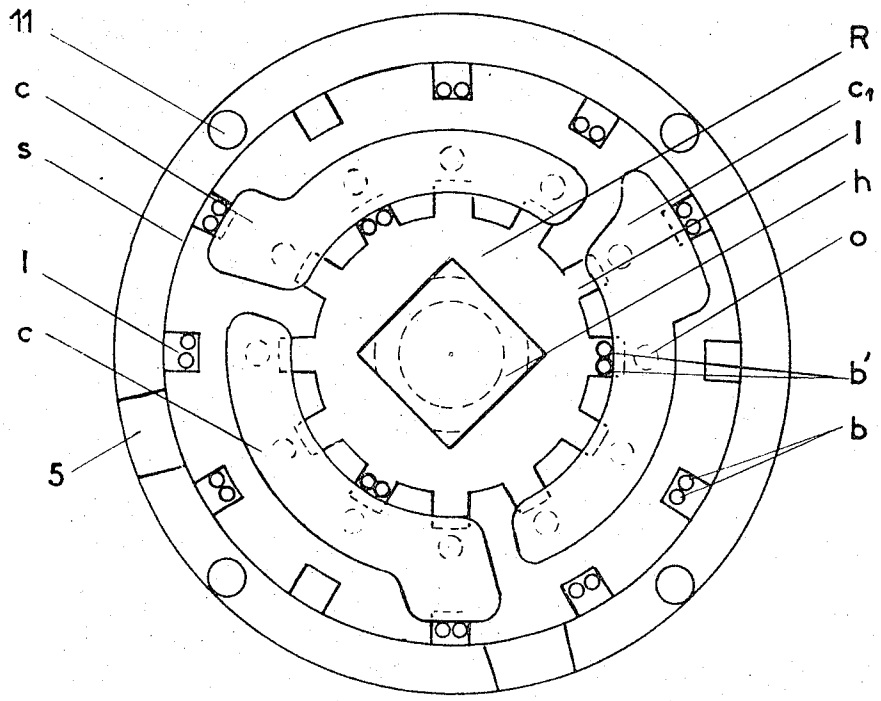
Feb. 6, 1968 H. L. CHAMBAUT 3,368,041

ROTARY MINIATURE COMMUTATOR SWITCH WITH IMPROVED CONTACT STRUCTURE

Filed June 13, 1966 4 Sheets-Sheet 1

FIG 1



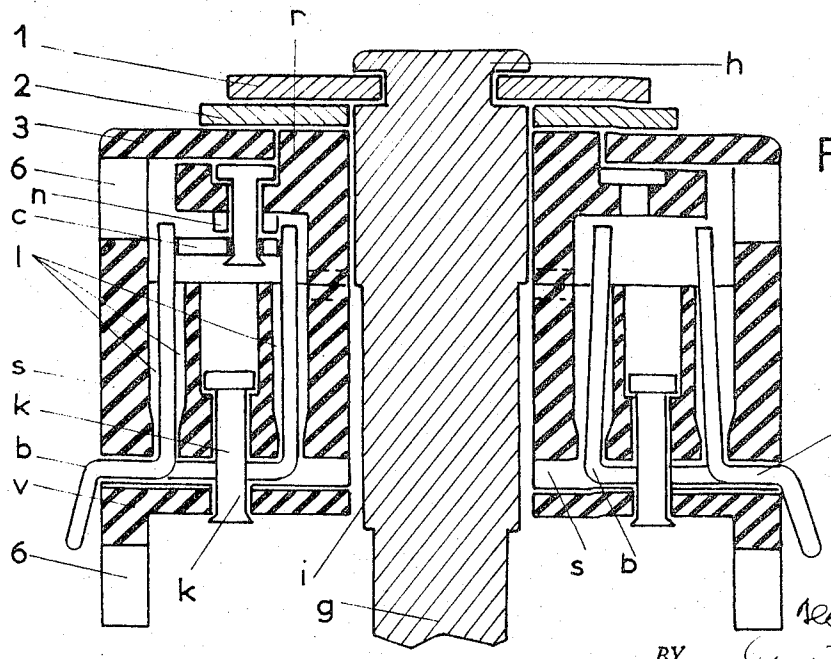


FIG 2

INVENTOR.
Henri L. Chambaut
BY Ernest Montague
Attorney

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FIG 3

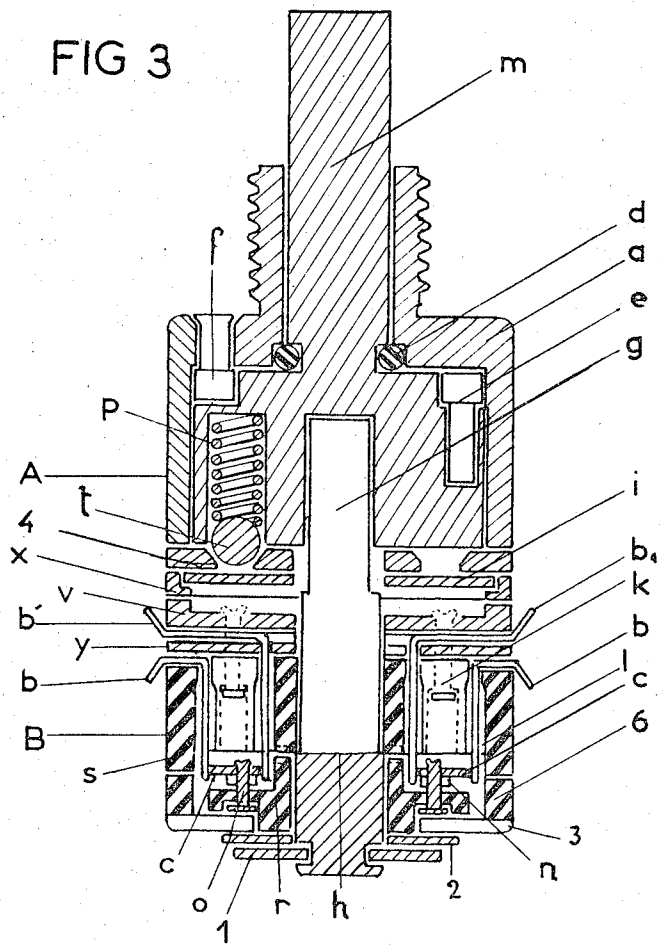


FIG.4A

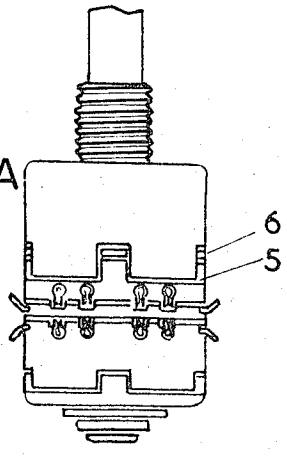
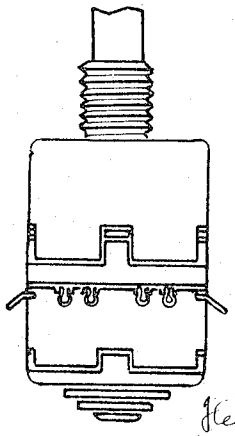


FIG.4B



INVENTOR.
Henri L. Chambaut
BY
Ernest Montagne
Attorney

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Fig 5

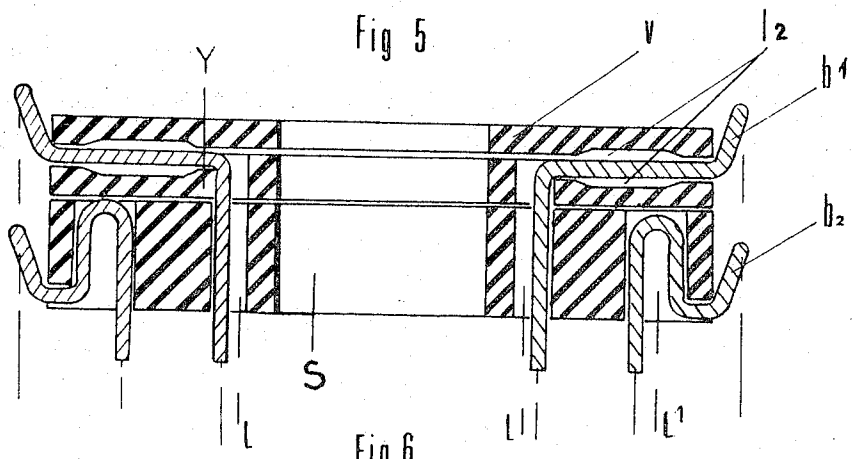


Fig 6

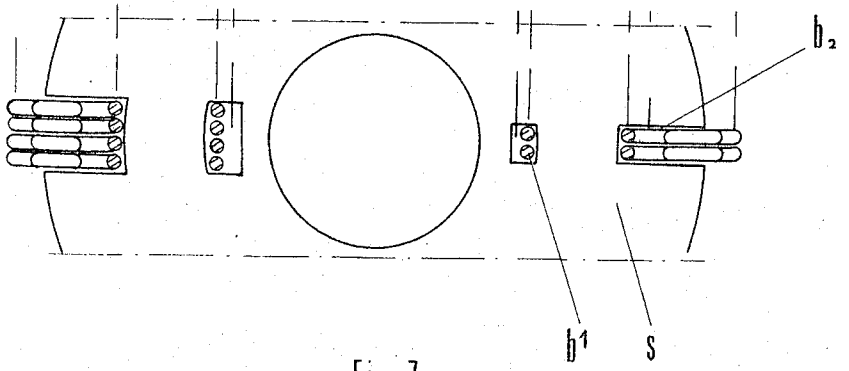
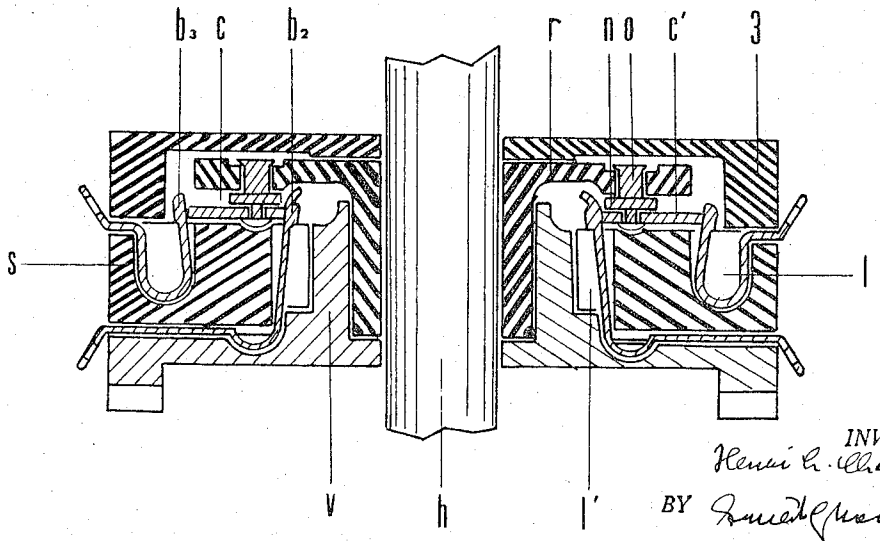


Fig 7



INVENTOR.
Henri L. Chambaut
BY Ronald Montague
attorney

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ROTARY MINIATURE COMMUTATOR SWITCH WITH IMPROVED CONTACT STRUCTURE

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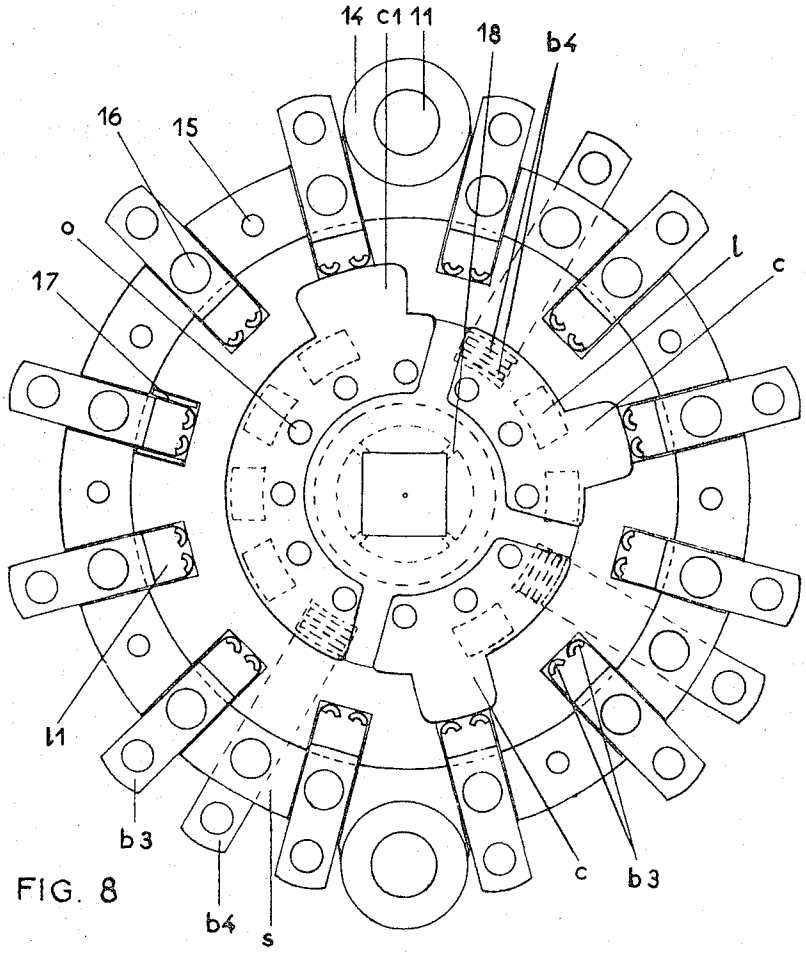

FIG. 8

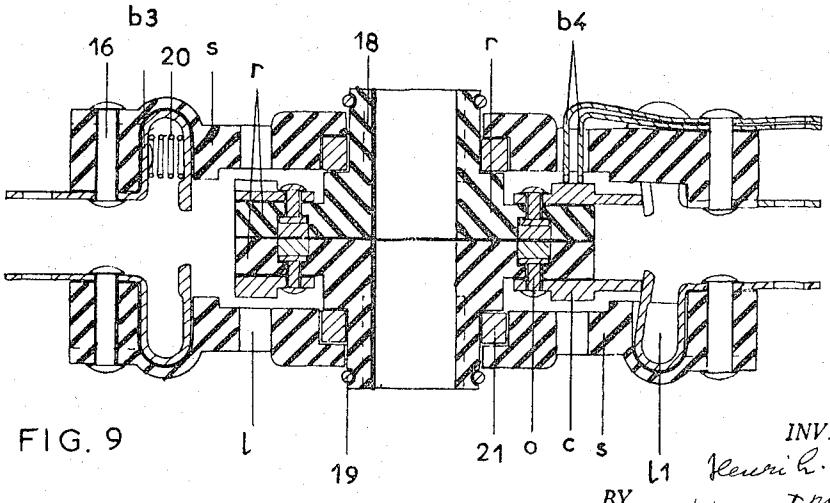

FIG. 9

INVENTOR.
Henri L. Chambaut
BY Vincent Montague
Attorney

United States Patent Office 3,368,041 Patented Feb. 6, 1968

3,368,041

ROTARY MINIATURE COMMUTATOR SWITCH WITH IMPROVED CONTACT STRUCTURE

Henri L. Chambaut, Villeneuve-Loubet, France

Filed June 13, 1966, Ser. No. 557,010
Claims priority, application Monaco, June 25, 1965, 41
6 Claims. (Cl. 200—11)

ABSTRACT OF THE DISCLOSURE

A rotary commutator miniature switch, with improved contact structure comprising two annular discs in juxtaposed position, one of the discs includes a control axle secured thereto, and spring means for locking and associated with the one of said discs are provided in a plurality of contact positions. A ball complementary to and locating each contact position and to maintain the respective contact positions. Circuit means include a plate having three portions, and a rotor supports and secures the three portions. Each of the portions includes a circuit of mobile contacts, adapted to be disposed opposite of fixed contacts. Two of the circuits having no continuous contact and a third of the circuits has continuous contact, so that contact continuity through at least one of the portions is assured.

The present invention relates to a rotary miniature commutator switch, which provides the possibility of establishing all normal or complex combinations generally in connection with commutators of all types, which have much larger dimensions.

It is one object of the present invention to provide a rotary commutator switch, which comprises simple or double contacts, the number of which being limited only by the dimensions of the switch and which finds its application in a great number of industrial fields or techniques complying with the requirements for modern electronic devices and for such devices of great precision.

It is another object of the present invention to provide a rotary miniature commutator switch, which is designed to permit by different embodiments and with a reduced volume, the passage of current and complete insulation between the points of contacts, between its double circuits and, first of all, with the mass, as well as only with a minimum resistance in all connections of the established combinations.

The recesses in which the contact elements are freely received by diminishing their capacity and in avoiding the channels, thereby resulting in a situation, which offers by its ventilation an effective insulation. With a great flexibility of variations, contacts of great security can be obtained, with or without continuity.

With these and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is an end view of the commutator switch, designed in accordance with the present invention;

FIG. 2 is an axial section of the commutator switch disclosed in FIG. 1;

FIG. 3 is an axial section of the commutator switch, disclosing a second embodiment thereof;

FIG. 4*a* is an elevation of the commutator switch disclosed in FIG. 3;

FIG. 4*b* is an elevation of the commutator switch shown in FIG. 4*a*, yet in a different position;

FIG. 5 is a fragmentary axial section of the embodiment of the switch disclosed in FIG. 3;

FIG. 6 is a bottom plan view of the showing in FIG. 5;

FIG. 7 is an axial section of the commutator switch disclosing a third embodiment of the present invention;

FIG. 8 is an end view of the commutator switch disclosing a variation over that of FIG. 7; and

FIG. 9 is a top plan view of the commutator switch disclosed in FIG. 8.

Referring now to the drawings, and in particular to FIGS. 1 to 4, the commutator switch comprises two parts A and B disposed next to each other and intimately connected with each other by securing means distributed therein on their peripheral members **5** and **6** and embedded with all necessary precision.

A connection by a special process, as, for instance, by soldering can be provided, but practically annular discs **1** and **2**, one of which is solidly locked by washers to the outer face of the control axle *h*, maintain a circular closing member **3**, which places itself under the discs **1** and **2**, and on the other hand on a stator *s* by grooves **5** and **6**, so that they constitute a very safe assembly arrangement, which serves at the same time for centering and guiding the axle *h* of the rotor *r*.

The water-tightness about the control axis *m* controlling the commutator is assured by a slip ring *d* of latex or other similar product, and disposed between the elements *a* and *m*, yet can be substituted by a flat ring of neutral material and predetermined thickness, which operates under pressure of springs *p*, which assures a good and sufficient connection.

The control axis *m* of the commutator forms an integral mass with its portion of greatest diameter constituting the rotor of a locking member disposed in the member *a*.

In that portion of the rotor which is in horizontal engagement with the member *a* are arranged one or a plurality of movable pegs *e* which cooperate with fixed pegs *f*, disposed at the same plane inside of the member *a* which determine the positions to be obtained.

At the opposite part of the same rotor are disposed one or a plurality of tubular vertical cavities, which serve the purpose of receiving springs *p* and balls *t* sufficiently tensioned, depending upon the desired torque, the necessary switching for the twelve contact positions requiring merely a revolution.

Under the vertical force of the springs *p* each ball *t* adapts itself to one of the orifices distributed circularly over the surface of the disc *n* maintained in place in the wall of the body *a*.

A circular member *j* having projecting fixing plates, engaging in a circular maintenance groove *x*, assures the locking of the assembly inside of the body *a*.

The portion of the control axle *h*, which drives the contact circuits *c* and *c*1, is integral with the control axle of the commutator *m* by means of gripping or soldering or both, of the portion *g* inside of its mounting reserved for this purpose in the mass adjacent to said axle.

The control axle *h*, indicated of square cross-section for one part of its length, can be of any other form capable of increasing the insulation surrounding the mass.

Referring now, in particular, to FIGS. 1 and 2, a first embodiment of the rotating commutator having multiple contacts and designed in accordance with the present invention, is disclosed.

It comprises two types of different circuit plates *c* and c_1 doubled by a disc and secured by means of rivets *o* to the rotor *r*, which drives the control axle *h*.

Two of these circuit plates are without continuous contact, their enlarged part forming contact engagement incapable of successively having contact only on one of the peripheral points *b* of contact, thus destroying with each change of position the continuity of the contacts with the corresponding point b^1 of the center part.

The third circuit represented by c^1 is a continuation of contact, its contact engagement being increased by dimensions which it can carry, without interruption, on one of the exterior double contacts *b*, thus assuring the con-

tact continuity with the interior point b^1, without diminishing the insulation between one and any of the other points.

The extremities of the circuits have rounded-up angles and the parts forming the engagement contact are at their edge slightly raised in order to facilitate the entrance thereof with the fixed elements of the stator.

The fixed double contacts *b* and *b*1 disposed parallel relative to the external part and inside of the circular arch forming the circuits *c* and c^1, are supported at the edge of the latter, in order to establish the contacts.

These elements of fixed contacts *b* and *b*1 are disposed in openings *l* arranged vertically and horizontally in the portion of the stator *s* where the rotor *r* is arranged and its contact circuits *c* and c_1.

The base of the stator *s* is radially grooved, in order to receive in the aired recesses the horizontal portion of the fixed contacts *b* and *b*1.

An insulating plate *v*, provided on the stator *s* by means of rivets *k*, maintains the contact elements in the best supporting position.

The fixed contacts *b* and *b*1 are made of silver threads, of precious metal, alloys or laminated metal, cut and treated, in order to give the same a degree of resistance against bending, assuring best contacts for support, regardless what the duration may be, the fixed elements being capable of being single, double or triple contacts, or more, if the dimensions of the commutator permit the same.

As indicated in FIGS. 1 and 2 of the drawings, the rotary commutator is equipped for twelve positions providing for each revolution the same number of double contacts. This number is not limited and can be reduced or increased, in accordance with the surface which is available.

It permits to make the following classic or complex combinations:

One circuit per revolution, with 2–11 active positions and the 12th being a stop;

Two circuits per revolution, with twice 2–5 active positions and the 6th being a stop;

Three circuits per revolution, with three times 2–3 active positions and the 4th being a stop;

Four circuits per revolution, with four times 2 active positions, and the third being a stop.

By an appropriate stop, the form of each circuit can consist on its arch of a variety of contacts rendering possible the least habitual combinations.

Referring now to FIG. 3, one embodiment of the present invention is disclosed, which differs from the preceding, described embodiment merely by the disposition of the contacts *b* and *b*1, at its start and at its end.

A portion *y* consisting of a radial groove identical with that of the stator *s* is intermediately provided in order to receive therein the same form of 12 central contacts b^1, which permit the use of openings of the outer portion.

The commutator as shown in FIG. 3, is likewise equipped with twelve positions, can provide the following combinations without excluding all other classic or more complex combinations:

One circuit per revolution, with one of 2–12 active positions, with or without stop;

Two circuits per revolution, with twice 2–6 active positions, stops included;

Three circuits per revolution, with three times 2–4 active positions, stops included;

Four circuits per revolution, with twice 2–3 active positions, stops included;

Six circuits per revolution, with six times 2 active positions, stops included.

Referring now again to the drawings, and in particular to FIGS. 5 and 6, another embodiment is disclosed, wherein the thickness of the stator *s* can be reduced by a different arrangement given to the contact elements *b*2 and

then bent and permitting the arrangement of all combinations without requiring recourse to different models.

Referring now to FIG. 7, which likewise provides a different embodiment of the present invention, comprises a simplified contact element, which is limited itself to four principal portions. A flask *v* covers the segments *b*2 and guides over a great length the rotor *r*. The stator *s* maintains the segments *b*3 and *b*2 nearly over their entire length. The rotor *r* is controlled by the axle *h* and the flask **3** closes the structure.

The assembly of the flask *v* on the stator *s* is obtained by means of rivets of insulating material, which are mounted or riveted in a hot state. Openings l^1 are arranged in the insulating mass of the stator *s*, in order to locate therein the portions of the contact segments which remain free. These contact segments, of any appropriate formation, are made of laminated metal for a single contact or grooved along a portion of their length, in order to provide a double contact, their extremity being lightly lifted, in order to facilitate the passage of the circuits *c* below the segments. They can be doubled by a spring of hard metal, hardened and designed to increase their power of the contact.

This embodiment permits the use of a mounting of completely controlled and finished elements before the contact element receives the locking in the position.

Another embodiment of the same type of commutator is disclosed in FIG. 8. It utilizes the same contacts in the same openings, except for the contact segments *b*4 engaging the surface of the circuits *c* and *c*1 and not by engagement with their rim.

This contact element is neither tight nor closed.

The stator *s* has two securing plates 14 permitting the passage of securing rods, the contact segments *b*3 being slotted over their length, in order to assure a double contact at the external portion of the circuits *c* and *c*1, so that the contacts *b*4 contacts the circuits *c* on the surface by traversing the openings **1**.

All contact segments are secured to the stator *s* by rivets **16**, which traverse the stator through the opening **15**. The circuit plates *c* and *c*1 are fixed by rivets on the rotor *r* which comprises two horizontal parts.

These two parts of the rotor *r* are centered and guided by rings **21** and their clamping on the control axis *h* is obtained by annular springs **19**, the two parts of the rotor having slots **18**.

By covering an insulating disc between the two parts of the rotor the circuits *c*, mounted opposite each of the two parts, can be equipped with a double insulation.

In the two last embodiments, a coil spring **20** is placed in the rounded portions of the segments *b*2 and *b*3, in order to increase the contact force against the circuits *c* and *c*1.

Small radial bosses or high portions, disposed at the surface of the circuits *c* and *c*1, on which they engage the segments *b*4 (FIG. 8), without diminishing the contact stability, provide, due to the possibility for reduction of the contact surface, a resistance nearly nil for the small and medium intensities.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. A rotary commutator miniature switch, with improved contact structure, comprising

two annular discs in juxtaposed position,

one of said discs including a control axle, secured thereto,

spring means for locking and associated with said one of said discs in a plurality of contact positions,

a ball complementary to and locating each contact position and to maintain the respective contact positions,

circuit means including a plate having three portions,
a rotor supporting and securing said three portions,
each of said portions including a circuit of mobile contacts, adapted to be disposed opposite of fixed contacts,
two of said circuits having no continuous contact, and
a third of said circuits having continuous contact, so that contact continuity through at least one of said portions is assured.

2. The switch, as set forth in claim **1**, wherein
said mobile contacts comprise metallic segments at least partly grooved.

3. The switch, as set forth in claim **1**, which includes
twelve contacts in said circuit means per revolution of said rotor.

4. The switch, as set forth in claim **1**, wherein
said metallic contact segments, maintained at different planes in their horizontal portion, are separated by an insulating grooved plate, in order to permit the utilization more complete of mobile circuits and fixed contact points.

5. The switch, as set forth in claim **1**, wherein
said rotor consists of two identical portions disposed adjacent to each other horizontally,
each of said portions supporting a circuit of mobile contacts, and
an insulating plate inserted between said portions in their assembled position to increase the insulation.

6. The switch, as set forth in claim **5**, which includes
fixed double contacts in recesses of each of said portions,
a portion of said segments engaging the surface of said mobile circuits.

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ROBERT K. SCHAEFER, *Primary Examiner.*
J. R. SCOTT, *Assistant Examiner.*