Aug. 25, 1970 D. A. OLSON ET AL 3,525,970

POTENTIOMETER WITH TAP

Filed Feb. 19, 1969 2 Sheets-Sheet 1

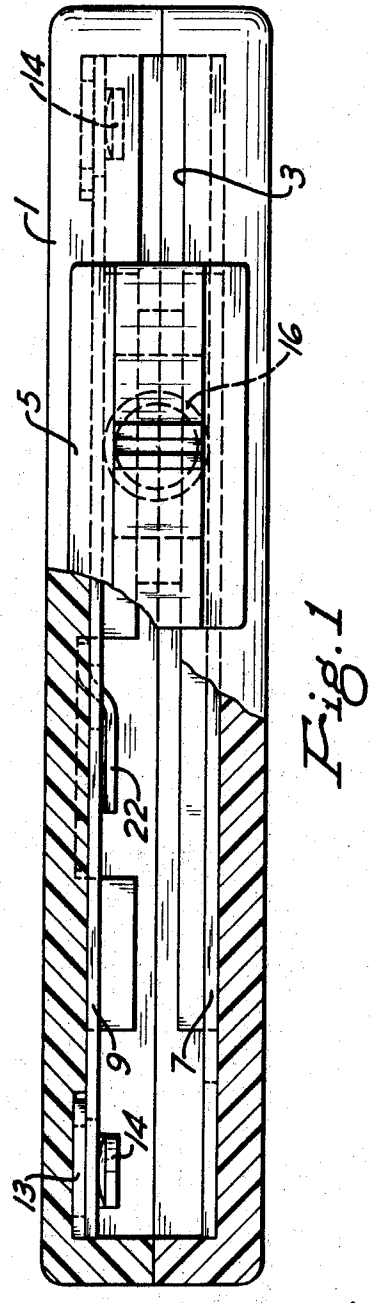


Fig. 1

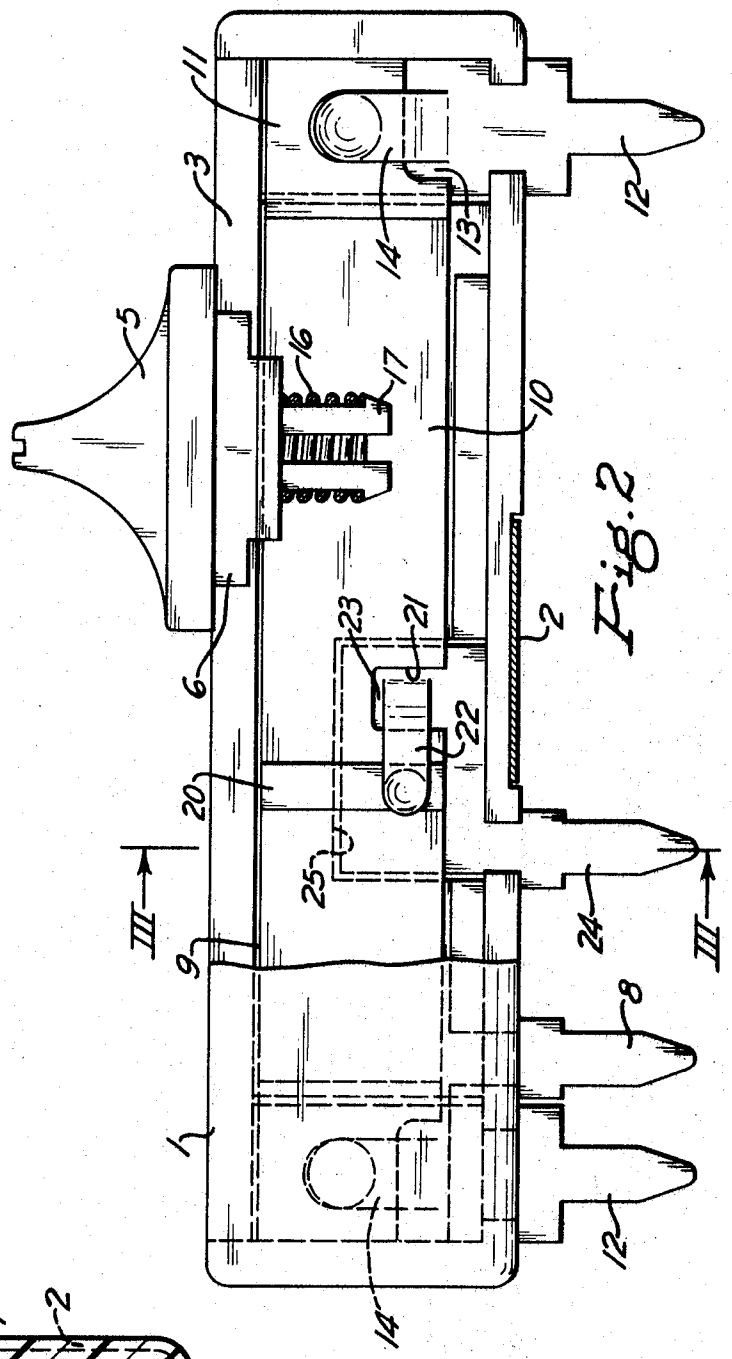


Fig. 2

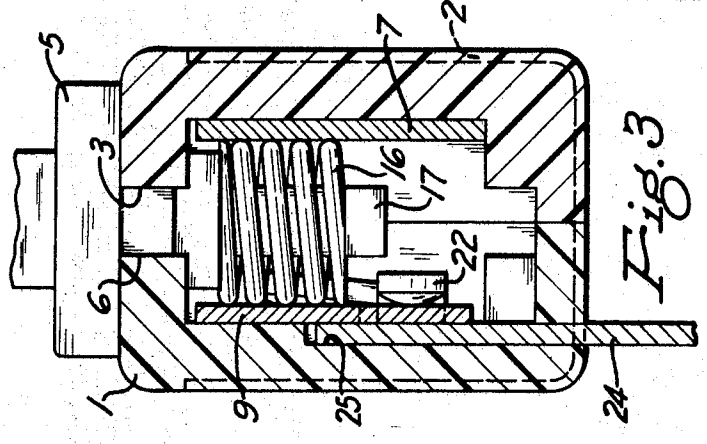


Fig. 3

INVENTORS.
DAVID A. OLSON
EARL A. PFEUFER
BY MOGENS W. BANG
Brown, Critchlow, Flick & Peckham
ATTORNEYS.

Aug. 25, 1970 D. A. OLSON ET AL 3,525,970

POTENTIOMETER WITH TAP

Filed Feb. 19, 1969 2 Sheets-Sheet 2

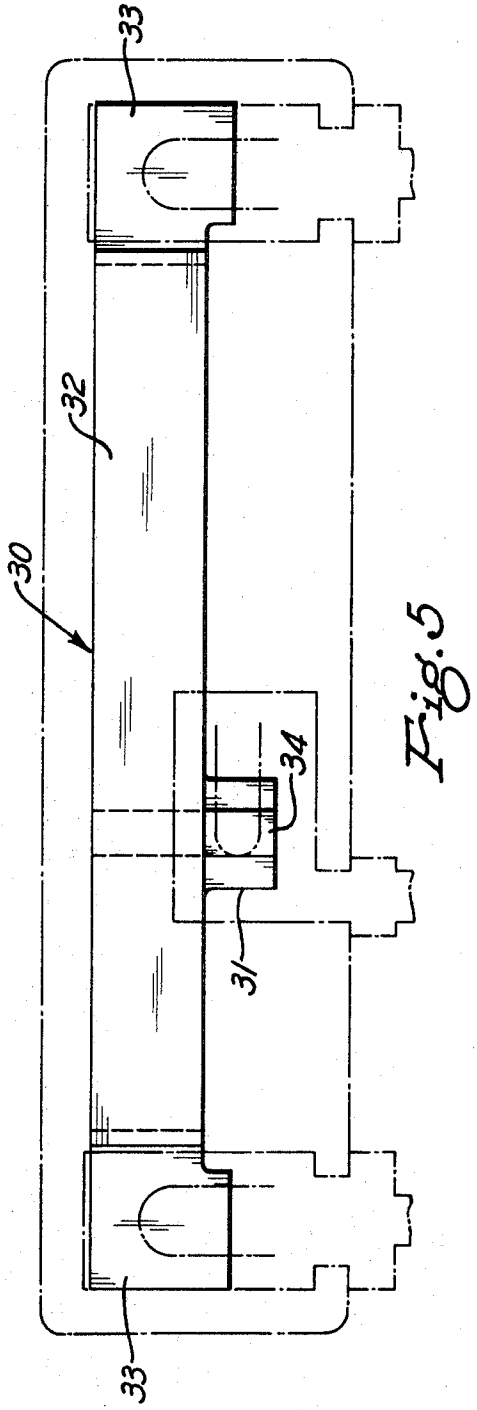


Fig. 5

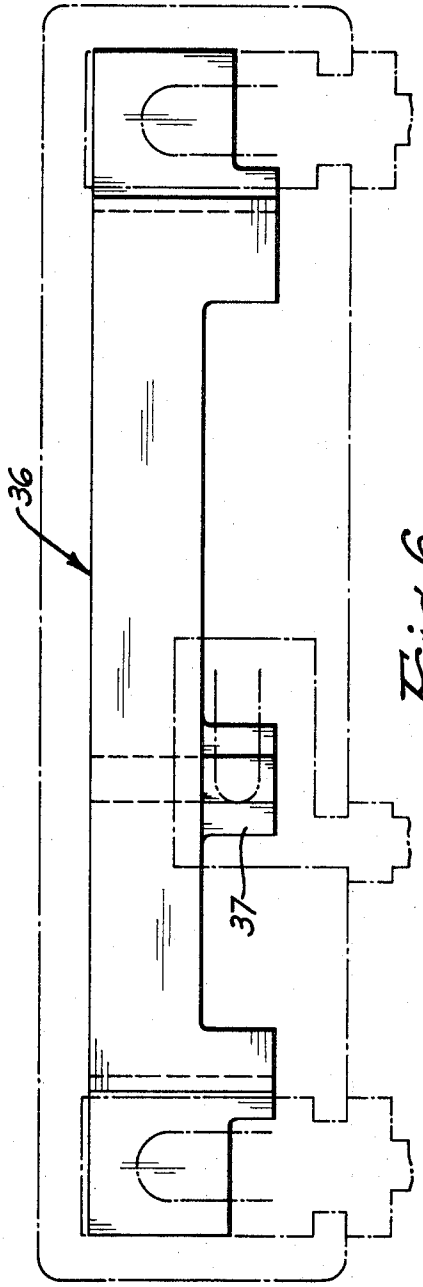


Fig. 6

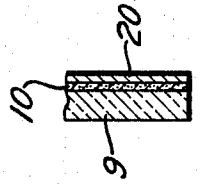


Fig. 4

INVENTORS.
DAVID A. OLSON
EARL A. PFEUFER
MOGENS W. BANG

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

United States Patent Office 3,525,970
Patented Aug. 25, 1970

3,525,970

POTENTIOMETER WITH TAP

David A. Olson, Ridgway, Earl A. Pfeufer, St. Marys, and Mogens W. Bang, Ridgway, Pa., assignors to Stackpole Carbon Company, St. Marys, Pa., a corporation of Pennsylvania

Filed Feb. 19, 1969, Ser. No. 800,573
Int. Cl. H01c 9/04
U.S. Cl. 338—183 10 Claims

ABSTRACT OF THE DISCLOSURE

A straight resistance strip in a linear motion potentiometer case is provided with a tap close to the back of the case. A portion of the rear edge of the strip beside the tap is located farther forward than the rear end of the tap to provide the tap with a side edge. A terminal has a flat portion between the tap and the side wall of the case provided with a spring tongue extending inwardly across said side edge and then lengthwise of the case across the tap to press it against the flat portion.

The potentiometer shown in Pat. 3,362,004 is intended primarily for production adjustment and user secondary adjustment applications, but it also can be used for primary control functions, such as volume and tone controls also are compensated. The arrangement of a tap in and high-priced sets a correction of the loudness curve to fit the nonlinear frequency pressure curve of the ear is desirable. This requires a compensating network that is connected to a tap of the volume control. Some tone controls also are compensated. The ararngemen tof a tap in the patented potentometer first mentioned has posed a problem, because of space limitations. A terminal clamped onto the tap in the ordinary way would extend so far across the resistor that effective width of the resistor would become too narrow.

It is among the objects of the invention to provide a linear motion potentiometer, which is very small and yet is provided with a satisfactory tap between its ends.

The preferred embodiments of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a front view, partly broken away, of the improved potentiometer;

FIG. 2 is a side view, also partly broken away;

FIG. 3 is an enlarged cross section taken on the line III—III of FIG. 2;

FIG. 4 is a greatly enlarged fragmentary cross section of the tap; and

FIGS. 5 and 6 are side views of two modified resistors.

Referring to FIGS. 1 to 4 of the drawings, the long rectangular case **1** of a potentiometer may be formed from any suitable material, such as a molded plastic or other rigid material. Preferably, the case is made from molded half sections that have meeting edges extending from front to back across the end of the case and lengthwise along its back or base. The half sections are joined together in any suitable manner, such as by a spring clip **2** extending across the back of the case and part way across its sides. The front or top of the case is provided centrally with a slot **3** through it extending lengthwise of the case for most of its length.

Slidably mounted in the slot for movement lengthwise in the case is a slide **5** that has laterally opening grooves **6** receiving the side walls of the slot so that the slide is locked in the slot and can move only lengthwise in it. A metal collector strip **7** is mounted inside the case against one side and is provided with an integral terminal **8** that extends through the back of the case. Also inside the case and disposed flat against the opposite side is a thin flat

strip **9** of dielectric material coated with an electrical resistance material **10**. Preferably, the end areas of the resistance material are coated with a much lower resistance material **11**, such as silver, forming terminal areas. This material can be applied over or under the resistance material.

Electric terminals **12** are connected to opposite ends of the resistance strip and extend out of the housing. Each of these two terminals has a flat portion **13** disposed between the resistance strip and the adjoining side wall of the case, and a spring tongue **14** stuck out of the flat portion and engaging a terminal area **11** to clamp the strip. The back edges of the end of the strip are cut away to accommodate the bases of the tongues. In order to allow the resistance strip to lie flat against the case, the side wall is provided with a pair of shallow recesses that receive the flat portions **13** of the terminals so that they will be flush with the wall.

Slide **5** carries a bridging contact that engages the resistance strip and the collector strip to electrically connect them. The contact preferably is a flexible wire coil **16** mounted on a split post **17** projecting from the slide into the space between the two strips, similar to the one shown in Pat. 3,362,004. The slide slides the contact along the strips to the desired position.

It is a feature of this invention that the resistance strip is provided with a tap and a terminal for it arranged in a particular way. The tap includes the rear end of a short, narrow band **20** of metal or other low resistance material extending across the resistance strip on top of or beneath the resistance coating. The band can be located in any desired position along the strip, and its rear end is at the rear edge of the strip, which is close to the back of the case. Preferably, the band and terminal areas **11** are applied after the strip **9** has been coated with the resistance material. The resistance strip is easy to fabricate in automatic machines.

The rear portion of the resistance strip is provided with a forwardly extending notch **21** beside the tap to provide the tap with a side edge. Extending through this notch is a spring tongue **22** stuck out of a flat portion **23** of a terminal **24**, the flat portion being disposed between the strip and the adjoining side of the case and fitting in a shallow recess **25** in the case wall, with which the flat portion is flush. The terminal extends out of the back of the case. Its spring tongue, which extends across the side edge of the tap, also extends lengthwise of the case across the tap, where it engages the rear end of narrow band **20** and presses the tap against the flat part of the terminal behind it.

By notching the resistance strip so that the tap terminal tongue **22** can extend lengthwise of the case, there is room in the case for the tongue without unduly narrowing the resistor in front of the tap. If the tongue had to extend forward across the strip like the end terminal tongues, there would not be enough room for the base of the tongue behind band **20** unless the back of the strip were notched there, and then the tongue would extend so far forward along the band that the width of the resistance area of the strip between the tongue and the front edge of the strip would become too narrow to be practicable. Most of the width of the strip would be ineffective as a resistor. On the other hand, the tongue that is shown can be as long as necessary and yet engage the tap close to the rear edge of the strip. This leaves adequate room for the bridging contact, which must be shorter than in Pat. 3,362,004, to move past the tap, and yet the wire coil still will have several points of contact with the resistance so that the noise level should not be affected.

In the modification shown in FIG. 5, the body of the resistance strip **30** is narrower than before, except at the

tap **31** that is formed by an integral tab extending as far back in the case in which the strip is mounted as in the first embodiment of the invention. The front edge of the strip will be close to the front of the case but, except for the tap, the rear edge of the resistance coated length of the strip is located as far forward as the front end of notch **21** in FIG. 2. In other words, the resistance strip is only as wide as is needed for the bridging contact. This makes it possible to use a lower resistivity coating for the same overall resistance, resulting in lower inherent noise and less operational noise because of the higher carbon to resin ratio of the coating.

This modification also shows another way of applying the resistance material **32**, the end terminal areas **33** and the conductor band **34** that extends across the strip at the tap. Thus, the three low resistance or metal areas are applied to the strip first, and then the resistance material is applied over them, but not for the full length of the strip because the ends of the coating should only slightly overlap the inner edges of the terminal areas **33**. Since only the narrow portion of the strip needs to be coated with resistance material, the conductor band **34** is not covered with resistance material on the tap. The spring tongue of a tap terminal will extend laterally across the tap as before and directly engage the rear end of band **34**.

In the further embodiment of the invention shown in FIG. 6, the main body of the resistance strip **36** is the same width as in FIG. 5, but near its ends the strip is the same width as it is at the tap **37**. The strip otherwise is formed in the same way as the one in FIG. 5, but this shape strip is better suited to automation in manufacture than the one in FIG. 5.

Instead of having a low resistance band extend entirely across any of these strips, the low resistance material could be applied only to the tap, but of course in electrical contact with the rear edge of the adjoining resistance material in front of it.

We claim:

1. A linear motion potentiometer comprising an elongated case having a front and a back connected by side walls, a resistance strip disposed inside the case against one side wall, electric terminals engaging the opposite ends of the strip and extending out of the case, a collector strip disposed in the case against the other side wall parallel to the resistance strip and provided with a terminal extending out of the case, the front of the case being provided with a central longitudinal slot therethrough, said resistance strip being provided with a tap close to the back of the case, a portion of the rear edge of the resistance strip beside the tap being located farther forward in the case than the rear end of the tap to provide the tap with a side edge, a terminal for said tap extending out of the back of the case and having a flat portion inside the case between the tap and the adjoining side wall, said flat portion extending laterally away from the tap at said side edge and being provided with a spring tongue extending inwardly across that edge and then lengthwise of the case across the tap to press it against said flat portion, a bridging contact in the case in sliding engagement with both of said strips, a slide disposed in said case slot and movable lengthwise thereof, and means connecting the slide with said contact for moving the contact lengthwise of the strips and past said tongue and tap.

2. A linear motion potentiometer according to claim **1**, in which said side wall of the case is provided with a recess receiving said flat portion of the tap terminal to hold it flush with that wall.

3. A linear motion potentiometer according to claim **1**, in which each of the terminals engaging the ends of the resistance strip include a flat portion between that strip and the adjoining side wall, and a spring tongue extending inwardly past the resistance strip and then across the end of the strip to clamp the terminal on the strip, and said side wall is provided with recesses receiving said flat portions of the terminals to hold them flush with that wall.

4. A linear motion potentiometer according to claim **1**, in which the rear portion of said resistance strip is provided with a forwardly extending notch beside said tap to form said side edge of the tap, and said tongue extends through said notch.

5. A linear motion potentiometer according to claim **1**, in which said tap and portions of the resistance strip near the ends thereof project rearwardly from the rest of the resistance strip farther than any other part of the strip.

6. A linear motion potentiometer according to claim **1**, in which said tap includes a low resistance band that extends forward across the resistance strip.

7. A linear motion potentiometer according to claim **6**, in which said band is exposed and engaged by said tongue.

8. A linear motion potentiometer according to claim **1**, in which said tap is formed from an integral tab projecting rearwardly from the rest of the resistance strip farther than any other part of the strip.

9. A linear motion potentiometer according to claim **8**, in which said resistance strip includes a layer of electrical resistance material, and said tap is free of said resistance material and includes a band of metal engaged by said terminal tongue and extending forward across the strip beneath said layer.

10. A linear motion potentiometer according to claim **1**, in which said resistance strip and its tap include a layer of electrical resistance material, and said tap also includes a layer of low resistance material covering the resistance material.

References Cited

UNITED STATES PATENTS

3,362,004 1/1968 Bang ---------- 338—183

LEWIS H. MYERS, Primary Examiner

D. A. TONE, Assistant Examiner

U.S. Cl. X.R.

338—323