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(54) **INTEGRATED ASSEMBLY FOR THE MOTORIZED OPERATION OF A ROLL-UP SHUTTER**

(57) An integrated assembly for the motorized operation of a roll-up shutter (A) comprises a tubular shaft (10) with horizontal axis, wherein the roll-up shutter is externally fixed and rolled, and wherein a geared motor

(20), an arresting device (30) and a set of compensating springs (40), which are disposed between said geared motor (20) and said arresting device (30), are housed.

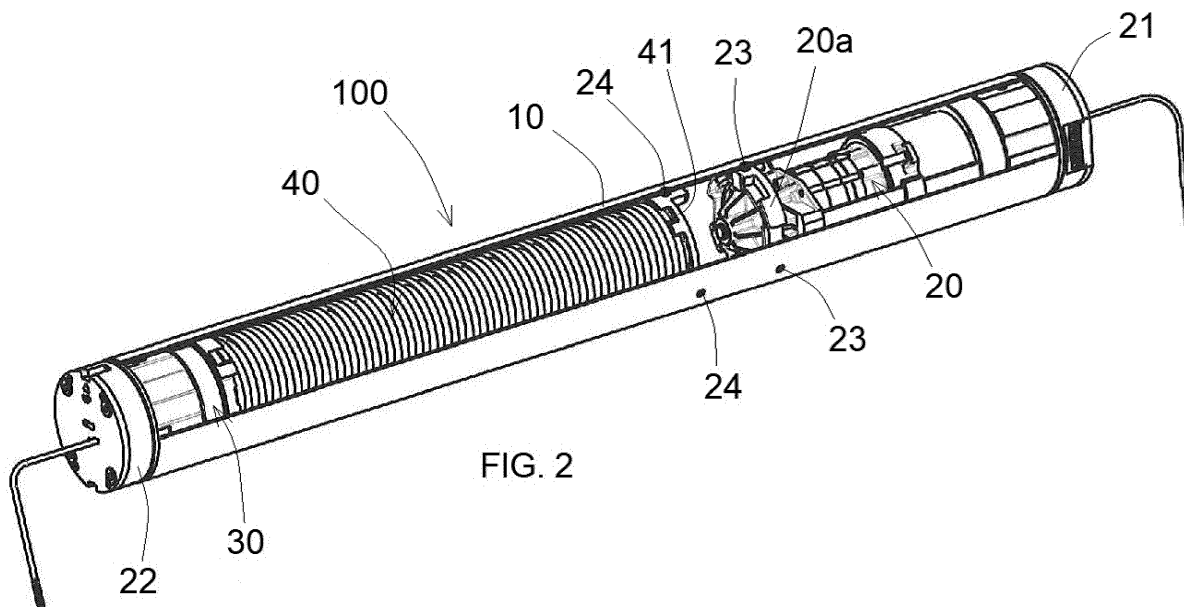


FIG. 2

Description

[0001] The present patent application for industrial invention relates to an integrated assembly for the motorized operation of a roll-up shutter.

[0002] An integrated assembly comprises a geared motor suitable for actuating the shaft associated with the roll-up shutter, a compensating spring and a safety device, which is technically known as "arresting device".

[0003] The compensating spring is a torsion spring that is wound around said shaft, and is automatically loaded during the descending travel of the roll-up shutter, in such a way that the following ascending travel will require less power from the geared motor, it being assisted by said torsion spring that provides a lifting force when it is discharged, basically balancing the weight of the roll-up shutter.

[0004] As it is known to all experts of the art, an arresting device is a safety device that is automatically operated to stop the descending travel of the roll-up shutter automatically and instantaneously when its speed exceeds a preset threshold value, said circumstance being indicative of a failure of the compensating spring that would cause the uncontrolled, dangerous free fall of the roll-up shutter because its weight is no longer balanced by the compensating spring.

[0005] The three parts of the roll-up shutter, namely the geared motor, the compensating spring and the arresting device, are known in the prior art and are normally used. However, they are never combined and used according to the operation mode provided in the integrated assembly of the present invention.

[0006] More precisely, integrated assemblies are known, wherein the arresting device is directly coupled with the geared motor, as well as integrated assemblies wherein the compensating spring cooperates with a geared motor, without the provision of an arresting device.

[0007] In the first case, being the arresting device directly coupled with the geared motor, in case of a failure of the compensating spring and consequently in case of operation of the arresting device, the reset operation of the arresting device is a complicated operation that requires an intervention on the geared motor.

[0008] WO2014/203287 discloses an anti-drop safety device against torsion spring break in rolling shutters.

[0009] DE202012012664 discloses a rolling shutter provided with an anti-drop safety device.

[0010] EP1760251 discloses an anti-fall safety device for rolling shutters compensated with torsion springs.

[0011] The purpose of the present invention is to disclose an integrated assembly for the motorized operation of a roll-up shutter that is not impaired by the drawbacks of the prior art and is characterized, first of all, by the easy, quick reset of the arresting device, in case of failure of the compensating spring.

[0012] The purpose of the present invention is to disclose an integrated assembly for the motorized operation

of a roll-up shutter that is reliable, safe and inexpensive to produce.

[0013] Finally, another purpose of the present invention is to disclose an integrated assembly wherein the power supply of the geared motor is automatically disconnected in case of actuation of the arresting device, thus preventing the geared motor from being involuntarily or inadvertently actuated when the tubular shaft of the roll-up shutter is blocked by the arresting device.

[0014] These purposes, together with additional purposes, are achieved according to the invention with the characteristics of the independent claim 1.

[0015] Advantageous embodiments of the invention appear from the dependent claims.

[0016] All the innovative features of the invention will appear manifest from the detailed description below, which refers to a merely illustrative, not limiting embodiment, as illustrated in the appended figures, wherein:

- Fig. 1 is an axonometric diagrammatic view of the integrated assembly according to the invention in operating condition;
- Fig. 2 is an axonometric diagrammatic view of the integrated assembly according to the invention;
- Fig. 3 is an exploded three-dimensional view of an enlarged detail enclosed in the circle (C) of Fig. 2;
- Fig. 3A is an enlarged view of a detail of Fig. 3, relative to said arresting device;
- Fig. 4 is an exploded three-dimensional view of all constructive parts illustrated in Fig. 3A;
- Fig. 5 is a sectional view, along a first longitudinal plane passing through the axis of rotation of the tubular shaft of the roller-up shutter, of said compensating spring and of said arresting device, with supports;
- Fig. 6 is a sectional view, along a second longitudinal plane passing through the axis of rotation of the tubular shaft of the roller-up shutter, of said compensating spring and of said arresting device, said second plane being orthogonal to said first longitudinal plane;
- Fig. 7 is a sectional view of one of the two ending supports of the tubular shaft of the roller-up shutter, along a third longitudinal plane passing through the axis of rotation of the tubular shaft of the roller-up shutter;
- Fig. 8 is a view of the support of Fig. 7 seen from the exterior along a coaxial direction relative to the axis of rotation of the tubular shaft of the roller-up shutter; in this figure, some parts are partially omitted in order to show other parts that are disposed in the back;
- Fig. 8A is an enlarged view of a detail enclosed in the circle (C) of Fig. 8, relative to said arresting device;
- Fig. 9 is a view of the support of Fig. 7 seen from the exterior along a coaxial direction with the axis of rotation of the tubular shaft of the roller-up shutter; in this figure, some parts are partially omitted to show

other parts that are disposed in the back;

- Fig. 9A is an enlarged view of a detail enclosed in the circle (C) of Fig. 9, relative to said arresting device.

[0017] With reference to Figs. 2 and 3, the present invention relates to an integrated assembly (100) for the motorized operation of a roll-up shutter (A) rolled around a tubular shaft (10) with horizontal axis, wherein said integrated assembly (100) comprises a geared motor (20), an arresting device (30) and a set of compensating springs (40) disposed between said geared motor (20) and said arresting device (30).

[0018] Said tubular shaft (10) is revolvingly supported by two bottoms (21 and 22) suitable for being fixed to the wall by means of ordinary brackets (B), as shown in Fig. 1.

[0019] Otherwise said, said bottoms (21 and 22) are fixed and support radial bearings, in such a way that said tubular shaft (10) is free to rotate with respect to the bottoms (21 and 22) around a horizontal axis (X) that coincides with the longitudinal axis of the tubular shaft (10).

[0020] One of said bottoms (21) acts as support also for said geared motor (20), the rotor (20a) of said geared motor (20) being joined to the tubular shaft (10) by means of screws (23).

[0021] Being the roller-up shutter (A) externally fixed on the tubular shaft (10), the rotation of the tubular shaft (10) in either direction determines the rolling or the unrolling of the roller-up shutter relative to the tubular shaft (10).

[0022] As already mentioned, the set of compensating springs (40) is disposed between said geared motor (20) and said arresting device (30).

[0023] As shown in Figs. 5 and 6, said set of compensating springs (40) comprises an opposite pair of circular flanges (41 and 42); a torsion spring (40a) is compacted and developed in intermediate position between the two flanges (41 and 42) and the ending turns of said torsion spring (40a) are joined to the flange (41) and the flange (42), respectively.

[0024] The flange (41) disposed at the end of the spring (40a) directed towards the geared motor (20) revolves around said axis (X), said flange (41) being joined with the tubular shaft (10) by means of screws (24), as shown in Fig. 2.

[0025] Otherwise said, the geared motor (20) rotates the tubular shaft (10), which rotates said flange (41) in the same direction.

[0026] Said two opposite flanges (41 and 42) are inserted in a same shaft (43), which is coaxial and internal to the tubular shaft (10), and is joined to said flange (41) by means of a pin (43a).

[0027] In view of the above, the geared motor (20) rotates the tubular shaft (10), which rotates said flange (41) in the same direction, said flange (41) rotating said shaft (43) in the same direction.

[0028] On the contrary, the flange (42) is fixed, it being indirectly connected to said bottom (22) in such a way

that said flange (42) remains stationary until said shaft (43) rotates with the other flange (41) and the tubular shaft (10).

[0029] Evidently, the loading of the torsion spring (40a) during the descending travel of the roller-up shutter (A) is possible because the flange (42) is fixed, whereas the flange (41) revolves around the axis X.

[0030] The arresting device (30) has a traditional constructive and functional configuration, comprising:

- a stator (31) that consists in a ring provided with a set of regularly spaced niches (31a) on its internal edge, as shown in Fig. 3A;
- a rotor (32) consisting in a disc disposed in central position inside said stator (31) and integrally revolving with said tubular shaft (10) of the roller-up shutter;
- said disk being provided with a set of counter-niches (32a) on its external cylindrical wall, said counter-niches (32a) being regularly spaced and housing cylindrical rollers (32b), as shown in Fig. 3A.

[0031] Until the rotational speed of the tubular shaft (10) is compatible with the number of revolutions of the geared motor (20), the centrifugal force exerted on said rollers (32b) is not sufficient to eject said rollers (32b) from the counter-niches (32a) wherein they are housed, and consequently said rotor (32) regularly revolves inside said stator (31).

[0032] When the roller-up shutter starts a free descending travel because of a failure, rotating the tubular shaft (10), said rollers (32b) are centrifuged out of the counter-niches (32a) wherein they are housed and are trapped astride said niches (31a) and said counter-niches (32b), determining the abrupt stop of the rotor (32) and indirectly of the tubular shaft (10) of the roller-up shutter.

[0033] As shown in Figs. 3A and 7, according to the preferred embodiment of the present invention, said stator (31) is obtained in one piece with said flange (42) provided on the side directed towards the bottom (22) with a circular housing (42a) wherein the rotor (32) is centered, it being enclosed in said circular housing (42a) by means of a grilled cover (33) fixed with screws (34) tightened on the stator (31).

[0034] As shown in Fig. 7, said shaft (43) passes through the flange (42) and the hub (32c) of the rotor (32).

[0035] With reference to Figs. 4, 5 and 7, said shaft (43) is joined with said hub (32c) by means of a radial pin (43b). In view of the above, the shaft (43) rotates said rotor (32) that rotates relative to the fixed flange (42).

[0036] With reference to Figs. 4 and 7, it must be noted that the flange (42) is indirectly supported by the bottom (22) by means of a drum (50) disposed between the bottom (22) and the flange (42).

[0037] Said drum (50) comprises a central hole (51) wherein the ending section (43c) of said shaft (43) is inserted and supported by means of radial bearings (60).

[0038] Said drum (50) comprises an external collar (52)

supported by radial bearings (61) in such a way that said external collar (52) and said ending section (43c) revolve around said axis (X), whereas the drum (50) remains stationary together with the bottom (22), which is joined to the drum (50) by means of screws (70) that pass through holes (70a) of the bottom (22) and are tightened in suitable threaded holes (70b) of the drum (50), as shown in Figs. 4 and 5.

[0039] It must be noted that the flange (42) is joined with the drum (50) by means of a male-female coupling that allows the flange (42) to rotate by a small angle around the axis (X) relative to the drum (50), which remains stationary together with the bottom (22).

[0040] As shown in Figs. 3A and 7, the side of the flange (42) directed towards the bottom (22) is provided with an external annular edge (42b) revolvingly inserted in a corresponding annular groove (50a) obtained on the drum (50).

[0041] The amplitude of the angle of rotation of the flange (42) relative to the drum (50) is determined by a screw (80) tightened in a hole (81) of the flange (42) and slidably inserted in a curved slot (90) obtained on the drum (50), as shown in Figs. 8 and 9.

[0042] A spring (95) is disposed between the drum (50) and the flange (42) to rotate the flange (42) in a direction (S1) opposite to the direction (S2) determined by the thrust of the torsion spring (40a) that exerts a much stronger thrust than the spring (95).

[0043] In view of the above, during the ordinary operation of the roller-up shutter (see Fig. 8), the position of the screw (80) relative to the slot (90) is determined by the thrust of the torsion spring (40a); on the contrary, in case of a failure of the torsion spring, the position of the screw (80) relative to the slot (90) is determined by the thrust of the spring (95), as shown in Fig. 9.

[0044] A rod (97) is fixed on the flange (42) with a screw (96), said rod (97) extending towards the bottom (22) along a direction parallel to said axis (X), as shown in Figs. 4 and 5.

[0045] As shown in Fig. 5, said rod (97) passes through the drum (50) and through the bottom (22), which is suitably provided with a through slot (50b), as shown in Figs. 8A and 9A.

[0046] A microswitch (99) is housed in the bottom (22) and fixed with a pair of screws (98), said microswitch (99) being suitable for disconnecting the power supply of the geared motor (20) when the striker (99a) is disengaged from said rod (97), as shown in Fig. 9.

[0047] Such a loss of engagement automatically occurs in case of an accidental failure of the torsion spring (40a), when the flange (42) and the rod (97) rotate by a small angle around the axis (x), under the thrust of the spring (95), as shown in Fig. 9.

[0048] With reference to Figs. 2, 3 and 4, the reference numeral (22c) indicates the cover of the bottom (22), whereas the reference numeral (99b) indicates the electrical connection cable of the microswitch (99).

[0049] Finally, it must be noted that said set of com-

pensating springs (40) also comprises a return spring (48) of known type.

[0050] In view of the preceding description, the advantages of the integrated assembly (100) according to the invention are manifest.

[0051] Firstly, in case of a failure, the geared motor (20) is no longer powered because of the operation of the microswitch (99).

[0052] Said microswitch (99) also prevents the winding of the compensating springs (40) in the opposite direction during the initial loading, it being provided that a contact (NC) is connected in series to the ascending cable of the geared motor (20).

[0053] Moreover, another function of said microswitch (99) is to help the installer during the loading of the compensating spring (40). As a matter of fact, in case of a mistake in the calculation of the number of turns, the installer can return to the starting point and restart loading the compensating spring (40) and calculating the turns because of the provision of said contact (NC) connected in series to the ascending cable of the geared motor (20).

[0054] Finally, it must be noted that, in case of failure of the compensating spring (40), said microswitch (99) can be used as signaling sensor for the user, providing a contact (NA) connected to a control station.

[0055] According to such a preferred embodiment, if automatically operated, said control station will enable the manual operation mode.

[0056] The replacement or the reset of the arresting device (30) is carried out easily without having to dismount the geared motor (20), either partially or completely, it being possible for the operator to access the arresting device (30) from the opposite side relative to the geared motor (20).

[0057] The cost of the arresting device (30) is reduced because the stator (31) is obtained in one piece with another part of the roller-up shutter, namely one (42) of the two flanges (41 and 42) that support the compensating spring (40a).

Claims

1. Integrated assembly for the motorized operation of a roll-up shutter (A), comprising a tubular shaft (10) with horizontal axis, wherein the roll-up shutter is externally fixed and rolled, and wherein a geared motor (20), an arresting device (30) and a set of compensating springs (40), which are disposed between said geared motor (20) and said arresting device (30), are housed; wherein said tubular shaft (10) is supported by two bottoms (21 and 22) suitable for being fixed to the wall by means of brackets, and wherein one of said bottoms (21) acts as support also for said geared motor (20), the rotor (20a) of said geared motor (20) being joined to the tubular shaft (10) by means of screws (23);

characterized in that

said set of compensating springs (40) comprises an opposite pair of circular flanges (41 and 42) and a torsion spring (40a) is mounted in intermediate position, the ending turns of said torsion spring (40a) being joined to the circular flanges (41, 42), and wherein:

- the flanges (41 and 42) are inserted in a same shaft (43) housed in the center of the tubular shaft (10) and joined to said flange (41) by means of a pin (43a);
- the flange (41) disposed at the end of the spring (40a) directed towards the geared motor (20) revolves with said tubular shaft (10), it being fixed by means of screws (24);
- the flange (42) is fixed, it being indirectly connected to said bottom (22), in such a way that said flange (42) remains stationary until said shaft (43) rotates with the other flange (41) and the tubular shaft (10);

wherein said arresting device (30) comprises:

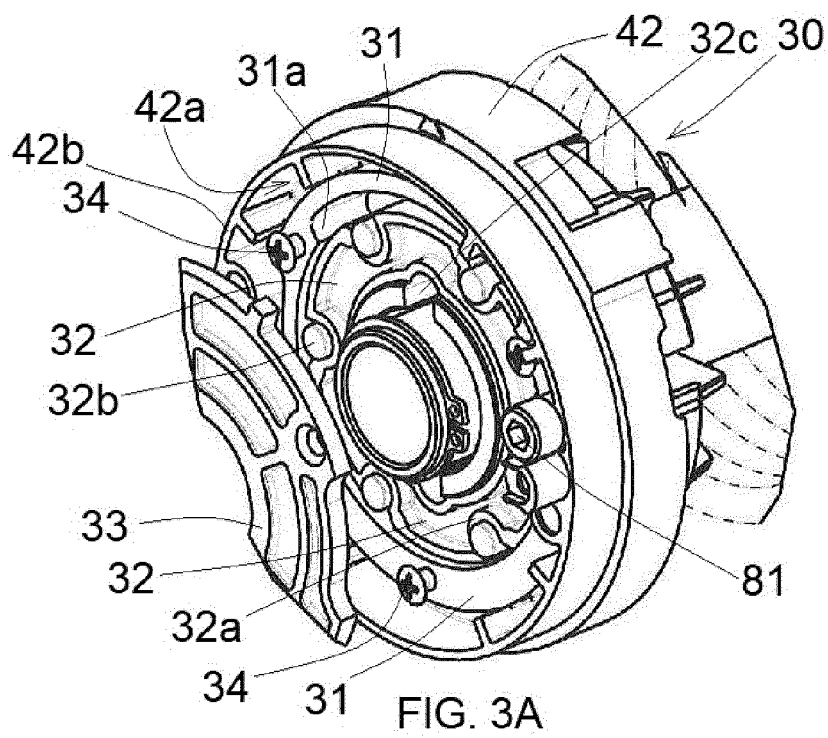
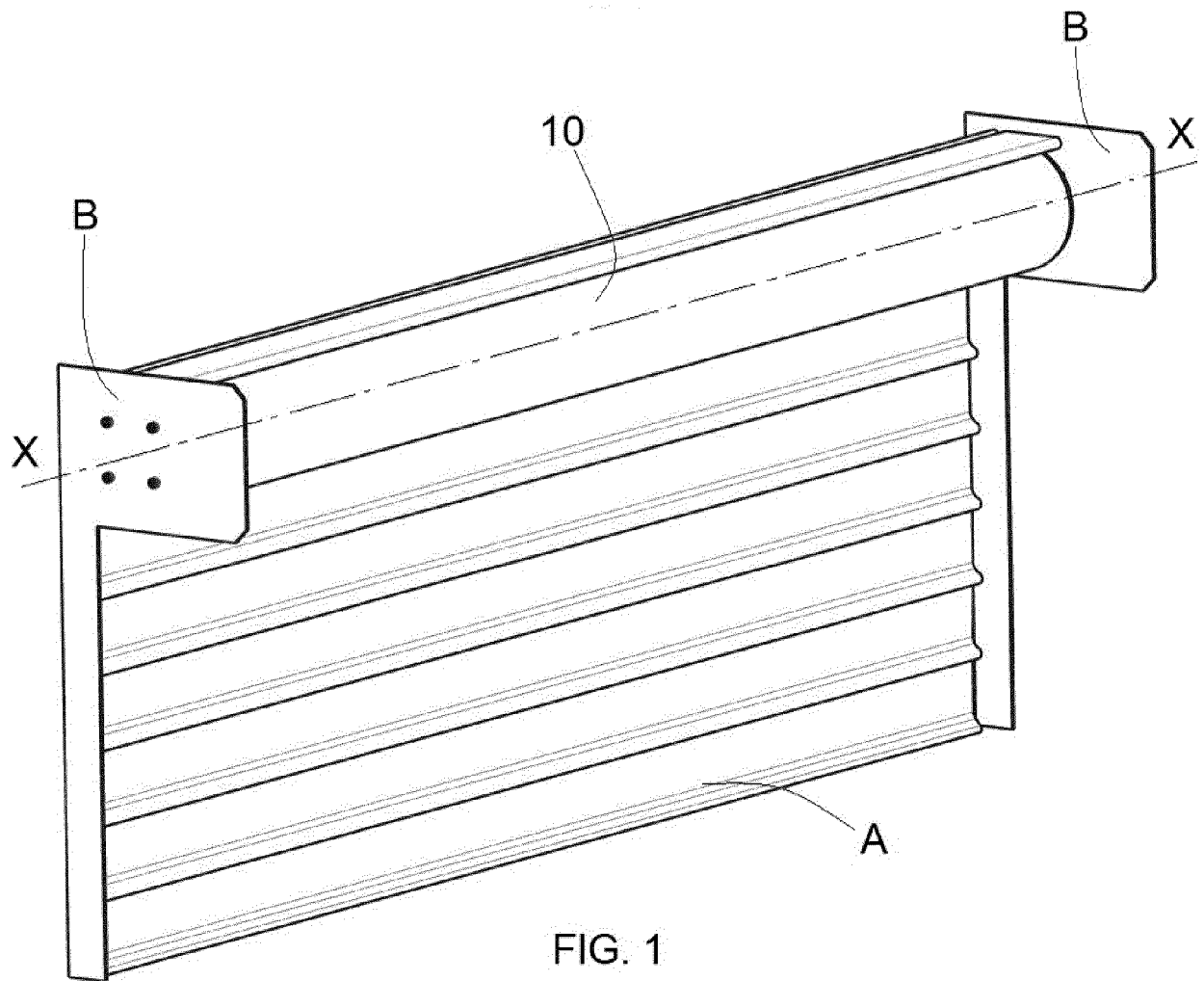
- a stator (31) consisting in a ring provided with a set of regularly spaced niches (31a) on its internal edge;
- a rotor (32) consisting in a disc disposed in central position inside said stator (31) and integrally revolving with said tubular shaft (10); said rotor (32) comprising a hub (32c) and an external cylindrical wall provided with a set of counter-niches (32a) that are regularly spaced and house cylindrical rollers (32b);

said shaft (43) passing through the flange (42) and the hub (32c) of the rotor (32), it being fixed by means of a radial pin (43b).

2. The integrated assembly for the motorized operation of a roll-up shutter according to claim 1, wherein said stator (31) is obtained in one piece with said flange (42) provided on the side directed towards the bottom (22) with a circular housing (42a) wherein the rotor (32) is centered, it being enclosed inside said circular housing (42a) by means of a grilled cover (33).
3. The integrated assembly for the motorized operation of a roll-up shutter according to claim 1 or 2, wherein said flange (42) is indirectly supported by the bottom (22) by means of a drum (50) disposed between the bottom (22) and the flange (42) and provided with a central hole (51) wherein the ending section (43) of said shaft (43) is inserted and supported by means of radial bearings (60); said drum (50) comprising an external collar (52) joined to the tubular shaft (10) and supported by radial bearings (61) in such a way

that said external collar (52) and said ending section (43c) revolve together with the tubular shaft (10), whereas the drum (50) remains stationary with the bottom (22) joined to the drum (50) by means of screws (70).

4. The integrated assembly for the motorized operation of a roll-up shutter according to claim 3, wherein said flange (42) is joined to the drum (50) by means of male-female coupling that allows the flange (42) to rotate by a small angle relative to the drum (50), which always remains stationary with the bottom (22), and wherein a spring (95) is disposed between the drum (50) and the flange (42) to rotate the flange (42) in a direction (S1) opposite to the direction (S2) determined by the thrust of the torsion spring (40a) that exerts a much stronger thrust than the spring (95).
5. The integrated assembly for the motorized operation of a roll-up shutter according to claim 4, wherein the amplitude of the rotation angle of the flange (42) relative to the drum (50) is determined by a screw (80) tightened in a hole (81) of the flange (42) and slidingly inserted in a curved slot (90) obtained on the drum (50).
6. The integrated assembly for the motorized operation of a roll-up shutter according to claim 5, wherein:
 - a rod (97) is fixed with a screw (96) on the flange (42), said rod (97) extending towards the bottom (22) along a direction parallel to the longitudinal axis of the tubular shaft (10) and passing through the drum (50) and through the bottom (22) suitably provided with a through slot (50b);
 - a microswitch (99) is housed in the bottom (22) and fixed with a pair of screws (98), said microswitch (99) being suitable for disconnecting the power supply of the geared motor (20) when the striker (99a) is disengaged from said rod (97).



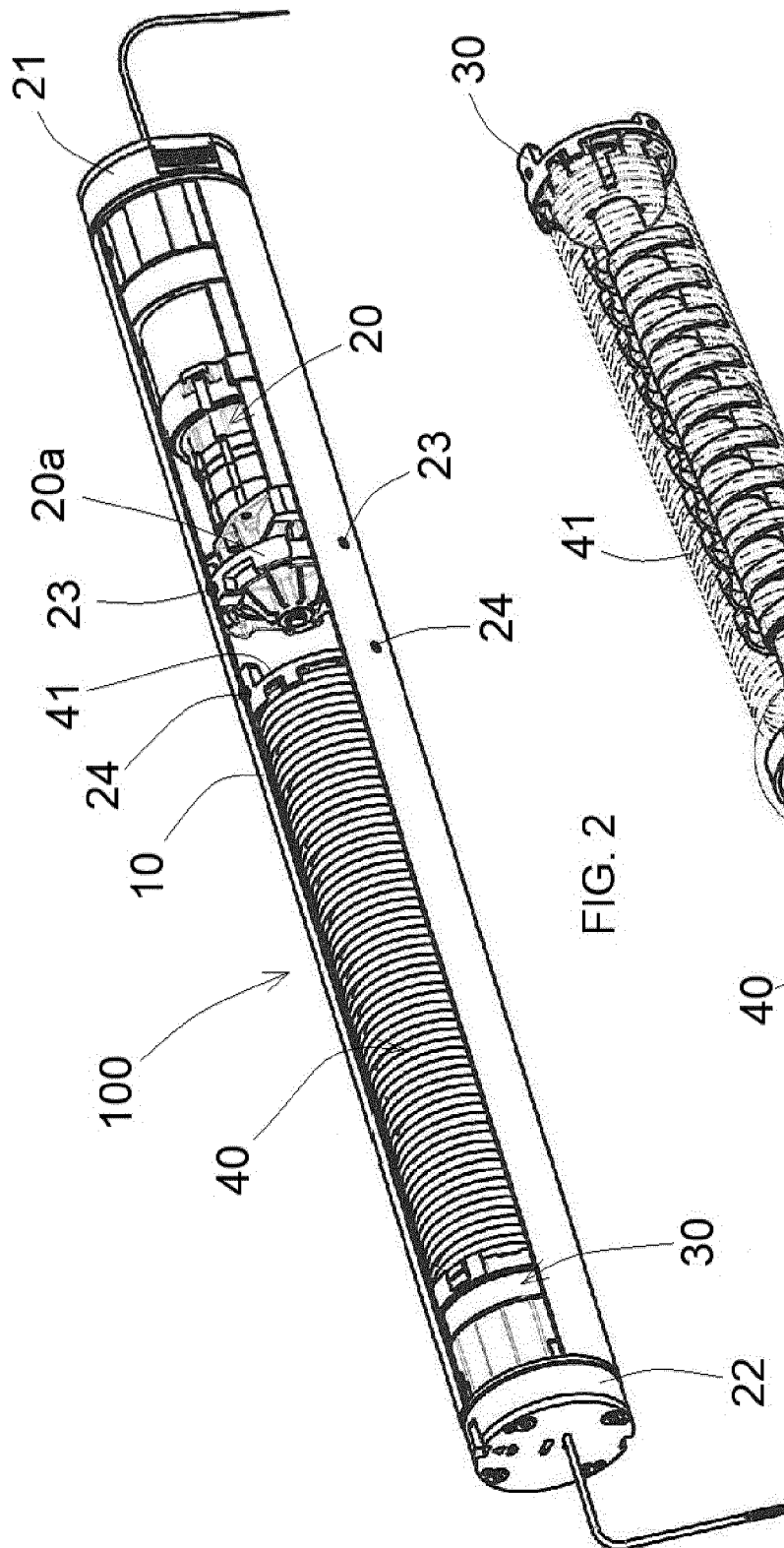


FIG. 2

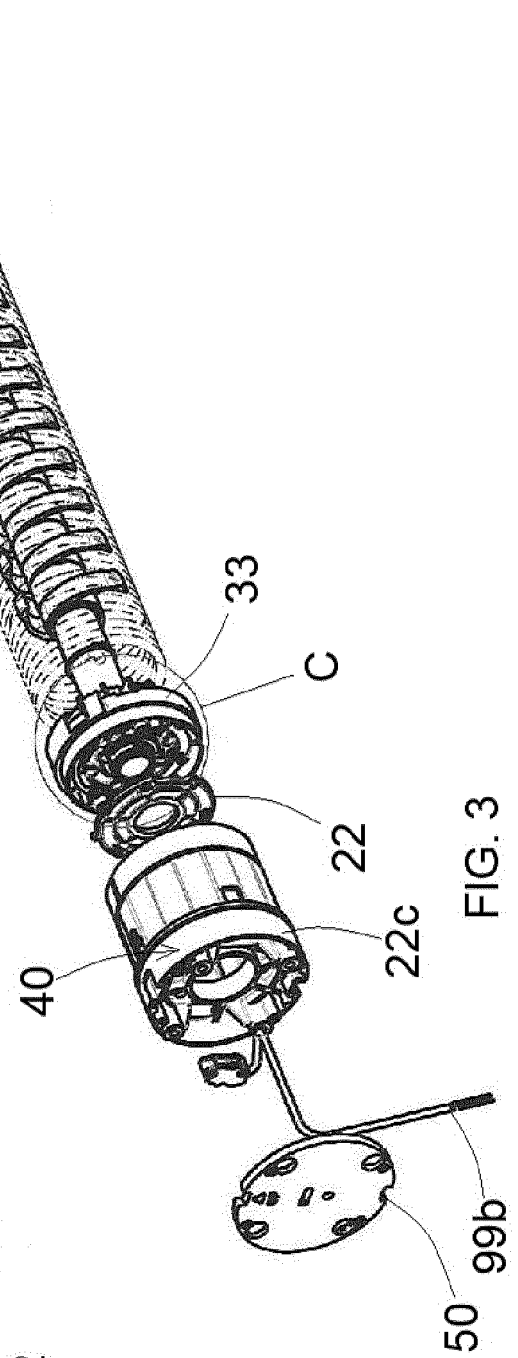


FIG. 3

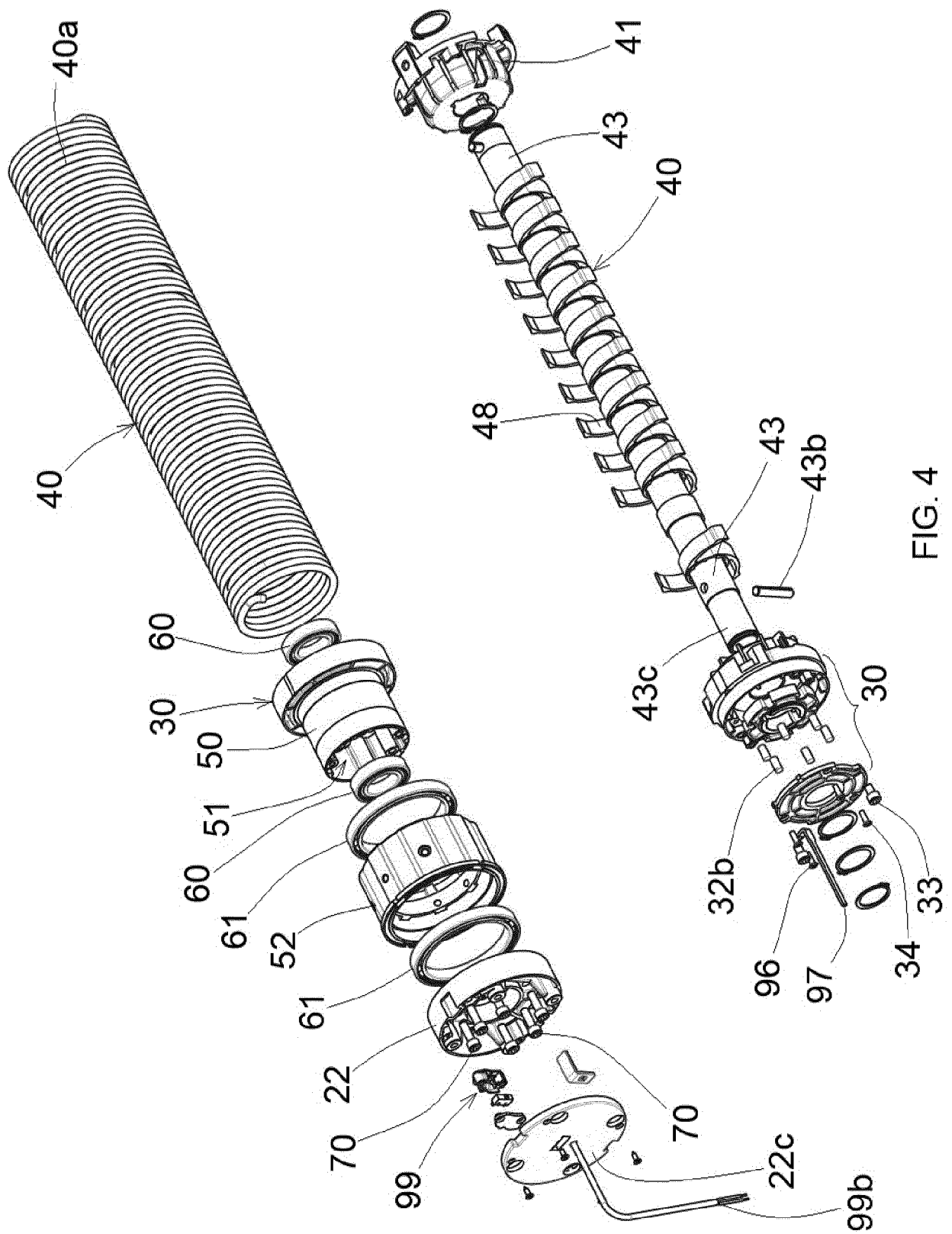
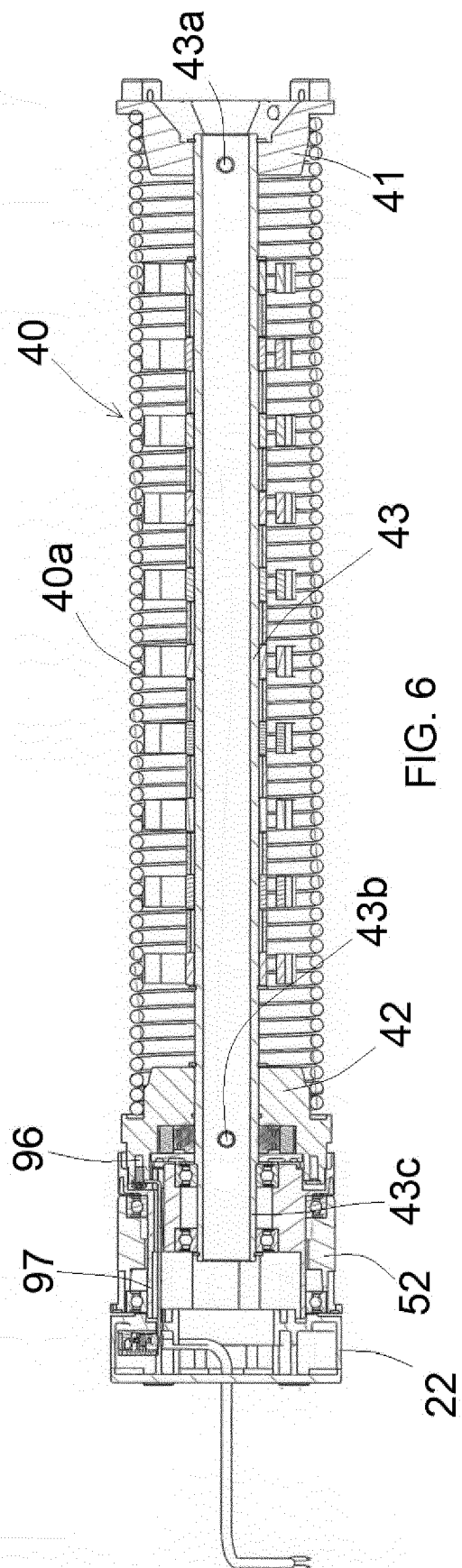
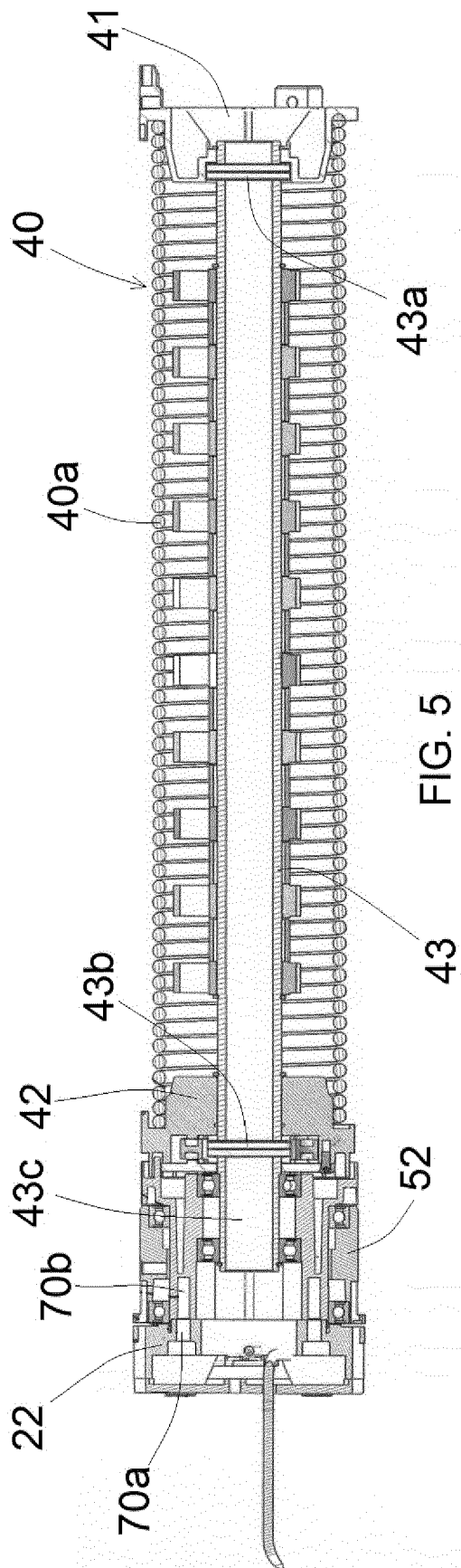


FIG. 4



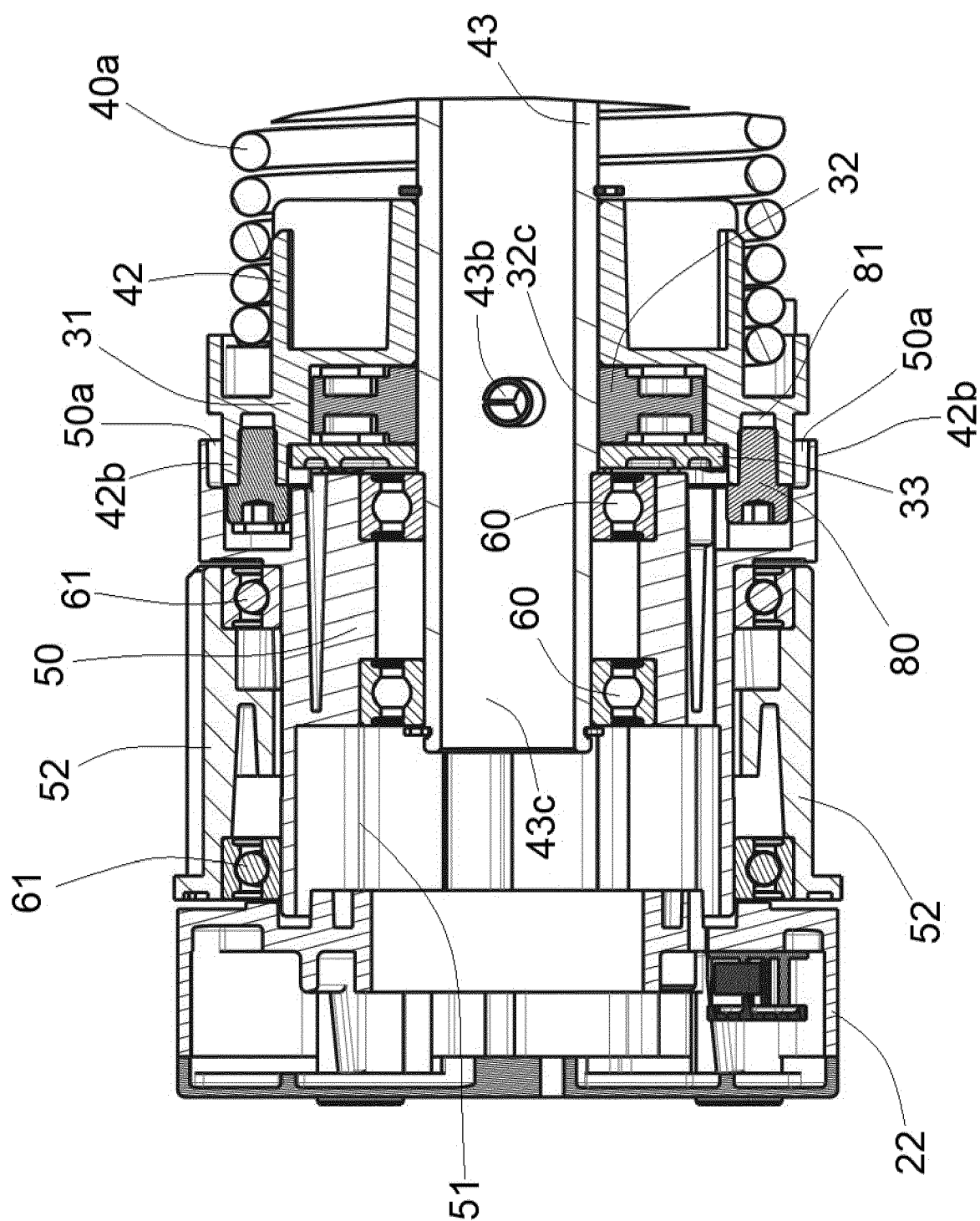


FIG. 7

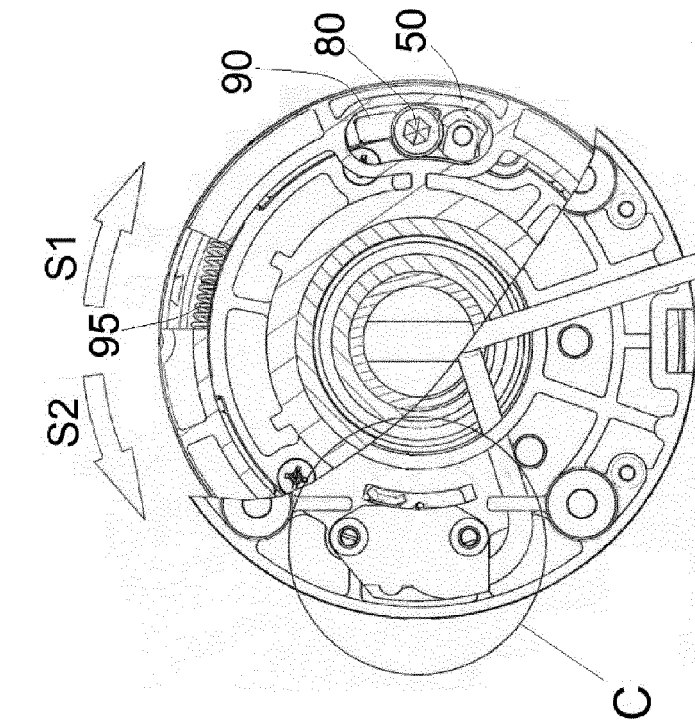


FIG. 8

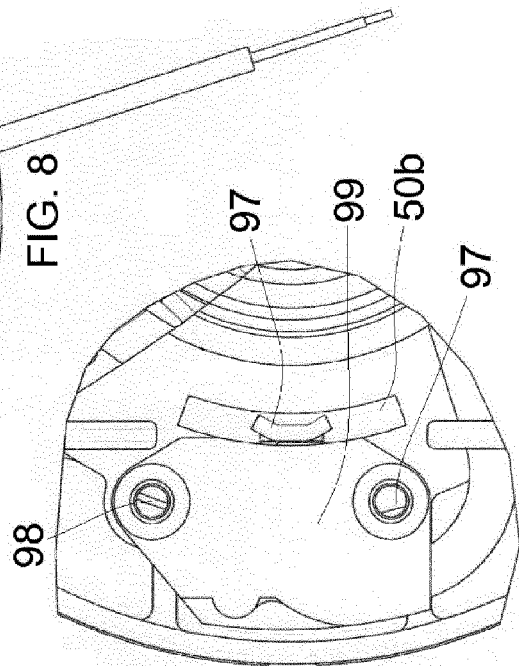


FIG. 8A

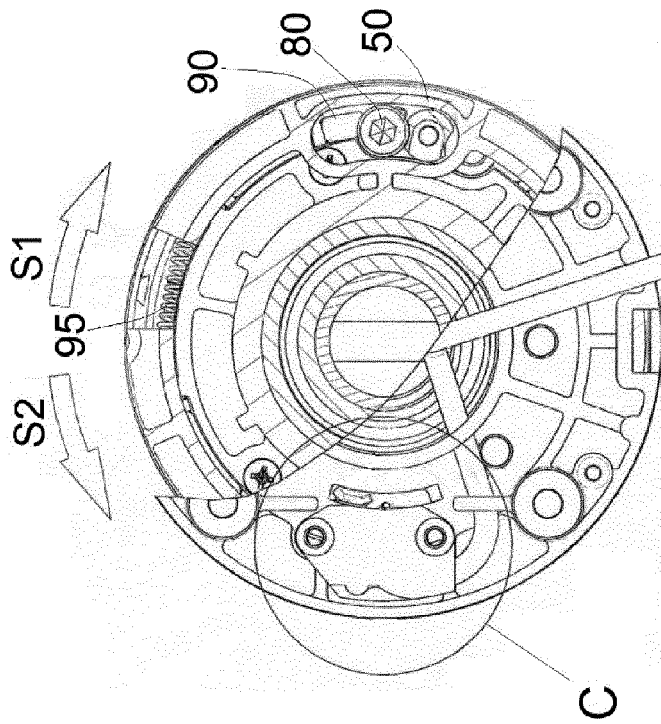


FIG. 9

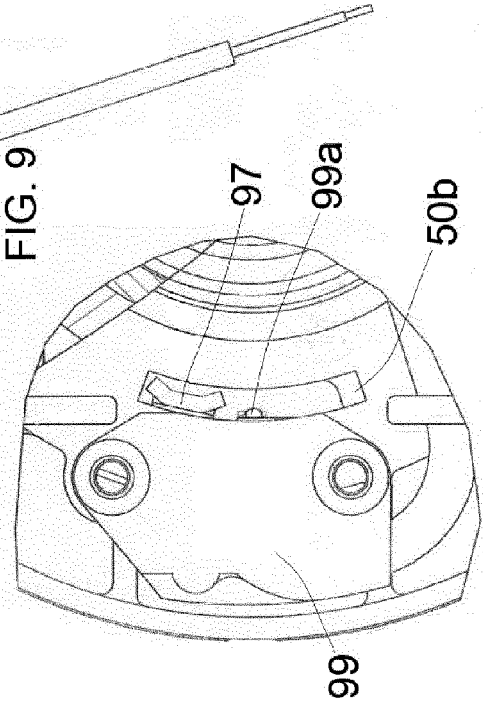


FIG. 9A



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 19 7290

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			E06B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 January 2021	Examiner Kofoed, Peter
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 19 7290

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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19-01-2021

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