April 19, 1955 L. W. RITTENHOUSE ET AL 2,706,757

CHIME TRANSFORMER SWITCH

Filed March 24, 1953 2 Sheets-Sheet 1

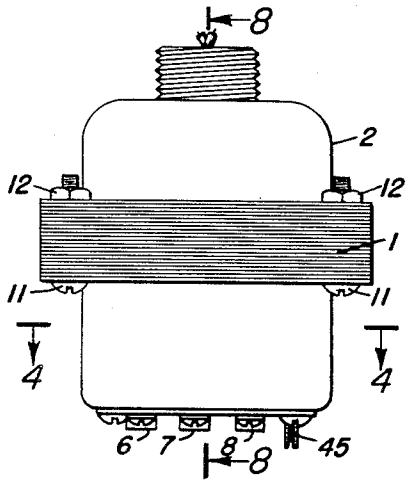

FIG. 1.

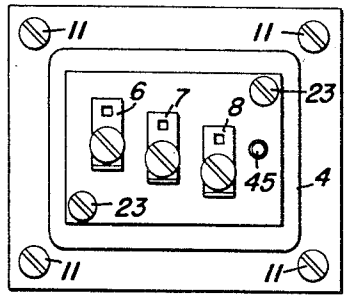

FIG. 2.

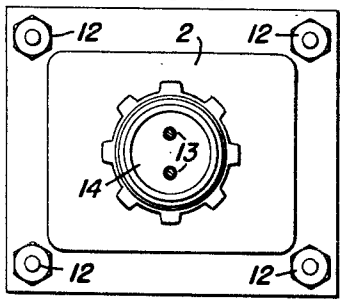

FIG. 3.

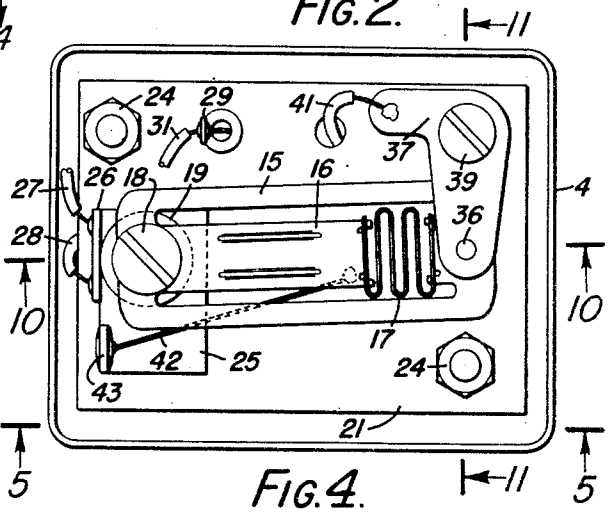

FIG. 4.

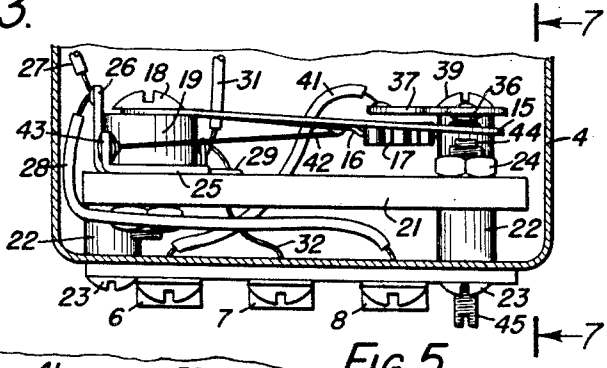

FIG. 5.

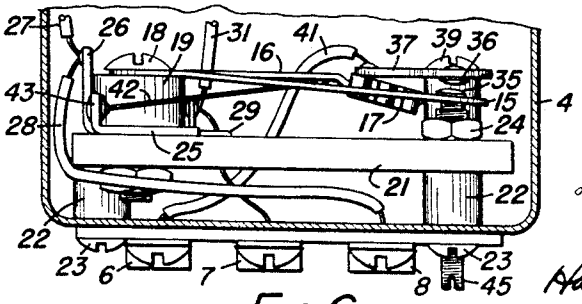

FIG. 6.

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CHIME TRANSFORMER SWITCH

Filed March 24, 1953 2 Sheets-Sheet 2

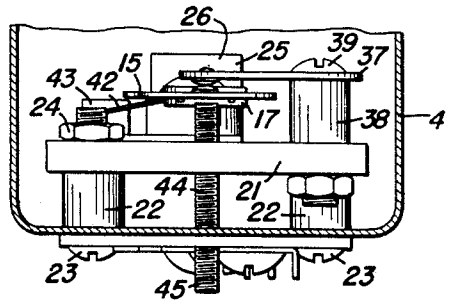

FIG. 7.

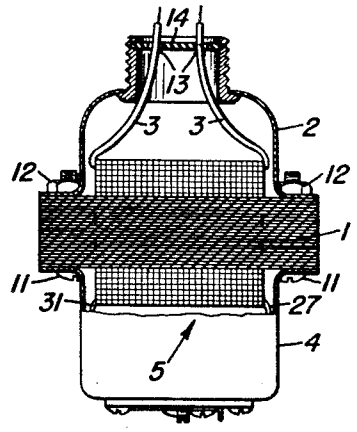

FIG. 8.

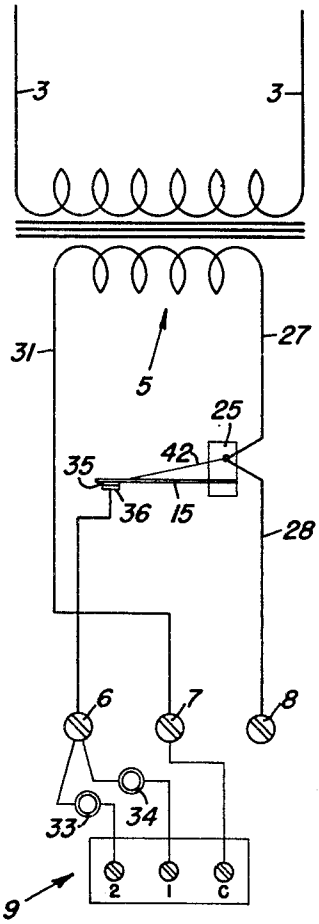

FIG. 9.

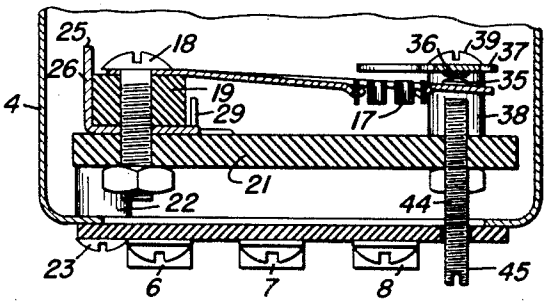

FIG. 10.

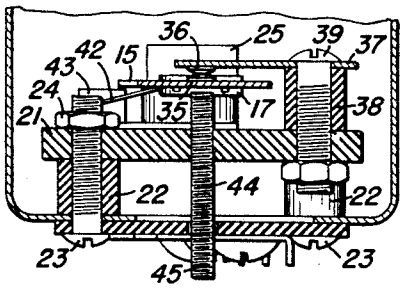

FIG. 11.

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2,706,757

CHIME TRANSFORMER SWITCH

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Application March 24, 1953, Serial No. 344,354

10 Claims. (Cl. 200—113)

This invention relates to a chime transformer, more particularly to the type of transformer employed in the operation of conventional door chimes and the like, and has for its object to afford a compact and practical control mechanism that can be arranged in a transformer housing and operates to effect intermittent sounding of a chime as long as the controlling push button is held in depressed or operating position.

The invention has for a further purpose to afford efficient means that enables repeated operation of a chime at selected intervals of from one to three cycles per second, the control mechanism being adaptable to conventional types of chime transformers for operation of either one-note, two-note, or multiple-note chimes.

A further object of the invention is to provide simple and reliable means for repeating the operation of a chime continuously as long as the push button is held and to maintain a repeating interval much slower than the repeat operation of conventional repeating or so-called continuous ringing chimes, but sufficiently fast to afford a pleasant repeat tone which can be easily produced at a rate of about two strokes per second.

Another purpose of the invention is to afford a chime repeating mechanism governed by a thermo-switch that is highly sensitive, can be operated with a small amount of current such as ordinarily available in a door chime circuit by means of a snap action that insures a swift movement of the circuit-closing switch to and from circuit-closing position, and which can be housed in a minimum space.

A more specific object of the invention is to provide a door chime transformer with a thermo-switch that has a faster action and is more sensitive than any switches heretofore available for the purpose, and to control such a switch by adjusting means whereby the interval between strokes of the chime or the number of strokes per second can be easily modified to increase or decrease the speed of cycle.

An additional purpose of the invention is to afford a construction that can be easily assembled within a conventional door chime transformer housing and lends itself to being confined within a relatively small compass completely protected by the transformer housing while at the same time affording more satisfactory and efficient control of the chime operation than has heretofore been possible.

To these and other ends, the invention consists in the construction and arrangement of parts that will appear clearly from the following description when read in conjunction with the accompanying drawings, the novel features being pointed out in the claims following the specification.

In the drawings:

Fig. 1 is a plan view of a door chime transformer constructed in accordance with a preferred embodiment of the invention:

Fig. 2 is an end elevation of the same;

Fig. 3 is an end elevation looking at the opposite end from Fig. 2;

Fig. 4 is a vertical sectional view on the line 4—4 of Fig. 1 looking in the direction indicated;

Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 4 looking in the direction indicated, and showing the outer yoke member and movable contact in circuit-closing position;

Fig. 6 is a view similar to Fig. 5 with parts broken away, showing the outer yoke member and movable contact engaged with the adjustable stop in circuit-opening position;

Fig. 7 is a vertical sectional view on the line 7—7 of Fig. 5;

Fig. 8 is a vertical sectional view on the line 8—8 of Fig. 1;

Fig. 9 is a diagrammatic view of the electric circuit with the thermo-switch in circuit-closing position, illustrating a conventional door chime with the connections to the transformer;

Fig. 10 is a detail sectional view on the line 10—10 of Fig. 4, and

Fig. 11 is a detail sectional view on the line 11—11 of Fig. 4.

Referring more particularly to the drawings in which like reference numerals refer to the same parts throughout the several views, 1 designates the core of a conventional door chime transformer, 2 is a housing within which is located a primary coil connected to the main circuit conductors 3, and 4 is a housing containing the secondary coil indicated diagrammatically at 5, see Fig. 9. The housing 4 also contains the thermo-switch controlled intermittent repeating mechanism associated with the secondary coil and connected with binding posts 6, 7 and 8 respectively on the exterior of the housing 4, see Figs. 2 and 5, said posts 6, 7 and 8 being adapted for connection with a door chime indicated diagrammatically at 9 in Fig. 9 to provide either a single operation or an intermittent repeat operation, depending upon the selected binding posts that are connected with the chime as will now be described.

The housings 2 and 4 are connected to the core 1 by bolts or screws 11 extending through the flanges of the housings and through the core 1 and secured by the fastening nuts 12 while 13 designate openings in an insulating plate 14 through which the conductors 3 to the supply circuit extend.

Referring to Figs. 4, 5 and 9, there is arranged within the housing 4 and connected to the secondary coil 5 in series therewith a thermo-switch which is spring-biased in one direction so that when released it opens the chime circuit, the thermo-switch being held normally in circuit-closing position by a thermal element in the form of a resistance wire which when cold contracts and imposes tension on the switch to maintain the same in circuit-closing position. Thus when the chime-operating push button is operated, the chime is struck, and by holding the push button is closed position, current passing through the resistance wire heats the same and causes it to expand to a point where it releases the switch which thereupon moves to its alternate position for opening the chime circuit. As soon as the resistance wire cools, it acts to move the switch back to circuit-closing position by a snap action and this cycle continues as long as the operating push button is held in chime-striking position.

To accomplish this, there is provided a conducting spring plate that includes an outer yoke member 15 and an inner tongue member 16, the free end of the tongue member being spaced from the free end of the yoke member and connected thereto by a convolute spring 17 that is operatively associated with the tongue and yoke members and acts to hold them on opposite sides of the center of the spring plate or to effect their movement in opposite directions when one of the pair is moved toward the other.

The opposite end of the spring plate is fixedly mounted by means of a suitable screw 18 and insulating collar 19 upon an insulating base plate 21 that is secured within the housing 4 upon insulating collars 22 and attached to the housing by means of screws 23 and nuts 24. Also fastened to the base plate 21 and held by the screw 18 is a conducting plate 25 arranged between the insulating base plate 21 and the insulating collar 19, the conducting plate 25 being provided with an upstanding portion 26 from which a conductor 27 leads to the secondary coil 5 while 28 is a conductor leading from the upstanding portion 26 of the conducting plate 25 to the binding post 8 from which connection is made to the chime as already described. 29 designates a conducting post mounted on the insulating base plate 21 and connected by conductor 31 to the secondary coil 5 of the transformer and by conductor 32 with the aforementioned binding post 7 from which connection is made to the

chime 9, and in this fashion when the front door push button 33 or the rear door push button 34 is operated with connections established from the chime to the binding posts 7 and 8, the front door chime or rear door chime, as the case may be, is operated only once irrespective of how long the push button is held, and the push button must be released and again depressed to secure a further operation of the chime, all of which is in accordance with a conventional single chime operation. In order to effect intermittent repeated operations of a chime as long as the push button is held in operating position, there is provided on the outer yoke member 15 a contact 35 that is arranged to engage a fixed contact 36 carried by a fixed conducting plate 37 that is mounted upon a sleeve 38 on the base plate 21 and held in place by a screw 39, while 41 designates a conductor leading from the conducting plate 37 to the binding post 6 from which connection can be made to the chime.

The spring plate including the outer yoke member 15 and inner tongue member 16 connected by spring 17 is so positioned with relation to the fixed contact 36 that the outer yoke member when released and free to move is actuated by spring 17 away from the fixed contact 36 so that the repeater circuit is broken at this point, and in order to hold the outer yoke member normally in position to close the circuit, there is provided a resistance wire 42 that is connected at one end by soldering or otherwise to the outer end of the inner tongue member 16 at one side thereof, see Fig. 4, while the opposite end of the resistance wire 42 is connected to a lug 43 formed on the conducting plate 25 and located below and to one side of the spring plate. The resistance wire 42 is so attached and related to the inner tongue member and lug 43 that when cold, with no current passing through, it places tension on the inner tongue member 16 and pulls the latter downwardly, referring to Fig. 5, and thus through the spring 17 actuates the outer yoke member in the opposite direction to move contact 35 carried thereby against the stationary contact 36 and thus close the circuit at this point. When in this position, the outer yoke member 15 is substantially straight but slightly below the fixed end of the spring plate and the fixed contact 36 so that it is always spring-biased away from said fixed contact and under the pressure of spring 17 which actuates it by a quick snap action as soon as resistance wire 42 is heated and expanded to release the inner tongue member 16.

The circuit through contacts 35 and 36 is in series with the secondary coil 5 through the spring plate, conducting plate 25, conductor 27, also through conductor 41 and binding post 6, so that when one of the chime push buttons 33 or 34 is operated, the selected chime is initially struck, and if the push button is held down in operating position, the current continuing through resistance wire 42 heats the latter and causes it to expand sufficiently to release inner tongue member 16 which thereupon moves upwardly, referring to Fig. 5, and through spring 17 actuates the outer yoke member 15 downwardly away from the fixed contact 36 and opening the circuit at that point. The circuit remains open at this point until resistance wire 42 has cooled sufficiently to again exert tension on the inner tongue member 16, whereupon the latter is pulled back to its initial position, and causes movement of the outer yoke member in the opposite direction to again close the circuit when movable contact 35 engages the fixed contact 36.

This cycle of operations continues as long as the push button is held down, and when movable contact 35 and outer yoke member 15 are moved away from fixed contact 36 to open the circuit, such movement is limited by a stop 44 located in the path of movement of the outer yoke member 15 as the latter moves away from fixed contact 36. The stop 44 is in the form of a post threaded into and extending through the insulating base plate 21 and through the housing, the outer end of the stop 44 being indicated at 45 where it is accessible from outside the housing. By turning the accessible portion 45 of the screw stop, the position of the stop with reference to the outer yoke member 15 can be adjusted to vary the distance through which the outer yoke member travels and thus the interval between successive operations of the chime. The greater the distance of the stop from the fixed contact, the farther the inner tongue member must travel to effect return of the outer yoke member to circuit-closing position, and thus a wide variation in the time interval between cycles can readily be had. The intermittent repeat operations can be controlled to produce a rate of from one to several strokes per second, and the usual preferred interval will give approximately two strokes of the chime per second. By this mechanism, it is possible to obtain repeated operations of the chime at a much slower rate than conventional repeating bell-ringing or continuous ringing chimes, and at the same time attain a sufficiently short interval between the repeat operations to insure a pleasing and satisfactory operation.

To effect intermittent repeat operations, connection is made to the chime from the binding posts 6 and 7, binding post 7 being the common connection in use at all times for either single or repeat operation of the chime. Binding post 6 is connected to the chime when intermittent operation are desirable, and binding post 8 is connected to the chime when a single operation is desired at each push button operation. When the intermittent circuit is connected and a push button is held down in operating position, the circuit is completed from the secondary coil through conductor 27 to the conducting plate 25, thence through resistance wire 42 to the spring plate, and through the outer yoke member and movable contact 35 to the fixed contact 36, thence through conductor 41 to binding post 6 to the chime which at the same time is connected to binding post 7 and through conductor 32 and conductor 31 to the secondary coil. This completes the circuit, which remains closed until resistance wire 42 has been heated sufficiently to expand and release the inner tongue member 16, changing the relative positions of outer yoke member 15 and inner tongue member 16, so that spring 17 effects a quick snap movement of the outer yoke member and movable contact 35 away from circuit-closing position and against the stop 44, opening the circuit. The circuit then remains opened until sufficient cooling of resistance wire 42 contracts the latter and restores the parts to their initial position to again close the circuit, and this cycle continues until the operating push button is released. By changing the position of stop 44, the extent of movement of the inner tongue member and movable contact and the degree of cooling of resistance wire 42 necessary to restore the movable contact to circuit-closing position can be modified to vary the interval between successive chime operations and obtain to a finely adjusted degree the exact interval desired without undue delay or excessive speed between the intermittent operations.

While the invention has been described with reference to the particular structure shown herein, it is not confined to the mechanical or electrical details disclosed, and this application is intended to cover such modifications or departures as may come within the purposes of the improvements or the scope of the following claims.

We claim:

1. A thermo-switch including a base plate of insulating material, a spring conducting plate fixedly supported at one end on said base plate and including a movable outer yoke member and a movable inner tongue member, a spring connecting the free ends of said tongue and yoke members, a fixed contact on said base plate on one side of said yoke member, a stop mounted on the base plate on the opposite side of said yoke member, a movable contact mounted on said yoke member and engaging alternately with said fixed contact and stop, a conducting plate mounted on said insulating base plate, said conducting plate including a fixed post, and a resistance wire having one end connected to said fixed conducting post and its opposite end connected to the free end of said inner tongue member.

2. A thermo-switch, including a base plate of insulating material, a spring conducting plate fixedly supported at one end of said base plate and including a movable outer yoke member and a movable inner tongue member, a spring connecting the free ends of said yoke and tongue members, a fixed contact on said base plate on one side of said yoke member, a fixed stop mounted on said base plate on the opposite side of said outer yoke member, a movable contact mounted on said outer yoke member and engaging alternately with said fixed contact and said stop, a conducting plate mounted on said insulating base plate, said conducting plate including a fixed post, a resistance wire having one end connected to said fixed conducting post and its opposite end connected to the free end of said inner tongue mem-

ber, said stop being adjustable toward and from said fixed contact, and adjusting means for varying the position of said adjustable stop.

3. A thermo-switch including a spring plate fixed at one end and embodying a movable outer yoke member and a movable inner tongue member, a spring connecting the free ends of said yoke and tongue members, a fixed contact arranged at one side of said yoke member, a stop on the opposite side of said yoke member spaced from and adjustable toward and from said fixed contact, a movable contact mounted on said outer yoke member and engaging alternately with said fixed contact and stop, and a resistance wire connected at one end to the free end of said inner tongue member and having its other end connected to a fixed conducting post, said resistance wire when cold being contracted and acting to put tension on said inner tongue member and thereby actuate said movable contact to circuit-closing position and when heated being expanded and acting to release said inner tongue member and thereby actuate the movable contact into engagement with said adjustable stop in circuit-opening position.

4. A thermo-switch including a spring plate fixed at one end and embodying a movable outer yoke member and a movable inner tongue member, a convolute spring connecting the free ends of said yoke and tongue members, a fixed contact at one side of said yoke member, a stop at the opposite side of said yoke member and adjustable toward and from said fixed contact, a movable contact mounted on said yoke member and engaging alternately with said fixed contact and stop, a resistance wire connected at one end to the free end of said inner tongue member and at its opposite end to a fixed conducting post located beneath said spring plate to one side thereof, said wire when cold being contracted and acting to put tension on the outer end of said inner tongue member and thereby actuate said movable contact to circuit-closing position and when heated being expanded and acting to release said inner tongue member and thereby actuate the movable contact toward said adjustable stop in circuit-opening position.

5. A thermo-switch including a spring plate fixed at one end and embodying a movable outer yoke member and a movable inner tongue member, a convolute spring connecting the free ends of said yoke and tongue members, a fixed contact at one side of said yoke member, a fixed stop at the opposite side of said yoke member, a movable contact mounted on said outer yoke member and alternately engaging said fixed contact and stop, said outer yoke member and movable contact being spring-biased and actuating the movable contact when released to circuit-opening position, and a resistance wire connecting the free end of said inner tongue member with a fixed conducting post, said resistance wire when cold being contracted and acting to place tension on said inner tongue member and maintain the yoke member and movable contact in circuit-closing position and when heated being expanded and acting to release said inner tongue member and thereby permit said spring to actuate the outer yoke member and movable contact against said stop to circuit-opening position.

6. A thermo-switch including a spring plate fixed at one end and embodying a movable outer yoke member and a movable inner tongue member, a spring connecting the free ends of said tongue and yoke members and actuating them in opposite directions, a fixed contact at one side of said yoke member, a fixed stop at the opposite side of said yoke member, a movable contact mounted on said outer yoke member and alternately engaging said fixed contact and stop, said outer yoke member being substantially straight when said contact is in circuit-closing position and spring-biased toward circuit-opening position whereby it moves to circuit-opening position when released, and a resistance wire having one end connected to said inner tongue member and its opposite end connected to a fixed conducting post, said resistance wire when cold being contracted and acting to place tension on said inner tongue member and thereby maintain the outer yoke member and movable contact in circuit-closing position and when heated being expanded and acting to release said inner tongue member and thereby permit said outer yoke member and movable contact to move against said stop to circuit-opening position.

7. A thermo-switch including a spring plate fixed at one end and embodying movable inner and outer members connected at their free ends by a spring, a fixed contact at one side of said outer member, a fixed stop at the opposite side of said outer member, a movable contact mounted on said outer member and alternately engaging said fixed contact and stop, said outer member being spring-biased and actuating said movable contact when released to circuit-opening position, and a resistance wire connected at one end to said inner member and at its opposite end to a fixed conducting post and acting when cold to contract and place tension on said inner member thereby moving said outer member and its contact into circuit-closing position and when heated to expand and permit said yoke member and movable contact to move against said stop to circuit-opening position.

8. A thermo-switch including a spring conducting plate fixed at one end and embodying inner and outer oppositely movable members, a spring connecting the free ends of said inner and outer members, a fixed contact at one side of said outer member, a fixed stop at the opposite side of said outer member, said stop being adjustable toward and from the fixed contact, a movable contact mounted on said outer member and engaging alternately with said fixed contact and stop, said outer member being substantially straight when its contact is in circuit-closing position and spring-biased toward said adjustable stop and circuit-opening position, and a resistance wire having one end connected to said inner member and its other end connected to a fixed conducting post, said wire when cold being contracted and acting to put tension on said inner member and thereby hold said outer member and movable contact in circuit-closing position and when heated being expanded and acting to permit said movable contact to move to circuit-opening position.

9. A thermo-switch including a spring conducting plate fixed at one end and embodying inner and outer oppositely movable members, a spring connecting the free ends of said members, a fixed contact at one side of said outer member, a fixed stop at the opposite side of said outer member, a movable contact mounted on said outer member and engaging alternately with said fixed contact and stop, and a resistance wire having one end connected to the free end of said inner member and its other end connected to a fixed conducting post, said wire when cold being contracted and acting to put tension on said inner member and thereby actuate said movable contact to circuit-closing position and when heated being expanded and acting to release said inner member and permit movement of the movable contact to circuit-opening position.

10. A thermo-switch including a spring conducting plate fixed at one end and embodying inner and outer oppositely movable members, a spring connecting the free ends of said members, a fixed contact at one side of said outer member, a stop at the opposite side of said outer member and adjustable toward and from said fixed contact, a movable contact mounted on said outer member and engaging alternately with said fixed contact and stop, a resistance wire having one end connected to the free end of said inner member and its opposite end connected to a fixed conducting post, said wire when cold being contracted and acting to put tension on said inner member and thereby hold the outer member and movable contact in circuit-closing position and when heated being expanded and releasing said inner member and movable contact into engagement with said adjustable stop in circuit-opening position, and adjusting means for varying the position of said adjustable stop.

References Cited in the file of this patent

UNITED STATES PATENTS

923,839	Henry	June 8, 1909
1,959,205	Hanel	May 15, 1934
2,075,614	Horton	Mar. 30, 1937
2,076,275	Jorgenson	Apr. 6, 1937
2,184,699	Horton	Dec. 26, 1939
2,313,969	Riche	Mar. 16, 1943
2,505,689	Rickmeyer	Apr. 25, 1950
2,644,899	Perry	July 7, 1953
2,672,563	Boddy	Mar. 16, 1954