Aug. 7, 1934. H. N. WAGAR 1,969,488

CIRCUIT CONTROLLER

Filed Sept. 23, 1930

FIG. 1

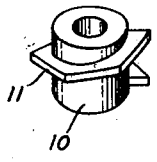


FIG. 2

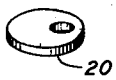


FIG. 3

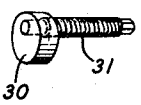


FIG. 4

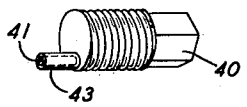


FIG. 5

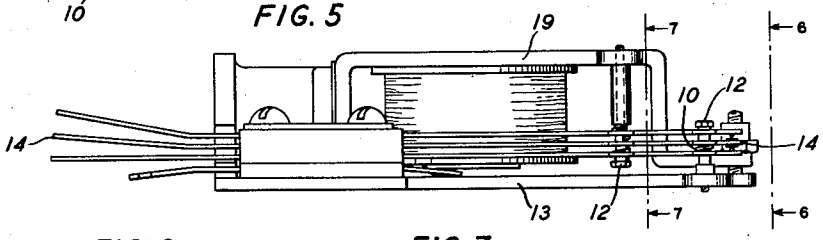


FIG. 6

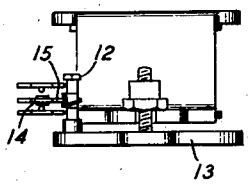


FIG. 7

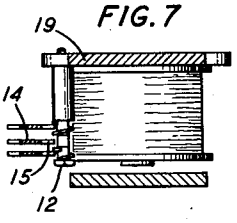


FIG. 8

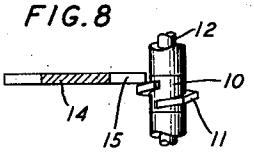


FIG. 9

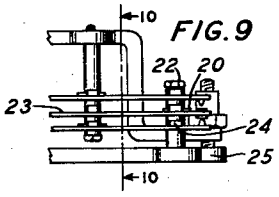


FIG. 10

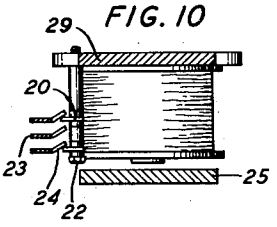


FIG. 11

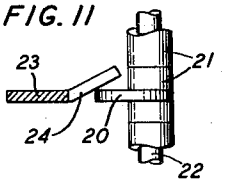


FIG. 12

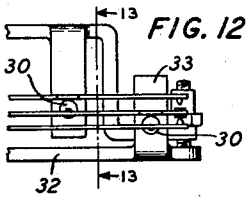


FIG. 13

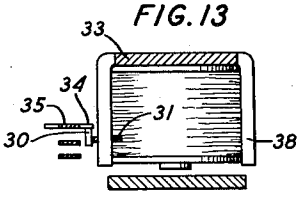


FIG. 14

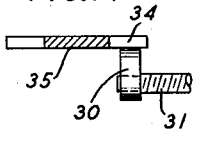


FIG. 15

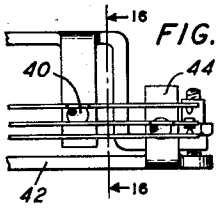


FIG. 16

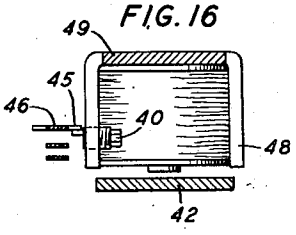
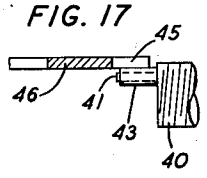


FIG. 17



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UNITED STATES PATENT OFFICE

1,969,488

CIRCUIT CONTROLLER

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Application September 23, 1930, Serial No. 483,794

3 Claims. (Cl. 200—166)

This invention relates to spring tensioning devices and more particularly to the means employed in pretensioning the resilient contact springs of electro-magnetic circuit controllers.

In various types of circuit controllers, metallic contact springs are employed as the circuit controlling elements. In the telephone art, for example, electromagnetic relays are used extensively, which comprise a plurality of superposed metal contact springs arranged in parallelism and actuated by the relay armature in response to the energization of the relay winding. The efficient functioning of these springs depends to a considerable degree upon their resilient properties, and it is essential that the tension of each spring should be such as to permit it to yield to exert a definite contact pressure upon the application of a predetermined pressure by the controlling relay armature.

It has been the practice in the past to pretension or set the contact spring prior to its assembly on the relay structure. In such cases the contact spring has been bent from normal to a greater or lesser degree, or the spring has been provided with a series of graduated indentations or depressions along its surface and extending transversely thereof. These and other similar methods of tensioning the contact spring have satisfactorily served their purposes in the past, but the ever increasing demand for relay springs of numerous different spring combinations necessitated the development of a more universal type of adjusting means and one which would conveniently and economically permit adjustments to be made in the field without undue disturbance to associated equipment.

It is the object of this invention to improve the means employed in adjusting circuit controllers of the spring contact type.

This object is attained in accordance with a feature of the invention by the provision of individually adjustable camming elements which are mounted in juxtaposition to the contact springs and cooperate with the spring tangs in effecting a simple, economical means for separately and positively pretensioning the contact springs of a relay spring pile-up.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing in which:

Figs. 1, 2, 3 and 4 show four specific forms of camming elements which may be employed in the structure of an electromagnetic device in attaining the object of the invention;

Fig. 5 shows a relay embodying in its structure the preferred form of camming element shown in Fig. 1;

Fig. 6 is an end view of the relay shown in Fig. 5;

Fig. 7 is a section taken along the line 7—7 in Fig. 5 looking in the direction of the arrows;

Fig. 8 is an enlarged fragmentary view showing the cooperation of the camming element shown in Fig. 1 and an associated contact;

Fig. 9 is a side view of the front end of a relay embodying the adjusting means shown in Fig. 2;

Fig. 10 is a section taken along the line 10—10 of Fig. 9 looking in the direction of the arrows;

Fig. 11 corresponds to Fig. 8 and shows the relation between the adjusting means shown in Fig. 2 and an associated contact spring;

Fig. 12 is a side view of the front end of a relay employing the adjusting means shown in Fig. 3;

Fig. 13 is a section taken along the line 13—13 of Fig. 12;

Fig. 14 corresponds to Figs. 8 and 11 and shows the relation between the adjusting means shown in Fig. 3 and an associated contact spring;

Fig. 15 is a side view of the front end of a relay employing the adjusting means shown in Fig. 4;

Fig. 16 is a section taken along the line 16—16 of Fig. 15 and looking in the direction of the arrow;

Fig. 17 corresponds to Figs. 8, 11 and 14 and is an enlarged fragmentary view showing the cooperation between the adjusting means shown in Fig. 4 and an associated contact spring.

The preferred form of the invention shown in Fig. 1 comprises a bored cylindrical hexagonal insulating bushing or stud 10 provided with a camming ridge or spiral thread 11.

As shown in Figs. 5, 6 and 8 the bushing 10 or a plurality thereof, are adjustably mounted in the case of operating studs, on a bolt 12 secured to the operating end of the relay armature 13. Each operating contact spring such as 14 is provided with a laterally extending tang 15 which rests on the surface of the stud thread 11.

The bolt 12 is located on the armature 13 in such a position as to bring the insulating stud or camming element 10 in operative association with the tang 15 on its associated contact spring.

In adjusting the spring tension, the bolt 12 is loosened slightly to permit the stud 10 to be rotated freely. The turning of the stud 10 on the bolt 12 causes the surface of the camming thread 11 to act upon the tang 15 in such a

manner that the spring associated with the tang 15 is raised or lowered from its normal position depending upon the direction in which the stud is turned. After proper adjustment of the spring is attained the bolt 12 is screwed up and holds the studs in their adjusted position.

Figs. 9 and 11 show the application of the eccentric disc 20, shown in Fig. 2 to a relay structure. In this embodiment of the invention the disc 20 is interposed between a plurality of insulating bushings 21 and mounted on the bolt 22 which is secured to the armature 25 in a manner similar to that described in connection with bolt 12 of Fig. 6. The contact springs 23 in this case are provided with inclined tangs 24, the underside of which engage and rest upon the edge of the disc 20 as shown in Fig. 11. The plane of the disc 20 is parallel to that of its associated spring 23.

In adjusting the contact spring in this case, the bolt 22 is loosened slightly to permit the disc 20 to be turned freely. Upon rotation of the disc 20 on the bolt 22 the effective radius of the disc is varied in length so that the point on the surface of the inclined tang 24 at which the disc 20 makes contact varies accordingly, with the result that the spring 23 is raised or lowered depending on whether the effective radius of the disc increases or decreases when the disc is turned.

A further embodiment of the invention shown in Figs. 12 and 14 comprises a circular insulating disc 30 mounted eccentrically on the bolt 31 as shown in Fig. 3.

In this instance the armature 32 is provided with two oppositely disposed vertical extensions, such as 33, which are tapped at regular intervals for the reception of the bolt 31. The outer periphery of the circular disc 30 makes engagement with the contact spring tang 34 as shown in Fig. 14.

In adjusting the contact springs by this means, the bolt 31 is turned or rotated in the armature extension 33 and carries with it the insulating disc 30. As the disc 30 is rotated, the distance between the spring tang 34 and the axis of the bolt 31 is varied due to the eccentric mounting of the disc on the bolt. The spring 35 with which the tang 34 is integrally formed is moved accordingly, upward or downward, depending upon the direction in which the disc 30 is rotated.

A still further embodiment of the invention is disclosed in Figs. 15 and 17. In this instance, the armature 42 is provided with oppositely disposed vertical projections 44 which are tapped to receive threaded bolts, such as 40. The bolt 40 is provided with an offset pin-like projection 41 having an insulating sleeve 42 snugly fitted thereon. The spring tang 45 of spring 46 rests upon and is supported by the insulated pin projection 41 of the bolt 40.

As in the case of the eccentric disc 30 shown in Fig. 3, any rotation of the bolt 40 is accompanied by a corresponding linear movement of the spring 46, either upward or downward, depending upon the direction in which the bolt is turned. The spring 46 is tensioned accordingly.

In the descriptions already given, the camming elements 10, 20, 30 and 40 have been referred to in connection with the adjustment of the contact spring pressure. Figures 7, 10, 13 and 16 show the application of the same camming elements to a relay structure for the purpose of acting as spring stops. When employed in this capacity the mounting bolts 12 and 22 of Figs. 7 and 10 respectively, are secured to the relay yokes 19 and 29 in the same manner as hereinbefore described in connection with the association of similar mounting bolts with armatures 13 and 25. In Figs. 13 and 16 the yokes 39 and 49 are provided with right angle depending portions 38 and 48 respectively, which correspond to the armature extensions 33 and 44 of Figs. 12 and 15 respectively, and serve the same purpose. The contact springs are provided with tangs which cooperate with the camming elements 10, 20, 30 and 40 when utilized as spring stops as shown in Figs. 7, 10, 13 and 16.

Though these elements, under ordinary circumstances serve as spring stops, it is apparent that they may be employed in conjunction with corresponding elements mounted on the relay armatures in effecting the tensioning of the contact springs.

From the description of applicant's invention already given it is evident that he has devised a simple, economical means for separately adjusting the tension of individual springs in a spring pile-up, and which enables the spring tension to be regulated in the field without removing the relay from service and without disturbance to associated equipment.

What is claimed is:

1. In a circuit controller, a plurality of circuit controlling spring contact members, a laterally extending tang associated with each of said contact members and means including a linearly stationary rotatable bushing having a spiral ledge peripherally located thereon and adapted to cooperate with the tangs on said contact members for tensioning said contact members.

2. In an electromagnetic switching device, movable and stationary contact springs, a movable armature for effecting engagement between said contact springs, a stationary yoke piece, a rotatable camming element for tensioning said movable spring, said element being mounted on said movable armature and a separate rotatable camming element for tensioning said stationary spring, said second element being mounted on said stationary yoke piece.

3. In an electromagnetic switching device, movable and stationary contact springs, a movable armature for effecting engagement between said contact springs, a stationary yoke piece, a member rigidly associated with said yoke piece and extending at right angles to the body thereof, a rotatable camming element mounted on said member and adapted, upon rotation, to exert a camming action on said stationary contact spring to tension it, a member rigidly associated with said movable armature and extending at right angles thereto, and a rotatable camming element mounted on said second member and adapted, upon rotation, to exert a camming action on said movable contact spring to tension it, said members being in substantial alignment.

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