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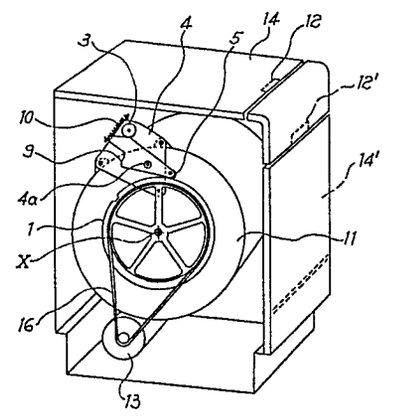
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(54) Automatic locking device to stop the drum of washing machines at a given position.

(57) An automatic locking device is described to stop the drum of a washing machine at a given position. As a last operative step of the washing cycle, before cutting off electric power from every part of the machine, the programming device causes an electric motor with reduction gear to be operated driving a shaped wheel with a cam for engagement with a lever having at one end a roller which is adapted to partially fit into a recess formed on the periphery of the drum driving pulley. Suitable microswitches, being responsive to the relative position of the said cam wheel and lever sequentially switch off the geared motor and actuate again the main motor for rotating the drum, then cause it to be finally switched off with the drum being locked and the electric lock to be actuated for opening, while upon starting a new cycle the geared motor is operated again to unlock the drum by lifting the lever with roller thus allowing the usual operation of the machine.

Fig. 1



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Description

AUTOMATIC LOCKING DEVICE TO STOP THE DRUM OF WASHING MACHINES AT A GIVEN POSITION

The present invention deals with an automatic locking device to stop at a given position a drum of washing machines or the like, in particular in order that its shutter stops in front of the loading and unloading door.

It is known that in the washing machines with drum, the type being loaded from the top, or however having the loading and unloading door from the peripheral mantle of the drum gasket, and consequently of the washing tank, such as the one being object of the EP-A-0282465 in the name of the same applicant, for having access to the inside of the drum through its shutter it is necessary that the latter corresponds with the outer loading door of the machine. This requires the manual rotation of the drum, when the machine is off, for taking out or loading the clothes.

It is true that recently, in the attempt to overcome such an inconvenience, DE-A-34 31 807 discloses a device for determining the desired positioning of the drum, being controlled by lifting of the cover or outer door of the machine. However, such a solution shows further drawbacks due to the fact that the positioning does not occur immediately upon opening of the door and it is necessary to provide between the latter and the inner shutter of the drum an additional intermediate safety door to avoid that the hands of the user may come into contact with the rotating drum before reaching the final position.

Therefore, it is the object of the present invention to provide an automatic positioning and locking device of the rotating drum in washing machines and the like, such that upon opening of the outer loading and loading door it is ensured that drum is stopped at the desired position, thereby without any need of intermediate guard elements.

This is achieved according to the invention by providing, in rotating drum machines of the above-mentioned type, a device comprising an electric motor with reduction gear, the axis of which is capable of driving through rotation a wheel or disc with a shaped profile and provided with a projecting cam for actuating one end of a three-arms lever which is pivotedly mounted on the support of said geared motor and bears at another end means for radially fitting into a recess formed at the peripheral circumference of the fully driving the drum, there being provided means responsive to the position of said lever and said wheel with cam to control, alternately in turn and according to machine programmer, the switching on of said geared motor, of the main motor for rotating drum and of the controls of an electric lock.

According to a preferred embodiment, microswitches are provided which are mounted so that, in connection with said lever being lifted under action of the cam to allow the free rotation of the drum, one of the microswitches is actuated by said lever, whereby the geared motor is switched off and keeps cam and thus lever at said position of drum being unlocked, while another microswitch operating with the control of said shaped wheel ensures that another operation of the geared motor is enabled upon control of the programmer device.

According to another aspect of the present invention there are provided resilient means biasing to keep said lever end within said recess of the pulley for locking the drum, said cam operating with the opposite end against the action of said resilient means, such as formed of a spring working under a tensile stress between this end and the stationally point of the geared motor support, while a third arm of said lever cooperates with a third microswitch for enabling, in turn, the operation of the main motor or of the electric lock.

Further objects, advantages and features of the device according to the invention will appear more clearly from the following detailed description of a preferred embodiment thereof, given by way of a non-limiting example, with reference to the annexed drawings in which:

Fig. 1 shows a schematic, perspective view of a washing machine provided with a device according to the invention and without a wall to show its inside, in the two possible modes of execution with loading from the top and, being shown by broken lines, with loading from the front, but on the peripheral mantle according to EP-A-0282465; and

Figs. 2a, 2b, 2c show the device according to the invention in three distinct operating steps, respectively.

With reference to the drawings, a washing machine being loaded from the top, either as shown with continuous lines in Fig. 1, or of the type described and claimed in EP-A-0282465 in the name of the same applicant, has a cover or loading and unloading outer door 14, 14′ and relevant electric lock 12, 12′ as well as a drum (not shown) rotatably mounted within a washing tank 11, around its axis X as it is journaled on a pulley 1 driven by a main drum motor 13 by means of a belt 16.

According to the invention there is provided an automatic locking device to stop the drum at a given position, namely such as its access door (not shown) is directly facing in front of the loading and unloading outer door 14 or 14′. This device comprises an electric motor with reduction gear 2, which is mounted on a support plate 20 being in turn resiliently connected to the washing tank 11, said geared motor 2 driving a wheel or disc 3 with a shaped contour and eccentrically provided with a projection or cam 3a. On the same support 20 there is pivotally mounted in 4a a lever 4, which is substantially L-shaped or, better, has three arms two of which are aligned each other and show respectively, at opposite ends, means 5 of engagement with a recess 15 radially formed on the periphery of the pulley 1, and the other anchoring means to an end of a spring 10 being fixed at the other end to said support 20. Between said two ends, lever 4 has a third arm, which on one side shows a recess 17

ending with a cam-shaped zone 9.

In proximity of said cam 9 and in association with said recessed zone 17 of lever 4, two microswitches 6, 7 are respectively provided, and a third microswitch is mounted, still on the support plate 20, in order to follow the shaped contour of the wheel 3 having in particular a recessed portion 18 which has been shown radiused with continuity from one side to the remaining portion of the wheel periphery and from the other side showing, with respect thereto, a tooth-shaped discontinuity.

Figures 2a, 2b 2c schematically show also the electrical connections relating to said microswitches for controlling the geared motor 2, the motor for rotating the drum, or washing motor 13 and the electric lock 12. It should be clear that said automatisms are illustrated and described only as an example, since equivalent solutions of the same technical problem can be suitably provided, as long as are based on the use of a geared motor, which is independent from the main washing motor and directly controlled by the machine programmer, provided that it is able to operate locking means to engage a peripheral groove on the drum pulley as the last step of the washing cycle, being also able to carry out automatically the disengagement of such a means as the first step of a new washing cycle.

The operation of the device as illustrated and described in detail is the following, starting from the condition shown in Fig. 2a, wherein the drum freely carries out its washing operation while rotating together with the pulley 1, driven in turn, through the belt 16, by the washing motor 13, which is controlled by the machine programmer (not shown). In this condition, lever 4 has such a position that its end 5, preferably formed by a rubbered roller, is lifted with respect to the periphery to pulley 1, being kept at that position by engagement of lever 4 with cam 3a of shaped wheel 3, which has been previously caused to rotate by the geared motor 2 until reaching that position against the bias exerted by spring 10. At the same time the microswitches 6, 7 in commutation, relating to the two arms of lever 4 defining the recess 17, are changed-over respectively to such positions to enable feeding power to motor 13, while switching off the geared motor 2 and the electric lock 12. At the same time the third microswitch 8 with its detecting element being actuated by the contact with the periphery of cam wheel 3, ensures that the geared motor 2 is preset to be switched on. At the end of the selected washing and/or drying programme in any case the programmer controls, as a last step before the machine is off, that the geared motor 2 is fed through microswitch 8, whereby the disc 3 rotates in the direction of arrow F until cam 3a disengages lever 4.

Thus the position shown in fig. 2b is reached, wherein lever 4, biased by spring 10, lowers its end 5 which comes to rest onto the peripheral edge of pulley 1, while the engagement between microswitch 8 and wheel 3 has shifted up to the recessed zone 18 where a commutation occurs causing the geared motor 2 to be cut out. At this point, as the microswitch 6 is still commutated to the effect that motor 13 is on, through microswitcher 6 is fed to the latter the electric power taken from geared motor 2 by the microswitch 8, whereby pulley 1 is driven to rotate until positioning its peripheral groove 15 in correspondance with the lever end 5 which fits therein under the bias of spring 10, blocking it at such a position shown in Fig. 2c. It should be clear that the rubber thickness coating from outside the roller at the end 5 will have such a size to efficiently damp the shock caused by blocking On the other hand the feed of motor 13 during the step of positioning until blocking, being controlled by microswitches 6, 8 (not directly by the programmer) will be such as to have a rotation speed of the pulley extremely low, still for the purpose of reducing impact consequences.

As a consequence of this further rotation of lever 4, when its end 5 meets the groove 15, the walls of the recessed zone 17 have a movement, whereby both microswitches 6, 7 commutate, the first of which switch off the motor 13 thus blocking pulley 1 at the position of Fig. 2c and at the same time enabling electric lock 12 to be opened, after its possibly prefixed delay. Therefore, upon opening of door 14, the drum which is fixedly mounted to the pulley, is already perfectly locked at the desired position, in function of which is formed the groove 15 on the pulley 1. Thus it will be possible to open the drum shutter without any manual rotation and in absence of any displacement during operations of loading and unloading of clothes, under absolute safety conditions. The other microswitch 7 presets the microswitch 2 to be fed through the programmer.

In fact at the beginning of a new operation cycle, as selected on the programmer as long as it is enabled by the door 14 being closed, the programme in any case gives as a first step that device 2 is fed through the microswitch 7. Then the cam 3a reaches again the position of Fig. 2a causing lever 4 to rotate against the bias of spring 10 so as to release the pulley 1 thus unlocking the drum. Upon rotation of lever 4, the microswitch 6, being no longer in contact with the cam 9 of said lever, takes out the electric feed from the electrical lock 12 and switches on the motor 13 which is caused to rotate under the exclusive control, in this step, of the programmer also through the enabling consent of the other microswitch 7, which at this stage, being pressed by lever 4, switches off the geared motor 2.

At the same time the microswitch 8 has brought its contact with the wheel 3 outside the recess 18, since the latter is suitably provided on the contour of wheel 3 in an area placed at the same side of cam 3a, with respect to the rotation axis, thus commutating its own controls to reset a subsequent operation of the geared motor 2 as soon as required, under control of the programmer, at the end of the operation cycle, that has just started. It will be appreciated that the usual consents to the various operations will be of course envisaged, in particular for actuation of the washing motor 13, e.g. depending on the door 14 being closed, as well as any timing with various delays which are usually predetermined for safety's reasons.

Possible additions and/or modifications can be

accomplished by those skilled in the art with reference to the above-described and illustrated embodiment of the device according to the invention, and in particular the devices responsive to the position of the lever being the same locking means, can be performed differently from the above-mentioned microswitches, as well as the cam element, which is driven by the geared motor and controls the lever itself. On the other hand, the device according to the invention can be used also in machines which are different from the washing machines and generally could be applied onto whichever apparatus wherein a rotating member like a drum, being controlled by a programme, must be stopped at the end of each operating cycle, in front of a door for the access from outside. Examples thereof could be dry cleaning machines, dyeing machines, or also for tumbling of metallic parts, mixing machines, kneading machines or the like.

Claims

1. Automatic locking device to stop at a given position the rotating drum in washing machines and the like controlled by a programmer, with washing motor (13) driving a pulley (1) fixed to a drum within a washing tank (11), with loading and unloading outer door (14) being controlled by an electric lock (12), characterized by comprising a geared motor (2) for driving to rotation a wheel or disc (3) with a shaped contour and provided with a projecting cam (3a) for operating one end of a three-arms lever (4) which is pivotedly mounted in (4a) and biasing at another end (5) locking means adapted to be fitted into a groove (15) formed on the peripheral circumference of the pulley (1), there being provided means (6, 7, 8) responsive to the position of said lever (4) and wheel with cam (3) for controlling, alternately in turn and according with the machine programmer, that power is fed to said motor (2), main motor (13) and controls of the electric lock (12).

2. A device according to claim 1, characterized in that said control responsive means (6, 7, 8) are microswitches being so mounted that, in association with said lever (4) kept lifted under the action of cam (3a) to allow the free rotation of the drum, one of them (7) is operated by said lever (4) whereby the geared motor (2) is switched off thus keeping cam (3a) and consequently lever (4) in said position of unlocked drum, another microswitch (8) ensuring the consent that the geared motor (2) is again switched on upon control of the programmer at the beginning of a new cycle.

3. A device according to claim 2, characterized in that a resilient means (10) is provided for keeping said lever end (5) to rest against the periphery of said pulley (1) until reaching said groove (15), said cam (3a) being adapted to engage the opposite end of lever (4) against said resilient means (10) to keep the end (5) lifted during the time of normal operation of the machine.

4. A device according to claim 3, characterized in that said resilient means (10) is formed as a spring having one end stationary and the other fixed to the end of the lever arm (4) which is opposite to the one having said locking means (5), there being also provided a third arm with shaped cam (9) for engagement with the responsive means of said microswitch (6) for the alternately consent to the operation of either motor (13) or the electrical lock (12).

5. A device according to claim 4, characterized in that between said arm with cam (9) and the arm of lever (4) which is connected to spring (10) the contour of lever is shaped with a recess (17) the walls of which, according to the position of lever (4) come into contact with the responsive means of at least one of the two microswitches (6, 7).

6. A device according to one or more of the claims 2-5, characterized in that said wheel with cam (3) has a recess (18) on its periphery in correspondance of which the contact of said microswitch (8) takes over its control cutting out the feed of the geared motor (2) and allowing the feed of motor (13) through said microswitch (6), while outside of said recess (18) said contact ensures that the microswitch (2) is preset for another actuation according to the programme.

7. A device according to claim 6, characterized in that said recess (18) on the periphery of the wheel (3) with cam is formed in the circumference portion which is positioned at the same side of said cam (3a) with respect to the rotation axis of the wheel itself.

8. A device according to one or more of the preceding claims, characterized in that the geared motor (2), the wheel with cam (3) and said microswitches (6, 7, 8) are all mounted on a support plate (20) resiliently connected to the washing tank (11), on the plate (20) there being also pivotedly mounted in (4a) said lever (4).

9. A device according to one or more of the preceding claims, wherein said locking means (5), adapted to engage the groove (15) of the pulley are formed as a roller pivotedly mounted at said end of lever (4) with a rubber coating of a not negligible thickness.

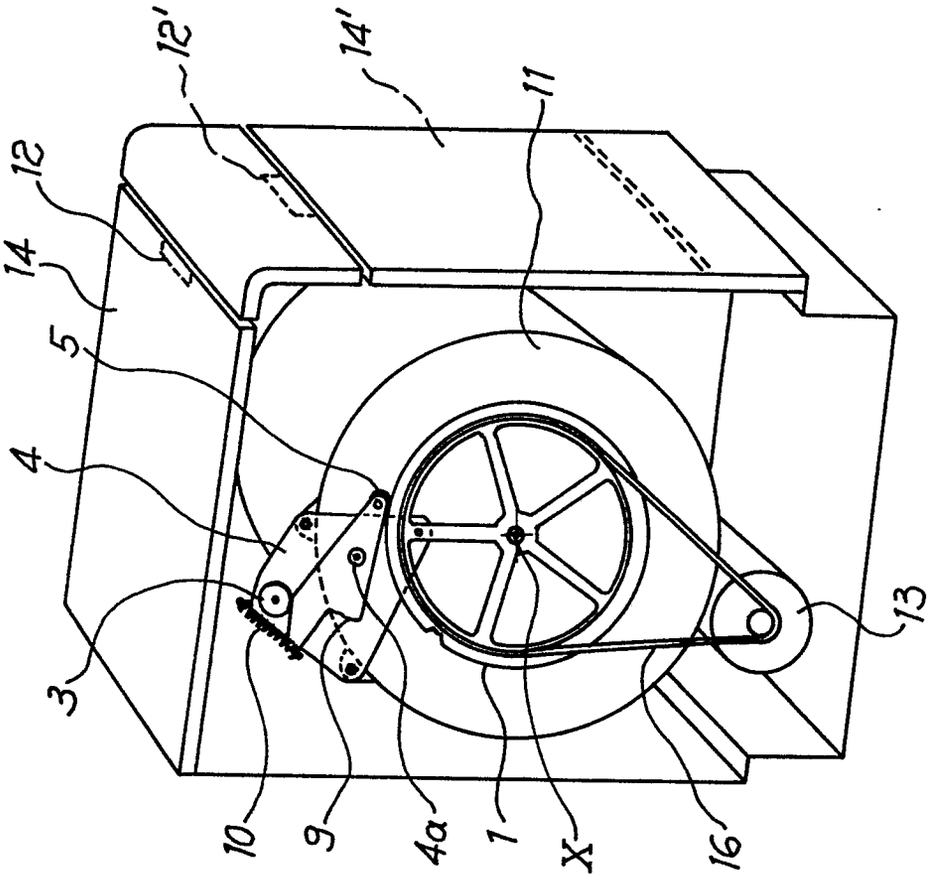


Fig.1

Fig.2a

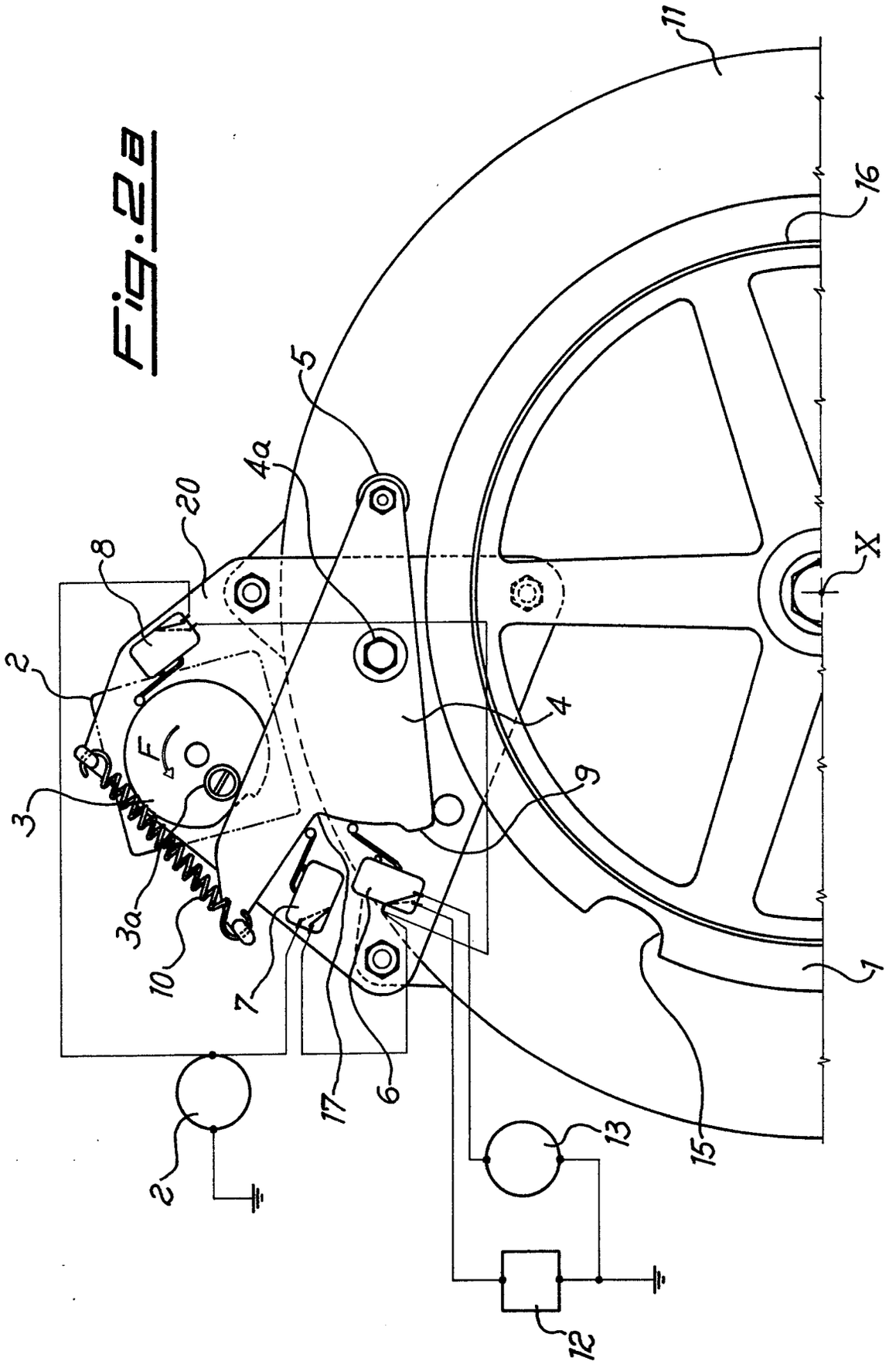


Fig.26

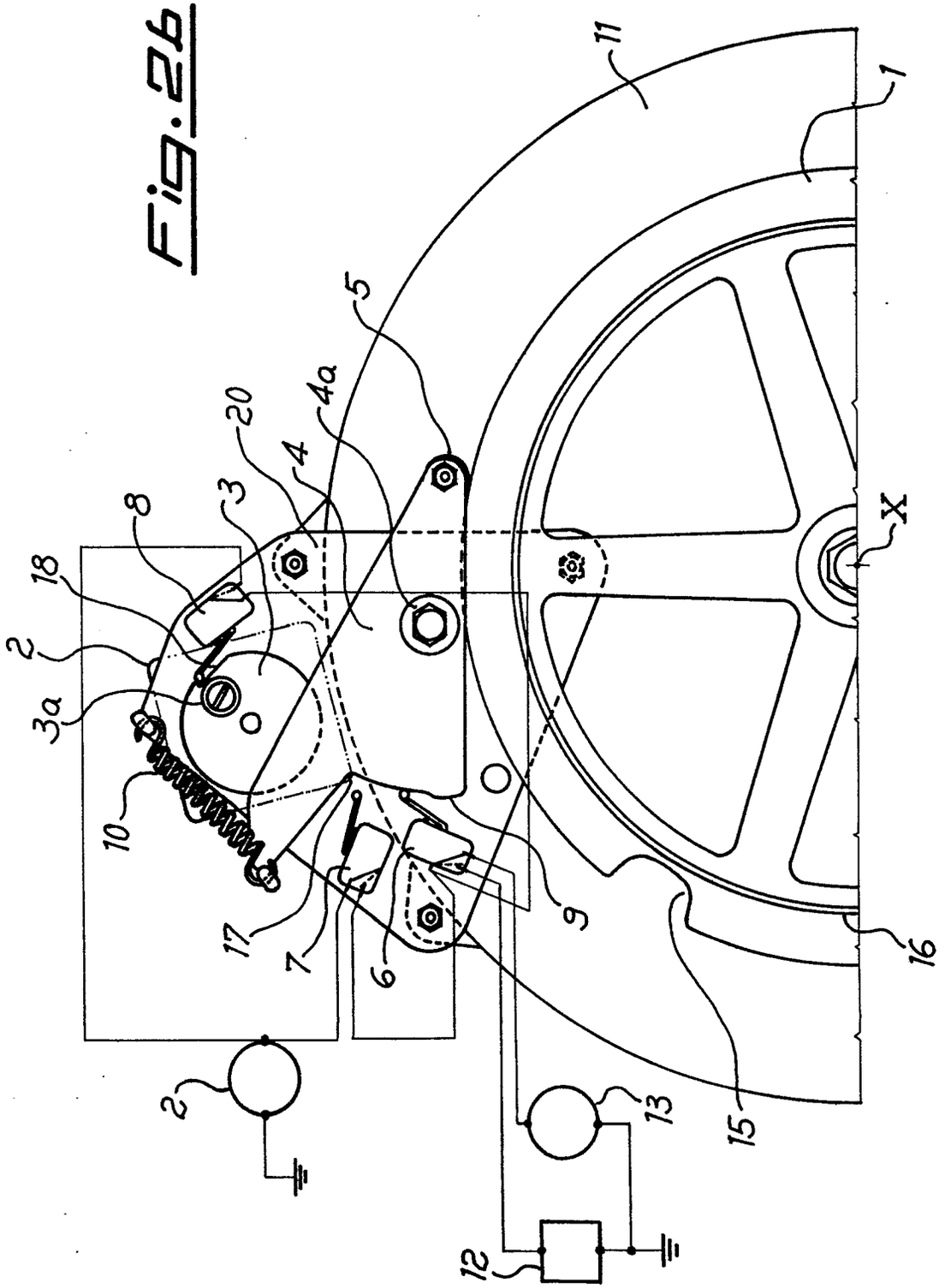


Fig.2c

