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(54) **Window regulator, particularly for vehicles**

(57) A window regulator (6), particularly for vehicles, wherein an actuating device (26)(58) provides for rotating about its axis (25) a nut screw (32)(74) connected by a screw-nut screw coupling (51)(76) to a flexible screw (50) extending along a guide (7) and connected to a window supporting slide (57) to move the slide (57) along the guide (7); and wherein the flexible screw (50) presents a metal core (52), and an externally-threaded tubular outer element (53) surrounding the core (52).

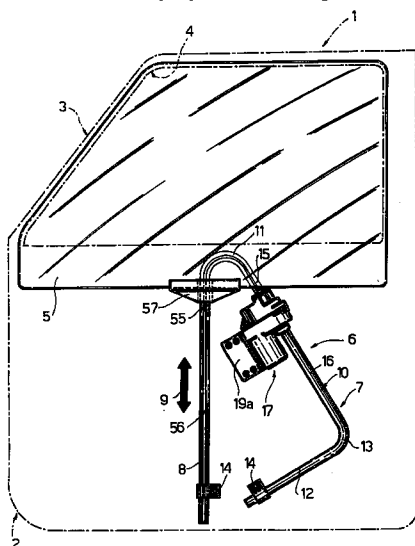


Fig. 1

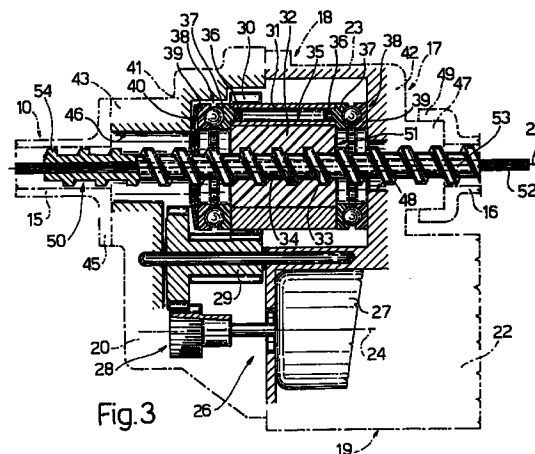


Fig. 3

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Description

The present invention relates to a window regulator, particularly for vehicles.

Vehicle door window regulators are known to comprise a tubular guide; a window supporting slide integral with and sliding along the guide; a flexible screw integral with the slide and movable axially along the guide; and actuating means connected to the screw to move it axially, together with the slide, along the guide.

The guide of window regulators of the above type is normally made of metal, and, for reasons of size, is bent substantially into a U with two straight portions - one connected to the slide and the other to the actuating means - connected by a curved portion; and the flexible screw comprises a cylindrical body made of plastic material and supporting a wire coil on its outer surface to define a constant-pitch thread.

Known window regulators of the above type present several drawbacks, mainly due to the presence of the wire coil which, by sliding on the inner surface of the guide, results in a relatively high noise level of the regulator, makes the screw relatively rigid, and, if the curved portion of the guide presents a radius of less than 70-80 millimeters, substantially prevents the screw from sliding along the guide. Moreover, on account of the curved portion of the guide, the coil itself is subjected to fatigue, thus shortening the working life of the regulator.

It is an object of the present invention to provide a window regulator of the aforementioned type, designed to overcome the aforementioned drawbacks.

According to the present invention, there is provided a window regulator, particularly for vehicles, comprising a tubular guide; a window supporting slide integral with and sliding along the guide; a flexible screw integral with the slide and movable axially along the guide; and actuating means connected to the screw to move it axially, together with the slide, along the guide; characterized in that the flexible screw presents a metal core, and a tubular outer element of flexible plastic material; the tubular element surrounding the metal core, and presenting a preferably square external thread preferably machined or molded on the tubular element.

According to a preferred embodiment of the above window regulator, the guide is substantially U-shaped, and comprises a first portion connected to the slide, a second portion connected to said actuating means, and a curved portion connecting the first and second portions; the curved portion presenting a maximum radius of curvature of 50 millimeters.

A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic side view of a preferred embodiment of the window regulator according to the present invention, as fitted to a vehicle door; Figure 2 shows a larger-scale view, with parts removed for clarity, of a detail in Figure 1;

Figure 3 shows a section of the Figure 2 detail in a plane parallel to that of Figure 2;

Figure 4 shows an axial section, with parts removed for clarity, of a detail of a variation of the Figure 1 regulator.

Number 1 in Figure 1 indicates a vehicle door comprising a lower box portion 2 from which extends upwards a U-shaped frame 3 defining, together with the top edge of lower portion 2, a window opening 4 closed by a window 5 which is movable between a raised closed position (Figure 1) and a lowered open position (not shown) by a window regulator 6 housed inside lower portion 2.

Regulator 6 comprises a tubular guide 7 in turn comprising a substantially straight first portion 8 parallel to the traveling direction 9 of window 5 between said open and closed positions; a substantially straight second portion 10 extending downwards from the top end of portion 8 and connected to portion 8 by a downwardly-concave curved portion 11 so that guide 7 is substantially U-shaped with its concavity facing downwards; and a straight third portion 12 extending towards the bottom end of portion 8 and connected to the bottom end of portion 10 by a curved portion 13. Guide 7 is connected integrally and removably to lower portion 2 of door 1 by two brackets 14, one of which is connected to the bottom portion of portion 8, and the other to the free end portion of portion 12.

Portion 10 of guide 7 is divided into two parts 15, 16 by an actuating device 17 which, as shown in Figures 2 and 3, comprises a housing 18 in turn comprising a casing 19 connected to portion 2 of door 1 by a bracket 19a and closed by a cover 20 fitted to casing 19 by a number of screws 21. Casing 19 and cover 20 define two tubular bodies 22, 23 presenting respective axes 24, 25 parallel to each other. As shown in Figure 3, body 22 houses a geared motor 26 comprising a motor 27 coaxial with axis 24, and a reduction gear 28, the output pinion 29 of which meshes with a gear 30 fitted to a metal jacket 31 housed inside body 23. Jacket 31 is the outer jacket of a cylindrical nut screw 32 made of plastic material, integral with jacket 31, and presenting a hole 33 coaxial with axis 25 and presenting a square internal thread 34.

As shown in Figure 3, holes 35 are formed in the thickness of jacket 31, the opposite ends of each of which are engaged by respective axial pins 36 of respective inner rings 37 of two thrust bearings 38. The outer ring 39 of one of bearings 38 is fitted, via the interposition of a Belleville washer 40, contacting a portion of the bottom wall 41 of cover 20 facing body 23, and the outer ring 39 of the other bearing 38 is compressed by washer 40 against the bottom wall 42 of body 23 opposite wall 41. Wall 41 presents an axial appendix 43 connected by screws 44 to an end flange 45 of part 15; and a through hole 46, coaxial with axis 25 and part 15, extends through wall 41 and appendix 43. Wall 42 presents an axial appendix 47; a hole 48, coaxial with hole 46 and part 16 of portion 10 of guide 7, extends through appen-

dix 47 and wall 42; and appendix 47 is engaged inside an end cup 49 of part 16.

As shown more clearly in Figure 3, regulator 6 comprises a flexible screw 50 extending along guide 7 and through body 23, and engaging nut screw 32 with which it defines a screw-nut screw coupling 51. Screw 50 presents a core comprising a stranded wire 52; and a tubular outer element 53 made of flexible plastic material, extruded with and surrounding wire 52, and presenting a square external thread 54 machined or molded on tubular element 53 and engaging thread 34 of nut screw 32.

As shown in Figure 1, the free end of screw 50 is fitted integral with a radial appendix 55 engaging in sliding manner a slot 56 formed along portions 8 and 11 and part 15 of portion 10 of guide 7; and appendix 55 is connected integral with a slide 57 fitted to the bottom edge of window 5, and is fitted to portion 8 of guide 7 so as to slide along portion 8 in direction 9 by virtue of screw 50.

In regulator 6 as described above - operation of which is doubtless self-explanatory to a skilled technician - the plastic tubular element 53 of screw 50 slides smoothly and relatively silently along the inner surface of guide 7; and screw 50, by presenting no rigid metal coil fitted externally to it, slides smoothly along curved portions 11 and 13 with a maximum radius of curvature of 50 millimeters. Reducing the radius of curved portions 11 and 13 provides for greatly reducing the size of regulator 6, which in turn provides for simplifying assembly of the regulator to door 1, and for increasing the strength of lower portion 2 of the door by reducing the size of the openings formed in lower portion 2 of the door to assemble regulator 6.

A further point to note is that, by presenting no rigid metal coil fitted externally to it, screw 50 presents substantially no parts subject to fatigue.

In the Figure 4 variation, actuating device 17 is replaced by a device 58 connected to portion 2 of door 1 by a bracket 59, and comprising an electric motor 60 coaxial with axis 25 and substantially housed inside a tubular casing 61. Motor 60 is a known quill-drive electric motor, and comprises a stator 62 integral with a lateral wall 63 of casing 61, and a rotor 64 fitted to a tubular drive shaft 65 engaged in sliding manner by screw 50 and supported for rotation on casing 61. For which purpose, a first end wall 66 of casing 61 presents a tubular outer appendix 67 engaged by shaft 65 and connected to shaft 65 via the interposition of a bearing 68. Similarly, a second end wall 69 of casing 61 presents a tubular inner appendix 70 engaged by shaft 65 and connected to shaft 65 via the interposition of a bearing 71.

Wall 69 is connected to an annular flange 72 of a cylindrical cup-shaped body 73 coaxial with appendices 67, 70 and axis 25, and housing a nut screw 74 coaxial with axis 25 and connected rigidly in known manner to the end 75 of shaft 65 projecting from casing 61. Nut screw 74 presents an internal thread, and defines, together with screw 50, a screw-nut screw coupling 76 for converting the rotary motion of nut screw 74 into linear

motion of screw 50. On the opposite side to flange 72, body 73 is closed by an end wall 77 which presents a central through hole 78 engaged by screw 50 and is connected to flange 45 by screws 44. As with actuating device 17, end cup 49 of portion 10 of guide 7 is force-fitted to appendix 67.

Claims

1. A window regulator, particularly for vehicles, comprising a tubular guide (7); a window supporting slide (57) integral with and sliding along the guide (7); a flexible screw (50) integral with the slide (57) and movable axially along the guide (7); and actuating means (17) connected to the screw (50) to move it axially, together with the slide (57), along the guide (7); characterized in that the flexible screw (50) presents a metal core (52), and a tubular outer element (53) of flexible plastic material; the tubular element (53) surrounding the metal core (52), and presenting an external thread (54) formed on the tubular element itself.
2. A regulator as claimed in Claim 1, characterized in that said external thread (54) is square.
3. A regulator as claimed in Claim 1 or 2, characterized in that said external thread (54) is formed by machining the tubular outer element (53).
4. A regulator as claimed in Claim 1 or 2, characterized in that said external thread (54) is molded on to the tubular outer element (53).
5. A regulator as claimed in any one of the foregoing Claims, characterized in that the tubular outer element (53) is extruded on to the metal core (52).
6. A regulator as claimed in any one of the foregoing Claims, characterized in that the metal core (52) comprises a stranded wire (52).
7. A regulator as claimed in any one of the foregoing Claims, characterized in that said actuating means (17) comprise a nut screw (32)(74) connected to said screw (50) by a screw-nut screw coupling (51)(76); and an actuating device (26)(58) for rotating the nut screw (32)(74) about its axis (25).
8. A regulator as claimed in Claim 7, characterized in that said actuating device (26)(58) comprises an electric motor (27)(60).
9. A regulator as claimed in Claim 8, characterized in that said motor (27) presents an axis (24) parallel to the axis (25) of the nut screw (32), and is connected to the nut screw (32) by a transmission (28).

10. A regulator as claimed in Claim 8, characterized in that said motor (60) is a quill-drive motor coaxial with the axis (25) of the nut screw (74); the motor (60) comprising a central tubular shaft (65) fitted through with said screw (50) and angularly integral with the nut screw (74). 5
11. A regulator as claimed in any one of the foregoing Claims, characterized in that said guide (7) is substantially U-shaped, and comprises a first portion (8) 10 connected to said slide (57), a second portion (10) connected to said actuating means (17), and a curved portion (11) connecting the first and second portions (8, 10); said curved portion (11) presenting a maximum radius of curvature of 50 millimeters. 15

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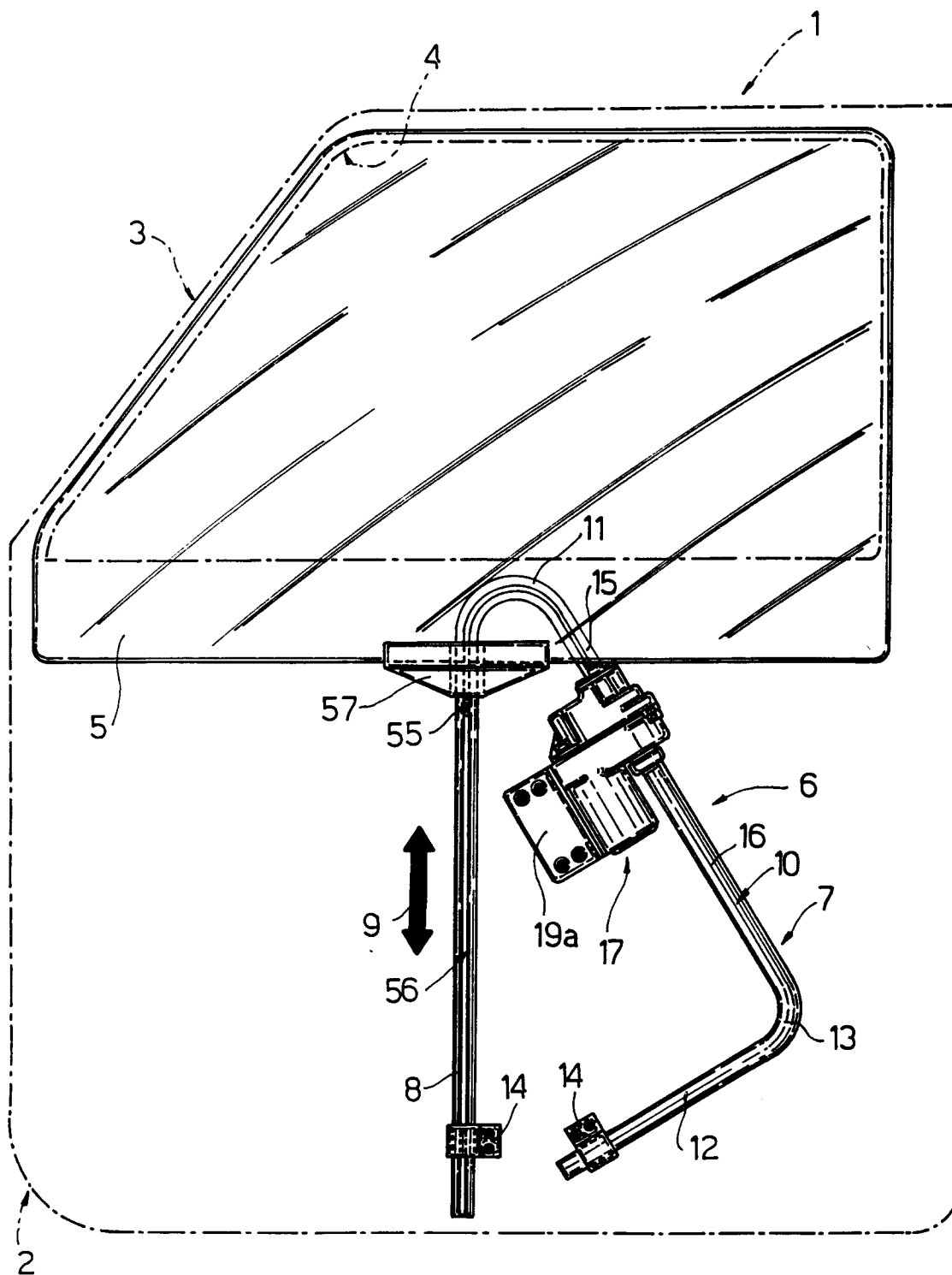
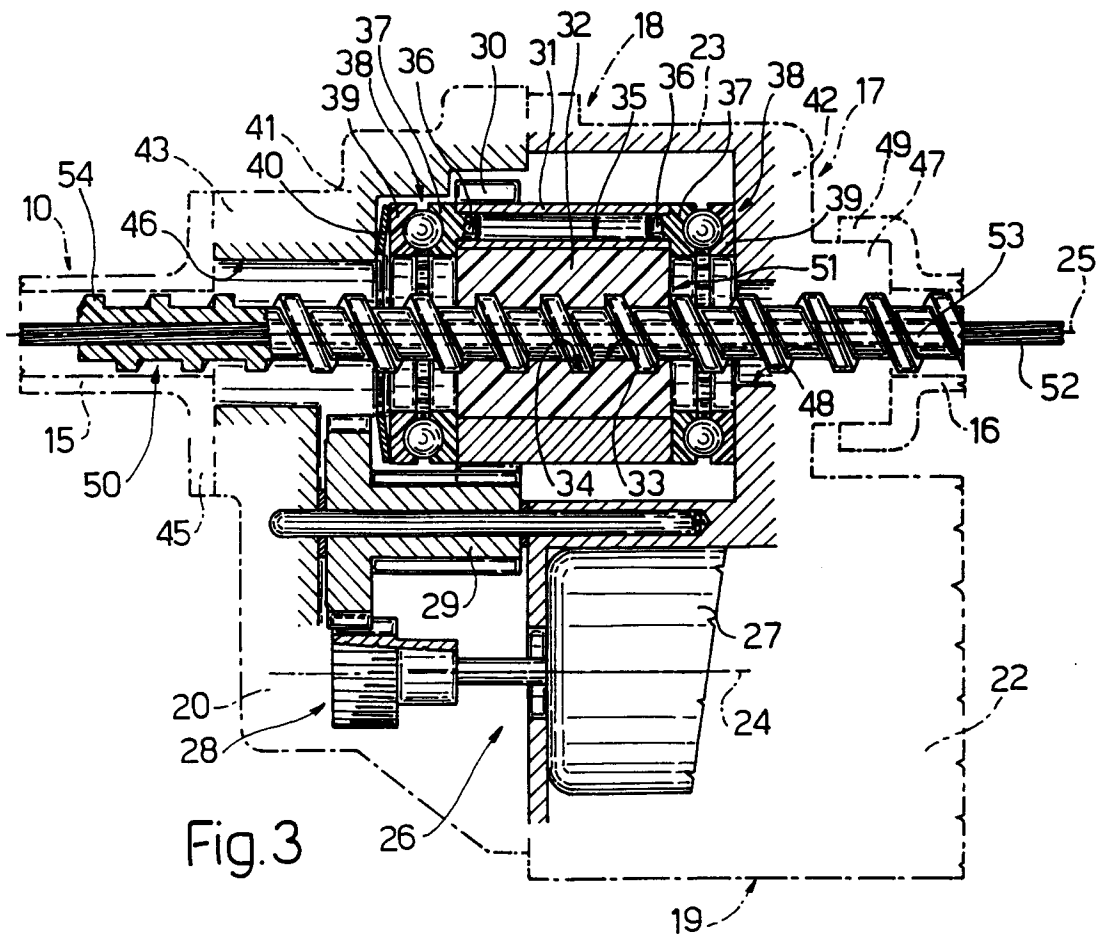
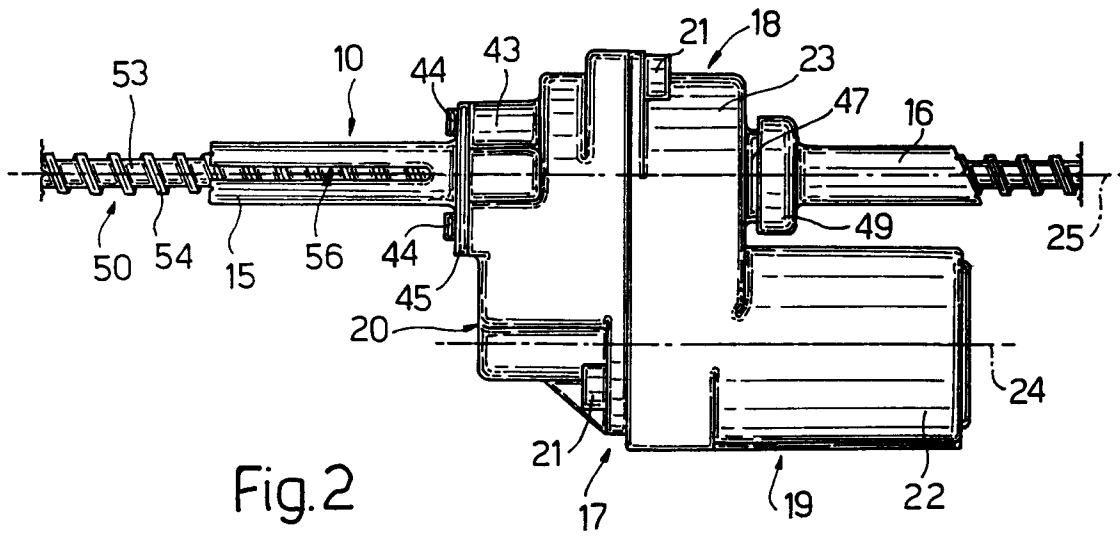


Fig.1



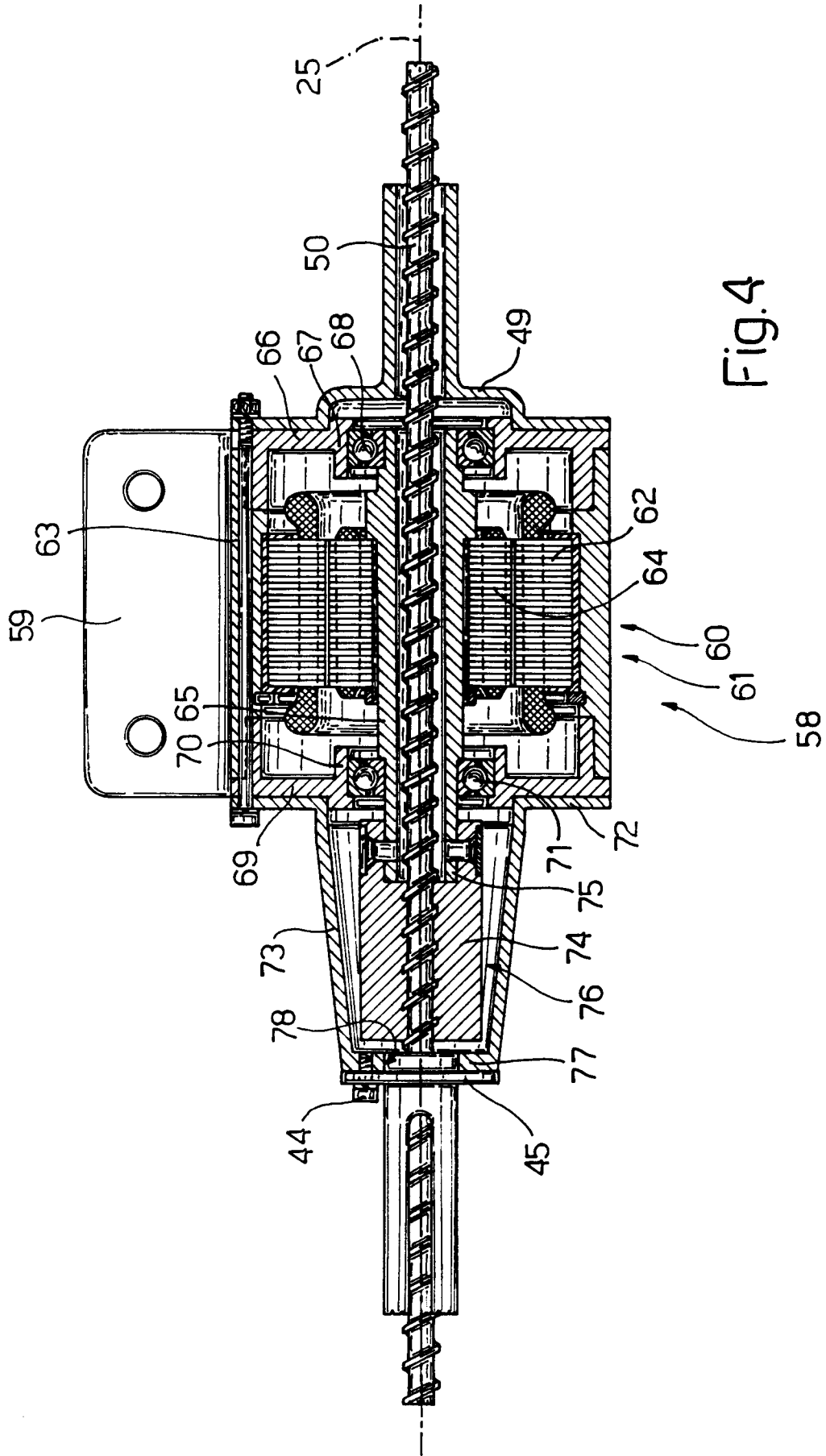


Fig.4



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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 95116739.4
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
X	<u>US - A - 4 402 160</u> (BRUSASCO) * Pages 1,2; fig. 1,5 * --	1,2,6	E 05 F 11/48 E 05 F 15/16
A	<u>US - A - 4 074 463</u> (COLANZI) * Abstract; fig. 1 * --		
A	<u>FR - A - 2 549 926</u> (EQUIPEMENTS AUTOMOBILES MARCHAL) * Abstract; fig. 1,2 * --		
A	<u>US - A - 4 171 594</u> (COLANZI) * Abstract; fig. 1; column 2, lines 50-65 * --		
A	<u>EP - A - 0 383 026</u> (ILCA S.P.A.) * Abstract; column 2; fig. 1 * -----		TECHNICAL FIELDS SEARCHED (Int. Cl. 6) E 05 F
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 15-01-1996	Examiner LAHODNY
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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