

Jan. 22, 1946.

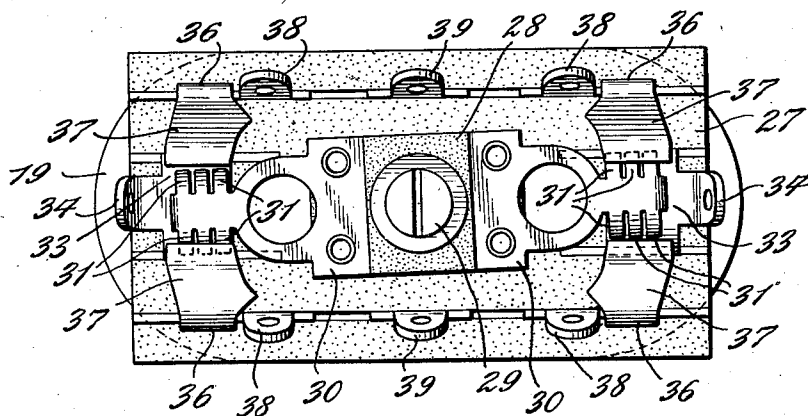
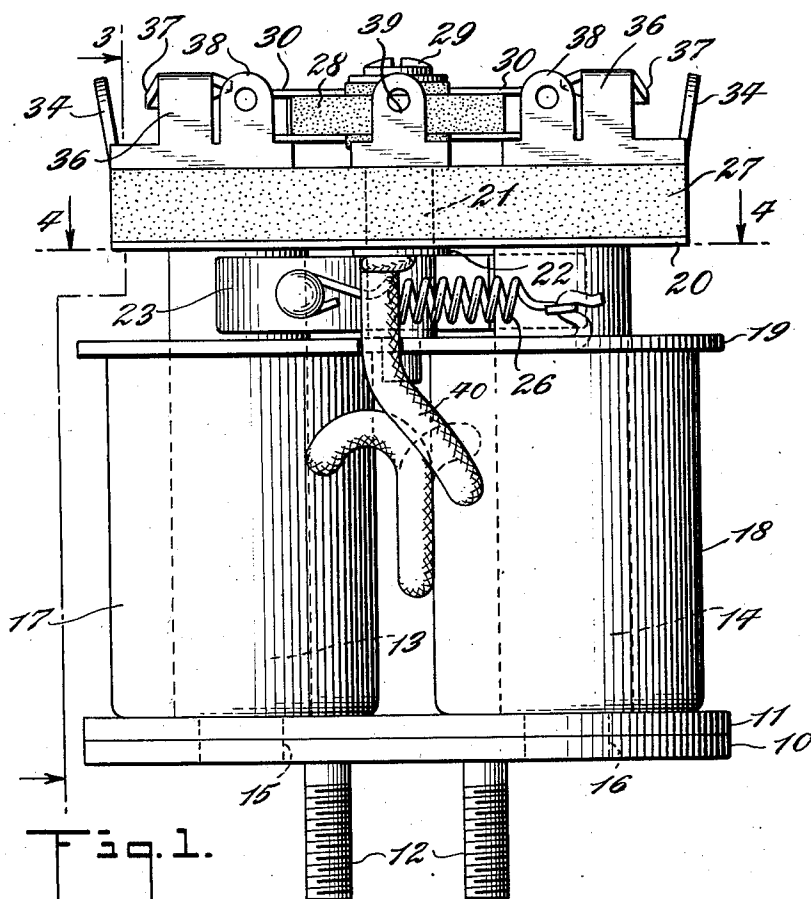
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2,393,535

ELECTROMAGNETIC RELAY

Filed July 31, 1943

2 Sheets-Sheet 1



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ELECTROMAGNETIC RELAY

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2 Sheets-Sheet 2

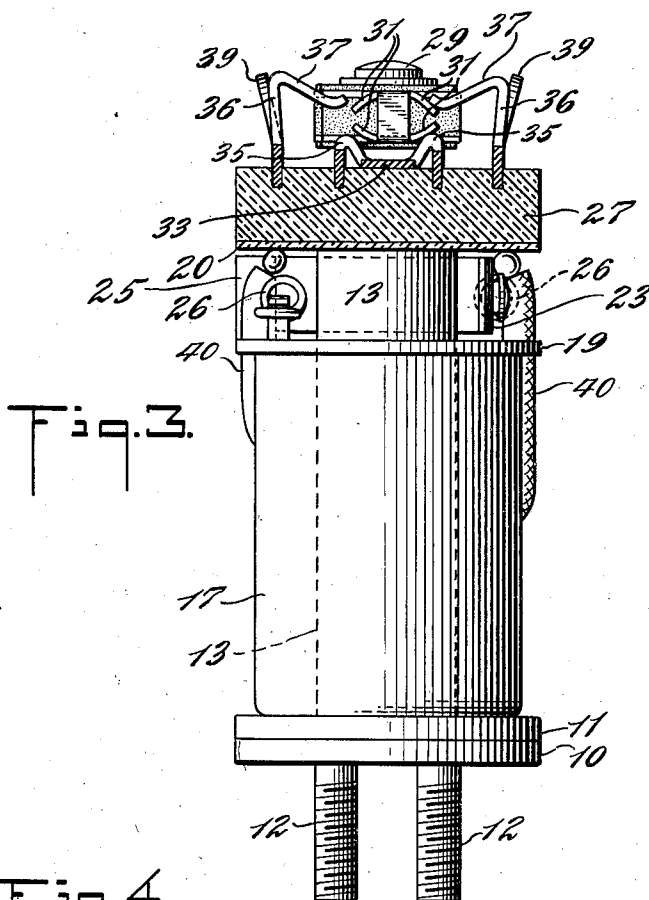


Fig. 3.

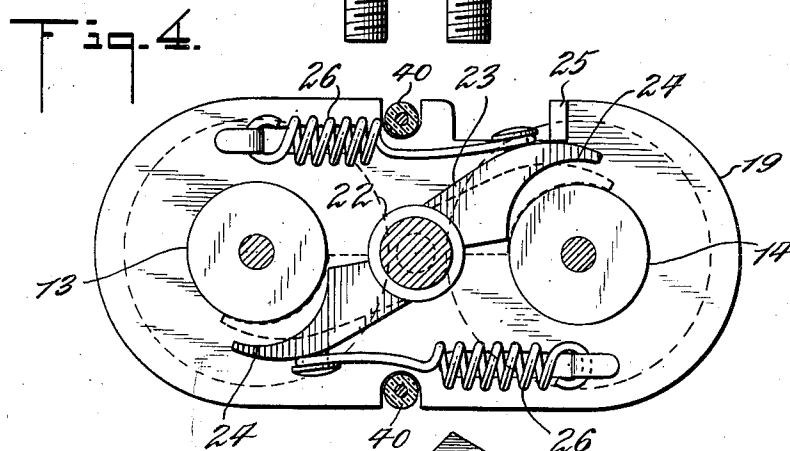


Fig. 4.

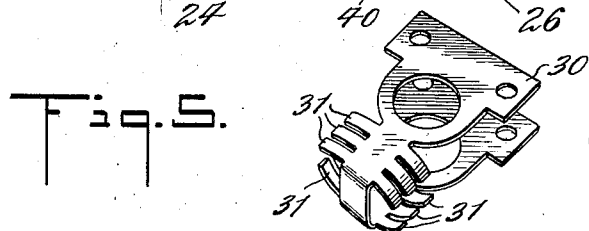


Fig. 5.

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ELECTROMAGNETIC RELAY

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New York

Application July 31, 1943, Serial No. 496,849

2 Claims. (Cl. 200—164)

This invention relates to electromagnetic re-
lays.

An object of this invention is an electromag-
netic relay of such construction that the effect
of vibration of the relay on the armature is re-
duced to a minimum.

Another object of the invention is an electro-
magnetic relay having an arrangement of the
coil and armature by which the electromagnetic
force developed by the coil is converted into
maximum pull on the armature.

A still further object of the invention is an
electromagnetic relay equipped with a make-and-
break arrangement for the controlled circuits in
which friction is minimized and good contact is
assured even under conditions of severe vibra-
tion.

Other objects, novel features and advantages of
this invention will become apparent from the
following specification and accompanying draw-
ings, wherein:

Fig. 1 is a side elevation of a relay embodying
the invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 1,
and

Fig. 5 is a perspective view of a detail.

The base of the relay consists of two plates
10 and 11 composed of magnetic metal and a pair
of mounting studs 12 are attached to the plate
10. A pair of rods 13 and 14 of magnetic metal
have extensions 15 and 16 of smaller diameter
than the remainder extending through the plates
10 and 11 and serving to hold said plates to-
gether as well as to attach the rods 13 and 14
to the relay base. Field coils 17 and 18 surround
the rods 13 and 14 and combine therewith to
form electro-magnets of which the rods 13 and
14 constitute the cores. The cores 13 and 14 are
of greater length than the coils 17 and 18 so that
they project beyond the ends of the coils.

A plate 19 of non-magnetic metal rests on the
ends of the coils 17 and 18 and is provided with
apertures through which pass the projecting ends
of the cores 13 and 14. A plate 20, also of non-
magnetic metal, rests on the ends of the pole
pieces 13 and 14 in which position it is held by
means subsequently to be described. A shaft 21
is journaled in apertures in the plates 19 and
20 between and parallel to the core axes. The
portion of the shaft 21 projecting through the
plate 19 is of less diameter than the armatures
to form a shoulder limiting downward movement
of the shaft and the shaft also is equipped with a

collar 22 of greater diameter than the portion of
the shaft extending through the plate 20 so as to
prevent upward movement of the shaft. The
shaft supports an armature 23 which is sym-
metrical with respect to the shaft. The armature
includes two wings, each of which is provided
with an arcuate recess 24 properly shaped par-
tially to enclose the projecting end of one of the
cores 15 and 16 when the armature is in the posi-
tion shown in dotted lines in Fig. 4. The arma-
ture 23 may be conveniently described as being
substantially S-shape. The plate 19 is provided
with a stop 25 for engagement by one wing of the
armature to limit counter-clockwise movement
of the armature as shown in Fig. 4, clockwise
movement of the armature being limited by the
cores 13 and 14. Springs 26 bias the armature
into engagement with a stop 25 in which posi-
tion the wings of the armature are spaced from
the cores 13 and 14.

A plate 27 of insulating material rests on the
non-magnetic plate 20 and screws 28 pass
through both plates and are threaded into the
cores 13 and 14 to attach the plates to the cores.
The plate 27 has a bore through which the shaft
21 extends beyond the top surface of the plate.
A block 28 of insulating material is attached to
the shaft 21 by a bolt 29. A pair of contact mem-
bers 30 are attached to the block 28. Each of
these contact members is composed of a thin
plate of electrically-conductive metal bent into
U-shape with the ends of the member contact-
ing the under and upper surfaces of the block
and being attached thereto by any suitable
means, such as rivets. Each leg of the U mem-
ber is of greater width than the bight thereof
and is provided with a plurality of slits to form
fingers 31. The fingers 31 are bowed inwardly so
that the effective width of the contact member
is less at its edges than at its central portion.

At each end of the plate 27 is mounted a con-
tact 32 having a flat central portion 33 leading
to a binding post 34 and two oblique wing por-
tions 35 diverging upwardly from the portion 33.
Also, at each end of the plate 27 are mounted
two contacts 36, each of which has an arm 37
projecting inwardly over a wing 35 with its end
slightly upturned to produce a tapering gap with
the wing 35 and provided with a binding post 38.
The arrangement of the contacts just described
is such that fingers 31 of the contact member
30 are adapted to enter the gaps upon rotation
of the shaft 21. Also provided on the plate 27
are binding posts 39 attached to wires 40 leading

to the coils 17 and 18 and providing means for supplying energizing current to the coils.

The operation of the above-described relay is as follows: When the coils 17 and 18 are de-energized, the springs 26 maintain the armature 23 and shaft 21 in the position shown in full lines in Fig. 4. With such arrangement of the armature and shaft, the block 28 and contacts 30 are in the position shown in full lines in Fig. 2 with each contact 30 bridging one gap between contacts 32 and 36 at each end of the plate 27 as shown in Fig. 3 with the other gap open. Energization of the coils 17 and 18 produces an electromagnetic force which attracts the armature into the position shown in dotted lines in Fig. 4, thereupon rotating the block 28 clockwise from the position shown in Fig. 2 to open-circuit the contacts originally closed and to close-circuit the contacts originally open. By reason of the shape of the fingers 31, they develop a spring pressure tending to assist in the clockwise movement of the armature out of the gap and also to reduce to a minimum the friction developed upon the contact entering the opposite gap. The provision of several fingers 31 insures firm engagement between the movable contact and the fixed contacts should there be any irregularity or out-of-alinement condition in the contacts. In addition, the provision of the rotary armature reduces to a minimum the effect thereon of vibration of the relay.

I claim:

1. In a switch, a pair of stationary contacts arranged in spaced relation to define a gap, a third contact, rotatable means for supporting said third contact for movement into and out of simultaneous engagement with both said stationary contacts, said third contact consisting of a U-shaped member having the ends of the legs thereof attached to said supporting means and having wider portions with corresponding edges thereof engageable with said stationary contacts, the spacing of said portions along said edges being less than the width of said gap and increasing to a greater width than said gap.

2. In a switch, a pair of stationary contacts arranged in spaced relation to define a gap, a third contact, rotatable means for supporting said third contact for movement into and out of simultaneous engagement with both said stationary contacts, said third contact consisting of a U-shaped member having the ends of the legs thereof attached to said supporting means and having wider portions with corresponding edges thereof engageable with said stationary contacts, the spacing of said portions along said edges being less than the width of said gap and increasing to a greater width than said gap, and slits in said legs extending to said edges thereof in the direction of movement of said member into engagement with said stationary contacts whereby the effective spacing of said edges may be reduced.

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