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ELECTROMAGNETIC DEVICE

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Fig. 1

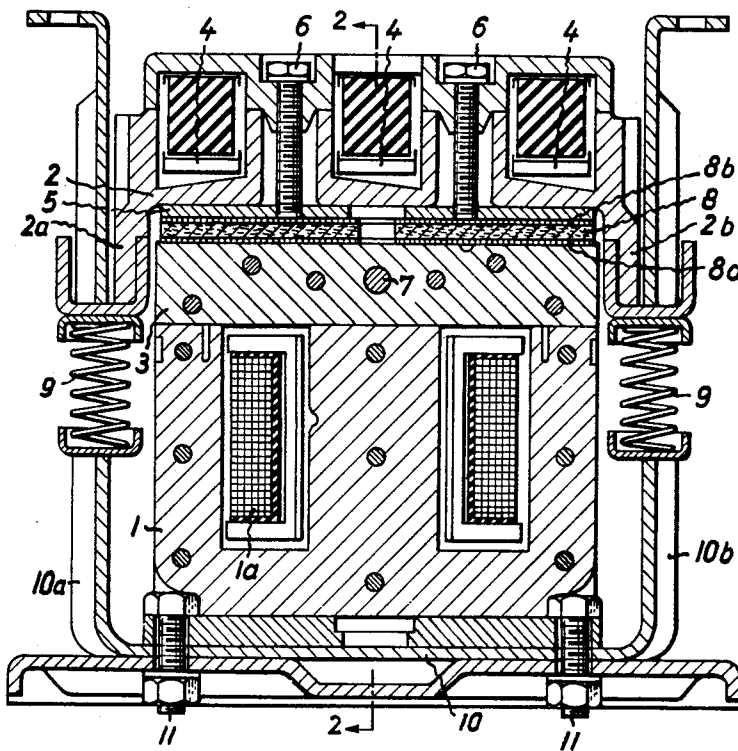
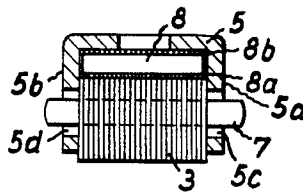


Fig. 2



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The present invention relates to electromagnetic devices, particularly to electromagnetic switching devices such as relays.

In electromagnetic switching devices, particularly in relays, it is essential that the recoil or shock occurring when the armature strikes the core upon energization of the electromagnet, be damped.

In existing relays a leaf spring is often interposed between the armature and a carrier therefor. This construction behaves as an oscillatable or vibratory system, and a rapid decay of the vibration which is set up upon impact of the armature on the coil may not always be possible. One might therefore seek to damp this vibration by using an elastically deformable material having high internal friction, as, for example rubber or the like. However, such elastically deformable material is inherently subject to fatigue, and since relays are often called upon to operate under unfavorable climatic conditions or in places where the relay is subjected to corrosive substances, the use of rubber or similar material is not practical.

It is therefore an object of the present invention to overcome the above disadvantages by providing an electromagnetic device, particularly an electromagnetic switching device such as a relay, in which the recoil of the armature, upon striking the core, is damped rapidly.

It is another object of the present invention to provide an electromagnetic device wherein the recoil of the armature, upon striking the core, is rapidly damped, which device is capable of being used under any climatic conditions as well as in the presence of substances which would have a corrosive effect on rubber or rubber-like material.

It is another object of the present invention to provide an electromagnetic device, such as a relay, which has a long useful life.

With the above objects in view, the present invention mainly resides in the provision of an electromagnetic device, particularly an electromagnetically switching device such as a relay, having a core, an armature and an armature carrier, wherein a cushioning means, preferably in the form of a cushioning layer made of fatigue and heat-resistant cushioning material such as packed mineral material, for example, fibrous and/or comminuted binder-impregnated mineral material such as asbestos, is interposed between the armature and the armature carrier for damping the recoil of the armature against the core upon energization of the device.

Additional objects and advantages of the present invention will become apparent upon consideration of the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view of an electromagnetic relay according to the present invention; and

FIG. 2 is a sectional view taken substantially along line 2—2 of FIG. 1.

Referring now to the drawings, the same show an electromagnetic relay comprising a laminated core 1 containing a coil 1a, an armature carrier 2 and a laminated armature 3. The armature carrier constitutes a switch-actuating head which carries contact blades 4 which, in turn, carry the movable contacts (not shown) that cooperate with the stationary contacts (not shown) in a manner well known in the art.

The switch-actuating head 2 is formed with downwardly

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depending portions 2a and 2b between which the armature 3 is arranged. The head also carries a carrier member in the form of a plate 5 which has a flat surface downwardly directed, and it is securely screwed to the carrier head by screws 6.

The plate 5 is also formed with two downwardly depending portions 5a and 5b (FIG. 2) which are formed with openings or slots 5c and 5d, respectively, which are elongated in the direction of movement of the armature 3 and head 2 with respect to the core 1. A coupling rod 7 passes through an opening in the armature 3 as well as through the slots 5c, 5d, so that the armature 3 is firmly but non-rigidly connected to the switch-actuating head 2.

According to the present invention, cushioning means are interposed between the armature and the armature carrier. These cushioning means are shown as being in the form of a cushioning layer which is made of fatigue and heat-resistant cushioning material such as packed mineral material, for example, fibrous and/or comminuted mineral material, such as asbestos, which may be impregnated with a binder. This cushioning layer may be in the form of a single plate or sheet 8, as shown, or may comprise a plurality of superposed sheets.

If desired, spacer sheets 8a and 8b of hard or bakelized paper may be provided for compensating for any deviations in the thickness of the layer 8, or for inaccuracies encountered in the manufacture of the device. Sheet 8a is disposed on the flat upwardly directed upper surface of armature 3.

The armature and armature carrier are spring-biased away from the core by means of compression springs 9 interposed between the downwardly depending portions 2a and 2b of the switch-actuating head 2 and upwardly extending portions 10a and 10b of a mounting plate 10 to which the core is securely fastened by means of screws 11.

Upon energization of the coil 1a, the armature 3, and with it the switch-actuating head 2, are attracted by the core against the action of the springs 9, and the recoil or impact of the armature upon the core 1 is damped by the above-described cushioning means. From the drawing it can be derived easily, that the movement of the armature is carried out perpendicular to the extension of plates 8 and sheets 8a and 8b. It has been found that thanks to the cushioning plate 8, the useful life of such devices, particularly in the case of electromagnetic relays, is materially increased.

It will be readily understood that the present invention is susceptible to modification without involving a departure from the basic construction. For example, instead of making the slots 5c and 5d elongated, the opening through the core 3 accommodating the coupling rod may be elongated. Also, the cushioning layer 8 may be of materials different from those set forth above. For example, instead of asbestos, one may use glass wool or any other unraveled inorganic material. Preferred is the use of an asbestos-material, well known under the trademark "Klingerit." Sheets or plates of "Klingerit" are hitherto obtained for other purposes, f.i. as packing discs in internal combustion engines. As binder any artificial resin or inorganic material f.i. water glass (silicate of sodium or potassium) may be used.

Accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. In an electromagnetic switching device, the combination which comprises: a core; a movable armature adapted to be attracted by said core upon energization of the switching device and having a flat surface extending perpendicular to its movements; spring means resiliently biasing said armature, said core when energized, attracting said armature against the force of said spring means;

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an armature carrier with switching head having a flat surface parallel to said flat surface of said armature; a flat cushioning plate made of packed mineral material interposed between said flat surfaces of said armature and said armature carrier for damping the recoil of said armature against said core upon energization of the switching device; and means gripping around said cushioning plate for nonrigidly connecting said armature to said carrier while permitting relative play in the direction of armature movement only.

2. In an electromagnetic switching device, the combination which comprises, a core; a movable armature adapted to be attracted by said core upon energization of the switching device and having a flat surface extending perpendicular to its movements; spring means resiliently biasing said armature, said core when energized, attracting said armature against the force of said spring means; an armature carrier with switching head having a flat surface extending parallel to said flat surface of said armature; means for non-rigidly connecting said armature to said carrier but permitting relative play perpendicular to said surface only and a flat cushioning plate made of packed comminuted mineral material interposed between said flat surfaces of said armature and said armature carrier for damping the recoil of said armature against said core upon energization of the switching device.

3. In an electromagnetic switching device, the combination which comprises: a core; a movable armature adapted to be attracted by said core upon energization of the switching device and having a flat surface extending perpendicular to its movement; spring means resiliently biasing said armature, said core when energized, attracting

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said armature against the force of said spring means; an armature carrier with switching head having a flat surface extending parallel to said flat surface of said armature; means for non-rigidly connecting said armature to said carrier but permitting relative play perpendicular to said surface only and a flat cushioning plate made of packed fibrous asbestos interposed between said flat surfaces of said armature and said armature carrier for damping the recoil of said armature against said core upon energization of the switching device.

4. In an electromagnetic switching device, the combination which comprises: a core; a movable armature adapted to be attracted by said core upon energization of the switching device and having a flat surface extending perpendicular to its movements; spring means resiliently biasing said armature, said core when energized, attracting said armature against the force of said spring means; an armature carrier with switching head having a flat surface extending parallel to said flat surface of said armature; means for non-rigidly connecting said armature to said carrier but permitting relative play perpendicular to said surface only and a flat cushioning plate made of binder-impregnated packed fibrous mineral material interposed between said flat surfaces of said armature and said armature carrier for damping the recoil of said armature against said core upon energization of the switching device.

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