March 20, 1945. T. L. WEYBREW 2,372,144

RELAY CONTACT MEMBERS

Filed Jan. 28, 1943

Fig. 1.

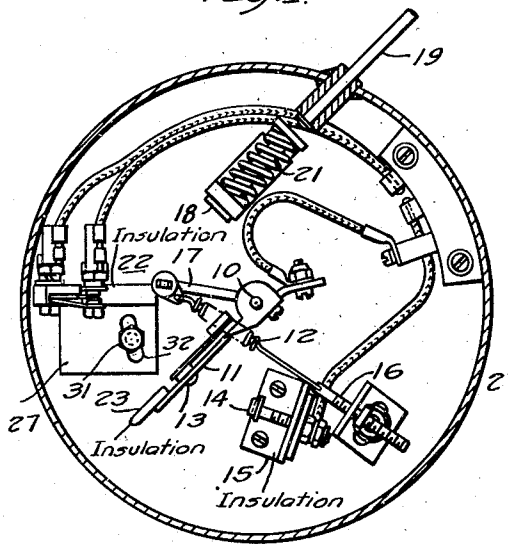


Fig. 2.

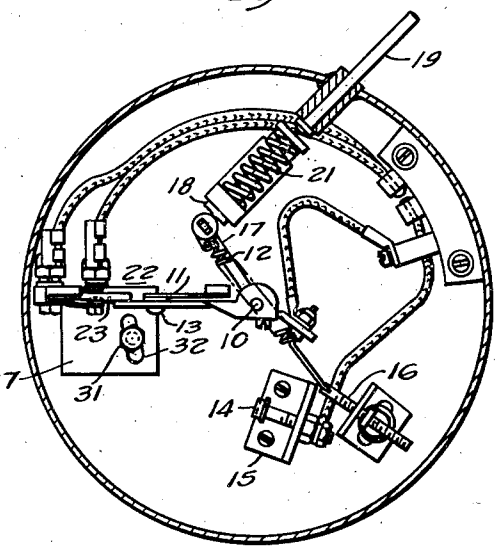


Fig. 3.

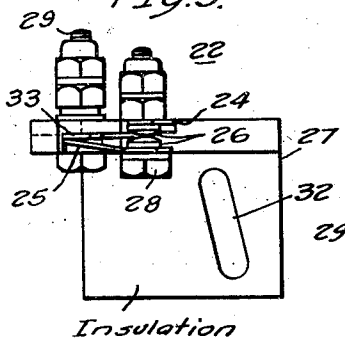


Fig. 4.

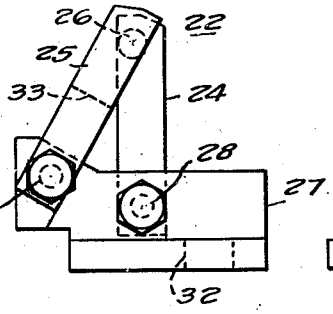
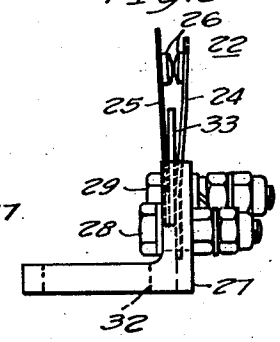


Fig. 5.



WITNESSES:

E. A. McCloskey.

H. E. Whitcraft

INVENTOR

Thelbert L. Weybrew

BY

G. M. Crawford

ATTORNEY

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RELAY CONTACT MEMBERS

Thelbert L. Weybrew, Edgewood, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

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2 Claims. (Cl. 200—166)

My invention relates, generally, to relays and, more particularly, to contact members for relays which are subject to vibration.

A magnetic-drag relay of the type disclosed in Patent No. 2,209,368, issued July 30, 1940, to C. C. Whittaker, may be utilized as a speed-indicating and over-speed protective relay on a Diesel engine for locomotive service. The overspeed contact members originally provided were of a usual type consisting of one stationary silver button on a screw post and one movable button on a flat steel spring.

Under normal conditions of operation these contact members remain closed. The circuit through the contact members is opened under an overspeed condition by motion of an insulated end of the relay arm. All Diesel engines vibrate to some extent, the frequency and amplitude varying with the speed and load, and the contact members originally provided were so disturbed by the vibration of the engine that the performance of the relay was not acceptable.

An object of my invention, generally stated, is to provide an improved relay which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of my invention is to overcome the effects of vibration on the contact members of a relay.

Another object of my invention is to provide individual supporting members for relay contacts which shall have the same natural period of vibration.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of my invention, a pair of cooperating contacts of a relay comprises two duplicate contact spring members each made of a thin metal strip carrying a small contact button. The two contact spring members are so mounted on an insulating base that the buttons face and bear against each other. The contact buttons do not separate under severe vibration of varying frequency and amplitude because the two contact springs have the same natural period of vibration and, therefore, vibrate in unison.

For a fuller understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view, partially in elevation and partially in section, of a speed-responsive relay embodying my invention, the contact-actuating arm of the relay being shown in an intermediate position between zero speed and overspeed of the engine or other rotating device with which the relay is utilized;

Fig. 2 is a view, similar to Fig. 1, with the relay arm in the overspeed position;

Fig. 3 is an enlarged view in plan, of a pair of the relay contact members and their mounting base;

Fig. 4 is an enlarged view, in side elevation, of the contact structure shown in Fig. 3; and

Fig. 5 is an enlarged view, in end elevation, of the contact structure.

Referring to the drawing, and particularly to Figs. 1 and 2, the relay shown therein may be of the magnetic-drag type such as disclosed in the aforesaid Patent 2,209,368 which is suitable for utilization as a speed-responsive relay. As described in the aforesaid patent, the relay comprises a shaft 10 which supports a rotatable disc (not shown) which is disposed between a pair of rotating magnets (not shown) driven by a Diesel engine or other device with which the relay is utilized. A contact actuating arm 11 is secured to the shaft 10 and is normally biased by a spring 12 to a position in which a contact member 13, carried by the arm 11, engages a fixed contact member 14 mounted on an insulating support 15. One end of the spring 12 is atttached to an adjustable screw 16 and the other end is attached to an arm 17 which is secured to the shaft 10.

As explained in the aforesaid patent, the contact members of the relay may be utilized to perform switching operations in response to the speed at which the rotating magnets are driven. In accordance with a principle well known in the art, eddy currents are set up in the disc by the flux produced by the magnets and the rotation of the magnets causes a magnetic drag or torque on the disc which is proportional to the speed of rotation of the magnets. When the torque of the disc is sufficient to overcome the biasing force of the spring 12, the contact member 13 is disengaged from the contact member 14 and the arm 11 is gradually actuated toward the position shown in Fig. 1.

As the arm 11 moves from the position shown in Fig. 1 to that shown in Fig. 2 in response to an overspeed condition of the engine, the spring 12 passes overcenter and the arm 17 engages the end of a stop member 18. Thus, the arm 11 is retained in the overspeed position by the spring 12 until the relay is reset by actuating a plunger 19 which pushes the stop member 18 against a com-

pression spring 21 to actuate the arm 17 past the overcenter position of the spring 12, thereby permitting the arm 11 to be returned to its normal position. It will remain in this position only if the torque has been reduced by a decrease in speed below that of the overspeed condition. The relay is provided with a pair of overspeed contacts 22 which are normally closed but which are separated by an insulating member 23 on the arm 11 in response to the overspeed condition of the engine or other device with which the relay is being utilized.

In order to overcome the effects of vibration on the contacts 22, these contacts comprise two duplicate contact spring members 24 and 25 each of which has a small silver button 26 mounted near one end thereof. The other ends of the spring members 24 and 25 are so secured to an insulating base 27 by terminal bolts 28 and 29, respectively, that the buttons 26 face and normally bear against each other. The base 27 may be adjustably mounted by a bolt 31 which is disposed in a slot 32 provided in one side of the base 27.

As shown in Fig. 4, the spring member 25 is angularly disposed on the base 27, thereby permitting the insulating end 23 of the arm 11 to engage the spring 24 when the contact arm is in the position shown in Fig. 2. In this manner the contact buttons 26 are separated, thereby interrupting the electrical circuit through these contact buttons.

As shown more clearly in Fig. 5, a stop member 33 is disposed between the contact springs 24 and 25 to limit the travel of the spring 25 in a direction towards the spring 24. Thus, it is necessary for the arm 11 to move the spring 24 only a relatively short distance in order to separate the contact buttons 26.

Since the two contact spring members 24 and 25 have the same natural period of vibration, they vibrate in unison and, therefore, the contact buttons 26 do not separate under severe vibration of varying frequency and amplitude. In this manner one of the defects of the contact arrangement previously utilized in relays of the present type is overcome, since the relay is not affected by the vibrations of a Diesel engine or similar device. Accordingly, the contacts 22 may be utilized to control electrical circuits, which will not be adversely affected by the vibration of the engine and will be interrupted only in response to an overspeed condition, as indicated by the operation of the relay.

While I have illustrated and described the contact arrangement as applied to a relay of the magnetic-drag type, it will be understood that contacts of the type herein disclosed may be utilized on relays of various other types. The present contact arrangement is, however, particularly suitable for use on any relay which is subject to excessive vibration.

From the foregoing description it is evident that I have provided a simple and inexpensive contact mounting arrangement which is not adversely affected by vibration and overcomes the difficulties of previously known relay contact structures.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a relay, in combination, a pair of cooperating contacts comprising two resilient spring members each having a contact member mounted near one end thereof, said end of each spring member being unattached and free to vibrate, and means for supporting the other ends of the spring members to normally hold said contact members in engagement, the free portions of said spring members being the same length and having the same natural period of vibration, whereby they vibrate in unison.

2. In a relay, in combination, a pair of cooperating contacts comprising two resilient spring members each having a contact member mounted near one end thereof, said end of each spring member being unattached and free to vibrate, means for supporting the other ends of the spring members, the free portions of said spring members being the same length and having the same natural period of vibration, whereby they vibrate in unison and said contact members are normally held in engagement by said spring members, and means for engaging one of said spring members to separate said contact members.

THELBERT L. WEYBREW.