Oct. 29, 1940. A. B. POOLE 2,219,372

AUTOMATIC ELECTRIC SWITCH MECHANISM

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Fig. 1.

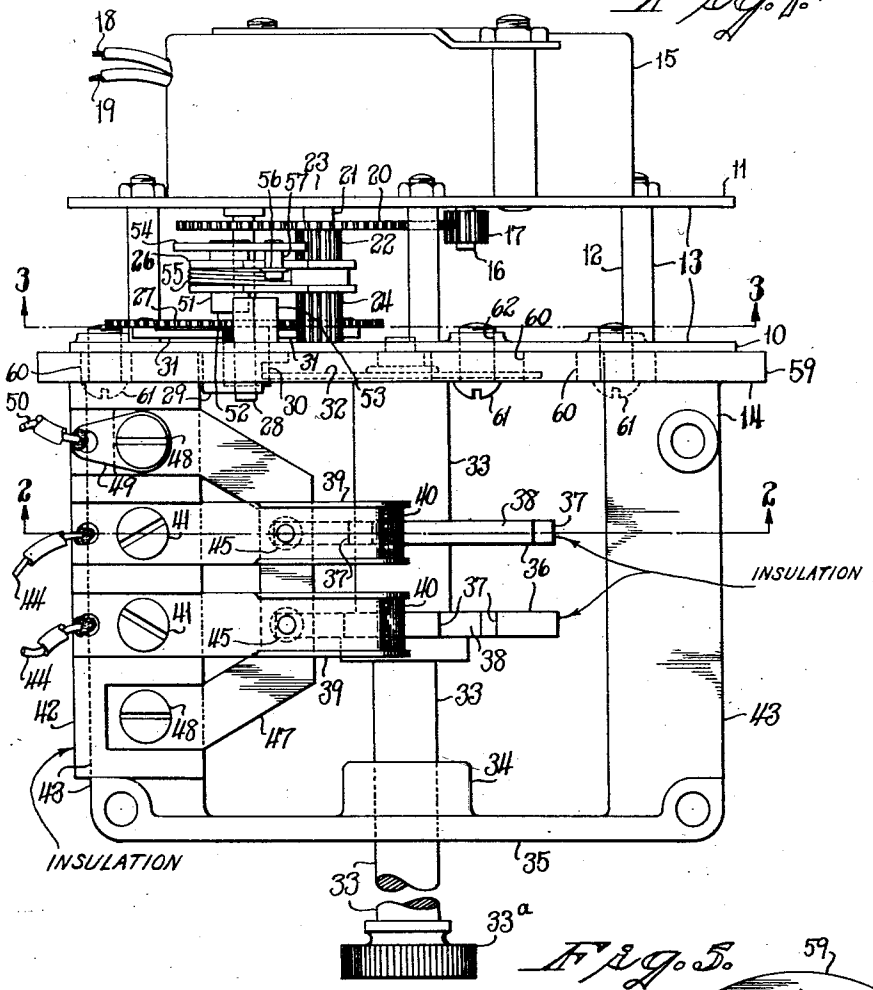


Fig. 4.

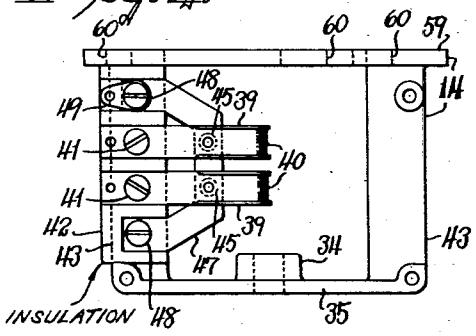
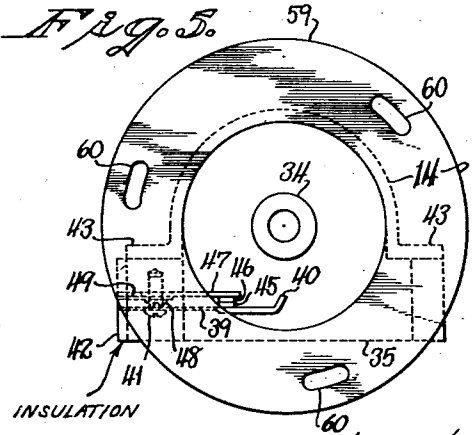


Fig. 5.



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Fig. 2.

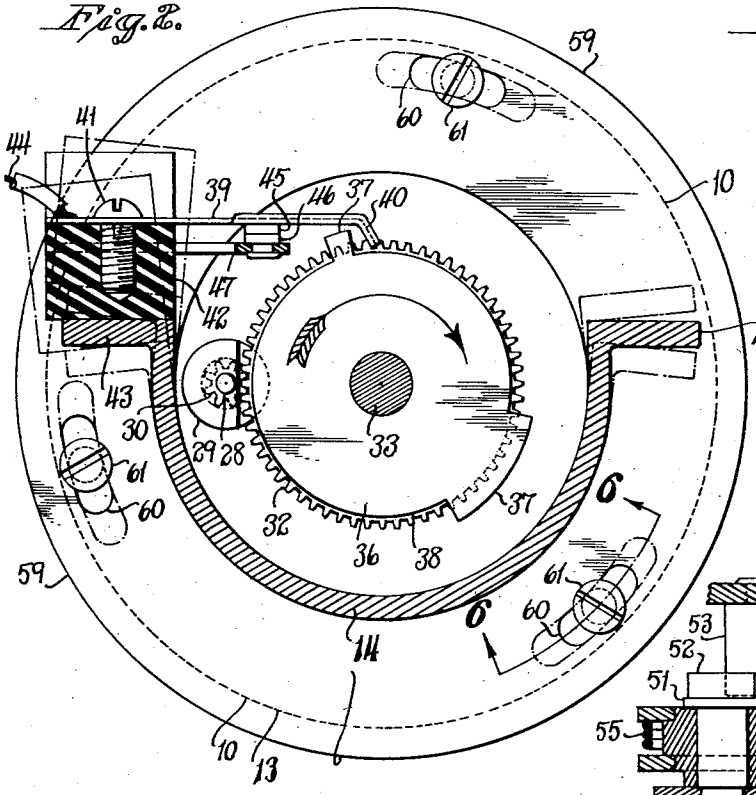


Fig. 6.

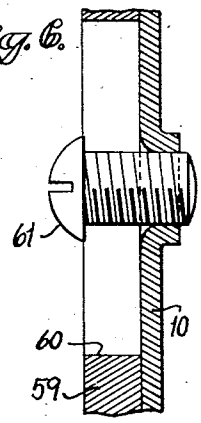


Fig. 7.

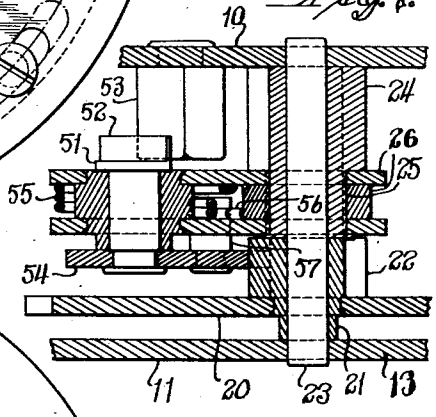
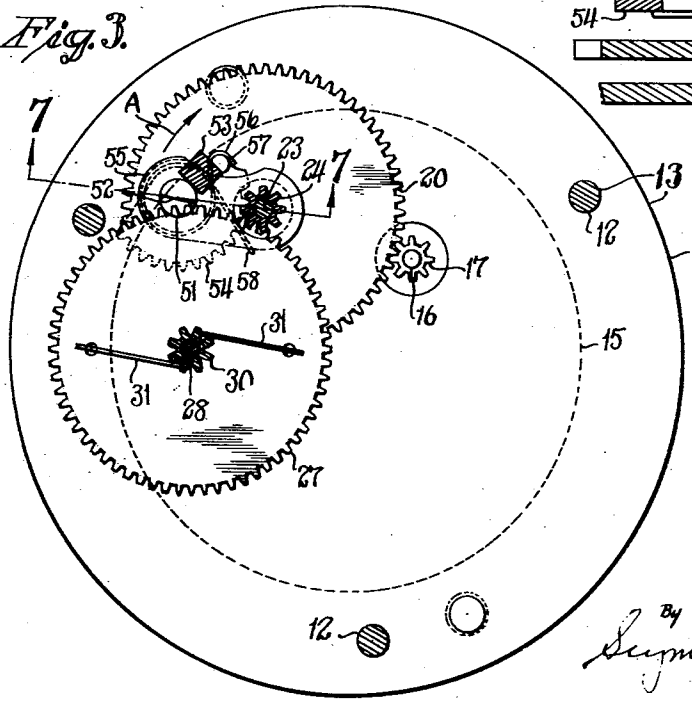


Fig. 3.



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UNITED STATES PATENT OFFICE

2,219,372

AUTOMATIC ELECTRIC SWITCH MECHANISM

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Application July 28, 1939, Serial No. 287,096

7 Claims. (Cl. 200—27)

This invention relates to improvements in automatic electric switch-mechanisms and more particularly to automatic electric switch-mechanisms in which a plurality of rotary switch-actuating members are provided, together with means for imparting intermittent or step-by-step movement thereto.

One of the objects of the present invention is to provide a superior automatic electric switch-mechanism in which the timing of a plurality of rotary intermittently-moving switch-actuating members and switches which they actuate, may be conveniently effected.

Another object of the present invention is to provide a superior automatic electric switch-mechanism in which relative adjustment or orientation may be conveniently effected between a plurality of intermittently-driven rotary switch-actuating members on the one hand, and a plurality of electric switches on the other hand.

A further object of the present invention is to provide a switch-mechanism of the character referred to, and having a superior construction and arrangement of parts whereby its assembly and adjustment may be effected conveniently and at low cost.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed in any separate application.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a top or plan view of one form which an automatic electric switch-mechanism may assume in accordance with the present invention;

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

Fig. 3 is a similar view taken on the line 3—3 of Fig. 1;

Fig. 4 is a top or plan view of the switch-assembly unit, detached from the switch-actuating unit;

Fig. 5 is an inner end view thereof;

Fig. 6 is a broken detail sectional view taken on the line 6—6 of Fig. 2; and

Fig. 7 is a similar view taken on the line 7—7 of Fig. 3.

The particular automatic electric switch-mechanism herein selected for purposes of illustrating one form which the present invention may assume, includes a disk-like front-plate 10 and a complemental disk-like back-plate 11 rigidly held in spaced relationship parallel with each other by a plurality of pillars 12. For purposes of description, the parts 10, 11 and 12 or their equivalents may be conveniently designated as an actuating-mechanism frame and as such, is generally designated by the reference character 13. The said frame 13 and the parts carried thereby are rotatable about a common center, for purposes as will hereinafter appear, with respect to a switch-frame generally designated by the reference character 14, and the parts carried thereby.

Secured against the rear face of the back-plate 11 of the actuating-mechanism frame 13, is a synchronous-electric motor-structure 15 which may be of any approved type and requiring no detailed description herein other than to point out that, as shown, said motor-structure is provided wih a power-output shaft 16 carrying a driving-pinion 17 and is provided with two leads 18 and 19 which may be connected to any suitable source of alternating current in the usual manner of synchronous-electric motors. The said synchronous-electric motor-structure 15 serves to impart accurately-timed rotational movement to the power-output shaft 16 and, therefore, serves in effect as timing-means which obviously may be replaced, if desired, by any ordinary spring-operated time-movement or other suitable time-mechanism.

The driving-pinion 17 above referred to, meshes into and drives a gear-wheel 20 staked or otherwise rigidly secured to the hub 21 of a sector-actuating pinion 22. The said sector-actuating pinion 22 together with the gear-wheel 20 carried thereby, is rigidly mounted upon a shaft 23 bearing at its respective opposite ends in the front-plate 10 and back-plate 11.

The mechanism now to be described constitutes means for translating the substantially-continuous rotational movement of the driving-pinion 17 or its equivalent into an intermittent or step-by-step movement of a driven element to be more fully hereinafter described, and is more elaborately set forth in my co-pending application, Serial No. 281,806 filed June 29, 1939.

Immediately forwardly of the sector-actuating pinion 22, the shaft 23 has mounted thereon with freedom for relative rotation, an intermittently-driven pinion 24. The said pinion 24 is provided with a hub-portion 25 (Fig. 7) to which is rigidly staked or otherwise secured, a stop-arm generally designated by the reference character 26.

The intermittently-driven pinion 24 is resiliently or elastically coupled to the sector-actuating pinion 22 and hence to the gear-wheel 20 and driving-pinion 17, through the intermediary of a chain of parts to be presently described, and which enables the said gear-wheel 20 to rotate constantly and effect the intermittent turning movement of the said intermittently-driven pinion 24.

The intermittently-driven pinion 24 meshes into and drives a gear-wheel 27 rigidly mounted upon a shaft 28 journaled at its rear end in the back-plate 11, and at its forward end in a cup-shaped bearing 29 carried by the front-plate 10 and extending forwardly therefrom. Immediately forwardly of the gear-wheel 27, the shaft 28 has mounted thereon with freedom for rotation with respect thereto, a pinion 30 which extends forwardly through the front-plate 10 and has a portion of its periphery exposed through the side of the cup-shaped bearing 29 which latter is cut away for this purpose.

Secured at their outer ends, respectively, to the forward face of the gear-wheel 27, are two corresponding spring-metal pawls 31—31 which engage at their respective inner ends with the portion of the pinion 30 which is located to the rear of the front-plate 10. The said pawls 31—31 thus serve to cause the gear-wheel 27 to drive the pinion 30 in one direction but which permit the said pinion to be turned ahead, so to speak, with respect to the said gear-wheel 27.

The pinion 30, above referred to, meshes into and drives a gear-wheel 32 (Figs. 1 and 2) rigidly mounted upon an intermittently-driven control-shaft 33 adjacent the inner end thereof. The said control-shaft 33 is provided with a finger-button 33a and is journaled for rotation at its rear end in the front-plate 10 of the actuating-mechanism frame 13 and at its outer end is journaled for rotation in a bearing 34 formed in the end-wall 35 of the switch-frame 14. Rigidly secured to the control-shaft 33 is a plurality of control-wheels or members 36 preferably formed in their entirety of insulating material so as to guard against the flowage of stray currents through the mechanism.

Each of the control-wheels 36 is provided upon its periphery with a plurality of cam-lugs 37 separated from each other by a similar number of clearance-notches 38 (Fig. 2). The cam-lugs 37 of a given one of the two control-wheels 36 shown, is adapted to operate its individual switch-member as will hereinafter appear.

Complementing each control-wheel 36, respectively, is one of two corresponding resilient contact-arms 39—39 each having an inclined cam-finger 40 at its free end for engagement by the cam-lugs 37 of the particular control-wheel 36 with which it is aligned. Each of the two contact-arms 39—39 is respectively secured by means of one of two screws 41—41 to an insulating-block 42 mounted upon one of the two side-flanges 43—43 of the switch-frame 14. Each flexible contact-arm 39 may have soldered thereto one of two lead-wires 44—44, respectively, extending to a device which it is desired to electrically control such, for instance, as a feature of an automatic washing machine or the like.

Each flexible contact-arm 39 is provided about midway of its length with a movable-contact 45 (Fig. 5) adapted to periodically engage with and be disengaged from a similarly-shaped stationary-contact 46. Each stationary-contact 46 is mounted at the inner end of a relatively-rigid contact-bracket or bus-bar 47 of U-shaped form and secured to the insulating-block 42, before referred to, by screws 48—48. One end of the bus-bar 47 may have clamped thereto by the adjacent one of its two screws 48, a connecting-plate 49 to which may be soldered a supply-wire 50 leading from any suitable source of current-supply.

Returning now to the stop-arm 26 before referred to, it will be noted by reference to Fig. 7 in particular that the said stop-arm has journaled in its outer end a latching-stud 51 having a semi-cylindrical latching-head 52 projecting forwardly beyond the front face of the stop-arm 26. The latching-head 52 of the latching-stud 51 is adapted to releasably engage with a latching-post 53 rigidly mounted in the front-plate 10 and projecting rearwardly therefrom.

The latching-stud 51 which is mounted for turning movement in the outer end of the stop-arm 26 has rigidly secured thereto a latch-sector 54 meshing into the sector-actuating pinion 22 before referred to. A transmitting-spring 55 encircles the latching-stud 51 and has one of its ends 56 hooked around a stud 57 carried by the latch-sector 54. The opposite end 58 of the spring 55 is hooked over an inner portion of the stop-arm 26. As thus installed, the transmitting-spring 55 exerts a constant effort to turn the stop-arm 26 and the parts carried at the outer end thereof in the direction of the arrow A in Fig. 3.

At its inner end and opposite its end-wall 35, the switch-frame 14 is formed with a ring-like annular-flange 59, the outer face of which abuts against the outer face of the front-plate 10 of the actuating-mechanism frame 13. The said ring-like flange 59 is formed with three (more or less) arcuate-slots 60 as is shown particularly well in Figs. 2 and 6. Extending through each of the arcuate-slots 60 is one of three binding-screws 61 each of which is in threaded engagement with one of three threaded bores 62, formed in the front-plate 10 of the frame 13.

By loosening the three binding-screws 61, the actuating-mechanism frame 13 and the switch-frame 14 may be turned or oriented with respect to each other about the control-shaft 33 as a center, to alter the relationship between the control-wheels 36 and the respective cam-fingers 40 of the contact-arms 39 for purposes as will more fully hereinafter appear.

For the purpose of making clear the operation of the particular device illustrated in the drawings let it be assumed that alternating current is being applied to the synchronous-electric motor-structure 15 through its leads 18 and 19 so that the driving-pinion 17 thereof will effect the continuous properly-timed rotation of the gear-wheel 20 and the sector-actuating pinion 22.

As the sector-actuating pinion 22 turns, it will turn the latch-sector 54 and hence also the latching-stud 51 carried by the latter to further tension the pre-tensioned spring 55. Ultimately in the turning of the latching-stud 51, its semi-cylindrical latching-head 52 will ride clear of the latching-post 53 and thereby permit the spring 55 to assert itself and snap or swing the entire stop-arm one revolution together with the latch-sector 54, latching-stud 51, and spring 55, which elements will bodily move with the said stop-arm. By the time that the stop-arm has completed one revolution, the latching-head 52 of the latching-stud 51 will have been turned so as to engage with the latching-post 53 until again re-

leased after the lapse of a predetermined interval, by the turning of the latch-sector **54** by the pinion **22**, as above described.

During the rapid swinging movement of the stop-arm **26** under the power of the intermittent-movement-transmitting spring **55**, the said arm will similarly turn the intermittently-driven pinion **24** and thus, through the chain of parts **27**, **30** and **32**, effect the partial turning of the control-shaft **33**. The turning of the control-shaft **33** will effect the simultaneous advancement of the control-wheels **36—36** through an arc of 6° in the particular mechanism shown. It will be understood, of course, that the amount of turning movement imparted to the control-wheels **36—36**, or their equivalent, may be varied to meet different requirements.

Dependent upon the positioning and extent of the cam-lugs **37** of the control-wheels **36—36**, their respective cooperating contact-arms **39—39** will be flexed to separate the movable contact **45** from the stationary contact **46** during some or all of the step-by-step turning movements of the said control-wheels.

Should it be desired, for any reason, to manually advance the control-wheels **36—36**, this may be done by turning the finger-button **33***a* of the control-shaft **33**, thus causing the pinion **30** to ratchet ahead with respect to the pawls **31—31** carried by the gear-wheel **27**. Preferably, the number of teeth on the pinion **30** is such that the advancement of the same a distance of one tooth will correspond to the advancement of the control-shaft **33** through one of its predetermined step-by-step movements.

Inasmuch as there is included in the mechanism for imparting step-by-step turning movement to the control-wheels **36—36**, or their equivalent, a relatively-complex and long chain of parts, the problem of insuring the correct positioning of the said control-wheels with respect to the cam-fingers **40** of the flexible contact-arms **39—39** at the end of each step-by-step movement, is one which requires attention.

If it is found that the control-wheels **36—36** are not sufficiently advanced at the conclusion of one of their step-by-step movements, the cam-fingers **40** of the respective contact-arms **39—39** may be retired sufficiently to provide the desired timing by first loosening the binding-screws **61** and then turning the switch-frame **14** to the required degree in a counterclockwise direction, as viewed in Fig. 2. If, on the other hand, it is found that the control-wheels **36—36** are too far advanced with respect to the cam-fingers **40—40** at the conclusion of any given step-by-step impulse imparted to the said control-wheels, the entire switch-frame **14** may be turned with respect to the actuating-mechanism frame **13** in a clockwise direction, to thereby advance the cam-fingers **40—40** with respect to the said control-wheels **36—36**. After adjustment or timing has been effected, the binding-screws **61** should be tightened to thus firmly interlock the switch-frame **14** with the actuating-mechanism frame **13**.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame movable with respect to the said actuating-mechanism frame; a substantially-continuously-moving driving-member carried by the said actuating-mechanism frame; a movable switch-actuating member; intermittent-drive means operatively interconnecting the said substantially-continuously-moving driving-member and the said movable switch-actuating member to cause the former to effect the intermittent movement of the latter; switch-means carried by the said switch-frame for movement therewith and having a portion extending into position for actuation by the said switch-actuating member; and releasable clamping-means for interlocking the said actuating-mechanism frame and the said switch-frame and, when released, permitting relative movement between the two said frames to effect proper timing between the said switch-actuating member and the said switch-means.

2. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame turnable with respect to the said actuating-mechanism frame; a substantially-continuously-rotating driving-member carried by the said actuating-mechanism frame; a control-shaft; a rotary switch-actuating member carried by the said control-shaft; intermittent-drive means operatively interconnecting the said substantially-continuously-rotating driving-member and the said control-shaft to cause the former to effect the intermittent turning movement of the latter and the switch-actuating member carried by the said control-shaft; switch-means carried by the said switch-frame for movement therewith and having a portion extending into position for actuation by the said rotary switch-actuating member; and releasable clamping-means for interlocking the said actuating-mechanism frame and the said switch-frame against relative turning movement and, when released, permitting relative turning movement between the said frames to effect proper timing between the said rotary switch-actuating member and the said switch-means.

3. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame turnable with respect to the said actuating-mechanism frame; a substantially-continuously-rotating driving-member carried by the said actuating-mechanism frame; a control-shaft journaled in both of the aforesaid frames; a rotary switch-actuating member carried by the said control-shaft; intermittent-drive means operatively interconnecting the said substantially-continuously-rotating driving-member and the said control-shaft to cause the former to effect the intermittent turning movement of the latter in both of said frames and the switch-actuating member carried by the said control-shaft; switch-means carried by the said switch-frame for movement therewith and having a portion extending into position for actuation by the said rotary switch-actuating member; and releasable clamping-means for interlocking the said actuating-mechanism frame and the said switch-frame against relative turning movement and, when released, permitting relative turning movement between the said frames to effect proper timing between the said rotary switch-actuating member and the said switch-means.

4. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame turnable with respect to the said actuating-

mechanism frame; a substantially-continuously-moving driving-member carried by the said actuating-mechanism frame; a rotary switch-actuating member; intermittent-drive means operatively interconnecting the said substantially-continuously-moving driving-member and the said rotary switch-actuating member to cause the former to effect the intermittent turning of the latter; switch-means carried by the said switch-frame for turning therewith and having a portion extending into position for actuation by the said rotary switch-actuating member; one of the said frames being provided with a plurality of arcuate clearance-slots; and a plurality of binding-screws respectively extending through one of the arcuate clearance slots in the frame provided therewith and into clamping engagement with the other of said frames to hold both thereof against relative turning movement and, when released, permitting relative turning movement between the said frames to effect proper timing between the said rotary switch-actuating member and the said switch-means.

5. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame turnable with respect to the said actuating-mechanism frame; a substantially-continuously-moving driving-member carried by the said actuating-mechanism frame; a rotary switch-actuating member; intermittent-drive means operatively interconnecting the said substantially-continuously-moving driving-member and the said rotary switch-actuating member to cause the former to effect the intermittent turning of the latter; switch-means carried by the said switch-frame for turning therewith and having a portion extending into position for actuation by the said rotary switch-actuating member; one of the said frames being provided with a plurality of arcuate clearance-slots and the other of said frames being provided with a plurality of threaded sockets; and a plurality of binding-screws one of which extends through a given one of the arcuate clearance-slots in the frame so provided and into engagement with the threaded socket in the other of said frames to releasably interlock both of the said frames against relative turning movement and, when released, permitting relative turning movement between the said frames to effect proper timing between the said rotary switch-actuating member and the said switch-means.

6. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame turnable with respect to the said actuating-mechanism frame; a substantially-continuously-rotating driving-member carried by the said actuating-mechanism frame; a control-shaft; a rotary switch-actuating member carried by the said control-shaft; intermittent-drive means operatively interconnecting the said substantially-continuously-rotating driving-member and the said control-shaft to cause the former to effect the intermittent turning movement of the latter and the switch-actuating member carried by the said control-shaft; a flexible contact-arm carried by the said switch-frame for movement therewith and provided with a cam-finger extending into position for actuation by the said rotary switch-actuating member; one of the said frames being provided with a plurality of arcuate clearance-slots; and a plurality of binding-screws respectively extending through one of the arcuate clearance-slots in the frame provided therewith and into clamping engagement with the other of said frames to hold both thereof against relative turning movement and, when released, permitting relative turning movement between the said frames to effect proper timing between the said rotary switch-actuating member and the cam-finger of the said switch-means.

7. An automatic switch-mechanism, comprising: an actuating-mechanism frame; a switch-frame turnable with respect to the said actuating-mechanism frame; a substantially-continuously-rotating driving-member carried by the said actuating-mechanism frame; a control-shaft; a rotary switch-actuating member carried by the said control-shaft; intermittent-drive means operatively interconnecting the said substantially-continuously-rotating driving-member and the said control-shaft to cause the former to effect the intermittent turning movement of the latter and the switch-actuating member carried by the said control-shaft; a flexible contact-arm carried by the said switch-frame for movement therewith and provided with a cam-finger extending into position for actuation by the said rotary switch-actuating member; one of the said frames being provided with a plurality of arcuate clearance-slots and the other of said frames being provided with a plurality of threaded sockets respectively registering with one of the plurality of arcuate clearance-slots in the other of said frames; and a plurality of binding-screws respectively extending through one of the arcuate clearance-slots in one of the said frames and into engagement with the adjacent one of the threaded sockets in the other of said frames to interlock both the said frames against relative turning movement and, when released, permitting relative turning movement between the said frames to adjust the position of the cam-finger of the said flexible contact-arm with respect to the said rotary switch-actuating member.

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