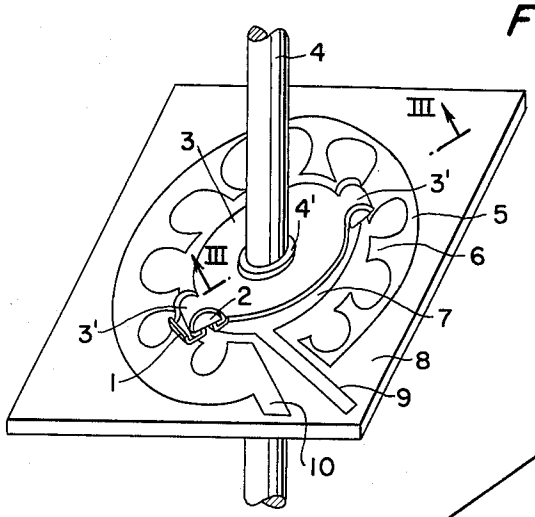
Dec. 28, 1965 KOUJI SEKI 3,226,495

ROTARY SWITCH STRUCTURE WITH SADDLE-SHAPED INSULATOR AND TWO-LEGGED CONTACT BRUSH

Filed Oct. 2, 1963

FIG. 1



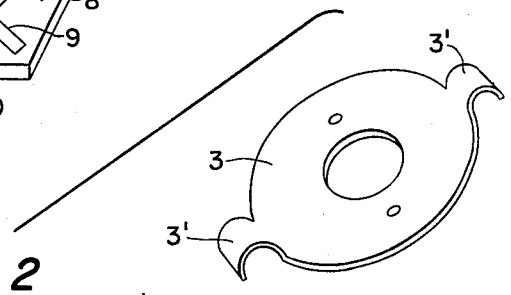
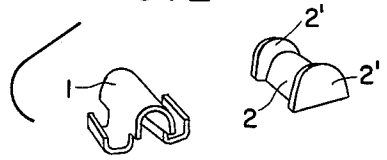


FIG. 2



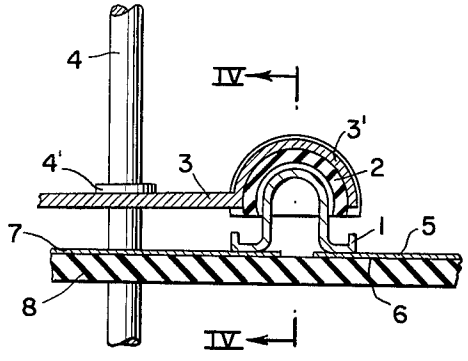


FIG. 3

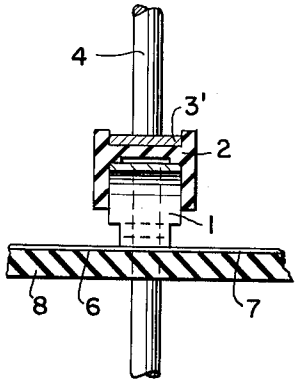


FIG. 4

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3,226,495

ROTARY SWITCH STRUCTURE WITH SADDLE-SHAPED INSULATOR AND TWO-LEGGED CONTACT BRUSH

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Claims priority, application Japan, Oct. 4, 1962, 37/58,059
7 Claims. (Cl. 200—11)

My invention relates to rotary switches particularly for channel selection in miniaturized television tuners or other switching functions in high-frequency circuits.

Television tuners may be miniaturized by forming the stators of the rotary channel selection switches from plate-mounted printed wiring which exhibits the required inductances and stray capacities between intermediate contact members, or by connecting the required inductances and capacitances between contact members. Such rotary switches are then suitable for switching the television radio-frequency circuits, the mixer input and the local oscillator of a television set. However, the extent of miniaturization is still limited.

It is an object of my invention to provide a rotary switch which is smaller than those hitherto known and yet is capable of performing the function of larger devices.

More specifically, it is an object of my invention to provide a rotary switch with miniaturized brush contacts which selectively connect the contact members of the stator.

Yet another object of the invention is to provide a miniaturized rotary switch having a contactor device which is smaller than hitherto known but yet assures secure contact of the rotary switch contactor parts.

To these ends and in accordance with a feature of my invention, I mount a shaft on the printed-wiring board holding the tuner circuits and print on the board a plurality of contact members circumferentially arranged about a contact ring. I then place a movable brush in such a position as to engage the contact ring and be engageable successively with the respective contact members, and I press the brush against the printed wiring ring and members with a resilient spring member mounted for rotation upon the shaft, while separating the spring member from the brush with an insulating material.

These and other features will be pointed out in the claims. Other objects and advantages of the invention will become obvious from the following detailed description when read in light of the accompanying drawing, wherein:

FIG. 1 is a perspective view of the printed rotary switch embodying features of the invention;

FIG. 2 is an exploded perspective view of a switch contactor brush in FIG. 1;

FIG. 3 is a section taken along the lines III–III of FIG. 1; and

FIG. 4 is a section taken along the lines IV–IV of FIG. 3.

In the drawings, two omega-shaped contactor brushes **1** each carry a saddle-shaped insulator **2** having retainer ends **2'** fitting over the brush ends. A circular sheet spring **3** presses downwardly upon the insulators **2** and the brushes **1** by means of two diametrically arranged retaining members **3'** extending radially therefrom and embracing the center portion of the saddle-shaped insulators **2** between the retaining ends **2'**. In this manner, lateral circular motion of the sheet spring **3** will move the brushes in a circle. Downward pressure upon the spring **3** is applied by a collar **4'** mounted on a shaft **4**. The latter is keyed to the center of the sheet spring **3** and passes through a base plate **8** on which the shaft **4** is

mounted by means of a bearing (not shown) which axially fixes the shaft but permits it to rotate. Printed upon the top surface of plate **8** by normal printed-wiring techniques are nine series connected printed-wiring-elements **5** arranged arcuately and coaxially about the shaft **4** and constituting the circuitry of a tuner. Contacts **6** extending radially inward from the mutual joining points of elements **5** are also formed by printed-wiring techniques. An annular contact ring **7** is printed by known means upon the upper surface of plate **8** so as to be coaxial with the shaft **4**. The inner ends of respective contact points **6** are spaced equally from the outer circumference of ring **7**. As shown in the drawings, the two legs of each brush **1** press respectively against the ring **7** and one contact point **6**, thereby connecting them to each other. Suitable printed connector leads **9** and **10** pass outwardly from one end of the circular path formed by elements **5** and from the annular ring **7**.

The contactor brushes **1** connecting the contact points **6** with contactor ring **7**, the saddle-shaped insulator **2**, and the sheet spring **3** are constructed so that in operation both brush legs press against their respective printed surfaces **6, 7** with equal force.

In operation, an operator turns the shaft **4** by means of a knob (not shown) to select a channel. The shaft **4** turns the spring **3** whose retainers **3'** push against the insulator ends **2'** so as to move the insulators **2** and the brushes **1** along a circular path. The brushes then connect the adjacent points **6** with the ring **7** in consecutive order until the brush **1** contacts the particular contact **6** which corresponds to tuning to the desired channel. If desired known means (not shown) can be provided to temporarily hold the shaft **4** in discrete contact positions, each corresponding to one brush contacting one contact point **6** and hence corresponding to the desired channel connection.

The resulting assembled device may be simply constructed out of few parts and achieves a device which avoids fatigue and poor contact. This is particularly so because the spring member **3** is constituted of a material particularly suitable for providing spring pressure whereas the contact brush **1** is comprised of another material particularly suitable for brushes. The device is thus particularly suitable for overall miniaturization of high-frequency circuits.

The invention contemplates that the shaft **4** simultaneously actuates the device of FIG. 1 together with several devices identical with FIG. 1 and having boards **8** parallel to the board **8** of FIG. 1. Thus a single ganged device composed of several switches is available for simultaneously switching various circuits such as the RF circuit and the local oscillator circuit as well as the converter circuit in a television or high-frequency tuning circuit.

While embodiments of the invention have been described in detail it will be obvious to those skilled in the art that the invention may be otherwise practiced without departing from its spirit and scope.

I claim:

1. A rotary switch comprising an insulating base plate, a conducting circular ring printed on said base plate, a plurality of conducting contact means printed on said base plate and spaced circumferentially about said ring, a plurality of circuit means printed on said base plate, each of said circuit means connecting adjacent ones of said contact means and being arranged circumferentially about said ring, a shaft rotatably mounted on the base plate at the center of said ring, a movable contactor brush engaging said ring and engageable with successive ones of said contact means, a saddle-shaped insulator embracing said brush, resilient means rotatable with said shaft pressing said insulator and said brush against said base plate.

2. A rotary switch comprising an insulating base plate, a conducting circular ring printed on said base plate, a plurality of conducting contact means printed on said base plate and spaced circumferentially about said ring, said contact means each being elongated and extending toward said ring, a plurality of circuit means printed on said base plate, each of said circuit means connecting the outer radial ends of adjacent ones of said contact means and being arranged circumferentially about said ring, a shaft rotatably mounted on the base plate at the center of said ring, a movable contactor brush engaging said ring and engageable with successive ones of said contact means at the inner radial ends thereof, a saddle-shaped insulator embracing said brush, resilient means rotatable with said shaft pressing said insulator and said brush against the base plate, said resilient means being circumferentially rigid so as to move said brush and insulator circularly in response to rotation of said shaft.

3. A rotary switch comprising an insulating base plate, a conducting ring printed on said base plate, a plurality of conducting contacting means printed on said base plate and spaced circumferentially about said ring, a plurality of circuit means printed on said plate, each of said circuit means connecting different ones of said contact means and being arranged circumferentially about said ring, a shaft rotatably mounted on the base plate at the center of said ring, a pair of movable contactor brushes engaging said ring and being each engageable with successive ones of said contact means on diametrically opposite sides of said shaft, a pair of saddle-shaped insulators each embracing a corresponding one of said brushes, a flat resilient plate secured to said shaft and having diametrically opposite retainer means pressing each of said insulators and each of said brushes against the base plate.

4. A rotary switch comprising an insulating base plate, a conducting ring printed on said base plate, a plurality of conducting contacting means printed on said base plate and spaced circumferentially about said ring, a plurality of circuit means printed on said plate, each of said circuit means connecting different ones of said contact means and being arranged circumferentially about said ring, a shaft rotatably mounted on the base plate at the center of said ring, a plurality of movable contactor brushes engaging said ring and being each engageable with successive ones of said contact means, a plurality of saddle-shaped insulators each embracing a corresponding one of said brushes, a flat resilient plate secured to said shaft and having retainer means pressing each of said insulators and each of said brushes against the base plate.

5. A rotary switch comprising an insulating base plate, a conducting circular ring printed on said base plate, a plurality of conducting contact means printed on said base plate and spaced circumferentially about said ring,

a plurality of circuit means printed on said base plate, each of said circuit means connecting adjacent ones of said contact means and being arranged circumferentially about said ring, a shaft rotatably mounted on the base plate at the center of said ring, a plurality of movable contactor brushes each having two legs and engaging said ring with one leg and engageable with the other leg with successive ones of said contact means, a plurality of saddle-shaped insulators each embracing a corresponding one of said brushes about its upper and lateral surfaces and having end projections extending above the center portions thereof, a disc spring secured at its center to said shaft and having radially extending retainer members embracing the center portion of said saddle-shaped insulators between said end projections on each of said insulators so as to press said insulators and said brushes against said base plate.

6. A rotary switch comprising an insulating base plate, a conducting circular ring printed on said base plate, a plurality of angularly-spaced conducting contact means printed on said base plate and extending radially outward from locations spaced from said ring, a plurality of circuit means printed on said base plate, each of said circuit means connecting the outer radial ends of adjacent ones of said contact means and being arranged circumferentially about said ring, a shaft rotatably mounted on the base plate at the center of said ring, a plurality of movable contactor brushes each having two legs and engaging said ring with one leg and engageable with the other leg with successive ones of said contact means, a plurality of saddle-shaped insulators each embracing a corresponding one of said brushes about its upper and lateral surfaces and having end projections extending above the center portions thereof, a disc spring secured at its center to said shaft and having radially extending retainer members embracing the center portion of said saddle-shaped insulators between said end projections on each of said insulators so as to press said insulators and said brushes against said base plate.

7. A rotary switch as claimed in claim 1, wherein said brush has two legs and engages said ring with one leg and engages with the other leg successive ones of said contact means.

References Cited by the Examiner

UNITED STATES PATENTS

1,624,374	4/1927	Swoboda	200—11
2,805,291	9/1957	Eickhorst	200—11
2,847,523	8/1958	Van Amelsfort	200—11
2,853,564	9/1958	Gahagan.	

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