Dec. 29, 1936. W. T. WEIDENMAN 2,066,022

THUMB SWITCH

Filed May 16, 1934

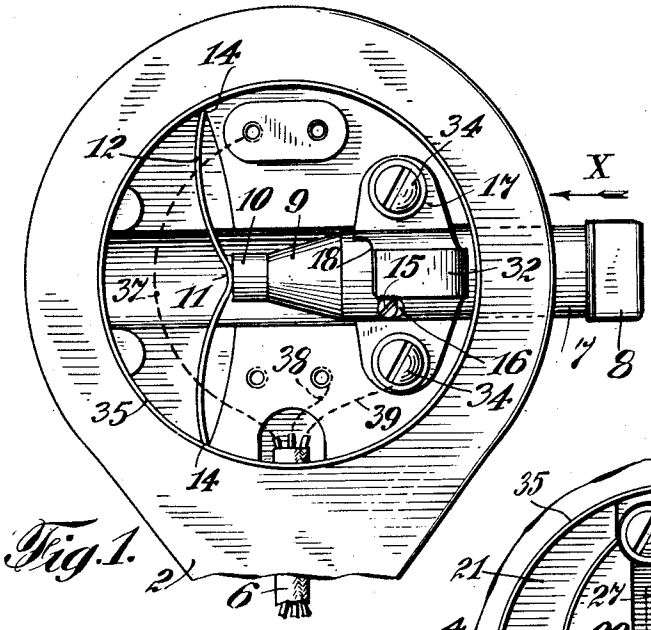


Fig. 1.

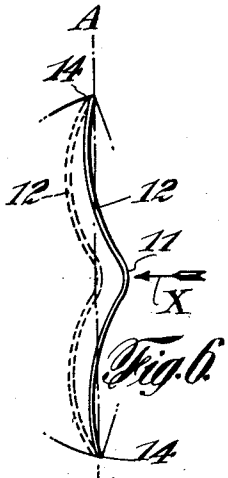


Fig. 6.

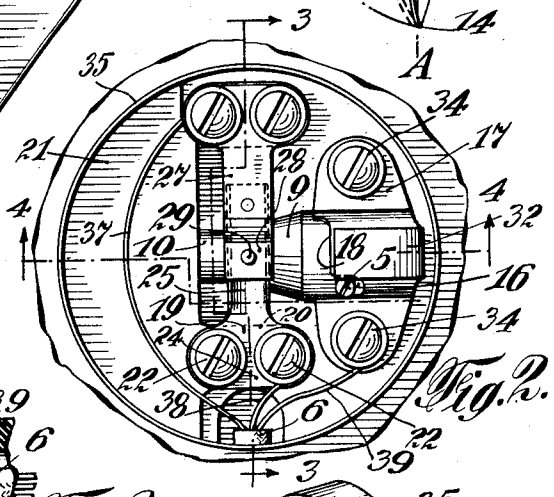


Fig. 2.

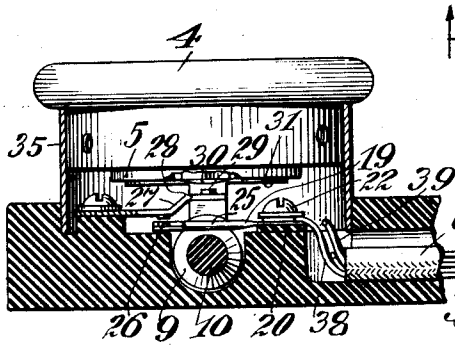


Fig. 3.

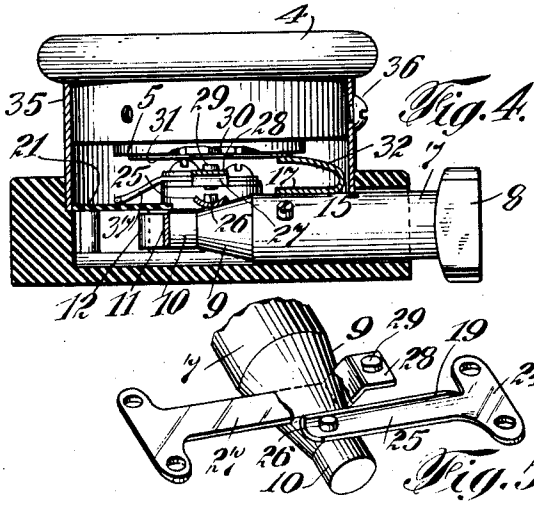


Fig. 4.

Fig. 5.

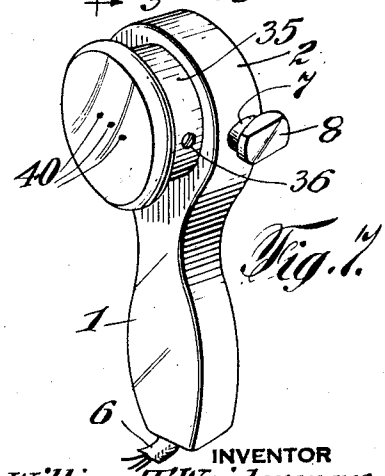


Fig. 7.

INVENTOR
William T. Weidenman
BY
Ramsey & Kent
ATTORNEYS

Patented Dec. 29, 1936 2,066,022

UNITED STATES PATENT OFFICE

2,066,022

THUMB SWITCH

William T. Weidenman, Baldwin, N. Y., assignor to Telephonics Corporation, New York, N. Y., a corporation of New York

Application May 16, 1934, Serial No. 725,896

6 Claims. (Cl. 200—157)

The present invention relates broadly to electrical apparatus and more especially to a thumb switch, particularly adapted for use with hand microphones or telephones.

In certain fields of communication where there is extraneous noise, particularly telephonic radio communication from airplanes, it is desirable to retain the microphone out of circuit except during periods of use and it is also desirable that the broadcast transmitter shall likewise be retained out of service except when in actual use. Under these conditions, preferably, on the cut-in, the broadcast transmitter is rendered operative before the microphone is connected in service; and on the cut-out, the microphone is cut out of service before the broadcast transmitter. This always insures that the broadcast transmitter is operative during the time when the microphone is effective. In order to carry out the above ends, the present invention comprises a thumb switch of simple, strong construction adapted to open and close two circuits, the first circuit controlling the energy supply to the broadcast transmitter and the second circuit comprising the microphone circuit to the transmitter.

It is desirable that a substantial initial force shall be required to initiate the operation of the thumb switch and that a much less pressure will be necessary to hold the thumb switch in effective operation. This is particularly important to prevent accidental operation of the switch due to laying down the microphone or other accidental contacts with the thumb switch button. Furthermore, a construction wherein a substantial force is required to initiate the movement of the thumb piece and a lesser force is necessary to retain the thumb piece in operative position, operates as a snap action. This is because a pressure of the operator's thumb sufficient to initiate the movement of the thumb switch is more than necessary to operate the switch so that such an initial pressure will quickly snap the switch to inward position where it is easily held with a lesser effort. Preferably, the switch is also provided with a locking pin and a T-shaped head so that a thumb movement on the T head to slightly rotate the switch plunger will lock the switch plunger in its inward position and thereby lock the two circuits closed.

Other and further features of the present invention will in part be obvious and will in part be pointed out in the detailed specification hereinafter following.

It is to be understood that the present invention may be embodied in structures other than those specifically disclosed herewith so that the present disclosure is to be considered as illustrative and not in the limiting sense.

Fig. 1 is a plan view showing the mouth piece and the contact switch arms removed in order to illustrate the inner end of the switch plunger and the operating spring therefor.

Fig. 2 is a view similar to Fig. 1 illustrating the switch contact arms and the cover plate in place.

Fig. 3 is a view on section line 3—3 of Fig. 2 with the mouth piece in place.

Fig. 4 is a view on section line 4—4 of Fig. 2 illustrating the mouth piece in place.

Fig. 5 is a detail view of the pair of switch arms showing the curved stiffened character of the main switch arm.

Fig. 6 is a view illustrating the operation of the switch control spring.

Fig. 7 is a perspective view of the assembled microphone unit.

The present invention is designed more especially with reference to a microphone adapted for telephonic radio communication from airplanes, and to this end comprises a small frame somewhat like a small hand mirror having a handle 1 and a head portion 2. This frame is preferably made of molded insulation material in general use in the telephonic art. The head portion carries a mouth piece 4, also of molded insulation material, in which is mounted a microphone 5 which may be of the usual carbon type. The handle 1 is hollow to comprise a conduit for a lead-in cord 6, which leads to a wiring board in the head portion of the frame beneath the mouth piece. A thumb plunger 7, likewise of molded insulation material, is provided with a T head 8 so that the operator's thumb may push the plunger inward and by a rotating motion on one end of the T head 8 may rotate the plunger when it has been forced to its inner position.

By reference to Fig. 1, it will be observed that the inner end of the plunger 7 is provided with a conical head 9 that terminates in a cylindrical point 10, the plane end of which bears on an apex 11 of a double bow spring 12. The ends of this double bow spring are seated in V-shaped abutments 14 in the casing, so that these abutments 14 act as pivot points for the ends of the spring. By reference to Fig. 6, it will be noted that the apex 14 of the spring 12 extends to one side of the line A—A through the V-shaped abutments. As pressure is applied to the apex 11 in the direction of the arrow X, by means of the plunger 7, the spring 12 resists this pressure until pressure becomes sufficient to flex the bows of the spring.

When this occurs, the spring starts to move toward the position indicated in dotted lines in Fig. 6, and as the apex 11 approaches the line A—A, (but does not cross this line), the pressure in the direction of the arrow X necessary to maintain the continued movement decreases. In the particular embodiment of the present invention adapted for airplane service, the spring 12 is constructed so as not to yield until a pressure of substantially three pounds is applied to the thumb piece 7. Since the effective resistance of the spring 12 decreases as soon as it starts to flex toward the line A—A, the pressure of the operator's thumb on the thumb piece tends to snap the plunger inward where a pressure of one pound or less holds the plunger inward. When pressure is released, the plunger immediately starts to move outward and the effective force of the spring 12 increases, thus snapping the plunger to its outward position. The distance of the T head 8 from the side of the head portion 2 of the frame limits the inward movement of the plunger, and a stop screw 15 in the side of the plunger 7 which operates in a slot 16 of a base plate 17 limits the outward movement of the plunger. The base plate 17 is cut away as at 18 so that when the plunger is pushed inward, and the stop screw 15 passes beyond the slot 16, a rotation of the plunger carries the stop screw in front of the cut-away 18, whereupon the plunger is locked in its inward position without continued thumb pressure being required by the operator to hold the plunger in place. By applying slight additional pressure and using the thumb on the front end of the T head to rotate the plunger, the screw 15 may be returned to a position opposite the slot 16 so that the spring 12 may be permitted to restore the parts with the plunger in its outer or ineffective position.

Referring now to Figs. 2 to 5 inclusive, a main switch arm 19 is securely mounted on the main frame over an extension 20 on spring cover plate 21. Mounting screws 22 for the main switch arm thereby perform the double function of securing the cover plate 21 in position and at the same time rigidly mounting the main switch arm in place. This switch arm 19 is formed of highly flexible metal and with a base 24 of this main switch arm being flat so as to be flexible and springy. An extending portion 25 of the main switch arm is cupped lengthwise so that the main portion 25 becomes a rigid unbending arm with the flexure of the switch arm occurring in the flat portion adjacent the base 24. It thus will be seen that the portion 25 has the characteristics of a stiffened bar, so that a pressure beneath the bar raises the same as an entity and the arm bends only adjacent the base 25. The outer end of arm 25 carries contact member 26 adapted to engage a contact on a subordinate switch arm 27 which is a flat flexible member having an upturned point 28 carrying a contact 29 adapted to engage one terminal 30 of the microphone 5. The microphone 5 comprises a metallic shell or ring 31 carrying an insulating member in the center of which is mounted the contact member 30. The edge of the ring, therefore, comprises the other contact member which is engaged by a spring 32 integral with the base plate 17 which is curved over the thumb plunger 7, and is mounted to the back frame by screws 34.

From the foregoing, it will be observed that the wires from the lead-in cord all terminate in a wiring board which comprises spring contacts with the microphone, carried by the mouth piece, so that no difficult connections need be made in setting the mouth piece and the microphone in place. The microphone 5, being carried by the mouth piece 4, comes into proper position to contact with the spring 32 and in direct position over the contact 29 on the subordinate switch arm when the mouth piece is set in the metal well or rim 35 which is molded integrally into the head 2 of the insulating frame. The mouth piece may be held in position within the rim 35 by machine screws 36 which pass through the rim and into the mouth piece. Preferably, the lead-in cord 6 carries three wires 37, 38, and 39. The wire 38, which is the common return, is connected with the main switch arm 19. The wire 37 is connected with the subordinate switch arm 27, and the wire 39 is connected with the base plate 17. At the other end, the wire 38 is connected to the broadcast transmitter as a common return member. The wire 37 is connected in circuit in the broadcast transmitter through a relay which operates the power circuit to energize the broadcast transmitter. The wire 39 connects in circuit the broadcast transmitter and the microphone 5.

From the foregoing, it will be observed that when the thumb piece 7 is pushed inward against the resistance of the spring 12, the conical head 9 on the thumb piece 7 raises the stiff arm 25 of the main switch arm 19 and brings the contact 26 thereon into engagement with contact on the subordinate switch arm 27. This causes a circuit to be closed through the lead-in wires 37 and 38, which operating through the relay in the broadcast transmitter turns on the main power circuit for the transmitter to energize the same ready for operation. A further inward movement of the thumb plunger 7 causes the stiff arm 25 to act as a lever to raise the subordinate switch arm 27 until the contact 29 thereof engages the microphone button 30 which completes the circuit through the lead-in wire 38, the microphone and the lead-in wire 39, thereby connecting the microphone in circuit with the broadcast transmitter. The apparatus is now ready to transmit voice waves which are delivered against the microphone through the small openings 40 in the mouth piece 4.

Practical demonstration of the apparatus shows it to be very satisfactory for the purposes intended.

Having described my invention, I claim:—

1. A switch mechanism comprising: a leaf spring so shaped that its edge forms substantially a "Witch of Agnes" geometrical curve, such curve having a hump and two branches that droop symmetrically on opposite sides of the hump; a movable plunger engaging the hump portion of the spring and operative to depress the same; and switching contacts actuated by the plunger.

2. A switch mechanism comprising: a leaf spring of the over-center type and so shaped that its edge forms substantially a "Witch of Agnes" geometrical curve, such curve having a hump and two branches that droop symmetrically on opposite sides of the hump; operating means engaging the hump portion of the spring, said operating means including a thumb portion with which to actuate the operating means and thereby depress the hump portion of the spring; self-restoring switching contacts actuated in response to movement of said operating means; and means to arrest movement of the parts before the over-center position of the spring is reached.

3. A switch mechanism comprising: a leaf spring of the over-center type and so shaped that its edge forms substantially a "Witch of Agnes"

geometrical curve, such curve having a hump and two branches that droop symmetrically on opposite sides of the hump; operating means engaging the hump portion of the spring, said operating means including a thumb portion with which to actuate the operating means and thereby depress the hump portion of the spring; self-restoring switching contacts actuated in response to movement of said operating means; means to arrest movement of the parts before the over-center position of the spring is reached; and selectively operable locking means to secure the parts in spring-depressed position.

4. A thumb switch comprising: a casing having a pair of oppositely positioned abutments; a leaf spring so shaped that its edge forms substantially a "Witch of Agnes" curve, such curve having a hump and two branches that droop symmetrically on opposite sides of the hump, said spring being mounted in said casing with its ends in pivotal engagement with said abutments; a manually operable reciprocatory plunger having one end in engagement with the hump portion of said spring and having the other end projecting outside of the casing for manual operation, said plunger being effective to depress the hump portion of said spring and having a conical portion; and successive-closing switch contacts actuated by said conical portion of the plunger.

5. A thumb switch comprising: a switch operating member; switch arms operated by said member; and means to resist the operation of said operating member, said means presenting a maximum resistance on initial movement of said member and decreasing resistance on continued movement of said member, and said means comprising a single leaf spring having a central hump and concave portions adjacent to each side of the hump.

6. A thumb switch comprising: a switch operating member; switch arms operated by said member; and means to resist the operation of said operating member, said means presenting a maximum resistance on initial movement of said member and decreasing resistance on continued movement of said member, and said means comprising a single leaf spring having a central hump and concave portions adjacent to each side of the hump, and said means also comprising abutments in which the ends of the spring are pivotally mounted.

WILLIAM T. WEIDENMAN.