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(54) **HOOD-TYPE INDUSTRIAL DISHWASHER WITH A DEVICE FOR BALANCING THE MOVEMENT OF THE HOOD**

(57) A hood-type industrial dishwasher includes a fixed base with a rear wall that extends upwards and on which a vertically movable hood is mounted through two side rods (14) and a handle (3) that rotates around a horizontal axis (4) being rotatably mounted on brackets (5) fixed to said rear wall, the handle (3) being equipped with rear levers (6) connected to the upper end of balancing springs (7) through connecting plates (8)

equipped with one or more shaped slots, and the rear levers (6) being equipped with three pins (11, 12, 13) configured to engage alternatively the upper ends of said shaped slots, the engagement of each pin (11, 12, 13) being made in a more forward or backward position on the connecting plate (8) depending on the position of the hood so as to obtain a variable arm hinge.

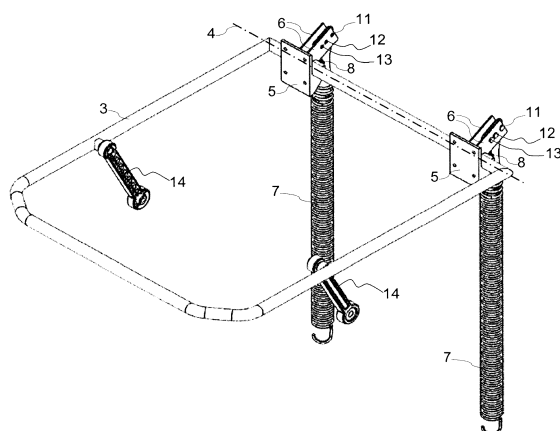


Fig.3

Description

[0001] This invention concerns hood-type industrial dishwashers, and in particular a dishwasher equipped with a device for "balancing the movement" of the hood both during opening (lifting) and closing (lowering).

[0002] It is well known that a hood-type industrial dishwasher essentially consists of a fixed base with a rear wall extending upwards and on which a hood is mounted through a handle and two side rods, so that the hood is vertically movable between a closed position where it rests on the base (during the operating cycle) and an open position where it is raised with respect to the base (for the loading/unloading of the dishes). Since an industrial dishwasher is used to wash many dishes, the hood is lifted and lowered by the operator many times during the day so it is important to have a "balanced" movement, typically obtained with levers and springs to counterbalance the weight of the hood, in order to reduce the effort required by the operator.

[0003] In hood-type dishwashers of the prior art, the handle is hinged on brackets fixed to the rear wall of the fixed base and is provided with rear levers inclined upwards to which the upper ends of balancing springs are attached, which at the lower ends are attached to the fixed base, the traction of the springs thus being greater the lower the hood is. However, the balancing moment is given by the product of the force of the springs by their arm, i.e. the horizontal distance between the point of attachment of the springs and the axis of rotation of the handle, so that in the initial phase of the opening the operator's effort is greater because the arm is minimum even if the force of the springs is maximum, while in the final phase the hood tends to escape upwards because the arm is maximum even if the force of the springs is minimum.

[0004] Similarly, during the closing phase a greater effort is required at the beginning of the stroke to overcome the force of the springs that hold the hood up, and at the end of the stroke the hood tends to hit the fixed base. However, it may also happen that, depending on the choice of springs and their arm, the hood is easy to lift but difficult to lower or vice versa. Clearly, with such a simple geometry, balancing is necessarily a compromise since the weight of the hood is constant while the balancing moment depends on its position, since the force of the springs depends on their extension and the arm depends on the position of the attachment levers.

[0005] The purpose of this invention is therefore to provide a hood-type dishwasher that is free from said drawback. This purpose is achieved by means of a hood-type dishwasher including connecting plates arranged between the springs and the levers and equipped with shaped slots, the levers being equipped with a plurality of pins that engage alternatively said shaped slots in a more forward or backward position on the connecting plates depending on the position of the hood, so as to obtain a hinge with variable arm. Other advantageous

features of this dishwasher are specified in the dependent claims.

[0006] The main advantage of this dishwasher is that it is able to achieve an optimal balancing of the hood throughout its stroke, both when opening and closing the hood, thus reducing the effort required by the operator. Moreover, the fact that it is possible to decide on the position of the pins and the shape of the slots allows to balance the weight of the hood at will, so not only perfectly balancing the weight of the hood but also being able to select a different balance in different stretches of the stroke. For example, it is possible to reduce the effect of the springs in the final stretch where the hood approaches the closure so that it closes autonomously by gravity, or to increase the effect of the springs when the hood approaches the complete opening to make it rise faster in the last stretch.

[0007] A second notable advantage of this dishwasher is the simple structure of the balancing device, which is economical to produce and install and requires no maintenance, since compared to the traditional solution it only requires the addition of pins on the levers and of connecting plates with one or more shaped slots.

[0008] Still another advantage stems from the fact that the force of each spring is transmitted through a plurality of pins and not just one pin or hook as in the traditional solution, improving the reliability of the dishwasher because even in the event of a breakage of one of the pins there is at least another one that can transmit the balancing moment.

[0009] Further advantages and characteristics of the dishwasher according to the present invention will be evident to those skilled in the art from the following detailed description of some embodiments thereof with reference to the attached drawings, in which:

Figs.1A-1C are vertical sectional side views of a dishwasher according to the invention, showing the movement of the hood from the closed to the open position;

Fig.2A-2C are enlarged views showing the detail of the spring/plate/lever connection in the positions of the hood corresponding to Figs.1A-1C;

Fig.3 is a front perspective view that shows only the components of the hood balancing device in a first embodiment;

Fig.4 is a rear perspective view showing a variant of the connecting plate;

Fig.5 is a rear perspective view of an exploded detail showing a second embodiment with a further variant of the connecting plate; and

Fig.6 is an assembled view of the components of Fig.5.

[0010] Referring to figures 1 to 3, there is seen that a hood-type dishwasher according to the invention traditionally includes a fixed base 1 with a rear wall 1a extending upwards and on which a hood 2 is mounted

through a handle 3 and two side rods 14, so that hood 2 is vertically movable between a closed position where it rests on base 1 (Fig.1A) and an open position where it is raised with respect to base 1 (Fig.1C). More specifically, handle 3 rotates around a horizontal axis 4, being rotatably mounted on two brackets 5 fixed to the rear wall 1a, and it is provided with two rear levers 6 inclined upwards to which are connected the upper ends of two pulling springs 7 which at the lower end are attached to the fixed base 1. Consequently, the force F exerted by each spring 7 is all the greater the lower hood 2 is (i.e. $F1 > F2 > F3$).

[0011] The innovative aspect of this dishwasher, as mentioned above, lies in the fact that in the balancing device the connection between a lever 6 and the corresponding spring 7 is not direct, being made through a connecting plate 8 equipped with two shaped slots 9, 10 which are engaged by three pins 11, 12, 13 arranged on lever 6. In particular, the backward first slot 9 extends downwards with an arcuate profile facing handle 3 and receives the backward first pin 11, which in the position of Fig.1A/2A is abutting against the upper end 9a of slot 9, while the forward second slot 10 is shaped to have two top seats 10a, 10b where the intermediate second pin 12 (Fig.1B/2B) and the forward third pin 13 (Fig.1C/2C) respectively abut.

[0012] In the closed position of hood 2, illustrated in Fig.1A/2A, the first pin 11 is in abutment on the upper end 9a of the first slot 9 and acts as connection pin to transmit the force F1 of spring 7 to lever 6, and therefore to handle 3. Thanks to the backward position of said first pin 11, arm B1 of force F1 exerted by spring 7 is greater than in a prior art hinge, and therefore the balancing moment transmitted to handle 3 allows to reduce the effort of the operator in the initial phase of lifting hood 2 from the closed position. Note that in this position the other two pins 12, 13 are at the bottom of slot 10 and therefore do not transmit any force.

[0013] During the lifting of hood 2, starting from the closed position, handle 3 rotates around axis 4, counter clockwise in the example shown, with the first pin 11 that remains in abutment on the upper end 9a of the first slot 9 in the first stretch of the lifting stroke, for example over 264 mm. When the position shown in figure 2B is reached, the rotation of lever 6 together with handle 3 has brought the second pin 12 into abutment on the first top seat 10a of the second slot 10, so that the function of transmitting force F2 of spring 7 is transferred to pin 12, which acts with a shorter arm B2 than pin 11, which moves away from the upper end 9a of the first slot 9.

[0014] In the next intermediate stretch of the lifting stroke, for example from 265 to 394 mm, the second pin 12 remains in abutment on the first top seat 10a of the second slot 10 until the position shown in figure 2C is reached, when the rotation of lever 6 has brought the third pin 13 in abutment on the second top seat 10b. In the next final stretch of the lifting stroke, for example from 395 to 470 mm, the function of transmitting force F3 of

spring 7 is performed by pin 13, which acts with a shorter arm B3 than pin 12, which moves away from the first top seat 10a of the second slot 10.

[0015] In the lowering stroke of hood 2, starting from the open position of Fig.2C, the rotation of handle 3 is in the opposite direction so that obviously there is an inverse sequence with respect to that illustrated above.

[0016] It should be noted that although in the example shown in Fig.3 specific reference is made to a balancing device that includes two spring/plate/lever units arranged symmetrically with respect to the vertical centre plane of the dishwasher, which represents the preferable solution in terms of structural complexity and smoothness of operation, it is clear that what is described above is also applicable to a device with a greater or smaller number of spring/plate/lever units that can even be arranged not symmetrically. Moreover, as shown in Fig.3, each lever 6 is preferably double being formed by two parallel parts, with pins 11, 12, 13 mounted between the two parts of the double lever passing through slots 9, 10 of the connecting plate 8. However, these pins could also be cantilevered on one or both sides of a single lever 6 as shown below.

[0017] In the variant illustrated in Fig.4 the only difference is that the connecting plate 8, instead of being monolithic, is made in two parts pivoted one to the other so that they can carry out a relative rotation in a vertical plane, namely an upper part 8a in which slots 9, 10 are formed and a lower part 8b to which the balancing spring 7 is connected. In this way, it is even possible to compensate for the slight bending of spring 7 that occurs when passing from the engagement of pin 12, which is aligned with the axis of spring 7, to the engagement of pin 11 or 13 (Figs. 1A and 1C respectively).

[0018] In fact, because of the offset of these pins, forces F1 and F3 produce on plate 8 also a small torque in the vertical plane, clockwise and counter clockwise respectively in the example shown, which through the rigid connection with spring 7 causes a slight bending. The presence of a joint between the two parts 8a, 8b of plate 8 prevents the transmission of this torque in order to avoid the bending of spring 7, which however also works very well with the monolithic plate shown in Figures 1A-3.

[0019] In a second embodiment, illustrated in detail in figures 5 and 6, a further variant of the connecting plate 8 consists in the fact that it is made up of three parts pivoted to each other, i.e. two identical upper parts 8a in which slots 9, 10 are formed and a lower part 8b to which the balancing spring 7 is connected. In this way, not only is it possible to obtain the relative rotation in a vertical plane between the two parts 8a and 8b for the reason explained above, but lever 6 can be realized as a single lever with pins 11, 12, 13 arranged cantilevered on both sides of lever 6, as mentioned above.

[0020] It is clear that the above-described and illustrated embodiments of the dishwasher according to the invention are only examples susceptible to numerous variations and can be combined with each other. In partic-

ular, the exact shape, size and position of slots 9, 10 and of the corresponding pins 11, 12 and 13 may vary according to the points of the stroke at which it is desired to make the transition from one pin to another.

[0021] Furthermore, although the illustrated example shows two slots 9, 10 respectively engaged by a pin 11 and two pins 12, 13 there could be one slot for each pin or a single shaped slot with three seats for all pins, depending on the distances between the pins and the size of the cross-section of plate 8 (or its parts 8a, 8b). This also applies, of course, to the case where the number of pins is greater or smaller than the three pins shown in the example, with consequent adjustment of the number of slots.

[0022] Finally, it is clear that although the invention is described and claimed with reference to the example shown in which the pins are on levers 6 and the slots are on plates 8, the same result could be obtained with a simple kinematic inversion by placing the pins on plates 8 and forming the slots on levers 6.

Claims

1. Hood-type industrial dishwasher comprising a fixed base (1) with a rear wall (1a) extending upwards and on which there is mounted a hood (2) vertically movable between a closed position where it rests on said fixed base (1) and an open position where it is raised with respect to the fixed base (1), said hood (2) being mounted on the fixed base (1) through two side rods (14) and a handle (3) that rotates around a horizontal axis (4) being rotatably mounted on one or more brackets (5) fixed to said rear wall (1a), said handle (3) being equipped with one or more rear levers (6) connected to the upper ends of as many balancing springs (7) whose lower ends are secured to the fixed base (1), **characterized in that** it further includes one or more connecting plates (8) arranged between each of said balancing springs (7) and each of said rear levers (6), each of said connecting plates (8) being equipped with one or more shaped slots and each rear lever (6) being equipped with a plurality of pins or vice versa, said pins being arranged at different distances from said horizontal axis (4) and configured to engage alternatively the upper ends of said one or more shaped slots, the engagement of each of said pins being realized at a more backward or forward position on the connecting plate (8) depending respectively on whether the hood (2) is in a lower or higher position.
2. Hood-type industrial dishwasher according to claim 1, **characterized in that** the pins on each rear lever (6) or connecting plate (8) are three in number (11, 12, 13).
3. Hood-type industrial dishwasher according to claim

1 or 2, **characterized in that** the shaped slots on each rear lever (6) or connecting plate (8) are two in number (9, 10).

4. Hood-type industrial dishwasher according to any of the previous claims, **characterized in that** at least one slot (10) is engaged by a plurality of pins and equipped with as many seats at the top (10a, 10b).
5. Hood-type industrial dishwasher according to any of claims 1 to 3, **characterized in that** each slot is engaged by only one pin.
6. Hood-type industrial dishwasher according to any of the previous claims, **characterized in that** each connecting plate (8) is formed by an upper part (8a), in which the one or more slots are formed or the pins are arranged, and a lower part (8b) to which is secured the corresponding balancing spring (7), said two parts (8a, 8b) being pivoted to each other so as to be able to make a relative rotation in a vertical plane.
7. Hood-type industrial dishwasher according to any of the previous claims, **characterized in that** each lever (6) is a double lever formed by two parallel parts.
8. Hood-type industrial dishwasher according to the preceding claim, **characterized in that** each double lever (6) has a plurality of pins mounted between the two parts of the double lever (6) passing through slots formed in the corresponding connecting plate (8).
9. Hood-type industrial dishwasher according to claim 6, **characterized in that** each connecting plate (8) comprises two identical upper parts (8a) arranged on opposite sides of a single lever (6).

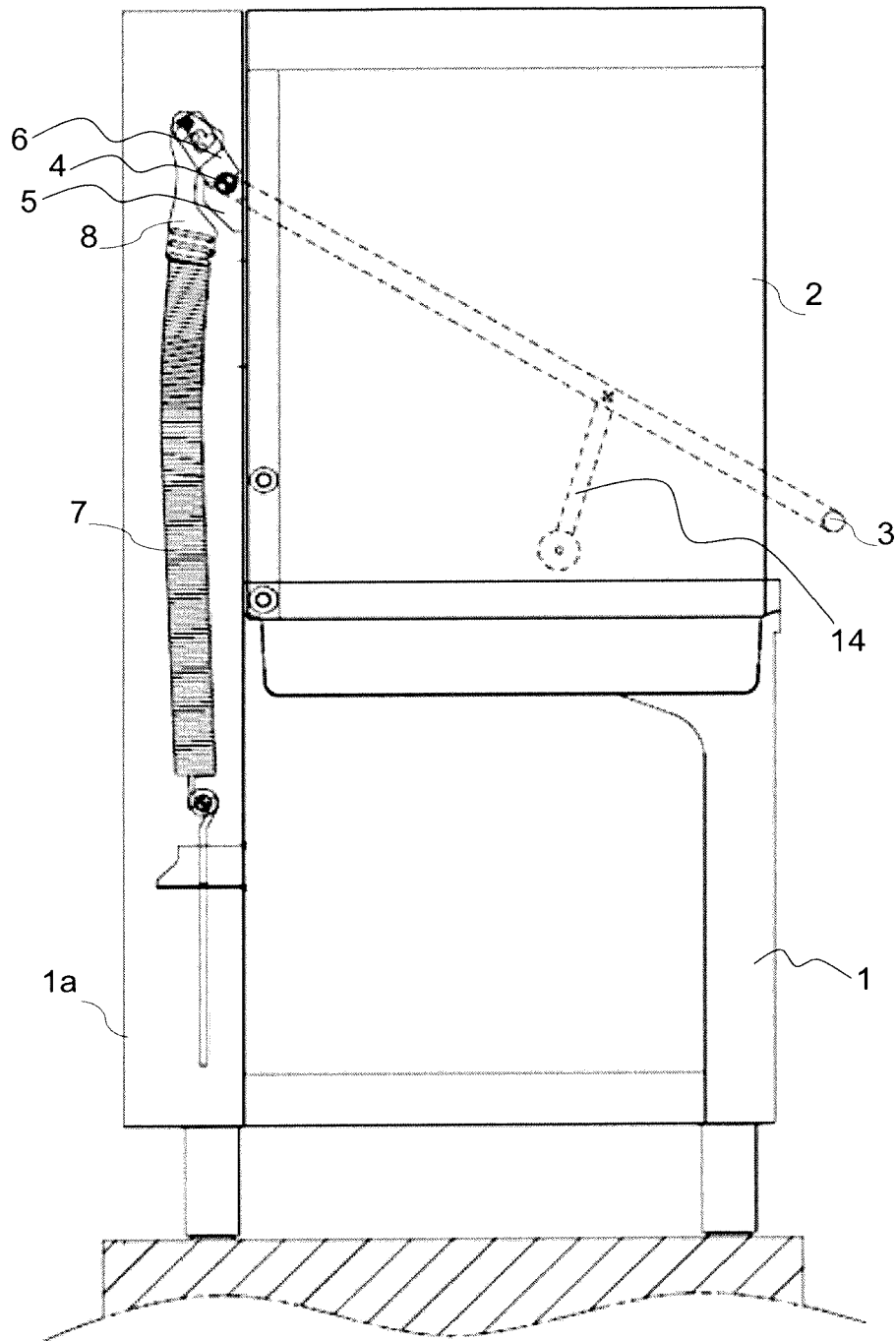


Fig.1A

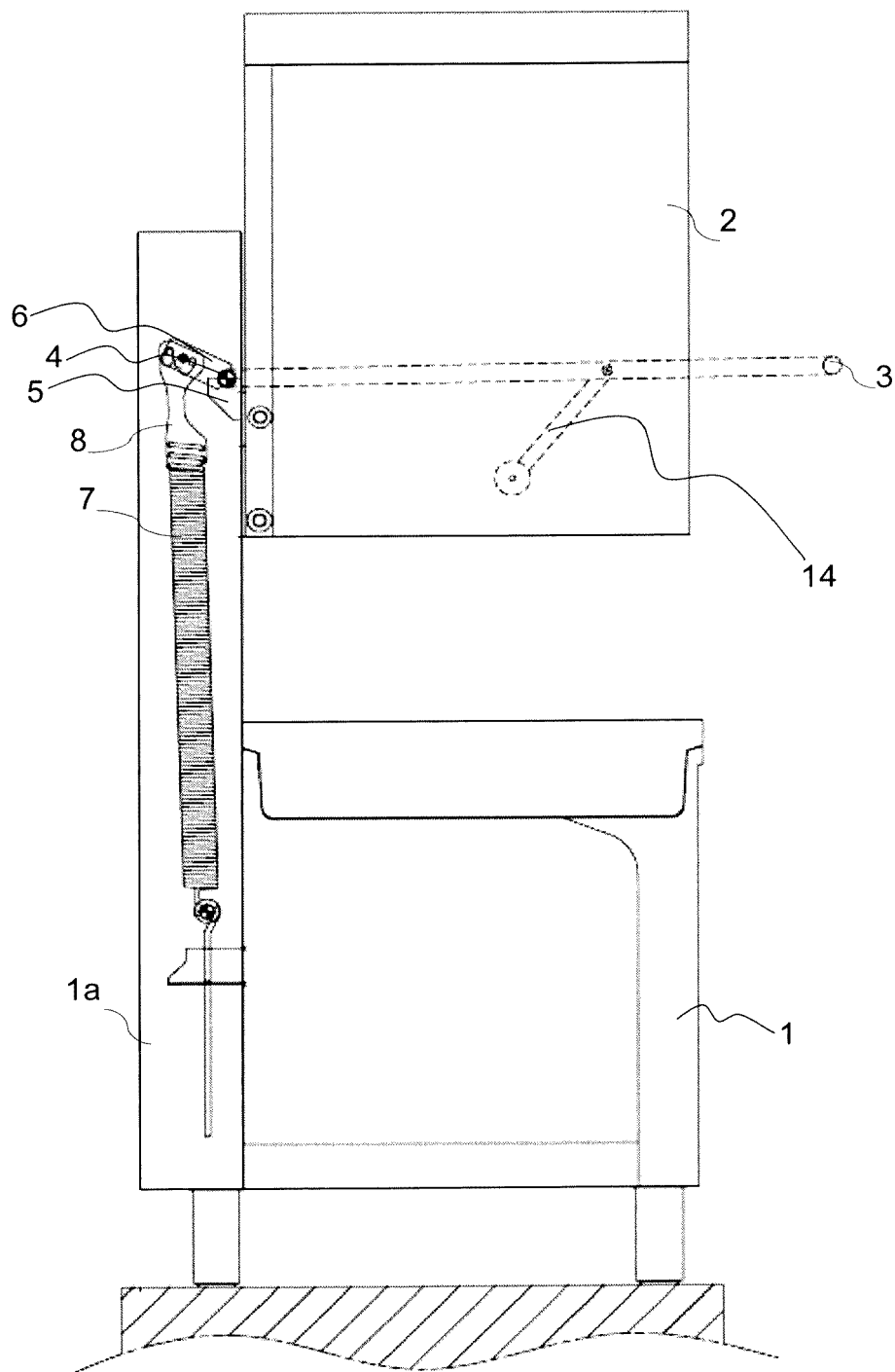


Fig.1B

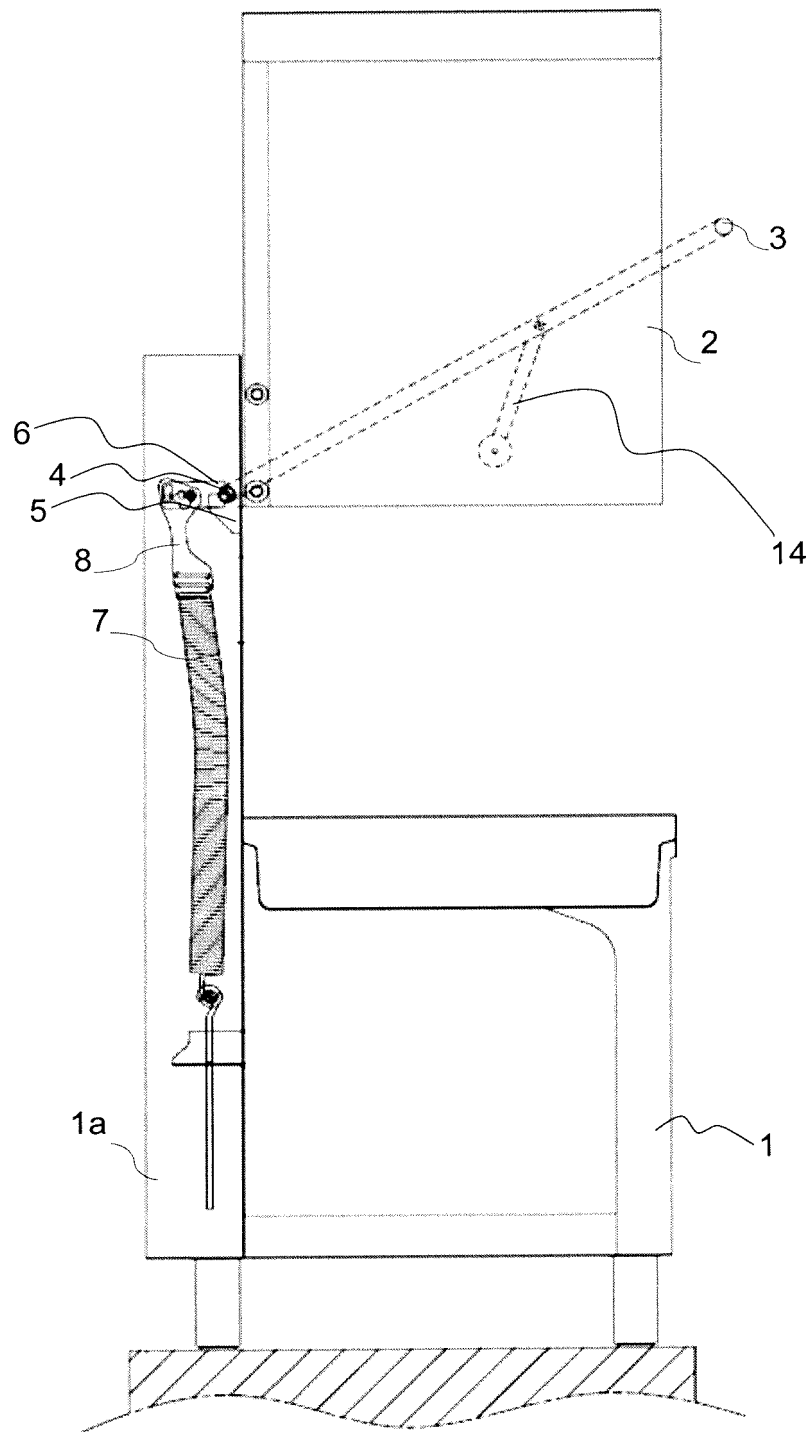


Fig.1C

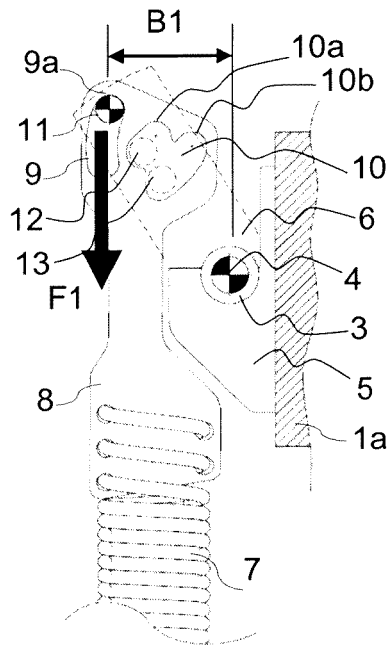


Fig.2A

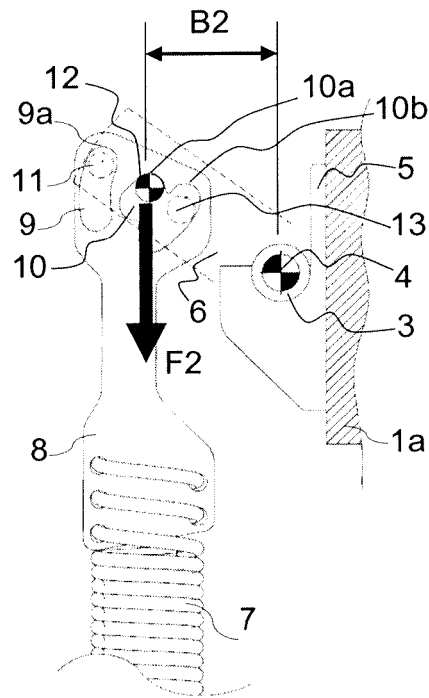


Fig.2B

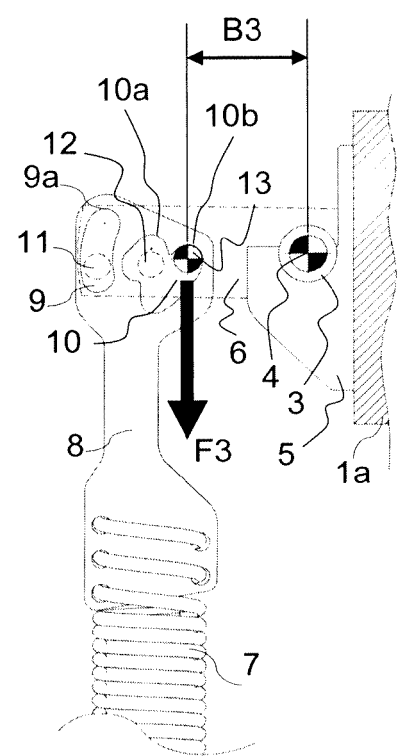


Fig.2C

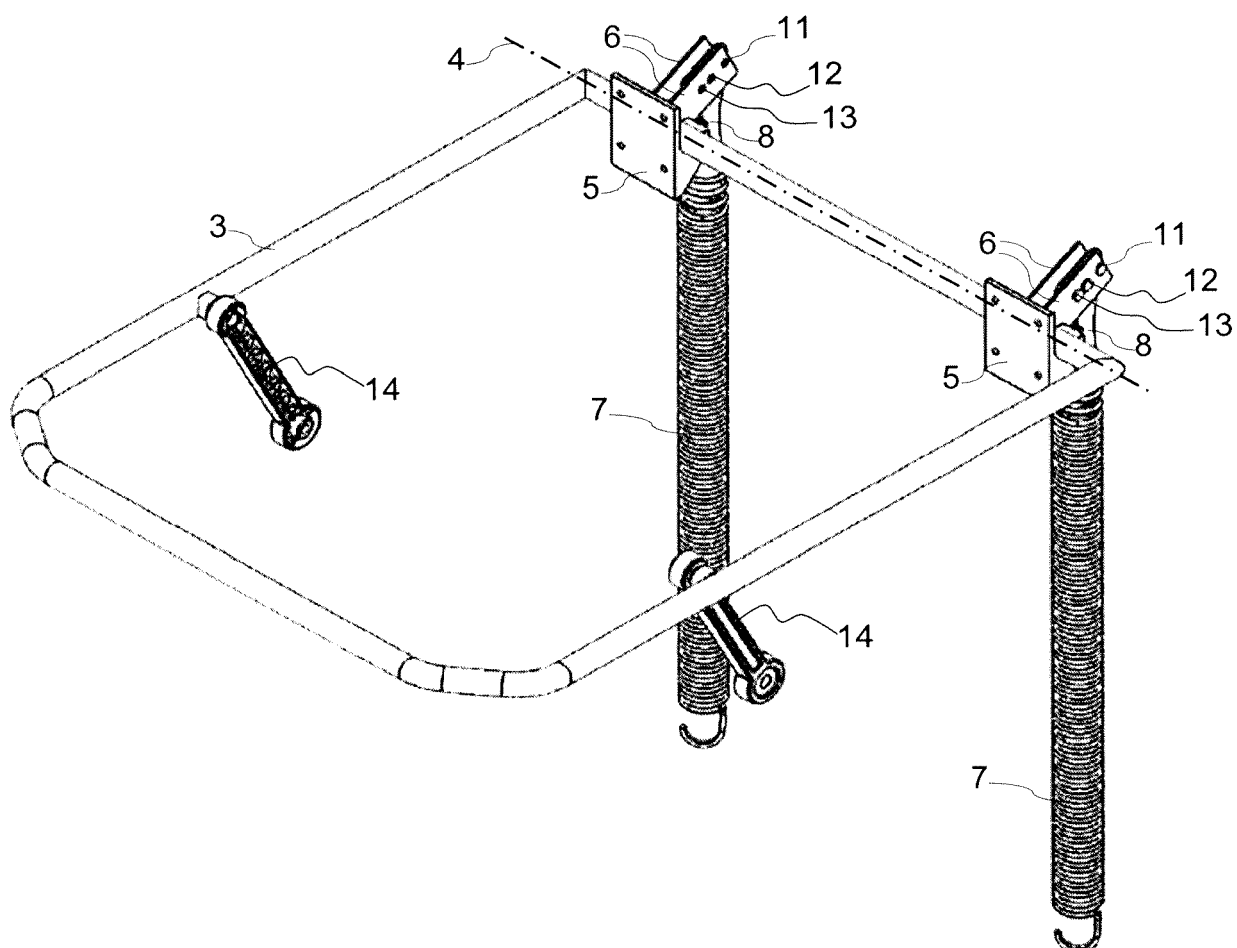


Fig.3

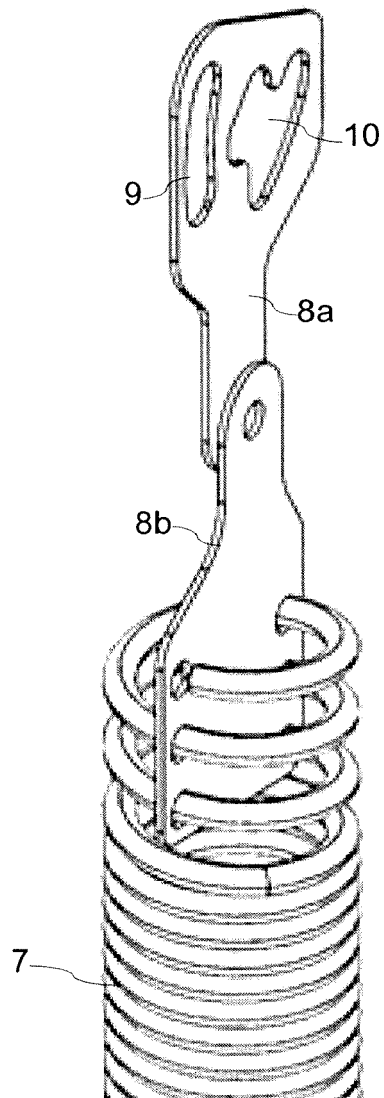


Fig.4

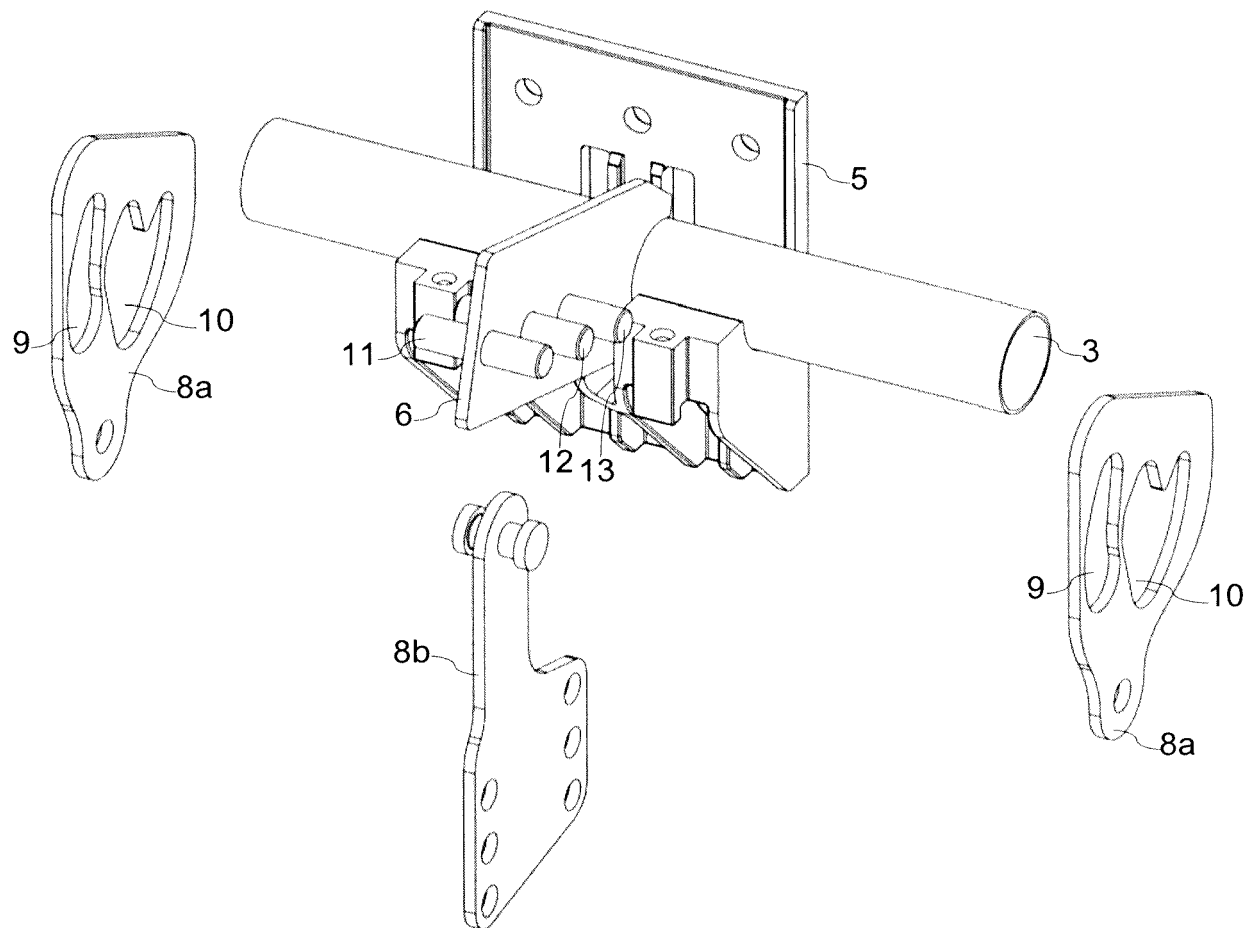


Fig.5

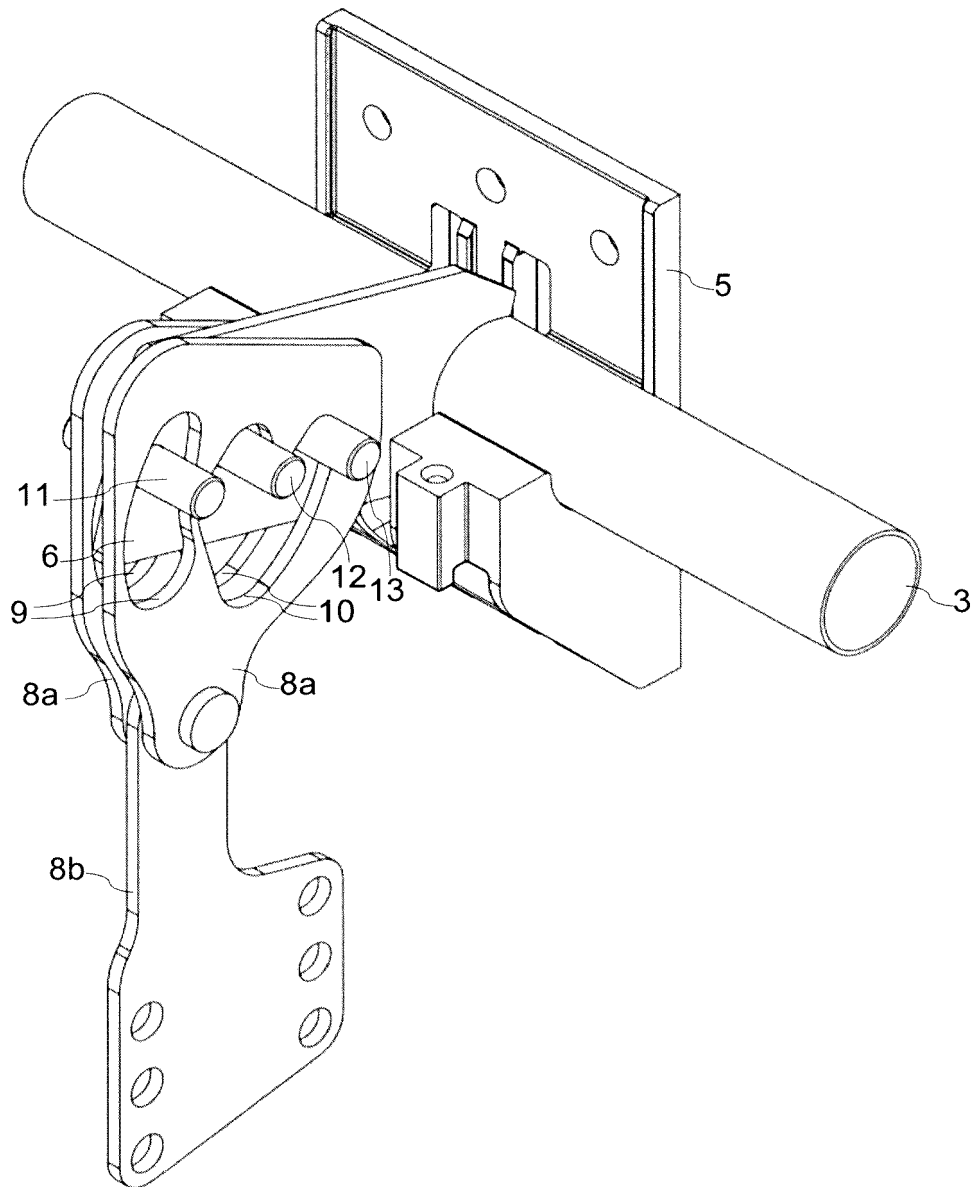


Fig.6



EUROPEAN SEARCH REPORT

Application Number
EP 19 42 5072

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2008/092933 A1 (TAMEISHI YOSHIMASA [JP] ET AL) 24 April 2008 (2008-04-24) * paragraph [0023] - paragraph [0036] *	1-9	INV. A47L15/00
A	EP 1 880 654 A1 (HOSHIZAKI ELECTRIC CO LTD [JP]) 23 January 2008 (2008-01-23) * paragraph [0020] - paragraph [0057] *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 February 2020	Examiner Jeziarski, Krzysztof
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EPO FORM 1503 03/82 (P04C01)

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

EP 19 42 5072

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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04-02-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008092933 A1	24-04-2008	CN 101102709 A	09-01-2008
		EP 1842477 A1	10-10-2007
		ES 2432551 T3	04-12-2013
		KR 20070105335 A	30-10-2007
		US 2008092933 A1	24-04-2008
		WO 2006075385 A1	20-07-2006

EP 1880654 A1	23-01-2008	CN 101166455 A	23-04-2008
		EP 1880654 A1	23-01-2008
		ES 2385835 T3	01-08-2012
		KR 20080002751 A	04-01-2008
		US 2009031848 A1	05-02-2009
		WO 2006117893 A1	09-11-2006
