Oct. 10, 1933. A. HALL 1,929,492

ELECTRIC SWITCH

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Fig. 1

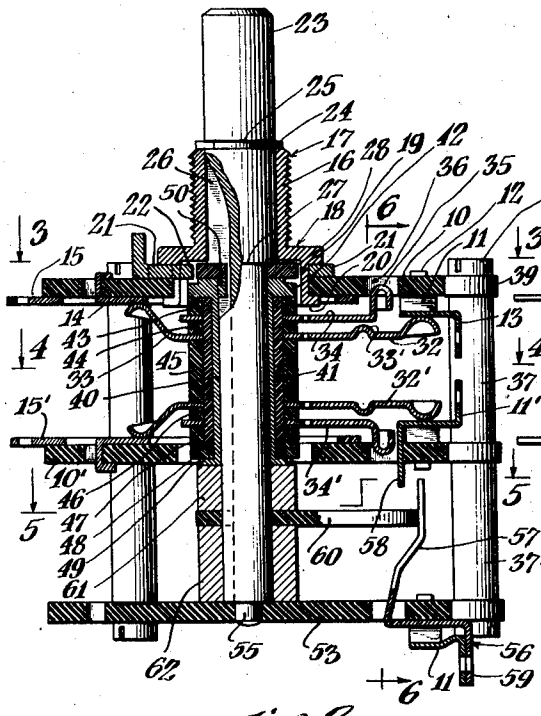


Fig. 2

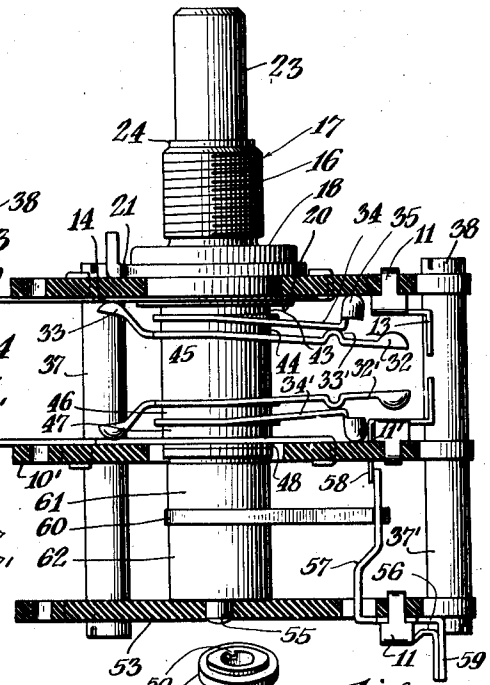


Fig. 3

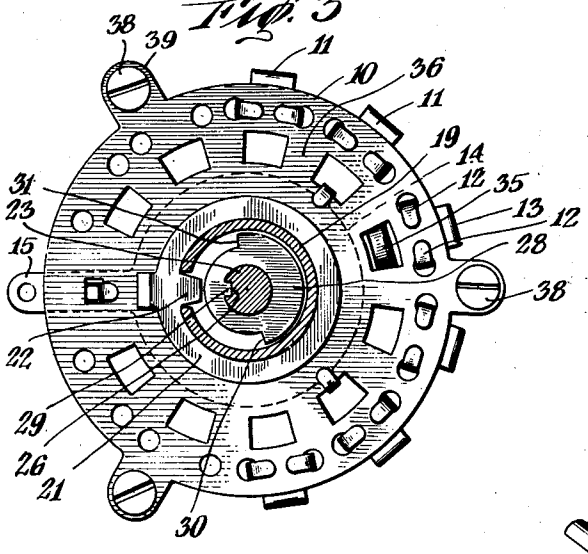
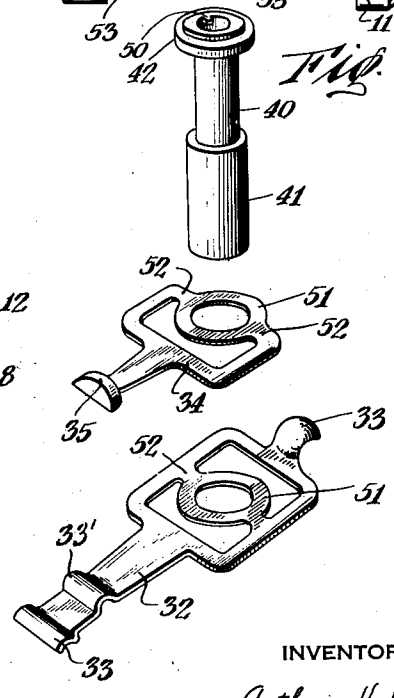


Fig. 7



INVENTOR

BY Arthur Hall

Watson, Bristol, Johnson & Leavenworth

ATTORNEYS

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Fig. 4

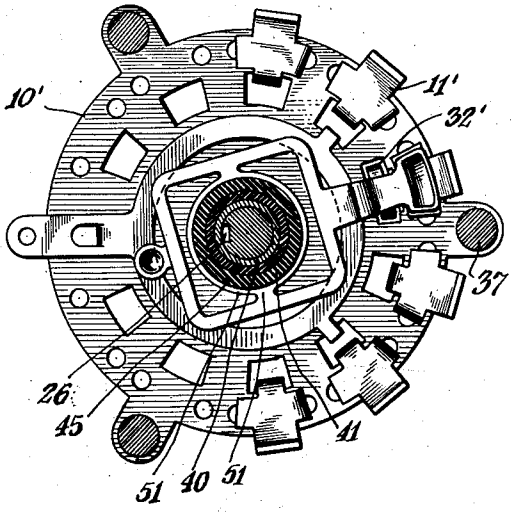


Fig. 6

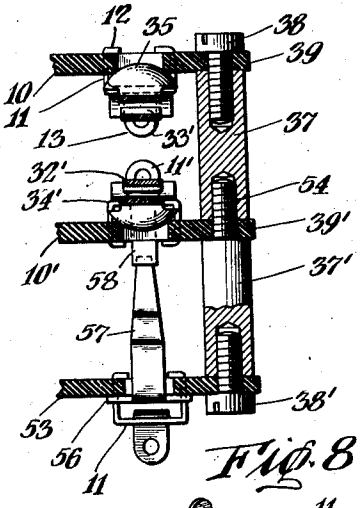


Fig. 8

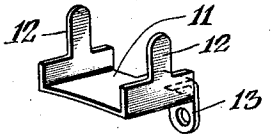
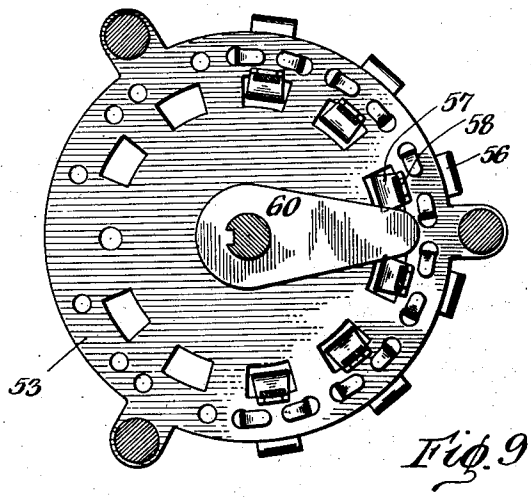


Fig. 5



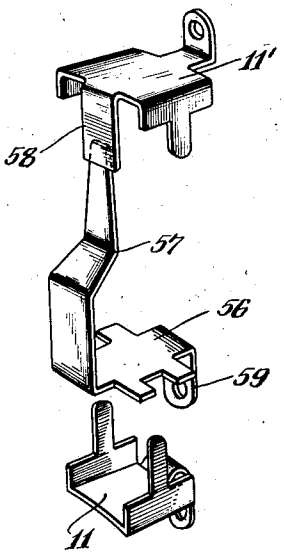
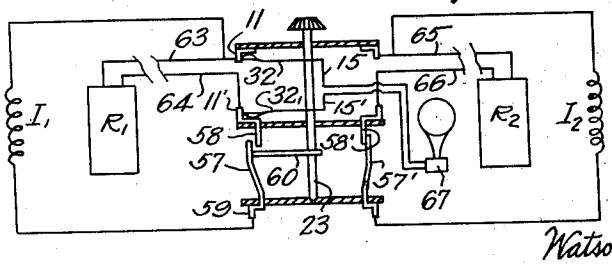


Fig. 9



INVENTOR

BY Arthur Hall

Watson, Bristol, Johnson & Leavenworth

ATTORNEYS

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ELECTRIC SWITCH

Arthur Hall, Oak Park, Ill., assignor to Yaxley Manufacturing Company, Chicago, Ill., a corporation of Indiana

Application January 8, 1932. Serial No. 585,463

1 Claim. (Cl. 200—7)

This invention relates to electric switches and has for a general object the provision of such a device which is compact in structure, efficient in operation and can be cheaply manufactured and easily assembled.

More specifically, the present invention contemplates the provision of electric switch devices which are capable of efficient circuit selection and simultaneous breaking of auxiliary circuits by simple manipulation of an operating member, and particular objects of the invention are the provisions of combinations and sub-combinations of elements useful both effectively to attain this general end and to perform certain subsidiary steps and operations involved therein.

Another object of the invention is the provision of such a switch having a plurality of circuit banks and a breaker bank, the contacts of the latter being normally closed but associated with a circuit bank operating member in a manner to be selectively opened when the circuit banks are operated.

A further object of the invention is the provision in such a device of an internal stop adapted to govern the maximum range of travel of a contact arm operating member.

An additional object of the invention is the provision in such a device of a flexible contact arm and a pick-up member associated therewith in a manner to cause the former in operation to be lifted clear of a contact and dropped down upon an adjacent contact.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claim.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a sectional elevation of the assembled three-bank switch of the present invention, with parts broken away and showing the contact arms and breaker arm in one operative position;

Fig. 2 is another sectional elevation of the device depicted in Fig. 1 showing the contact arms and breaker arm in another operative position;

Fig. 3 is a sectional plan view on line 3—3 of Fig. 1;

Fig. 4 is a sectional plan view on line 4—4 of Fig. 1;

Fig. 5 is a sectional plan view on line 5—5 of Fig. 1;

Fig. 6 is a sectional elevational view on line 6—6 of Fig. 1 with parts broken away;

Fig. 7 is an exploded perspective of the contact arm collar and the parts of one circuit bank contact arm unit to be mounted thereon;

Fig. 8 is a partially exploded enlarged perspective of one vertical row of circuit and breaker contacts of the three-bank switch of the present invention showing their relative positions in the assembly; and

Fig. 9 depicts a circuit in which the switch of the present invention may be used, the structure being shown in simplified manner and with parts in section.

Prior to the present invention electric switches have been chiefly characterized by travel stops positioned to engage the contact arm giving rise to a tendency of displacement of the contact arm from a predetermined position; a wiping action between the row of contacts and the contact arm or, when it has been attempted to eliminate this wiping action, strain of the switch arm; complex structures making manufacture and assembly difficult and expensive; and other and various undesirable features. The device of the present invention obviates these and other difficulties of the prior art and insures the efficient attainment of desired ends.

Referring to the drawings, in Fig. 1 is shown a sectional elevational view of the three-bank switch of the present invention, the first bank comprising a base 10, preferably of insulating material, on which is mounted a plurality of spaced contacts 11 around the periphery thereof. Each contact 11 is preferably formed from a single stamping and is provided with anchoring means, preferably a pair of lugs 12—12, adapted to be projected through spaced holes in the insulating base 10 and clinched over in a manner such as shown in Figs. 3, 5 and 6. Each contact 11 is additionally provided with a member 13, preferably an integral tab, as shown in Figs. 1 and 8, adapted to be secured to a circuit terminal. An electrically conductive ring 14 is secured to the base 10 in any suitable manner and is provided with a projecting portion 15 adapted to receive another circuit terminal.

A bushing 16, preferably threaded at 17 to receive a threaded sleeve (not shown) adapted to cooperate with the shoulder 18 on the bushing 16 to secure the electric switch device to a panel,

is centrally mounted on the base 10 in any suitable manner, such as, for example, by means of an annular flange 19 projected through a hole in the base and spun over at 20. This structure forms a recess in the base of the switch adapted to receive a travel stop device preferably comprising a ring 21 surrounding the flange 19 and provided with an inwardly projecting stop 22 extending through a hole or slot in the flange 19 as shown in Fig. 3.

A shaft 23, having a bearing fit within the bushing 16, is provided with a projection, such as a spring ring 24 seated in a groove 25, to limit the inward longitudinal movement thereof. The shaft 23 is preferably provided with a longitudinally extending spline 26 and is reduced in diameter from a point beyond the bottom of the recess in the base to provide a shoulder 27. A stop disc 28 is provided with a hole to receive the reduced portion of the shaft 23 and a key 29 adapted to fit in the spline 26 to prevent relative rotation between the stop disc 28 and the shaft 23. When mounted in position the stop disc 28 engages the shoulder 27 as shown in Fig. 1.

The stop disc 28 is provided with a pair of spaced stops 30 and 31 preferably formed by the removal of a portion of the periphery of this disc as shown in Fig. 3. These stops 30 and 31 are adapted to cooperate with the projecting stop 22 to limit the angular movement of the shaft 23 such that the end of the contact arm, or a plurality thereof, mounted on the shaft 23 may be limited in travel to the length of the row of contacts 11 mounted on the switch base 10.

A metallic contact arm 32, preferably resilient, is mounted on the shaft 23 preferably in fixed relation thereto and insulated therefrom. This contact arm is provided with a projecting portion 33 adapted to engage the contact ring 14 and a portion 33 adapted to engage the fixed contacts 11.

To prevent a bridging action when the contact arm is moved from one fixed contact 11 to an adjacent fixed contact, a cam arm 34, preferably resilient, is mounted on the shaft 23 between the contact arm 32 and base 10. This arm 34 is provided with a portion 35 adapted to engage a cam device or an undulated path, preferably formed on the base by removing portions thereof opposite each fixed contact 11 to leave circumferentially spaced portions 36 each aligned between a pair of fixed contacts 11 as shown in Fig. 3. When the shaft 23 is rotated the portion 35 of the cam arm 34 will ride up over the portions 36 of the base causing the arm 34 to engage the projection 33' on the contact arm 32 and lift the end thereof free from the face of a fixed contact 11 as shown in Fig. 2. Upon further rotation of the shaft 23 the portion 35 of the cam arm 34 drops down gradually into the hole 36 as the contact arm 32 approaches the adjacent fixed contact 11 thus allowing the end of the contact arm 32 to make contact with the fixed contact 11 when properly aligned therewith, a condition depicted in Fig. 1. This structure prevents a bridging of adjacent fixed contacts 11 by the contact arm 32 and substantially eliminates strains thereof since the lateral stress encountered by a laterally moving member when periodically encountering obstructions over which it must ride in its travel is received by the cam arm.

The switch structure described will be termed a "bank" for convenience. Additional banks may be added to the device of the present invention to obtain as many separate circuit banks as desired operable by a single operating member, that is, the shaft, by mounting additional bases on base 10 of the first bank by suitable spacers and additional contact arm units on the extended shank of the shaft 23. In selector devices wherein an electrical device is desired to be switched from one circuit to another it is often desirable to break both sides of the circuit. This function may be performed by the electric switch of the present invention by duplicating the circuit bank including the base 10, fixed contacts 11 and contact arm 34. As shown in Fig. 1, the base 10' of the second circuit bank is spaced from base 10 of the first circuit bank by a plurality of spacers 37 preferably provided with internal threads adapted to engage screws 38 having their shanks mounted in ears 39 on the base 10 as is more clearly shown in Fig. 6.

In such structure the fixed contacts 11' of the second circuit bank are preferably mounted so as to face the series of contacts 11 mounted on the base 10 to allow the mounting of the second contact arm 32' and its associated cam arm 34' as a unit with the contact arm 32 and the cam arm 34.

A collar 40 is preferably provided for this purpose and is adapted to receive an insulating sleeve 41. The contact arms and cam arms are apertured to be received by the sleeve 41. A flange 42 provided at one end of the collar 40 provides a stop for the sleeve 41 and insulating rings govern the positions of the contact arms and the cam arms on the collar. These spacing rings comprise a ring 43 interposed between the flange 42 and the cam arm 34, a ring 44 interposed between the cam arm 34 and the contact arm 42, a ring 45 interposed between the contact arm 32 and the contact arm 32' and rings 46 and 47 similar to rings 43 and 44 respectively. A bridging ring 48 is provided at the end of the assembly and is held in position preferably by a flange 49 formed on the end of the collar 40 such that the contact arms and their associated cam arms constitute a unit. The sleeve 40 is preferably provided with an internal key 50 adapted to be received by the spline 26 such that the contact arm unit may be mounted on the shaft 23 in a fixed relation thereto.

Resilience of the contact arms and the cam arms is insured by the structure shown in Fig. 7 wherein the sleeve receiving aperture is formed in a portion 51 secured to the arm by a pair of diametrically opposed portions 52. The cam arms and contact arms are preferably formed by stamping from sheet metal, portions thereof being cut out to form the collar receiving aperture and the connecting strips 52.

It may be desirable to associate with one or more circuit banks one or more breaker banks each adapted to normally close an auxiliary circuit, or a plurality thereof, the member or members adapted to operate contacts of each breaker bank being mounted on the extended shank of the operating shaft thereby obtaining a definite relationship between the operation of the circuit bank or banks and the operation of the breaker bank or banks. When the electric switch having two circuit banks is used as a selector device in radio circuits, it may be desirable to provide means for inserting an inductance equal to that of the speaker unit when the latter is removed from the circuit, that is switched over from one circuit to another as depicted in Fig. 9. Such a feature is provided in the device of the

present invention by adding thereto a breaker bank consisting of a base 53 of insulating material spaced from the base 10' by spacers 37' preferably provided at one end with threaded shanks 54 adapted to be received through the ears 39' of the base 10' and within the internal threaded end of the spacer 37 as depicted in Fig. 6. This base 53 is preferably provided with a central aperture adapted to receive a reduced portion 55 of the end of the shaft 23.

A series of contact members 56 are mounted upon the base 53, each being provided with an elongated portion 57 projected through a hole in the base and shaped to resiliently engage a portion 58 forming a part of the fixed contact 11' as shown in Fig. 1. Each of these contact members is preferably provided with a portion 59 adapted to engage a circuit terminal and is secured to the base 53 in any desired manner, such as, for example, by a duplicate of the fixed contact 11 as shown in Figs. 2 and 8.

A breaker arm 60, insulated from the rest of the assembly and preferably formed from insulating material for this purpose, is splined upon the shaft 23 suitably positioned by collars 61 and 62 loosely mounted upon the shaft 23.

In mounting the fixed contacts 11 and 11' of the two circuit banks and the contact members 56 of the breaker banks care should be taken to carefully align them vertically such that when the contact arms 32 and 32' and the breaker arm 60 are mounted on the shaft 23 in vertical alignment the main circuits will be made and broken simultaneously with a breaking and making of the inductance circuits. This condition will be explained more fully when describing the operation of the three-bank electric switch.

An operating knob is preferably mounted upon the extending end of the shaft 23 in any suitable manner such that the shaft 23 may be rotated thereby. A three-bank electric switch constructed in the manner described above may be operated in the following manner:

If, for example, as depicted in Fig. 9 each opposed pair of fixed contacts 11 and 11' of the two circuit banks is connected to the two terminals 63 and 64 of a circuit such as an output circuit of a radio set R_1 each pair will represent the terminals of the speaker circuit of a radio set tuned to a particular broadcast. The other opposed pairs will similarly be connected to the output circuit of other radio sets tuned to receive other broadcasts such as terminals 65 and 66 of R_2 and the speaker unit 67 of the operator is connected to portions 15 and 15' forming extensions of the contact rings 14 and 14' electrically connected to the contact arms 32 and 32'. To obtain a different program, that is a different broadcast, being brought in on another radio set such as R_2, the operator merely rotates the shaft 23 so that the contact arms 32 and 32' are carried over to make contact with the desired pair of fixed contacts constituting the circuit terminals of the output circuit of the other radio set. Such operation removes an inductance, that of the speaker unit, from the one circuit and interposes it into the other circuit. This variation of inductance in the respective circuits will obviously unbalance the other speaker units which may be in the circuits. To avoid this undesirable feature, an inductance I_1 equal to that of the speaker unit is bridged across the fixed contact 11 and the terminal 59. If the contact members 58 and the circuit terminals 11 and 11' and likewise the contact arms 32 and 32' and the breaker arm 60 are properly aligned the device will interpose the inductance I_1 bridged across the contact 11 and the terminal 59 into the first mentioned circuit when the contact arms 32 and 32' are shifted to an adjacent pair of circuit terminals, since the members 57 and 58 normally tend to contact. This shifting of the contact arms 32 and 32' places the speaker 67 in the output circuit of the receiver R_2 and simultaneously cuts out the inductance I_2 since the corresponding members 57' and 58' will be separated by the breaker arm 60, as shown in Fig. 9, the inductance I_1 being substituted in the first mentioned circuit for the inductance of the speaker 67 by the closing of the contact members 57 and 58.

As has been previously pointed out contact arms 32 and 32' when being shifted from one pair of contacts 11 and 11' to an adjacent pair of contacts are lifted free therefrom by the cam arms 34 and 34' respectively, and are carried over in this position to the adjacent pair of contacts where they are allowed to drop down and contact with the adjacent pair of fixed contacts 11 and 11'.

It will thus be seen that the device of the present invention efficiently attains the objects set forth and it is to be understood that although a three-bank switch is shown, the various features of the structure are not limited to such a construction since they may obviously be used to advantage in other constructions. For example, the shaft mounting of the units, the internal stop device, adapted to govern the travel of the contact arm, and the cam structure including a separate cam arm to cooperate with the contact arm may be used advantageously in a single or plural bank switch.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claim is intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

An electric switch comprising in combination, a row of fixed contacts, a resilient contact arm movable relative to said row of fixed contacts and adapted to contact with one contact of said row at a time, a base of insulating material carrying said fixed contacts spaced from each other and having a plurality of holes each of which is positioned in front of a fixed contact, a plurality of base portions between the holes and cooperating therewith to provide an undulated path, a cam arm interposed between said base and said contact arm having a portion adapted to engage said contact arm and another portion adapted to engage said base portions and to bridge each of the series of holes when moved relative thereto, an operating shaft adapted to carry said contact arm and said cam arm in fixed relationship to each other and a stop device affixed to said shaft adapted to cooperate with a fixed stop on said base.

ARTHUR HALL.