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(54) Rotary control device with retractable knob, in particular for household appliances.

(57) A rotary control knob with a first protruding work position and a second retracted rest position has no need that the support panel on which it is mounted, especially a dish-washing machine door, has a thickness such as required to allow housing a two-steps operated restraint device. The control knob is integral with an axially slidable control shaft, which does not rotate with respect to the rotating portion of the machine component to be controlled. The same shaft is connected at a point situated backward of the control knob, to the two-steps operated device which in a first embodiment is housed in a hollow part of the rotating portion of the machine component to be controlled and, according to a second embodiment, is linked to the rear end of the control shaft passing through the said component.

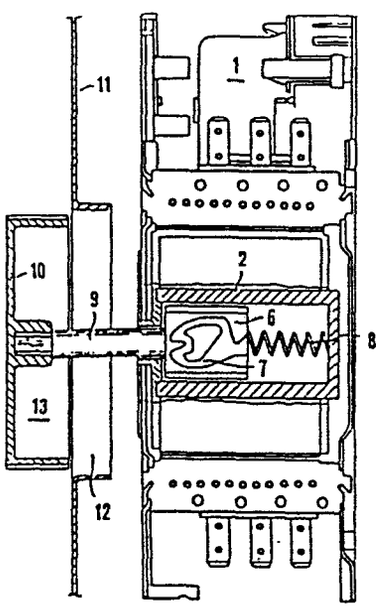

FIG.1

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"ROTATORY CONTROL DEVICE WITH RETRACTABLE KNOB, IN PARTICULAR FOR HOUSEHOLD APPLIANCES"

The present invention deals with a rotatory control device having a control handle or knob movable from a work position in which it projects from a surrounding surface to a rest position, being retracted with respect to said surface.

Such control devices are sometimes used in household appliances, such as for controlling cocks or switches of gas cookers or electric cookers, respectively, ovens and the like. Their purpose is that of providing an easy handling and working of the knob when this is in the projecting position, and its subsequent travel to the rest position, in which it does not project from the surrounding surface of the household apparatus, generally formed of a control panel, thus being protected from shocks and undesired strokes, and in addition the apparatus aspect is aesthetically improved.

In these known control devices with retractable knob, the latter is mounted axially movable but not rotatable with respect to a shaft which is integral to the rotating portion of the component to be controlled, such as a cock or a switch, and the knob includes a restraint device being operated in two steps, which upon a first pressure on the knob allows its assuming the retracted position and keeps it there, and upon a second pressure releases the knob and allows its reversal trip, under the action

of a spring, to the protruding work position. However the necessity of housing this device within the knob causes the latter to considerably extend itself in depth and require a correspondingly deep seat to be completely housed under the external surface of the apparatus. Therefore the known devices cannot be adopted in those cases in which there is no sufficient available space in the depth direction. For example the known devices could not be used with the timer knob of a dishwashing machine, when it is mounted on the machine door and all the associated linkages as well as the seat for the back stroke of the knob, must be contained in the restricted thickness available between the door and the inner screen-door of the machine.

Additionally, the relatively short extension of the slide coupling between the knob and its shaft and the necessary clearance for a ready sliding cause the knob in the forward position to swing, thus giving the user the impression of an inadequate firmness or of a failure that has occurred.

It is the object of the present invention to provide a rotatory control device with retractable knob, particularly suitable for household appliances, which is without the inconveniences shown by the known devices of the same kind, or shows these inconveniences in a lower degree.

This object is achieved according to the invention by means of the fact that in a device of the above-mentioned type the control knob is integral with the control shaft, this is mounted axially slidable, but not turnable with respect to the rotating portion of the component to be controlled, and is connected, at a point located rearward of the control knob, to a restraint

device operated in two steps which upon exerting a first pressure on said shaft by means of the knob, causes it to assume a position with the knob recessed from the surrounding surface, and upon a second pressure releases a spring that biases the shaft to a position with the knob in the forward projecting work position.

By this arrangement the restraint device operated in two steps does not affect the knob dimensions in the direction of depth and this can be chosen only in view of the requirements for a correct seizing and operation of the knob, thereby with a smaller size than usually. Correspondingly less deep may be the seat in which the knob must be able to be retracted and it results therefrom the possibility of using the device in arrangements to which the prior art solutions could not be applied. Furthermore the shaft integral to the knob can be guided within the component to be controlled, or in relationship to parts integral therewith, much more efficiently than the way a slidable knob can be guided along its shaft, and also results an improved stability of the knob in the "work" position.

The two-steps operated restraint device, which is designed to actuate the control shaft, is mounted in a hollow central part of the rotating portion of the component to be controlled or, in an alternative embodiment, is connected to the rear end of the control shaft which in this case extends itself across the whole component to be controlled.

With the first arrangement, which can be adopted whenever the component to be controlled is adapted to be formed with a hollow central portion, the presence of the restraint device does not add to the depth size of the control device assembly, which consequently may have a particularly compact construction.

With the second mentioned arrangement, being instead particularly recommendable in all those cases wherein the component to be controlled is not suitable to be made with a hollow central portion adapted to house the restraint device, the device size in the depth direction affects no longer the knob, but a region behind the component to be controlled, where there is frequently more availability of space.

Advantageously in the first case the control shaft, to the front end of which the control knob is fixedly mounted, is made integral in its back end portion to a piston-shaped member being axially slidable in the hollow central part of the rotating portion of the component to be controlled and said piston-shaped member is provided with a key-type coupling with said rotating portion, shows its own configurations being part of the two-steps operated restraint device and co-operates with a rear return spring biasing it to the position corresponding to the forward projecting knob.

Conveniently these configurations of the piston member, forming a part of the restraint device, comprise a hollow shaped track co-operating with a coupling clip which is inserted in the rotating portion of the component to be controlled.

In the second embodiment it may be preferable that the restraint device is placed at a side (transversely or vertically) of the component to be controlled and is linked to the rear end of the control shaft through a rocking lever. By this arrangement only the slight dimensions of the rocking lever are to be taken into account, while the size of the restraint device is compris ed, in the depth direction, within the overall size of

the component to be controlled whereby a minimum total depth of the device is achieved. In this case the restraint device operated in two step is of a commercial type, commonly used to fasten doors and the like.

In a typical and particularly advantageous application the control device of the invention is the actuation means for operating the programme timer of a dishwasher, washing machine, cooker, oven or the like.

The present invention will be better understood by means of the following description of two embodiments, given by way of non-limiting examples, relating to a control device for a dishwasher timer, and diagrammatically shown in the accompanying drawings, in which:

FIGURE 1 shows in a side elevational view, partially in cross-section, a programme timer device for dishwashing machines, which is provided with a control device having a retractable knob according to the invention, the control knob being in the "work" position;

FIGURE 2 shows the same parts of Fig. 1, but with the control knob in the rest back position;

FIGURE 3 is a particular as viewed of the hollow central part of the timer rotating portion;

FIGURE 4 shows a cross-section thereof;

FIGURE 5 shows a horizontal sectional view along a diameter thereof;

FIGURE 6 shows in a view similar to Fig. 1 a programme timer device for dishwashing machines, which is provided with a different embodiment of the control device having a retractable knob according to the invention, with the knob again in the "work" position; and

FIGURE 7 represents the same parts of Fig. 6, but with the control knob in the "rest" position as in Fig. 2.

With reference to Figs. 1-5, numeral 1 represents a programme timer of a generally known type, but having a hollow central portion 2 which is integral to the rotating part of the component and formed of a multiplicity of cams, not shown. This hollow central portion 2 is provided with a key 3 extending longitudinally within its cavity. In addition the hollow portion 2 houses a coupling clip 4 with a bent free end 5.

A piston-shaped member 6 is placed within the hollow portion 2 of the timer and shows a groove corresponding to the key 3 and co-operating therewith, so that the piston 6 can slide axially in the hollow portion 2 while rotates with the latter without relative motion. On the side opposite to the key 3 the piston 6 has a plane face with a shaped grooved track 7 adapted to co-operate with the bent free end 5 of the coupling clip 4 to form therewith a restraint device operable in two steps, which is well known per se. By means of this restraint device when the piston 6 is moved a first time toward the bottom of the hollow portion 2, it is kept in this position, whereas if it is brought a second time even more deeply to the bottom, it is released and can leave again the bottom. A return spring 8, partially inserted in a cavity of the piston 6 and resting against the bottom of the hollow portion 2, urges the piston 6 to move away from this bottom.

A control shaft 9 projecting from the timer hollow portion 2 is fixed to the piston-shaped member 6 and a knob 10 is fixedly mounted at its outer end. The knob is placed in correspondence with a recess 12 formed in a surface 11, in this case a dishwasher door. The position of the knob 10 in relationship with the surface 11 is such that when the piston 6 is in its position far from the bottom of the

hollow portion 2 (Fig. 1), the knob 10 protrudes from surface 11, whereas when the piston 6 is near the bottom of the hollow portion 2 (Fig. 2) the knob is within (in this case completely) the recess 12 which is the seat for its housing.

The operation of the device is as follows. Supposing initially the rest position (Fig. 2), upon exerting a pressure on the knob 10 which is retracted in the seat 12, the restraint device to be operated in two steps is actuated to the effect that spring 8 is allowed to move piston 6 away from the bottom of the hollow portion 2: the knob 10 assumes the protruding position of Fig. 1. Then it can be grasped and caused to rotate in order to set the timer on the wished programme. The rotation of the knob 10 is rigidly transmitted to shaft 9 and piston 6 and from this to the rotating portion of the timer through the key 3. Upon setting, a further pressure on the knob 10 causes this to move back into the seat 12 while the restraint device operable in two steps holds the piston 6 in the vicinity of the hollow portion bottom. In this position the knob 10 does not protrude from the machine door surface 11, is protected from any accidental shock and cannot be inadvertently rotated such as by children. Furthermore in this not protruding condition it cooperates to a better aspect of the machine. However the knob 10 is still perfectly visible and its observation provides an indication of the progress of the pre-set working programme.

The fitting between piston 6 and hollow portion 2 may be precise enough and the control shaft 9 in turn may be efficiently supported in that point where it projects from the hollow portion 2, so that any oscillation of the knob 10 in the "work" forward position can be efficiently prevented.

With reference to Figs. 6, 7 where members similar to those already defined bear the same reference numerals, the timer 1a has its rotating portion, instead of being directly fixed to a control shaft, crossed throughout by an axially slidable control shaft 9a having a coupling means 20 cooperating with said rotating portion of the component to be controlled. This coupling means 20 is prismatic, such as a key or the like, in order to be able to give said rotating portion the rotation movements imparted to the control shaft 9a by means of the operating knob 10, which is mounted as previously described. By means of an axial movement of the shaft 9a with respect to the component to be controlled through which it passes, the knob 10 is brought either to a "work" position (Fig. 6), protruding from the surface 11, or to a "rest" position (Fig. 7) back within the recess 12 (completely in the illustrated embodiment).

In the example shown, according to which the restraint device operable in two steps is mounted at a side of the timer 1, the rear end of the control shaft 9a, which protrudes backwards behind the timer 1, shows a coupling groove 14 for engagement with a fork-shaped end of a first arm 15 of a rocking lever 15-16 which is pivoted to a stationary support 17, a second arm 16 thereof being engaged with the moving element 18 of a restraint device 19 to be operated in two steps, sidely positioned to the timer 1. This restraint device is of a commercial type, commonly used for keeping doors and the like closed, and contains therein a return spring which is used, when required, also to urge the knob 10 toward the work position.

The operation of this second embodiment is as follows. Supposing initially the rest position (Fig. 7), upon exerting a pressure on the knob 10 which is retracted in the seat

12, the restraint device 19 is actuated to the effect that the moving element 18 is caused (by means of its own return spring) to have a shift in the direction to the outside with the consequence of urging forward the lever 15-16 and also the shaft 9a: the knob 10 reaches the protruding position of Fig. 6. In this position the operation of the knob is as described before, since the rotation of the shaft 9 is transmitted, through the coupling means 20, to the rotating portion of the timer 1. Upon timer setting, a further pressure on the knob 10 causes this to move back into the seat 12 while the restraint device 19 keeps again its own moving element 18 in the back position of Fig. 7. In this position the knob 10 does not protrude from the machine door surface 11 with the same advantages already pointed out for the embodiment of Figs. 1-5.

The knob 10 can be efficiently prevented from oscillating as in the previously described embodiment when making the control shaft efficiently supported at both its ends where it extends from the rotating portion of timer 1.

It is clear that in those cases in which a space of greater size is available behind the device, the restraint device operable in two steps, of whichever type, may be mounted directly at the rear end of the control shaft 9.

Although the control device according to the invention has been described as applied to a dishwasher programme timer, it is obvious that such a device can be applied to timers for any different type of household apparatus, as well as to whichever else component to be rotatively controlled, and the knob of which can be advantageously retracted into a seat, provided that such a component allows for a hollow portion at the central zone of its rotating member or can be crossed throughout by an axially movable control shaft, respectively in the first and second

described embodiment.

The surface 11 may belong, instead of a door, to a control panel and the seat 12, which is entirely free in the represented examples, may be partially occupied by protruding elements adapted to be contained in the rear-side cavity 13 of the knob 10, between its mounting hub on the shaft 9 and its outer skirt, which in some cases may provide a further reduction of the dimensions required for the whole device in the depth direction.

In any case the shape of the parts forming the device may be modified to conform to the various application requirements and the various components, especially the restraint device operable in two steps, may be replaced with their technical equivalents.

C L A I M S

1. A rotary control device of the type provided with a control knob movable between a working position, protruding from the surrounding surface, and a rest position, retracted with respect to said surface, characterized by the fact that the control knob (10) is fixed to a control shaft (9; 9a) mounted axially movable but not turnable to the rotating portion of a component (1, 1a) to be controlled, and said control shaft (9, 9a) is connected at a point behind the control knob (10) to a restraint device (4, 7; 19) to be operated in two steps, which upon a first pressure impressed on said shaft (9, 9a) through the knob (10) provides for its movement to a position where the knob (10) is retracted from the surrounding surface (11), and upon a second pressure releases a return spring (8) urging the shaft to a position having the knob in the protruding working position.

2. A device according to claim 1, wherein the restraint device (4, 7) operable in two steps to control the shaft (9) is housed in a hollow central portion (2) of the rotating part of the component (1) to be controlled.

3. A device according to claim 2, wherein the control shaft (9) at the outer end of which there is fixed said control knob (10), is connected at the inner rear end thereof to a piston-shaped member (6) axially slidable in said hollow central portion (2), and said piston-shaped member (6) having a key-type coupling (3) with said rotating part shows its shaped portions (7) being a part of said restraint device and cooperates with said return spring (8) urging said member to a position corresponding to the protruding knob (10).

4. A device according to claim 3, wherein said shaped

portions (7) of the piston member (6), being a part of said restraint device operable in two steps, comprise a recessed and shaped track cooperating with a coupling clip (4) inserted in the rotating portion of the component to be controlled.

5. A device according to claim 3, wherein said return spring (8) is partially housed in a cavity of the piston-shaped member (6).

6. A device according to claim 1, wherein the restraint device (19) operable in two steps to control the shaft (9) is linked to the inner rear end of the control shaft (9a) which crosses throughout the component (1a) to be controlled.

7. A device according to claim 6, wherein said restraint device (19) is positioned (laterally or vertically) at a side of the component to be controlled (1a) and is connected to the rear end of the control shaft (9a) through a rocking lever (15, 16).

8. A device according to claim 7, wherein said rocking lever (15, 16) shows a first fork-shaped arm (15) engaged in a recess (14) of the rear end of the control shaft (9a) and a second arm (16) abutting against the moving element (18) of said restraint device (19).

9. A device according to claim 7, wherein said restraint device (19) operated in two steps is of a commercial type, commonly used to keep doors and the like close.

10. A device according to claim 1, being the actuating means to control a programme timer (1) of a dishwasher, of a washing machine, a cooker, an oven or the like.

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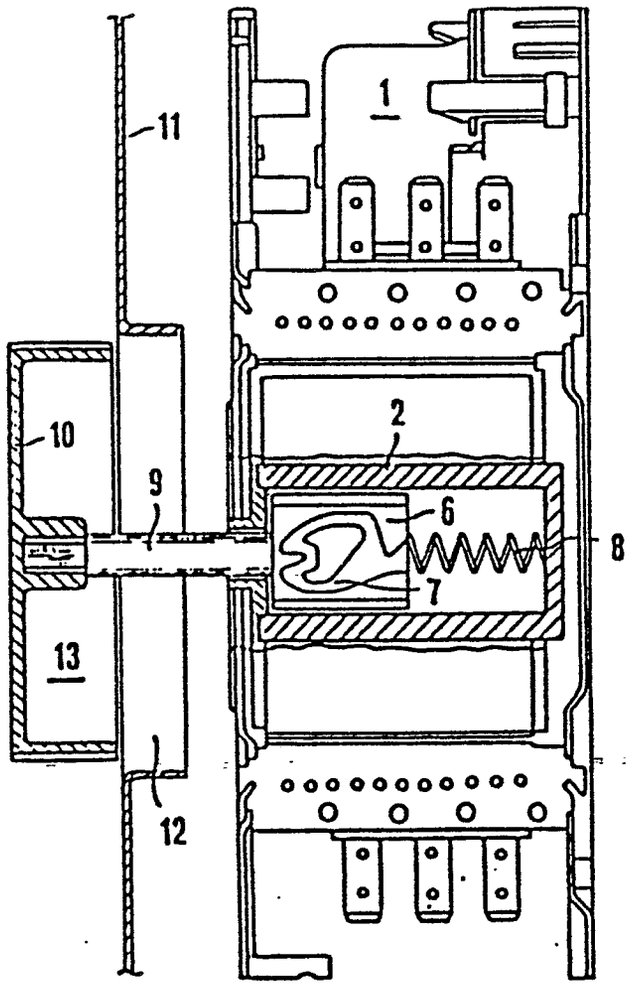

FIG.1

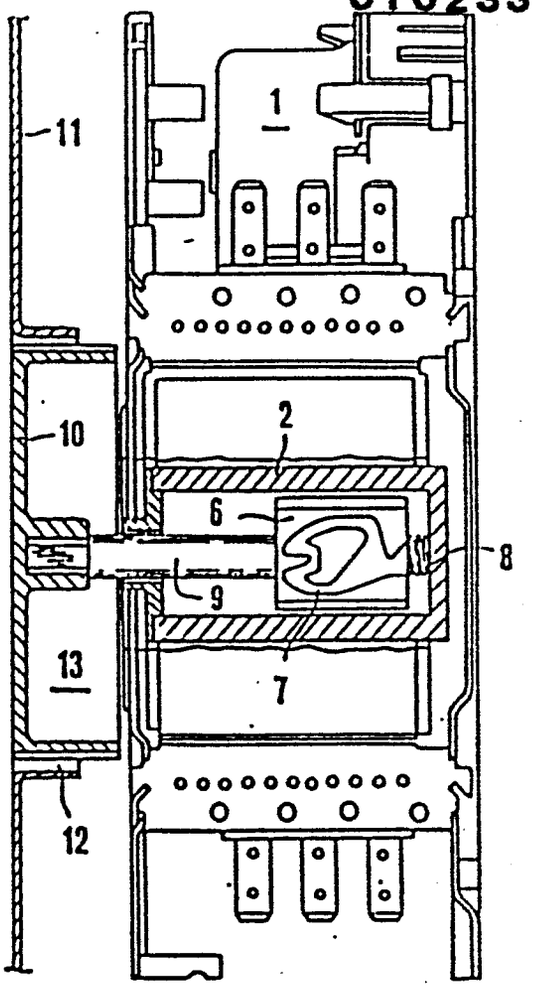

FIG.2

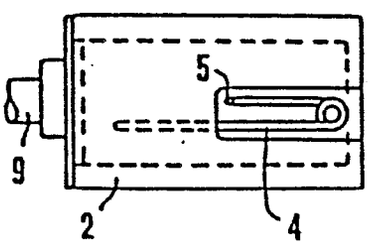

FIG.3

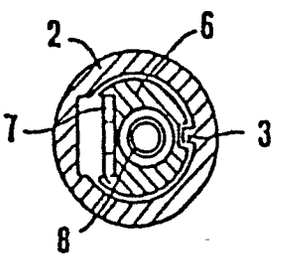

FIG.4

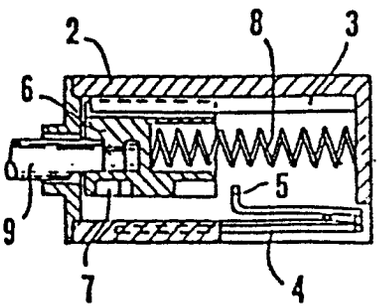

FIG.5

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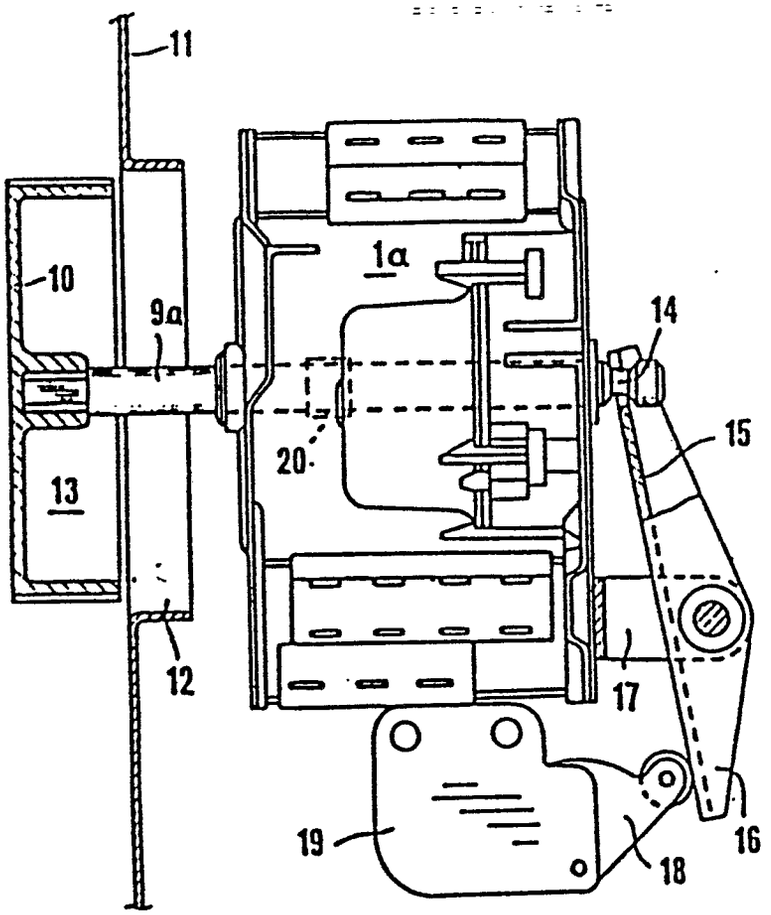

FIG.6

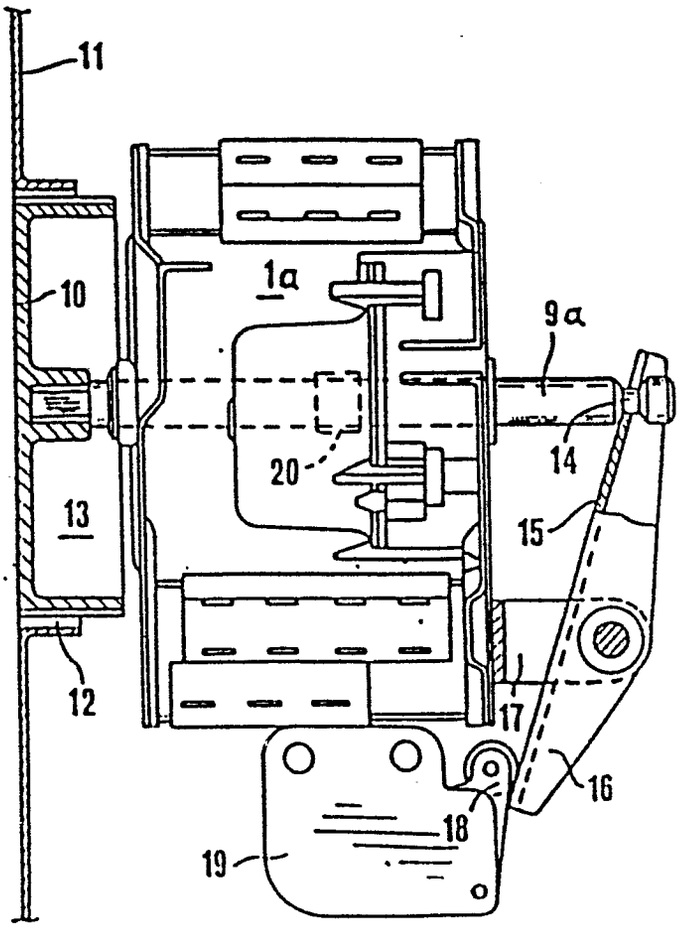

FIG.7