

July 25, 1933.

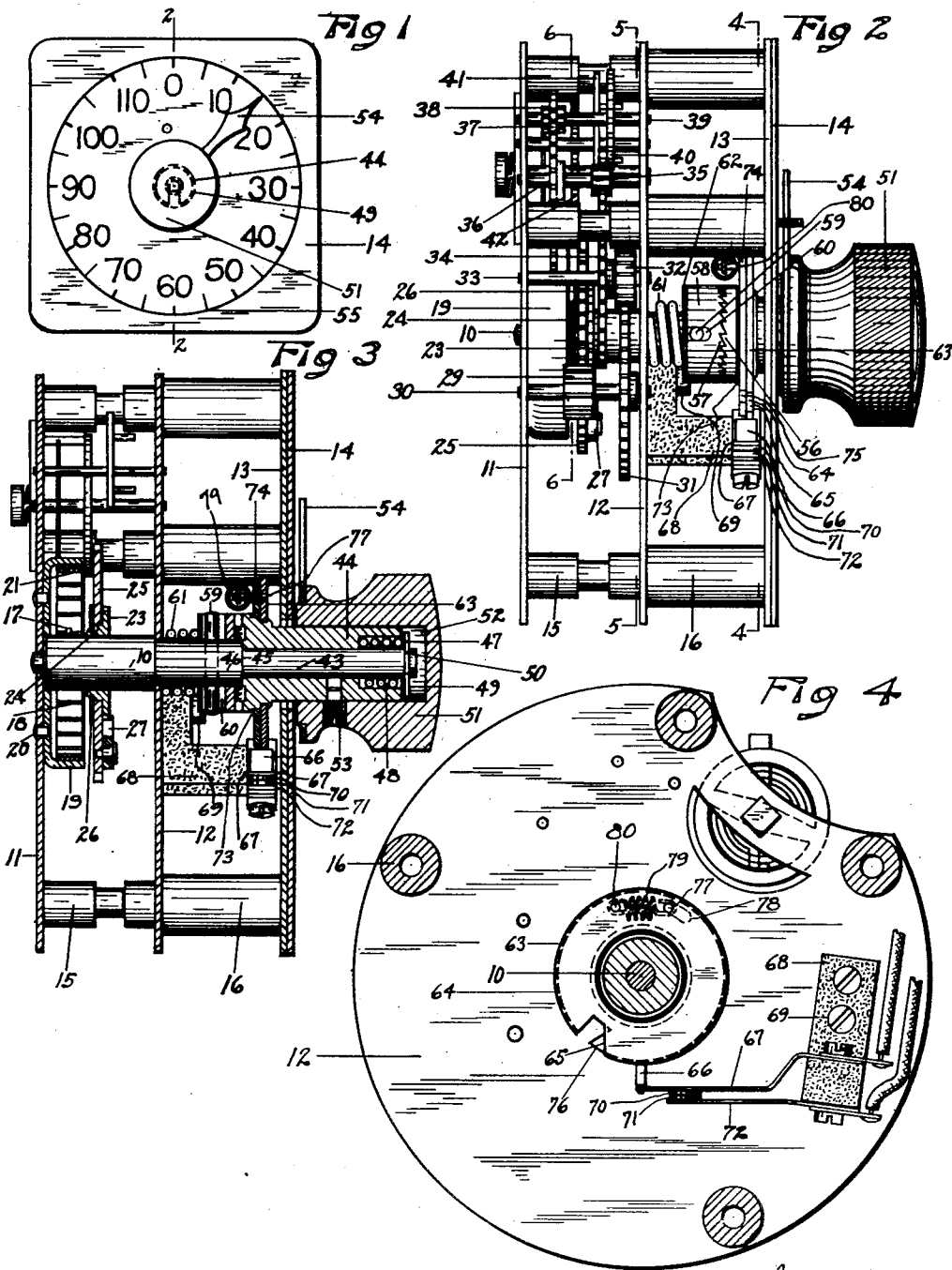
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1,919,255

AUTOMATIC TIMING DEVICE

Filed March 27, 1930

2 Sheets-Sheet 1



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Fig 5

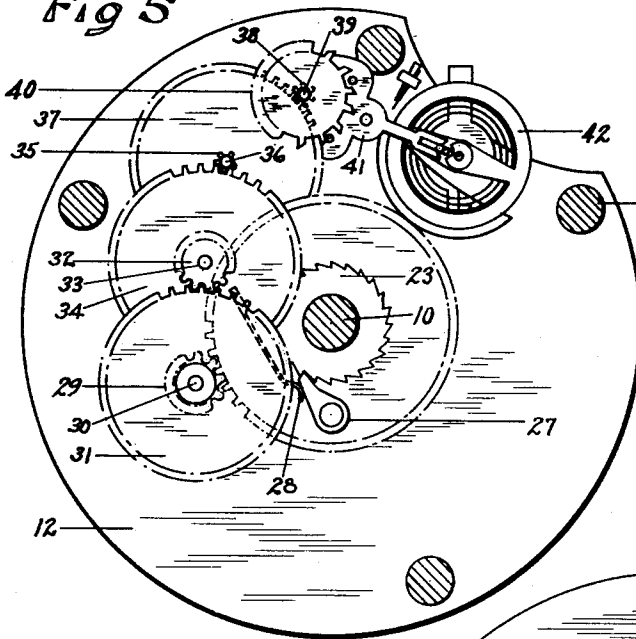


Fig 7

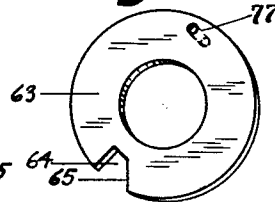


Fig 8

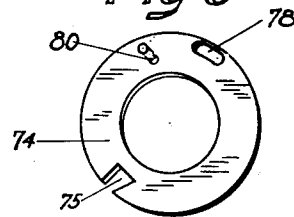


Fig 6

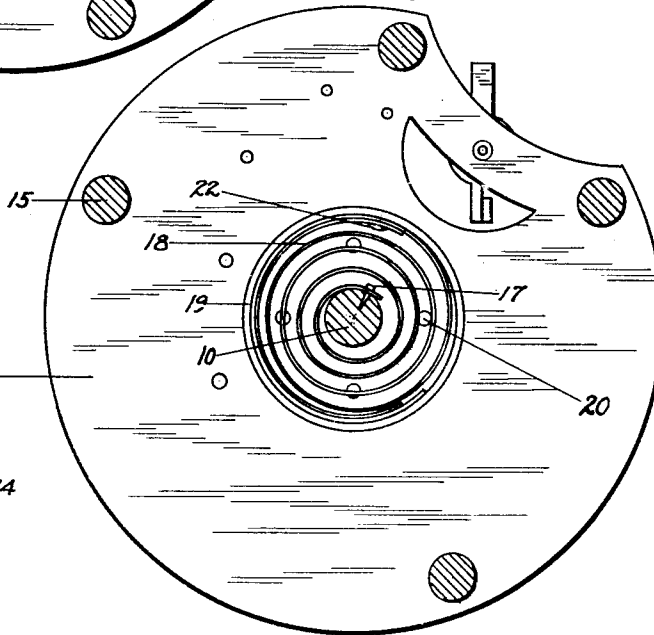
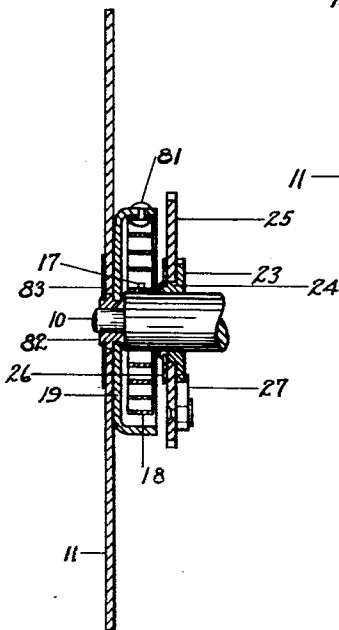


Fig 9



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UNITED STATES PATENT OFFICE

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AUTOMATIC TIMING DEVICE

Application filed March 27, 1930. Serial No. 439,313.

This invention relates to an improvement in timing devices designed for automatically effecting a given operation, such as the opening or closing of an electric circuit, after the lapse of a predetermined time-period.

The main object of this invention is to provide, at a low cost for manufacture, a simple, reliable and smooth-acting automatic timing device which may be readily reset to shorten or terminate a previously-selected time-interval, without occasioning such wear as would materially affect the operation of the device over a long period of service.

A further object of this invention is to provide an automatic timing device of the character referred to which will provide against the overwinding of the driving-spring as the result of repeated setting and resetting.

With the above and other objects in view as will appear from the following, my invention consists in an automatic timing device having certain details of construction and combinations of parts as will be hereinafter described and particularly recited in the claims.

In the accompanying drawings:

Fig. 1 is a view in front elevation of one form which an automatic timing device constructed in accordance with my invention may assume;

Fig. 2 is an edge view thereof upon a larger scale;

Fig. 3 is a transverse sectional view taken on the line 2—2 of Fig. 1 but on a larger scale;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a similar view taken on the line 5—5 of Fig. 2;

Fig. 6 is a corresponding view taken on the line 6—6 of Fig. 2;

Fig. 7 is a detached perspective view of the cocking-disk;

Fig. 8 is a similar view of the control-disk; and

Fig. 9 is a broken transverse sectional view illustrating another mode of frictionally anchoring the outer end of the main-spring to prevent the overwinding thereof.

In the embodiment of my invention herein chosen for illustration in Figs. 1 to 8 inclusive, I employ a winding-arbor 10 mounted for rotation in a rear assembly-plate 11 and an intermediate assembly-plate 12 and extending forward through a front assem-

bly-plate 13 and a dial-plate 14. The plates 11 and 12 are held in spaced relationship by means of pillars 15 and, similarly, the plates 12 and 13 are held in spaced relationship by pillars 16.

Near its rear end the winding-arbor 10 is provided with a hook or pin 17 with which the inner end of a spiral driving-spring 18 is engaged in the usual manner of clock main-springs, while the outer end of the said spring frictionally engages the interior surface of the flange of a cup-shaped spring-barrel 19 concentrically positioned with respect to the arbor 10 and secured to the forward face of the rear plate 11 by means of rivets 20. To heighten the frictional engagement between the outer coil of the spiral spring 18 and the inner face of the flange of the spring-barrel 19, I secure thereto a short reinforcing strip 21 of spring-stock by means of a rivet 22, as clearly shown in Fig. 6 of the drawings.

Staked to the winding-arbor 10 just forward of the spiral spring 18 is a ratchet-wheel 23, upon the hub 24 of which is mounted, with freedom for rotation, a main-wheel 25 held in place by means of a retaining-washer 26 and carrying upon its forward face a pawl 27 engaging with the teeth of the ratchet-wheel 23 under the urge of a spring 28.

The main-wheel 25 meshes into and drives a first pinion 29 mounted upon an arbor 30 carrying a second wheel 31 meshing into and driving a second pinion 32 mounted upon an arbor 33 carrying a third wheel 34. The third wheel 34 meshes into and drives a pinion 35 upon an arbor 36 which carries a fourth wheel 37 which, in turn, meshes into and drives a pinion 38 mounted upon the arbor 39 of an escapement-wheel 40 coacting in the usual manner of time-trains with an escapement-lever 41 which imparts oscillatory movement to a balance-wheel 42.

The wheels, pinions, etc., 25 to 42 inclusive, are positioned between the rear plate 11 and the intermediate plate 12, as clearly shown in Fig. 2 of the drawings.

The forward end of the winding-arbor 10 is reduced in diameter to form a stem 43 upon which is mounted, with freedom for rotation, a winding-sleeve 44 seated at its inner end against a forwardly-facing shoulder 45 formed at the junction of the stem 43 and the intermediate portion 46 of the winding-arbor. The said sleeve is seated against

the shoulder 45 by means of a helical spring 47 located in a recess 48 in the outer end of the said sleeve and retained in place therein by a bifurcated key 49 clipped into an annular groove 50 near the extreme forward end of the stem 43.

Positioned upon the outer end of the winding-sleeve 44 is a finger-button 51 provided with an inwardly-opening axial bore 52 for the reception of the outer end of the said sleeve, to which it is coupled by means of a coupling-screw 53. The inner end of the finger-button 51 mounts a pointer 54 adapted to sweep over an annular series of graduations 55 engraved or etched upon the forward face of the dial-plate 14 before referred to.

The inner face of the sleeve 44 is formed with an annular series of ratchet-teeth 56 meshing into a similar series of ratchet-teeth 57 formed upon the forward face of a coupling-sleeve 58 mounted upon the central portion 46 of the arbor 10, to which it is coupled for rotation, but with freedom for axial sliding movement, by means of a transverse coupling-pin 59 fitting into a diametrical groove 60 in the rear face of the said coupling-sleeve.

For the purpose of yieldingly maintaining the ratchet-teeth 56 and 57 in engagement, I employ a helical spring 61 encircling the central portion 46 of the arbor 10 and bearing at its rear end against the forward face of the intermediate plate 12 and at its forward end against a thrust-washer 62 resting against the rear end of the ratchet-sleeve 58.

For the purpose of controlling an electric switch, or any other device which it may be desired to control, I employ a cocking-disk 63 staked upon the sleeve 44 near the rear end thereof and formed in its periphery with a notch 64, one wall of which is tangentially sloped, as shown in Fig. 8, to provide a cam-surface 65 for coaction with a shoe 66 offsetting from the free end of a flexible switch-arm 67.

The opposite end of the switch-arm 67 is mounted, as shown, upon a block 68 of insulating material forwardly offsetting from the intermediate plate 12, to which it is secured by means of screws 69. The flexible switch-arm 67 also carries a contact 70 which engages with a similar contact 71 upon a flexible complementary switch-arm 72 when the shoe 66 is moved outward upon the periphery of the cocking-disk 63, as will hereinafter appear.

The inner end of the sleeve 44 is also formed with a bearing-surface 73 located immediately to the rear of the cocking-disk 63 and upon which is mounted, with freedom for limited rotation, what I shall for convenience of description refer to as a "control-disk" 74 which is formed with a notch 75 resulting in the formation of a drop-off nose 76 which,

as will hereinafter appear, is adapted to overlap the cam-surface 65 of the adjacent cocking-disk 63.

As before pointed out, the cocking-disk 63 is rigidly coupled to the sleeve 44, while the control-disk 74 may turn upon the bearing 73 of the said sleeve. Now for the purpose of coupling the control-disk 74 to the cocking-disk 63 for movement therewith but with capacity for limited relative movement, I provide the said cocking-disk with a rearwardly-projecting pin 77 extending through an arcuate slot 78 in the control-disk 74 and having one end of a helical spring 79 hooked over its rear end. The opposite end of the said spring is hooked over the rear end of a pin 80 rearwardly projecting from the control-disk 74.

The spring 79 just above described exerts a constant effort to turn the control-disk 74 with respect to the cocking-disk 63 in a direction required to cause the drop-off nose 76 of the former to overlap the cam-surface 65 of the latter.

In the operation of my improved timer, the user grasps the finger-button 51 and turns the same clockwise until the pointer 54, carried thereby, registers with the graduation upon the dial-plate 14, indicating the particular time interval which it is desired to have elapse before the automatic accomplishment of a function such as the opening of a circuit, as is herein illustrated.

For the purpose of description, let it be supposed that the desired interval is fifteen minutes.

As the finger-button 51 is turned clockwise, as above described, to register the pointer 54 with the desired graduation, the winding-sleeve 44 is turned, and through the intermediary of the ratchet-teeth 56 and 57, coupling-sleeve 58 and coupling-pin 59, effects the turning of the arbor 10 and the winding of the driving-spring 18. Concurrently with the turning of the finger-button 51 and sleeve 44, the cocking-disk 63 will also be turned so as to cause the cam-surface 65 thereof to lift the shoe 66 of the switch-arm 67 and flex the latter so as to engage its contact 70 with the contact 71 of the switch-arm 72 and thus close the circuit.

As the cocking-disk 63 is turned, as just above described, to lift the shoe 66, the control-disk 74 will remain stationary until the said shoe has been lifted high enough to permit the drop-off nose 76 thereof to be snapped under it by the spring 79, this being effected by virtue of the fact that the cocking-disk is of slightly greater diameter than the control-disk.

The continued rotation of the parts propelled, by the finger-button 51 until the pointer 54 registers with the fifteen-minute graduation upon the dial-plate 14, will bring the parts into the positions in which they are

shown in the drawings, in which the shoe 66 is resting upon the periphery of the cocking-disk 63.

Upon the setting of the device, as just above described, and the removal of any manual restraint upon the finger-button 51, the driving-spring 18 will immediately assert itself and slowly turn the arbor 10 counter-clockwise together with the disks 63 and 74, and pointer 54, under the control of the time-train already described. When the pointer 54 has reached the zero mark upon the dial-plate 14, the drop-off nose 76 of the control-disk 74 will have ridden out from under the shoe 66 which will immediately snap downward under the tension of the resilient switch-arm 67 with the result that the contact 70 will be separated from the contact 71 and the circuit thus broken, all as more completely shown, described and claimed in my co-pending application of the same title, filed March 14, 1930, Serial No. 435,792, now Patent No. 1,831,605, dated Nov. 10, 1931.

Let it be supposed that the user wishes to shorten or terminate a previously-selected time-interval for which he has set the timer. This may be readily accomplished by turning the finger-button 51 counter-clockwise together with the pointer 54, sleeve 44 and disks 63 and 74. During this resetting operation the teeth 56 of the sleeve 44 will ratchet idly back over the teeth 57 of the coupling-sleeve 58 without affecting the tension of the spiral driving-spring 18.

It will readily be seen that, were not provision made for its prevention, the repeated setting and resetting of the timing device would ultimately wind the driving-spring 18 to such a degree as to prevent the further clockwise rotation of the finger-button 51 without breaking the said spring or some of the connecting parts.

In my improved device, it will be noted that the outer end of the spiral driving-spring 18, instead of being rigidly anchored, is frictionally anchored by the frictional grip of its outer convolution assisted by the reinforcing-strip 21 upon the inner surface of the flange of the spring-barrel 19 so that when the said spring is wound to a predetermined degree, it will automatically overcome the frictional grip of its outer convolution upon the said spring-barrel so as to cause a relative slippage and thus automatically relieve the said spring of any excess tension.

Instead of effecting the frictional anchorage of the outer end of the spiral driving-spring by means of the frictional engagement thereof with the spring-barrel 19, I may effect a similar result by anchoring the outer convolution of the said spring to the spring-barrel by means of a rivet 81 and frictionally anchoring the spring-barrel itself to the rear plate 11 by providing it with a rearwardly-extending bushing 82 bearing

in the said plate 11 and provided at its rear end with a spring-washer 83 bearing against the rear face of the said plate and exerting a constant effort to engage the rear face of the spring-barrel with the front face of the said plate, as clearly shown in Fig. 9 of the drawings.

It will be understood by those skilled in the art that my invention may assume varied physical forms without departing from my inventive concept and I, therefore, do not limit myself to the specific embodiment herein chosen for illustration, but only as indicated in the appended claims.

I claim:

1. In an automatic timing device, the combination with the time-train, control-mechanism and manually-operable setting-member thereof; of a driving-spring and arbor for the said time-train; and two complementary ratchet-devices, one of said ratchet-devices comprising a ratchet-wheel fixed for rotation with said arbor and a pawl carried by a member of said time-train and adapted to drive said time-train under the influence of said spring, and the other ratchet-device including two toothed members carried by said arbor and relatively movable axially of said arbor, one of said toothed members fixed for rotation with said arbor and operable to wind said spring upon rotation of the other toothed member; the said ratchet-devices constructed and arranged to yield oppositely, the former when the said setting-member is turned in the direction for winding the said driving-spring, and the latter when the said setting-member is turned in the opposite direction.

2. In an automatic timing device, the combination with the time-train, control-mechanism and manually-operable setting-member thereof; of a driving-spring and arbor for the said time-train; and two complementary ratchet-devices, one of said ratchet-devices comprising a ratchet-wheel fixed for rotation with said arbor and a pawl carried by a member of said time-train and adapted to drive said time-train under the influence of said spring, and the other ratchet-device including two toothed members carried by said arbor and relatively movable axially of said arbor, one of said toothed members fixed for rotation with said arbor and operable to wind said spring upon rotation of the other toothed member, said other toothed member including a sleeve connected with said setting-member and rotatable therewith; the said ratchet-devices constructed and arranged to yield oppositely, the former when the said setting-member is turned in the direction for winding the said driving spring, and the latter when the said setting-member is turned in the opposite direction.