Nov. 29, 1966 G. WESSEL 3,289,129

PUSH AND PULL KEY WITH REED CONTACTS

Filed Sept. 2, 1964 2 Sheets-Sheet 1

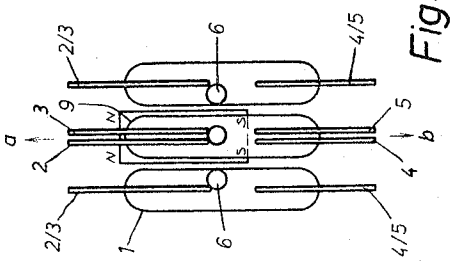


Fig. 3a

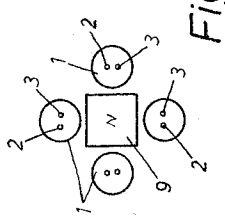


Fig. 3b

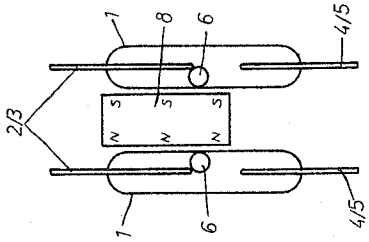


Fig. 2a

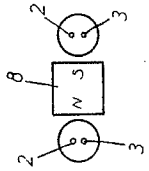


Fig. 2b

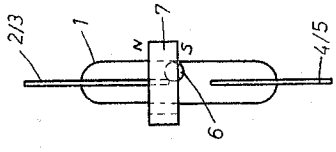


Fig. 1a

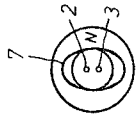


Fig. 1b

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PUSH AND PULL KEY WITH REED CONTACTS

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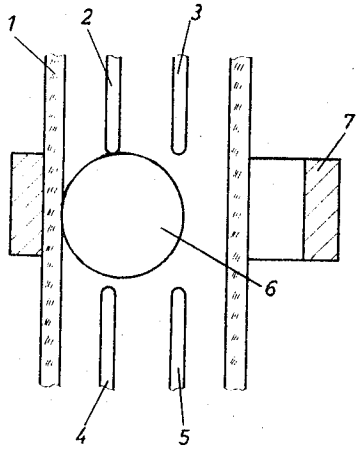


Fig. 4B

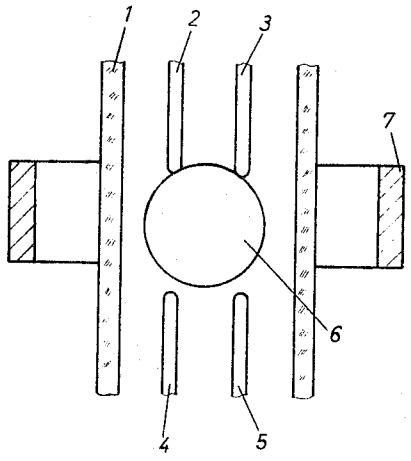


Fig. 5B

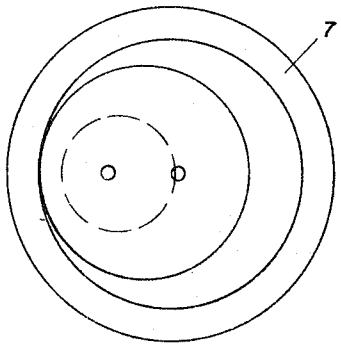


Fig. 4A

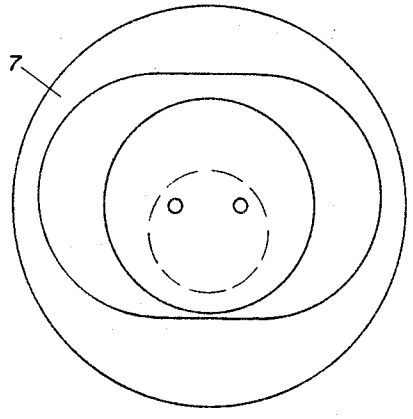


Fig. 5A

United States Patent Office 3,289,129 Patented Nov. 29, 1966

3,289,129

PUSH AND PULL KEY WITH REED CONTACTS

Gerhard Wessel, Kornwestheim, Germany, assignor to International Standard Electric Corporation, New York, N.Y., a corporation of Delaware

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Claims priority, application Germany, Sept. 21, 1963, St 21,101
4 Claims. (Cl. 335—153)

The invention relates to a push and pull key or button with reed contacts influenced at least by one permanent magnet.

There are push or pull keys known which use, instead of an open spring set pack, contacts enclosed in reed tubes which pull up by permanent magnets moved in the direction of the key pushing or pulling. The hitherto known kind of reed contacts takes a lot of space in length and since the reed contacts in their longitudinal direction must be mounted in parallel to the direction of keying in order to obtain the most favorable effect the known push buttons with reed contacts are very expensive and cannot be kept very short and consequently small such as the different types operating with open contacts.

Furthermore, there are electromagnetic relays known with an armature, preferably ball-shaped, freely movable in the air gap of the relay being under the influence of at least one permanent magnet. The ferro-magnetic circuit of this relay consists of two straight rods, preferably with a round profile, arranged in series and limiting the operating air gap by their ends facing each other. The permanent magnet or magnets are made as flat components, preferably of a rectangular cross-section arranged in a plane being in parallel to that plane in which the rods are located. This arrangement of reed contacts known, used in the aforementioned relays, however, do not suit for push-buttons or pull-keys, because their construction, when using as individual contact in keys, represents no technical teaching and progress with regard to the size compared with the blade-type contacts known to the art.

It is the object of the invention to provide push and pull buttons with a kind of reed contacts which excel by particularly small dimensions, and to use for operating these contacts permanent magnets which are poled in such a way that no preferable magnetic flux can occur on one of the contact elements. This is achieved according to the invention that the individual reed contacts are pulled up with permanent magnets poled in different directions, depending on the number of contacts to be operated. A reed contact is operated through an annular magnet poled in the axial direction. Two reed contacts are operated by a rod-type magnet located between the two contacts and poled transverse to the keying direction. Four reed contacts, star-arranged, are operated by a bar magnet arranged in the center between the four contacts, poled longitudinal to the keying direction.

The invention is now in detail explained with the aid of the accompanying drawings, wherein:

FIGS. 1*a* and 1*b* show one reed contact to be operated by shifting an annular magnet,

FIGS. 2*a* and 2*b* show two reed contacts located side by side, between which a bar magnet is arranged, poled transverse to the keying direction,

FIGS. 3*a* and 3*b* show four reed contacts, star-arranged, having a bar magnet in their center poled in longitudinal direction,

FIG. 4A shows an enlarged view of a preferred embodiment of a reed contact,

FIG. 4B shows a sectional view of the reed contact of FIG. 4A and includes a showing of an armature which has failed to make contact between the contact points,

FIG. 5A shows an enlarged view of a reed contact in accordance with an aspect of the invention, and

FIG. 5B shows a sectional view of the embodiment of FIG. 5A with an armature in contact with contact points.

FIG. 1 shows a reed tube **1**, preferably made of glass, and accommodating on either front side two contact elements **2** and **3** respectively **4** and **5**. Said contact elements are melted into the reed tube at the front sides. Between the ends protruding into the reed tube **1** of the contact elements **2**, **3**, **4**, **5** a freely movable armature **6** is inserted, having the shape of a ball. An annular magnet **7** is slid over the reed tube **1**, poled in axial direction, the internal boring of said magnet has the shape of a longitudinal pole. By this it is warranted that the ball-type armature **6** cannot stay at one contact element only in an intermediate position (FIG. 4), but both contact elements are practically simultaneously opened or closed, even at the slowest movement of the key (FIG. 5). This so-called snapping effect is very important for certain switching purposes.

FIG. 2 shows a twin-arrangement of the above-described contacts. Between these two contacts, arranged side by side, a permanent magnet **8** is provided, poled transverse to the keying direction.

FIG. 3 shows an example in which four reed contacts are arranged star-shaped around a bar magnet **9** which is poled in the longitudinal direction towards the motion of the key.

FIGS. 4A, 4B, 5A and 5B show a cross-section through the center part of a reed contact according to FIG. 1 and in an enlarged scale. For operating the ball-type armature **6** in the reed contact according to FIGS. 4A and 4B and annular magnet **7** with a round boring is used. When the annular magnet **7** is applied to the reed contact tube **1** on one side a preferable magnetic point occurs for the ball-type armature **6**, e.g. at the contact element **2**. If, however, as shown in FIGS. 5A and 5B, an annular magnet **7** provided with a longitudinal hole (as opposed to the round boring) is used to operate the ball-type armature **6** and when said annular magnet **7** takes a defined position towards the contact elements **2** to **4** of the reed contact no single magnetic point can occur for the ball-type armature **6**, e.g. at the contact pins **2** or **3**; instead, the ball-type armature **6** bridges the contact elements **2** and **3** or sticks to both contact elements **2** and **3**.

What is claimed is:

1. A push-pull key having a snap-action effect comprising

a container having walls the inner faces of which form a closed body,

reed contacts having pairs of contact points enclosed at one end of said container and connecting to terminate outside said container,

a movable armature in said container,

said movable armature being substantially spherical in form, large enough to bridge pairs of contact points and having a diameter substantially less than the spaces between the inner faces of the closed body, and

an annular permanent magnet of substantially cylindrical external form with an internal bore forming an inner opening of elongated cross section at right angles to a long axis through its own center,

said permanent magnet being linked magnetically to said movable armature so that motion of said permanent magnet will cause said movable armature to move quickly along and in contact with a selected portion of the inner faces of the closed body of the container to make and break circuits between the contact points at said one end of the container and to provide a snapping action relative to the contact points.

2. A push-pull key substantially as described in claim 1, in which

said permanent magnet is placed around said container and poled in an axial direction to further increase the snap-action effect.

3. A push-pull key substantially as described in claim 1 in which

two containers and two independent sets of reed contacts are employed, and

said permanent magnet is a bar magnet located between the containers and poled in a direction transverse to the keying direction.

4. A push-pull key substantially as claimed in claim 1 in which

four containers and four independent sets of reed contacts are employed arranged substantially equidistantly and equiangularly about a common axis, and

said permanent magnet is a bar magnet located along said common axis and poled in the longitudinal direction of keying movement.

References Cited by the Examiner

UNITED STATES PATENTS

2,732,464	1/1956	Ohl	200—87
2,999,914	9/1961	Stanaway	200—87
3,015,707	1/1962	Perreault	200—93 X
3,103,562	9/1963	Di Noia	200—87

OTHER REFERENCES

German application 1,116,815, November 1961.

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