Oct. 31, 1939. H. N. WAGAR 2,178,151

RELAY CONTACT SPRING

Filed Sept. 22, 1937

FIG. 1

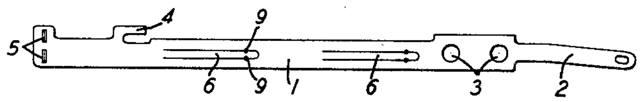


FIG. 2

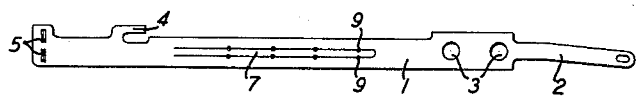


FIG. 3

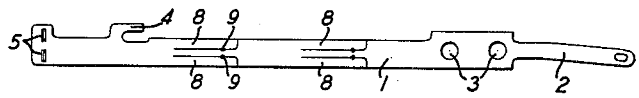


FIG. 4A

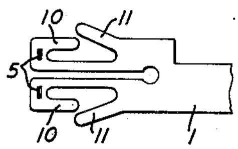


FIG. 4B

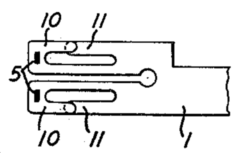


FIG. 5A

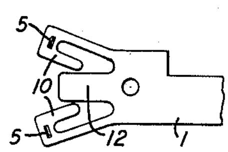


FIG. 5B

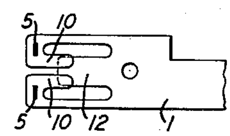


FIG. 6A

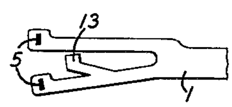


FIG. 6B

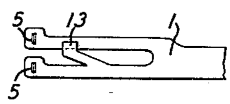


FIG. 7A

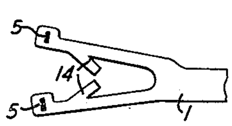


FIG. 7B

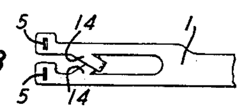


FIG. 8

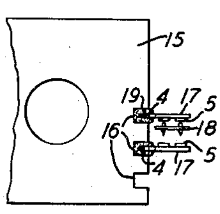


FIG. 10

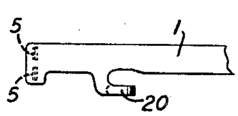


FIG. 11

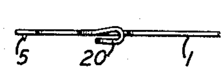
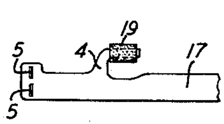


FIG. 9



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UNITED STATES PATENT OFFICE

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RELAY CONTACT SPRING

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Application September 22, 1937, Serial No. 165,019

12 Claims. (Cl. 200—166)

This invention relates to relays and more particularly to relay contact springs.

In electric circuits generally and in telephone circuits particularly relays are extensively employed. In such circuits the functions to be performed are numerous and varied and it is often very essential that relays employed in such circuits shall positively make and break the circuits controlled over their contacts. If the contacts of a relay do not make firmly or break cleanly, or in other words, if the contacts have a tendency to chatter when they make or break, false operation in the circuits controlled thereover will result.

It has been found that one of the factors which contributes to the tendency of relay contacts to chatter is the inherent vibratory action of the springs. Since each spring is in effect a reed fixedly supported at one end and free at the other end, any motion imparted to the free end, either through the operation of the relay armature or through the vibration of the support upon which the relay is mounted, will tend to cause the spring to vibrate at a periodicity determined by its free length, by the location and form of any supports along its length, and with an amplitude determined by the force applied thereto. It has been determined by experimentation that the vibration of a relay spring can be materially reduced by making the spring self-damping or with a large internal energy dissipation.

It is therefore the object of the present invention to reduce the chattering of relay contacts by rendering the springs which carry the contacts self-damping.

This object is attained in accordance with the present invention by shearing the springs to form tongues having a different periodicity than that of the springs as a whole, which tongues may be staked to or have their ends in frictional engagement with the body of the springs, or in the case of the passive or spoolhead springs, providing damping pads or other damping media on the tangs of the springs which are engaged in the spoolhead notches.

It is believed that the invention will be more readily understood from the following detailed description taken in connection with the accompanying drawing in which:

Figs. 1 to 3, inclusive, show relay springs having tongues sheared therein, Fig. 1 showing two tongues sheared from the spring along its axial line, Fig. 2 showing a single long tongue sheared from the spring along its axial line and Fig. 3 showing tongues sheared from the spring along its two edges;

Figs. 4A to 7A, inclusive, show different methods of shearing the contact ends of spring blanks to form tongues while the corresponding Figs. 4B to 7B, inclusive, show the tongues bent into their final positions in which the tongues of each spring are in frictional engagement;

Fig. 8 shows the front spoolhead of a relay in the notches of which the tangs of springs are engaged, a damping medium being interposed between the tangs and the notches;

Fig. 9 shows a plan view of one of the springs disclosed in Fig. 8 with a damping medium applied to the spoolhead tang thereof; and

Figs. 10 and 11 show respectively a plan view and a side elevation of the end of a spring with the spoolhead tang thereof bent to provide damping between the spring and a notch of the spoolhead.

Referring first to Figs. 1 to 3, inclusive, relay contact springs are disclosed which are rendered self-damping by shearing the body of the springs in such a manner as to form tongues. Each spring 1 is provided with the usual terminal lug 2, holes 3 through which screws may extend for clamping the spring to the relay heel-piece or mounting bracket and tang 4 for engagement in a notch of the front spoolhead and contacts 5. In the spring disclosed in Fig. 1, two tongues 6 located along the axial line of the spring are sheared from the spring in the portion thereof located between the mounting holes 3 and the tang 4, or between the rear support of the spring on the heel-piece and the front support on the spoolhead. The spring of Fig. 2 is similarly sheared to form a single long tongue 7, while the spring of Fig. 3 is sheared adjacent to its edges to form four tongues 8.

The tongues of 6, 7 or 8 may be free to vibrate except as restrained by the frictional resistance between their edges and the adjacent edges of the body of the springs, or may be staked to the body of the springs as indicated by the dots 9. Although the shearing has been illustrated as applied to the passive or spoolhead springs of a relay, it is to be understood that similar shearing might also be applied to the active or armature operated springs.

By thus shearing the springs, the short tongues formed by the shearing process will have different flexural characteristics than the springs as a whole, since the bending moments tending to produce flexure of the main body of the springs will not act on the tongues except through frictional contact between the edges of the tongues and the main body of the springs. Thus, when the springs vibrate, the frictional forces between the tongues and spring bodies during the resulting flexure will tend to give the springs a large internal dissipation which will render them self damping.

As an alternative to the shearing of the body of the spring, the contact carrying end of the spring may be formed with tongues the ends of which are in frictional or rubbing engagement.

Figs. 4A to 7A, inclusive, show spring blanks stamped in different designs to provide such tongues and the corresponding Figs. 4B to 7B, inclusive, show such blanks after the tongues have been bent into their final positions. As is common practice, the tip of each spring 1 is divided or split and each section thus formed carries a contact 5.

As illustrated in Fig. 4A, each end section of the spring 1 is stamped to provide a pair of tongues 10 and 11 after which the tongues 11 are bent as shown in Fig. 4B so that their ends overlap and engage the ends of tongues 10. As illustrated in Fig. 5A, the end of the spring is stamped to form a central section, or tongue 12, and a contact carrying section on either side thereof, each of the latter sections having an inwardly extending tongue 10. The spring blank so formed is then bent, as shown in Fig. 5B, with the ends of tongues 10 overlapping and engaging the central tongue 12. As a further alternative construction, the spring blank may be stamped as shown in Fig. 6A with a tongue 13 on only one of the end sections of the spring, which section is then bent, as shown in Fig. 6B, so that the tongue 13 thereof overlaps and engages the other end section of the spring. As a still further alternative construction, the spring blank may be stamped as shown in Fig. 7A with a tongue 14 extending inwardly from the inner edge of each end section of the spring. The end sections are then bent toward each other into the position shown in Fig. 7B in which position the tongues 14 overlap and engage each other. It will, of course, be apparent that the springs might be stamped out in designs not herein illustrated, to form tongues which could be bent to overlap and engage with each other.

With the spring tips thus divided into end sections, the end sections carrying separate contacts tend to vibrate independently of each other and through the rubbing engagement between the tongues formed thereon, mutually damp each other and thereby reduce the tendency of the contacts carried thereby to make a chattering engagement with the contacts of mate springs.

As a further embodiment of the invention, the spoolhead or passive springs of a relay may be made self-damping by the application of a damping medium to the spring tangs 4 at their point of engagement in the notches of the front spoolhead. This embodiment of the invention is illustrated in Figs. 8 to 11, inclusive. Referring to Figs. 8 and 9, the front spoolhead of a relay is shown at 15 provided with notches 16 in the edge thereof in which the tangs 4 of the passive contact springs 17 are engaged. A cooperating armature or active spring is shown at 18. The tang 4 of each passive spring is provided with a surrounding pad 19 which may be of energy absorbing material such as cork, cellulose acetate sheet, or fabric treated with such substances as cellulose acetate, varnish or rubber. For convenience of manufacture and assembly on the tangs, the padding material may be made in tubular form.

As an alternative, the spoolhead tangs of the springs may be bent into a spring loop, as illustrated at 20 in Figs. 10 and 11, so that the tang when inserted into the spoolhead notch will entirely fill the notch.

What is claimed is:

1. In a relay, a contact spring having portions sheared therein for increasing the internal dissipation of mechanical vibration imparted to said spring.

2. In a relay, a contact spring having a tongue sheared therein, said tongue being in frictional engagement with another portion of said spring whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

3. In a relay, a contact spring having a tongue sheared from the body thereof, the edges of said tongue being in frictional engagement with the body of said spring whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

4. In a relay, a contact spring having a plurality of tongues sheared from the body thereof, the edges of said tongues being in frictional engagement with the body of said spring whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

5. In a relay, a contact spring having a plurality of tongues sheared from the edges thereof, the inner edges of said tongues being in frictional engagement with the body of said spring whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

6. In a relay, a contact spring having a tongue sheared therein, the edges of said tongue being staked to the adjacent edges of the body of said spring whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

7. In a relay, a contact spring having a plurality of tongues sheared therein, the edges of said tongues being staked to the adjacent edges of the body of said spring whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

8. In a relay, a contact spring having its contact tip sheared to form tongues, said tongues being bent to overlap each other with a frictional engagement whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

9. In a relay, a contact spring having its contact tip divided into two sections and tongues formed on each section, said tongues being bent to overlap with a frictional engagement whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

10. In a relay, a contact spring having its contact tip divided into two sections and tongues formed on each section, the tongues of each section overlapping each other with a frictional engagement whereby the internal dissipation of mechanical vibration imparted to said spring is increased.

11. In a relay, a contact spring a notched member positioned adjacent to the free end of said spring, a tang extending laterally from said spring into a notch of said member, and vibration damping means on said tang for engagement with the walls of said notch.

12. In a relay, a contact spring, a notched member positioned adjacent to the free end of said spring, a tang extending laterally from said spring into a notch of said member, and a vibration damping pad surrounding said tang for engagement with the walls of said notch.

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