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CENTRIFUGAL SWITCH WITH TIME DELAY

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Fig. 1.

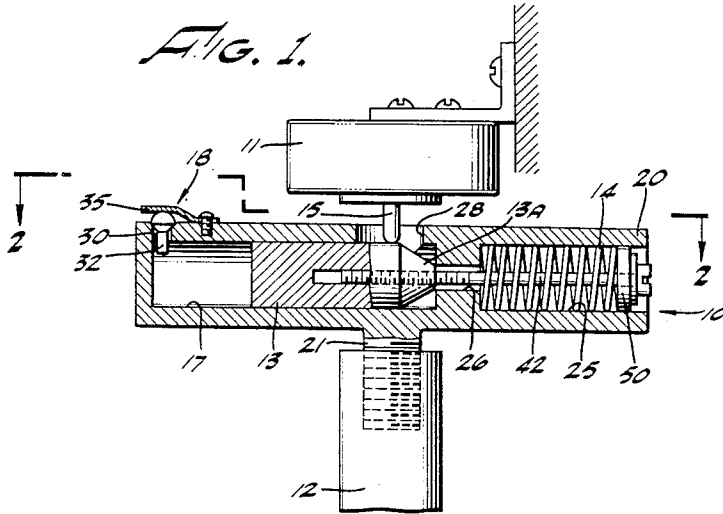


Fig. 2.

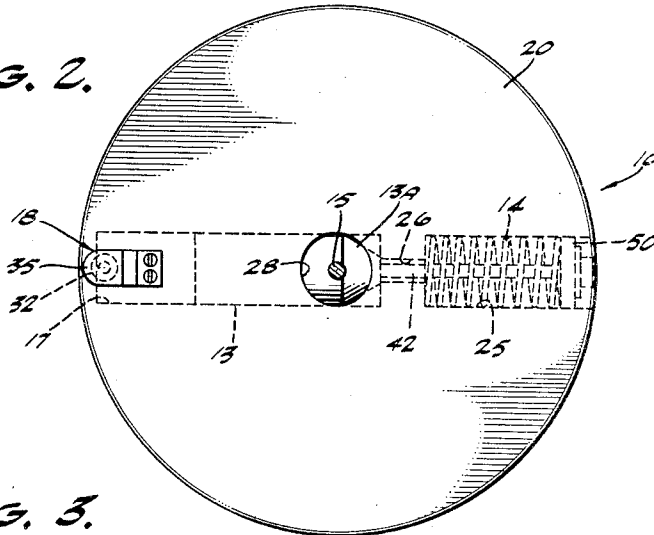
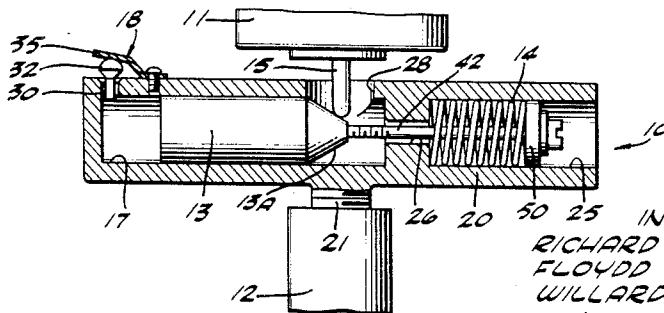


Fig. 3.



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CENTRIFUGAL SWITCH WITH TIME DELAY

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6 Claims. (Cl. 200—80)

The present invention relates to an improved switch operated by centrifugal force developed on a weighted member which has means associated therewith for providing a desired time delay.

In certain equipment as, for example, hand cranked telephone equipment and the like, it is desirable to cause a switch to be automatically operated when a shaft assumes a predetermined speed, and to thereafter maintain such switch in its operated position for a predetermined time interval, even though the shaft speed is reduced during such time interval. It is desirable that mechanism of this character be small, inexpensive, fool-proof and easy to install and adjust.

It is, therefore, a general object of the present invention to provide apparatus of this type which is characterized by its simplicity.

A specified object of the present invention is to provide apparatus of this character which utilizes a weighted member, subject to centrifugal force, as a piston element in a cylinder for achieving a desired time delay.

Another specific object of the present invention is to provide apparatus of this character for obtaining a time delay in the actuating mechanism of a centrifugally actuated switch.

Another specific object of the present invention is to provide apparatus of this character in which the centrifugal actuated mechanism incorporates at least one element which is instrumental in providing the desired time delay.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 illustrates a longitudinal sectional view taken through a switch actuating mechanism which is mounted on a rotating shaft for actuating a stationarily mounted switch, in accordance with features of the present invention;

Figure 2 is a view taken generally on the line 2—2 of Figure 1;

Figure 3 is a view corresponding to the view illustrated in Figure 1, but shows the switch actuating mechanism in a different operating position.

In brief, the drawings illustrate a switch actuating mechanism 10 mounted on a rotatable shaft 12 for actuating the switch 11, such switch 11 being stationarily mounted. The mechanism 10 includes a weighted piston 13 which moves outwardly under the influence of centrifugal forces and against the action of a coil compression spring 14 to a position where the switch actuating element 15 may move inwardly to a position as shown in Figure 3. The switch 11 with its actuating element 15 is conventional and such switch contains means which are considered conventional for normally urging the element 15 outwardly to its position shown in Figure 3.

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One important feature of the present invention resides in the fact that the weighted piston 13 moves in an air cylinder 17 which is vented to the atmosphere through the spring biased check valve 18. The piston 13 is relatively free to move outwardly, but its subsequent return inward movement is retarded due to the fact that in this condition the check valve 18 is in its closed position. While the element 10, which is made circular, rotates with the shaft 12, the switch 11 need not rotate, and as a matter of fact, is mounted on an independent stationary structure.

A detailed description of the apparatus described generally above now follows.

The switch actuating mechanism 10 includes generally a circular disc 20 which has integrally formed therewith the threaded, centrally disposed stud 21 threaded in the shaft 12, such disc 20 being modified, however, in the following details. The disc 20 is provided with two aligned bores 17 and 25, such bores being in communication through the bore 26 of reduced diameter. Also, the disc 20 has a centrally apertured portion 28, sufficiently large, to receive the switch actuating element 15. Also, the disc 20 has an apertured portion 30 or vent in which the spring pressed check valve element 32 is disposed, such element 32 being urged into the apertured portion 30 to normally seal the vent by a cantilever supported leaf spring 35 having one of its ends engaging the valve element 32 and the other one of its ends affixed to the disc 20 as shown in the drawings.

A weighted piston element 13 is slidably mounted in the cylindrical bore 17, such piston 13 having a tapered end 13A and screw threadedly receiving the rod 42 which extends through the channel 26 and through the prestressed coil compression spring 14. One end of the spring 14 bears against the circular wall of bore 25, and the other end of the spring 14 is engaged by the washer 50. The spring 14 is prestressed the desired amount by turning the threaded rod 42 the desired amount. This spring 14 causes the tapered end of piston 13 to bear against one of the circular end walls of the bore 17, as illustrated in Figure 1, Figure 1 serving to illustrate the relationship of the elements when the shaft 12 is stationary. When the shaft 12 is rotated and achieves a predetermined speed, the conditions illustrated in Figure 3 exist, wherein the piston 13 is moved outwardly under the influence of centrifugal forces acting thereon, and against the action of the compression spring 14 to a position wherein the switch actuating element 15 is allowed to move inwardly, under the influence of conventional means embodied in the switch 11, to thereby effect operation of the switch 11. It is noted that in such outward movement of the piston 13, its motion is not impeded to any large extent as a result of pressure conditions in the cylinder 17 since the check valve element 32 is relatively free to move outwardly to open the vent 30.

However, when the speed of the shaft 12 is subsequently slowed down, the piston 13 moves or returns to its normal position, with some time delay, however, occasioned by the fact that subatmospheric pressures are developed in the cylinder 17 because of closing of the vent 30. For this purpose, there is a relatively tight fit between the piston 13 and the cylinder walls. If desired, the check valve element 32 may be provided with a metered aperture therethrough for purposes of controlling the speed at which the piston 13 may move in its return movement. However, in the present instance, it is preferred that the piston 13 be of predetermined diameter with respect to the diameter of the cylinder 17 to allow the desired flow of air between the piston and its cylinder wall. It is understood, of course, that other means readily suggests itself for venting the cylinder 17 at a controlled rate, such as for example, providing a relatively small

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aperture through the wall defining the lefthand end of the cylinder 17 in Figure 1.

The shaft 12 may, for example, be an element of a hand cranked telephone and the switch 11 may be used to control the flow of current through different circuits associated with such telephone. Thus, for example, such circuits may be fully energized by switch 11 when the shaft 12 assumes a predetermined speed, and such circuits remain energized for at least a predetermined time interval, such predetermined time interval being established by the rate at which the piston 13 moves in its return movement, i. e., by the stressed condition of spring 14 and the rate at which air may leak into the chamber 17 to destroy the partial vacuum developed therein when and as the piston 13 recedes.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

We claim:

1. In an arrangement of the character described, a switch actuating mechanism comprising a disc, means mounting said disc on a rotatable shaft for rotation about the axis of said disc, said disc having a pair of aligned bores extending radially of said disc, a channel in said disc placing said bores in communication, a weighted piston in one of said bores and movable radially of said disc, a coil compression spring in the other one of said bores, a threaded bolt, threaded in said piston and passing through said channel and through said spring, abutment means mounted on said bolt and engaging one end of said spring, the first mentioned bore being vented to the atmosphere through a vent, a check valve disposed in said vent, said piston having a tapered end, and said disc having an apertured portion through which a switch actuating member may extend to contact said tapered end of said piston.

2. In an arrangement of the character described, a member having a rotative axis, means mounting said member for rotation on a rotatable shaft for rotation about said axis, said member having a chamber extending radially of said axis, a piston in said chamber and movable radially of said axis, a cam surface on said piston said member having an apertured portion aligned with said rotational axis through which a non-rotatably supported switch actuating element may extend and contact said cam surface on said piston, said piston comprising a weighted member, spring means carried by said member and acting on said piston in opposition to centrifugal forces developed on said piston, and means controlling the venting of said chamber to the atmosphere.

3. In an arrangement of the character described, a rotatable shaft rotatable about a predetermined axis, a switch actuating mechanism mounted on said shaft for rotation therewith, a switch having an actuating element, said actuating element being aligned with said rotational axis and being non-rotatably supported and cooperating with said mechanism, said mechanism comprising a member having a chamber extending radially of said axis, a piston in said chamber movable therein in a direction extending radially of said axis, spring means carried on said member and producing a force on said piston in opposition to the centrifugal forces developed on said

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piston, means controlling the venting of said chamber to the atmosphere, and a cam surface on said piston engageable with said switch actuating element.

4. In an arrangement of the character described, a rotatable shaft rotatable about an axis, a switch actuating mechanism comprising a disc, said disc having a threaded shaft extending therefrom for engagement with internal threads on said shaft, said disc having a pair of aligned chambers extending radially of said axis, said disc having a channel communicating said chambers, said disc having a central apertured portion, a switch having its actuating element extending through said central apertured portion, one of said chambers having disposed therein a weighted piston movable radially of said axis in accordance with centrifugal forces developed thereon, the other one of said chambers having housed therein a prestressed coil compression spring, a cam surface on said piston an adjustment rod passing through said channel and connecting one end of said spring to said piston, said switch actuating element cooperating with and engaging said cam surface on said piston, and means controlling the venting of the chamber within which said piston is disposed.

5. In an arrangement of the character described, a switch actuating mechanism rotatable about a predetermined axis, said mechanism comprising a member having a chamber therein extending radially of said axis, a piston in said chamber and movable radially of said axis, spring means mounted on said member and producing a force on said piston in opposition to the centrifugal forces developed on said piston, said piston having a cam surface thereon, said member having an apertured portion aligned with said rotatable axis through which a non-rotatably supported switch actuating element extends and contacts said cam surface on said piston, and means controlling the venting of said chamber to the atmosphere.

6. In an arrangement of the character described, a switch and an actuating mechanism therefor, said switch comprising a housing, means stationarily mounting said housing, an actuating member for said switch extending out of said housing and movable in a longitudinal direction, said switch actuating mechanism comprising a casing rotatably supported for rotation about a rotative axis, said casing having a chamber therein extending generally radially of said rotative axis, a weighted member in said chamber for movement in a radial direction in accordance with centrifugal forces developed thereon, a cam surface on said weighted member, resilient means acting on said weighted member in opposition to the centrifugal forces developed on said weighted member, said casing having an apertured portion located on said rotative axis of said casing, and said switch actuating member being aligned with said rotative axis and extending through said apertured portion and cooperating with the cam surface on said weighted member for longitudinal movement thereby, and means controlling the venting of said chamber to the atmosphere.

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