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ESCAPEMENT FOR RETARDING DEVICE

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FIG.1

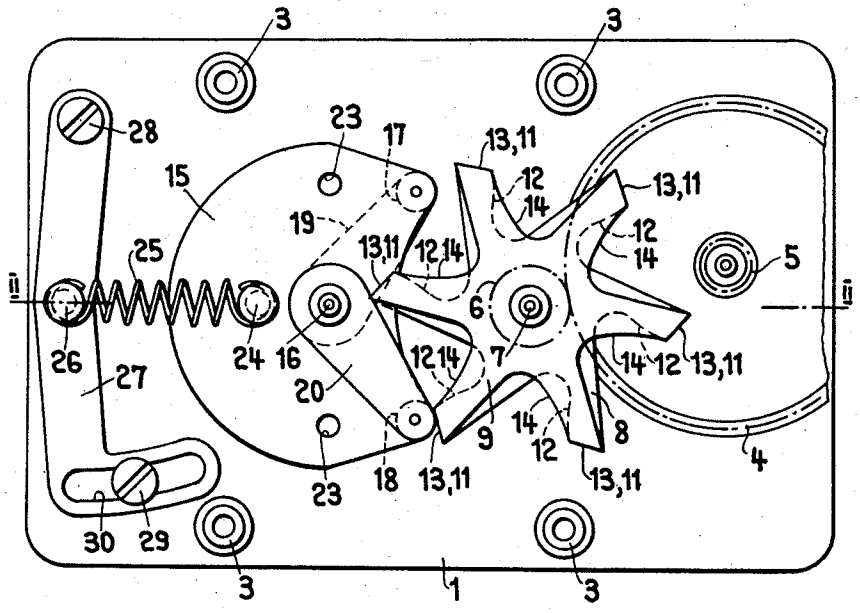
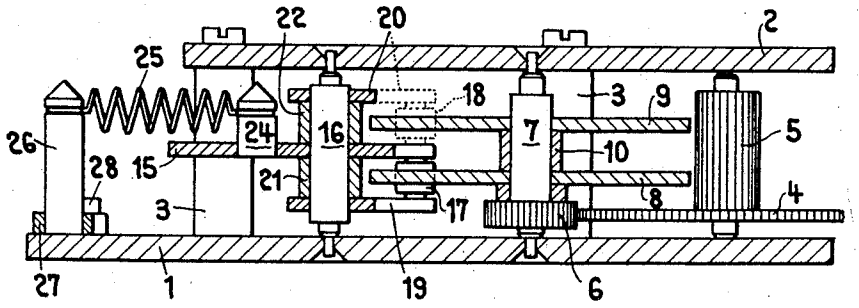


FIG.2



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ESCAPEMENT FOR RETARDING DEVICE

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5 Claims. (Cl. 74—1.5)

The present invention relates to an escapement for retarding device.

In the retarding devices for time relays or apparatus of the timer type which should open or close an electric contact at the end of a predetermined lapse of time, there are used in the constructions of high quality lever escapements or pin escapements, whereas in the very cheap apparatus, there are often used simplified escapements merely consisting of a ratchet wheel and a lever. In the latter case it is evident that the running precision leaves much to be desired, since the period of oscillation of the lever depends on the driving force of the apparatus.

An object of the invention is to provide an escapement which is simple, strongly built and self-starting.

Another object of the invention is to provide an escapement which, though not having the running precision of a lever escapement, yet is much more accurate than a mechanism consisting of a ratchet wheel and a lever of the type mentioned.

A further object of the invention is to provide an escapement including an oscillating and regulating member subjected to the action of at least one return spring, such escapement having an escape member formed of two superposed wheels, the oscillating member consisting of a disc carrying on both sides of its plane two rollers on which the said wheels of the escape member act alternately when the latter rotates under the action of a driving force, the whole being constructed and arranged so that the amplitude of the oscillations of the regulating member is limited only by the return force of the said return spring and that the period of oscillation of the said regulating member is practically independent of the variations of the driving force.

The accompanying drawing shows, by way of example, an embodiment of the invention.

Fig. 1 is a top view of the said embodiment, the upper pillar plate being removed.

Fig. 2 is a cross-sectional view taken along the line II—II in Fig. 1.

The escapement illustrated in the drawing includes two parallel pillar plates 1 and 2 which are assembled by means of pillars 3. All the moving parts of the device are pivoted in the said pillar plates 1 and 2. A toothed wheel 4 is adapted to be rotated in the counterclockwise direction of Fig. 1 over its pinion 5 by a source of driving force (not shown), which may be of any kind such as a spring motor. The wheel 4 is in mesh with a pinion 6 the spindle 7 of which carries an escape member consisting of two wheels 8 and 9 which are superposed and parallel to each other. The wheels 8 and 9 are secured to the spindle 7 and a spacing piece 10 guarantees between them a certain spacing. The lower wheel 8 has six teeth having each an impulse plane 11 and a locking face 12. The upper wheel 9 has also six teeth having each an impulse plane 13 and a locking face 14. The wheels 8 and 9 are oriented with respect to the spindle 7 in such a manner that when an observer

looks at the apparatus from above, as in Fig. 1, the impulse planes 11 and 13 of each pair of teeth are superposed. The locking faces 12 and 14, on the contrary, are not superposed; they consist each of a cylinder portion the axis of which is determined as indicated below. The number of teeth of the wheels 8 and 9 might of course be other than six, but both wheels 8 and 9 have always the same number of teeth.

The oscillating member includes a plain disc or plate 15 rigidly fixed to a spindle 16 which is pivoted in the pillar plates 1 and 2, the disc 15 carrying on both sides of its plane two rollers 17 and 18 the axes of which are parallel to the spindle 16 of the disc 15. The roller 17 is pivoted between the disc 15 and an arm 19 keyed on the spindle 16; in the same manner, the roller 18 is pivoted between the disc 15 and an arm 20 keyed on the spindle 16. Spacing pieces 21 and 22, keyed on the spindle 16, maintain an appropriate spacing between the disc 15 and the arms 19 and 20, respectively. Two holes 23 diametrically opposite, made in the disc 15, permit fixing to the said disc 15 masses (not shown) adapted to increase the inertia of the disc 15 in order to increase its period of oscillation.

The distance between the spindles 7 and 16 is selected in such a manner that the rollers 17 and 18 project into the path of the impulse planes 11 and 13 of the teeth of the escape wheels 8 and 9, respectively, when the disc 15 is in its position of equilibrium (position shown in Fig. 1).

The disc 15 carries near the spindle 16 a pin 24 extending upwardly, to which is attached the one end of a coil spring 25 acting as a return spring for the oscillating member 15. The other end of the spring 25 is fixed to a stud 26 driven in a small plate 27. The latter is fixed to the pillar plate 1 by means of two screws 28 and 29, the screw 29 engaging an elongated opening 30 of the small plate 27, in order to allow changing of the tension of the spring 25. The spring 25 exerts on the disc 15 a restoring force permanently tending to bring it back into its position of equilibrium.

The escapement as described and illustrated operates as follows:

As already said, the toothed wheel 4 is driven in the counter-clockwise direction of Fig. 1, so that the escape member 8, 9 tends to rotate in the clockwise direction. Fig. 1 shows the escapement at the moment when the impulse plane 13 of one tooth of the upper wheel 9 comes into contact with the roller 18 of the disc 15 and gives an impulse to the said disc 15 in the clockwise direction. At the end of this impulse, the escape member 8, 9 continues to rotate freely for a moment, which constitutes the "drop" of the escapement, then is suddenly stopped, since the locking face 12 of one tooth of the wheel 8 strikes, without rebounding, against the roller 17 of the disc 15. This locking face 12 is, as already said, a cylinder portion which is determined in such a manner that at the moment when the face 12 strikes against the roller 17, its axis coincides with the axis of the spindle 16 of the disc 15. The disc 15, therefore, can, according to the importance of the impulse received, continue to rotate in the clockwise direction (supplementary oscillating arc), the roller 17 rolling on the locking face 12, thus loading the return spring 25. The disc 15 then reaches its greatest deviation, then comes back into its position of equilibrium under the action of the spring 25. The roller 17 then leaves the locking face 12 and comes into contact with the impulse plane 11 of the tooth of the wheel 8, which thus gives to the disc 15 a new impulse which will cause it to rotate, this time, in the counter-clockwise direction of Fig. 1. The escape member 8, 9 continues to rotate freely for a moment, then is suddenly stopped, since the locking face 14 of the next

tooth of the wheel 9 strikes, without rebounding, against the roller 18 of the disc 15. This locking face 14 is also a cylinder portion, which is determined in such a manner that at the moment when the face 14 strikes against the roller 18, its axis coincides with the axis of the spindle 16 of the disc 15. The disc 15 can, therefore, according to the importance of the impulse received, continue to rotate in the counter-clockwise direction (supplementary oscillating arc), the roller 18 rolling on the locking face 14, thus loading the return spring 25. The disc 15 then reaches its greatest deviation and then comes back to its position of equilibrium under the action of the spring 25. The cycle described then begins again in the same manner.

It results from the preceding that for a given impulse the amplitude of the oscillations of the disc 15 is limited only by the force of the return spring 25 and not by the escape member. Therefore, if the driving force varies within certain limits, the amplitude of oscillation of the disc 15 will also vary, but the duration of the period of oscillation remains practically constant, that is to say, the oscillations are isochronous. In order to change the period of oscillation, it is sufficient to change the tension of the return spring 25 or else to load the disc 15 with inertia masses.

The spring 25 might be replaced by a pair of coil springs acting on both sides of the spindle of the disc 15, or else by a spiral spring or a leaf spring, means being provided to permit variations in the return force.

As soon as the motor force acts on the escape member 8, 9, the disc 15 begins to oscillate, since the impulse planes 11 and 13 are of large dimensions and, in the position of rest of the disc 15, the rollers 17 and 18 are placed in such a manner that always one of the impulse planes 11, 13 lies before either one of the rollers 17, 18. The escapement is therefore self-starting, which represents a great advantage in practice.

While I have described and illustrated one embodiment of my invenhtion, I do not wish to unnecessarily limit the scope thereof, but reserve the right to make such modifications and rearrangements of the several parts as may come within the purview of the accompanying claims.

What I claim is:

1. In an escapement mechanism of the type comprising a pivotally mounted escape member including two axially spaced toothed wheels disposed in generally parallel planes and adapted to be rotatively driven in one direction, a regulating member pivotally mounted on an axis parallel to the pivot axis of said escape member and generally disposed in a plane intermediate the planes of said toothed wheels, said regulating member having a pair of angularly spaced impulse means cooperative with said escape member, and resilient means biasing said regulating member toward a neutral position with its impulse means spaced on opposite sides of the plane common to the axes of said escape and regulating members but permitting oscillatory movement of said regulating member upon rotation of said escape member and cooperation therewith of said pair of impulse means, the improvement wherein said impulse means comprises a pair of rollers pivotally mounted on axes parallel with the pivot axis of said regulating member and respectively disposed on opposite sides of said regulating member and in the planes of said toothed wheels and within the path of the teeth of said wheels, and the teeth of said wheels each having an impulse surface on the outer ends thereof and disposed at angles to the radii of the teeth with the leading portion thereof closer to the axis of said wheels, whereby to drive the respective rollers to swing said regulating member in opposition to said resilient means, said teeth being spaced to alternately engage their respective rollers and oscillate said regulating member, the leading edges of said teeth having faces engageable with their respective rollers during the oscillation of said regulating member in the direction opposite the direction of drive thereof by the respective teeth said faces being constituted by segments of circles having axes coincident with the pivotal axis of the regulating member when the respective faces are engaged with their corresponding roller to avoid oscillatory movement of said escape member and permit the regulating member to oscillate without resistance.

2. The improvement of claim 1 comprising means for selectively varying the biasing force of said resilient means to thus vary the period of oscillation fo said regulating member.

3. In an escapement mechanism of the type comprising a pivotally mounted escape member including two axially spaced toothed wheels disposed in generally parallel planes and having an equal number of teeth in substantially coincident relation and adapted to be rotatively driven in one direction, a regulating member pivotally mounted on an axis parallel to the pivot axis of said escape member and generally disposed in a plane intermediate the planes of said toothed wheels, said regulating member having a pair of angularly spaced impulse means cooperative with said escape member, and resilient means biasing said regulating member toward a neutral position with its impulse means uniformly spaced on opposite sides of the plane common to the axes of said escape and regulating members but permitting oscillatory movement of said regulating member upon rotation of said escape member and cooperation therewith of said pair of impulse means, the improvement wherein said impulse means comprises a pair of rollers pivotally mounted on axes parallel with the pivot axis of said regulating member and respectively disposed on opposite sides of said regulating member and in the planes of said toothed wheels and within the path of the teeth of said wheels, and the teeth of said wheels each having a flat impulse surface on the outer ends thereof and disposed at angles to the radii of the teeth with the leading portion thereof closer to the axis of said wheels, whereby to drive the respective rollers to swing said regulating member in opposition to said resilient means, the impulse surfaces of corresponding teeth of said wheels being coplanar to drivingly engage their respective rollers at equal angles relative to said common plane, said teeth being spaced to alternately engage their respective rollers and oscillate said regulating member, and the leading edges of said teeth having locking faces initially engageable with their respective rollers during the oscillation of said regulating member in the direction opposite the direction of drive thereof by the respective teeth, said locking faces being constituted by segments of circles having axes coincident with the pivotal axis of the regulating member when the respective locking faces are engaged with their corresponding roller to avoid oscillatory movement of said escape member and permit the regulating member to oscillate with minimal resistance.

4. The improvement of claim 3 wherein said regulating member includes a spindle coincident with the pivotal axis thereof, a disc on said spindle disposed in a plane intermediate the planes of said toothed wheels, and an arm mounted on the spindle on each side of and spaced from said disc, said arms being movable with said disc and disposed axially outwardly of said toothed wheels, said rollers being mounted between the disc and said arms and each being disposed in the plane of a toothed wheel.

5. The improvement of claim 4 comprising means on said disc for accommodating masses of desired weight to increase the inertia of said regulating member and thus increase its period of oscillation.

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