Oct. 10, 1950 A. E. FRANKS ET AL 2,524,784

SNAP SWITCH

Filed Jan. 24, 1946 2 Sheets-Sheet 1

Fig. 1

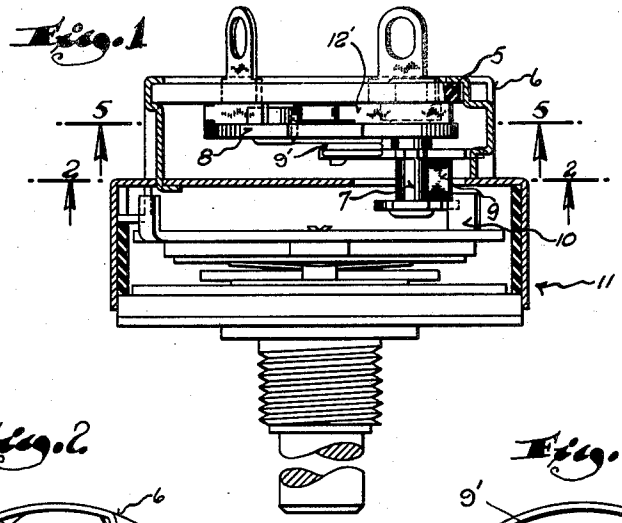


Fig. 2

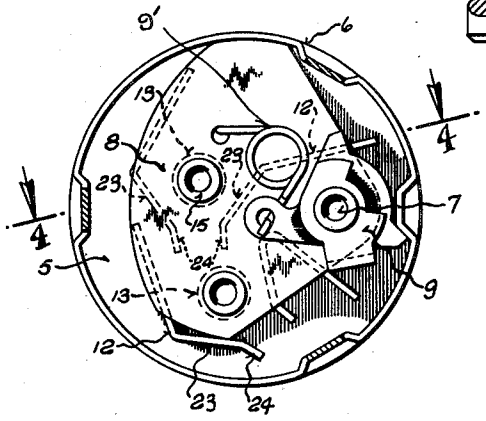


Fig. 3

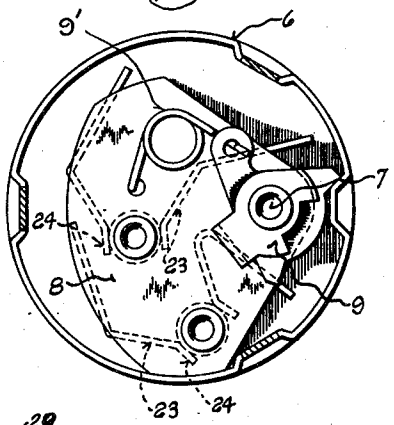
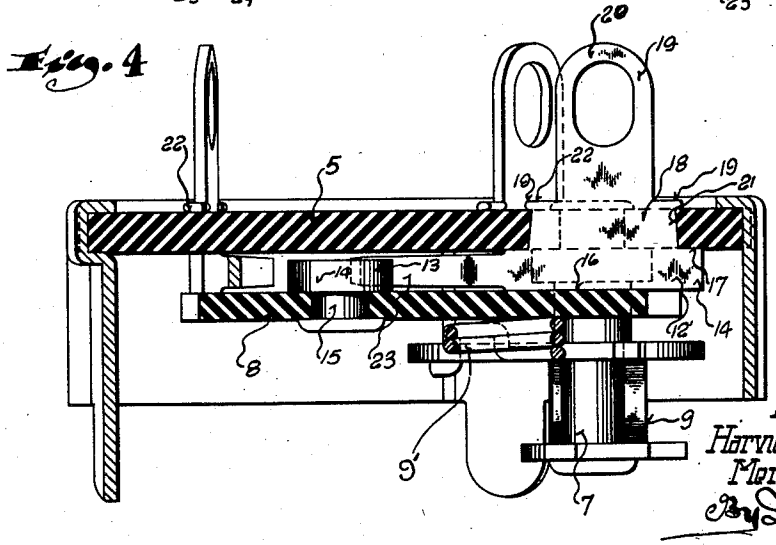


Fig. 4



Inventor
Albert E. Franks
Harville Lees Rawlings
Marvin B. Arisman
By Shelton & Jones
Attorney

Oct. 10, 1950 A. E. FRANKS ET AL 2,524,784

SNAP SWITCH

Filed Jan. 24, 1946 2 Sheets-Sheet 2

Fig. 5

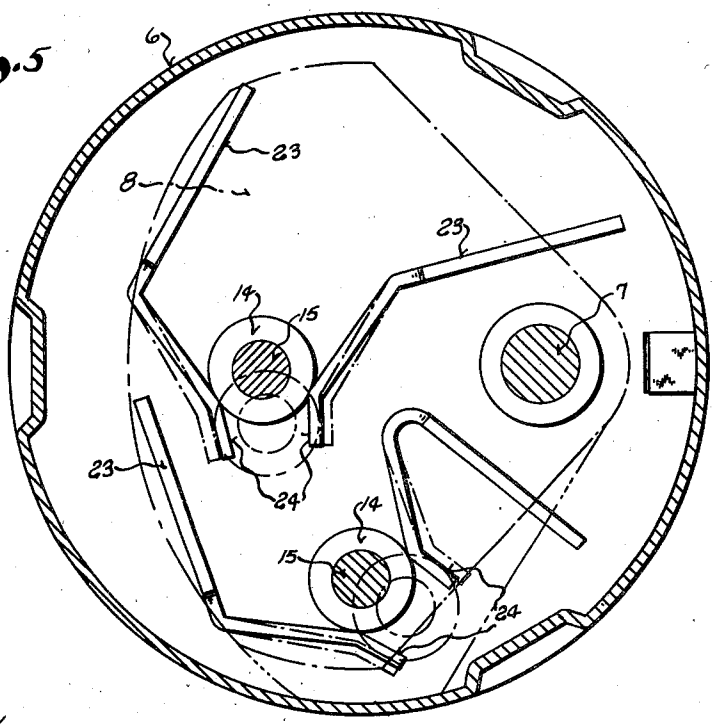
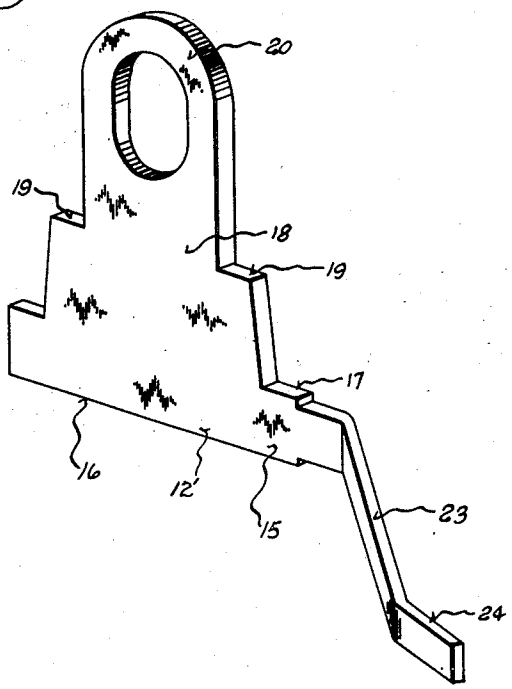


Fig. 6



Inventor
Albert E. Franks
Harville Lees Rawlings
Mervin B. Arisman
By Dallas Hutton Jones
Attorney

Patented Oct. 10, 1950

2,524,784

UNITED STATES PATENT OFFICE

2,524,784

SNAP SWITCH

Albert E. Franks, Harville Lees Rawlings and Mervin B. Arisman, Elkhart, Ind., assignors to Chicago Telephone Supply Company, Elkhart, Ind., a corporation of Indiana

Application January 24, 1946, Serial No. 643,081

4 Claims. (Cl. 200—67)

1

This invention relates to electric switches and refers more particularly to snap switches of the type mounted on the back of volume controls for radio equipment as in Patent No. 2,286,162 issued to N. C. Schellenger, June 9, 1942.

Switches of this type are of necessity quite small. They are generally housed in small diameter, shallow casings and as a consequence, there are definite design limitations making it exceedingly difficult to obtain sufficient spring action or spring range. The same limitations make it difficult to achieve desirable wiping action between the contact surfaces. Both of these features are of great importance in snap switches and to a large degree determine the stability of the electrical contact during the life of the switch.

With a view toward achieving optimum satisfaction as to both these features in a small snap switch, it is an object of this invention to provide a switch wherein the necessary spring action is obtained through use of a novel combination terminal and stationary contact member.

In this connection it is more specifically another object of this invention to provide a snap switch wherein the stationary contacts consist essentially of spring fingers anchored at one end to the base and adapted to flex freely across the face of the base in consequence to engagement of the contactor therewith.

Another object of this invention is to provide a novel combination terminal and stationary contact for use in switches of the character described, which is so designed that its contact portion can be readily shaped and formed to secure maximum compactness without in anywise affecting or sacrificing its spring properties.

Another object of this invention is to provide a switch wherein the actual make and break between the movable contactor and the stationary contacts occurs at areas spaced from the surfaces which are engaged in the closed condition of the switch so that the ill effects of any arcing which may take place during opening and closing of the switch does not affect the areas where final contact is made and thus does not cause high contact resistance or interfere with the stability of the contact resistance.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may made as come within the scope of the claims.

2

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view showing a switch embodying this invention mounted on the back of a volume control;

Figure 2 is a cross sectional view taken through Figure 1 on the plane of the line 2—2 and looking into the switch, the switch being shown in "open" position;

Figure 3 is a view similar to Figure 2 but showing the switch "closed";

Figure 4 is an enlarged detail sectional view taken through Figure 2 on the plane of the line 4—4;

Figure 5 is an enlarged cross sectional view taken through Figure 1 on the plane of the line 5—5 and showing the manner in which the contacts engage during closure of the switch; and

Figure 6 is a perspective view of one of the combination terminal and stationary contact members.

Referring now particularly to the accompanying drawing in which like numerals indicate like parts, the numeral 5 designates the base of the switch which consists of a circular disc of suitable insulating material and closes one end of a cylindrical metal shell 6. The base and the shell thus constitute a substantially cup-shaped switch housing. Fixed to the base and projecting from the inner flat surface thereof is a pivot post 7. This post, which is located near one edge of the base, has a flat switch arm 8 of insulating material pivoted thereon to swing edgewise across the base but in spaced relation thereto.

Also mounted on the pivot post 7 is an actuating cam 9. Inasmuch as this invention does not concern the construction of the actuating cam and as this element is similar to that of the aforesaid patent and other prior art, it is sufficient to point out that the cam is adapted to be swung between defined limits by a driver 10 carried by the rotatable structure of the volume control or other similar unit, indicated generally by numeral 11, on the back of which the switch is mounted.

The actuator 9 is drivingly connected with the switch arm 8 through a toggle spring 9' which snaps the switch arm from one position to the other as the actuator is rocked about the pivot post 7. The limits of movement of the switch arm are defined by the engagement of its opposite edges with the side of the metal shell 6 as will be readily apparent from a comparison of Figures 2 and 3.

Interposed between the base 5 and switch arm 8 are the stationary contacts 12 of the switch. The present embodiment of the invention being a double pole single throw switch, there are four of these stationary contacts, arranged in two pairs each adapted to be electrically bridged by one of two contactors 13 fixed to the underside of the switch arm.

The contactors 13 consist of stubby cylindrical studs 14 having a rivet portion 15 by which the contactors are anchored to the switch arm as clearly shown in Figure 4. Thus the motion of the contactors is constrained to a defined arc concentric to the axis of the pivot post 7. The arcs of motion of the two contactors may coincide or be concentric depending upon the nature of the switch and the most suitable arrangement of stationary contacts. In the present double pole, single throw switch, the arcs of movement of the two contactors coincide.

The stationary contacts 12, in which the chief novelty of the present invention resides, are actually combination terminal and contact members. Their specific shape may vary but all of the combination terminal and contact members are formed as stampings and have a flat body portion 12' with parallel side edges 16 and 17. A tongue 18 projects from the edge 17 of the body portion. This tongue is abruptly reduced in width at a point spaced from the edge 17 a distance substantially equal to the thickness of the base, to form shoulders 19 and an extended terminal portion 20.

The tongue 18 passes through a slot 21 in the base where it is secured by peening or swedging over the shoulders 19 as at 22. Attention is directed to the fact that the side edges of the tongue 18 are tapered so that as the tongue is driven into the slot 21 to bring the edge 17 of the body portion flat against the inner surface of the base the tongue becomes wedged into the slot to hold the same against edgewise displacement. Also the peening and swedging 22 not only extends over the ends of the slot 21 but spreads sidewise or laterally over the edges of the slot to thus firmly anchor the combination terminal and contact member to the base with its body portion 12' disposed edgewise and perpendicular to the flat inner face of the base.

The edges 16 of all of the body members lie in a common plane and being located at various points on the base provide a support for the switch arm 8 to hold the same in proper parallel spaced relation to the base. Projecting from one end of the body portion 12' of each of the combination terminal and contact members is a blade-like spring finger 23. These spring fingers, as clearly shown in Figure 4, are of less height than the body portions and are clear of the base and switch arm so as not to be frictionally restrained from free resilient flexure in a plane parallel to the base.

The spring fingers of each pair of stationary contacts are opposite each other and their free end portions converge to terminate in almost parallel portions 24. These end portions 24 are spaced apart a distance less than the diameter of the contactor studs 14. Thus, as best shown in Figure 5, when the switch is closed and the contactors are brought into engagement with their respective spring fingers, the contactors are wedged between the spring fingers with a wiping engagement.

In addition, the areas of the contactors and spring fingers between which initial make and final break occurs are spaced from the areas of the contactors and spring fingers which are engaged when the switch is closed. Therefore, any pitting which might result from possible arcing will not interfere with the contact resistance of the switch in its closed position.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides an exceedingly compact switch construction and that the nature of the combination terminal and stationary contact members achieves exceptional flexibility in design enabling the salient features of the invention to be embodied in single pole, double throw, and single pole, single throw switches as readily as in the present disclosed double pole, single throw, adaptation.

What we claim as our invention is:

1. In an electric switch: a flat base of insulating material; a stationary contact mounted on the base, said stationary contact having a rigidly fixed mounting portion projecting up from the base with its top edge parallel to the base and a spring finger extending from the mounting portion and adapted to be flexed in a plane parallel to the base; a flat switch arm of insulating material resting on the top edge of the fixed mounting portion of the stationary contact to be guided thereby for edgewise movement across the base in a plane parallel thereto but spaced therefrom; means constraining such edgewise movement of the switch arm to an arcuate motion between defined limits; the switch arm having substantial area and riding on the top edge of the fixed mounting portion throughout its entire range of motion; the spring finger having less height than said mounting portion and being spaced from the top edge thereof and from the base so that flexure of the spring finger in a plane parallel to the base is not frictionally restrained; snap acting driving means above the switch arm and connected thereto for swinging the switch arm from one position to the other with a snap action; and a contactor carried by the switch arm and movable thereby into switch closing engagement with the spring finger, the path of movement of the contactor with respect to location of the stationary contact being such that the spring finger is tensioned during closure of the switch.

2. In an electric switch: a flat base; a plurality of stationary contacts mounted on the base and each having a rigidly fixed mounting portion projecting up from the base and a spring finger extending laterally from the mounting portion, all of the mounting portions have the same height and the top edges thereof being parallel to the base; a flat switch arm pivoted to swing edgewise across the base and riding on said top edges of the mounting portions to be guided thereby, said switch arm riding on the top edges of the mounting portions throughout its entire range of motion; the spring fingers being of less height than the mounting portion and being spaced from the base and the switch arm so that flexure of the spring fingers in a plane parallel with the base is not frictionally restrained; and contactors carried by the switch arm and movable thereby across the base to and from bridging engagement, each with a pair of said spring fingers.

3. In an electric switch: a flat base; a pair of stationary contacts mounted on the base and each having a rigidly fixed mounting portion projecting up from the base with its top edge parallel

to the base, and a spring finger extending therefrom to be capable of flexure in a plane parallel to the base; a flat switch arm of insulating material resting on the top edges of the fixed mounting portions to be guided thereby for edgewise movement across the base in a plane parallel thereto but spaced therefrom; means constraining such edgewise movement of the switch arm to a defined path between definite limits, the switch arm having substantial area and riding on the top edges of the fixed mounting portions throughout its entire range of motion; the spring fingers being of less height than the mounting portion and being spaced from the base and the switch arm so that flexure of the spring fingers in a plane parallel with the base is not frictionally restrained; a contactor carried by the switch arm at the underside thereof and movable thereby to and from bridging engagement with the spring fingers; and snap acting driving means above the switch arm and connected thereto for moving the switch arm from one position to the other with a snap action, the insulated switch arm—by virtue of its substantial area and disposition between the contacts and driving means—serving as an insulating shield between the switch contacts and the snap acting driving means.

4. In an electric switch: a base having a flat top surface; a pair of stationary contacts mounted on the base and each having a rigidly fixed mounting portion projecting up from the base with its top edge parallel to the flat top surface of the base, and a blade-like spring finger extending therefrom and resiliently yieldable in a direction parallel with the flat top surface of the base; a flat switch arm of insulating material resting on the top edges of the fixed mounting portions of the stationary contacts to be guided thereby for edgewise movement across the base in a plane spaced therefrom but parallel to its flat top surface; the spring fingers being of less height than the mounting portion and being spaced from the base and the switch arm so that flexure of the spring fingers in a plane parallel

with the base is not frictionally restrained; said spring fingers being opposite each other and converging towards but spaced from each other; a cylindrical contactor of a diameter greater than the minimum distance between the spring fingers; means securing the cylindrical contactor to the underside of said switch arm; means constraining edgewise movement of the switch arm to a defined path between fixed limits with the cylindrical contactor moving across the base with the axis of the contactor perpendicular to the flat top surface of the base and travelling along a line which lies between the spring fingers so that the contactor is brought into bridging engagement with the spring fingers as the switch arm is moved in one direction and vice versa; and means disposed above the switch arm and connected thereto for moving the same back and forth.

ALBERT E. FRANKS.
HARVILLE LEES RAWLINGS.
MERVIN B. ARISMAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,474,013	Benjamin	Nov. 13, 1923
1,655,614	Kaisling	Jan. 10, 1928
1,748,439	Bugh	Feb. 25, 1930
2,090,470	Clinton	Aug. 17, 1937
2,131,590	Hathorn	Sept. 27, 1938
2,235,366	Haselwood	Mar. 18, 1941
2,286,162	Schellenger	June 9, 1942
2,304,808	Draving	Dec. 15, 1942
2,314,855	Del Camp	Mar. 23, 1943
2,329,460	Ebert	Sept. 14, 1943
2,408,843	Gauthier	Oct. 8, 1946

FOREIGN PATENTS

Number	Country	Date
387,831	Great Britain	Feb. 16, 1933