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ELECTRIC SWITCH

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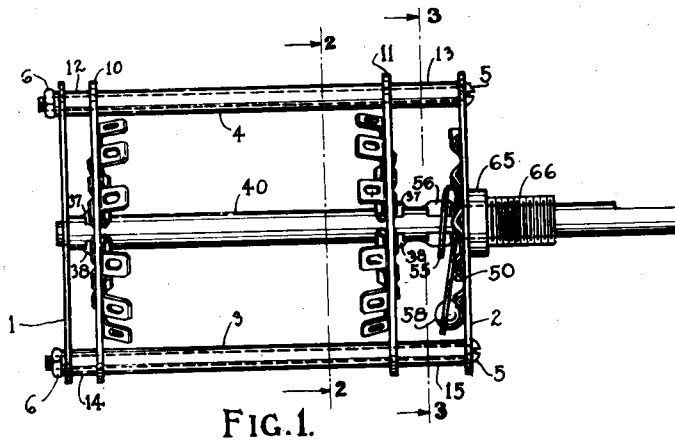


FIG. 1.

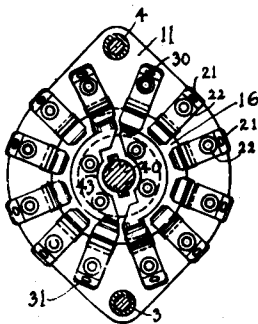


FIG. 2.

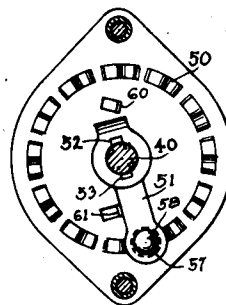


FIG. 3.

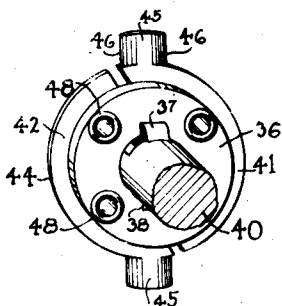


FIG. 4.

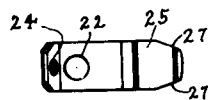


FIG. 5.



FIG. 6.

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## UNITED STATES PATENT OFFICE

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## ELECTRIC SWITCH

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13 Claims. (Cl. 200—11)

This invention relates to an electric switch and especially to a switch useful for handling minute potentials. In radio receivers of the type having a plurality of sets of transformers for use over a plurality of wave bands, it is necessary that suitable switching mechanism be provided to cut in and out various coils or condensers. Because of the minute potentials and currents, it is essential that the switch provide good contact. In addition, it is desirable that the switch be simple, and cheap to manufacture and not get out of order.

Referring to the drawing, Figure 1 is a side view of a switch.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 1.

Figure 4 is a detail of the rotor, while Figures 5 and 6 are detailed views of the stationary contact elements.

The switch may have any suitable frame and as illustrated, comprises a pair of rigid plates 1 and 2, supported in spaced relationship by sleeves 3 and 4. Passing through each of the sleeves is a bolt 5, having a nut 6, threaded on the end thereof. On the opposite ends of sleeves 3 and 4 and over the bolts 5, is a pair of switch plates 10 and 11.

Beyond these plates are small sleeve sections, 12, 13, 14, and 15, bridging the spaces between plates 10 and 11 and end plates 1 and 2.

Since switching plates 10 and 11 are similar, only one will be described.

Plate 10 is preferably of some rigid insulation material such as bakelite and is provided with an interior open region 16. Disposed on plate 10 around region 16 are a plurality of contact members 21. These contact members are preferably riveted or eyeleted to plate 10 at 22. Contact member 21 has a lug 23 provided with an aperture 24 into which any suitable connections may be soldered.

Beyond rivet 22 the contact member flares out to form a pair of jaws 25 and 26. The sides of the jaws are preferably tapered, inwardly at 27 and terminate in a pair of contact edges 28 and 29. The entire contact member 21, is preferably made of some spring material such as brass or phosphor bronze and because of its resiliency, tends to keep contact edges 28 and 29 tightly pressed together.

It will be noted that the contact members 21 are symmetrically disposed on plate 10 so that the contact edges 28 and 29 are tangent to the arc of a circle.

Certain of the contact members such as 30 and

31 may be provided with jaws 25 and 26 which are slightly larger than the jaws of the other contact members so that the contact edges 28 and 29 of these members extend further in toward the center of the region than the contact members 21. The purpose of this will appear later.

Cooperating with each of the switch plates 10 and 11, is a rotor 36 of rigid insulating material such as bakelite or the like. This rotor has an aperture in the center thereof and a pair of diametrically opposed recesses 37 and 38. A shaft, 40, is adapted to pass through aperture 36 and has the material thereof distorted at the rotor so that recesses 37 and 38 are filled by the shaft. In this way, rotation of shaft 40 will cause rotor 36 to turn but will permit the rotor to float on the shaft to some extent.

Rotor 36 carries a pair of contact plates 41 and 42 each one insulated from the other. These plates have their inner edges 43 cut to clear shaft 40 and their outer edges form a circle 44. Each plate 41 and 42 is provided with an outwardly extending tongue 45, the sides of which are ground to knife edges 46. The two contact plates 41 and 42 are rigidly maintained on rotors 45 by means of rivets 48.

With rotor 36 in position in region 16 of contact plate 10, it will be noted that contact members 30 and 31 extend beyond the circular contour 44 of the contact plates 41 and 42 and thus remain in contact with one or the other of these plates at all times. This may be useful for establishing a ground connection.

Tongues 45, however, are adapted to cooperate with contact edges 28 and 29 of the rest of the contact members 21. Due to the knife edges of the sides of tongues 45 as well as the shape of jaws 25 and 26, tongues 45 can be rotated to be gripped by any desired set of contact edges 28 and 29. Because of the cutting action, and the tangency of the jaw edges, any rotation of shaft 40 will cause the contact edges 28 and 29 to bite into the metal of the rotor with both a cutting and sweeping action and thus establish a firm clean contact. The same is true of circular portion 44 and the two contact members 30 and 31.

It is obvious that rotor 36 may have more than 2 contact plates and may be provided with more or less of the tongues 45. Also any number of contact members 21, 30 and 31 may be provided. Obviously the fixed contacts may be disposed on the rotor and the flat contact strips on the frame.

In order to provide a simple and convenient means for forcing a switch to assume one of a definite switching positions plate 2 is provided

with a plurality of struck up portions 50. These portions are symmetrically disposed in a circle around shaft 40 and pass through this plate. A spring member 51, is adapted to be rotated by shaft 40. Any suitable means may be provided to effect this, such as a pair of wings 52 and 53 provided in shaft 40 and fitting into a pair of slots in spring 51, this construction being similar to the switch rotor. Spring 51 has its inner end, 55, bent over and locked by wings 56, struck out from shaft 40. The outer end of spring 51 is provided with an aperture 57 which is adapted to maintain a ball bearing 58 struck up portions 50. It is clear that spring 51 will tend to turn shaft 40 so that ball bearing 58 is between two adjacent struck up portions 50 on plate 2. A pair of ears may be struck up from plate 2 in such a way as to act as stops for spring 51. In order to mount the switch on a panel, a bushing 65 having a sleeve may be provided.

The above described stop is more fully described and claimed in the copending application of William Major, filed June 22, 1934.

We claim:

1. A switch comprising a pair of end members in spaced parallel planes, a plurality of insulating stator plates in parallel planes intermediate said end plates, bolts passing through said end and stator plates, sleeves surrounding the exposed portions of said bolts and maintaining said end and stator plates in predetermined fixed relationship, a shaft rotatably supported by said end plates and passing through said stator plates, said stator plates having suitable apertures defining a free region around the portion of the shaft in proximity thereto, a series of fixed contacts mounted on each stator plate, said contacts being disposed on the circumference of a circle concentric with the shaft, said shaft having a non-circular cross-section at least in the regions surrounded by said stator plates, a rotor for each stator plate, said rotor comprising an insulating disc having an aperture therethrough, said aperture being non-circular and similar in cross-section to that of the shaft in proximity to said stator plates, whereby said rotor may be readily moved longitudinally of said shaft but is rotated therewith, a plurality of contacts rigidly secured to said insulating disc, the contacts on one rotor only being adapted to cooperate with the contacts on one stator only so that in one position certain of said contacts cooperate and when said rotor is turned other contacts cooperate, one set of said series of cooperating contacts being blade-like, while the other set of said series of contacts is yoke-shaped and adapted to press on the opposite sides of said bladelike contacts.

2. The structure of claim 1, wherein the stator series of contacts is yoke-like and cooperates with the opposite sides of the rotor contacts.

3. The structure of claim 1, wherein certain of said stator contacts have their active switching surfaces further in toward the shaft than others, whereby a larger contact angle is secured.

4. In an electric switch structure, two spaced bases in parallel planes, one of said bases having index indentations circumferentially arranged, a shaft mounted in said bases, an index spring arm mounted on said shaft and means for rotatively coupling said shaft and spring arm only when said switch is in its assembled condition, and uncoupling said arm when said index base is moved away from said switch structure preparatory to disassembly.

5. The structure of claim 4, wherein said shaft

is composed of at least two portions, one portion having a non-circular cross-section which said spring arm engages during normal assembled position, and another portion of circular cross-section which said arm engages when said index base is backed away.

6. An electric switch comprising a front plate having index indentations circumferentially arranged, a rear base parallel to said front base and spaced therefrom, a plurality of flat stator plates disposed in parallel planes between said two base plates and in line therewith, a plurality of bolts passing through said base and stator plates and maintaining them in assembled relation, sleeves over the exposed portions of said bolts between adjacent stator plates and end plates to maintain the members in spaced position, each of said stator plates having an open central region, a plurality of yoke-like stationary contacts circumferentially arranged on each stator plate around said open region, a shaft rotatably mounted in said base plates and passing through the open regions in said stator plates, a rotor for each stator plate, each rotor comprising an insulating disc and a non-circular aperture centrally disposed thereof through which said shaft passes, at least a portion of said shaft passing through each insulating disc having a cross-section similar to the aperture in said disc whereby said disc is rotatably secured to said shaft but is capable of longitudinal movement, and a plurality of flat contacts mounted on said insulating disc of said rotor and adapted to cooperate with the contacts of a corresponding stator, and a spring arm mounted on said shaft adjacent said front plate rotatably secured to said shaft and adapted to cooperate with said index indentations.

7. An electric switch comprising a pair of spaced parallel base plates, at least one flat stator plate disposed between said base plates and spaced therefrom, bolts passing through said base and stator plates, sleeves surrounding the exposed portions of said bolts only, maintaining said plates in spaced relationship, said stator plate having an interior open region, a plurality of fixed contacts circumferentially arranged on said stator plate around said open region, a round shaft rotatably secured in said two base plates, a rotor comprising a flat disc carrying a plurality of contacts mounted on said shaft, said rotor being adapted to cooperate with said stator, said rotor having a circumferential aperture through which said shaft passes, and at least one notch cut in said rotor at the circumference of said aperture and at least one protuberance on said shaft adjacent said stator adapted to cooperate with the notch on said rotor for rotatably locking said rotor to said shaft while permitting longitudinal movement thereof.

8. The structure of claim 7, wherein one of said end plates has a plurality of circumferentially arranged indentations around said shaft for index purposes and a spring arm rotatably locked to said shaft and cooperating with said indentations.

9. The switch of claim 1 wherein said stator contacts each comprise a doubled strip of spring metal having a body portion for mounting on said stator, a connecting portion extending from one side of said body portion away from said shaft and adapted to have wires soldered thereto, and a contacting portion extending from the opposite side of the body portion in toward said shaft, said connecting and body portions having the two

thicknesses of metal in contacting relation, said contacting portion having the two metal layers bent away from each other with their free edges turned toward and opposite each other and adapted to grip the movable contact therebetween.

10. An electric switch comprising a rotor having a plurality of flat contacts thereon adapted to be moved in their own plane, a stator having a plurality of contacts mounted thereon, each contact comprising a doubled strip of spring metal forming a body portion for mounting on said stator, a connecting portion extending from said body portion at one side thereof said body and connecting portions having the two thicknesses of metal pressed together and a contacting portion extending from said body portion at the other side, said contacting portion having the two strips of spring metal bent outwardly from each other with their free edges approaching each other on opposite sides of said rotor to form a knife edge contact on both sides of said movable contact.

11. A multi-section switch comprising a plurality of insulating stator disks each of said disks having a large central aperture and a plurality of smaller mounting apertures, a series of stationary contacts carried by each disk and disposed around said central aperture, bolts passing through said mounting apertures and sleeves surrounding the exposed portions of each bolt between disks for maintaining said disks in predetermined spaced relation, a shaft, means for ro-

tatively mounting said shaft so that it passes through the central apertures of said disks, said shaft having a non-circular cross section at least at the portions thereof passing through each disk, a rotor disk of insulating material for each of the stator disks, a series of contacts carried by each rotor disk, each rotor disk having a non-circular aperture corresponding to the cross section of the shaft whereby each rotor disk is rotatively secured to said shaft but is transversely movable along said shaft to adjust itself to irregularities in the alignment of said stator disks, said stationary and movable contacts cooperating so that as said rotor disks are turned a switching action is obtained.

12. The switch of claim 11 wherein an end plate is provided through which said bolts pass, said end plate having an indexing means including an arm having a non-circular aperture through which said shaft passes, said shaft having a non-circular cross section to rotatively engage said arm.

13. The switch of claim 11 wherein one of said two series of cooperating contacts of each switching section includes means for maintaining the stator and rotor disks of each section in cooperative relationship whereby when said shaft is withdrawn from a section, each switching section will remain in place.

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