain actuator 12 is provided, as shown in the diagram of Figure 5, with a pair of electric power supply cables 31 and an electric control cable 32, which carries the control pulses to the electronic board (not shown in the figures) that controls the actuator 12.

**[0029]** In order to allow the simultaneous operation of the two single-chain actuators 12, there are means 33 for simultaneous actuation, which are constituted by the common connection connection to a terminal strip 20 of the respective electric power supply cables 31 and of the electric control cables 32 (in practice, the motors are arranged in parallel as regards the electric power supply and so are the electric control cables 32 that transmit the control pulses to the electronic boards).

**[0030]** It is evident that in constructive variations not shown the figures, the means 33 for simultaneous actuation can also comprise electronic synchronization boards.

**[0031]** The two single-chain actuators 12 are associated with means 34 for locking by interference within the extruded body 17, which are constituted by two pairs of jaws 35, each pair being arranged so as to grip mutually opposite portions of the extruded body 17 with respect to the opening 16; the jaws 35 of each pair are mutually connected by a bolt 36 arranged transversely to the opening 16.

**[0032]** The jaws 35, when they are moved mutually closer by way of the action of the bolt 36, are adapted to produce the deformation of the extruded body 17 by flexing, since it is constituted by a profile having an open cross-section.

**[0033]** A horizontal pivot 37 is provided on one of the two jaws 35 of each pair and its ends rest against a fork

38 provided on a bracket 39 for fixing to a supporting structure, such as typically a wall.

**[0034]** The bracket 39 is provided with a tab 40 for reversible locking, by elastic deformation, of the horizontal pivot 37 in the fork 38.

**[0035]** In practice it has been found that the invention thus described solves the problems noted in known types of twin-chain actuator; in particular, the present invention provides a chain-drive actuator assembly particularly for moving large doors or windows that allows to reduce production and storage costs with respect to known types of twin-chain actuator.

**[0036]** The present invention in fact provides an actuator assembly that has two or more single-chain actuators, normally usable as individual actuators, which are combined together inside a common supporting structure which can be sized cheaply for the specific requirements of the market.

**[0037]** The actuator manufacturer will in fact manufacture and keep in stock single-chain actuators and use simple extruded bodies, which can be manufactured easily and cheaply according to the intended measurements, into which he will insert the single-chain actuators so as to provide a multiple-chain actuator.

**[0038]** The costs for design and production (as well as for inventory) of all twin-chain actuators that require a dedicated containment box for actuation components (electric motors, reduction units, chains) are thus reduced.

**[0039]** Moreover, said actuator assembly has an extremely simple structure, and this facilitates considerably both installation and maintenance.

**[0040]** In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

**[0041]** The disclosures in Italian Utility Model Application No. PD2005U000088 from which this application claims priority are incorporated herein by reference.

**[0042]** Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

## Claims

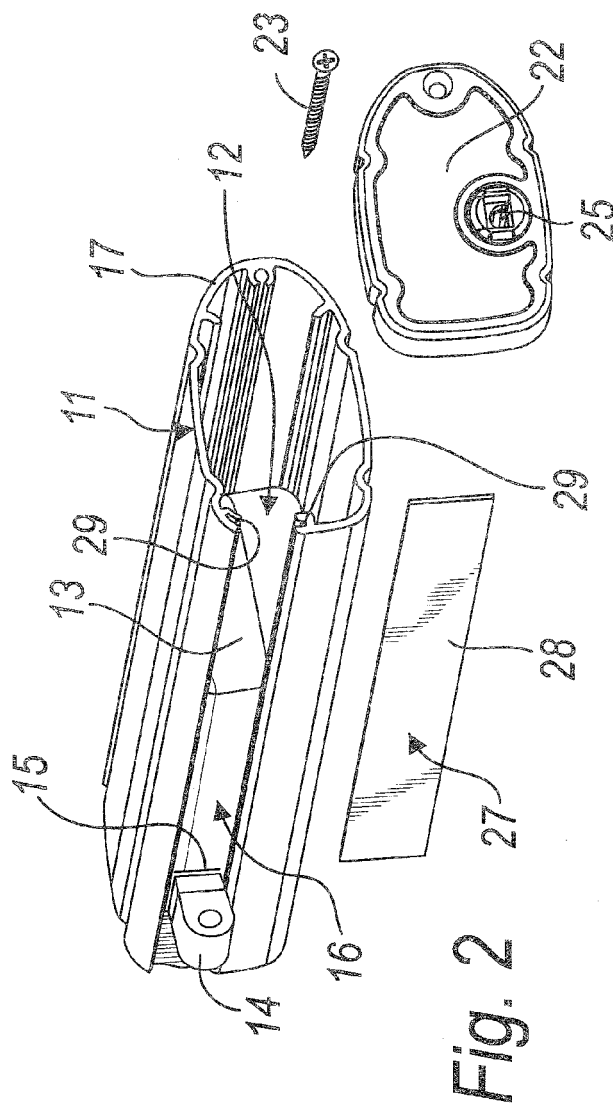
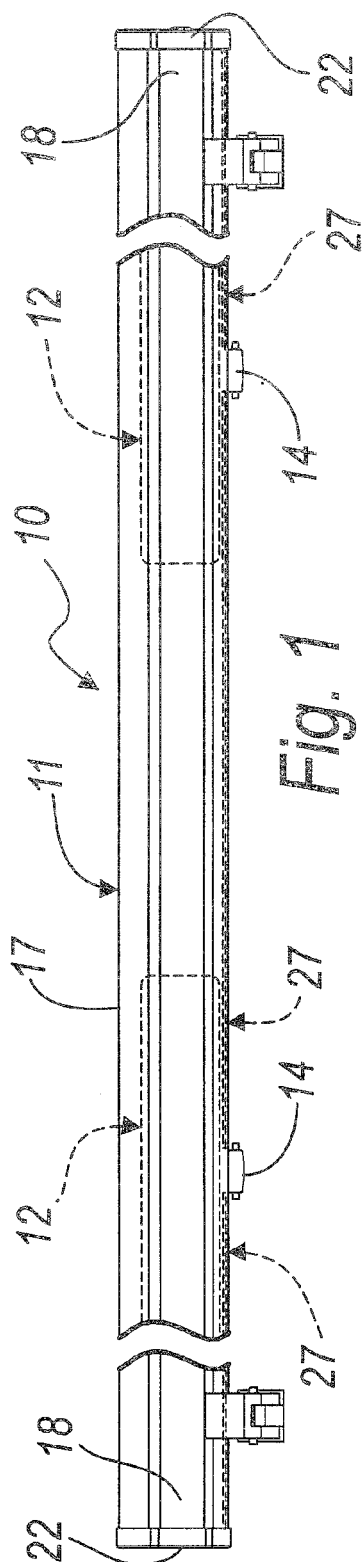
1. A chain-drive actuator assembly, particularly for moving large doors or windows, **characterized in that** it comprises an outer enclosure (11) which is predominantly longitudinally elongated and inside which at least two similar single-chain actuators (12) are aligned at a preset distance, each actuator having the outer working end (14) of the respective chain preset so as to pass through an opening (16) pro-

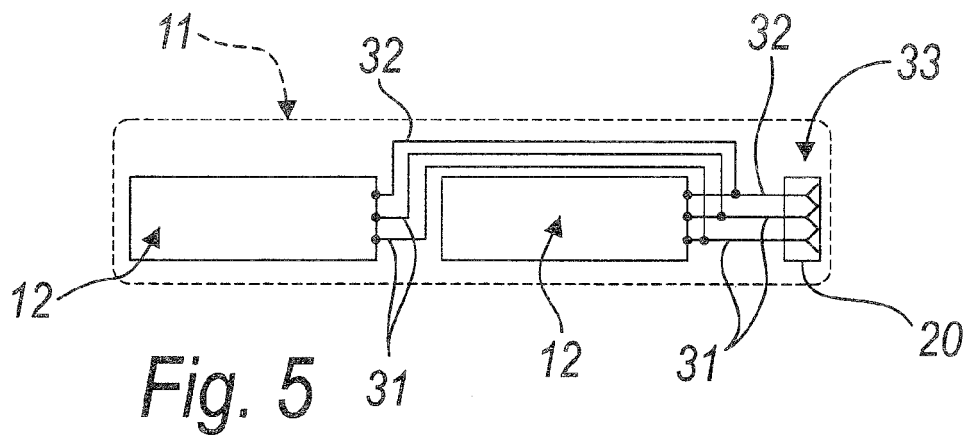
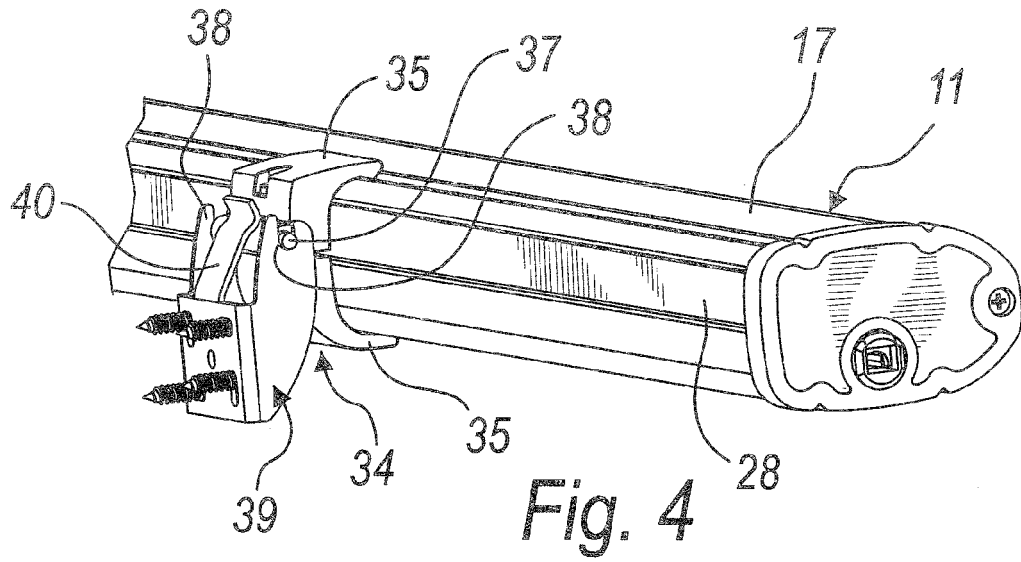
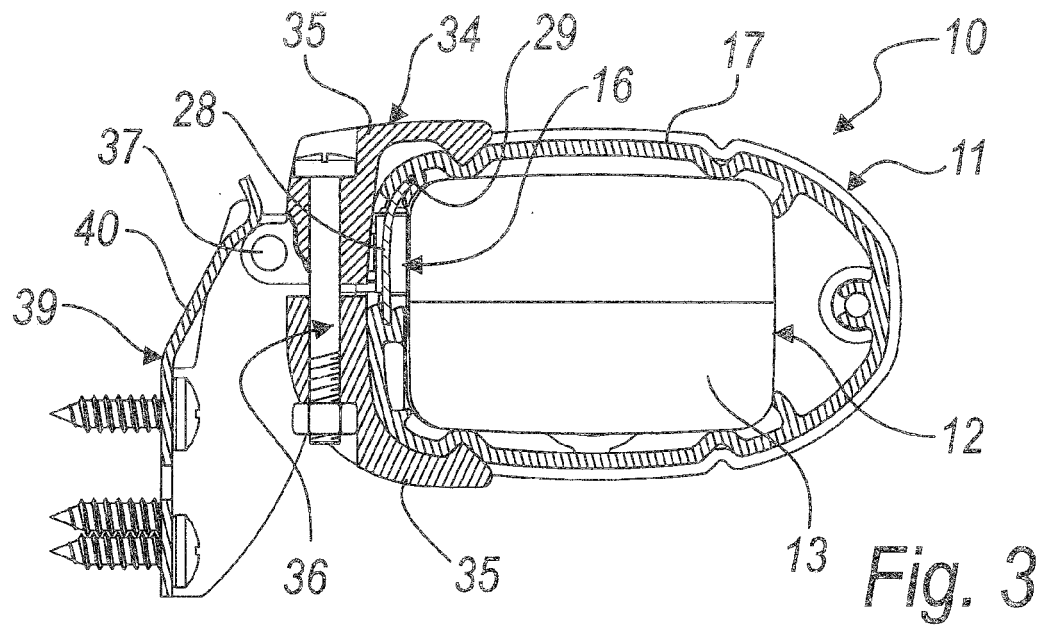
vided in said outer enclosure (11), said at least two single-chain actuators (12) being associated with means (33) for their simultaneous actuation, said outer enclosure (11) having a supporting and covering function for said at least two single-chain actuators (12).

2. The chain-drive actuator assembly according to claim 1, **characterized in that** said outer enclosure (11) is constituted by an extruded body (17) which has an open transverse profile, said external working ends (14) of the chains of said actuators (12) protruding from said longitudinal opening (16) formed by the open portion of the transverse profile of said extruded body (17), two complementarily shaped closure plugs (22) for closing said extruded body (17) being provided at the two end portions (18) of said extruded body (17). 10
  
3. The chain-drive actuator assembly according to claim 2, **characterized in that** said at least two similar single-chain actuators (12) are associated with means (34) for locking by interference within said extruded body (17). 20
  
4. The chain-drive actuator assembly according to claim 3, **characterized in that** said means (17) for locking by interference comprise at least one pair of jaws (35), which is arranged so as to grip opposite portions of said extruded body (17) with respect to said opening (16), said jaws (35) of said pair being mutually connected by a bolt (36) arranged transversely to said opening (16), said jaws (35), when moved mutually closer by way of the action of said bolt (36), being adapted to deform said extruded body (17) by flexing, since it is constituted by a profile having an open cross-section. 25 30 35
  
5. The chain-drive actuator assembly according to claim 4, **characterized in that** a horizontal pivot (37) is provided on one of said two jaws (35) and its ends rest on a fork (38) which is formed on a bracket (39) for fixing to a supporting structure, said bracket (39) having a tab (40) for the reversible locking, by elastic deformation, of said horizontal pivot (37) in said fork (38). 40 45
  
6. The chain-drive actuator assembly according to claim 2 or 3, **characterized in that** said at least one said closure plug (22) is provided with a through hole (25), with which a grommet is associated for the electrical wiring for power supply and control of said single-chain actuators (12) contained within said outer enclosure (11). 50 55
  
7. The chain-drive actuator assembly according to claim 2 or 3, **characterized in that** it comprises means (27) for covering said opening (16) of said

outer enclosure (11) in the regions that are not occupied at the outer working ends (14) of the chains of said single-chain actuators (18).

8. The chain-drive actuator assembly according to claim 7, **characterized in that** said covering means (27) are constituted by plates (28) made of plastic material, which are fixed to the internal portions of the edges of said opening (16). 10
  
9. The chain-drive actuator assembly according to claim 8, **characterized in that** said means (33) for simultaneous actuation of said at least two single-chain actuators (12) are constituted by a common connection of the respective electrical power supply cables (31) and electrical control cables (32). 15





**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- IT PD20050088 U [0041]