United States Patent [19]

Faffari

[11] **3,833,778**

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[54] **BELLOWS-TYPE TIME DELAY DEVICE FOR RETARDED SWITCH**

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[73] Assignee: **La Telemecanique Electrique,** Nanterre, France

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[30] **Foreign Application Priority Data**

Dec. 8, 1971 France 71.44021

[52] **U.S. Cl.** ..... **200/33 R,** 200/34, 200/83 T

[51] **Int. Cl.** **H01h 7/03,** H01h 43/00

[58] **Field of Search** ..... 200/33 R, 34, 83 C, 83 T; 335/59, 60, 61; 337/320

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Primary Examiner—James R. Scott

Attorney, Agent, or Firm—William Anthony Drucker

[57] **ABSTRACT**

Particularly compact, removable bellows-type timing device for electric contacts whose closing or opening can be delayed. This timing device comprises a movable contact-holder pivotally mounted on two pivots disposed on the internal surface of the shell of the device, on either side of the bellows, the shape of the holder, ring or fork, being such that it surrounds at least partially the bellows when the latter is in expanded configuration: as a result, the dimension of the device, parallel to the direction of displacement of ghe bellows, is reduced.

The device further comprises a flexibly mounted mechanical coupling component which enables dove-tail coupling with the mobile unit of an eventual relay.

4 Claims, 4 Drawing Figures

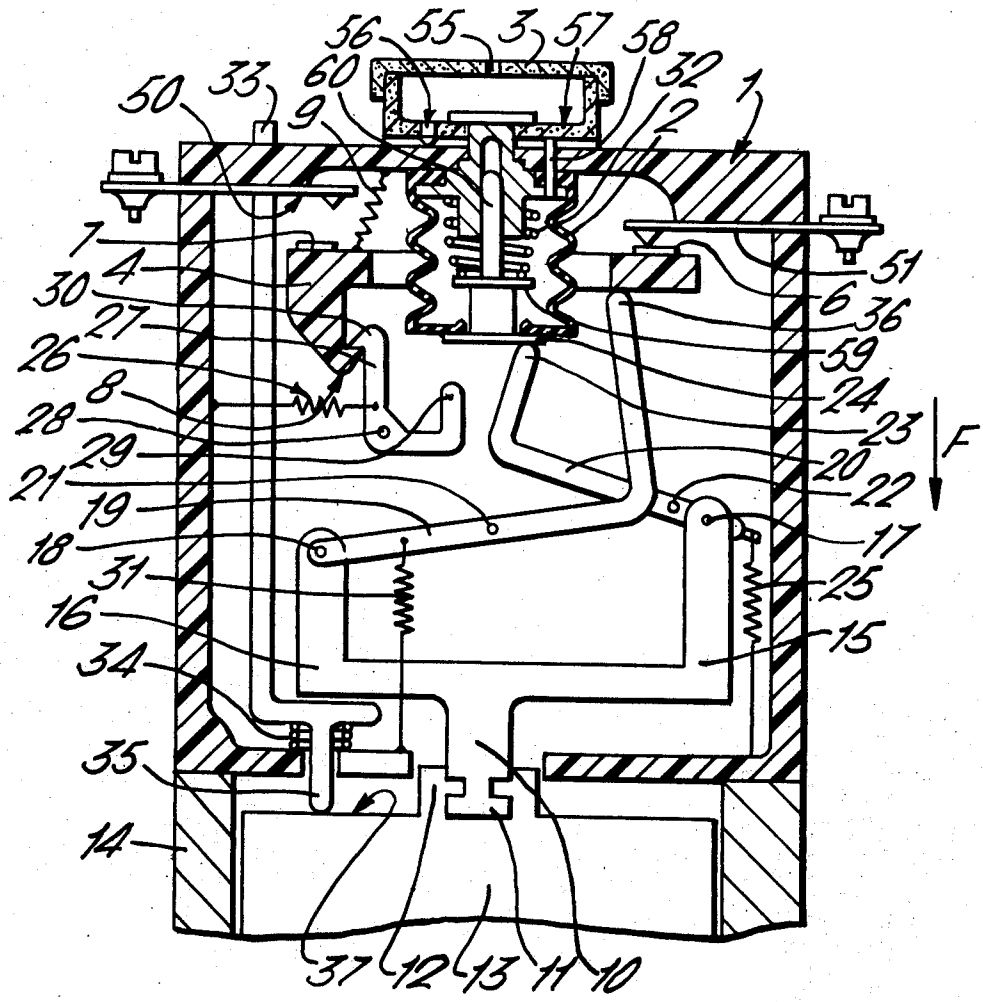

FIG. 1.

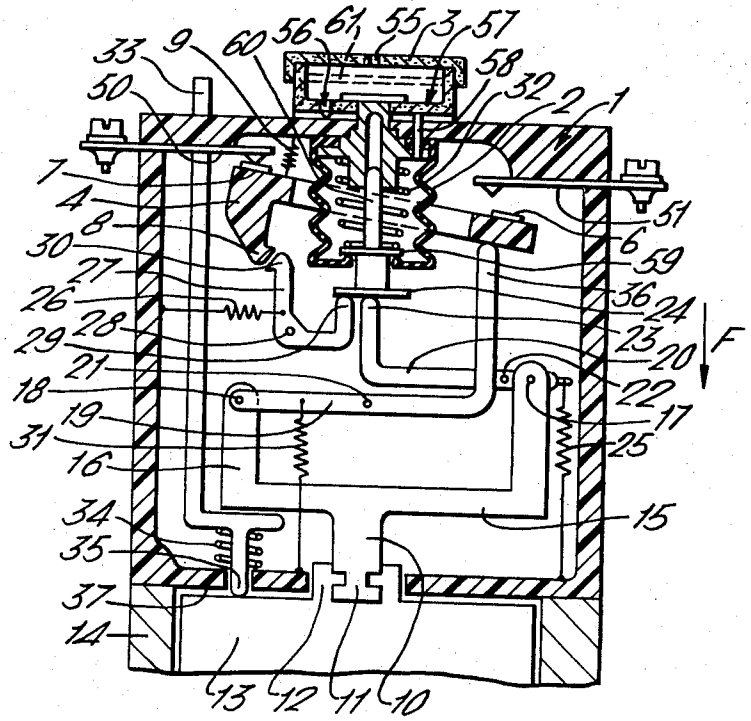
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FIG. 2.

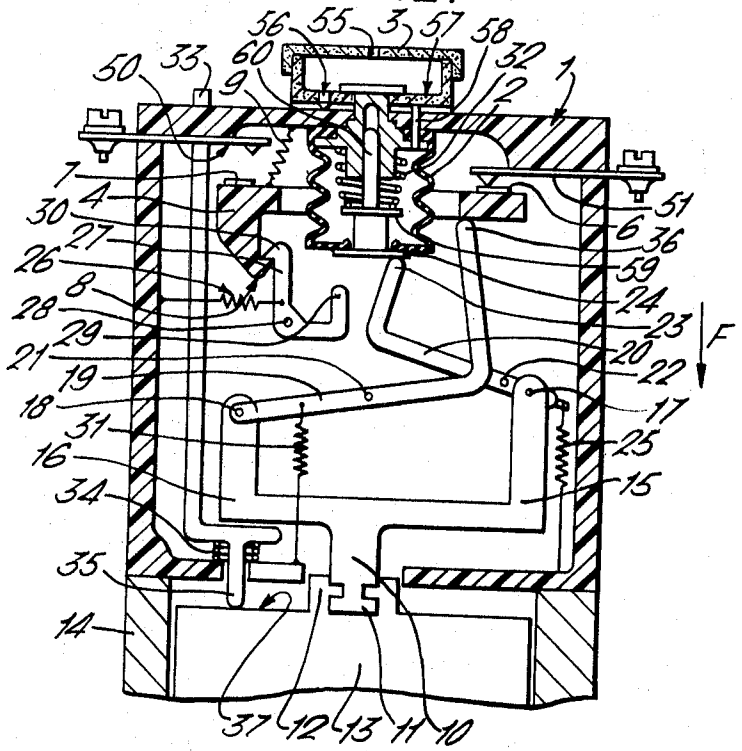
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FIG. 3.

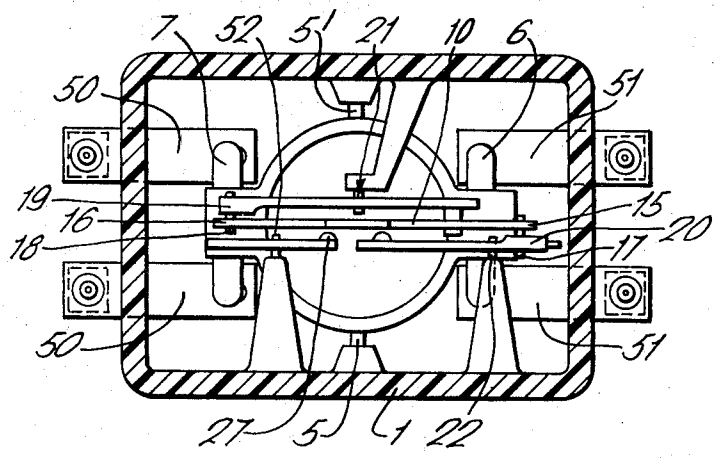
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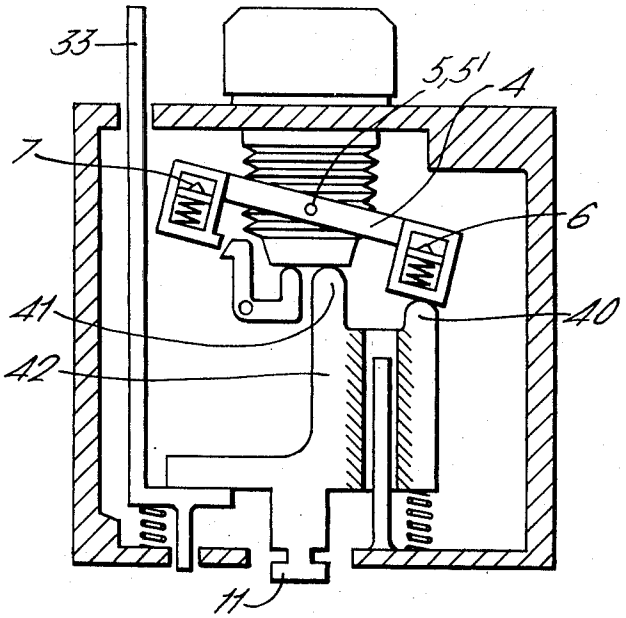
FIG. 4.


33
5,51
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7
6
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40
42
11

BELLOWS-TYPE TIME DELAY DEVICE FOR RETARDED SWITCH

The invention relates to a timing device for electric contacts whose closing or opening can be delayed.

Such devices are in particular applicable to the removable blocks which comprise auxiliary contacts, and are capable of being fixed on to a contactor or a relay by means of a coupling component which allows the transmission of movement between said contactor and the relevant components contained in the blocks.

Many timing devices containing the above units are known, but these are generally positioned either between the coupling component and the bellows of the timing unit or next to the latter. The result is an increase in the transversal or longitudinal dimensions, which were only small when the contactors were themselves large; the reduction of the size of the latter has nevertheless complicated the construction of known timing devices inasmuch as it is no longer possible to give the contact parts the necessary travel and the pivoting of the mobile parts becomes faulty due to the short length of or the small space between the pivoting components of the moving parts.

The present invention therefore proposes to supply a timing device for a removable block of small-sized auxiliary contacts whose construction and mounting is very simple while enabling wide movements and satisfactory guiding.

In accordance with the invention, this result is achieved due to the fact that the contacts are positioned on a pivotal component whose bearings are positioned on either side of the bellows and in the immediate vicinity thereof.

In accordance with a preferred form of embodiment of the invention, the pivotal component takes the form of a ring through which the bellows is inserted and on which the mobile contacts are fixed at the ends of a dimaeter.

Other useful characteristics will emerge from the description hereunder, illustrated by means of the drawings in which

FIGS. **1** and **2** show an elevation view of a contact timing device when the contactor with which it is associated is de-excited;

FIG. **3** shows a partial view from below;

FIG. **4** shows an elevation view of a contact timing device when the contactor with which it is associated is excited.

Referring to FIG. **1**, we see the shell of a timed auxiliary contact block which is fixed on the shell **14** of a contactor or a relay, and receives its movement from the latter, by means of a coupling comprising, on the one hand, a dovetail **11** which forms part of the timing device, and on the other hand, a claw **12** which forms part of the mobile part **13** of the contactor.

The chronometer unit situated at the top of the shell **1** consists of a bellows **2** tending to dilate in the direction of the arrow F under the action of an internal spring **32**, one end of which is attached to a hollow element **101**, integer with the shell **1**, and the other end tends to force downwards the lower end of the bellow **2**, by means of a valve **59** integer with a rod **60** located inside the bellow and sliding in the hollow part of hollow element **101** (which provides a guide for the valve displacement) and with a driving plate, outside the bellow. A passage or air duct **58** couples the interior of

bellows **2** to a circular groove in the lower part of a disc **57**, said groove being formed for example in the course of the lamination of the latter; disc **57** is placed on top of shell **1**, and is integer therewith. On the upper surface of disc **57** is applied the bottom of a hollow rotary knob, having a slot **56** opening into said groove, and a further slot **55** in the upper portion of the knob **3**, a filter **61** being inserted in the hollow section of the knob.

Upon forcing upwards the driving plate **24**, against the spring **32**, the valve **59** comes into the "open" position and the bellows becomes compressed, as shown in FIG. **2**, the air being driven out rapidly, escaping through valve **59**.

When the upwardly exerted action on plate **24** is released, spring **32** controls the closing of valve **59**, whereby the lower part of the bellows is pushed downwards; however, the downward movement of the bellow is slow, due to both the laminating of the incoming air and the length of the passage way, the air being fed to the bellow only through the labyrinth built up by the slot **55**, the filter **61**, the slot **55**, the laminated groove (not referenced) and the duct **58**.

The angular position of knob **3** settles the position of slot **56** in regard of the groove, thereby controlling the laminating of the incoming air and affording control of the necessary time for the bellow to resume the expanded shape under action of spring **32**.

The contact unit comprises a working contact-holder **4** carrying contacts **6** and **7**, and stationary contacting studs, **50** and **51**. The contact holder shown in the drawings consists of a ring, which rocks around pivots **5** and **5'** (shown FIG. **3**); the ring is positioned around the bellows, pivots **5** and **5'** being mounted on the inside of shell **1** as shown FIG. **3**. The reason for this arrangement will be explained elsewhere.

The whole device in FIG. **1** is shown in the "at rest" or "off" state, i.e., the contactor is de-energized, the bellows is expanded and the contact-holder **4** is in its inoperative position. In this position, the contact **7** is applied against the conducting stud **50**, and the contact **6** is separated from stud **51**.

Referring again to FIG. **1**, we see that the dovetail **11** forms part of a mobile control slide **10** in the shape of a T whose arms are shown at **15** and **16**. This slide is suspended by two articulations **18** and **17** which also form part of two levers **19** and **20** respectively. These levers are themselves pivoted in the shell **1** by the fulcrums **21** and **22** respectively.

It can clearly be seen that if these two levers had no fulcrums the control slide could slide downwards (in the direction of the arrow F). This movement is in reality limited due to the fact that their ends **36** and **23** respectively find a purchase, the first on the contact-holder **4** itself retained by a flexible unit **9** and the second on the plate **24** of the valve itself retained by the internal spring **32**. The precise point of equilibrium is obtained by means of compensating springs such as springs **31** and **25** respectively.

The result of this arrangement is that the control slide **10** is flexibly mounted and the dovetail **11** has two degrees of freedom which enable it easily to align itself with the claw **12** at the time of coupling. This coupling is achieved by a relative movement of the two shells **1** and **14**, which is perpendicular to the plane of the figure.

A lock **27** pivoted on the shell through a pivot **28** and biased by a spring **26,** has a lip **30** designed to cooperate with a rim **8** integral with the contact-holder. In the position shown in FIG. **1,** this lock is inactive and its end **29** is resting on the plate **24** of the valve.

An operating push-button **33** projecting from the shell near the adjusting knob **3** is extended near the bottom by a stop **35** which projects slightly from the lower face; a return spring **34** tends to apply lightly a portion of this stop against the bottom of the arm **16** of the control slide **10.**

It will also be appreciated from FIG. **3** that the different levers and mobile parts are situated in different vertical planes. Similarly, while FIG. **1,** for greater clarity, shows the pivots or articulations **17, 18, 21, 22** and **28** in different planes, these are in reality positioned substantially in the same plane, which corresponds to that in FIG. **3.**

The result of this arrangement is that the space around the different mobile parts is large and consequently allows considerable clearance which facilitates the choice of an alignment position for the dovetail **11;** it can also be understood the proximity of the plate **24** of the valve **59** entails taking special measures for the contact-holder **4,** which must remain close to the lever **19.** An elegant solution has been found by giving this contact-holder **4** the shape of a ring which can be traversed by the bellows.

This ring is pivoted by two bearings **5, 5'** which are diametrically opposite each other and consequently provide excellent guiding for the contact-holder **4.** The contacts carried by the ring, shown at **6** and **7** are also placed at the ends of a diameter of the ring, which ensures good equilibration of the contact-holder and gives the contacts a large travel for a specific rotation.

If only one of the contacts **6** or **7** were necessary, the contact-holder **4** could merely take the form of a fork the ends of which would carry pivots the essential feature being that the bellows traverses the contact-holder, the latter being pivotally mounted on two bearings or pivots integer with the shell, located on either side of the bellows, the virtual axis joining the pivots crossing said bellows, at least when the latter is expanded position, this feature enabling achieving the desired compactness of the assembly.

In operation, the mobile slide is drawn in the direction of the arrow F as shown in FIG. **2.**

In this position, the end **23** of the lever **20** has compressed the bellows in opposition to the internal spring **32.** On the other hand, the upward movement of the end **36** of the lever **19** has caused the contact-holder **4** to rock, on the one hand commutating the contacts **6** and **7** and compressing the spring **9,** and on the other hand locking the rim **8** with the lip **30** of the lock **27.**

This position corresponds to the active position of the contact-holder. When the contactor **14** is de-energized, the control slide **10** immediately goes back to its position in FIG. **1,** but the bottom part of the bellows driven by the valve **59** takes some time to resume its "at rest" state; in its downward travel, it strikes the arm **29** of the lock thus releasing the contact-holder under the action of the spring. Contacts **6** and **7** are thus commuted with some delay.

Returning to FIG. **1,** we see that putting the shell **1** in place on the shell **14** will cause the stop **35** to be put in contact with a bearing surface **37** of the mobile component **13** of the contactor. This stop is placed so as to project slightly so that its movement when it is pushed back causes a slight upward movement of the dovetail **11** which, before coupling of the two units, could be put out of alignment with the claw **12.** This movement is sufficient to make it possible to achieve this alignment now without difficulty.

It will be appreciated that the push-button **33** makes it possible to simulate the working of the contactor. Since, moreover, it is not connected in the direction of the arrow F with the control slide, its manipulation cannot put the coupling **12** and **11** out of alignment.

In the device illustrated in FIG. **4,** the push-rod **42** comprising the coupling dovetail **11** is guided vertically with play in translation and has two bosses **40** and **41;** the first of these bosses serves to set the contact-holder and the second serves to set the time-switch, when the contactor is de-excited. When the contactor is excited, the bellows expands and as in the previous case causes the unlocking of the lock **27** thus releasing the contact-holder. The same contact-holder **4** as the one used and described in the previous example is applied here with the same advantages for the sake of clarity, only those features are shown in FIG. **4,** which differ from those of the embodiment shown in FIG. **1.** It is to be understood that, although not shown in FIG. **4,** the valve **59,** the stationary contacting studs **50,** the rotary knob **3,** may be embodied as shown in FIG. **1.**

I claim:

1. Timing device for delaying the breaking and/or the closing of auxiliary contacts, capable of being removably coupled to a relay or contactor having a movable part, and comprising:

a shell equipped with coupling means for coupling with said relay or contactor;

at least one stationary contact;

a movable contact holder carrying at least one contact, said holder being capable of taking any one of two positions, respectively corresponding to the breaking and the closing of said contacts;

locking means securing said holder in the position where the contacts are closed, against the action of a spring which tends to place said holder in the position where the contacts are off or vice-versa;

a bellows, the time-controllable expansion movement of which controls, at the end of the travel, the unlocking of said holder; and

mechanical transmission means, having a first end, controllable from outside the shell, and second ends, said second end driving simultaneously the rocking of said holder and the compression of the bellows, upon the displacement in a given direction of said first end under control of said movable part of said relay or contactor, and driving the expansion of the bellows upon the displacement of said first end in the opposite direction,

wherein,

said contact-holder (**4**) is pivotally mounted on pivots in said shell, disposed on either side of said bellows, said holder having such a shape that it surrounds at least partially the bellows.

2. A timing device according to claim **1,** comprising two stationary contacts and two contacts on said contact-holder, wherein said holder is ring-shaped, said contacts (**6, 7**) on said holder being disposed at the re-

spective extremities of a diameter approximately perpendicular to the rotation axes of the pivots.

3. A timing device according to claim **1**, comprising only one contact on said holder, wherein said holder is fork-shaped.

4. A timing device according to claim **1**, wherein said transmission means (**10, 19, 20**) is coupled to said bellows and to said holder only along one direction (that of arrow F), thereby having a transverse liberty for facilitating the coupling with the movable part (**12**) of the contactor or relay.

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