

(19)



(11)

**EP 1 970 517 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**15.09.2010 Bulletin 2010/37**

(51) Int Cl.:  
**E05F 15/12<sup>(2006.01)</sup> E05F 15/10<sup>(2006.01)</sup>**

(21) Application number: **08151555.3**

(22) Date of filing: **18.02.2008**

(54) **Box-like container for electrical actuators for automating doors or windows**

Schachtelähnlicher Behälter für elektrische Betätiger zur Automatisierung von Türen oder Fenstern

Réceptacle de type boîte pour actionneurs électriques pour l'automatisation de portes et de fenêtres

(84) Designated Contracting States:  
**DE ES FR GB IT**

(30) Priority: **12.03.2007 IT PD20070083**

(43) Date of publication of application:  
**17.09.2008 Bulletin 2008/38**

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## Description

**[0001]** The present invention relates to a box-like container for electrical actuators for automating doors or windows.

**[0002]** Electrical actuators for automating doors or windows, i.e., which allow to open and close automatically a leaf of a door or window with respect to its casing, are currently known and widespread.

**[0003]** These actuators comprise, within a box-like container which is fixed to the frame of the casing or of the leaf, an electric motor and a series of gears for reduction and transmission of the torque to a push-pull element, which can be a chain or a bar with a rack.

**[0004]** The push element also is contained at least partially within the box-like container, where it engages the last corresponding gear of the series of reduction and transmission gears.

**[0005]** A typical box-like container which has been used up to now, and is disclosed in EP 1 524 397 A, is composed of at least three shell portions: a first outer shell portion, an intermediate shell portion, and a second outer shell portion.

**[0006]** The intermediate shell portion coupled to the first shell portion forms with the latter a first chamber for accommodating the electric motor, the associated electronic components for management, and the gear train for reduction and torque transmission.

**[0007]** The second outer shell portion, which together with the first outer shell portion forms the actual outer box-like enclosure, forms with the intermediate shell portion a second chamber for the push-pull element.

**[0008]** A sealing gasket is arranged between the first outer shell portion and the intermediate shell portion in order to seal the chamber in which the electric motor and the electronic components are fitted.

**[0009]** A box-like container such as the one described has aspects which can be improved.

**[0010]** Such container is in fact constituted by such shell portions, each of which has to be provided by molding, and then mutually assembled with a certain number of screws, an operation which requires an amount of time which is proportional to the number of elements to be assembled and of threaded elements to be screwed.

**[0011]** The number of components and the complexity of the assembly inevitably affect the overall production costs of the container.

**[0012]** The aim of the present invention is to provide a box-like container for electrical actuators for automating doors or windows which has a simplified structure with respect to known box-like containers.

**[0013]** Within this aim, an object of the present invention is to provide a box-like container for electrical actuators for automating doors or windows which is simple and quick to assemble.

**[0014]** Another object of the present invention is to provide a box-like container in which the hermetic seal of the chamber which accommodates the electric motor and

the electronic components is ideal.

**[0015]** Another object of the invention is to provide a box-like container which can be manufactured at lower costs than known box-like containers.

5 **[0016]** Another object of the present invention is to provide a box-like container for electrical actuators for automating doors or windows which can be manufactured with known systems and technologies.

10 **[0017]** This aim and these and other objects, which will become better apparent hereinafter, are achieved by a box-like container for electrical actuators for automating doors or windows, which contains internally an electric motor, the associated electronic components, at least part of a push-pull element for moving the leaf of the door or window, and a gear train for reduction and torque transmission, which is interposed between said motor and said push-pull element, characterized in that it is constituted by two shell portions which form the outer enclosure and have corresponding internal partitions, which when juxtaposed when the shell portions are closed onto each other, provide a first chamber for the motor, the electronic components and at least part of the gear train, and a second chamber for at least part of said push-pull element, a gasket being interposed between said two shell portions and being shaped so as to cover the facing perimetric edges of the two shell portions and the edges of the juxtaposed partitions which divide said first chamber from said second chamber.

25 **[0018]** 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:

30 Figure 1 is a perspective view of a linear actuator which comprises a box-like container according to the invention;

Figure 2 is an exploded perspective view of the container according to the invention;

35 Figure 3 is a first sectional view, taken along a longitudinal plane, of the container according to the invention;

40 Figure 4 is a second sectional view, taken along the line IV-IV of Figure 3, of the container according to the invention;

45 Figure 5 is a third sectional view, taken along the line V-V of Figure 3, of the container according to the invention;

50 Figure 6 is a sectional view of a detail of the container according to the invention.

**[0019]** With reference to the figures, a box-like container for electrical actuators for automating doors or windows according to the invention is generally designated by the reference numeral 10.

**[0020]** The box-like container 10 is shown by way of non-limiting example of the invention as a part of a linear actuator 11 of the type with a bar 12 provided with a rack

13.

**[0021]** The container 10 is designed to contain internally an electric motor 14, the associated electronic components 15, part of a push-pull element for moving the leaf of the door or window, which in the example described here is the bar 12, and a gear train 16 for reduction and torque transmission, which is interposed between the motor 14 and the push-pull element, i.e., the bar 12 with the rack 13.

**[0022]** The box-like container 10 is constituted by two shell portions 17 and 18.

**[0023]** The two shell portions, the first one 17 and the second one 18, form the outer enclosure of the container 10 and are provided with corresponding internal partitions 24, which, juxtaposed with respect to mutually closed shell portions 17 and 18, provide a first chamber 20 for the motor 14, the electronic components 15 and at least part of the gear train 16, and a second chamber 21, which contains part of the bar 12, which passes through it; the bar 12 with the rack 13 which does not protrude at the front from the actuator 11 and is not in the second chamber 21 lies inside a tubular container 22 which is fixed to the box-like container 11.

**[0024]** A gasket 23 is interposed between the two shell portions 17 and 18 and is shaped so as to cover the facing perimetric edges 17a and 18a of the two shell portions 17 and 18 and the edges 24a of the juxtaposed partitions 24 which divide the first chamber 20 from the second chamber 21.

**[0025]** The partitions 24 are substantially flat.

**[0026]** In particular, in the exemplary embodiment of the invention described here, the gasket 23 is provided by a frame-like portion 23a which lies so as to affect the perimetric edges 17a and 18a of the shell portions 17 and 18, and by an intermediate portion 23b, which extends from a first side 23c to a second opposite side 23d of the frame 23a in the direction of the length of the gasket 23.

**[0027]** The intermediate portion 23b is intended to be interposed, as mentioned, between the edges 24a of the partitions 24, which in the central region 24b of the container 10 are shaped like a circular arc in order to allow to accommodate the last-but-one gear 25 of the gear train within the first chamber 20; the last-but-one gear 25 is keyed onto a shaft 26 which passes through the first chamber 20 and the second chamber 21 and transmits motion to the last gear 27, which is arranged in the second chamber 21 and engages directly the rack 13 to move the bar 12.

**[0028]** At the central region 24b shaped like a circular arc of the partitions 24, the gasket 23 has a complementary shaped arc-like portion 23e.

**[0029]** Each portion of the gasket 23 has two lips in order to surround the edges 24a of the partitions 24 and 17a of the first shell portion 17, while on the opposite side, on the perimetric portion 23a, there are grooves for the correct arrangement of the edges 18a of the second shell portion 18.

**[0030]** The hermetic seal of the first chamber 20 with respect to the second chamber 21 and with respect to the outside is ensured by two annular seals, designated by the reference numerals 28 and 29 respectively.

**[0031]** The first annular seal 28 is arranged between a corresponding collar 25a of the last-but-one gear 25 and the complementarily shaped facing edge of the hole through which the collar 25a faces the second chamber 21; the first seal 28 ensures protection of the first chamber 20 against water and moisture which might enter the second chamber 21, which is inevitably open onto the outside for the passage of the bar 12.

**[0032]** The second annular seal 29 surrounds the end of the shaft that lies opposite to the end onto which the last gear 27 is keyed, and is pressed between a shoulder 30 provided outside the first shell portion 17 and an opposite abutment 31 which is formed on a covering element 32 which is associated externally with the first shell portion 17.

**[0033]** The hermetic seal of the first chamber 20 is completed by the conical rubber grommet 32 for the power supply cable 33, which is pressed against the corresponding locking collar 34 on the first shell portion 17 by an annular lid 35, which together with the edge 35a of its own hole clamps the grommet 32 against the cable 33.

**[0034]** In an embodiment of the invention which has not been shown, the push-pull element can be a chain, which is designed to wind inside a second suitably contoured chamber.

**[0035]** In practice it has been found that the invention thus described achieves the intended aim and objects.

**[0036]** In particular, the present invention provides a box-like container for electrical actuators for automating doors or windows which has a simplified structure with respect to known box-like containers; the container 10 according to the invention is in fact composed of just two shell portions 17 and 18, instead of three like known containers, which by being appropriately contoured and with the interposition of the gasket 23 allow to provide the two chambers 20 and 21, of which the first chamber 20, with the motor 14 and the electronic components 15, is hermetic.

**[0037]** Just two shell portions imply fewer components to be manufactured, fewer components to be assembled, fewer threaded elements to be fitted and therefore reduced complexity and faster execution during assembly, with consequent positive effects both on production rate and on labor costs.

**[0038]** Further, the box-like container according to the invention allows to provide a chamber 20 for the motor and the electronic components which is perfectly hermetic, by way of the refinements constituted by the presence of the two annular seals 28 and 29 in the points in which the shaft 26 exits from the first chamber 20.

**[0039]** Further, the container 10 according to the invention can still be manufactured by molding plastic material, but at lower costs than known box-like containers, since it is composed of just two shell portions, as ex-

plained above.

**[0040]** Moreover, the present invention provides a box-like container for electrical actuators for automating doors or windows which can be manufactured with known systems and technologies.

**[0041]** The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

**[0042]** 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.

**[0043]** 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 box-like container for electrical actuators for automating doors or windows, containing internally an electric motor (14), the associated electronic components (15), at least part of a push-pull element (12) for moving the leaf of the door or window, and a gear train (16) for reduction and torque transmission, which is interposed between said motor (14) and said push-pull element (12), said box-like container (10) being **characterized in that** it is constituted by two shell portions, a first one (17) and a second one (18), which form the outer enclosure and have corresponding internal partitions (24), which when juxtaposed when the shell portions (17, 18) are closed onto each other, provide a first chamber (20) for the motor (14), the electronic components (15) and at least part of the gear train (16), and a second chamber (21) for at least part of said push-pull element (12), a gasket (23) being interposed between said two shell portions (17, 18) and being shaped so as to cover the facing perimetric edges (17a, 18a) of the two shell portions (17, 18) and the edges (24a) of the juxtaposed partitions (24) which divide said first chamber (20) from said second chamber (21).
2. The box-like container according to claim 1, **characterized in that** said push-pull element for moving the leaf of the door or window is a bar (12) with a rack (13).
3. The container according to the preceding claims, **characterized in that** said partition elements (24, 24b) are substantially flat.
4. The container according to the preceding claims, **characterized in that** said gasket (23) is provided by a frame-like portion (23a) which is arranged so as to affect the perimetric edges (17a, 18a) of the shell portions (17, 18), and by an intermediate portion (23b) which extends from a first side (23c) to a second opposite side (23d) of said frame (23a) in the direction of the length of the gasket (23).
5. The container according to one or more of the preceding claims, **characterized** that said intermediate portion (23b) is designed to be interposed between the edges (24a) of the partitions (24), which in the central region (24b) of the container (10) are shaped like a circular arc in order to allow the accommodation of the last-but-one gear (25) of the gear train inside the first chamber (20).
6. The container according to one or more of the preceding claims, **characterized in that** said last-but-one gear (25) is keyed onto a shaft (26), which passes through the first chamber (20) and the second chamber (21) and transmits motion to the last gear (27), which is arranged in the second chamber (21) and engages directly the rack (13) to move the bar (12).
7. The container according to one or more of the preceding claims, **characterized in that** the gasket (23) has a complementarily shaped arc-like portion (23e) at the central circular arc-like region (24b) of the partitions (24).
8. The container according to one or more of the preceding claims, **characterized in that** each portion of the gasket (23) has two lips in order to surround the edges (24a) of the partitions (24) and the edges (17a) of the first shell portion (17), while on the opposite side, on the perimetric portion (23a), there are grooves for correctly positioning the edges (18a) of the second shell portion (18).
9. The container according to one or more of the preceding claims, **characterized in that** the hermetic seal of the first chamber (20) with respect to the second chamber (21) and with respect to the outside is ensured by two annular seals (28, 29), a first seal (28) being arranged between a corresponding collar (25a) of the last-but-one gear (25) and the complementarily shaped facing edge of the hole through which said collar (25a) faces the second chamber (21), said second annular seal (29) surrounding the end of the shaft (26) which lies opposite the end to which the last gear (27) is keyed, and is pressed between a shoulder (30) which is provided outside the first shell portion (17), and an opposite abutment (31) which is formed on a covering element (32) which is associated externally with respect to the first

shell portion (17).

10. The container according to one or more of the preceding claims, **characterized in that** the hermetic seal of the first chamber (20) is completed by a conical grommet (32) made of rubber for the power supply cable (33), which is pressed against the corresponding locking collar (34) on the first shell portion (17) by an annular cover (35), which together with the edge (35a) of its hole clamps the grommet (32) against the cable (33).
11. The container according to one or more of the preceding claims, **characterized in that** said push-pull element can be a chain which is intended to wind inside a second chamber.

### Patentansprüche

1. Ein schachtelähnlicher Behälter für elektrische Betätiger zur Automatisierung von Türen oder Fenstern, der innen Folgendes enthält: einen Elektromotor (14), die dazugehörigen elektronischen Bauteile (15), mindestens einen Teil eines Schub- und Zug-Elements (12) zur Bewegung des Blatts der Tür oder des Fensters, und einen Getriebezug (16) zur Reduzierung und Drehmomentübertragung, der zwischen dem Motor (14) und dem Schub- und-Zug-Element (12) angeordnet ist, wobei der schachtelähnliche Behälter (10) **dadurch gekennzeichnet ist, dass** er aus zwei Schalenabschnitten besteht, einem ersten (17) und einem zweiten (18), welche das Außengehäuse bilden und entsprechende innere Trennwände (24) haben, die bei Nebeneinanderstellung, wenn die Schalenabschnitte (17, 18) aufeinander geschlossen werden, eine erste Kammer (20) für den Motor (14), die elektronischen Komponenten (15) bereitstellen und mindestens einen Teil des Getriebezugs (16) und eine zweite Kammer (21) für mindestens einen Teil des Schub- und-Zug-Elements (12) bereitstellen, wobei eine Dichtung (23) zwischen den beiden Schalenabschnitten (17, 18) zwischengeordnet ist und so geformt ist, dass sie die einander gegenüberliegenden umgrenzenden Kanten (17a, 18a) der beiden Schalenabschnitte (17, 18) und die Kanten (24a) der nebeneinander gestellten Trennwände (24) bedeckt, welche die erste Kammer (20) von der zweiten Kammer (21) trennen.
2. Der schachtelähnliche Behälter gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Schub- und-Zug-Element zum Bewegen des Blatts der Tür oder des Fensters eine Stange (12) mit einer Zahnstange (13) ist.
3. Der Behälter gemäß den obigen Ansprüchen, **da-**

**durch gekennzeichnet, dass** die Trennelemente (24, 24b) im Wesentlichen flach sind.

4. Der Behälter gemäß den obigen Ansprüchen, **dadurch gekennzeichnet, dass** die Dichtung (23) von einem rahmenartigen Abschnitt (23a) bereitgestellt wird, der so angeordnet ist, dass er die umgrenzenden Kanten (17a, 18a) der Schalenabschnitte (17, 18) beeinflusst, und von einem mittleren Abschnitt (23b) bereitgestellt wird, der sich von einer ersten Seite (23c) zu einer zweiten gegenüberliegenden Seite (23d) des Rahmens (23a) in die Richtung der Länge der Dichtung (23) erstreckt.
5. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** der mittlere Abschnitt (23b) konstruiert ist, um zwischen den Kanten (24a) der Trennwände (24) angeordnet zu werden, die im zentralen Bereich (24b) des Behälters (10) wie ein Kreisbogen geformt sind, um die Aufnahme des vorletzten Zahnrads (25) des Getriebezugs in die erste Kammer (20) zu ermöglichen.
6. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** das vorletzte Zahnrad (25) auf einer Welle (26) festgekeilt ist, die durch die erste Kammer (20) und die zweite Kammer (21) verläuft und Bewegung auf das letzte Zahnrad (27) überträgt, das in der zweiten Kammer (21) angebracht ist und direkt in die Zahnstange (13) eingreift, um die Stange (12) zu bewegen.
7. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Dichtung (23) im zentralen kreisbogenförmigen Bereich (24b) der Trennwände (24) einen komplementär geformten kreisbogenförmigen Abschnitt (23e) hat.
8. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** jeder Abschnitt der Dichtung (23) zwei Lippen hat, um die Kanten (24a) der Trennwände (24) und die Kanten (17a) des ersten Schalenabschnitts (17) zu umgeben, während sich auf der gegenüberliegenden Seite, am umgrenzenden Abschnitt (23a), Rillen zur korrekten Positionierung der Kanten (18a) des zweiten Schalenabschnitts (18) befinden.
9. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die hermetische Abdichtung der ersten Kammer (20) gegenüber der zweiten Kammer (21) und gegenüber der Außenseite von zwei Dichtringen (28, 29) sichergestellt wird, wobei eine erste Dichtung (28) zwischen einer entsprechenden Manschette (25a) des

vorletzten Zahnrads (25) und der komplementär geformten gegenüberliegenden Kante des Lochs angebracht ist, durch das die Manschette (25a) zur zweiten Kammer (21) hin weist, wobei der zweite Dichtring (29) das Ende der Welle (26) umgibt, das gegenüber dem Ende liegt, auf dem das letzte Zahnrad (27) festgekeilt ist, und zwischen eine Schulter (30), die außerhalb des ersten Schalenabschnitts (17) bereitgestellt ist, und ein gegenüberliegendes Widerlager (31) gepresst ist, welches an einem Abdeckungselement (32) geformt ist, das außerhalb des ersten Schalenabschnitts (17) angeschlossen ist.

10. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die hermetische Abdichtung der ersten Kammer (20) durch eine kegelförmige Gummitülle (32) für das Stromversorgungskabel (33) vervollständigt wird, die von einer ringförmigen Abdeckung (35), welche gemeinsam mit dem Rand (35a) ihres Lochs die Tülle (32) gegen das Kabel (33) klemmt, gegen den entsprechenden Lagerring (34) am ersten Schalenabschnitt (17) gedrückt wird.

11. Der Behälter gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** das Schub- und-Zug-Element eine Kette sein kann, die dazu bestimmt ist, sich in einer zweiten Kammer aufzuwickeln.

## Revendications

1. Conteneur en forme de boîte pour actionneurs électriques pour automatiser des portes ou des fenêtres, comprenant intérieurement un moteur électrique (14), les composants électroniques associés (15), au moins une partie d'un élément de poussée et de traction (12) pour déplacer le vantail de la porte ou de la fenêtre, et un train d'engrenages (16) pour une réduction et une transmission de couple, interposé entre ledit moteur (14) et ledit élément de poussée et de traction (12), ledit conteneur en forme de boîte (10) étant **caractérisé en ce qu'il** est constitué par deux parties de coque, une première partie (17) et une deuxième partie (18), qui forment l'enceinte extérieure et qui comportent des séparations intérieures correspondantes (24), qui, lorsqu'elles sont juxtaposées lorsque les parties de coque (17, 18) sont fermées l'une contre l'autre, constituent une première chambre (20) pour le moteur (14), les composants électroniques (15) et au moins une partie du train d'engrenages (16), et une deuxième chambre (21) pour au moins une partie dudit élément de poussée et de traction (12), un joint d'étanchéité (23) étant interposé entre lesdites deux parties de coque (17, 18), et étant conformé de façon à couvrir les bords

périphériques en vis-à-vis (17a, 18a) des deux parties de coque (17, 18) et les bords (24a) des séparations juxtaposées (24) qui séparent ladite première chambre (20) de ladite deuxième chambre (21).

2. Conteneur en forme de boîte selon la revendication 1, **caractérisé en ce que** ledit élément de poussée et de traction pour déplacer le vantail de la porte ou de la fenêtre est une barre (12) avec une crémaillère (13).
3. Conteneur selon les revendications précédentes, **caractérisé en ce que** lesdits éléments de séparation (24, 24b) sont sensiblement plats.
4. Conteneur selon les revendications précédentes, **caractérisé en ce que** ledit joint d'étanchéité (23) est constitué par une partie en forme de cadre (23a) qui est agencée de façon à affecter les bords périphériques (17a, 18a) des parties de coque (17, 18) et par une partie intermédiaire (23b) qui s'étend d'un premier côté (23c) à un deuxième côté opposé (23d) dudit cadre (23a) dans la direction de la longueur du joint d'étanchéité (23).
5. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite partie intermédiaire (23b) est conçue de façon à être interposée entre les bords (24a) des séparations (24), qui, dans la région centrale (24b) du conteneur (10), sont formées sous la forme d'un arc circulaire afin de permettre la réception de l'avant-dernier engrenage (25) du train d'engrenages à l'intérieur de la première chambre (20).
6. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit avant-dernier engrenage (25) est calé sur un arbre (26) qui traverse la première chambre (20) et la deuxième chambre (21) et transmet un mouvement au dernier engrenage (27), qui est disposé dans la deuxième chambre (21) et qui s'engrène directement avec la crémaillère (13) de façon à déplacer la barre (12).
7. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** le joint d'étanchéité (23) comporte une partie en forme d'arc formée de façon complémentaire (23e) dans la région en forme d'arc circulaire centrale (24b) des séparations (24).
8. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** chaque partie du joint d'étanchéité (23) comporte deux lèvres pour entourer les bords (24a) des séparations (24) et les bords (17a) de la première partie de coque (17), tandis que, sur le côté opposé, sur la partie

périphérique (23a), se trouvent des rainures pour positionner correctement les bords (18a) de la deuxième partie de coque (18).

9. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** l'étanchéité hermétique de la première chambre (20) par rapport à la deuxième chambre (21) et par rapport à l'extérieur est assurée par deux joints d'étanchéité annulaires (28, 29), un premier joint d'étanchéité (28) étant disposé entre un collier correspondant (25a) de l'avant-dernier engrenage (25) et le bord en vis-à-vis formé de façon correspondante du trou traversant à travers lequel ledit collier (25a) fait face à la deuxième chambre (21), ledit deuxième joint d'étanchéité annulaire (29) entourant l'extrémité de l'arbre (26) qui se trouve à l'opposé de l'extrémité sur laquelle est calé le dernier engrenage (27), et étant pressé entre un épaulement (30) qui est disposé à l'extérieur de la première partie de coque (17), et une butée opposée (31) qui est formée sur un élément de recouvrement (32) qui est extérieurement associé à la première partie de coque (17).
 

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10. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** l'étanchéité hermétique de la première chambre (20) est assurée par un passe-fils conique (32) réalisé en caoutchouc pour le câble d'alimentation (33), pressé contre le collier de verrouillage correspondant (34) sur la première partie de coque (17) par un capot annulaire (35), qui, avec le bord (35a) de son trou, serre le passe-fils (32) contre le câble (33).
 

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11. Conteneur selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit élément de poussée et de traction peut être une chaîne qui est conçue pour s'enrouler à l'intérieur d'une deuxième chambre.
 

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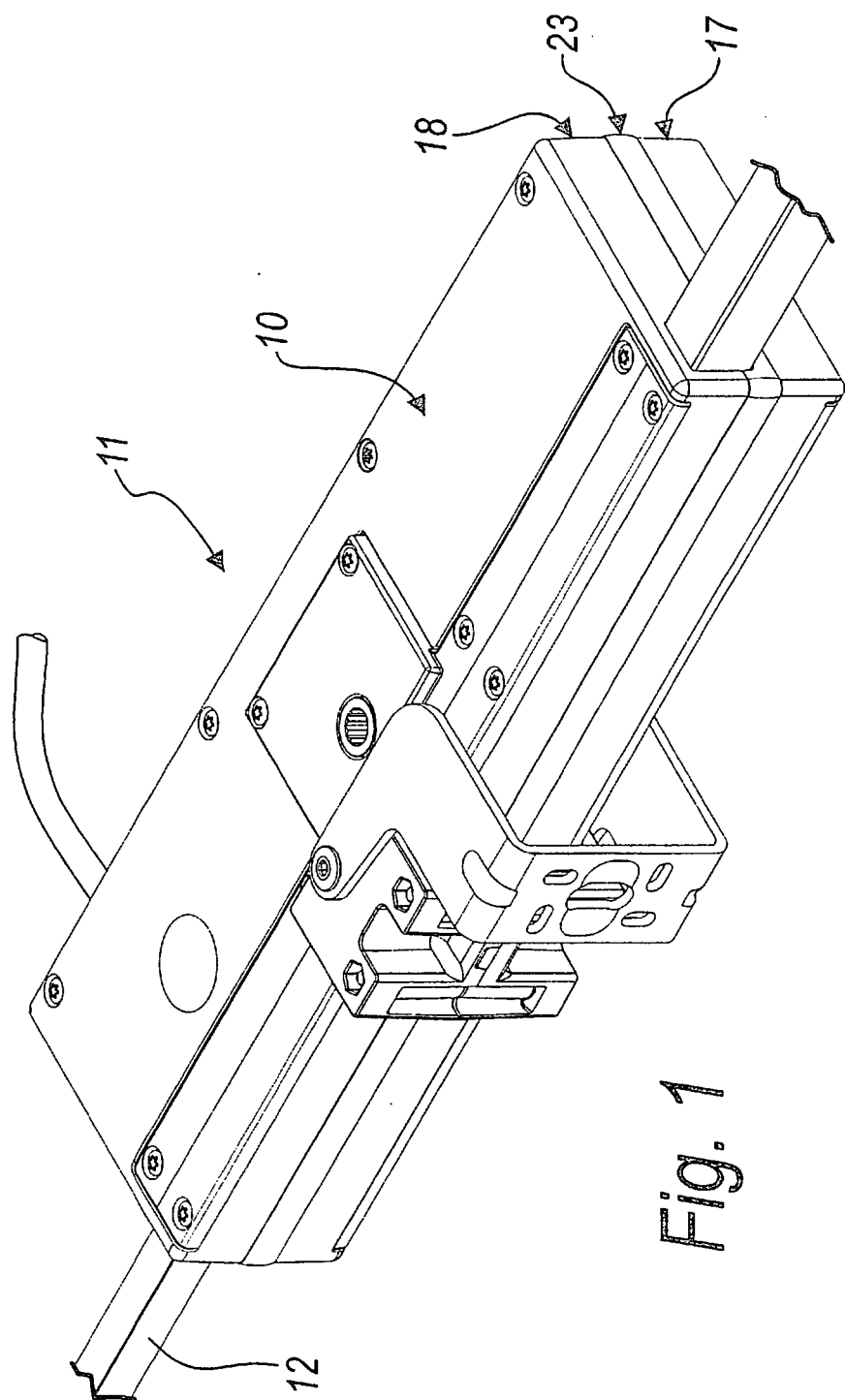


Fig. 1

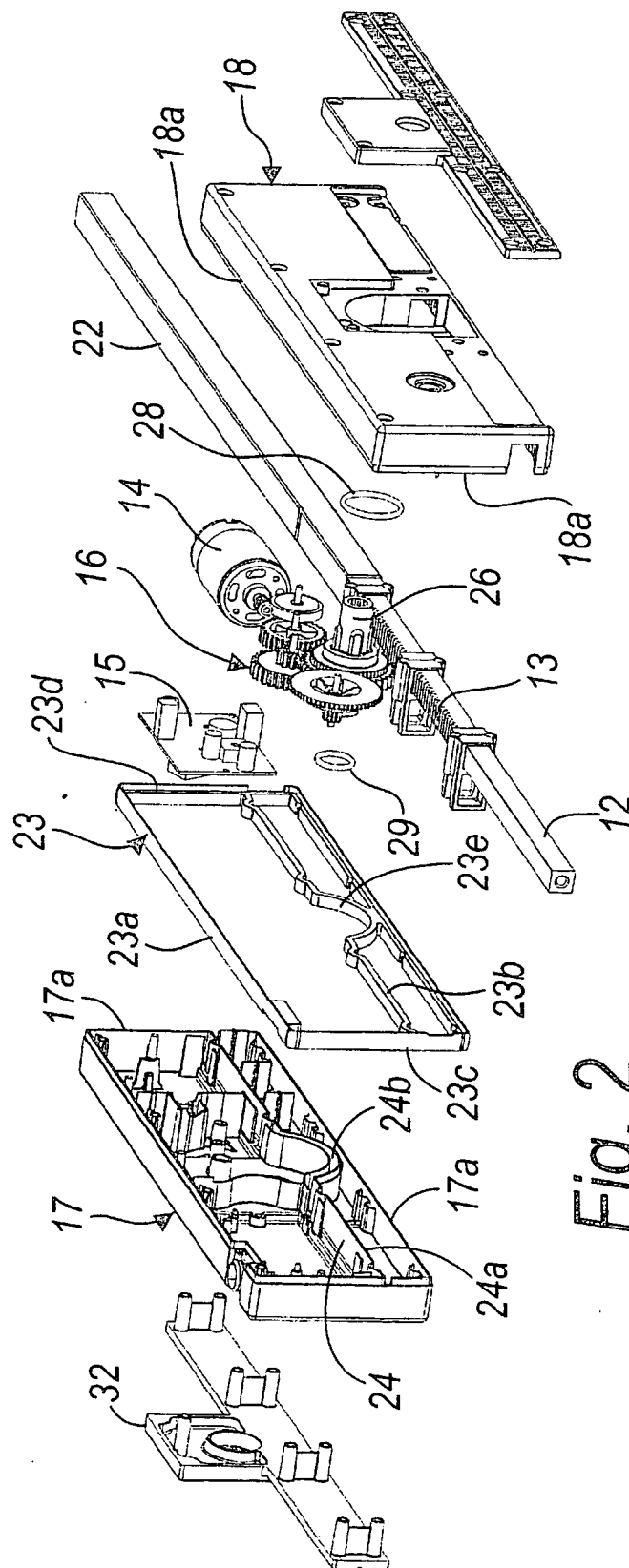


Fig. 2

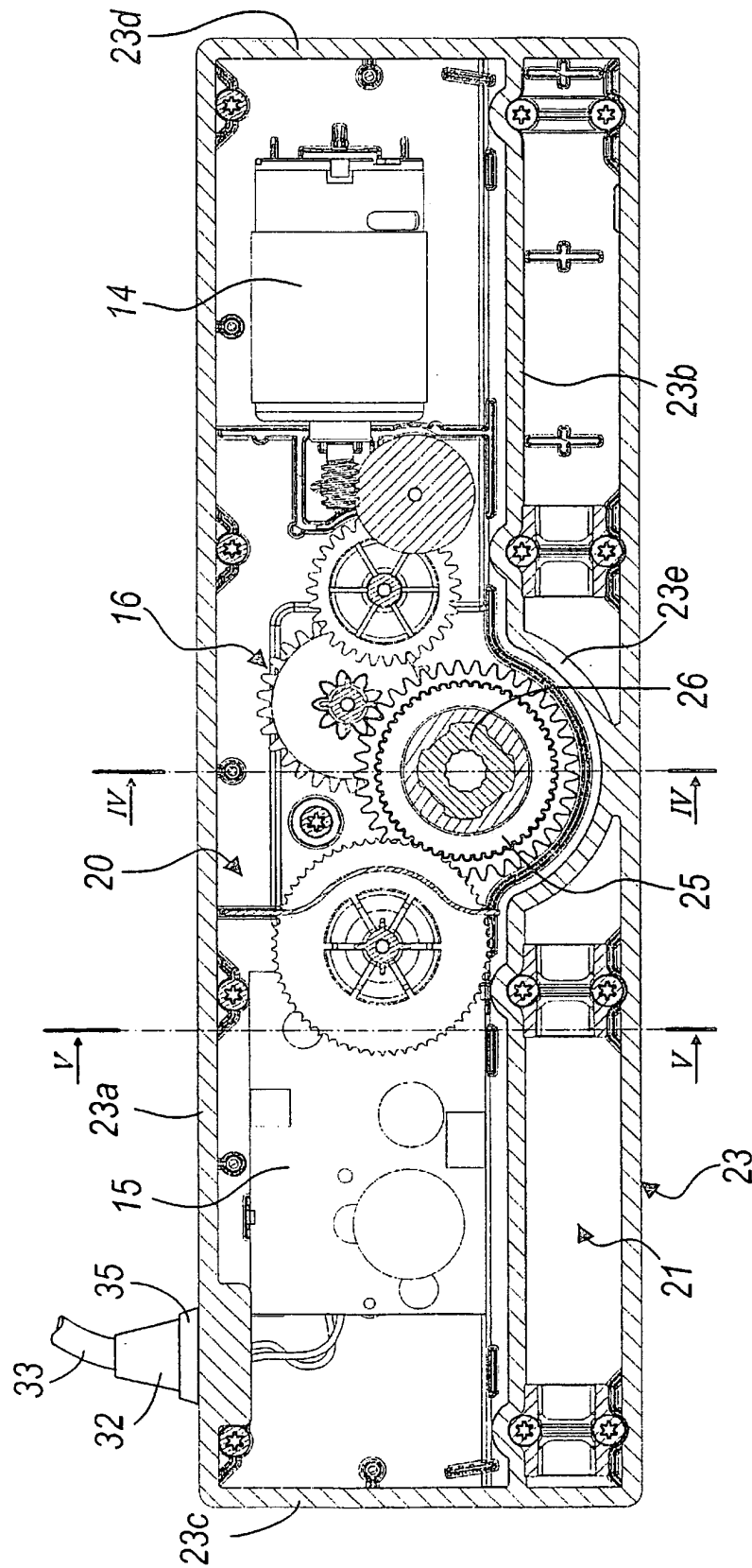


Fig. 3

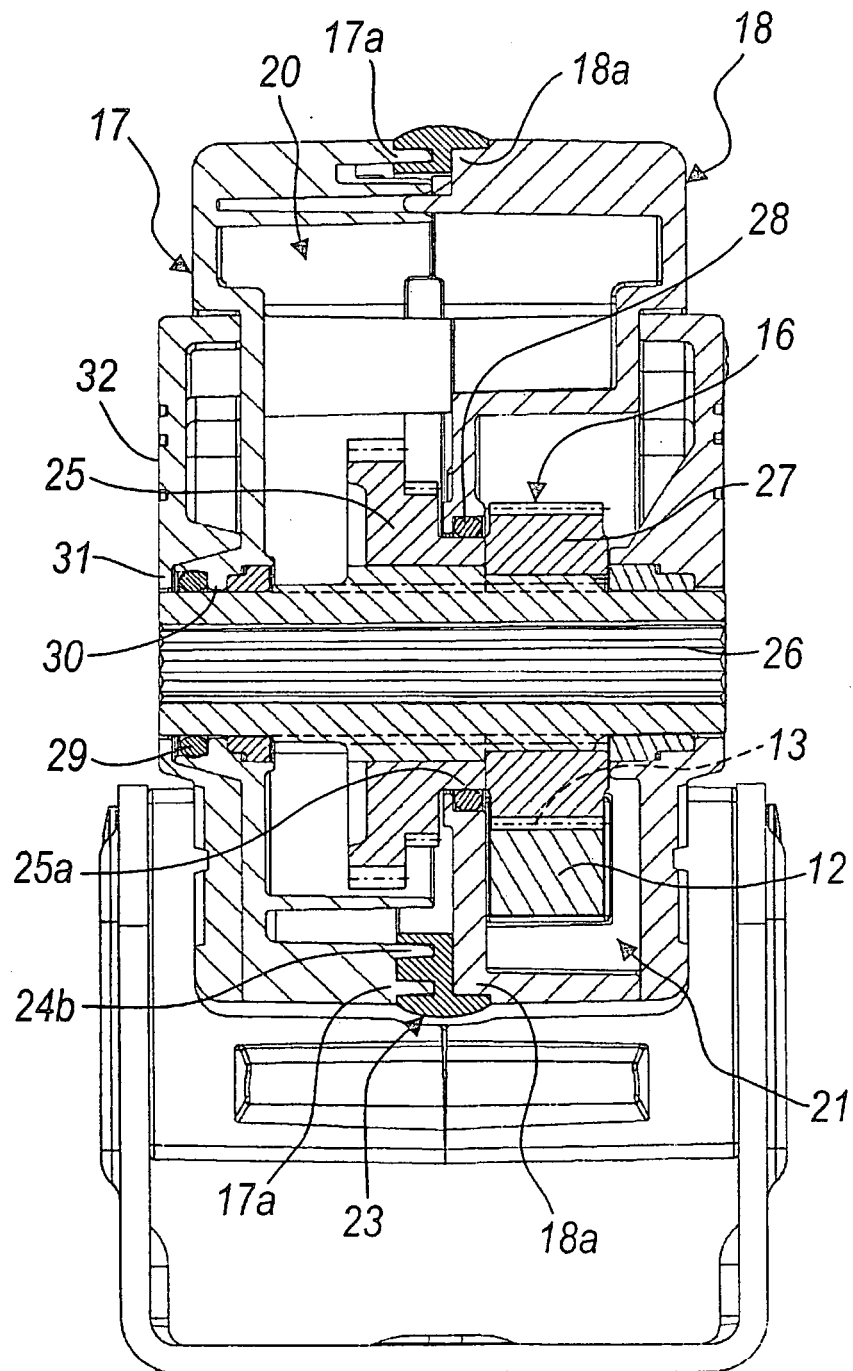
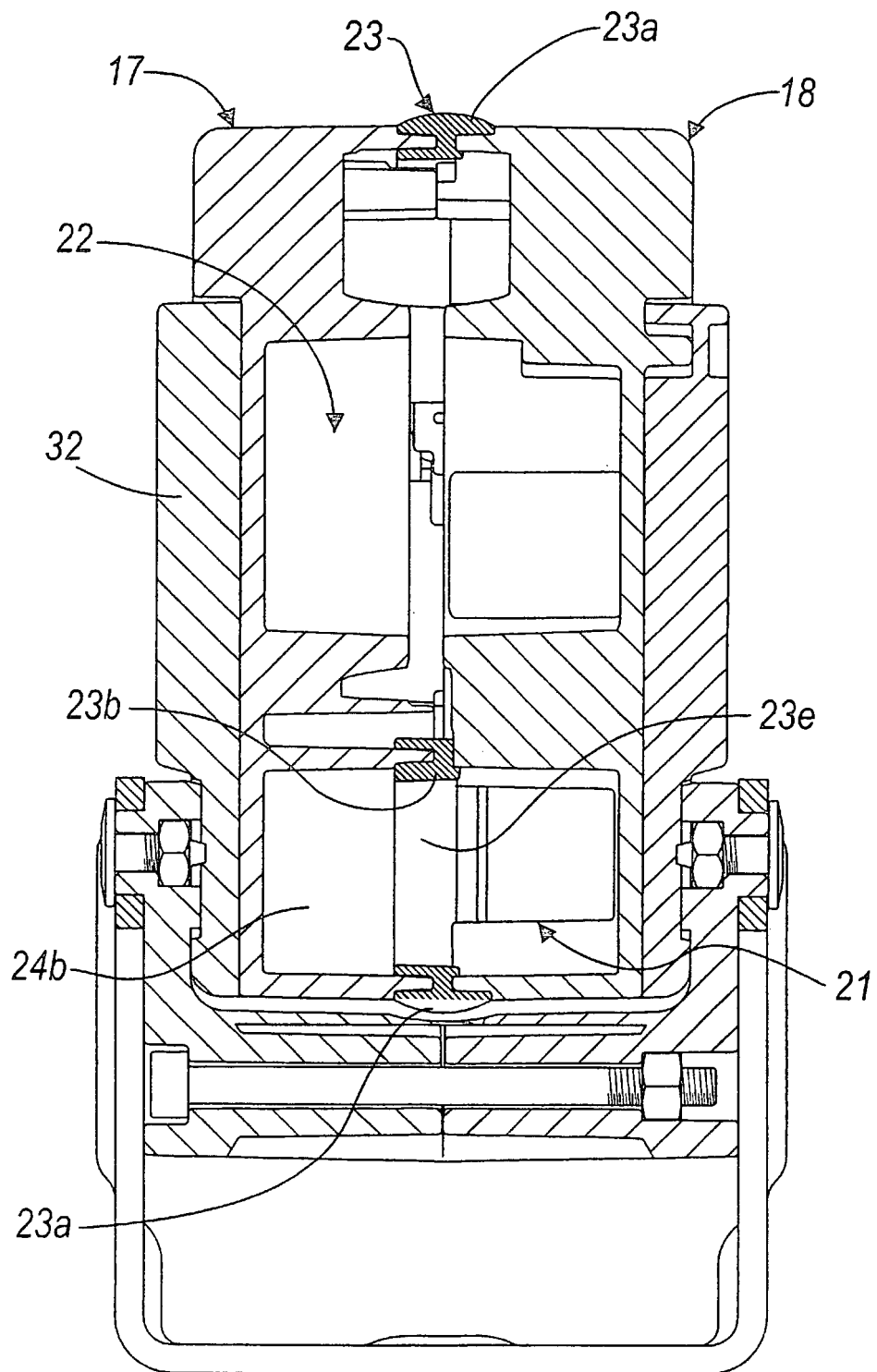
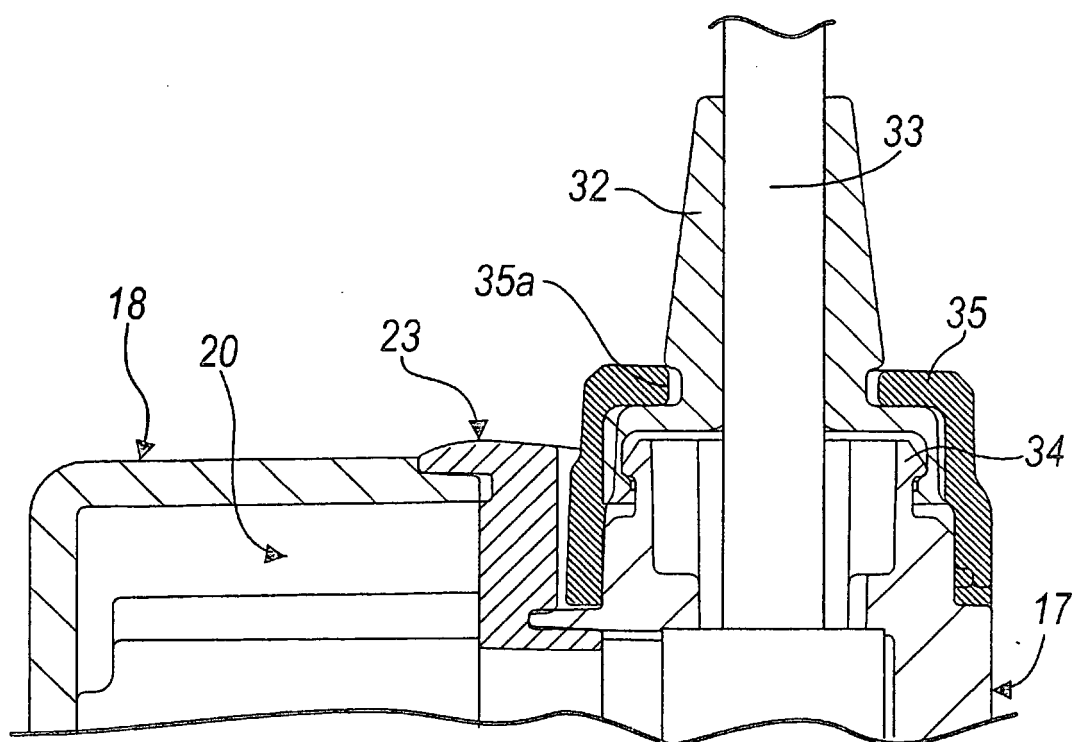


Fig. 4



*Fig. 5*



*Fig. 6*

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- EP 1524397 A [0005]