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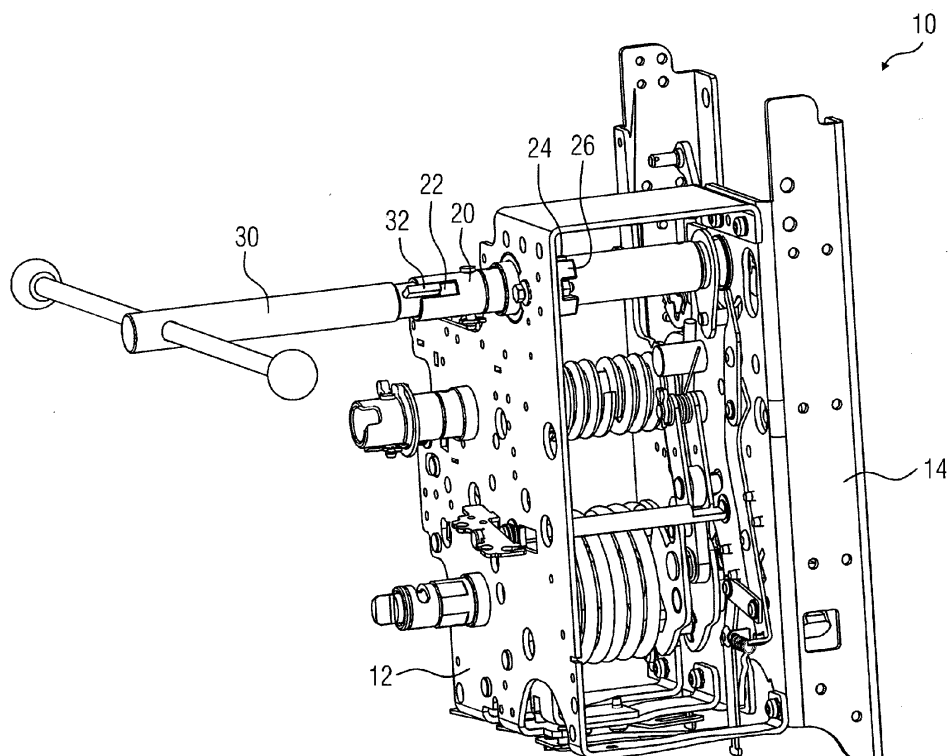
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(54) **Drive mechanism for disconnecting a switch**

(57) A drive mechanism (10) for disconnecting a switch is presented. The drive mechanism (10) includes a first shaft (20) rotatable along a horizontal axis, a handle (30) for rotating the first shaft (20), a pusher (29) disposed within the first shaft (20) mechanically coupled to a spring (28) disposed therein, wherein the spring (28) is coupled to the pusher (29) at a first end and mechanically coupled to an extension (40) of the first shaft (20) at a second

end, an assembly (45) coupled to the extension (40) of the first shaft (20), the assembly (45) coupled to a second shaft (60) through a rotary bushing (44) and a coupler (46) disposed within the second shaft (60) for transferring a motion of the first shaft (20) to the second shaft (60), such that the second shaft (60) rotates between two or more positions.

FIG 1



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Description

[0001] The present invention relates to a drive mechanism for disconnecting a switch and more particularly to a drive mechanism for three position electrical disconnect switch.

[0002] An electrical distribution device has a circuit breaker with the vacuum interrupter and a three position disconnect switch enclosed inside the vessel of stainless steel with sulphur hexafluoride (SF₆) gas as insulating medium and an operating mechanism to operate the circuit breaker and the disconnect. The three position disconnect consists of disconnect shaft with contact blades mounted on it, service contacts or ON contacts to keep the contacts in service giving "ON" position and earth contacts to earth the feeder or incoming line in electrical distribution giving "earth" position and an intermediate position between the "ON" and "earth" position giving "OFF" position. It also consists of an operating mechanism that will keep operated and keep the disconnect shaft in above-mentioned position.

[0003] Existing drive mechanisms have a disconnect shaft which is operated by means of a spring loaded snap action mechanism, which typically includes multiple parts or components. Furthermore, existing storage drive sub-assemblies take up a large amount of space.

[0004] The locking in different position is provided by the latches on the spring loaded mechanism. The snap action mechanism is connected to the rotary bushing on the vessel through a link and coupler on the inside of the vessel is connected to the disconnect shaft. The latches keep the disconnect shaft in ON, OFF or EARTH position till there is an external force is applied on the shaft. Such a mechanism may not be suitable in the vessel which has small dimensions.

[0005] It is an object of the present invention to provide a drive mechanism for disconnecting a switch which can be fitted in a compact vessel, involves less number of components and is also cost effective.

[0006] The object is achieved by providing a drive mechanism for disconnecting a switch according to claim 1.

[0007] According to the invention a drive mechanism for disconnecting a switch is presented. The drive mechanism includes a first shaft rotatable along a horizontal axis, a handle for rotating the first shaft, a pusher disposed within the first shaft mechanically coupled to a spring disposed therein, wherein the spring is coupled to the pusher at a first end and mechanically coupled to an extension of the first shaft at a second end, an assembly coupled to the extension of the first shaft, the assembly coupled to a second shaft through a rotary bushing and a coupler disposed within the second shaft for transferring a motion of the first shaft to the second shaft, such that the second shaft rotates between two or more positions. By having such an arrangement the first shaft is rotated by using the handle, which in turn rotates a second shaft to rotate between two or more positions.

[0008] In one embodiment, the handle is replaceably coupled to the first shaft. This arrangement enables the handle to be coupled or decoupled with the first shaft when required.

5 **[0009]** In one embodiment, the first shaft includes a slot for engaging the handle. A key in the handle is engaged with the slot to prevent movement of the handle during operation.

[0010] In one embodiment, the drive mechanism includes a pin engaged with the pusher, the pin passing through the first shaft. The pin enables a locking mechanism in the first shaft.

10 **[0011]** In another embodiment, the pin is engaged with a bush having a plurality of engagement slots for preventing movement of the first shaft and the second shaft. The engagement slots in the bush enable the pin to be locked at respective positions according to the arrangement of the engagement slots. Locking of the pin prevents movement of both the first shaft and the second shaft, thereby preventing the shaft to move from positions, which are two or more positions.

[0012] In one embodiment, a second pin engaged in a slot on the handle prevents the pusher to move beyond the desired distance inside the first shaft.

25 **[0013]** In another embodiment, the engagement slots on the bush are arranged such that the pin is aligned at a position corresponding to the two or more positions. The engagement slots lock the pin thus not allowing the first shaft and the second shaft to rotate. By having the engagement slots the locking of the pin in the two or more positions between which the second shaft rotates is achieved.

30 **[0014]** In one embodiment, the two or more positions include a first position, a second position and an intermediate position between the first position and the second position.

35 **[0015]** In another embodiment, the bush includes a plurality of extension for preventing the second shaft to rotate beyond the two or more positions. The extensions prevent movement of the second shaft directly from the first position to the second position and/or from the second position to the first position.

40 **[0016]** The above-mentioned and other features of the invention will now be addressed with reference to the accompanying drawings of the present invention. The illustrated embodiments are intended to illustrate, but not limit the invention. The drawings contain the following figures, in which like numbers refer to like parts, throughout the description and drawings.

FIG. 1 is a schematic diagram depicting an exemplary drive mechanism for disconnecting a switch;

FIG. 2 is a schematic diagram depicting another view of the exemplary drive mechanism;

FIG. 3 is a schematic diagram depicting a handle coupled with the first shaft;

FIG. 4 is a schematic diagram depicting positions in bush depicting the locking arrangement; and

FIG. 5 is a schematic diagram depicting an arrangement of the first shaft and a second shaft with contacts, in accordance with aspects of the present technique.

[0017] Embodiments of the present technique relate to a drive mechanism for disconnecting a switch and more particularly to a drive mechanism for three position electrical disconnect switch. As used herein, the term "switch" may refer to a circuit breaker, a disconnect an isolator and so forth.

[0018] Referring now to FIG. 1 and FIG. 2, a schematic diagram depicting an exemplary drive mechanism 10 for disconnecting a switch is presented. The drive mechanism 10 includes a first shaft 20, a handle 30 coupled to the first shaft 20, a pin 24, a bush 26, a second shaft 60 with one or more contact blades 62 mounted on it.

[0019] In accordance with aspects of the present technique, the first shaft 20 which is rotatable along a horizontal axis and the handle 30 for rotating the first shaft 20 are mechanically coupled to each other.

[0020] The first shaft 20 is a hollow shaft having a pusher 29 (see FIG. 3) disposed within the first shaft 20. The pusher 29 is mechanically coupled to a spring 28, as will be described in greater detail with reference to FIG. 3.

[0021] It may be noted that the handle 30 includes a key 32 which engages in a slot 22 of the first shaft 20. The handle 30 is replaceably coupled with the first shaft 20. As used herein the term "replaceably coupled" means that the handle 30 may be removed and may be replaced either with the same or similar handle at the slot 22 in the first shaft 20 to couple with the first shaft 20.

[0022] With continuing reference to FIG. 1 and FIG. 2, the drive arrangement of the first shaft 20 is pivoted between a front bearing plate 12 and a rear bearing plate 14. A pin 24 passes through the first shaft 20, the pin 24 is fitted onto the pusher 29 (not shown in FIG. 1 and FIG. 2, see FIG. 3) by interference fit. The drive mechanism 10 includes a bush 26 through which the first shaft 20 passes, the bush 26 coupled to the front bearing plate. The bush 26 may be coupled using bolts or screws with the front bearing plate 12.

[0023] In accordance with aspects of the present technique, the bush 26 includes a plurality of engagement slots 25, such that the pin 24 engages with the engagement slots 25 providing a locking arrangement.

[0024] It may be noted that the movement of the pusher 29 causes the pin 24 to move in a to and fro direction. This enables the pin 24 to get engaged in the engagement slots 25 of the bush 26. The engagement of the pin 24 prevents movement of the first shaft 20 and the second shaft 60.

[0025] Turning now to FIG. 3, a schematic diagram depicting the first shaft 20 alongwith the handle 30 is presented. A second pin 34 for engagement with a slot on

the handle 30 is provided. The second pin 34 locks with the slot on the handle 30 thereby preventing further movement of the handle 30.

[0026] As previously noted, the first shaft 20 is a hollow shaft having the pusher 29 and the spring 28 disposed therein. The handle 30 pushes the pusher 29 inside the first shaft 20, which includes the pin 24 fitted by interference fit causing a to and fro movement of the pin 24.

[0027] Furthermore, movement of the pusher 29 causes compression in the spring 28 which is attached or coupled to the pusher 29 at a first end and attached or coupled to an extension 40 of the first shaft 20 at a second end.

[0028] In accordance with aspects of the present technique, the spring 28 is mechanically coupled with the pusher 29 at the first end and mechanically coupled to the extension 40 of the first shaft 20 at the second end.

[0029] It may be noted that the extension 40 of the first shaft 20 is a solid shaft.

[0030] In accordance with aspects of the present technique, the spring 28 may be welded or engaged in a slot on the pusher 29 at the first end, similarly, at the second end the spring 28 may be coupled to the extension 40 of the first shaft 20 by inserting the spring 28 into a slot in the extension 40.

[0031] In another embodiment, the spring 28 may be placed in a manner, such that the first end of the spring 28 is in contact with the pusher 29 and the second end is in contact with the extension 40 of the first shaft 20.

[0032] Referring now to FIG. 4, a schematic diagram depicting the positions of the pin 24 engaged with the bush 26 is presented. The bush 26 includes a plurality of engagement slots 25 for engaging the pin 24. Reference numeral 100 is representative of a first position, reference numeral 300 is representative of a second position and reference numeral 200 is representative of an intermediate position between the first position 100 and the second position 300.

[0033] In accordance with aspects of the present technique, the first position 100 corresponds to "ON" position, the second position 300 corresponds to "Earth" position and the intermediate position 200 corresponds to the "OFF" position.

[0034] Referring now to FIG. 5, a schematic diagram depicting an arrangement of the first shaft 20 with the second shaft 60 is presented.

[0035] As previously noted, the first drive shaft 20 includes the extension 40, wherein the extension 40 is coupled to the assembly 45. The assembly 45 is in turn mechanically coupled to the second shaft 60 through a rotary bushing 44 and a coupler 46. It may be noted that the coupler 46 is disposed within the second shaft 60.

[0036] Furthermore, the pin 24 is engaged with the bush 26, and particularly with the engagement slots 25 of the bush 26, thereby providing a locking arrangement.

[0037] In accordance with aspects of the present technique, the assembly 45 includes a first lever 41 and a second lever 43 mechanically coupled to each other

through a coupler 42. The second lever 43 is connected to the second shaft 60 through the rotary bushing 44 and the coupler 46.

[0038] The second shaft 60 includes one or more contact blades 62, which get into contact with the one or more contacts, such as the "ON" contacts 50 and the "Earth" contacts 52.

[0039] As mentioned earlier, the second shaft 60 rotates between the two or more positions. In the presently contemplated configuration, the second shaft rotates between the first position 100, the intermediate position 200 and the second position 300.

[0040] As an example, at the first position 100, the contact blades 62 of the second shaft 60 are in contact with the "ON" contacts 50, at the second position 300, the contact blades 62 of the second shaft 60 are in contact with the "Earth" contacts 52, and at the intermediate position 200, the contact blades 62 do not touch the contacts 50, 52 aligned between the "ON" contacts 50 and the "Earth" contacts 52.

[0041] Furthermore, the bush 26 includes extensions 27 for preventing the pin 24 to move to beyond the first position 100 and/or the second position 300, more particularly preventing the second shaft 60 to rotate beyond the first position and/or the second position.

[0042] In accordance with aspects of the present technique, the motion of the first shaft 20 is transferred to the first lever 41 of the assembly 45 through the coupler 42 to the second lever 43, which is coupled to the rotary bushing 44. The rotary bushing 44 has the coupler 46 mounted thereon and the coupler is disposed inside the second shaft 60. Such an arrangement transfers the motion of the first shaft 20 to the second shaft 60.

[0043] It may be noted that in the present drive mechanism 10 the handle 30 when removed from the first shaft 20 after the pin 24 is locked in the engagement slot 25 of the bush 26, a locking is achieved which prevents the first shaft 20 and the second shaft 60 to rotate. By such an arrangement the locking at the two or more positions, such as the first position 100, the second position 300 and the intermediate position 200 is achieved.

[0044] Furthermore, an interlocking plate (not shown) may be present having slots therein for inserting the key 32 of the handle 30, the key 32 may go beyond the interlocking plate. This arrangement prevents removal of the handle 30 from the first shaft 20 as the handle is locked by the interlocking plate through the key 32. Additionally, the arrangement prevents the removal of handle 30 in between the first position 100 and the intermediate position 200 and the second position 300 and the intermediate position 200.

[0045] Although the invention has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternate embodiments of the invention, will become apparent to persons skilled in the art upon reference to the description of the invention. It is therefore contemplated that

such modifications can be made without departing from the embodiments of the present invention as defined.

5 Claims

1. A drive mechanism (10) for disconnecting a switch, comprising
 - a first shaft (20) rotatable along a horizontal axis,
 - a handle (30) for rotating the first shaft (20),
 - a pusher (29) disposed within the first shaft (20) mechanically coupled to a spring (28) disposed therein, wherein the spring (28) is coupled to the pusher (29) at a first end and mechanically coupled to an extension (40) of the first shaft (20) at a second end,
 - an assembly (45) coupled to the extension (40) of the first shaft (20), the assembly (45) coupled to a second shaft (60) through a rotary bushing (44) and a coupler (46) disposed within the second shaft (60) for transferring a motion of the first shaft (20) to the second shaft (60), such that the second shaft (60) rotates between two or more positions.
2. The drive mechanism (10) for disconnecting a switch according to claim 1, wherein the first shaft (20) is a hollow shaft.
3. The drive mechanism (10) for disconnecting a switch according to claim 1, wherein the extension (40) of the first shaft (20) is a solid shaft.
4. The drive mechanism (10) for disconnecting a switch according to claims 1 to 3, wherein the handle (30) is replaceably coupled to the first shaft (20).
5. The drive mechanism (10) for disconnecting a switch according to claim 1 to 4, wherein the first shaft (20) comprises a slot (22) for engaging the handle (30).
6. The drive mechanism (10) for disconnecting a switch according to claims 1 to 5, further comprising a pin (24) engaged with the pusher (29), the pin (24) passing through the first shaft (20).
7. The drive mechanism (10) for disconnecting a switch according to claim 6, wherein the pin (24) is engaged in a bush (26) having a plurality of engagement slots (25) for preventing movement of the first shaft (20) and the second shaft (60).
8. The drive mechanism (10) for disconnecting a switch according to claim 7, wherein the engagement slots (25) on the bush (26) are arranged such that the pin (24) is aligned at a position corresponding to the two

or more positions.

9. The drive mechanism (10) for disconnecting a switch according to any of the claims 7 and 8, wherein the bush (26) comprises a plurality of extension (27) for preventing the second shaft (60) to rotate beyond the two or more positions. 5
10. The drive mechanism (10) for disconnecting a switch according to any of the claims 1 to 9, further comprising a second pin (34) engaged in a slot on the handle (30). 10
11. The drive mechanism (10) for disconnecting a switch according to any of the claims 1 to 10, wherein the assembly (45) comprises a first lever (41) and a second lever (43) for transferring a motion from the first shaft (20) to the rotary bushing (44) and the coupler (46) inside the second shaft (60). 15
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12. The drive mechanism (10) for disconnecting a switch according to claim 11, wherein the extension (40) of the first shaft (20) is coupled to the first lever (41) for transferring the motion from the first shaft (20) to the second shaft (60). 25
13. The drive mechanism (10) for disconnecting a switch according to claims 11 or 12, wherein the first lever (41) is mechanically coupled to the second lever (43) on the rotary bushing (44), the rotary bushing (44) mechanically coupled the second shaft (60). 30
14. The drive mechanism (10) for disconnecting a switch according to any of the claims 1 to 13, wherein the two or more positions comprise a first position (100), a second position (300) and an intermediate position (200) between the first position (100) and the second position (300). 35
15. The drive mechanism (10) for disconnecting a switch according to any of the claims 1 to 14, wherein the second shaft (60) comprises one or more contact blades (62) for contacting with one or more contacts (50,52). 40
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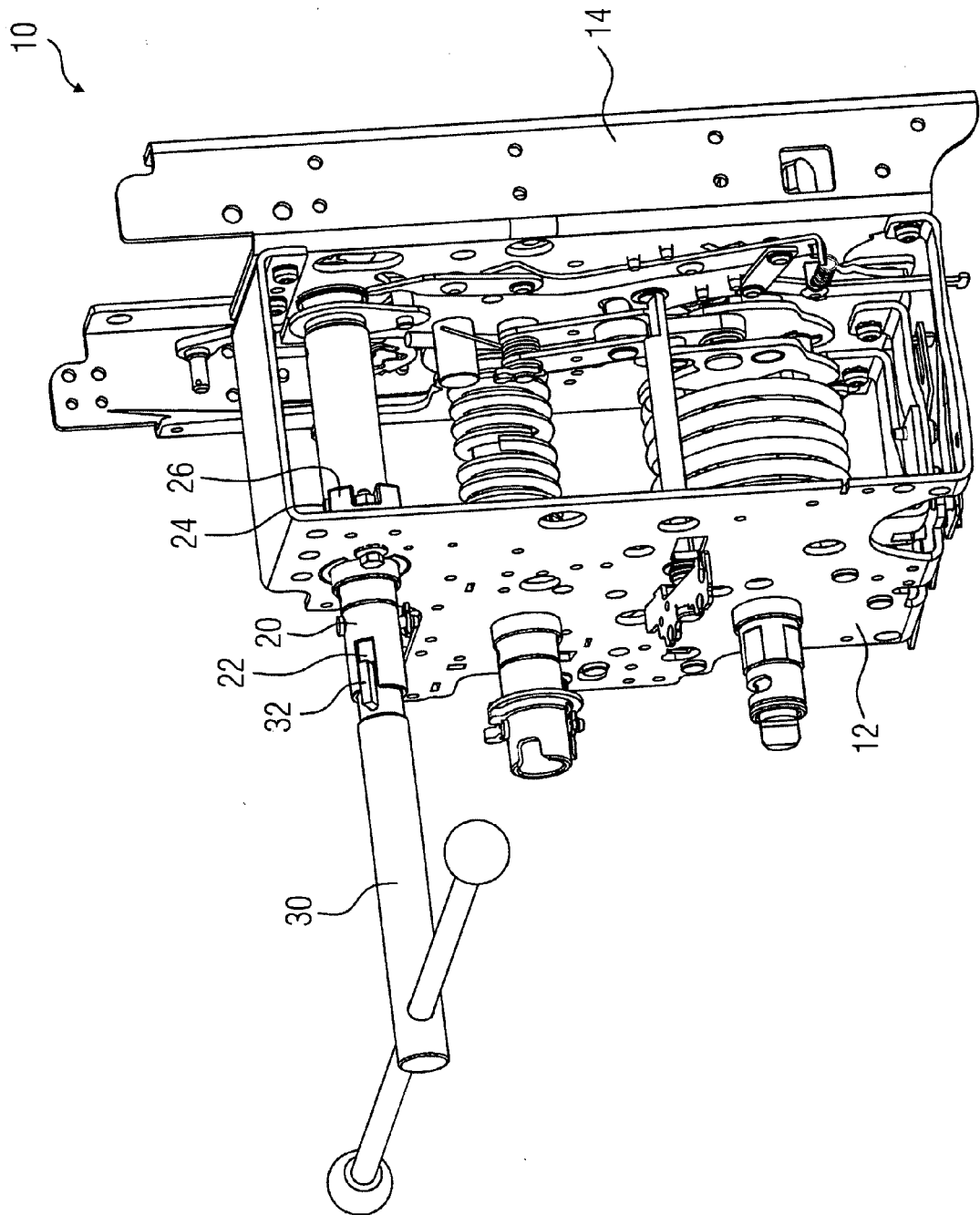


FIG 1

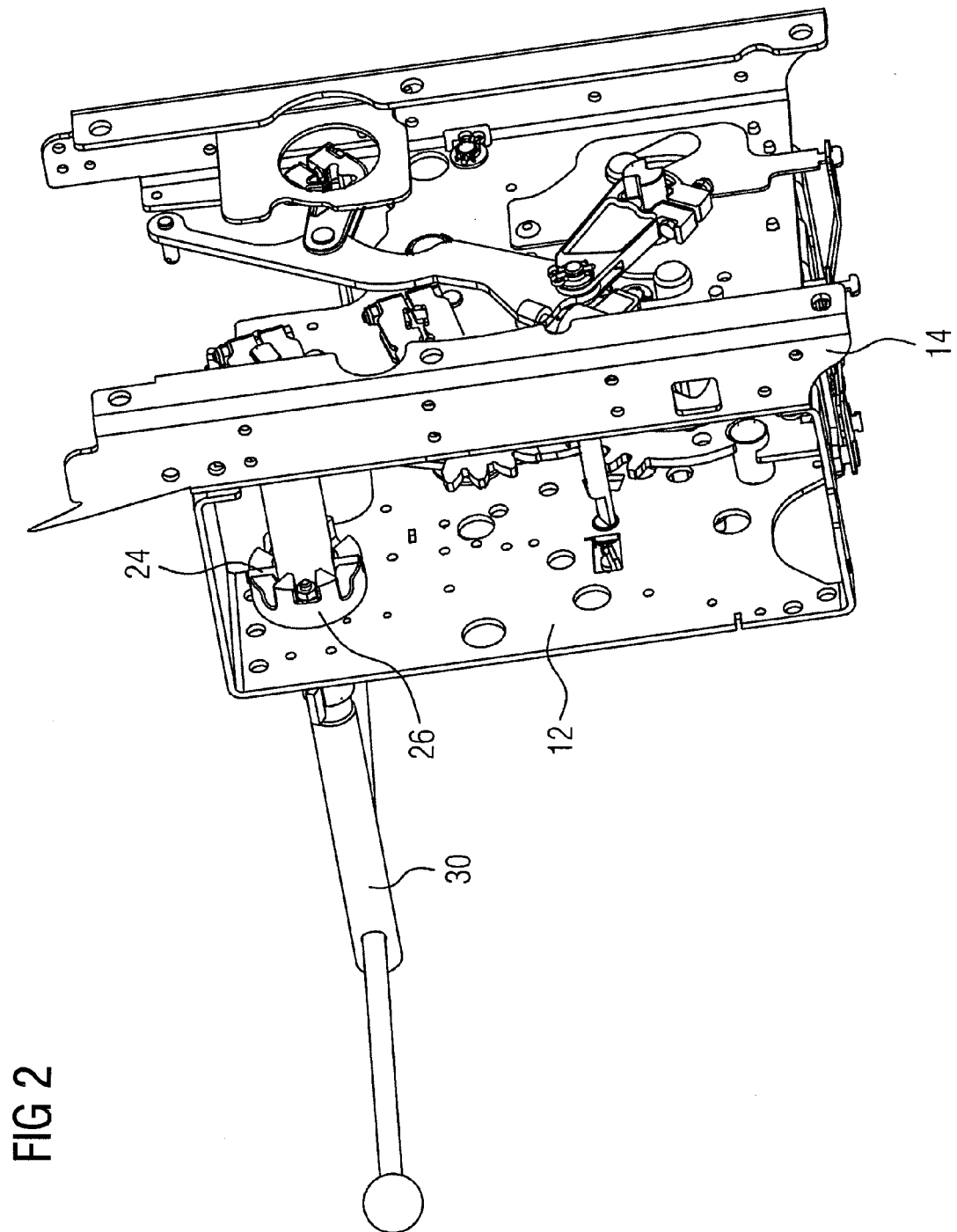


FIG 3

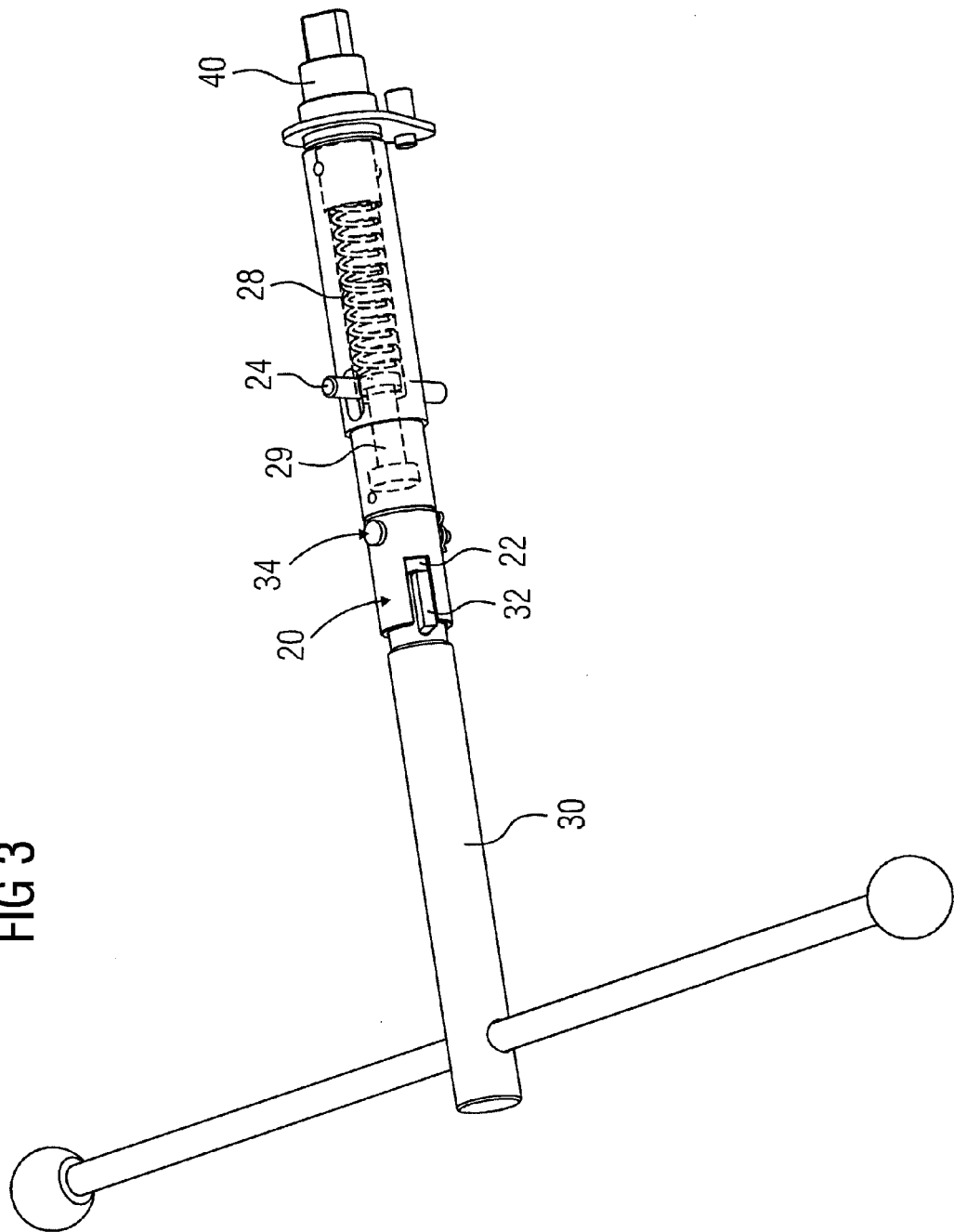
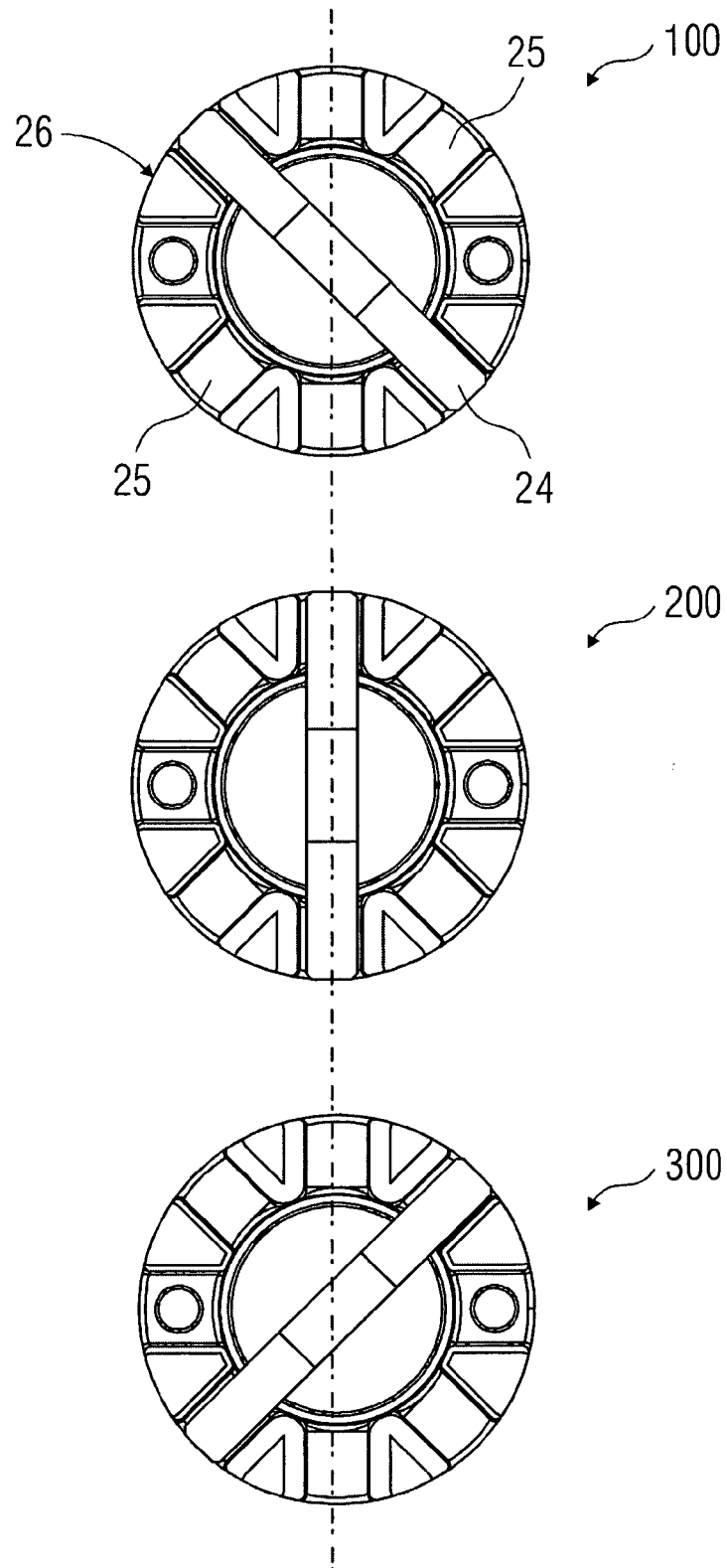


FIG 4



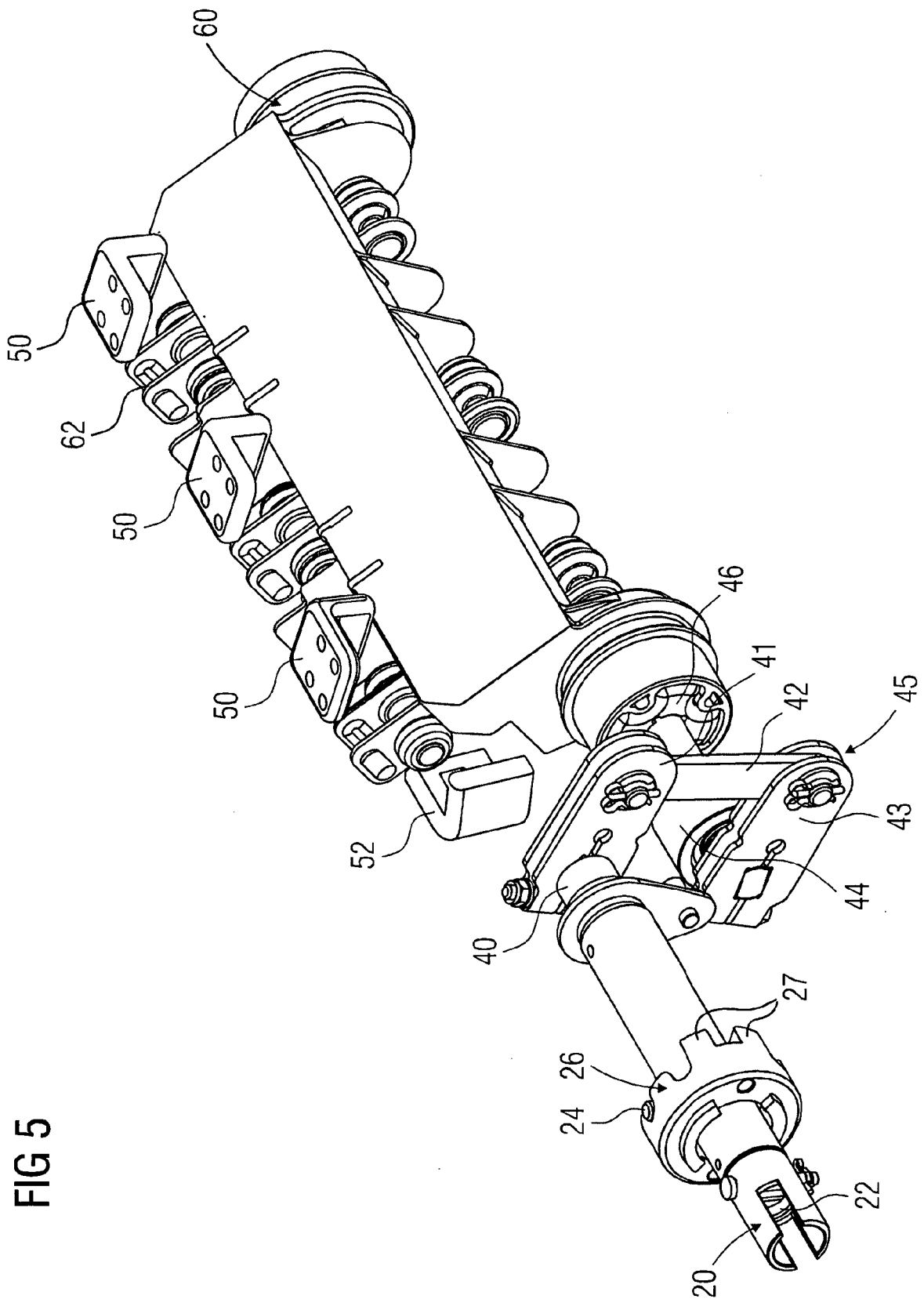


FIG 5



EUROPEAN SEARCH REPORT

Application Number
EP 14 15 8829

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 1 684 148 A (FRITZ RONNEBERGER) 11 September 1928 (1928-09-11) * page 1, line 1 - page 2, line 7; figures 1, 2 *	1-15	INV. H01H31/06 H01H19/46 H01H9/22
Y	EP 2 339 603 A2 (LS IND SYSTEMS CO LTD [KR]) 29 June 2011 (2011-06-29) * paragraphs [0013] - [0021]; figures 4, 5 *	1-15	ADD. H01H31/00
Y	US 2004/045937 A1 (HOG LUND JUSTIN R [US] ET AL) 11 March 2004 (2004-03-11) * paragraphs [0016] - [0022]; figures 1-6 *	1-15	
Y	DE 43 13 650 A1 (SIEMENS AG [DE]) 27 October 1994 (1994-10-27) * column 1, line 1 - column 3, line 43; figures 1-4 *	1-15	
Y	DE 10 2006 041366 B3 (SIEMENS AG [DE]) 24 January 2008 (2008-01-24) * paragraph [0020]; figures 1-4 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 July 2014	Examiner Meyer, Jan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 15 8829

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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17-07-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1684148 A	11-09-1928	NONE	
EP 2339603 A2	29-06-2011	CN 102110545 A EP 2339603 A2 JP 5249312 B2 JP 2011135773 A KR 101036989 B1 US 2011147172 A1	29-06-2011 29-06-2011 31-07-2013 07-07-2011 26-05-2011 23-06-2011
US 2004045937 A1	11-03-2004	CA 2440049 A1 GB 2394601 A US 2004045937 A1	11-03-2004 28-04-2004 11-03-2004
DE 4313650 A1	27-10-1994	AT 154858 T BR 9406638 A CA 2161010 A1 CN 1123585 A DE 4313650 A1 EP 0695474 A1 TR 27683 A WO 9424746 A1	15-07-1997 12-03-1996 27-10-1994 29-05-1996 27-10-1994 07-02-1996 16-06-1995 27-10-1994
DE 102006041366 B3	24-01-2008	CN 101136539 A DE 102006041366 B3	05-03-2008 24-01-2008

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82