

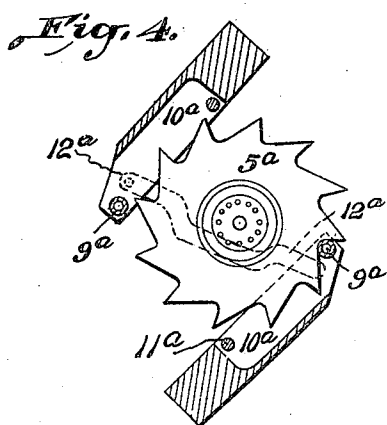
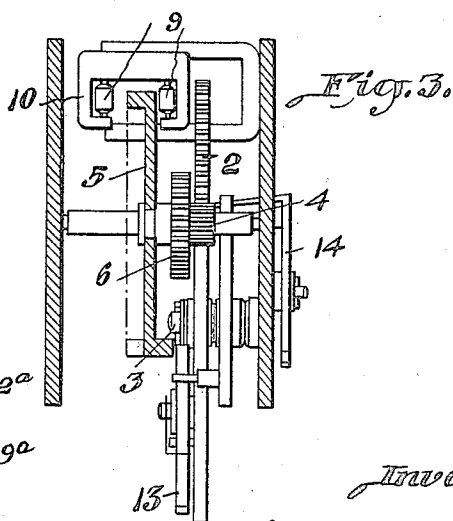
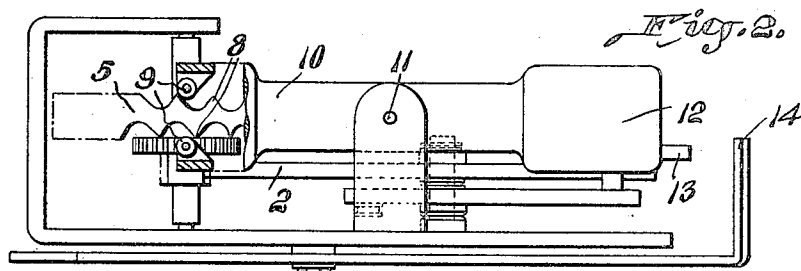
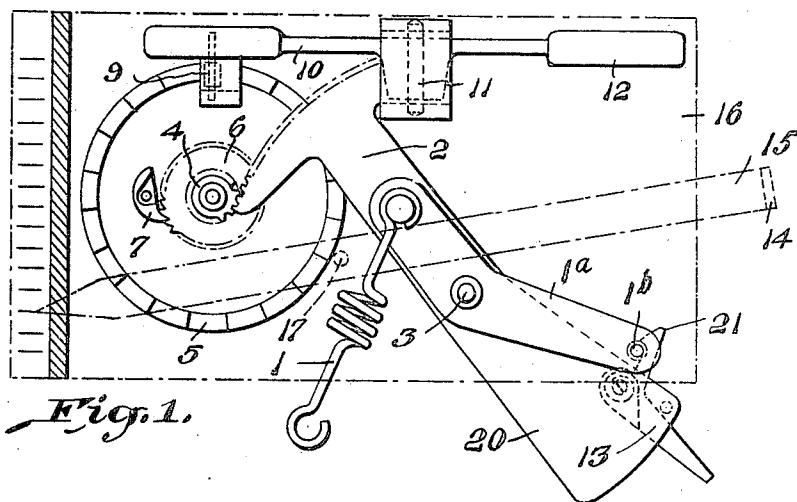
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RETARDING DEVICE FOR TIME SWITCHES

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UNITED STATES PATENT OFFICE.

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RETARDING DEVICE FOR TIME SWITCHES.

Application filed May 26, 1921. Serial No. 472,849.

To all whom it may concern:

Be it known that I, WILHELM HENNING PETERSÉN, a subject of the King of Sweden, residing at Ludvika, Sweden, have invented new and useful Improvements in Retarding Devices for Time Switches, of which the following is a specification.

Switches, especially those employed for protecting purposes, which have to exert their releasing action with a certain retardation which generally depends upon the acting current are chiefly constructed according to two different types. One type is the so-called induction switch in which a member moving at a speed directly corresponding to the current effects the release after moving through a certain distance. Such switches can be made simple and at the same time safe-acting but are rather sensitive and cannot exert forces strong enough to directly release large circuit-breakers, if they be not themselves of rather large dimensions. The other type, which is better suited for the last-mentioned purpose, consists of magnets of the solenoid, or other, type in combination with a retarding device which prevents the armature of the magnet from reaching its final position quickly. The retarding device may be of different kinds. Air, or liquid, cataracts are often employed but these make the switch very sensitive to external influences. A retardation which is better from several points of view is obtained by means of an escapement wheel with a feeding device somewhat of the type used in clockwork.

An escapement wheel retarding device of exactly the type used in clockwork mechanism is, however, not suitable for time limit switches because the oscillating member, which is always present in such mechanism, requires a certain force for starting its motion. After the switch magnet has overcome the counter-force, which is always present and corresponds to the minimum current for which the switch is adapted to act, no further constant force should counteract its motion because that makes the returning of the relay to its initial position more difficult, should the current drop again below the releasing value. The attractive force of the magnet must, in such switches, always rise a little above the releasing value before the timing mechanism is set in motion, and must therefore drop a corresponding quantity below before the returning move-

ment can take place. Consequently it is always desirable to have a retarding mechanism in which the constant counter-force is reduced to the minimum value which can never be avoided by reason of friction.

According to the present invention, the oscillatory feeding and locking member which acts upon the escapement wheel is constructed so as to be completely balanced against forces acting from outside. As no forces act upon the said member other than those exerted by the wheel itself, the member cannot be constructed in the usual, simple way but must consist of two parts connected together and acting each on one portion of the wheel, one part being pressed outwards by one side of one tooth while the other part, at the same time, slides inwards along the opposite side of another tooth. The two parts may, for instance, act upon two diametrically opposite teeth of the wheel but a more simple device is obtained by constructing the wheel with axial teeth projecting in opposite directions.

A construction comprising the invention in its last mentioned form is shown in the accompanying drawing in side elevation, with certain parts broken away, in Figure 1 and in plan in Figure 2. Figure 3 is an end view partially in section. The escapement anchor is shown in its mid position in Figure 2 and in one of its end positions in Figure 3. Fig. 4 is a sectional, side view showing a detail of another form of the escapement wheel and its anchor.

The relay armature is supposed to act on the link-rod 1, which is elastic for preventing the transmission of too strong vibratory movements to the retarding mechanism. The link-rod is connected (by means of a device, hereinafter described) to a toothed segment 2 rotating on a shaft 3 carried by the frame. From this segment, the motion is transmitted, by means of a pinion 4, to the escapement wheel 5, with the inter-connection of a ratchet-wheel 6 and pawl 7 whereby the return upward movement of the toothed segment is possible without operating the escapement wheel, which, (as most clearly seen in Figure 2) is provided with axial teeth 8, projecting from both sides. Between these teeth engage rollers 9, mounted on an escapement anchor 10, which swings on a pivot 11, and is balanced by means of a counter-weight 12, so that no external forces act upon it, even if the switch should be ar-

ranged in a position other than that shown in the drawing. The rollers 9 are provided for reducing the friction between the escapement anchor and wheel, but may be dispensed with if elimination of friction is considered of minor importance. The teeth 8 are bevelled in such way that the escapement wheel, when influenced by the magnet-armature by means of the described mechanism, imparts an oscillating motion to the anchor which permits the successive feeding forward of the wheel. The toothed segment 2 is thus lowered, and the opposite end of the lever 20 carrying it is raised. When this segment has proceeded through a certain angle, the tail 13 of a pawl 21, pivoted to the last mentioned end of the lever 20, strikes a stud 14 on a lever 15, pivoted to the frame 16 at 17. The latch 21 is thereby moved and releases a stud 1^b on the lever 1^a to which the linkrod 1 is attached, so that the latter will be free from the retarding mechanism and permit the instantaneous attraction of the magnet armature to its final position with a releasing action caused thereby. The position of the lever 15 can be set by hand and the period of retardation of the mechanism thus regulated.

In the form shown in Figure 4, the escapement wheel 5^a has radial teeth between which engage rollers 9^a on two swinging anchor members 10^a. These members swing on fixed pivots 11^a, and are connected together by a link 12^a, in such a manner that one of the members always swings outwards from the wheel when the other swings inward to engage it. The two rollers describe similar paths with respect to the teeth of the wheel, as in Figures 1-3, but differently from the kind of escapement mechanism where a simple anchor pivoted on one point engages a wheel radially. This kind of engagement enables the wheel to move continuously while the anchor is swinging, and thus also to start its motion from any point with a minimum of force.

A retarding mechanism of the kind described permits the magnet armature to move at a speed which is practically directly proportional to the force exerted by the armature since this force determines the acceleration of the oscillating masses of the anchor. The minimum force necessary for setting the mechanism in motion will be very small presuming proper attention be paid to the mechanical construction of the mechanism, as

only friction and no external force has to be overcome.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In retarding devices for time switches, an escapement wheel and a swinging anchor, which is balanced with respect to its fulcrum and engages the wheel from two opposite sides under equal angles of engagement.

2. In retarding devices for time switches, an escapement wheel and an anchor which is entirely balanced with respect to its fulcrum and engages the wheel from two opposite sides under equal angles of engagement, the teeth of said wheel being bevelled on their leading side so as to form an acute angle with the direction of movement of the engaging members of the anchor.

3. In retarding devices for time switches, an escapement wheel having teeth projecting axially in two opposite directions, said teeth being beveled on their leading side with respect to the direction of movement of said wheel, and a balanced anchor having members engaging said teeth from two opposite sides.

4. In retarding devices for time switches, an escapement wheel having teeth projecting axially in two opposite directions, and an anchor having two engaging members adapted to cooperate with two opposite teeth of said wheel, said anchor having a fulcrum and a counterweight balancing its weight with respect to said fulcrum.

5. In retarding devices for time switches, an escapement wheel and a swinging anchor, which is balanced with respect to its fulcrum and has anti-friction rollers, which engage said wheel under equal angles from two opposite sides.

6. In retarding devices for time switches, a link rod adapted to be pulled by an electromagnet, an escapement wheel, latch means connecting said rod and wheel, a balanced anchor engaging said wheel from two opposite sides, and means, arranged in the path of motion of said latch means, for releasing it when the rod and wheel have moved together through a certain distance.

In testimony whereof I have signed my name to this specification.

WILHELM HENNING PETERSÉN.