March 31, 1925. 1,531,347

W. A. RHODES

RELAY

Filed April 25, 1922

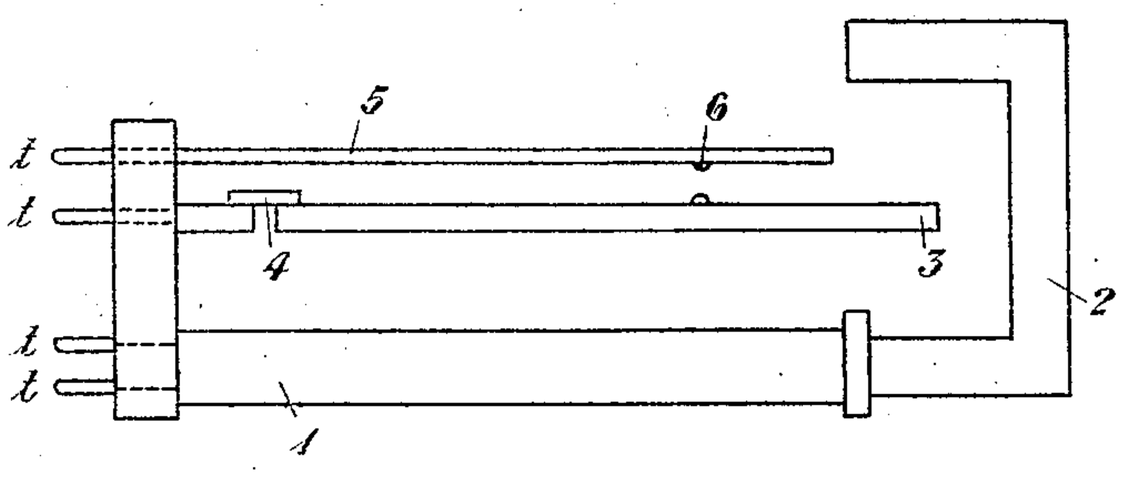

Fig. 1

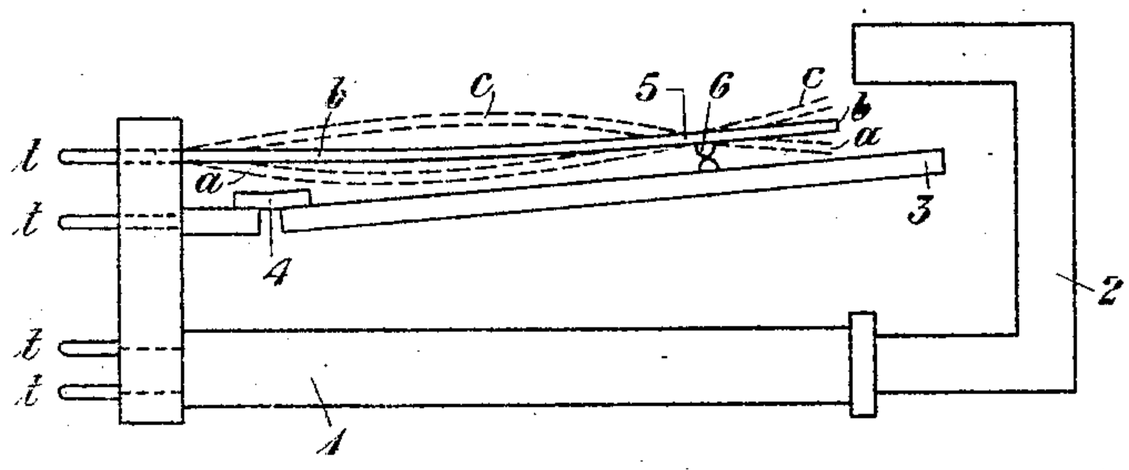

Fig. 2

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UNITED STATES PATENT OFFICE.

WILLIAM A. RHODES, OF KANSAS CITY, MISSOURI, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

RELAY.

Application filed April 25, 1922. Serial No. 556,416.

To all whom it may concern:

Be it known that I, WILLIAM A. RHODES, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain Improvements in Relays, of which the following is a specification.

This invention relates to improvements in relays, and, in particular, spring contact relays. The object of the invention is to reduce to the minimum the rebounding of the contacts which follows the operation or release of the relay.

It has been the practice in connection with spring contact relays to place the contacts either close to the free ends of the springs or, in some instances, close to the fixed ends. Since, upon the operation or release of the relay, the springs and other masses are set in vibration, contacts so placed are caused to rebound, and destructive arcing is likely to result.

This invention consists in the placing of the spring contact or contacts at the point or points not at all affected or least affected by such vibration. The desired points are, in each case, to be determined experimentally. The vibration not only of the springs but also of the entire relay framework is to be considered. In general, however, it may be said that the point or points least affected will be at or very near the node or nodes of free vibration of the springs—since, according to the usual relay construction, the greater part of the vibration affecting the contacts will be found in the springs themselves.

It is proposed, for purposes of illustration, to show specifically the application of the invention to a simple spring contact relay comprising an armature designed to make contact with a single spring. In a relay such as that shown in the drawing and hereinafter fully described, the vibration of masses other than the spring is negligible, and it will here be disregarded. It is to be understood, however, that the invention is in no way limited in scope to application to a relay such as that here shown—which is merely for purposes of illustration—but may be applied to any spring contact relay, whatever may be the number, size or shape of the springs and armatures, or the number and arrangement of the contacts.

In the accompanying drawing, Fig. 1 shows the essential parts of a simple spring contact relay, with the armature in its unoperated position and the spring at rest. Fig. 2 shows the armature in its operated position and the circuit closed, and indicates by the added broken lines the action of the spring immediately after the contact is made. Like numerals and letters of reference in the two figures of the drawing designate corresponding parts of the device.

With reference to the details of the drawing, 1 designates the winding of the electromagnet, and 2 the pole piece. 3 is the armature, and 4 the armature hinge, while *t* marks the terminals. 5 designates the spring, and 6 marks the point of contact of the spring 5. The location of this contact 6 is at the point least affected—in this case not at all affected—by the vibration attendant upon the operation or release of the relay. Since the only vibration here considered is that of the spring 5, the point not disturbed by the vibration is at the node of free vibration of the spring. The exact location of this node depends upon the position of the fixed point of the spring and upon the degree to which the spring is bent. In the usual type of relay spring, the distance from the free end to this node is approximately one-fifth of the total length of the spring, as shown in the accompanying drawing.

In Fig. 2, the successive positions of the spring 5 immediately after the operation of the relay are indicated by broken lines and the unbroken lines at *a*, *b* and *c*—the vibratory motion being greatly exaggerated. It is clearly shown that a contact located at any other point on the spring than at the point chosen would rebound with the movement of the spring, whereas the contact 6, located as here shown, is not affected by the action of the vibrating spring.

What is claimed is:

1. In a relay including an armature designed for operation by an electromagnet, a spring designed to make contact with said armature, said spring having its contact so located thereon as to reduce to the minimum the rebounding of said contact due to the vibration of the relay masses attendant upon the operation of the relay.

2. In a relay including an armature de-

signed for operation by an electromagnet, a spring designed to make contact with said armature, said spring having its contact located at that point of said spring which is least affected by the vibration of the relay masses attendant upon the operation of the relay, whereby the rebounding of said contact is reduced to the minimum.

3. In a relay including an armature designed for operation by an electromagnet, a spring designed to make contact with said armature, said spring having a contact located at the node of free vibration of said spring, whereby the rebounding of said contact is reduced to the minimum.

4. In a relay including an armature designed for operation by an electromagnet, a spring having its point of contact with said armature located at the node of free vibration of said spring, whereby the rebounding of the spring contact is prevented.

In testimony whereof, I have signed my name to this specification this twentieth day of April, 1922.

WILLIAM A. RHODES.