

Jan. 4, 1955

A. E. BLOMGREN

2,698,657

CONTROL DEVICE

Filed Jan. 22, 1954

FIG. 1.

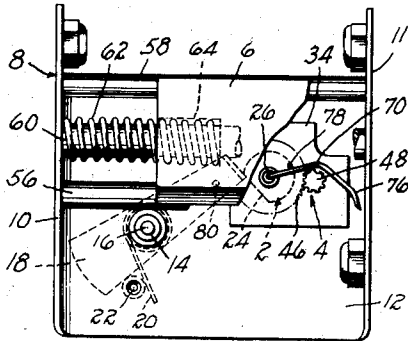


FIG. 2.

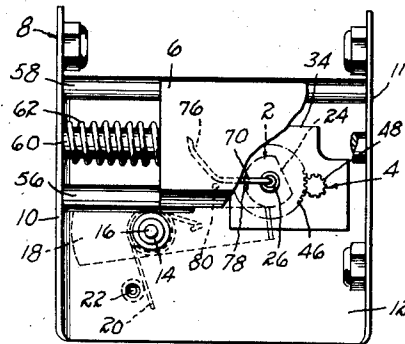


FIG. 3.

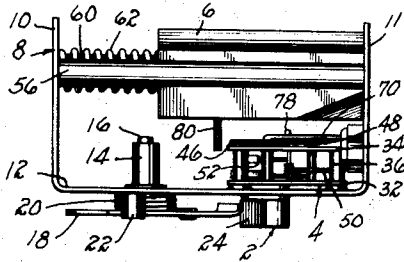


FIG. 4.

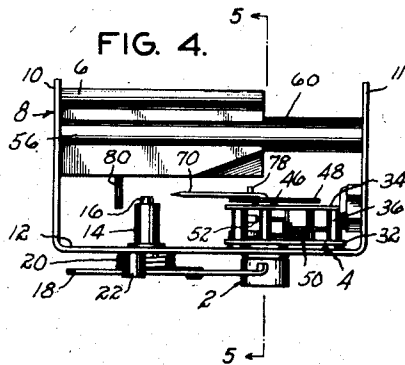
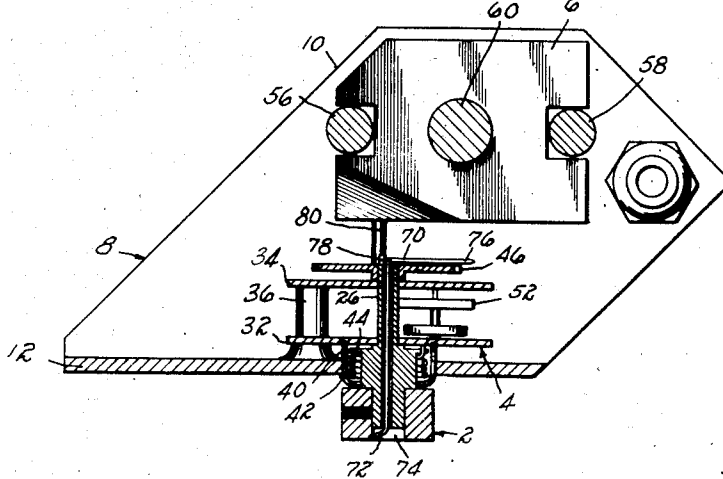


FIG. 5.



INVENTOR.  
AXEL E. BLOMGREN

BY

*Lindsey and Prutzman*  
ATTORNEYS

1

2,698,657

## CONTROL DEVICE

Axel E. Blomgren, Kensington, Conn., assignor to Raymond Engineering Laboratory, Inc., Middletown, Conn., a corporation of Connecticut

Application January 22, 1954, Serial No. 405,576

4 Claims. (Cl. 161—1)

The present invention relates to acceleration responsive delayed action control devices.

An object of the present invention is to provide a device for initiating a mechanical movement when subjected to a change in velocity in excess of a predetermined degree and for a duration in excess of a predetermined amount.

Another object is to provide a device of the above character which is simple, rugged, compact, inexpensive and dependable.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawings:

Fig. 1 is a plan view of a device constructed in accordance with the present invention with certain portions cut away to show the arrangement of parts;

Fig. 2 is another view of the structure shown in Fig. 1 showing the arrangement of parts in a preset condition for operation responsive to acceleration;

Fig. 3 is a front view of the structure shown in Fig. 1;

Fig. 4 is a front view of the structure shown in Fig. 2 illustrating the movement of certain parts thereof in response to acceleration; and

Fig. 5 is an enlarged sectional view of the structure of Fig. 4 taken on the line 5—5 thereof.

Referring to the drawing wherein like reference characters denote like parts in the several views, a device of the type with which the present invention is particularly suitable includes generally a control member 2 which is arranged to be driven at a controlled rate by a clock mechanism 4 or the like, the clock mechanism being prevented from running by the mechanical interference of a sliding weight 6. The weight 6 is mounted for sliding movement out of interfering relation with clock mechanism 4 when the device is subject to acceleration, and thereafter the running of clock mechanism 4 drives control member 2 to the proper position necessary to initiate whatever control action, such as the tripping of a lever or closing of a switch, is desired.

The device includes a generally U-shaped frame 8 having upstanding sides 10, 11 and a flat bottom 12. Secured to bottom 12 is a bushing 14 in which is rotatably mounted a shaft 16 on which is supported an actuating lever 18 which may be employed to accomplish any desired operation such as closing a switch, moving a linkage, etc. The lever 18 is biased for rotation in a counterclockwise direction as viewed in Figs. 1 and 2 by a coil spring 20 wound around an enlarged hub of shaft 16 and secured at one end to lever 18 and at the other end to a pin 22 depending from the bottom 12 of frame 8. Pin 22 also serves as a stop for limiting counterclockwise movement of the latch.

The lever 18 is adapted to be held in what may be termed a cocked position, as shown in Fig. 2 of the drawing, close to its extreme clockwise position, by a control member 2 in the form of a rotatable latch. Control member 2 has a flat 24 on its periphery, however, so that when rotated to the proper position with the flat 24 aligned with lever 18, lever 18 is released from its cocked position and spring 20 carries it counterclockwise to the position shown in Fig. 1; the resulting movement of lever 18 serving to perform any desired operation.

2

The control member 2 is fixed to one end of a shaft 26, which is the main driving shaft of the spring-driven clock mechanism 4 and is mounted for rotation in a pair of parallel plates 32, 34 spaced apart by posts 36 and secured to the bottom of frame 8. Secured to the bottom plate 32 is a spring cover 40 within which is housed the main spring 42 of clock mechanism 4. One end of main spring 42 is secured to spring cover 40 in a conventional manner and the other end is secured to a flange 44 on shaft 26 so as to bias shaft 26 for rotation in a counterclockwise direction as viewed in Figs. 1 and 2.

On the opposite end of shaft 26 from the control member 2 is mounted the main driving gear 46 of the clock mechanism. Driving gear 46 is connected through pinion 48 and intermediate gear train 50 to a conventional reversible escapement 52, which serves to control the rate at which driving gear 46 is rotated when the clock mechanism 4 is allowed to run.

Between the sides 10 and 11 of frame 8 is supported a pair of slides 56, 58 and a guide 60, which form a track for the sliding weight 6 and confine its path of movement to a plane substantially normal to the clock main driving shaft 26. The weight 6 is bored out to slidably receive guide 60. A compression spring 62 is supported on guide 60, and acts between side 10 of the frame and the bottom of a counterbore 64 in weight 6 to bias the weight to its rest position, as shown in Figs. 1 and 2, at which it bears against the side 11 of frame 8.

The shaft 26 is hollow, and supported within the shaft is a stiff torsion wire 70 which is bent over at its lower end 72, as shown in Fig. 5, and confined in a transverse slot 74 provided in the lower end of the shaft 26. The torsion wire 70 is thus fixed for rotation with shaft 26 at its extreme lower end, and is supported against substantial bending or flexing by the hollow shaft 26, but is free to twist within shaft 26 at its upper end responsive to torsional forces imposed upon it.

At the upper end of shaft 26 the wire 70 is provided with a cam 76 in the form of an integral extension of the wire itself, bent over as it emerges from shaft 26 into a plane parallel to the bottom of frame 8, and extending outwardly from the axis of shaft 26 with a generally involute-shaped curvature. The upper end of wire 70 is prestressed in a clockwise direction as viewed in Figs. 1 and 2 so as to have a tendency to rotate counterclockwise relative to its lower end. The wire 70 is maintained in its prestressed condition by a stop 78 on the main driving gear 46 against which the cam portion 76 bears. The arrangement is such that a torque applied to the top of the wire 70 tending to rotate the wire in a clockwise direction as shown in Fig. 1 will be transmitted torsionally through the length of the wire and rotate shaft 26 clockwise, which is the reverse of the direction of rotation of the shaft 26 by the clock main spring 42.

Depending from the bottom side of the weight 6 is a projection or pin 80 which is of sufficient length to extend below the plane of the cam 76 formed by the bent-over portion of wire 70. Pin 80 is spaced close enough to shaft 26 to engage the cam 76 when weight 6 is in its rest position and the clock spring 42 is wound, and thus prevents the clock mechanism 4 from running until weight 6 is displaced away from its rest position by acceleration. When weight 6 is displaced by acceleration, pin 80 disengages from and releases cam 76, and the main driving gear 46 and shaft 26 will be rotated counterclockwise by clock main spring 42, the rate of rotation being governed by the escapement 52.

The operation of the device will now be described. Assuming that the device is conditioned for operation, as shown in Fig. 2, the lever 18 is in cocked position and retained in its cocked position by the arcuate portion of the control member 2; the clock main spring being wound up and biasing the torsion wire 70 and cam 76 in a counterclockwise direction as shown in Fig. 2. However, the wire 70 is retained in its extreme clockwise position as shown in Fig. 2 by engagement with the pin 80 of weight 6, the weight 6 and its pin 80 being held in obstructing position by the spring 62.

When the device is thereafter subjected to acceleration in the direction of guide 60, sufficient to overcome the

3

force of spring 62 on weight 6, the weight will be displaced along the slides 56, 58 toward side 10, as shown in Fig. 4. As weight 6 is displaced toward side 10, pin 80 is disengaged from cam 76 which permits the cam to rotate counterclockwise and thus permits the clock mechanism 4 to start running. If weight 6 returns to its rest position before the bent-over portion of the wire forming the cam 76 has rotated beyond the path of movement of the pin 80, it will be appreciated that pin 80 will re-engage cam 76 and will return the cam to its extreme clockwise position as shown in Fig. 2, thereby rewinding the clock mechanism and returning the device to original condition. However, if the acceleration force is of sufficient magnitude to displace weight 6 far enough so that pin 80 clears the end of the bent-over cam portion 76 of wire 70, and this displacement is of sufficient duration so that the end of cam 76 passes the line of movement of pin 80, subsequent cessation of acceleration and return of the weight to its rest position will be unable to stop the rotation of the main driving gear 46 of the clock. The clock mechanism thereupon drives cam 76 progressively counterclockwise toward its extreme counterclockwise position, as shown in Fig. 1. As the main driving shaft 26 of the clock rotates, of course, the control member 2 is rotated with it in a counterclockwise direction, as shown in Figs. 1 and 2. When the control member 2 has rotated far enough, as shown in Fig. 1, to bring its flat side 24 into alignment with lever 18, the control member can no longer retain the lever and it falls under the influence of spring 20 to its extreme counterclockwise or actuating position, thereby performing whatever actuating operation is desired.

Thus, it will be appreciated that if the acceleration force on the weight is sufficient in duration and degree to carry pin 80 past the end of cam 76 and hold it there long enough to allow clock mechanism 4 to rotate cam 76 past the line of movement of the pin, the release of lever 18 from its cocked position to its actuating position will inevitably follow after a predetermined time interval.

The degree of acceleration required to insure release of cam 76 is determined by the length and shape of the bent portion of the wire 70, and this length and shape also determines how long the wire must be rotated before its end clears the path of movement of pin 80. Thus by a proper choice of length and shape for this portion of the wire, any desired minimum values for the degree and duration of acceleration required to release the clock mechanism may be chosen, and delay of the release of lever 18 by control member 2 for at least the required acceleration duration will be insured.

An important feature of the invention is the use of a cam 76 in the form of an elongated wire 70 anchored at one end for torsional movement which permits the use of a relatively heavy weight 6 and spring 62 with a clockworks mechanism of light construction. As will be appreciated, a sudden cessation of acceleration which has caused displacement of weight 6 against spring 62 will cause a sudden return of the weight to original position, particularly if spring 62 is of relatively heavy construction. The resulting momentum of the weight, particularly if the weight is relatively heavy, will create a heavy impact against cam 76, which would tend to cause breakage of the mechanism and particularly the clockworks 4. By designing the wire cam so that it will have sufficient torsional strength to withstand material twisting when subjected to the force of the clock mechanism 4 but sufficiently weak that it will twist when subjected to the heavy impact of the moving weight 6, it is insured that the device will operate accurately, and at the same time will not break under varying conditions of operation. The prestressing of the wire 70 and its engagement with pin 78 lends greater accuracy to the device and also permits the use of a wire of smaller gauge. Also, the mounting of the wire within the hollow shaft 26 of the clock mechanism 4 insures adequate support of the wire against bending or flexing, and at the same time renders the device exceedingly compact, since the portion of wire 70 subjected to torsion is at least as long as the hollow shaft and requires no additional space other than that taken by the clockwork mechanism itself. Moreover the construction of the cam in this manner is simple, and it is convenient and easy to fabricate and assemble.

4

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. In an acceleration responsive delayed action control device having a rotatable control member driven at a control speed, a weight supported for sliding movement away from a rest position responsive to acceleration, and a spring biasing said weight toward said rest position, means for governing operation of said control member comprising a projection on said weight adapted to move in a linear path responsive to sliding of said weight, a cam carried by said control member adapted to be engaged by said projection to prevent rotation of said control member, said cam comprising a wire having a convexly bent portion lying in a plane parallel to the path of said projection and a shank portion perpendicular to the plane of said bent portion, and a torsional connection between said shank portion and said control member.
2. In a device for delaying the operation of an actuating member until a predetermined time after the imposition of an acceleration of predetermined duration and degree, said device having a clock mechanism with a rotatable driving shaft, a control member driven by said clock, a weight supported for sliding movement away from a rest position responsive to acceleration, and a spring biasing said weight toward said rest position, means for controlling the operation of said clock comprising a surface on said weight adapted to move in a linear path responsive to sliding of said weight, a cam on said clock mechanism adapted to be engaged by said surface to prevent running of said clock mechanism, said cam comprising a wire having a convexly bent portion lying in a plane parallel to said linear path and a shank portion perpendicular to the plane of said bent portion, said bent portion defining a camming surface having a lift corresponding to the degree of acceleration and extending over an included angle corresponding to the duration of acceleration, and a torsional connection between said shank portion and said driving shaft.
3. In an acceleration responsive delayed action control device of the type having a rotatable control member driven at a controlled rate, an acceleration responsive sliding weight for releasing said control member and a spring biasing said weight to a rest position, a cam resiliently supported on said control member and rotatable therewith, a projection on said weight engaging said cam in the rest position of said weight to retain said control member in the unreleased position, said cam being curved so as to intercept the line of movement of said projection during acceleration of said weight at points progressively further from said initial position of said projection as said control member rotates, whereby the point of interception of said cam with said line of movement furthest from said rest position determines the degree of acceleration required to fully release said control member, and the time required to sweep said cam fully past said line of movement determines the minimum delay of said control member.
4. In an acceleration responsive delayed action control device of the type having a control member driven by a clock mechanism, an acceleration responsive sliding weight for releasing said clock mechanism, and a spring biasing said weight to a rest position, a hollow driving shaft in said clock mechanism, a torsion wire supported within said hollow shaft and connected at one end thereto, a pin on said weight adapted to slide therewith away from an initial position responsive to acceleration, and a cam on said torsion wire adapted to be engaged by said pin in the rest position of said weight to retain said main driving shaft of said clock mechanism in a wound position, said cam consisting of an integral extension of the other end of said torsion wire bent into a plane parallel to the direction of sliding movement of

5

said weight, said extension being curved so as to intersect the line of movement of said pin at points progressively further from said initial position of said pin as said clock mechanism unwinds, whereby the point of interception of said cam with said line of movement furthest from said initial point determines the degree of

6

acceleration required to fully release said clock mechanism, and the time required to sweep said cam fully past said line of movement determines the minimum delay of said control member.

No references cited.