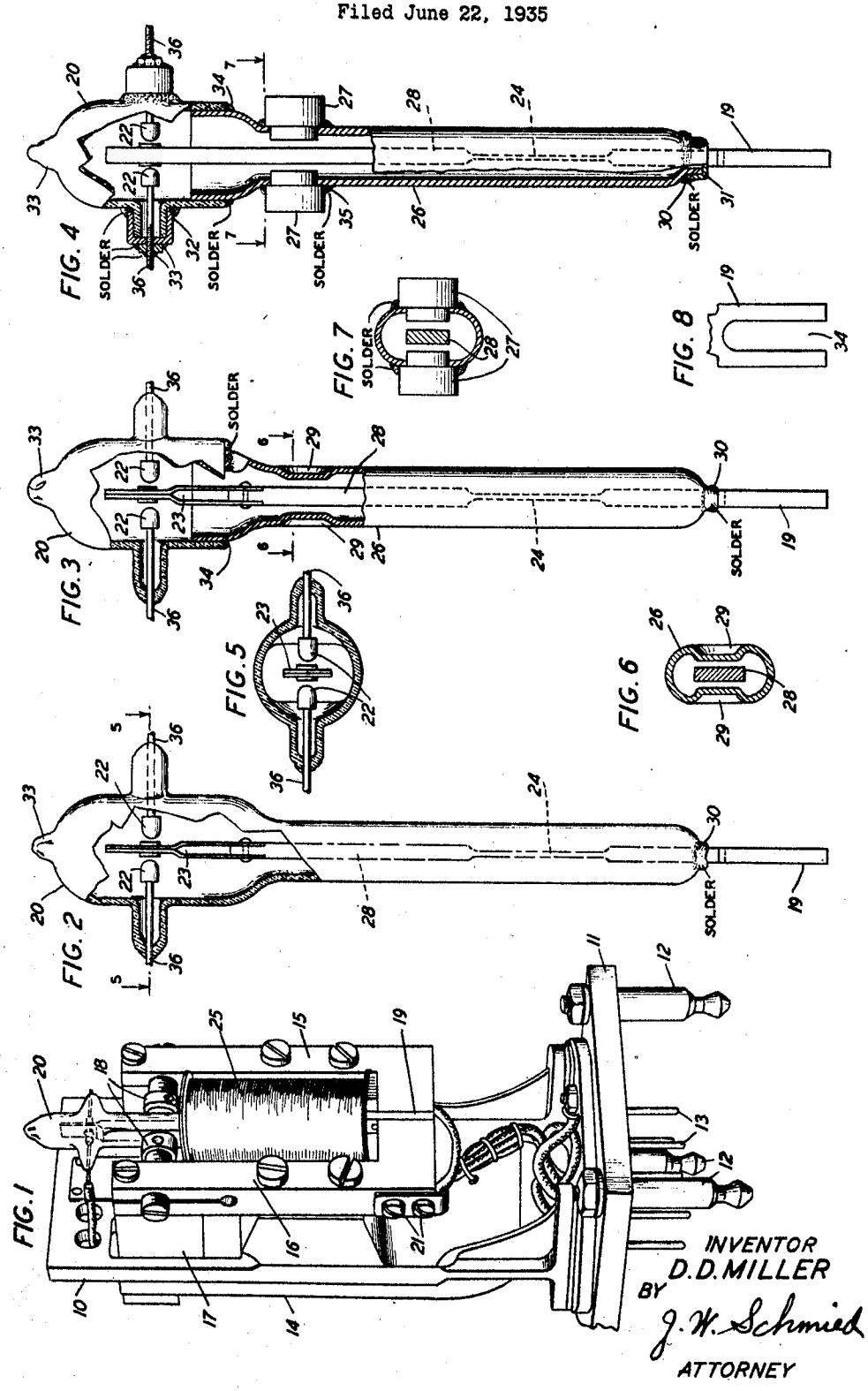
Nov. 10, 1936. D. D. MILLER 2,060,235

RELAY

Filed June 22, 1935



INVENTOR
D. D. MILLER
BY
J. W. Schmied
ATTORNEY

Patented Nov. 10, 1936 2,060,235

UNITED STATES PATENT OFFICE

2,060,235

RELAY

Daniel D. Miller, New York, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application June 22, 1935, Serial No. 27,954

3 Claims. (Cl. 200—87)

This invention relates to relays and more particularly to sensitive polarized telegraph relays.

The length of telegraph lines and the speed of transmission of telegraph signal impulses over them is largely dependent upon the speed and sensitivity of the receiving relays used with these lines. About the only relay available to meet the severe requirements of commercial telegraph systems, is a sensitive polarized relay.

This relay, however, requires frequent adjusting and cleaning to compensate for contact wear and to remove dirt from the contacts and pole-pieces. Since the adjustments are critical, considerable time and expense are required to maintain these relays.

Various relay structures have been proposed from time to time in which the contact wear and erosion are greatly reduced and in which dirt and soot are not allowed to reach the contacts or pole-pieces. These structures, however, greatly reduce the sensitivity of the relays so that they will no longer meet the requirements of the commercial telegraph systems.

The object of this invention is to provide an improved relay structure in which the contacts are enclosed and maintained in a non-corrosive atmosphere or in a vacuum without greatly reducing the sensitivity of the relay. This reduces the contact wear and erosion and also keeps dust and dirt away from these parts of the relay so that the relay does not have to be adjusted very often.

A further object of the invention is to reduce the expense of maintenance required. This is accomplished by incorporating the armature, armature hinge, contacts and in some cases the pole-pieces in a small readily detachable and replaceable structure or unit. Then when the contacts become worn and require adjustment, this entire structure may be replaced with a new or rebuilt structure at a small expense.

These and other objects and features of this invention may be more fully understood from the following description when read with reference to the attached drawing in which:

Fig. 1 shows a relay equipped with a contact structure made in accordance with this invention.

Fig. 2 shows details of the contact structure or unit.

Fig. 3 shows a modified form of the unit in which the casing is made of glass and metal.

Fig. 4 shows another modification in which the pole-pieces extend through the casing.

Figs. 5, 6, and 7 are sectional views taken along lines 5—5, 6—6, and 7—7 of Figs. 2, 3, and 4, respectively; and

Fig. 8 shows another view of the end of the armature and illustrates one method of mounting the armature and unit.

Similar parts of the various figures have been designated by the same numbers.

Referring now to Fig. 1, 10 represents the base or supporting member of the relay. Terminal block 11 is mounted on base 10 and carries mounting lugs 12 and contacts 13 which serve to support and connect the relay to its associated circuit. Also supported on base 10 is the permanent magnet 14 which is connected through members 17 to yokes 15 and 16 of the relay. Mounted within yokes 15 and 16 is a relay coil 25 through the windings of which the energizing current of the relay flows. Supported at the rear end of the yokes is armature 19 which extends through the coil 25 between adjustable pole-pieces 18 and forms the portion of the contact making means of the unit 20.

Unit 20 is shown in greater detail in Figs. 2 and 5. As shown in Fig. 2 this unit comprises a glass envelope through which armature 28 extends. The glass is hermetically sealed or soldered to armature 28 at 30.

In order that the armature may be soldered to the glass, the glass is first metallized such as by sputtering under reduced pressures, spraying or in some other suitable manner after which it may be electroplated when necessary or desirable and then soldered to make a gas-tight joint.

Armature 28 is provided with a reduced or hinged portion 24 so that the contact end 23 may move freely between contacts 22. This hinge is shown as a reduced and flexible portion of the armature but it is to be understood that any suitable hinge may be employed which will permit the end 23 of armature 28 to move freely between contacts 22 without creating any undue strain on the soldered joint 30 or supporting end 19 of armature 28.

Rods 36 are sealed into the upper end of the glass tube and support contacts 22 which are made of suitable contact metal and provide connections through the glass to these contacts (see Figs. 2 and 5).

In making these units, the component parts are first fabricated and then assembled. The armature 28 is soldered to the tubes at 30. The contacts 22 are next adjusted by inserting suitable gauges through the end 33, which has not yet been sealed off, between the contacts and the armature member. The glass surrounding these

contacts is then heated and these contacts adjusted in this manner to provide the required contact gap. The unit is then connected onto a gaseous pumping system which may either pump all the air out or flush the structure with some suitable gas or both pump it out of the structure and then flush a suitable gas through the entire structure. While the unit is thus connected to the pumping system it may be heated if desirable to drive out some or all of the occluded or adsorbed gases after which a suitable atmosphere is introduced, and the unit sealed off at 33.

This atmosphere may be of any suitable gas such as the inert gases like helium, argon or neon, etc. or may be of some non-corrosive gas such as nitrogen, hydrogen, CO or CO_2 etc. Furthermore the pressure of these gases is adjusted in accordance with the operating conditions such as, for example, the associated circuit, contact metals, contact gaps, etc. as to give the best operation and least wear.

In inserting the unit in the relay screws 21 are loosened and the end 19 of the armature 28 is inserted between them. The screws pass in the slot 34 of end 19 of armature 29. (See Fig. 8.) After the armature is inserted these screws are tightened to securely hold the entire unit. Rods 36 are clamped or fastened in any suitable manner to leads from contact pins 13. The relay may then be adjusted by controlling or moving the positions of the pole-pieces 18.

It is to be noted that this structure does not greatly increase the length of the air-gap since the glass may be quite close to armature 28 and also rather thin.

However, in case it is desired to more nearly approach the air-gap now in use in relays not equipped with this unit, the lower portion of the tube or envelope may be made of metal as shown in Fig. 3. Here the metal tube 26 is formed preferably of a highly resistive material or alloy such as a copper-manganese alloy so as not to appreciably delay the change of flux in the armature when the current through coil 25 changes. Armature 24 is then inserted in tube 26 and soldered at 30 as before. A glass cap 20 is provided which fits over the end of this tube and is treated so that it may be soldered to the metal tube at 34. Here again the contacts 22 are then inserted and sealed in the glass cap in such a manner as to provide suitable contact gaps. In this case it is easy to provide special indentations 29 to permit the pole-pieces to come very close to armature 28. This is shown more clearly in Fig. 6 which is the section of the unit along line 6—6 of Fig. 3 which is in the plane of the pole-pieces. It is to be noted that in this case the air-gap between the armature and pole-pieces may be quite small.

This arrangement has the further advantage that it is more rugged and able to withstand shocks and jars better than the unit having the entire casing or tube made of glass.

In this case as before the atmosphere within the unit may be controlled by first pumping all the air out and then admitting a suitable gas at such a pressure as may be desired.

Furthermore the metal tube used in the arrangement shown in Fig. 3 is provided with sufficient resilience to permit more accurate adjustment of the pole-pieces of the relay and secure closer operating limits. However, in case it is necessary to further reduce the air-gap this may be accomplished by inserting the pole-pieces through the casing as shown in Fig. 4. These pole-pieces may be soldered or brazed to the casing 26 as shown at 35.

As shown in Fig. 4 armature 28 is provided with a shoulder or cap 31 to which casing 26 is soldered, brazed, or welded at 30. Pole-pieces 27 are soldered, brazed or welded in the casing 26 which is provided with sufficient resilience to permit the air-gaps between these pole-pieces and the armatures to be adjusted. As shown in Fig. 4 the contacts are supported on threaded rods 36 which fit through caps 32 which in turn are soldered to the glass cap 20. Glass cap 20 is soldered to the tube 26 at 34. With this arrangement it is much easier to adjust and readjust contacts 22 since they may be screwed through cap 30 until the required contact gap is obtained after which nuts 32 are tightened to lock the contacts 22 in this position. If it is desired to seal this arrangement nuts 32 may be soldered both to cap 32 and the contact supporting rod 36 as shown at 33 in Fig. 3.

It is thus apparent that the contacts 22 are protected from all dirt and dust and erosion. Consequently they will need no cleaning and very little if any adjustment. However, when any adjustment is required, all that is necessary is that the two screws 21 be loosened; the old unit 20 removed and the new or rebuilt or readjusted unit inserted and these screws tightened after which the relay may be readily adjusted. Thus both the maintenance and wear of the contacts are greatly reduced.

The foregoing describes several specific embodiments of this invention, the novel features of which are set forth in the following claims.

What is claimed is:

1. A sensitive polarized telegraph relay having a readily detachable armature and contact structure comprising a flexible armature, a metallic casing of highly resistive material surrounding a portion of said armature, said armature extending through said casing and soldered thereto, a glass cap surrounding the contact end of said armature soldered to said metallic casing, a contact member extending through and soldered to said glass cap and non-corrosive atmosphere sealed within said cap and casing.

2. A sensitive polarized relay having a small readily detachable and replaceable structure comprising a gas-tight casing, a flexible armature member extending therethrough, pole-pieces extending through said casing and contact members supported on and insulated from said casing which cooperate with said armature member.

3. In combination, a sensitive polarized relay and a contact structure therefor comprising an armature member a metallic casing of material of high electrical resistance surrounding a portion of said armature hermetically sealed to said armature, pole-pieces for said armature extending through and resiliently supported by said casing, a glass cap hermetically sealed to the end of said casing, contact members extending through said cap and hermetically sealed therethrough, and a non-corrosive atmosphere sealed within said casing.

DANIEL D. MILLER.