June 4, 1968 R. E. C. BROWN 3,387,102

SUBSCRIBER'S TELEPHONE INSTRUMENTS

Filed Nov. 27, 1964 2 Sheets-Sheet 1

Fig. 1.

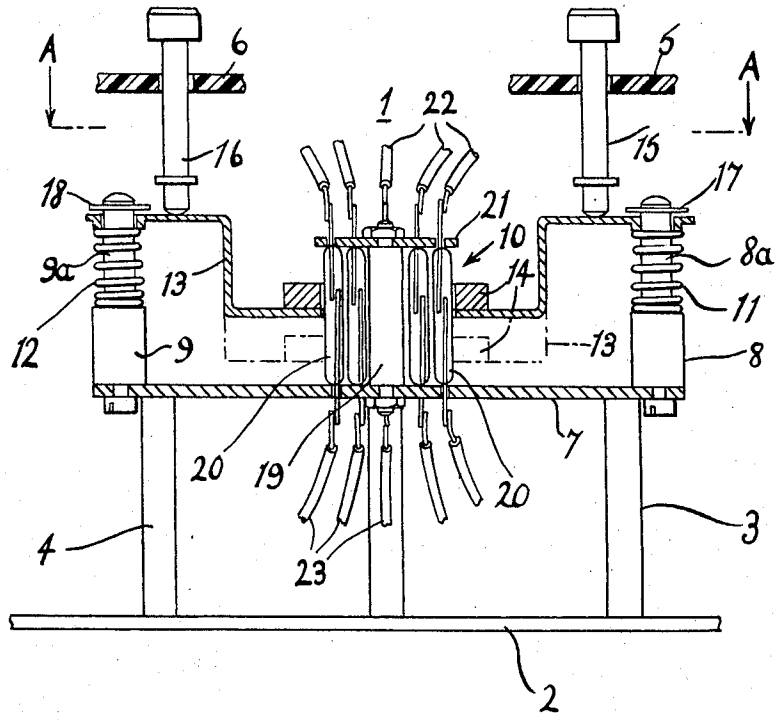
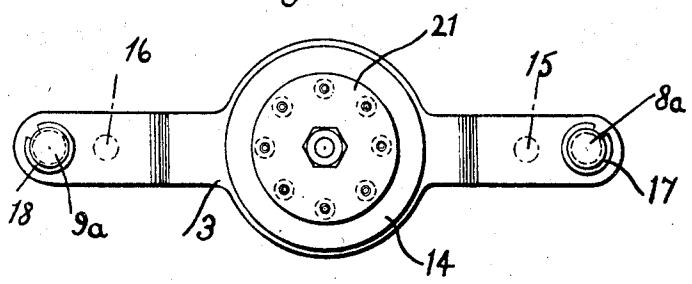


Fig. 2.



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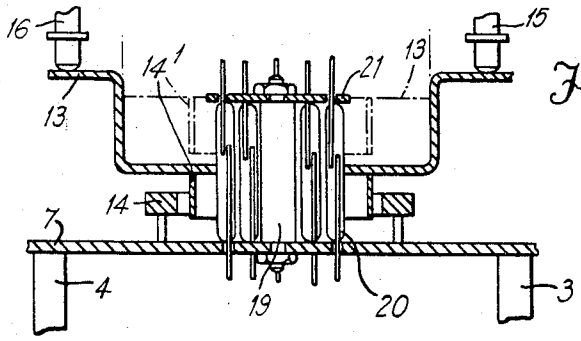


Fig. 3.

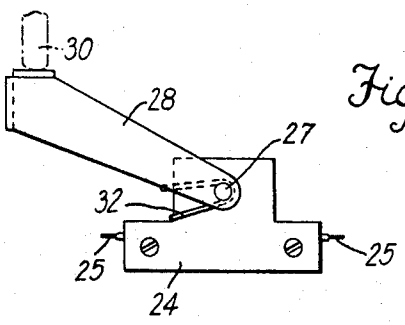


Fig. 4.

Fig. 5.

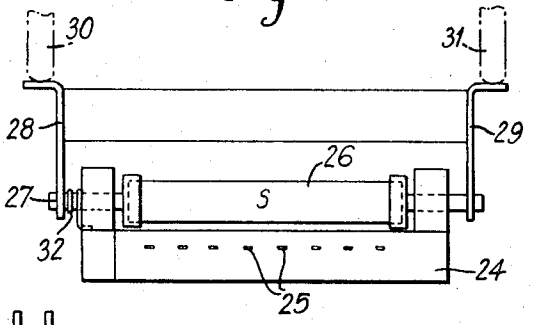
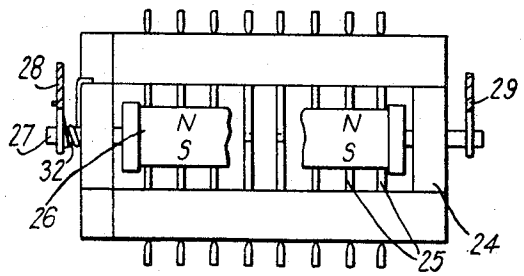


Fig. 6.



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3,387,102

SUBSCRIBER'S TELEPHONE INSTRUMENTS

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Claims priority, application Great Britain, Nov. 29, 1963, 47,270/63
3 Claims. (Cl. 179—165)

ABSTRACT OF THE DISCLOSURE

In a subcriber's telephone instrument a gravity switch of the character in which magnetisable reed contacts are arranged for operation by a permanent magnet under control of a gravity mechanism of the switch. In one embodiment, the gravity mechanism controls movement of a magnetic shield into and out of a flux diverting position between the permanent magnet and the reed contacts. In a second embodiment, the gravity mechanism controls angular movement of the permanent magnet for directing its flux into and out of operating relationship with the reed contacts.

This invention relates to subcriber's telephone instruments and more particularly to gravity switches therefor.

In more recent designs of subscriber's telephone instruments there is employed the principle of tone calling using a transducer which necessitates the inclusion in the gravity switch of the instrument of contacts additional to those normally required. The provision of these additional contacts tends to increase the fault liability of the instrument as there are now more contacts than hitherto in respect of which a fault can arise.

With a view to increasing the reliability of a gravity switch the present invention proposes the inclusion therein of magnetisable reed contacts, instead of the usual mechanically actuated contacts, which are operable by a magnetic field under the control of the gravity mechanism of the switch.

In carrying out the invention the reed contacts may be operable by the magnetic field produced by a permanent magnet which is movable by means of the gravity mechanism into and out of an operating position in which it magnetises the reed contacts to cause operation thereof. Alternatively, the permanent magnet may be permanently at such an operating position and there may be provided a shield of magnetic material movable under control of the gravity mechanism between a shielding position in which it lies between the permanent magnet and the reed contacts to cause the flux of the magnet to be diverted away from the reed contacts, and a second position at which it allows operation of the contacts by the magnet flux. This latter arrangement has the advantage that the gravity mechanism is only required to move the mass of the shield which would be appreciably less than that of the permanent magnet. As another alternative, a permanent magnet may be mounted for angular movement under the control of the gravity mechanism into and out of an operating position in which it magnetises the reed contacts to cause operation thereof. The magnetisable reed contacts used for the invention may be of the well-known sealed reed contact unit kind or, particularly in the case when the permanent magnet is mounted for angular movement, they may be unsealed reed contacts mounted in an open frame.

In order that the invention may be more fully understood reference will now be made by way of example to the accompanying drawings, in which:

FIG. 1 shows diagrammatically a section through a gravity switch provided with sealed reed contact units in conformity with the invention;

FIG. 2 is a section of FIG. 1 taken through the line A—A;

FIG. 3 shows a modification of FIG. 1; and

FIGS. 4 to 6 show fragmentary details of an alternative form of gravity switch.

Referring to the drawings, a gravity switch **1** is mounted on a base plate **2** of a telephone instrument casing by means of support pillars **3** and **4**. Fragmentary portions of the telephone instrument casing are indicated at **5** and **6**. The gravity switch **1** has an insulating plate **7** secured to the support pillars **3** and **4** and there is mounted on this plate **7** two upstanding guide pins **8** and **9** and a sealed reed contact unit assembly **10**. The upper portions **8***a* and **9***a* of the two guide pins **8** and **9** are of reduced diameter and carry respective restoring springs **11** and **12**. These two restoring springs **11** and **12** support a movable platform **13** at a central recessed position on which is mounted a permanent magnet **14**. Plungers **15** and **16** of the telephone instrument which extend through the casing portions **5** and **6**, respectively, and are depressed downwards in well-known manner under the weight of a telephone handset of the instrument, bear against the movable platform **13** to move it downwards (to the position indicated in dotted lines) when the handset is in position on the casing. When the handset is removed, the restoring springs **11** and **12** urge the movable platform **13** upwards to the position shown. Stops **17** and **18** located at the tops of the guide pins **8** and **9** retain the restoring springs **11** and **12** on these guide pins and determine the uppermost position of the movable platform **13**. The sealed contact reed unit assembly **10** has a central pillar **19** around which a plurality of sealed reed contact units **20** are mounted vertically between the insulating plate **7** and a retaining disc **21**. Connections **22** and **23** are soldered to terminals at opposite ends of the reed contact units **20**.

When the handset of the telephone instrument is in position, the movable platform **13** is in the lower position as shown in dotted lines. In this position, the flux produced by the permanent magnet **14** has no effect on the need contact units **20**, the normally open contacts of which therefore remain open. However, upon removal of the handset, the permanent magnet **14** is moved upwards by the platform **13** to a position adjacent the contact ends of the reed contacts. In this position, the flux from the magnet magnetises the reed contacts, thus causing them to close.

In the modification of FIG. 1 shown in FIG. 3, the permanent magnet **14** is fixed at what was the uppermost position in FIG. 1 so that its flux tends to act on the reed contacts the whole time to cause them to close. However, there is now mounted on the platform **13** a shield **14'** of magnetic material which in a shielding position as shown is disposed between the permanent magnet **14** and the reed contacts to cause the flux of the magnets to be diverted away from the contacts so that the latter remain unoperated. This corresponds to the unoperated condition of the gravity switch which, as aforesaid, is brought about when the handset is in position on the telephone casing. When the handset is removed, the movable platform **13** moves upwards as before, but in this instance the shield **14'** is moved from between the magnet **14** and the reed contacts **20** so allowing the latter to close due to the flux from the magnet **14**.

In the alternative arrangement which is illustrated in the fragmentary details of FIGS. 4 to 6, there is provided a non-magnetic mounting frame **24** (e.g., of cast resin) from opposite sides of which cooperating pairs of magnetisable reed contacts **25** extend into the central region

of the frame. There is pivotally mounted on the frame **24** at one side of the reed contacts **25** a permanent magnet **26** which extends lengthwise along the frame transversely of the reed contacts. The pivot for the permanent magnet **26** is a spindle **27** to opposite ends of which are secured respective lever arms **28** and **29**. The ends of these lever arms **28** and **29** away from the spindle **27** have plungers **30** and **31** of the telephone instrument bearing against them and a restoring spring **32** wound on the spindle **27** at one end tends to rotate the spindle **27** in a clockwise direction so as to urge these ends of the lever arms **28** and **29** against the plungers **30** and **31**. The permanent magnet **26** is magnetised in a direction normal to its longitudinal axis so that north and south poles of the magnet exist along opposite side faces thereof. When the telephone handset is resting on the plungers **30** and **31**, the lever arms **28** and **29** have rotated the magnet **26** to a quiescent position in which its direction of magnetisation is perpendicular to the reed contacts **25** so that the flux of the magnet is unable to operate the contacts. On the other hand, when the telephone handset is removed from the plungers **30** and **31**, the restoring spring **32** rotates the magnet **26** to an angular position in which its direction of magnetisation lies parallel to the reed contacts **25** so that the contacts are now magnetised and operated.

With the arrangement of FIGS. 4 to 6, it would be possible to extend the mounting frame **24** and provide therein on the other side of the magnet **26** another line of cooperating pairs of reed contacts on which the magnet **26** would act in the same way as it acts on the other reed contacts.

A gravity switch conforming to the invention provides a relatively large number of contacts which can be used, as necessary, in the telephone instrument circuit. Moreover, where the contacts are sealed and so free from contamination by atmosphere, dust, etc., an overall improvement in reliability of the telephone instrument can be expected as compared with telephone instruments using existing gravity switches in which the contacts are mechanically actuated and are open to atmosphere.

Furthermore, gravity switches providing mechanical actuation of the contacts must be designed so that the weight of the handset is sufficient to operate the contacts satisfactorily, even when additional contacts, such as required for tone sounding or plan working instruments, are provided. With the advent of lightweight handsets, this has presented a problem that can only be resolved by providing additional ballast weight in the handset, so that the facility of using a lightweight handset is largely lost to the user. However, with the present invention, the contact operating force is magnetic and not mechanical and does not have to be increased as the number of contacts to be operated increases. Therefore, a lightweight handset can be used without the need for, or at least requiring less, ballast weight in the handset.

I claim:

1. In a subscriber's telephone instrument a gravity switch comprising:

a gravity mechanism,

magnetisable reed contacts,

magnetic field producing means controllable by said gravity mechanism to cause operation of said reed contacts, characterised in that:

said magnetic field producing means is a permanent magnet,

means are provided for mounting said permanent magnet in an operating position at which it can magnetise said reed contacts to cause operation thereof,

said gravity switch also includes a shield of magnetic material,

means are provided for moving said shield under control of said gravity mechanism between a shielding position in which it lies between said permanent magnet and said reed contacts to cause the magnetic flux of said permanent magnet to be diverted away from said reed contacts, and a second position at which it allows operation of said reed contacts by said magnetic flux.

2. A gravity switch according to claim **1**, wherein:

said reed contacts comprise a plurality of sealed reed contact units,

said permanent magnet is an annular permanent magnet through which said contact units extend and which is located at said operating position, and

said shield of magnetic material is an annular shield mounted for movement lengthwise of said contact units under control of said gravity mechanism between said shielding and second positions.

3. In a subscriber's telephone instrument a gravity switch comprising:

a gravity mechanism,

magnetisable reed contacts, and

magnetic field producing means controllable by said gravity mechanism to cause operation of said reed contacts, characterised in that:

said reed contacts are arranged side-by-side in a line,

said magnetic field producing means is a permanent magnet of elongate form having side faces which extend along one side of said line of reed contacts,

said permanent magnet being magnetised in a direction normal to its longitudinal axis so that north and south poles of the magnet exist along opposite ones of its side faces, and

means are provided for pivotally mounting and for coupling said permanent magnet to said gravity mechanism for angular movement under control of the latter between an operating position in which its direction of magnetisation lies parallel to said reed contacts so that they are magnetised and operated, and a second position in which said direction is perpendicular to said reed contacts and the flux of said magnet is thereby unable to operate them.

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