United States Patent [19]

Diehr

[11] **3,894,203**

[45] **July 8, 1975**

[54] **CRADLE SWITCH FOR TELEPHONE APPARATUS HAVING SELF-ALIGNING, PIVOTED CONTACT ASSEMBLY**

[75] Inventor: **Helmut Heinrich Walter Diehr,** Berlin, Germany

[73] Assignee: **GTE International Incorporated,** Stamford, Conn.

[22] Filed: **Jan. 8, 1974**

[21] Appl. No.: **431,643**

[30] **Foreign Application Priority Data**

Jan. 18, 1973 Germany 2302322

[52] **U.S. Cl.** ..... **200/6 R;** 200/61.58 R; 200/164; 200/254; 200/258; 200/282; 200/293; 200/339

[51] **Int. Cl.** ... **H01h 21/26;** H01h 1/36; H04m 1/00

[58] **Field of Search** ..... 200/1 R, 6 R, 6 B–6 C, 200/15, 16 F, 16 R, 17 R, 61.58 R, 63 R, 61.85, 67 B, 154, 238, 244–246, 275, 280–282, 329, 333, 336–339, 293–307, 164, 252–260; 179/167–169

[56] **References Cited**

UNITED STATES PATENTS

2,902,550	9/1959	Allison	200/16 F
3,610,845	10/1971	Lewandowski	200/16 F

FOREIGN PATENTS OR APPLICATIONS

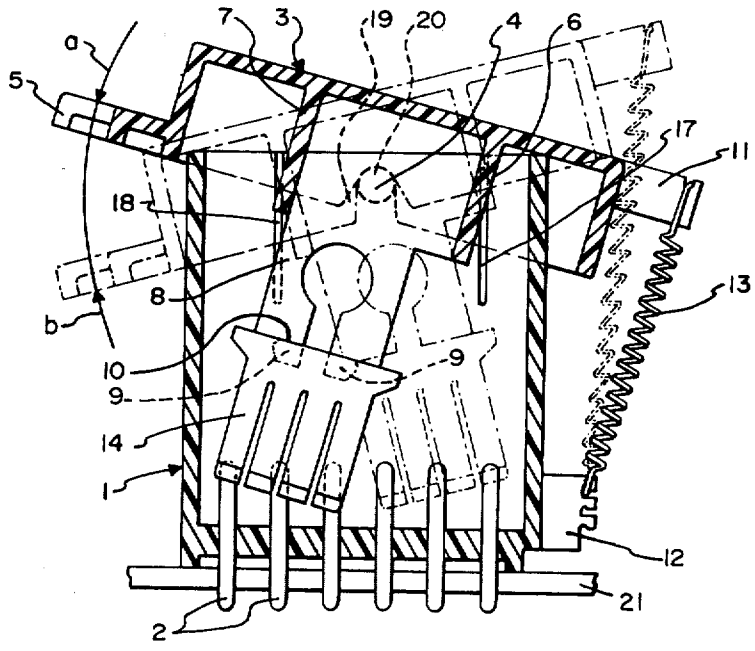
1,082,815	6/1960	Germany	200/339
1,116,153	6/1968	United Kingdom	200/281
1,022,294	1/1958	Germany	200/6 R
1,022,295	1/1958	Germany	200/6 R
2,056,548	5/1972	Germany	

Primary Examiner—James R. Scott

[57] **ABSTRACT**

A cradle switch for telephones in which the contact elements, for dust protection, are enclosed by a housing, in turn covered by a hood which is tiltable by the cradle and which controls one or more comb-shaped contact spring members through the medium of corresponding arms rigidly attached to, or integral with, the hood. The contact springs of each comb-shaped member on both sides slidably engage contact pins disposed in corresponding rows in the bottom of the housing, the lower ends of these contact pins being insertable in a printed circuit board. The hood is supported for rocking movement by rows of bearing pins extending from both sides of the housing into recesses in the side walls of the hood. The design avoids adjustments, e.g., to adapt the switch to different switching functions such as break-make, make-before-break, etc.

6 Claims, 5 Drawing Figures



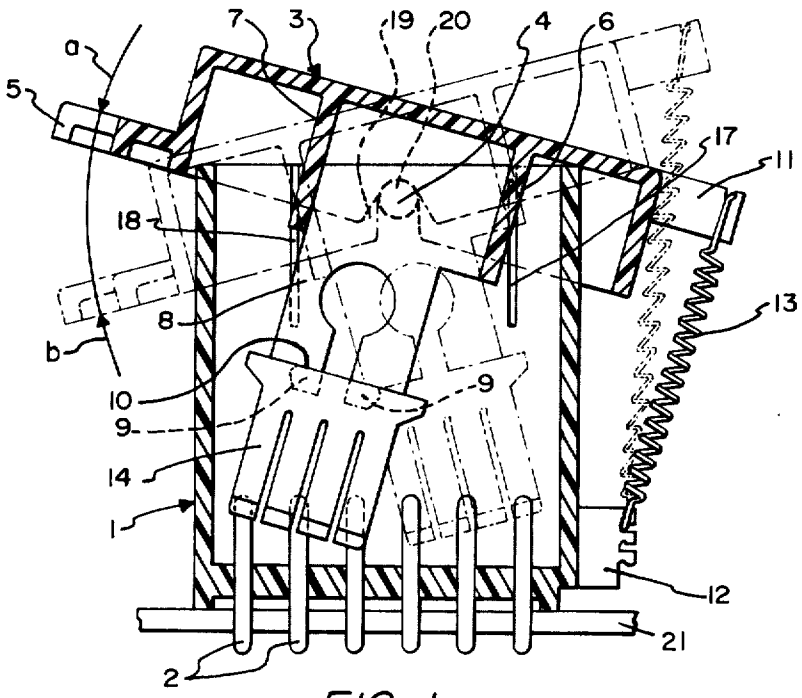


FIG. 1

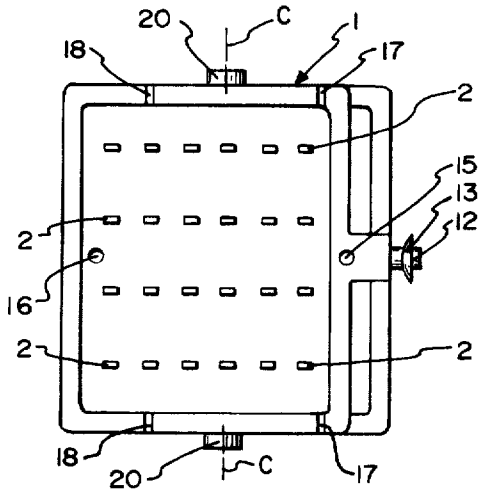


FIG. 2

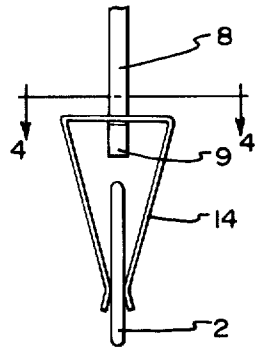


FIG. 3

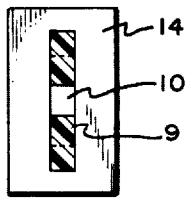


FIG. 4

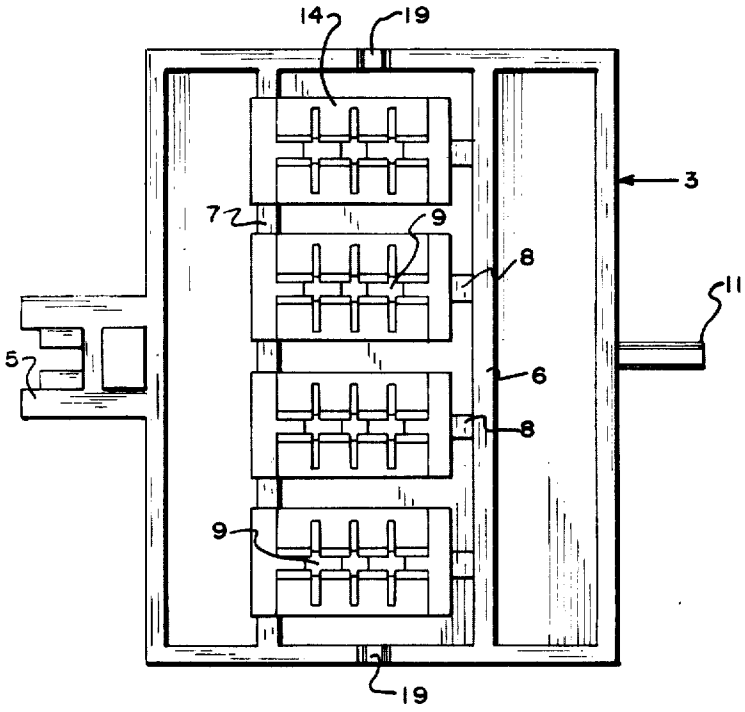


FIG. 5

CRADLE SWITCH FOR TELEPHONE APPARATUS HAVING SELF-ALIGNING, PIVOTED CONTACT ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a cradle switch for telephones, in which the contact elements, in order to be protected from dust, are enclosed by a protective housing covered by a hood which is arranged to be tilted by the cradle resting surface and which controls the contacts.

2. Description of the Prior Art

A cradle switch of this kind is known from German Pat. No. 1,134,111. The objective of this known design was to provide an arrangement which protects the sets of contact springs adequately against dust, while at the same time making the sets of contacts readily accessible and permitting dependable support of the switch rocker.

This design is expensive with respect to the manufacturing and assembling costs of the individual parts required. The adjusting of the contact switches which may be of the make, break, transfer, make-before-break or the like type and which upon actuation of the switch rocker must switch in a predetermined sequence, is extremely expensive.

Another solution is known from German Published Pat. application No. 2,056,548. In this case a separate set of springs is provided for each chamber in the switch housing. In this connection, contact springs and at least one comparatively longer switch spring are used, the latter being operatively connected with a switch rocker which is under the action of a tension spring. This switch rocker which at the same time forms the cover for the switch housing is swung when the telephone handset is picked up. The switch rocker, with the aid of a spacing grid, actuates the protruding tongues of the switch springs. This solution is very expensive, both from a manufacturing standpoint and with respect to the expensive adjustment necessarily required in order to obtain the desired switching sequences.

OBJECTS AND SUMMARY OF THE INVENTION

The object of the present invention, therefore, is substantially to simplify the entire cradle switch, eliminate any necessity of adjustment and cause the proper sequence of actuation of the contacts to be brought about automatically.

Furthermore, it is an object of the invention that the cradle switch, in line with present-day techniques, be adapted for mounting, without additional expenditure for holding means, in a printed-circuit board of standard raster and be fastened therein, without assembling procedures, by the use of plug-in connections.

Briefly, the foregoing objects are achieved, in accordance with the present invention, by a design in which the cradle switch consists of only a few, and possibly only two, parts of insulating material. These parts can be formed inexpensively by extrusion of plastic material. The switching sequence is unambigously established by a rigid coupling between the switch rocker and the arms of insulating material which bear the contact springs, and it does not require any adjustment. The switch times and switch functions are permanently established by the selection of the contact pins and the shape of the contact springs. In the embodiment described the switch rocker and the cover-like part of insulating material with the arms of insulating material bearing the switch contact springs, form in effect a single unit; and the movement of this unit takes place without play and synchronously with the actuating stroke under continuous pressure contact. The contact pins as well as the self-aligning contact springs are automatically cleaned incident to the switching movement. The contact pins, spaced according to standard raster, can be forced into the bottom of the cup-shaped part of insulating material and can be electrically connected by dip-soldering with the printed-circuit board. In this way the cradle switch is simultaneously mounted without any subsequent work being necesssary. In this operation, the switch functions cannot be changed or the switch adjustment affected, as used to be the case in the contact switches of the prior art.

BRIEF DESCRIPTION OF THE DRAWING

One embodiment of the invention will be described below with reference to the drawing in which:

FIG. 1 is a side view of a complete cradle switch, shown partly in section in a plane perpendicular to the axis of tilt;

FIG. 2 is a view of the cup-shaped part of insulating material seen from below, looking at the bottom containing four rows of contact pins.

FIG. 3 is a showing in principle of one of the double, chamber-like contact spring elements wiping against the corresponding row of contact pins.

FIG. 4 is a sectional view taken along lines 4—4 in FIG. 3.

FIG. 5 is a bottom plan view of hood-shaped part 3.

DESCRIPTION OF PREFERRED EMBODIMENT

The cradle switch shown in FIG. 1 consists of the two housing parts 1 and 3 of insulating material. The cup-shaped part 1 has contact pins 2 pressed in its bottom plate. In FIG. 1 it will be noted that contact pins 2 extend through printed circuit board 21 a sufficient length to facilitate soldering of the ends of pins 2 to printed circuit patterns, not shown, on the under side of printed circuit board 21. The part 3 closes off the part 1 in the manner of a hood. However, this hood is sufficiently large that a tilting movement around the axis C is possible. This axis C is formed by one bearing pin 20 each on opposite sides of the cup-shaped part 1. These bearing pins extend in corresponding recesses in the hood-shaped part 3. The side walls which carry the bearing pins are provided with parallel slits 17 and 18 for resiliency and permit the hood-shaped part 3 to be seated without play and also rapid removal and reattachment. For the replacement, in addition, oblique grooves 19 are provided for the bearing pins, that is, the grooves have a depth which decreases in the direction toward the recesses. On the hood-shaped part 3 there is an arm 5 for actuating the switch rocker represented by these parts 3 and 5. Between the ribs 6 and 7, arms 8 of insulating material are glued into place or molded integrally with hood 3. On their lower ends these arms are made flexible, for example, by suitably shaped resilient tongues 9 so that the corresponding, double, comb-shaped contact spring member 14 which has a corresponding recess 10 on the back thereof snaps firmly into position. These contact spring members 14 are, however, movable in their mounting to

such an extent that they align themselves as they move wiping over both sides of the contact pins, as can be noted from the showing of FIG. 3. It will be appreciated that the desired switching mode (break, make, transfer, etc.) may be obtained by correspondingly choosing the number and the position of the contact pins used.

Between the projections 11 and 12, a tension spring 13 is attached. It acts in the direction *b* on the hood-shaped switch rocker, and therefore assures its return. The handset (not shown), when resting on the telephone, presses the switch rocker 3 in the direction *a* into the position shown in dashed lines.

FIG. 2 shows the raster pattern of the contact pins 2 inserted in rows in the bottom of the cup-shaped part 1. The holes 15 and 16 can serve for purposes of attachment.

FIG. 4 is a view taken along section lines 4—4 of FIG. 3, and illustrates the rectangular shape of aperture 10 in the top of spring contact member 14. It will be noted that resilient tongues 9 are suitably dimensioned such that they fit snugly in aperture 10 to hold spring member 14 associated therewith firmly in place on arm 8 which is of insulating material.

Referring to FIG. 5, there is illustrated a bottom plan view of hood-shaped part 3. It will be observed that there are a plurality of insulating arms 8, each of which have included on the lower ends a spring member 14. Arms 8 with spring members 14 attached thereto are suitably positioned such that when hood 3 is placed over cup-shaped part 1 each spring member set 14 will operatively engage a corresponding row of pins 2 to provide a switching function upon the tilting of hood 3. It will also be observed in FIG. 5 that arms 8 are positioned between ribs 6 and 7 of hood 3, and may, as noted previously herein, either be integrally molded with hood 3 or separate elements which are glued into place between ribs 6 and 7.

What I claim is:

1. An improved cradle switch for a telephone, said switch comprising in combination a cup-shaped lower portion of insulating material including in the bottom thereof at least one row of contact pins which outside of said lower portion serve for connections and within said lower portion serve as contact elements, the side walls of said lower portion including bearing pins with a pair of slits in said side walls adjacent to said bearing pins, with one slit on each side of said bearing pins, and a hood tiltably supported on said bearing pins, said hood including at least one arm of insulating material with a comb-shaped spring contact member secured to the free end of said arm, said spring contacts being adapted to slidably engage said row of contact pins.

2. The improved cradle switch as claimed in claim 1, wherein said hood is provided on opposite sides with recesses engaged by corresponding bearing pins for tiltably supporting said hood on opposite sides close to the edge of said cup-shaped lower portion.

3. The improved cradle switch as claimed in claim 1 wherein the tilt axis of the hood is perpendicular to the row of contact pins and wherein the contact springs of said member are adapted to bear and wipe against opposed sides of said contact pins.

4. The improved cradle switch as claimed in claim 1, wherein said arm of insulating material carrying said combshaped member is integral with said hood.

5. The improved cradle switch as claimed in claim 2 wherein said hood includes slide grooves leading to said recesses, said slide grooves having a width which decreases in the direction toward said recesses.

6. The improved cradle switch as claimed in claim 1, wherein said arm of insulating material includes at its free end a pair of resilient tongues and said comb-shaped member includes an aperture adapted to receive said tongues in locking engagement whereby said comb-shaped member may be snap-fastened to said tongues in self-holding and self-aligning relationship.

* * * * *