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(71) Applicants:
- **Zottino, Sandro**
  30035 Mirano (VE) (IT)
- **Masiero, Nicoletta**
  30035 Mirano (VE) (IT)

(72) Inventors:
- **Zottino, Sandro**
  30035 Mirano (VE) (IT)
- **Masiero, Nicoletta**
  30035 Mirano (VE) (IT)

(74) Representative: **Modiano, Micaela Nadia et al**
Dr. Modiano & Associati SpA
Via Meravigli 16
20123 Milano (IT)

(54) **Limit switch particularly for roll-up blinds or awnings**

(57) A limit switch (1), particularly for one or more blinds or awnings which can be rolled up onto a hollow drum which can be actuated by an electric motor (2) which is accommodated in an appropriately provided tubular element (3) inserted coaxially with respect to the drum, comprising a first stem (5), which is approximately cylindrical and hollow and can be inserted at one end of the tubular element (3) and with which a ring (6) is rotatably associated, the ring (6) being associable with the drum by keying and having, on its internal surface, a set of teeth (7) which interacts with a first sprocket (8) which is supported rotatably within the first stem (5). The first stem (5) is connected, on the opposite side and externally with respect to the drum, to a box-like body (11) which accommodates internally a first gear system (41a) and a second gear system (41b), which interact selectively with the first sprocket (8) and are adapted to actuate respectively two switches, the pressing of which stops the electric motor (2) and brings the motor to a condition in which it can subsequently rotate only in a direction which is the opposite of the preceding one.

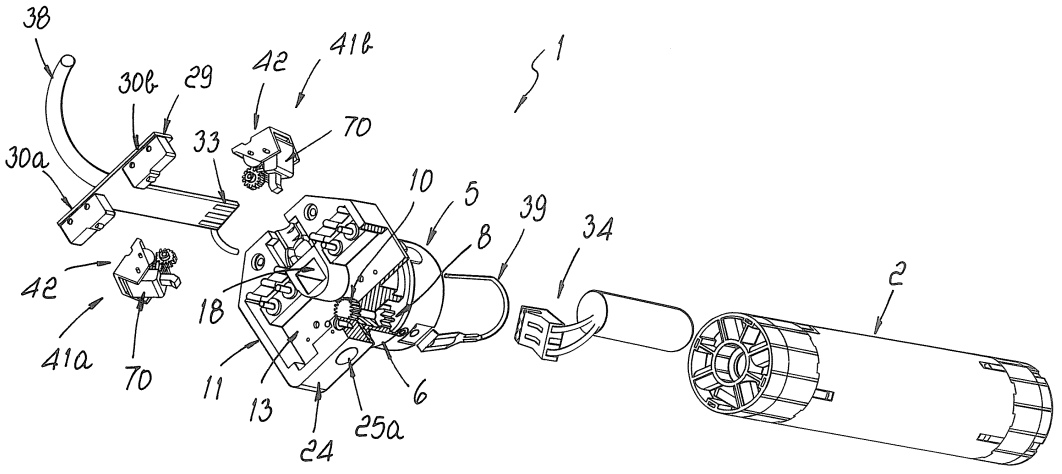

Fig. 3

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Description

[0001] The present invention relates to a limit switch particularly for roll-up blinds or awnings.

[0002] Currently it is known to use blinds or awnings which can be rolled up and unrolled on an appropriately provided drum, which can be fixed above an opening to be closed with said blinds or awnings, such as for example a window or door.

[0003] The rotation which can be imparted to the drum is obtained by means of an appropriately provided electric motor, which is contained in an appropriately provided tubular element, which is inserted coaxially with respect to the drum and from one end of which there protrudes a pulley which is actuated by the motor and is keyed to a first end of the drum, so as to transmit rotation thereto.

[0004] One problem that occurs is to achieve automatic halting of the rotation of the drum when a preset rolled-up or unrolled condition of the blind/s or awning/s associated therewith is reached: it is therefore known to use appropriately provided limit switches, which comprise a cylindrical hollow stem which can be inserted at one end of the tubular element that contains the motor and supports rotatably a ring which is keyed to the drum on the opposite side with respect to the pulley.

[0005] A set of teeth is provided on the inner surface of the ring and interacts with a toothed shaft, which is supported axially so that it can rotate within the stem and is adapted to transmit the rotation to two sprockets which are arranged laterally thereto and are supported rotatably by two worm screws which are threaded in opposite directions and are arranged parallel to the toothed shaft.

[0006] The rotation of the toothed shaft forces the opposite rotation of the two sprockets, which accordingly advance axially with respect to the worm screws which support them in mutually opposite directions.

[0007] Inside the stem, proximate to one end of the worm screws, there are two switches, each of which interacts with one of the two sprockets; the pressure of the sprockets on one switch or the other stops the electric motor and brings the motor to the condition in which it can only turn in the opposite direction with respect to the direction in which it was turning previously.

[0008] The rotation of the toothed shaft in fact is followed by an advancement of one of the two sprockets toward the respective switch until the sprocket presses the switch, stopping the motor, which enters a condition in which it can subsequently turn only in the opposite direction; simultaneously, the other sprocket is moved axially with respect to the respective worm screw in the direction away from the switch with which it can interact.

[0009] By actuating the motor again, the motor turns, as already indicated, in the opposite direction with respect to the preceding one, causing the advancement of the two sprockets on the respective worm screws in directions which are opposite to the preceding ones, until the activation of the other switch is achieved, consequently stopping the motor and presetting it for a new rotation in the opposite direction.

[0010] By acting appropriately on the two worm screws it is possible to adjust the initial position of the two sprockets and thus achieve the actuation of the switches and therefore the halting of the drum and the subsequent reversal of its direction of rotation according to two chosen stroke limiting conditions.

[0011] However, such known type of limit switch suffers drawbacks: first of all, the operations for adjusting the mutual position of the two sprockets are laborious and require good skill of the operator and a considerable expenditure of time to optimize the adjustments.

[0012] Moreover, the switches are arranged inside the stem of the limit switch, which in turn is accommodated within the tubular element which contains the electric motor, and this does not ensure an adequate heat exchange between the switches and the outside environment, which can cause an overheating of the switches, consequently reducing the life of the limit switch.

[0013] Further, in order to allow a sufficient stroke of the sprockets, the stem is quite long, and as a whole the limit switch is rather bulky in an axial direction.

[0014] Another drawback of these known types of limit switch is that the stem, and therefore the worm screws contained therein, undergo, particularly if the drum is large, intense flexural stresses, which can compromise its functionality and/or cause its breakage.

[0015] Moreover, the construction of these known types of limit switch is rather laborious and this entails high production costs and times.

[0016] Limit switches are also known which are constituted by a cylindrical hollow stem, which can be inserted at one end of the tubular element which contains the motor and supports rotatably a ring which can be keyed to the drum, the internal surface of which has a set of teeth which interacts with a first sprocket which is supported rotatably within the stem and is adapted to transmit the rotation, by way of suitable gears, to a first gear system and a second gear system which can be associated selectively therewith.

[0017] Each of such first and second gear systems is constituted by a plurality of second sprockets which mutually interact and are supported by a frame which is pivoted within the stem and whose position can be modified selectively by means of an appropriately provided lever, which can be accessed from the outside of the limit switch, in order to temporarily disengage the first and second gear systems from the first sprocket, in contrast with appropriately provided elastic means.

[0018] The first gear system and the second gear system interact, in the condition in which they are connected to the first sprocket, respectively with a first switch and a second switch, which are arranged inside the stem and whose activation by pressing stops the electric motor and places said motor in the condition in which it can only rotate in a direction which is opposite to the one in which it was rotating previously.

[0019] By acting on the levers it is possible to disen-

gage the first and second gear systems from the first gear, allowing the drum to rotate freely in a chosen direction.

[0020] Once a chosen first stroke limit condition has been reached, by acting on one of the levers it is possible to move for example the first gear system so that it interacts with the first sprocket, simultaneously pressing the first switch and consequently stopping the motor, presetting it to be able to rotate subsequently only in the opposite direction.

[0021] By actuating the motor again, the motor turns in a direction which is opposite to the previous one, and the rotation of the first gear system, which now interacts with the first sprocket, releases the first switch connected thereto.

[0022] Once a chosen second stroke limit condition has been reached, the operator, by acting on the other lever, moves the second gear system into engagement with the first sprocket and further presses the second switch, interrupting the rotation of the motor and presetting it so that subsequently it can turn only in the opposite direction.

[0023] By actuating the motor again, the rotation of the second gear system causes the release of the second switch; by proceeding with the rotation of the motor, the first gear system turns in the opposite direction with respect to the preceding one until it reaches again the condition for activation by pressing of the first switch, in the condition that corresponds to the preset first stroke limit.

[0024] Once the position of the first and second stroke limits has been adjusted in the manner described above, during the rotation of the motor the first and second gear systems, actuated by the first sprocket, press respectively the first and second switches when the first and second stroke limit conditions are reached, thus locking each time the motor in such conditions and presetting it to rotate in the opposite direction.

[0025] However, even these known types of limit switch suffer drawbacks: first of all, in this case also the switches are contained within the stem, which is accommodated within the tubular element arranged coaxially to the drum, and this reduces their heat exchange with the outside environment and can therefore cause their overheating.

[0026] Further, particularly in the case of drums and tubular elements which have a considerable length and weight, the stem and the levers are subjected to intense flexural stresses, which can compromise their functionality.

[0027] Moreover, these known types of limit switch are structurally rather complicated, since they must occupy a very compact space, and this entails high production and assembly costs and times.

[0028] The aim of the present invention is to solve the above-mentioned problems, eliminating the drawbacks of the cited background art, by providing a limit switch for roll-up blinds and awnings whose adjustment can be achieved easily and rapidly.

[0029] Within this aim, an object of the invention is to provide a limit switch which has a long life.

[0030] Another object is to provide a limit switch which can also be used with heavy and large drums, keeping its functionality unchanged.

[0031] Another object is to provide a limit switch which is structurally simple and has low manufacturing costs.

[0032] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a limit switch, particularly for one or more blinds or awnings which can be rolled up onto a hollow drum which can be actuated by an electric motor which is accommodated in an appropriately provided tubular element inserted coaxially with respect to said drum and comprises an approximately cylindrical and hollow stem, which can be inserted at one end of said tubular element and with which a ring is rotatably associated, said ring being associable with said drum by keying and having, on its internal surface, a set of teeth which interacts with a first sprocket which is supported rotatably within said stem, characterized in that said stem is connected, on the opposite side with respect to said drum, to a box-like body which lies outside said drum and which accommodates internally a first gear system and a second gear system, which interact selectively with said first sprocket and are adapted to actuate respectively two switches, the pressing of which stops said electric motor and brings said motor to a condition in which it can subsequently rotate only in a direction which is the opposite of the preceding direction.

[0033] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a particular but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a partially sectional exploded perspective view of a limit switch according to the invention;

Figure 2 is a partially sectional perspective view of some components of the limit switch according to the invention;

Figure 3 is a partially sectional exploded perspective view of the limit switch according to the invention and of an electric motor which can be associated therewith;

Figure 4 is a sectional view, taken along a longitudinal central plane, of the limit switch according to the invention, associated with a tubular element which contains an electric motor;

Figure 5 is a sectional view, taken along a longitudinal central plane, of the limit switch according to the invention;

Figure 6 is a rear view of the limit switch according to the invention in the condition for use;

Figure 7 is a bottom view of the limit switch of Figure 6;

Figures 8 and 9 are partially sectional front views of a detail of the first gear system of the limit switch according to the invention in two different operating

conditions;

Figure 10 is an exploded perspective view of the first gear system of the limit switch according to the invention;

Figure 11 is a bottom view of the second gear system of the limit switch according to the invention;

Figure 12 is a perspective view of the limit switch according to the invention associated with a tubular element which contains an electric motor.

[0034] In the exemplary embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0035] Moreover, 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.

[0036] With reference to the figures, the reference numeral 1 generally designates a limit switch, particularly for one or more blinds or awnings, not shown in the accompanying figures, which can be wound onto a hollow drum, also not shown, which can be for example cylindrical or prism-shaped.

[0037] Such drum can be actuated by an appropriately provided electric motor 2, which is accommodated axially within an appropriate tubular element 3, which can be inserted coaxially with respect to the drum and from one end of which there protrudes a pulley 4, which is actuated by the electric motor 2 and is keyed to one end of the drum, so as to transmit rotation to the latter.

[0038] Advantageously, the limit switch 1 comprises a first approximately cylindrical and hollow stem 5, which can be inserted and fixed rigidly at one end of the tubular element 3 on the opposite side with respect to the pulley 4.

[0039] A ring 6 is rotatably associated with the first stem 5 and can be keyed to one end of the drum, on the opposite side with respect to the pulley 4, and has, on its inner surface, a set of teeth 7 which interacts with a first sprocket 8, which is supported rotatably within the first stem 5 and is keyed to one end of first shaft 9 which has, at the other end, a second sprocket 10 which is keyed thereto.

[0040] The first stem 5 is connected, on the opposite side and externally with respect to the drum and the tubular element 3, to a box-like body 11, which is open at the rear on the opposite side with respect to the first stem 5 and can be closed by means of an appropriately provided lid 12.

[0041] A cavity 13 having an approximately rectangular plan shape is formed within the box-like body 11 and a first approximately T-shaped raised portion 15 protrudes from its bottom wall 14, adjacent to a longitudinal edge; a second stem 15a of said raised portion is approximately as high as the cavity 13 is deep, and its first wings 15b and 15c are not as high as the second stem 15a so as to form two lateral seats 16a and 16b, which have a substantially rectangular plan shape.

[0042] Two pairs of pins, designated by the reference numerals 17a and 17b and arranged mutually side by side in pairs, protrude approximately at right angles from the first wings 15b and 15c of the first raised portion 15 so as to affect the two lateral seats 16a and 16b.

[0043] A first through hole 18 is provided axially with respect to the second stem 15a of the raised portion 15 and preferably has an approximately square cross-section; a complementarily shaped reinforcement bar 19 is arranged in said hole, protrudes beyond the lid 12, is preferably made of steel and is adapted to strengthen the limit switch 1 and absorb in particular the flexural stresses imparted thereto by the tubular element 3 and by the drum.

[0044] The reinforcement bar 19 is conveniently fixed to the limit switch 1 by means of at least one screw 20, which can be inserted transversely in the first stem 5 through an appropriately provided opening 21.

[0045] Two pairs of second holes, designated by the reference numerals 23a and 23b, are provided on the bottom wall 14 of the cavity 13, mirror-symmetrically with respect to a transverse central axis, designated by the reference numeral 22 in Figure 6, and lie in pairs along axes which are parallel to an axis which is longitudinal with respect to the first raised portion 15, each on axes which are parallel to an axis which lies transversely to the first raised portion 15.

[0046] The second sprocket 10, which is keyed to the first shaft 9, is accommodated within the cavity 13, preferably on the opposite side with respect to the raised portion 15, and the transverse central axis 22 passes through one of its diameters.

[0047] Advantageously, two third through holes 25a and 25b are provided on a lower lateral surface 24 of the box-like body 11, on the opposite side with respect to the first raised portion 15.

[0048] Advantageously, in the limit switch 1 there is a fourth hole 26, which is parallel to and arranged above the first hole 18, affects both the box-like body 11 and the first stem 5 and has an approximately T-shaped transverse cross-section; in the hole 26 there are a head 26a, which has an approximately rectangular cross-section, and a third stem 26b, which has a substantially semicircular cross-section.

[0049] An appropriately provided groove 28, which has a preferably semicircular cross-section, is formed along the transverse central axis 22 at the lateral surface 27 of the box-like body 11 on which the lid 12 rests, and is connected to the fourth hole 26.

[0050] Advantageously, the limit switch 1 comprises a removable card 29, which supports two switches, designated by the reference numerals 30a and 30b, which can be connected electrically to the electric motor 2 and whose activation by pressing stops the electric motor 2 and places the motor in the condition in which it can subsequently rotate only in a direction which is the opposite

of the one in which it was rotating previously.

[0051] Advantageously, the card 29 is approximately T-shaped in plan view, so as to form a fourth stem 31 which is shaped approximately complementary with respect to the third stem 26a of the fourth hole 26, so that it can be inserted therein.

[0052] Advantageously, the fourth stem 31 protrudes from the limit switch 1 with its free end 32, which has, preferably on its upper and lower surfaces, suitable electrical contacts 33 which allow its electrical connection to an appropriately provided connector 34, which is connected electrically to the electric motor 2 and can be fixed, preferably by interlocking, to the free end 32.

[0053] Two lateral arms, designated by the reference numerals 35a and 35b, protrude from the other end of the fourth stem 31 approximately at right angles thereto, and one of the two switches 30a and 30b is fixed to each of said arms in a lower region.

[0054] Advantageously, on the card 29 there is an appropriately provided printed circuit, not shown in the accompanying Figures, which appropriately connects the switches 30a and 30b to the electrical contacts 33.

[0055] The switches 30a and 30b are preferably shaped approximately like a parallelepiped and have such dimensions that they can be accommodated respectively within the two seats 16a and 16b formed in the box-like body 11.

[0056] Two buttons, designated respectively by the reference numerals 36a and 36b, protrude approximately at right angles from the surface of the switches 30a and 30b which is directed toward the lower lateral surface 24 of the box-like body 11.

[0057] Two fifth holes 37a and 37b are provided respectively in the switches 30a and 30b, on the opposite side with respect to the fourth stem 31 and therefore toward the surface that is concealed by the lid 12, and their dimensions and arrangement are such as to allow to accommodate therein respectively the pins 17a and 17b which protrude from the first raised portion 15 at the seats 16a and 16b.

[0058] Means for connection to an electrical mains, which is not shown in the accompanying figures, are further associated with the card 29 and are constituted advantageously by an electrical cable 38, which is fixed in an upper region to the card 29 and can be inserted in the head 26b of the fourth hole 26 through the groove 28.

[0059] Advantageously, the electrical cable 38 preferably contains four separate wires, three of which, not shown in the accompanying figures, are conveniently soldered to the printed circuit provided on the card 29, while the fourth one, designated by the reference numeral 39, constitutes the ground wire and exits from the first stem 5 of the limit switch on the opposite side with respect to the box-like body 11; the fourth wire 39 can be connected to an appropriately provided terminal for grounding the limit switch 1 which is provided on the first stem 5 and is schematically designated by the reference numeral 40.

[0060] Advantageously, a first gear system and a second gear system, designated respectively by the reference numerals 41a and 41b, are accommodated within the cavity 13 of the box-like body 11, below the switches 30a and 30b, interact selectively with the first sprocket 8 and are adapted to actuate respectively one of the switches 30a, 30b.

[0061] Each one of the first and second gear systems 41a and 41b comprises a frame 42 which is approximately shaped like an inverted letter U in a side view so as to form a base 43, which is substantially flat and arranged, during use, so that it faces one of the buttons 36a and 36b, and two asymmetrical second wings 46a and 46b.

[0062] A first longitudinal slot 44 is provided in the base 43 and affects at least the region thereof which during use faces one of the buttons 36a or 36b.

[0063] Advantageously, a first elastically deformable tab 45 protrudes from the region of the base 43 that is not affected by the first slot 44 toward the overlying switch 30a or 30b and abuts during use against the overlying first wings 15b and 15c, so as to apply constantly to the frame 42 a pressure in a direction which is opposite with respect to the first raised portion 15.

[0064] Two sixth holes 47 and two seventh holes 52 are provided in the second wings 46a and 46b, have the same axis in pairs, and are arranged, during use, so that they face respectively the second holes 23a or 23b formed in the bottom wall 14 of the cavity 13 of the box-like body 11.

[0065] A second raised portion 48 protrudes from the perimetric edge of the second wings 46b which is directed away from the base 43, approximately at right angles and centrally to said wings.

[0066] An appropriately provided pin 49 protrudes proximate to one of the corners of the second wings 46b, approximately at right angles and on the opposite side with respect to the bottom wall 14 of the chamber 13; a third sprocket 50 is rotatably associated with said pin and is engaged, during use, with the second sprocket 10.

[0067] A substantially semicircular recess 53 is further provided on the base 43 starting from the perimetric edge of the second wings 46a and is connected to the adjacent first slot 44 and arranged so that it can accommodate partially, during use, the button 36a or 36b of the overlying switch 30a or 30b.

[0068] A second shaft 55 is associated with the sixth holes 47 and the seventh holes 52 that lie closest to the center of the cavity 13 and protrudes with its ends approximately at right angles from said second wings 46a and 46b, with which a fourth sprocket 56 is rotatably associated, said sprocket being adjacent to the second wings 46b and interacting with the third sprocket 50.

[0069] The second shaft 55 further supports rotatably a fifth sprocket 57, which is adjacent to the fourth sprocket 56 and has, on the opposite side with respect to the fourth sprocket 56, a first disk 58 from the perimetric edge of which two first teeth 59 protrude, approximately at right angles to said edge, and are approximately mutually parallel and laterally adjacent.

[0070] A first annular raised portion 60 protrudes at right angles from the first disk 58, approximately centrally thereto and on the opposite side with respect to the fourth sprocket 56, has an approximately cardioid plan shape, and therefore has a pointed end which is arranged diametrically opposite a groove, both not shown in the accompanying figures; advantageously, said pointed end is arranged at a preset angular distance from the first two teeth 59.

[0071] The second shaft 55 further supports rotatably a second disk 61, which is contiguous to the first disk 58 of the fifth sprocket 57 proximate to the perimetric edge of which a plurality of first teeth 62 protrude approximately at right angles thereto and toward the fifth sprocket 57; the first teeth 62 are approximately mutually equidistant along a circumference.

[0072] A second annular raised portion 63 protrudes from the surface of the second disk 61 which is directed toward the first disk 58, at right angles and approximately centrally thereto, has an approximately cardioid plan shape and abuts against the first annular raised portion 60.

[0073] Advantageously, two second teeth 59 protrude approximately at right angles from the surface of the second disk 61 that is directed in the opposite direction with respect to the fifth sprocket 57, proximate to the perimetric edge of the second disk 61, and are approximately mutually parallel and longitudinally adjacent; advantageously, the angular distance between the second teeth 59 and the pointed end of the second annular raised portion 63 is equal to the distance between the two first teeth 59 and the pointed end of the first annular raised portion 60.

[0074] The second shaft 55 further supports rotatably a third disk 65, which is adjacent to the surface of the second disk 61 which lies opposite the one provided with the second annular raised portion 63, and from the perimetric edge of which a plurality of second teeth 66 protrude approximately at right angles to said edge and toward the second disk 61, said teeth being mutually equidistant and arranged along a circumference.

[0075] A third annular raised portion 67 which is approximately shaped like a cardioid in plan view protrudes approximately centrally and at right angles from the surface of the third disk 65 which is directed toward the second disk 61.

[0076] A second tab 68 protrudes radially from the perimetric edge of the third disk 65, is arranged advantageously approximately on the opposite side with respect to the pointed end of the third annular raised portion 67, and is adapted to abut against the overlying button 36a or 36b of the overlying switch 30a or 30b.

[0077] A third shaft 69 is associated with the sixth holes 47 and seventh holes 52 of the second wings 46a and 46b of the frame 42 that lie furthest from the center of the cavity 13; such shaft protrudes with its ends approximately at right angles from said second wings, and a box-like lever 70 is associated rotatably with the third shaft 69 and can rotate selectively with respect to the frame 42.

[0078] Advantageously, the lever 70 has, at one of its ends which during use is directed toward the base 43 of the frame 42, two lugs 71a and 71b, which protrude toward the second shaft 55 of the frame 42 and whose lanceolate transverse ends engage respectively and selectively the first and second annular raised portions 60 and 63 and the third annular raised portion 67; advantageously, the lugs 71a and 71b each have, at their free end, a lower corner 171a, 171b which during use is directed away from the base 43 of the frame 42.

[0079] By turning the lever 70 appropriately, the lugs 71a and 71b engage respectively the first and second annular raised portions 60 and 63 and the third annular raised portion 67, causing the rotation of the fifth sprocket 57 and of the second and third disks to a condition of equilibrium in which the lower corners 171a and 171b of said lugs 71a and 71b are arranged respectively at the grooves formed in the first and second annular raised portions 60 and 63 and in the third annular raised portion 67.

[0080] Advantageously, shoulders 72 protrude approximately at right angles from the end of the lever 70 that lies opposite the lugs 71a and 71b and are adapted to support a fourth shaft 73, which protrudes with its ends from the shoulders 72, so as to abut, with one of its ends, against the second raised portion 48 which protrudes from the perimetric edge of the second wings 46a of the frame 42 and thus interrupt the rotation of the lever 70.

[0081] A first gear 74, a second gear 75 and a third gear 76 are associated rotatably with the fourth shaft 73.

[0082] Advantageously, the shape and position of the first gear 74 are such that said gear, in the condition in which the lugs 71a and 71b are not engaged with the respective first, second and third annular raised portions, meshes simultaneously with the fourth sprocket 56 and with the fifth sprocket 57.

[0083] Advantageously, the shape and position of the second gear 75 are such that, in the condition in which the lugs 71a and 71b are not engaged respectively with the first and second annular raised portions 60 and 63 and with the third annular raised portion 67, such gear meshes with the first teeth 62 of the second disk 61 and also meshes with the first teeth 59 of the first disk 58 when they pass proximate to the second gear 75.

[0084] Advantageously, the shape and position of the third gear 76 are such that, in the condition in which the lugs 71a and 71b are not engaged respectively with the first and second annular raised portions 60 and 63 and with the third annular raised portion 67, such third gear meshes with the second teeth 66 of the third disk 65 and also with the second teeth 64 of the second disk 61 when they pass proximate to the third gear 76.

[0085] An appropriately provided arm 77 protrudes longitudinally from the end of the lever 70 which lies opposite the lugs 71a and 71b and can engage appropriately provided means for adjusting the position of the

lever 70.

[0086] The first and second gear systems 41a and 41b are accommodated, during use, by arranging the second wing 46b of their frames 42 adjacent to the bottom wall 14 of the cavity 13 of the box-like body 11 and by inserting the ends of the second shaft 55 and of the third shaft 69 within the second holes 23a and 23b provided in the bottom wall 14; advantageously, the size and shape of the second holes 23a, 23b are such as to allow a slight rotation of the frame 42 of the first and second gear systems 41a and 41b with respect to the third shafts 69 which are rigidly coupled to the box-like body 11.

[0087] Advantageously, such means for adjusting the position of the lever 70 comprise two first plates 78a and 78b, which preferably have an approximately rectangular plan shape and have such dimensions that they can be associated slidingly with the lower lateral surface 24 of the box-like body 11, on opposite sides with respect to the vertical central axis 22 of the latter; advantageously, the stroke of said plates with respect to the lower lateral surface 24 toward the centerline of the latter is limited by the presence of a third raised portion 79 which protrudes from the lower lateral surface 24 toward the inside of the cavity 13, approximately at the vertical central axis 22.

[0088] Advantageously, starting from the perimetric edge of the first plates 78a and 78b that during use is directed toward the bottom wall 14 of the cavity 13 and approximately at a first transverse end thereof, there are two second transverse slots 80a, 80b within which the arms 77 that protrude from the levers 70 are inserted during use.

[0089] Two third transverse slots 81a, 81b are provided respectively at a second transverse end of the first plates 78a and 78b, and appropriately provided pins 82a, 82b are slidingly associable therein and protrude approximately at right angles and eccentrically from the upper end of two appropriately provided adjustment screws 83a, 83b, which are substantially cylindrical and can be associated freely within the third holes formed in the lower lateral surface 24 of the box-like body 11.

[0090] By turning the adjustment screws 83a and 83b it is possible to achieve the translational motion of the first plates 78a and 78b with respect to the lower lateral surface 24 of the box-like body 11 and consequently the oscillation of the levers 70 of the first and second gear systems 41a and 41b with respect to their frame 42.

[0091] Advantageously, the frames 42 of the first and second gear systems 41a and 41b are connected to the overlying switches 30a and 30b by means of two appropriately provided second plates 84a, 84b, which have a preferably approximately rectangular plan shape and proximate to a third transverse end of which there are two appropriately provided eighth holes 85a, 85b, within which it is possible to accommodate respectively the pins 17a and 17b which protrude from the first raised portion 15.

[0092] Advantageously, ninth holes 86a, 86b are provided respectively proximate to a fourth transverse end of said second plates 84a, 84b and can accommodate respectively, during use, the ends of the third shafts 69 of the first and second gear systems 41a and 41b.

[0093] Arc-like slots 87a, 87b are provided in the second plates 84a, 84b, advantageously proximate to the ninth holes 86a, 86b, and can slidingly accommodate the ends of the second shafts 55 of the first and second gear systems 41a and 41b; advantageously, the shape of the slots 87a, 87b is such as to allow a slight rotation of the frame 42 of the first and second gear systems 41a and 41b with respect to the third shafts 69, which are rigidly coupled to the box-like body 11.

[0094] Operation is therefore as follows: with reference to the accompanying figures, after associating the limit switch 1 with the tubular element 3 which contains the electric motor 2 and after connecting the free end 32 of the card 29 to the connector 34 which is associated with the electric motor 2, it is possible to key to the ring 6 and to the pulley 4 a drum, not shown in the accompanying figures, which supports one or more blinds or awnings, also not shown.

[0095] It is thus possible to adjust the two stroke limit positions, the upper one and the lower one, of the limit switch 1; for this purpose, it is necessary to turn the adjustment screws 83a and 83b in an appropriate direction, so as to arrange the lugs 71a and 71b which protrude from the levers 70 of the first and second gear systems 41a and 41b so that they abut respectively against the first and second annular raised portions 60 and 63 and against the third annular raised portion 67; by continuing to turn the adjustment screws 83a and 83b, the fifth sprocket 57 and the second and third disks are turned until the equilibrium condition is reached in which the lower corners 171a and 171b of the lugs 71a and 71b are arranged respectively at the grooves formed in the first and second annular raised portions 60 and 63 and in the third annular raised portion 67.

[0096] In this equilibrium condition, the second tabs 68 which protrude from the third disks 65 are arranged below the overlying buttons 36a and 36b of the switches 30a and 30b.

[0097] It is thus possible to activate the electric motor 2 in order to turn the drum and roll up or unroll therefrom the blind/s or awning/s rolled up thereon.

[0098] Once a chosen first stroke limit condition has been reached, by acting on one of the two adjustment screws, for example the one designated by the reference numeral 83a, it is possible to turn the lever 70, in this case of the first gear system 41a, which is associated therewith, until the lugs 71a and 71b disengage respectively from the first, second and third annular raised portions.

[0099] Simultaneously, the first gear 74 engages the overlying fourth and fifth sprockets 56 and 57, the second gear 75 engages the first teeth 62 of the second disk 61, and the third gear 76 engages the second teeth 66 of the third disk 65.

[0100] By continuing the rotation of the adjustment

screw 83a, the frame 42 of the first gear system 41a, which interacts with the adjustment screw 83a, also rotates upward, in contrast with the elastic deformation of the respective first tab 45, until the second tab 68 presses the overlying button 36a of the switch 30a.

[0101] Pressing the button 36a stops the electric motor 2 and places it in a condition in which it can turn only in the opposite direction with respect to the one in which it was rotating previously.

[0102] By actuating the electric motor 2 again, the rotation of the drum in the opposite direction with respect to the preceding one is achieved, and therefore the movement of the blind/s or awning/s in the opposite direction with respect to the preceding one is achieved.

[0103] The rotation of the electric motor 2 is transmitted, through the first sprocket 8, the second sprocket 10 and the third sprocket 50, to the first gear 74 of the first gear system 41 a.

[0104] The first gear 74 transmits the rotation to the fifth sprocket 57, the first teeth 59 of which are already positioned, by way of the action of the previous interaction between the lugs 71a and 71b and the first, second and third annular raised portions, proximate to the second gear 75, so that the rotation of the fifth sprocket 57 causes the almost instantaneous rotation of the second gear 75.

[0105] The second gear 75 transmits the rotation to the second disk 61, the second teeth 66 of which are already positioned, by way of the action of the previous interaction between the lugs 71a and 71b and the first, second and third annular raised portions, proximate to the third gear 75, so that the rotation of the second disk 61 causes the almost instantaneous rotation of the third gear 76.

[0106] The third gear 76 transmits the rotation to the second disk 65, which turns, thus disengaging the button 36a or 36b from the second tab 68.

[0107] By continuing the rotation of the electric motor 2, the various sprockets, disks and gears of the first gear system 41 a which currently interacts with the electric motor 2 continue to turn.

[0108] Each full turn of the fifth sprocket 57 is matched by a rotation equal to one tooth pitch of the first teeth 59 of the second disk 61; a full turn of the second disk 61 is matched by a rotation equal to one tooth pitch of the second teeth 66 of the third disk 65.

[0109] Once the second stroke limit position has been reached, by acting on the other adjustment screw, in this case the screw 83b, in a manner similar to what has been described above, it is possible to press the button 36b of the switch 30b that lies above the second gear system 41b associated with the adjustment screw 83b, consequently stopping the electric motor 2 and presetting it so that subsequently it can rotate only in a direction which is opposite to the preceding one.

[0110] If the electric motor 2 is activated again, it turns in the opposite direction with respect to the preceding one, causing the rotation of the gears, disks and sprockets of the first and second gear systems 41a and 41b in mutually opposite directions.

[0111] As the electric motor 2 turns, the disks, gears, and sprockets of the first gear system 41a rotate in the opposite direction with respect to the one in which they had rotated in order to reach the second stroke limit position, tracing in reverse the angular positions that they had assumed, until the second tab 68 of the third disk 65 presses again the button 36a, stopping the electric motor 2, at the first stroke limit position.

[0112] By actuating again the electric motor 2, in a manner similar to what has been described above for the first gear system 41 a, the second gear system also traces in reverse the path to reach the first stroke limit position, until the second tab 68 of its third disk 65 presses again the button 36b at the second stroke limit position, stopping the electric motor 2 and presetting it to be able to subsequently rotate only in the opposite direction with respect to the preceding one.

[0113] Once the position of the first and second stroke limits has been adjusted in the manner described above, during the rotation of the electric motor 2 the first and second gear systems 41a and 41b, actuated by the first sprocket 8, press respectively the first and second buttons 36a and 36b when they reach the first and second stroke limit conditions, thus locking each time the electric motor 2 in these conditions and presetting it to turn in the opposite direction.

[0114] It has thus been found that the invention has achieved the intended aim and objects, a limit switch particularly for roll-up blinds or awnings having been devised whose adjustment can be achieved easily and rapidly by acting on the adjustment screws.

[0115] Further, since the switches are accommodated within the box-like body, which is arranged outside the tubular element that contains the electric motor and the drum, heat exchange between said switches and the outside environment is improved, and the possibility of their overheating is thus reduced; this increases the life of the limit switch according to the invention.

[0116] Moreover, thanks to the presence of the reinforcement bar which is associated longitudinally therewith, the limit switch according to the invention is very tough and can therefore be used also in combination with tubular elements and drums of considerable weight and size, withstanding in an optimum manner the flexural stresses imparted thereby.

[0117] Moreover, thanks to the integration of the switches and of the electrical power supply cable on the card which comprises a printed circuit and appropriately provided electrical contacts which allow easy connection of said card to the electric motor, the operations for fitting and any repair of the limit switch according to the invention are very easy, and this reduces assembly and maintenance costs and times.

[0118] Further, the production costs of the limit switch according to the invention remain low, since it is provided exclusively by means of components which are easy to manufacture and/or assemble.

[0119] The invention is of course susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0120] The materials used, as well as the dimensions that constitute the individual components of the invention, may of course be more pertinent accord to specific requirements.

[0121] The various means for performing certain different functions need not certainly coexist only in the illustrated embodiment but can be present per se in many embodiments, including ones that are not illustrated.

[0122] The characteristics indicated as advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0123] The disclosures in Italian Patent Application No. TV2006A000225 from which this application claims priority are incorporated herein by reference.

[0124] 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 limit switch, particularly for one or more blinds or awnings which can be rolled up onto a hollow drum which can be actuated by an electric motor which is accommodated in an appropriately provided tubular element inserted coaxially with respect to said drum, comprising an approximately cylindrical and hollow first stem, which can be inserted at one end of said tubular element and with which a ring is rotatably associated, said ring being associable with said drum by keying and having, on its internal surface, a set of teeth which interacts with a first sprocket which is supported rotatably within said first stem, **characterized in that** said first stem is connected, on the opposite side and externally with respect to said drum, to a box-like body which accommodates internally a first gear system and a second gear system, which interact selectively with said first sprocket and are adapted to actuate respectively two switches, the pressing of which stops said electric motor and brings said motor to a condition in which it can subsequently rotate only in a direction which is the opposite of the preceding one.

2. The limit switch according to claim 1, **characterized in that** said box-like body is open at the rear on the opposite side with respect to said first stem and can be closed by means of an appropriately provided lid.

3. The limit switch according to claims 1 and 2, **characterized in that** a cavity which has an approximately rectangular plan shape is formed within said box-like body, a first approximately T-shaped raised portion protruding from its bottom wall adjacent to one of its longitudinal edges, said raised portion comprising a second stem whose height is approximately equal to the depth of said cavity and two first wings which are not as high as said second stem, so as to form two lateral seats which have a substantially rectangular plan shape.

4. The limit switch according to claims 1 and 3, **characterized in that** two pairs of pins protrude approximately at right angles from said first wings of said first raised portion, so as to affect said two lateral seats, and are arranged mutually side by side in pairs.

5. The limit switch according to one or more of the preceding claims, **characterized in that** axially to said second stem of said raised portion there is a first through hole which preferably has an approximately square cross-section and within which a complementarily shaped reinforcement bar is arranged, said bar protruding beyond said lid and being preferably made of steel.

6. The limit switch according to claims 1 and 5, **characterized in that** said reinforcement bar is fixed to said limit switch by means of at least one screw which can be inserted transversely in said first stem through an appropriately provided opening.

7. The limit switch according to one or more of the preceding claims, **characterized in that** respectively two pairs of second holes are provided in a mirror-symmetrical fashion with respect to a transverse central axis in said bottom wall of said cavity and lie in pairs along axes which are parallel to an axis which is longitudinal with respect to said first raised portion, each on axes which are parallel to an axis which lies transversely to said first raised portion.

8. The limit switch according to one or more of the preceding claims, **characterized in that** said first sprocket is keyed to an end of a first shaft which has, at the other end, a second sprocket which is keyed thereto, said second sprocket being accommodated within said cavity, preferably on the opposite side with respect to said raised portion, along a diameter which passes through said transverse central axis.

9. The limit switch according to one or more of the preceding claims, **characterized in that** two third through holes are provided on a lower lateral surface of said box-like body on the opposite side with respect to said first raised portion.

10. The limit switch according to one or more of the pre-

ceding claims, **characterized in that** a fourth hole is provided parallel to and above said first hole and affects both said box-like body and said first stem.

11. The limit switch according to claims 1 and 10, **characterized in that** said fourth hole has an approximately T-shaped transverse cross-section in which there is a head which has a preferably approximately rectangular cross-section and a third stem which has a preferably substantially semicircular cross-section.

12. The limit switch according to claims 1 and 11, **characterized in that** an appropriately provided groove which has a preferably semicircular cross-section is formed at the lateral surface of said box-like body on which said lid rests, along a transverse central axis, and is connected to said fourth hole.

13. The limit switch according to one or more of the preceding claims, **characterized in that** it comprises a removable card which supports said two switches with which means for connection to an electrical mains are associated.

14. The limit switch according to claims 1 and 13, **characterized in that** said card has, in plan view, an approximately T-shaped configuration so as to form a fourth stem, which is shaped approximately complementary to said third stem of said fourth hole, so that it can be inserted therein, said fourth stem protruding from said limit switch with its free end.

15. The limit switch according to claims 1 and 14, **characterized in that** said free end of said third stem has, preferably on its upper and lower surfaces, suitable electrical contacts which allow the electrical connection thereof to an appropriately provided connector which is connected or connectable electrically to said electric motor and can be fixed, preferably by interlocking, to said free end.

16. The limit switch according to claims 1 and 15, **characterized in that** two lateral arms protrude from the other end of said fourth stem, approximately at right angles thereto, one of said two switches being fixed to each of said arms in a lower region.

17. The limit switch according to claims 1 and 15, **characterized in that** on said card there is an appropriately provided printed circuit which appropriately connects said switches to said electrical contacts.

18. The limit switch according to claims 1 and 17, **characterized in that** said switches are preferably shaped approximately like a parallelepiped and have such dimensions that they can be accommodated respectively within said seats formed in said box-like body, two buttons protruding approximately at right angles from the surface of said switches which is directed toward said lower lateral surface of said box-like body, two fifth holes being provided in said switches on the opposite side with respect to said fourth stem and therefore toward the surface concealed by said lid, the dimensions and arrangement of said holes being such as to allow to accommodate therein respectively said pins which protrude from said first raised portion at said seats.

19. The limit switch according to one or more of the preceding claims, **characterized in that** said means for connection to an electrical mains are constituted by an electrical cable, which is fixed above said card and can be inserted in said head of said fourth hole through said groove, said cable containing four distinct wires, of which three are soldered appropriately to said printed circuit of said card and the fourth one, which constitutes the ground wire, protrudes from said first stem on the opposite side with respect to said box-like body and can be connected to an appropriately provided grounding terminal of said limit switch, which is provided on said first stem.

20. The limit switch according to one or more of the preceding claims, **characterized in that** said first and second gear systems are accommodated within said cavity of said box-like body below said switches.

21. The limit switch according to claims 1 and 20, **characterized in that** each one of said first and second gear systems comprises a frame which is shaped, in a side view, approximately like an inverted letter U so as to form a substantially flat base, which is arranged during use so as to face one of said buttons, and two second wings, which are asymmetrical.

22. The limit switch according to claims 1 and 21, **characterized in that** a first longitudinal slot is provided in said base and affects at least the region thereof which during use faces one of said buttons.

23. The limit switch according to claims 1 and 22, **characterized in that** a first elastically deformable tab protrudes from the region of said base which is not affected by said first slot toward said overlying switch and abuts, during use, against said overlying first wings of said first raised portion, so as to apply constantly to said frame pressure in the opposite direction with respect to said first raised portion.

24. The limit switch according to claims 1 and 23, **characterized in that** two sixth holes and two seventh holes are provided in said second wings, have the same axis in pairs and are arranged during use so that they face respectively said second holes formed in said bottom wall of said cavity of said box-like

body.

25. The limit switch according to claims 1 and 24, **characterized in that** a second raised portion protrudes from the perimetric edge of one of said second wings and is directed away from said base approximately at right angles and approximately centrally to said wings.

26. The limit switch according to claims 1 and 25, **characterized in that** an appropriately provided pin protrudes, proximate to one of said corners of the wing of said second wings which during use is contiguous to said bottom wall, approximately at right angles and in the opposite direction with respect to said bottom wall, a third sprocket being rotatably associated with said pin and engaging said second sprocket during use.

27. The limit switch according to one or more of the preceding claims, **characterized in that** a substantially semicircular recess is formed in said base starting from the perimetric edge of one of said second wings and is connected to said adjacent first slot and arranged so that it can accommodate partially, during use, said button of said overlying switch.

28. The limit switch according to claims 1 and 27, **characterized in that** a second shaft is associated with said sixth and seventh holes that are arranged closest to the center of said cavity, said second shaft protruding with its ends approximately at right angles from said second wings, a fourth sprocket being associated rotatably with said second shaft, being adjacent to said second wings and interacting with said third sprocket.

29. The limit switch according to claims 1 and 28, **characterized in that** said second shaft supports rotatably a fifth sprocket, which is adjacent to said fourth sprocket and has, on the opposite side with respect to said fourth sprocket, a first disk from the perimetric edge of which two first teeth protrude approximately at right angles thereto, said first teeth being approximately parallel and mutually laterally adjacent, a first annular raised portion protruding from said first disk approximately centrally and on the opposite side with respect to said fourth sprocket, having an approximately cardioid plan shape and having a pointed end which is arranged diametrically opposite a groove, said pointed end being arranged at a preset angular distance from said first teeth.

30. The limit switch according to claims 1 and 29, **characterized in that** said second shaft supports rotatably a second disk which is contiguous to said first disk, proximate to the perimetric edge of which a plurality of first teeth protrude approximately at right angles thereto and in the direction of said fifth sprocket, said first teeth being arranged approximately equidistantly along a circumference, a second annular raised portion protruding from the surface of said second disk which is directed toward said first disk approximately at right angles and centrally thereto, having an approximately cardioid plan shape, and abutting against said first annular raised portion, two second teeth protruding approximately at right angles, proximate to the perimetric edge of said second disk, from the surface of said second disk which is directed in the opposite direction with respect to said fifth sprocket, said second teeth being approximately mutually parallel and laterally adjacent, their angular distance from the pointed end of said second annular raised portion being equal to the distance between said two first teeth and the pointed end of said first annular raised portion.

31. The limit switch according to claims 1 and 30, **characterized in that** said second shaft supports rotatably a third disk, which is adjacent to the surface of said second disk which lies opposite the one provided with said second annular raised portion, from the perimetric edge of which a plurality of second teeth protrude approximately at right angles thereto and in the direction of said second disk, said second teeth being mutually equidistant and arranged along a circumference, a third annular raised portion protruding approximately centrally and at right angles from the surface of said third disk which is directed toward said second disk and having an approximately cardioid plan shape, a second tab protruding radially from the perimetric edge of said third disk and being arranged approximately on the opposite side with respect to the pointed end of said third annular raised portion and being adapted to abut against said overlying button of said overlying switch.

32. The limit switch according to one or more of the preceding claims, **characterized in that** a third shaft is associated with said sixth and seventh holes of said second wings of said frame which lie furthest from the center of said cavity, said third shaft protruding, with its ends, approximately at right angles from said second wings, a box-like lever being rotatably associated with said second wings and being able to rotate selectively with respect to said frame.

33. The limit switch according to claims 1 and 32, **characterized in that** said lever has, at one of its ends which is directed during use toward said base of said frame, two lugs which protrude toward said second shaft and whose lanceolate transverse ends engage selectively respectively said first and second and third annular raised portions, each of said lugs having, at their free end, a lower corner which during use is directed away from said base of said frame.

34. The limit switch according to claims 1 and 33, **characterized in that** an appropriate rotation of said lever causes the engagement of said two lugs respectively with said first and second annular raised portions and with said third annular raised portion, causing the rotation of said fifth gear and of said second and third disks to a condition of equilibrium in which said lower corners of said lugs are positioned respectively at said grooves formed in said first and second annular raised portions and in said third annular raised portion.

35. The limit switch according to one or more of the preceding claims, **characterized in that** shoulders protrude approximately at right angles from the end of said lever which lies opposite said lugs and are adapted to support a fourth shaft, which protrudes with its ends from said shoulders, so as to abut, with one of its ends, against said second raised portion which protrudes from said perimetric edge of one of said second wings of said frame in order to limit the rotation of said lever.

36. The limit switch according to one or more of the preceding claims, **characterized in that** a first, second and third gear are associated rotatably with said fourth shaft.

37. The limit switch according to claims 1 and 36, **characterized in that** the shape and position of said first gear are such that said gear, in the condition in which said lugs are not engaged with the respective first, second and third annular raised portions, meshes simultaneously with said fourth sprocket and with said fifth sprocket.

38. The limit switch according to claims 1 and 37, **characterized in that** the shape and position of said second gear are such that in the condition in which said lugs are not engaged respectively with said first and second annular raised portions and with said third annular raised portion, said second gear meshes with said first teeth of said second disk and with said first teeth of said first disk when they pass proximate to said second gear.

39. The limit switch according to claims 1 and 38, **characterized in that** the shape and position of said third gear are such that said third gear, in the condition in which said lugs are not engaged respectively with said first and second annular raised portions and with said third annular raised portion, meshes with said second teeth of said third disk and with said second teeth of said second disk when they pass proximate to said third gear.

40. The limit switch according to claims 1 and 39, **characterized in that** an appropriately provided arm protrudes longitudinally from the end of said lever which lies opposite said lugs and can engage appropriately provided means for adjusting the position of said lever.

41. The limit switch according to one or more of the preceding claims, **characterized in that** said first and second gear systems are accommodated during use by arranging said second wing of said frame provided with said pin adjacent to said bottom wall of said cavity of said box-like body and by inserting said ends of said second and third shafts within said second holes formed in said bottom wall, the dimension and shape of said second holes being such as to allow a slight rotation of said frames of said first and second gear systems with respect to said third shafts rigidly coupled to said box-like body.

42. The limit switch according to one or more of the preceding claims, **characterized in that** said means for adjusting the position of said lever comprise two first plates which have a preferably approximately rectangular plan shape and have such dimensions that they can be associated slidingly with the lower lateral surface of said box-like body, on opposite sides with respect to said vertical central axis, the stroke of said first plates with respect to said lower lateral surface in the direction of the centerline of the latter being limited by the presence of a third raised portion which protrudes from said lower lateral surface, toward the inside of said cavity, approximately at said vertical central axis.

43. The limit switch according to claims 1 and 42, **characterized in that** two second transverse slots are provided starting from the perimetric edge of said first plates which during use is directed toward said bottom wall of said cavity and approximately at a first transverse end thereof, said arms which protrude from said levers being inserted in said slots during use.

44. The limit switch according to claims 1 and 43, **characterized in that** two third transverse slots are provided respectively at a second transverse end of said first plates, appropriately provided pins being slidingly associable therein and protruding approximately at right angles and in an eccentric position from the upper end of two appropriately provided substantially cylindrical adjustment screws which can be associated freely within said third holes formed in said lower lateral surface of said box-like body.

45. The limit switch according to claims 1 and 44, **characterized in that** the rotation of said adjustment screws causes the translational motion of said first plates with respect to said lower lateral surface of said box-like body and the oscillation of said levers

of said first and second gear systems with respect to said frame.

46. The limit switch according to one or more of the preceding claims, **characterized in that** said frames of said first and second gear systems are connected to said overlying switches by means of two appropriately provided second plates, which have a preferably approximately rectangular plan shape, proximate to a third transverse end of which there are two eighth holes within which said pins which protrude from said first raised portion can be accommodated respectively, ninth holes being provided respectively proximate to a fourth transverse end of said second plates, said ends of said third shafts being accommodatable respectively, during use, within said holes, arc-like slots being formed in said second plates proximate to said ninth holes and being able to accommodate slidingly the ends of said second shafts of said first and second gear systems, the shape of said slots being such as to allow a slight rotation of said frames of said first and second gear systems with respect to said third shafts rigidly coupled to said box-like body.

47. A limit switch, particularly for one or more blinds or awnings which can be rolled up onto a hollow drum which can be actuated by an electric motor which is accommodated in an appropriately provided tubular element inserted coaxially with respect to said drum, comprising a first approximately cylindrical hollow stem which can be inserted at one end of said tubular element and with which a ring is rotatably associated which can be keyed to said drum and has, on its internal surface, a set of teeth which interacts with a first sprocket which is supported rotatably within said first stem, **characterized in that** said first stem is connected, on the opposite side and externally with respect to said drum, to a box-like body within which a first gear system and a second gear system are accommodated which interact selectively with said first sprocket and are adapted to actuate respectively two switches whose pressing stops said the electric motor and places it in a condition in which it can subsequently rotate only in the opposite direction with respect to the preceding one, said limit switch comprising a removable card which supports said two switches and with which means for connection to an electrical mains are associated.

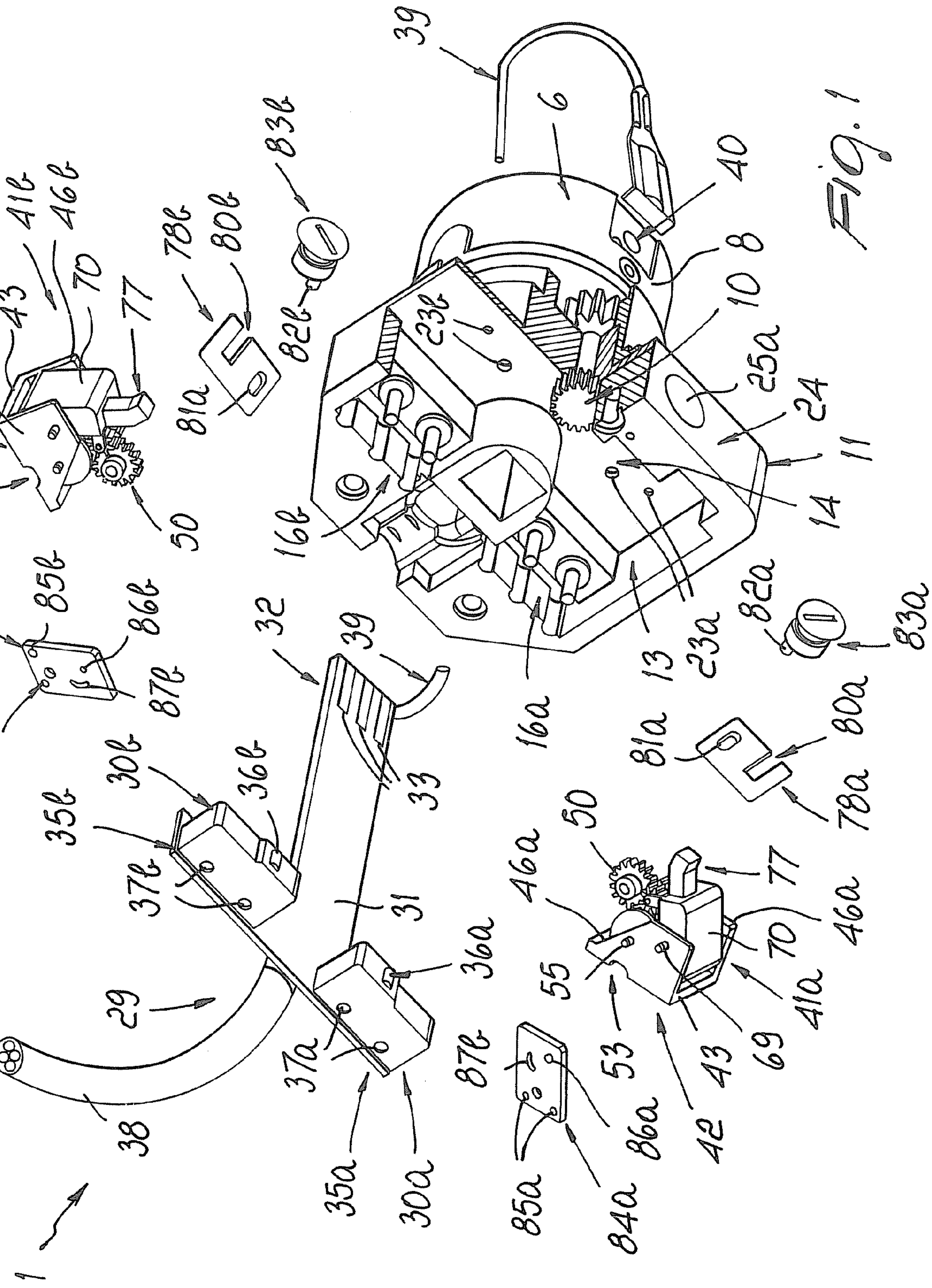

Fig. 1

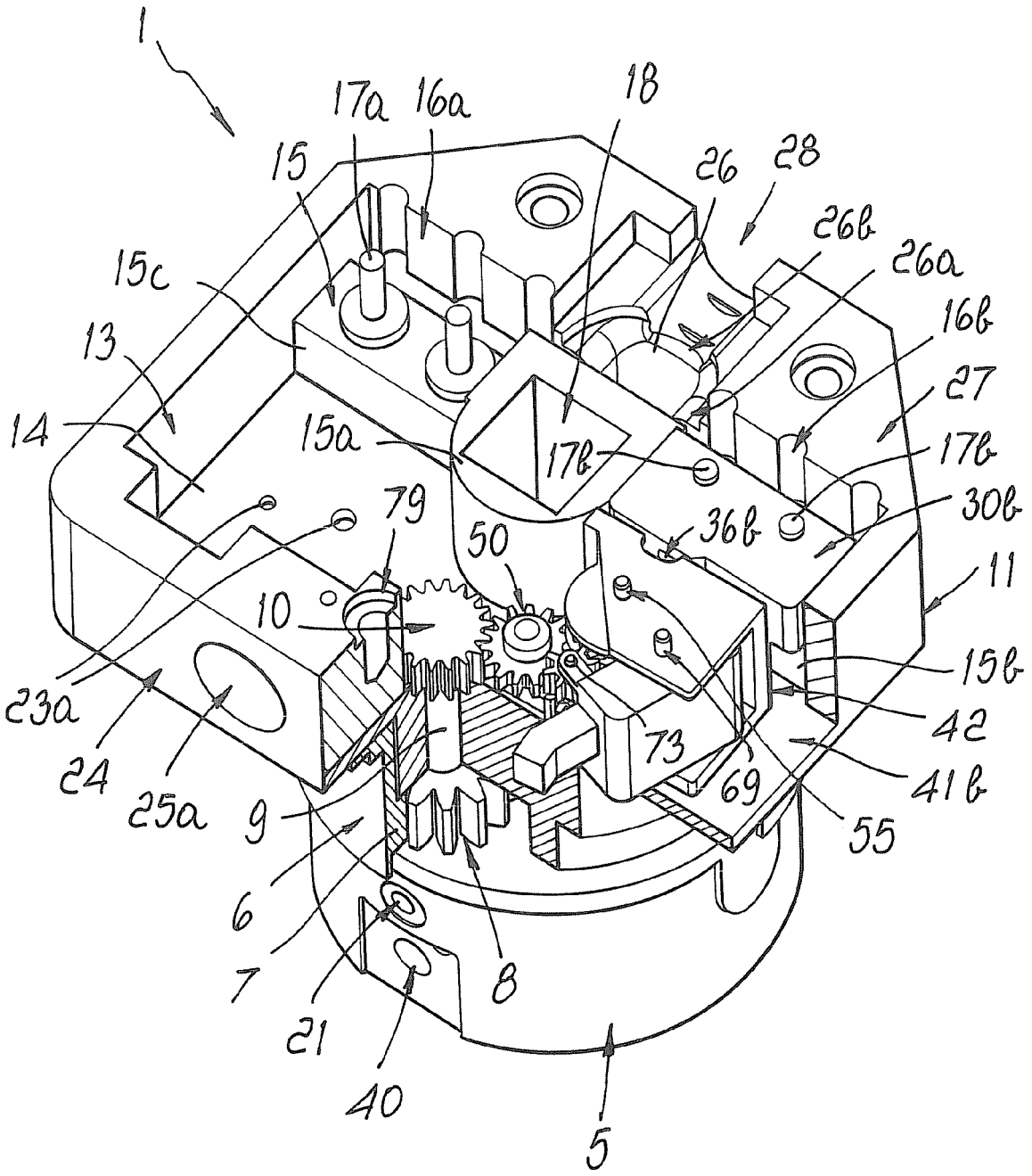
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Fig. 2

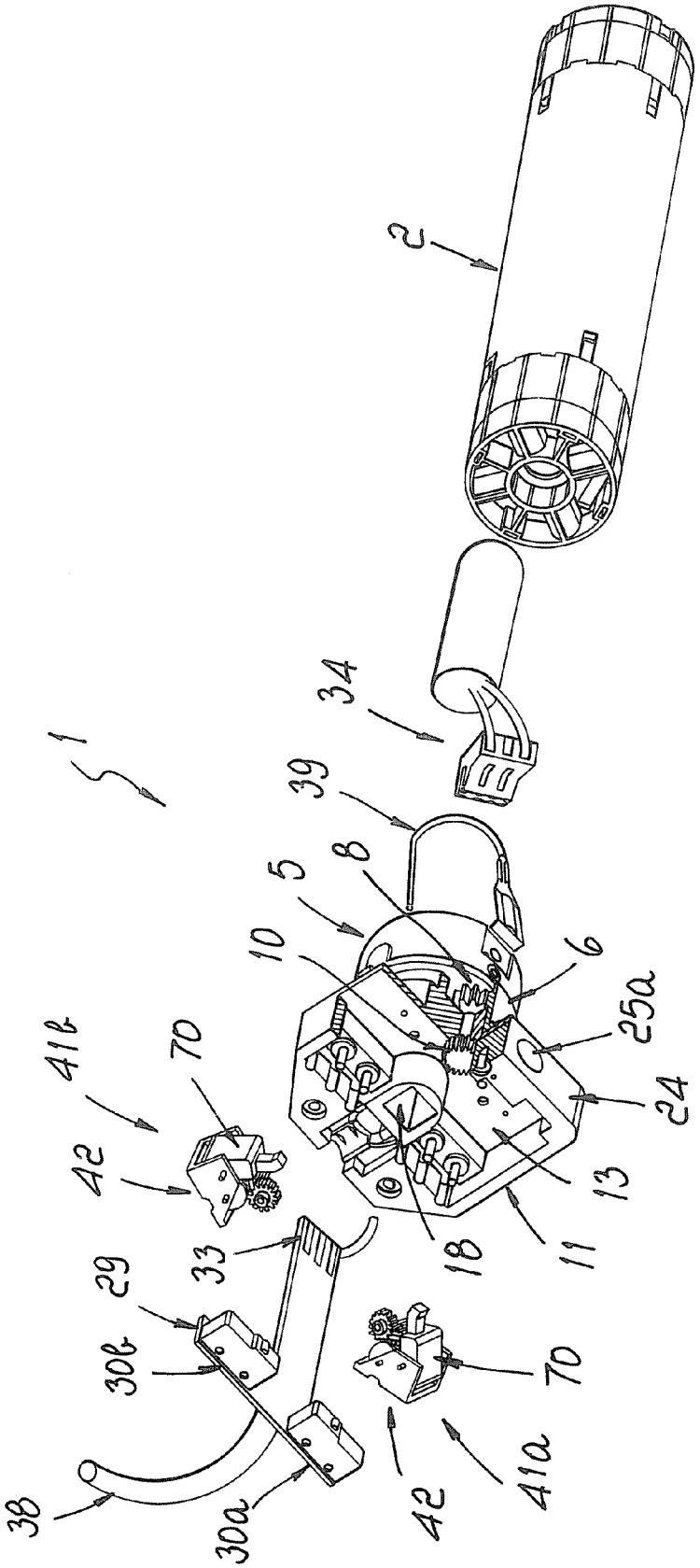


Fig. 3

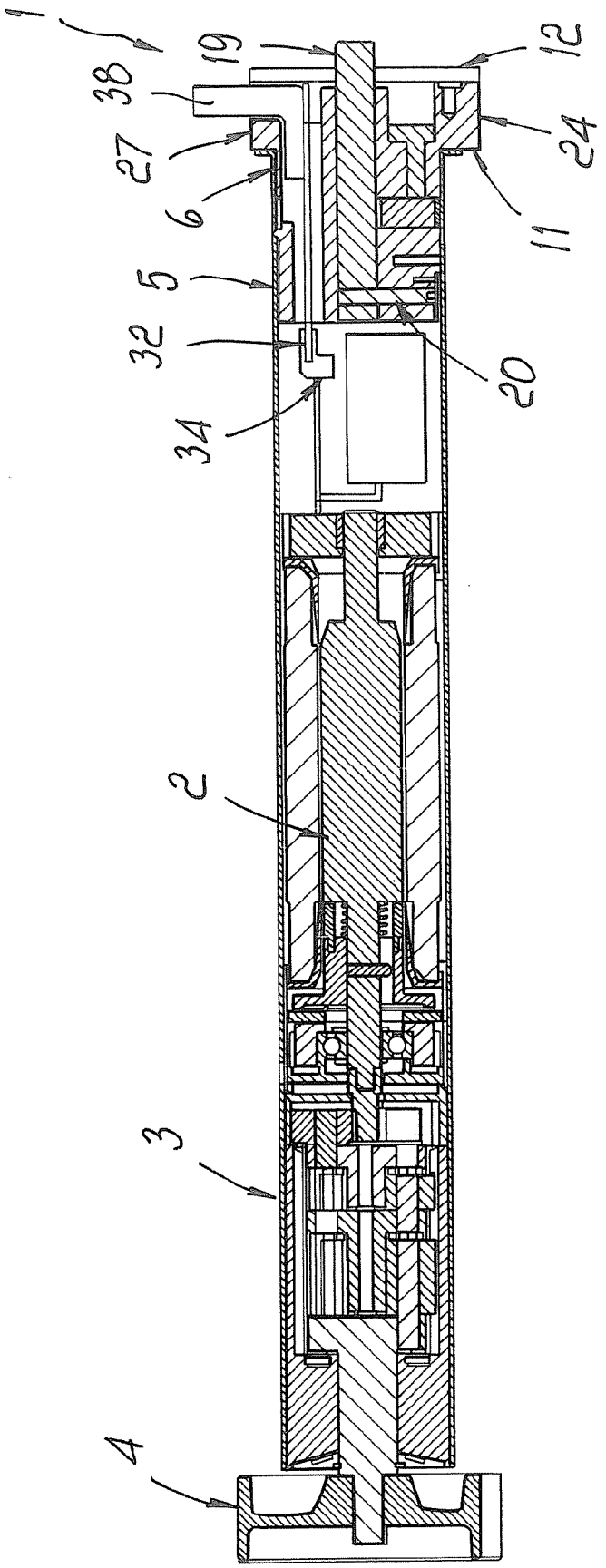


Fig. 4

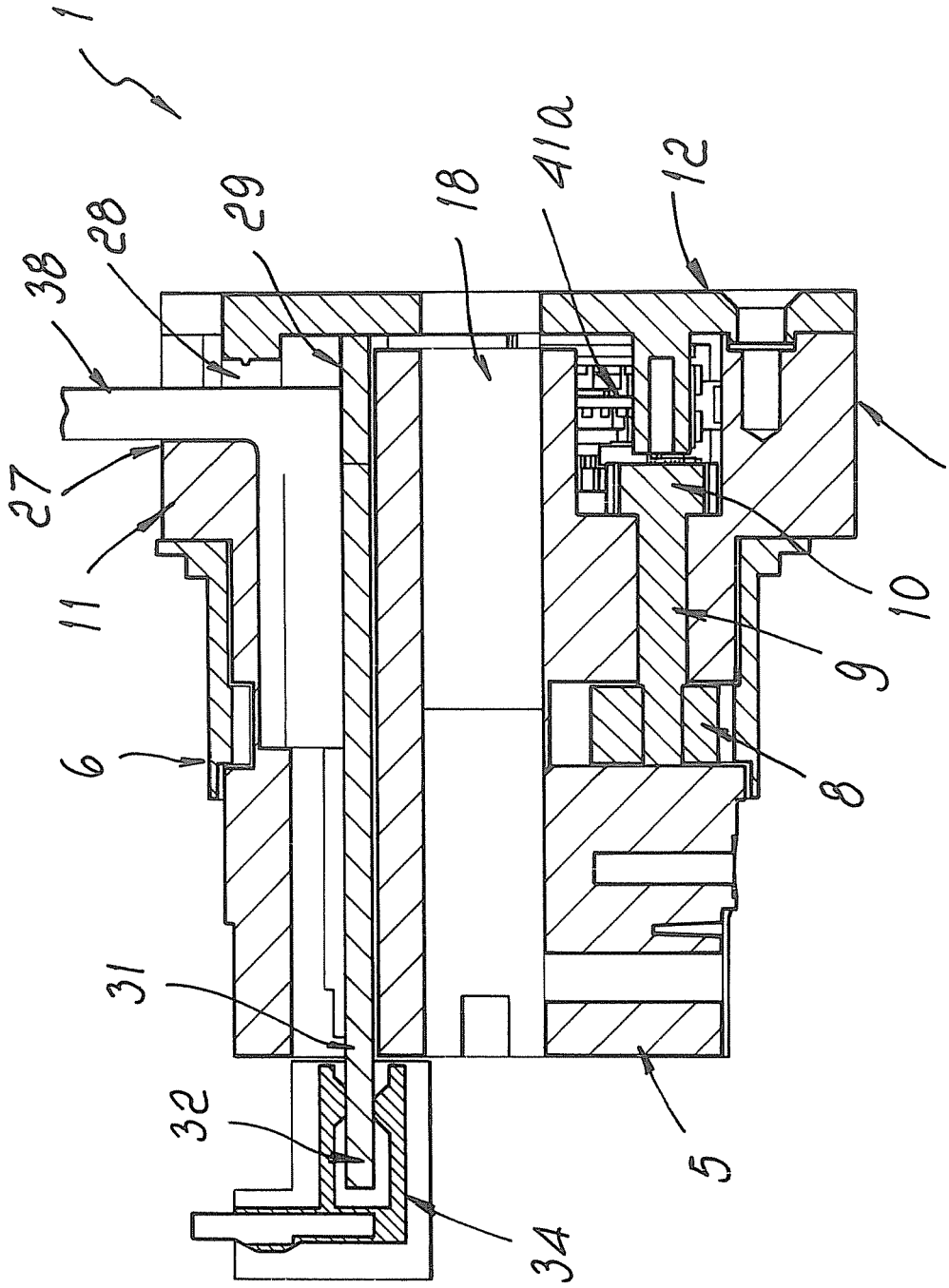
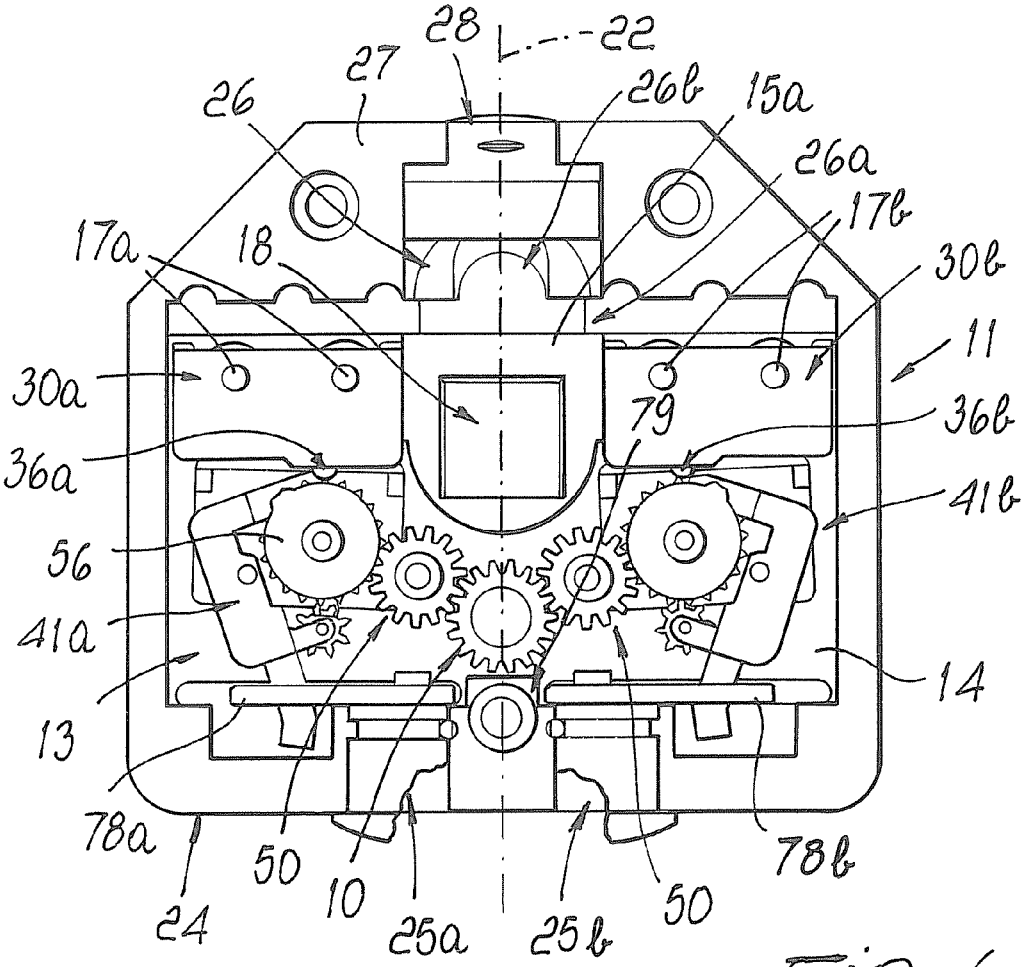


Fig. 5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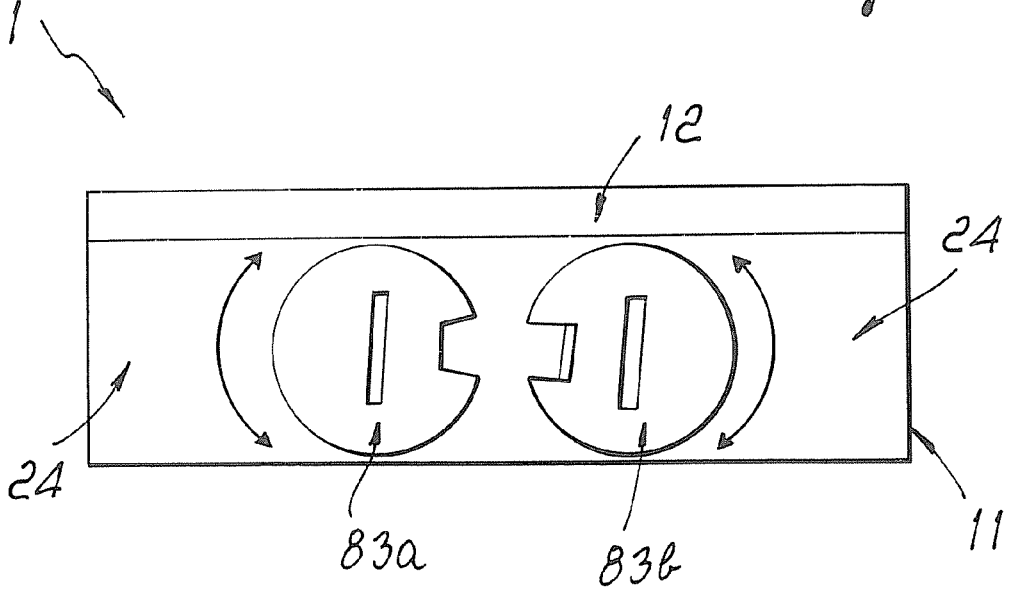
25b
50
78b
24

Fig. 6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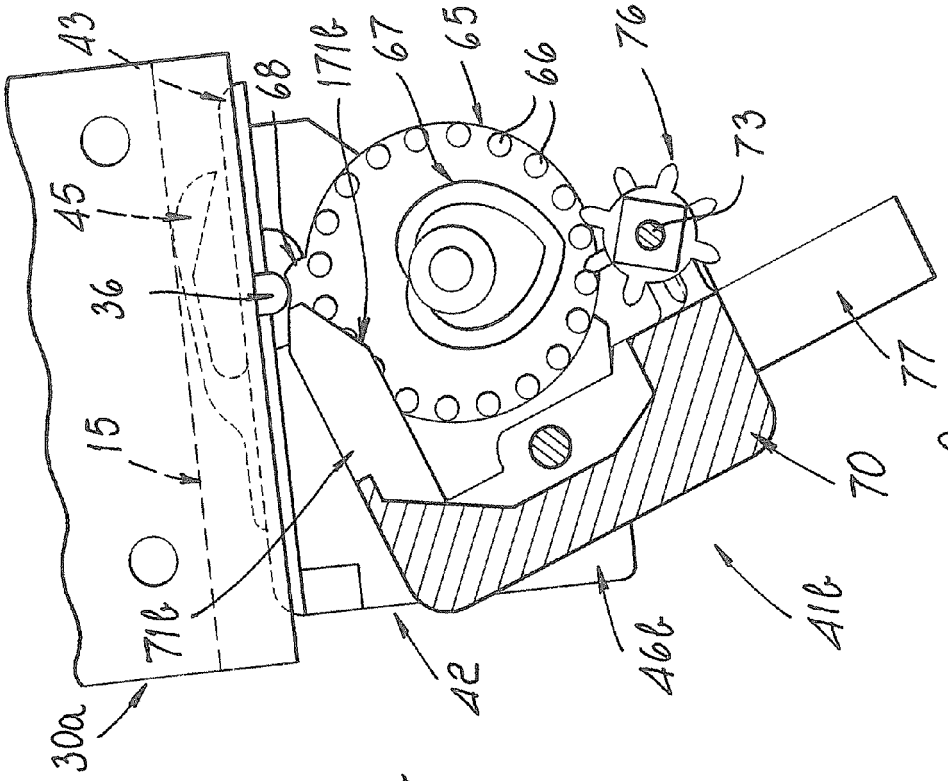
83a
83b
11

Fig. 7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36
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71b
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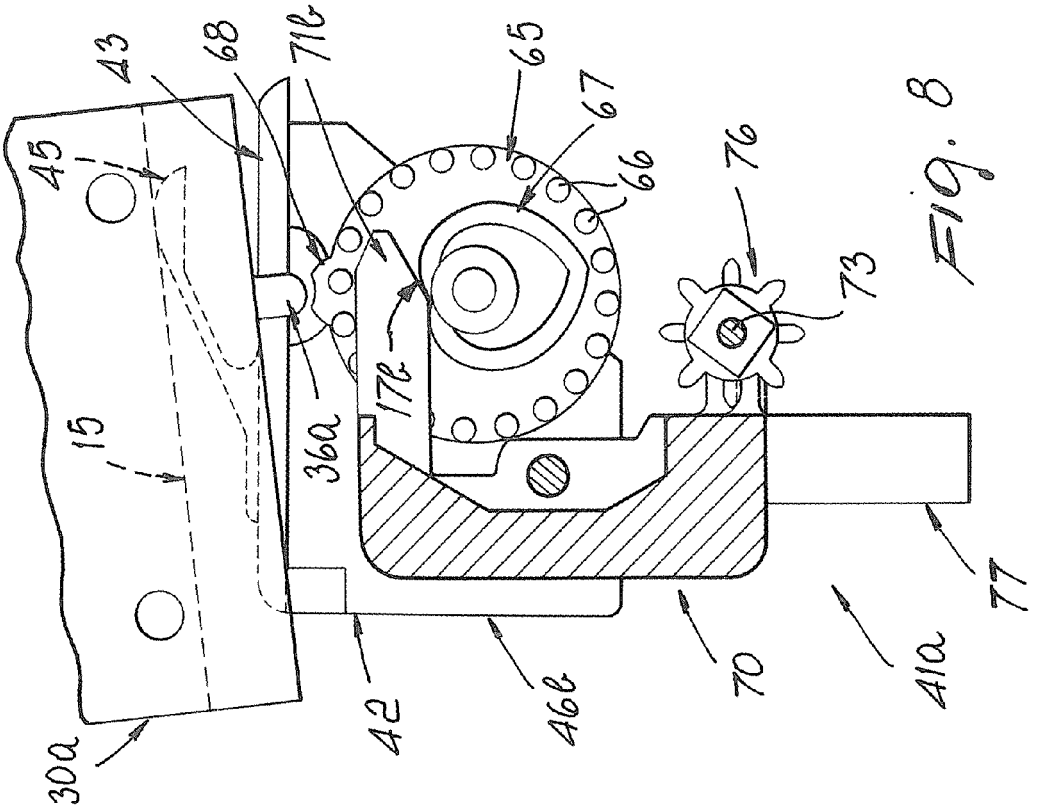
30a
42
46b
41b

Fig. 9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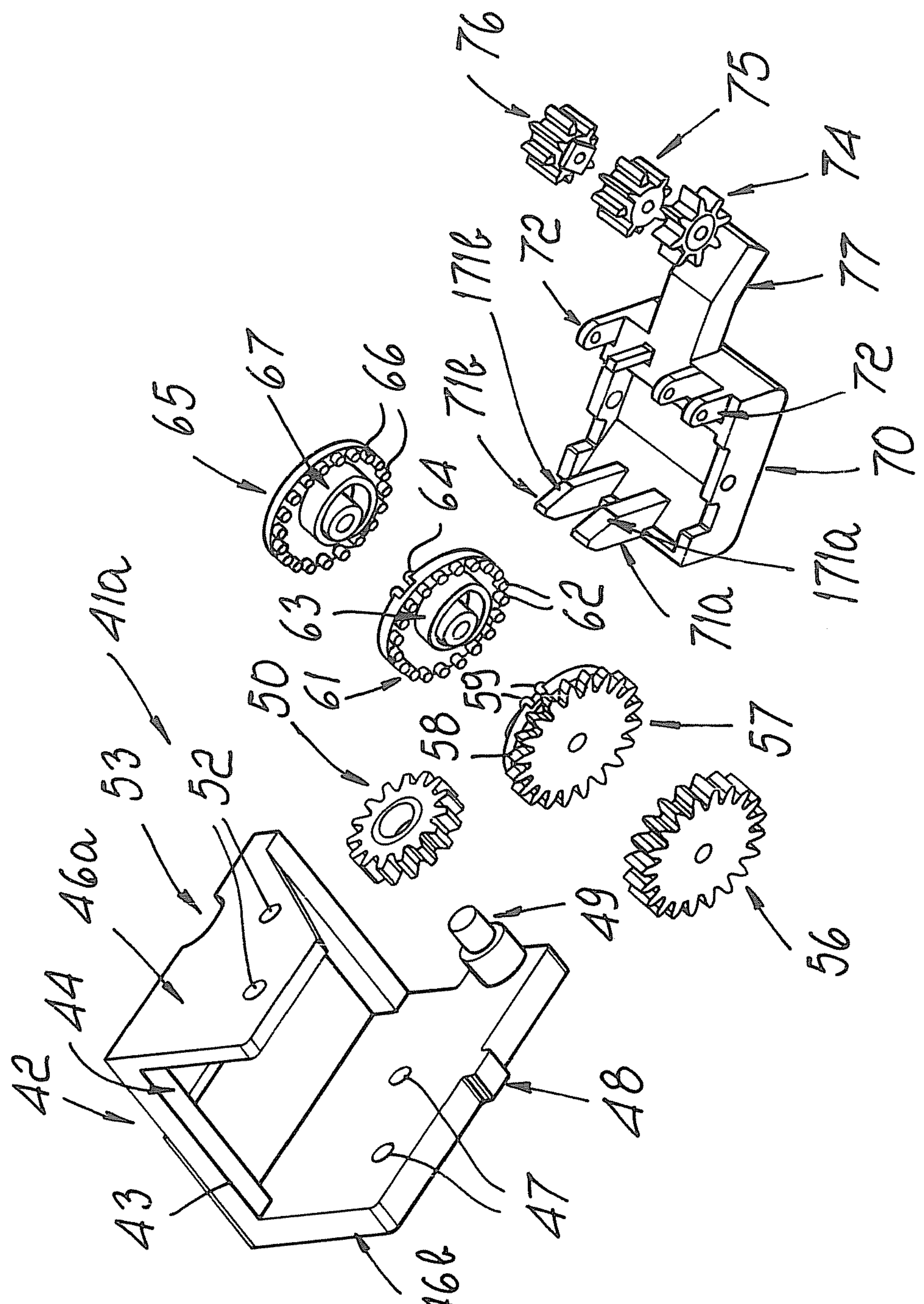
66
76
73
45
15
36a
17b
77
70
30a
42
46b
41a

Fig. 8


41a
42
43
44
46a
46b
47
48
49
50
52
53
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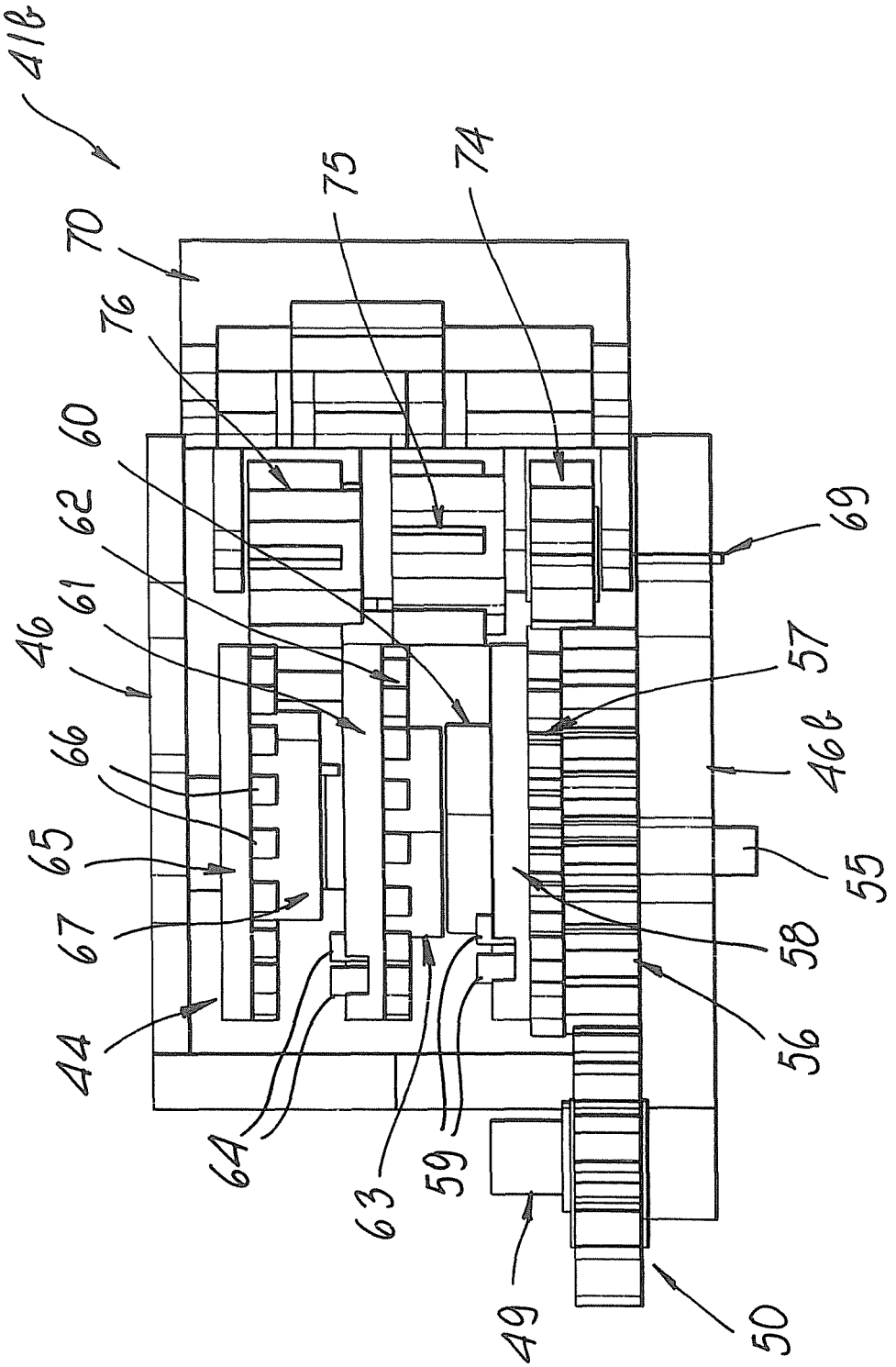
57
58
59
61
62
63
64
65
66
67
70
71a
71b
171a
171b
72
72
74
75
76
77

Fig. 10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65
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49
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56
58
55
46b
57
69

Fig. 11

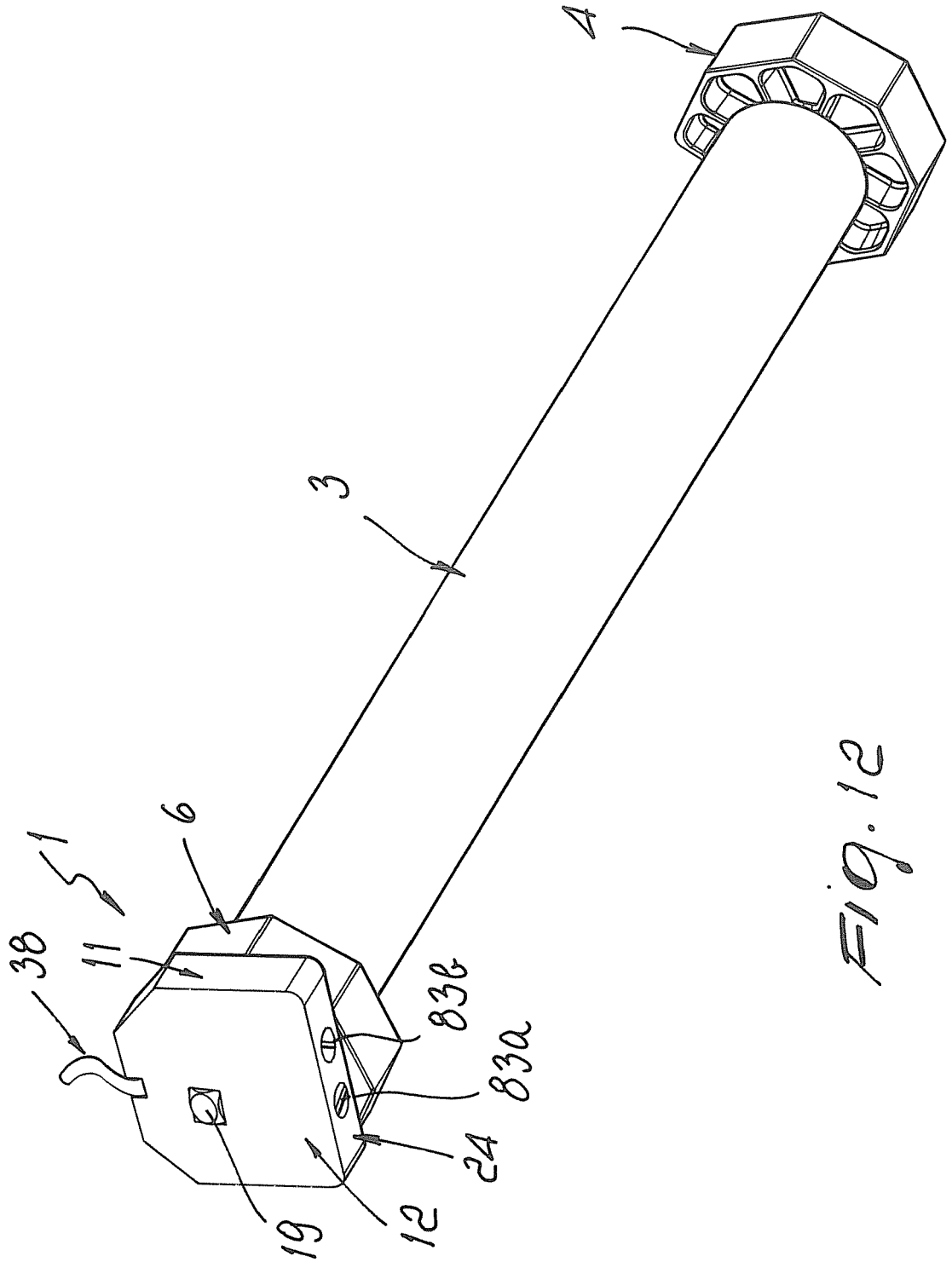

Fig. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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