Dec. 2, 1958 F. A. ZUPA 2,863,102

RELAY MOUNTING

Filed Nov. 27, 1953

FIG. 1

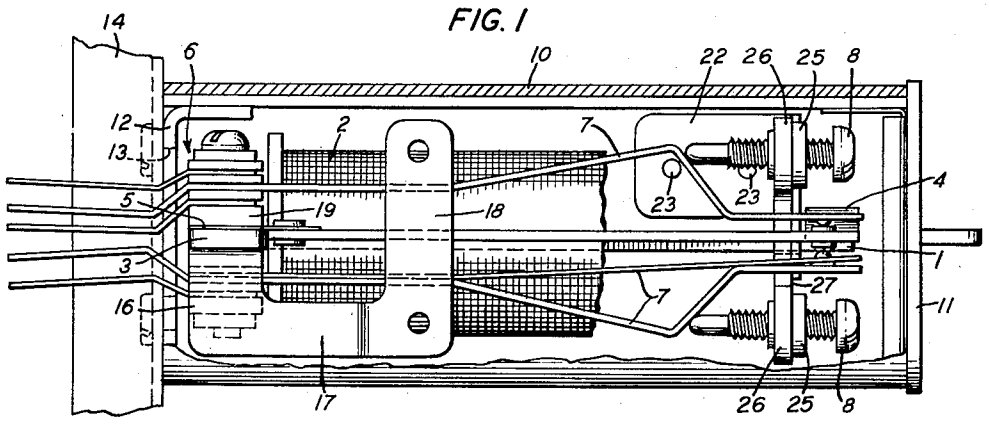


FIG. 2

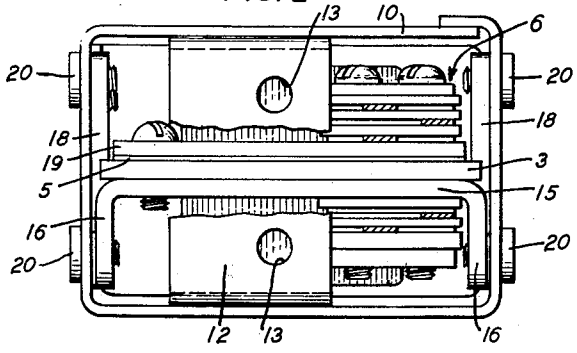
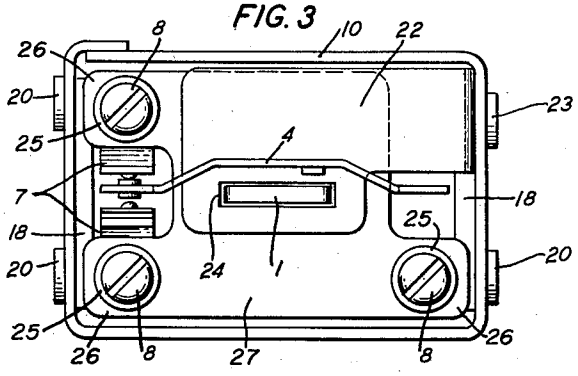


FIG. 3



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United States Patent Office 2,863,102 Patented Dec. 2, 1958

2,863,102

RELAY MOUNTING

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Application November 27, 1953, Serial No. 394,818

7 Claims. (Cl. 317—165)

This invention relates to electromagnetic relays and more particularly to means for mounting electromagnetic relays.

The object of this invention is to improve the stability of adjustment of relays.

A feature of this invention is a mounting means which supports a relay in position without subjecting the magnetic structure to undue stresses.

Rack-mounted relays are normally supported by means of a core extension which is attached to a channel or other structural member by means of machine screws or other similar fastening devices. It has been found that this method of attachment frequently distorts the core and inevitably produces substantial internal stresses in the core assembly structure. Consequently, a relay which has its armature travel and contact positions accurately adjusted during manufacture will frequently become maladjusted during mounting; and a relay accurately adjusted after mounting will tend to lose its adjustment with the shifts of core position which occur as a result of the gradual relieving of the aforesaid internal stresses, this loss of adjustment tending to be accelerated by subsequent handling of the relay and by movement of the equipment of which the relay is a part.

Additionally, it is now recognized that a rack-mounted relay, when pulsed, will tend to oscillate since the core, regardless of its apparent rigidity, actually acts as a flexible member. At critical pulse frequencies, the amplitude of the movement of the free end of the cantilever-mounted core has been found to be very substantial. Obviously, these oscillations result in instantaneous variations in the dynamic relations between the relay parts so that even though the relay be in proper adjustment when unoperated and idle, it may not so be when the relay has just restored to its unoperated position following pulsing. It is also apparent that the oscillation of the core will tend to accelerate the aforesaid shifting of the static position of the core due to changes in the internal stress conditions of the core structure.

While these factors serve to render any rack-mounted relay maladjusted, the condition is particularly severe with highly sensitive relays because adjustment of those relays is necessarily more critical and the structure per se is normally less massive, less rigid and more subject to distortion.

Since the expense of repetitively readjusting relays can become substantial, various efforts have been made to reduce the tendency toward maladjustment. These efforts have been directed both towards more rapidly and more flexibly attaching a relay to its supporting channel, but normally, regardless of the presence or absence of an interposed support detail, the core structure has been rendered integral with the supporting channel. Further, it has not generally been perceived that it is imperative that the position of the front end of the core be closely controlled both statically and dynamically if a relay is to retain its adjusted condition, nor has there been recognition of the fact that this control must be exercised without imposing additional static stresses in the internal structure of the core.

Therefore, under the precepts of the present invention a sensitive relay is provided with a cover which cover constitutes the primary medium of support for the relay. The cover is mounted on the supporting channel, the rear end of the relay is semiflexibly attached to the cover and the front end of the core is restricted in its movement to a limited amplitude of oscillation, but being free, within those limitations, to assume an unrestrained static position.

The exact nature of this contribution to the art may be more fully understood from the following detailed description of one embodiment of the invention when read with reference to the accompanying drawings in which:

Fig. 1 is a plan or top view of a covered, sensitive relay mounted in accordance with the principles of the invention, with part of the cover and part of the coil being cut away for purposes of clarity;

Fig. 2 is a view taken from the rear end of the relay shown in Fig. 1 with a portion of the cover structure being cut away; and

Fig. 3 is a view taken from the front end of the relay shown in Fig. 1 with the front cover removed.

The relay shown in the drawings is, except for certain modifications hereinafter to be described, a conventional type well known in the art. It is characterized primarily as a highly sensitive relay, being operable on very small currents. As a result, adjustment of the relay is critical and must be accurately maintained.

In general, the relay comprises a core **1** which is a long flat member extending through and rearwardly of the coil **2** and terminating at the rear of the relay, in an enlarged core crosspiece **3**. The cross-section area of the core **1** is normally small in view of the magnetic and inductance requirements of sensitive relays. The core crosspiece **3** serves as the fundamental structural element of the relay, and supports the armature **4** through the medium of the armature spring **5**, and supports the contact spring pile-up assembly represented generally at **6**. Formerly, this core crosspiece **3** bore certain extensions which were apertured and tapped to receive machine screws to mount the relay to the support channel. This method of support, however, has been found to tend to distort the core and to establish internal stresses in the core structure, as before noted.

Extending forwardly of the relay and in spaced relation to the core is a plurality of spring members **7**, at least some of which bear electrical contacts engageable with contacts on the armature **4**. The initial spacing between the contacts carried by the members **7** and the contacts on the armature **4** may be controlled and adjusted by means of the adjusting screws **8** threaded into the bushings **25**, which are secured in suitable orifices in the ears **26** of the spoolhead or end member **27**. For present purposes, these screws and bushings may be any suitable type, but preferred forms of them are shown in Fig. 1 of the drawings and are further disclosed and claimed in Patent 2,802,503, issued August 13, 1957, on my copending application, Serial No. 394,819, filed November 27, 1953.

Sensitive relays of this type have normally been provided with iron covers to minimize disturbances from adjacent magnetic fields and to prevent malfunctioning due to dust. It has previously been the practice to mount the relay to the supporting channel, in the previously described fashion, and then to mount the cover to the relay. In the disclosed embodiment of the invention a rectangular parallelepiped main cover **10** which is open both at

the front and the rear is provided. A front cover 11 is removably affixed to the main cover 10 to enclose the front of the relay. Extending across the open rear end of the cover 10 is a mounting bracket 12 (Figs. 1 and 2) which is welded or otherwise affixed to the cover. Mounting holes 13 are provided in the bracket 12 for assembling the cover to the support channel or other structural member 14 on the relay mounting rack.

To support the relay within the cover, a support bracket is provided which includes a cross member 15 (Fig. 2) secured to the core crosspiece 3 by means, for example, of screws engaging a spacing strip 19 and the support bracket cross member 15. At each side of the relay, the support bracket is in the shape of a U, having a first portion or leg 16, integral with the cross member 15, extending laterally of the relay, a second portion or bridging member 17 extending longitudinally of the relay and a third portion or leg 18 extending laterally of the relay and in approximate parallelism with the aforesaid first portion 16 of the support bracket. Each of the legs 18 is suitably apertured and preferably tapped so as to be attachable to the cover 10 by means of screws 20 (Fig. 2). Portions 17 are formed with an offset (Fig. 1) so that the main cover 10 will clear the portions 18 during assembly. When the screws 20 are tightened, the portions 17 flex to permit the portions 18 to move into engagement with the cover. By virtue of this configuration and through the appropriate selection of materials, the support brackets are less rigid than the core structure by a substantial factor. Therefore, if when assembling the relay within the cover structure by means of screws 20, the fit is not exact so that some element or elements of the overall structure are distorted as the screws 20 are tightened, the distortion will occur either in the cover 10 or in the support bracket and not in the core or armature structures. It is of course clear that the core will not be distorted as a result of the affixing of the cover to any supporting channel.

As before noted, a relay when mounted on a rack will tend to oscillate as a unit and this condition is particularly critical where a relay must operate under pulsing conditions. In order that there be maximum stability of adjustment of the relay, it is important that the front end of the core 1 be accurately positioned initially and that it be maintained in that position. But if any force, however slight, be exerted to restrain the motion of the core or to displace it from its free position, there will be internal stresses set up in the core structure which will ultimately result in maladjustment of the relay. It has been found, therefore, that means must be provided to limit the motion of the core without in any way restricting its assumption of a free and unrestrained initial or idle position. Any means, regardless of its resiliency, which engages the forward end of the core when the relay is idle will not meet this requirement and, as a consequence, springs and rubber cushions have been found to be unsatisfactory. A suitable means, obviating the difficulties and meeting the requirements, is the amplitude limiting bracket 22 which may be seen most clearly in Figs. 1 and 3 of the drawings. Bracket 22 comprises a first portion in juxtaposition with the cover 10 and affixed thereto by means of screws 23. Another portion of the amplitude limiting bracket 22 extends perpendicularly to the above-mentioned first portion and perpendicularly to the longitudinal axis of the core. This latter portion of bracket 22 is provided with an aperture 24 which is wider than the front end of the core 1 so that the edges defining the aperture 24 will normally lie in spaced proximity to the core 1. The relay is preferably so designed and the tolerances so specified that the front end of the core 1 will be centered in the aperture 24. It is desirable that the core 1 be spaced from the edges defining the opening 24 when the relay is initially assembled to insure that there are no forces acting upon the front end of core 1 to in any way distort it from its free or idle position. However, since the edges of the aperture 24 are in proximity to the core 1, they impose a limit upon the amplitude of oscillation or vibration of the front end of the core 1. As one example, it has been found that with the front end of the core 1 being in the order of .078 inch thick and .437 inch wide, the aperture 24 should be in the order of .088 inch wide and .447 inch long.

Therefore, the relay may be mounted, via the cover 10, to a supporting channel without any distortion of the core resulting from the attachment since the rear end of the relay is supported by means which are more flexible than the core structure itself, and the front end of the core may be accurately limited in its motion without any restraints whatsoever being imposed upon the free, idle position of that end. In this manner, the relay is mounted so that it will maintain its critical adjustment for greatly extended periods.

It is to be understood that the above-described arrangements are but illustrative of the application of the principles of the invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In combination with a mounting channel and a relay having a core, a cover for said relay, means for affixing said cover to said mounting channel, a support bracket affixed to each side of said relay at one end thereof and affixed to said cover, and an amplitude limiting bracket affixed to said cover and loosely engaging said relay at the other end thereof.

2. In combination with a mounting channel and a relay having a core, a cover enclosing said relay, a mounting bracket integral with the rear end of said cover, means for affixing said mounting bracket to said mounting channel, a support bracket affixed to each side of said relay at one end thereof and affixed to said cover, and an amplitude limiting bracket affixed to said cover and loosely engaging said relay at the other end thereof.

3. In combination with a mounting channel and a relay having a core, a cover for said relay, means for affixing said cover to said mounting channel, a pair of support brackets integral with the rear end of said core and extending forwardly and then laterally on each side of said relay, means for affixing the said laterally extending portions of said support brackets to said cover, and an amplitude limiting bracket affixed to said cover and loosely engaging the front end of said core.

4. In combination with a mounting channel and a relay having a core, a cover for said relay, means for affixing said cover to said mounting channel, a support bracket affixed to each side of said relay at one end thereof and affixed to said cover adjacent said sides and intermediate said one end and other end, and an amplitude limiting bracket having a first portion affixed to said cover and a second portion extending perpendicularly to said core and having an aperture therein, the sides forming said aperture normally lying in spaced proximity to said core thereby to limit the amplitude of motion of said core.

5. In combination with a mounting channel and a relay having a core, a cover enclosing said relay, a mounting bracket extending across the rear end of said cover, means for affixing said mounting bracket to said mounting channel, a pair of support brackets integral with the rear end of said core and extending forwardly and then laterally on each side of said relay, means for affixing the said laterally extending portions of said support brackets to said cover, and an amplitude limiting bracket having a first portion affixed to said cover and a second portion extending perpendicularly to the center line of said core and having an aperture therein, the sides forming said aperture normally lying in spaced proximity to said core thereby to limit the amplitude of motion of said core.

6. Stress reducing support means associated with a sensitive electromagnetic relay which is encased in a cover

having an integral mounting bracket and which comprises a thin flat core, a coil and an armature cooperating with said core, and a plurality of contact springs having cooperating contact surfaces capable of accurate adjustment and selectively actuable by the movement of said armature, said stress reducing support means comprising a support bracket integral with the rear end of said core and having a pair of forwardly extending portions disposed along each side of said relay in planes essentially parallel to the longitudinal axis of said core, said portions having laterally extending projections thereon to couple said relay to said cover, and an amplitude limiting bracket having one of its legs affixed to said cover and having its other leg extending in a plane substantially perpendicular to said longitudinal axis of said core and apertured such that the edges defining said aperture loosely surround the forward end of said core to limit the amplitude of motion of said core.

7. Stress reducing support means associated with a sensitive electromagnetic relay which is encased in a cover having an integral mounting bracket and which comprises a thin flat core, a coil and an armature cooperating with said core, and a plurality of contact springs having cooperating contact surfaces capable of accurate adjustment and selectively actuable by the movement of said armature, said stress reducing support means comprising a unitary bracket having a flat portion fixedly

attached to the rear end of said core and a pair of forwardly extending U-shaped portions disposed along each side of said relay with the legs thereof lying in planes essentially perpendicular to the plane of the flat surfaces of said core and parallel to the longitudinal axis of said core, the forwardmost legs of said U-shaped portions offset slightly in an outward direction from the planes of said U-shaped portions generally in order to couple said relay to said cover by virtue of said forwardmost legs only, and an amplitude limiting L-shaped bracket having one leg affixed to said cover and having its other leg extending in a plane substantially perpendicular to said longitudinal axis of said core and apertured rectangularly whereby the sides of said aperture loosely surround the forward end of said core to limit the amplitude of motion of said core.

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