

Oct. 19, 1943.

R. L. PEEK, JR

2,332,338

CONTACT MAKING DEVICE

Filed Dec. 3, 1942

FIG. 1

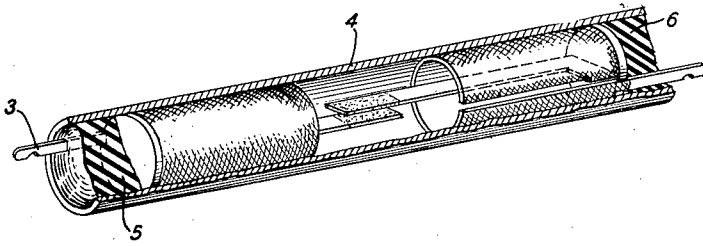


FIG. 2

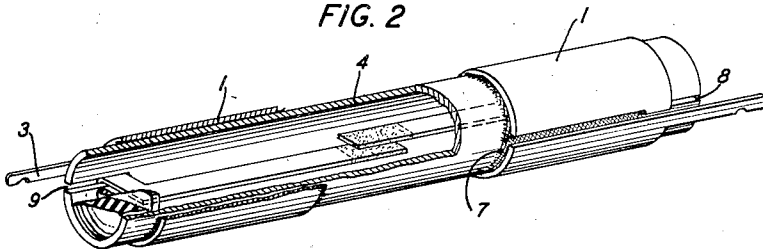


FIG. 3

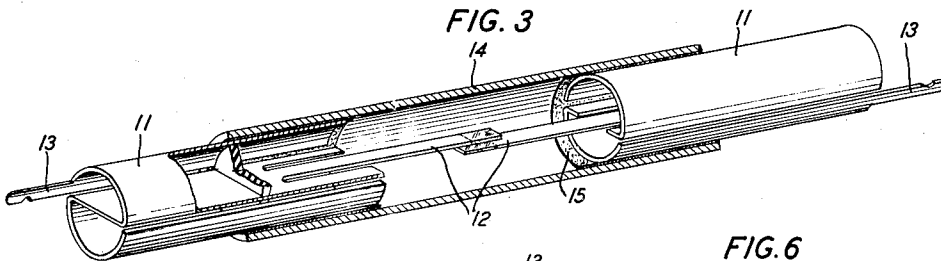


FIG. 4

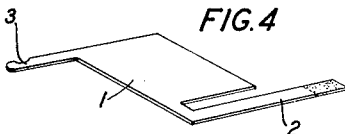


FIG. 5

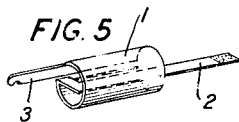


FIG. 6

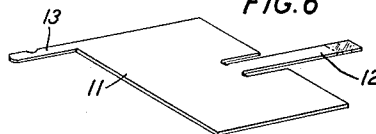
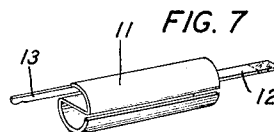


FIG. 7



INVENTOR  
R. L. PEEK JR.

BY

*Shustall*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,332,338

## CONTACT MAKING DEVICE

Robert Lee Peek, Jr., Short Hills, N. J., assignor  
to Bell Telephone Laboratories, Incorporated,  
New York, N. Y., a corporation of New York

Application December 3, 1942, Serial No. 467,754

3 Claims. (Cl. 200—87)

This invention relates to contact making devices and particularly to magnetically operated devices in the minute current field.

The object of the invention is to provide an economical and rugged contact device having certain advantages in sensitivity and other operating characteristics not heretofore achieved in devices of a similar type. There is in commercial use a glass sealed contact device consisting of a pair of overlapping reeds sealed in the opposite ends of a tiny glass tube and which unit may be operated magnetically in any convenient manner. For maximum speed in operation such a unit is placed axially within an energizing coil in what is known as an open return circuit. For maximum sensitivity a return magnetic path sometimes consisting of a magnetic path over the outside of the energizing coil is provided. In other cases magnetic cylinders are placed over the ends of the glass tubes leaving an air-gap between the ends thereof at about the overlapping position of the reeds. The sensitivity of such devices may be adjusted by varying the dimensions and the position of such air-gap. In any case, however, there is a path of some reluctance between the return path about the energizing coil and the reeds or between the magnetic cylinders and the reeds.

It is desirable to reduce the reluctance of this path to a minimum and hence the body of the enclosing cylinder is made of thin material and the magnetic detail forming the reed anchorage is brought physically as near the outside surface of the unit as possible. In accordance with the present invention, this desideratum is achieved by forming a magnetic element to be inserted in either end of a tube of non-magnetic metal comprising a reed and a collector which fits snugly against the inside surface of the tube. Such an element may be in the form of a detail stamped out of a sheet of magnetic material and then formed or bent into the desired shape. Since in these devices the reed serves the double purpose of acting as an element moved by magnetic influence and as an electrical conductor, an electrical terminal may be formed integrally therewith.

A feature of the invention is a magnetic element including a reed which may be placed in a tube and then adjusted under working conditions before being sealed in place. In accordance with this feature, the device may be assembled except for the final sealing operation and then the position of the two reeds with respect to each other may be adjusted through the open ends of the de-

vice. Since in one embodiment of the invention the reed is formed integrally with the magnetic collector which hugs the inside of the tube, a simple bending operation of the anchorage of the reed is sufficient to make a proper adjustment. Moreover, the partially completed assembly may be placed in a coil and energized so that adjustment may be made with respect to operating energy.

When the adjustment is completed, an insulating disc may be placed over the end of the magnetic detail and sealing compound of a plastic nature may be introduced into the end of the tube to seal the interior against dirt and corrosion from the atmosphere.

Other features will appear hereinafter.

The drawing consists of a single sheet having seven figures as follows:

Fig. 1 is a perspective view partly in section showing one form of the invention in which the magnetic element is inserted in the end of the metal tube forming the body of the device;

Fig. 2 is a similar view showing another form of the invention in which the magnetic element is slipped over the outside of the body; portion of the device;

Fig. 3 is a similar view showing another form of the invention in which the magnetic element which is inserted in the end of the metal tube is elongated so that the protruding portion thereof may be brought into closer cooperative relationship with other parts of a magnetic circuit;

Fig. 4 is a detailed view showing the magnetic element as it is stamped or otherwise formed from a piece of sheet metal;

Fig. 5 is a perspective view of the same element after it has been bent into the desired shape ready for attachment to the body of the device;

Fig. 6 is a view similar to that of Fig. 4 of an alternative form of magnetic element; and

Fig. 7 is a perspective view of the element of Fig. 6 bent substantially into an S-shape.

The magnetic element consists of a piece of sheet magnetic material shaped generally as shown in Fig. 4 and consisting of a collector portion 1, a reed portion 2 and a terminal portion 3. The tip of the terminal portion 3 may be tinned for soldering purposes and the tip of the reed 2 may be treated to prepare it for contact purposes. One satisfactory manner of treating such contact surface is to plate it with gold and then to heat treat it in an atmosphere of hydrogen, whereupon the gold seems to migrate into the

iron leaving a surface particularly good for the purposes intended.

The piece part of Fig. 4 is then bent or rolled into the form illustrated in Fig. 5; the diameter of the cylindrical portion being such that it will fit snugly into the end of a metal tube 4 forming the body portion of the device. There is a thin sheet of insulating material which may be of cloth-like structure placed between the collector portion 1 and the body portion 4.

After two of these magnetic elements are inserted in a tube so that the contact portions of the reeds overlap and on energization will come together face to face, the reeds may be adjusted by twisting and bending the small part between the collector portion 1 and the reed portion 2. Since the device is then practically in its final form the whole device may be inserted in a coil and energized during the adjusting operation.

When the device is found to be satisfactorily adjusted it is sealed by the insertion of lugs of insulating material 5 and 6 into the ends of the tube 4. This may be done in an atmosphere of inert gas or in a vacuum. These plugs may be in the form of a liquid or semiliquid mass which will solidify and remain solid under conditions to be met in service.

In an alternative arrangement, the collector portions of the magnetic elements may be placed on the external surface of the tube 4, with a sheet of insulating material 7 between the two. In this case the ends of the tube 4 are slotted as at 8 and 9 to accommodate the portion of the magnetic element between the collector portion 1 and the reed 2. The device, after adjustment, is sealed as before. One advantage of this alternative arrangement is that the collector portions can be brought into physical contact with magnetic portions of the magnetic circuit in which the device is placed.

Another alternative arrangement is shown in Figs. 3, 6 and 7. In this arrangement we still have the collector portion 11, the reed portion 12 and the terminal portion 13, but in this instance the collector portion is bent or formed substantially into an S-shaped form whereby somewhat greater rigidity is attained.

The magnetic element may be short and inserted entirely into the body portion tube 4 as illustrated in Fig. 1, or it may be elongated as shown in Fig. 3 so that a portion thereof protrudes from the end of the tube 14 to attain better magnetic coupling with the cooperating parts of a magnetic circuit.

Also as illustrated in Figs. 3, 6 and 7, the contact portion of the reed may be gold plated and then burnished instead of heat treated as hereinbefore described.

As shown in Fig. 3 portions of the inner surface of the metal tube 14 may be enameled as at 15 or treated in any other manner to provide a coating or thin layer of insulation between the body portion and the magnetic element.

What is claimed is:

1. A sealed reed contact device comprising a tube of non-magnetic metal, a magnetic element secured at each end thereof consisting of a unitary combination of a reed having a contact making surface at its free end, a substantially cylindrical magnetic collector and a circuit terminal, said magnetic elements having their free ends overlapping and normally separated from each other and plastic material at each end of said tube for sealing the space within said tube against the atmosphere.

2. A sealed reed contact device comprising a non-magnetic metal tube, a magnetic element insulated from said tube inserted into each end thereof consisting of a combination of a reed having contact making surface at its free end, said surface being covered with low resistance contact material, a split cylindrical magnetic collector and a circuit terminal, said magnetic elements having their free ends overlapping and normally separated from each other and plastic material in each end of said tube for sealing the space within said tube against the atmosphere.

3. A sealed reed contact device comprising a tube of non-magnetic metal, a magnetic element sealed into each end thereof, each said element consisting of a detail formed from a sheet of magnetic material and having portions constituting a reed, a magnetic collector and an electrical terminal, said detail being formed into a reed extending longitudinally along the axis of said tube, a split cylinder having an outside diameter slightly less than the inside diameter of said tube and an electrical terminal extending longitudinally beyond the end of said tube, the free ends of said reed portions of said detail being adjusted to overlap one another and being normally separated from each other, and insulating material placed in each end of said tube to secure said details in place and to seal the interior of said tube against the atmosphere.

ROBERT LEE PEEK, JR.