United States Patent

Rüster et al.

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[54] CRADLE SWITCH

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[52] **U.S. Cl.** **179/164**

[51] **Int. Cl.** **H04m 1/08**

[58] **Field of Search** 179/158, 159, 160, 164, 169

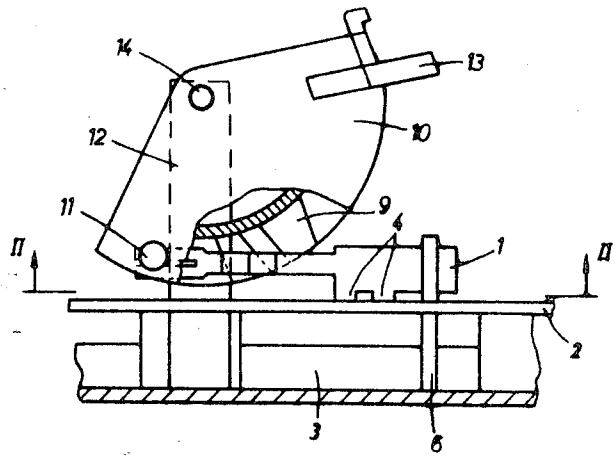
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[57] **ABSTRACT**

A cradle switch is formed by a rocker having the shape of a cylinder section which, on its bent jacketing surface, is provided with switching cams which are capable of being moved between contact springs mounted to move horizontally on a printed circuit board, and thus to actuate these contacts.

6 Claims, 4 Drawing Figures



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SHEET 1 OF 2

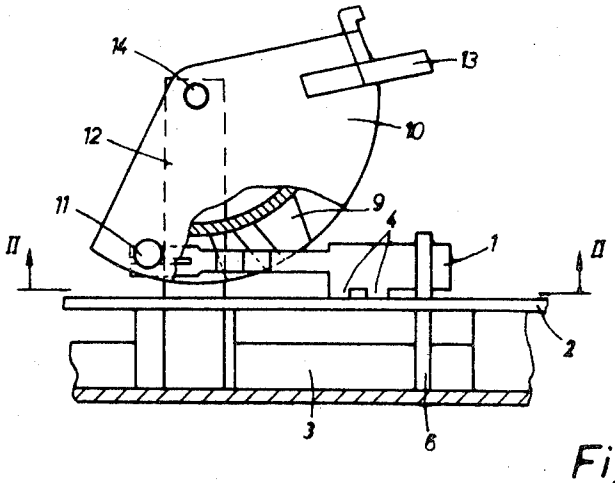


Fig. 1

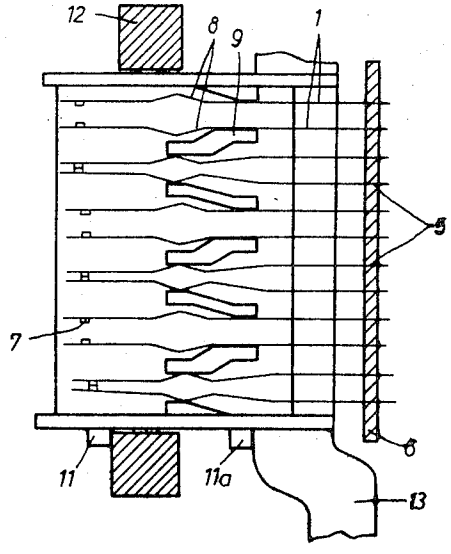


Fig. 2

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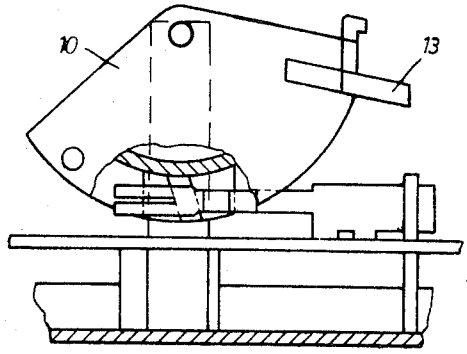


Fig.3

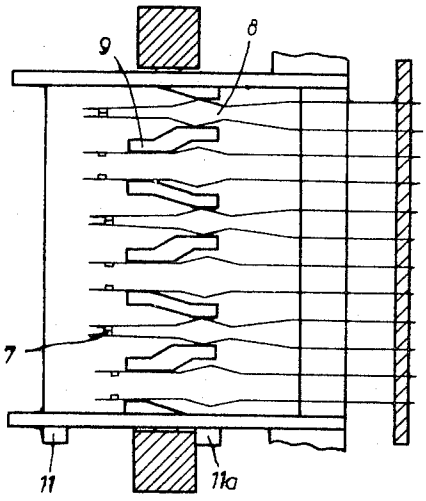


Fig.4

CRADLE SWITCH

The present invention relates to a cradle switch for the use in telephone subscriber's stations, comprising a rocker for actuating the contact springs.

Earlier types of cradle switches are known having contact spring assemblies consisting of flat springs which, in the usual way, are laminated and held in place by screws. The manufacture thereof requires a large number of individual parts and an amount of time for labor which, under present day conditions, are no longer deemed acceptable. The same also applies to the parts serving to transfer the cradle movement to the contact spring assembly.

In constructing modern types of subsets, therefore, efforts have been made to reduce the number of parts, to render the manufacture thereof less expensive by using plastics materials extensively, and avoiding wage-intensive assembly and adjustment works. Such types of solutions have been disclosed, for example, by the German Pat. Nos. 1,134,111 and 1,191,426. Both of the cradle switches as proposed in these patents, are provided with stand up types of contact springs which are accommodated in tubular sockets, with the upper ends of the sockets being covered by a cap-shaped rocker placed thereon. The two switching straps of the housing act upon two attached arms which have taken the place of the former cradle switch. The rocker transfers its movement with the aid of projections, on to the ends of the contact springs. It is considered a disadvantage in these types of embodiments, that a large overall height results from the stand-up springs, as well as a relatively large number of individual parts.

The first mentioned disadvantage is avoided by another conventional type of embodiment in which the contact springs are inserted in an almost horizontal position (DOS 1 437 940). The holding arrangement of the one type of springs—there are used two different types—is rather complicated. In addition thereto, the springs must be inserted in a pretensioned or biased fashion. The bearing of the rocker is effected in shock-sensitive blade bearings. The number of parts required in this case is still considerable, and the assembly is rather costly. The actuating parts have to be riveted.

It is a primary object of the present invention to completely avoid the use of screwed or riveted connections, to reduce the number of different parts to an unavoidable minimum, and to restrict the assembly to a few simple operations. Moreover, the arrangement is intended to be insensitive to shocks and impacts. According to the invention this is accomplished by use of a rocker having the shape of a cylinder section which is provided on the curved jacketing surface with switching cams which are capable of being moved between the contact springs as mounted in a horizontal way on a printed circuit board, between the two end positions, within a range in which the contact springs are provided with recesses which run off and on to the cams. The rocker itself is arranged in a snap-in fashion with the aid of die-cast bearing pivots in the corresponding bore holes upright supports die-cast to the baseplate of the subset. To the covering surface areas thereof there are die-cast limiting stops for restricting the movement, as well as actuating means which are acted upon by the switching straps or elements as operated by the handset.

According to one advantageous type of embodiment the switching cams are constituted in their outline by respectively two rectangles which are arranged in a staggered fashion behind each other in the direction of movement, and by a rhombic center part. If the contacts are to be switched successively in a predetermined order of sequence, this problem can be solved, in accordance with the present invention, arbitrarily in three different ways: by staggering the contact springs, by staggering the recesses thereof, or else by staggering the switching cams, each time in the direction of movement.

Moreover, it is provided by the invention that the ends of the contact springs on the connecting side are inserted in slots of a strap die-cast to the baseplate.

One example of embodiment of the invention is shown in the accompanying drawings, and will now be described in detail with reference to FIGS. 1 to 4, thereof, in which:

FIG. 1 shows the cradle switch of a telephone subset in the actuated position, in a sideview;

FIG. 2 shows a section taken through the arrangement according to FIG. 1, on line II—II thereof;

FIG. 3 shows the cradle switch as in FIG. 1, but in the normal position; and

FIG. 4 shows the same sectional view as in FIG. 2, but with respect to the normal position of the cradle switch, according to FIG. 3.

FIGS. 1 and 2 show the cradle switch in the actuated condition, i.e., with the handset removed, hereinafter referred to as the operated or actuated position, whereas FIGS. 3 and 4 show the cradle switch in the replaced condition of the handset. In the following this condition is referred to as the normal position.

The handset and the switching straps actuated thereby in the cover, are of no importance to the specification and, therefore, are not shown.

The contact springs 1 of the cradle switch are arranged horizontally with their flat faces in a standing-up position on the board 2 preferably designed as a printed circuit which, in turn, is mounted to the baseplate 3 of the telephone subset. Within the connecting range the contact springs 1 are provided with extensions 4 which are inserted into corresponding holes provided in the conductor board 2, with the bottom sides thereof being soldered to the conductor leads. In this way there is not only established the electrical, but also a mechanical connection which is still supported by the fact that the ends of the contact springs 1, on their connecting sides, are inserted in slots 5 of a strap 6 die-cast to the baseplate 3.

Between the contacts 7 at the other end and the mounting extensions 4, the contact springs are provided with bends, forming bulges 8 out of the respective spring plane which are acted upon by the switching cams 9 of the rocker 10, for moving the contact springs 1. Quite depending thereon, the contacts 7 are either opened or closed (FIGS. 2 and 4).

The rocker 10 represents a section of a cylinder which is suspended between an axially rotatable fashion in two supports 12 supported by the baseplate 3. The rotary movement of the rocker is restricted by limiting stops 11 and 11*a* which are die-cast on the outside to the covering surface areas and lodge against the supports 12. Upon lifting of the handset, the rocker 10 is moved into the operating position according to FIG. 1 by the action of the springs, with the left-hand limiting stop 11 meeting against the support.

Upon replacement of the handset, the switching straps press upon the actuating wings 13 as shaped to the covering surface areas, and return the rocker to the normal position (FIG. 3). Since this normal position is already sufficiently defined by the replaced handset, the right-hand limiting stop 11*a* only serves as a protection against the pressing-in by force of one switching strap.

On the bent jacketing surface of the rocker 10 there are arranged various switching cams 9, with the outline thereof capable of being characterized by respectively two rectangles displaced with respect to one another in the direction of movement, and which are connected to one another by rhombic means. These cams 9 are positioned between the contact springs 1, so that upon movement of the rocker, the bulges 8 of the springs will run on to or off the caps respectively. FIGS. 2 and 4 most clearly illustrate how, in this way, the different contacts 7 are opened or closed respectively, with a self-cleaning of the contacts being effected by a slight friction. Moreover, it may be taken from these drawings that by a slight staggering of the pairs of contact springs 1 in the direction of movement of the rocker it is possible to achieve sequential switching operations. The same effect can also be achieved by correspondingly staggering the switching cams 9.

The rocker 10 is beared by its bearing pins or pivots 14 in corresponding shell-type recesses of the supports 12. Appropriately there are provided over the bearings constricted introductory slots through which the bearing pins or pivots 14 are pressed during the assembly. In this way, by maintaining a

very simple assembly, there is met the requirement for providing shock and impact-proof subsets. The baseplate **3** with its extensions **6** and **12**, as well as the rocker **10** are die-cast plastics parts which are inexpensive to manufacture.

In another, likewise simple type of embodiment the bearing pins or pivots are taken up by throughgoing boreholes in the upright supports **12**. For inserting the rocker **10**, the supports are slightly pressed apart each other, until the bearing pins or pivots are permitted to snap-in.

We claim:

1. A cradle switch for use in telephone subsets, comprising a plurality of contact springs having connect ends and contact ends, a printed circuit board mounted on a baseplate, mounting means associated with said last plate for supporting said contact springs by respective connect ends, means electrically coupling said respective connect ends to said printed circuit board, said mounting means permitting contact ends of said contact springs to move parallel to the face of the printed circuit board, means supporting a rocker on said baseplate for actuating the contact springs, the rocker including a cylinder section provided with switching cams capable of being moved in interleaf fashion between the contact springs, and means restricting travel of the rocker between two end positions.

2. A cradle switch according to claim **1**, in which the means supporting the rocker includes upright supports die-cast as part of the baseplate.

3. A cradle switch according to claim **1**, in which limiting stops for restricting movement are die-cast as part of said rocker.

4. A cradle switch according to claim **1**, in which the switching cams are constituted respectively by two rectangular bodies which are staggered behind each other in the direction of movement, and which are connected to one another by a rhombic center part.

5. A cradle switch according to claim **1**, in which sequence contacts are formed by staggering the spacing between the contact springs, bulges forming part of said contact springs, and the switching cams in the direction of movement.

6. A cradle switch according to claim **2**, in which the means mounting said contact springs includes slots in a strap die-cast as part of the baseplate of the subset.

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