Jan. 12, 1971 M. W. BANG 3,555,484

FINE ADJUSTMENT VARIABLE RESISTOR

Filed May 16, 1969 2 Sheets-Sheet 1

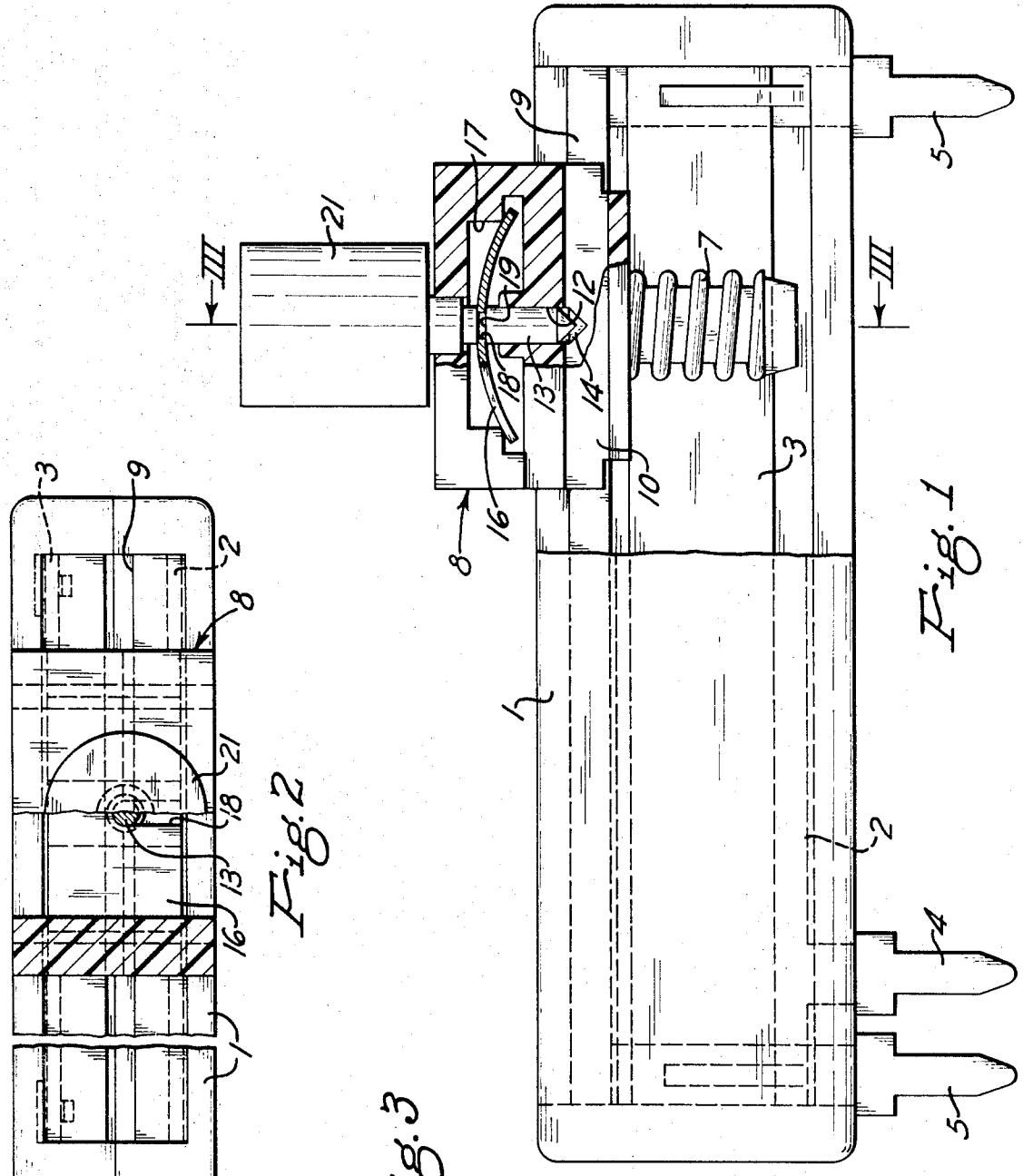


Fig. 1

Fig. 2

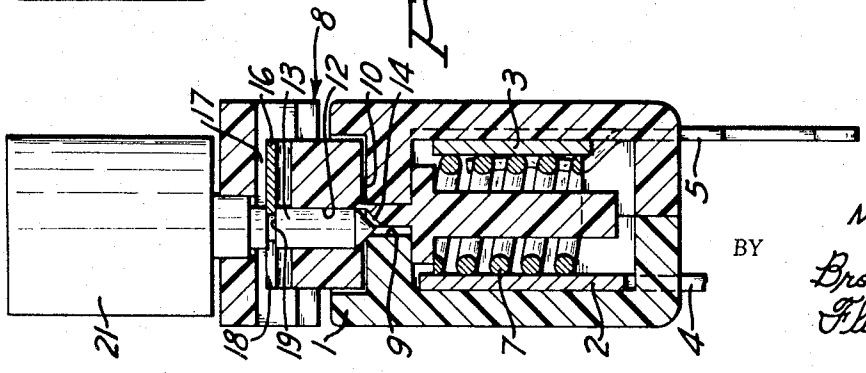


Fig. 3

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FINE ADJUSTMENT VARIABLE RESISTOR

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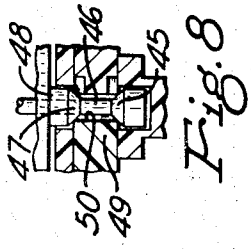


Fig. 8

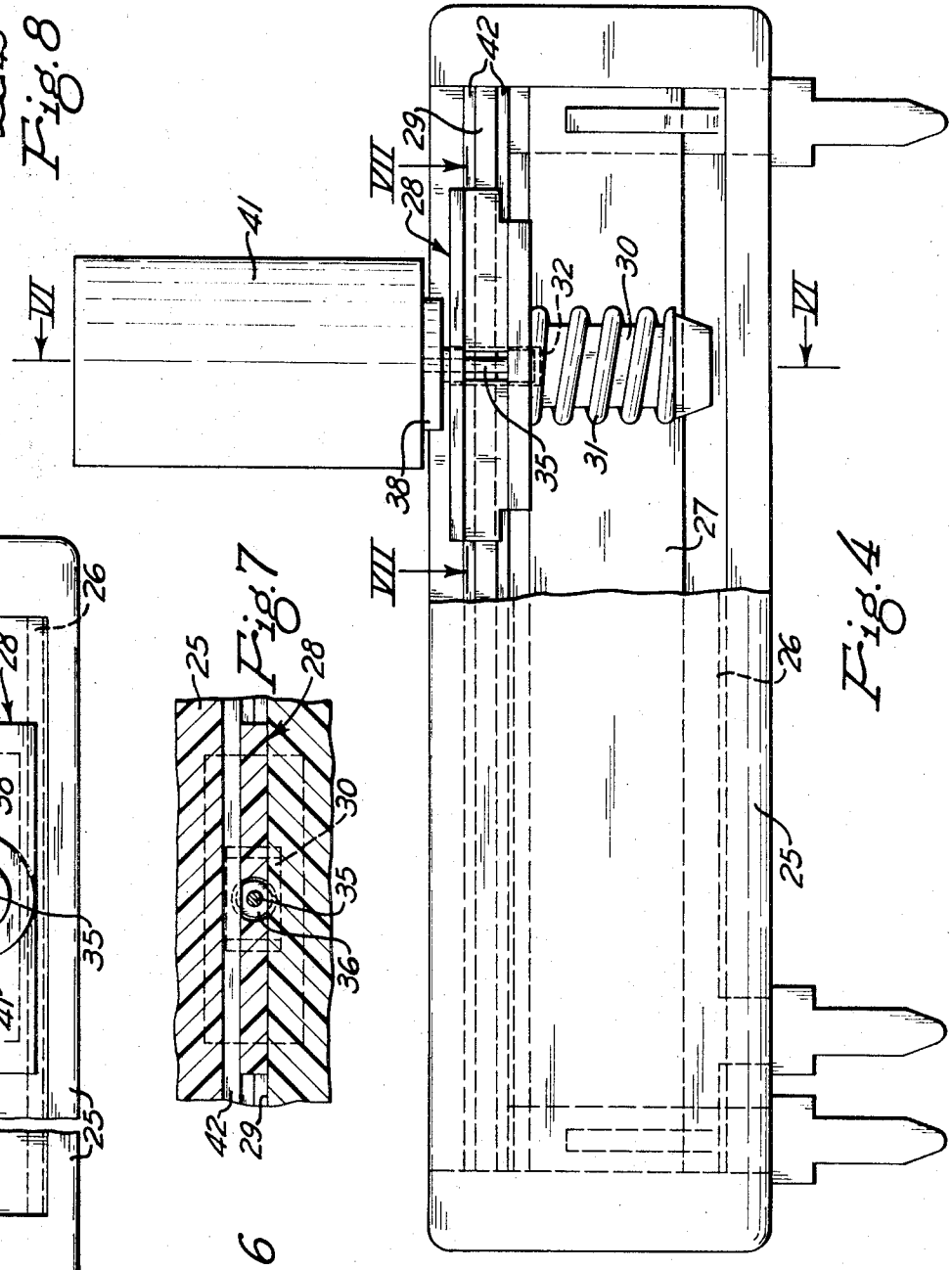


Fig. 4

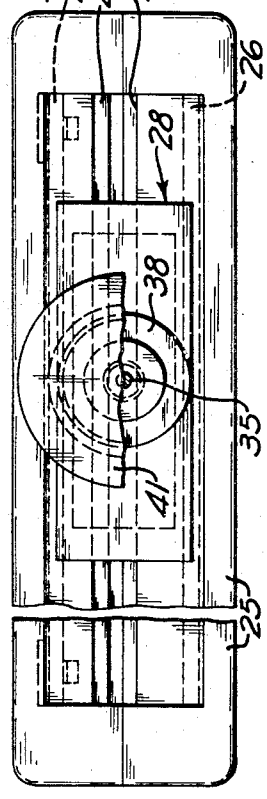


Fig. 5

Fig. 7

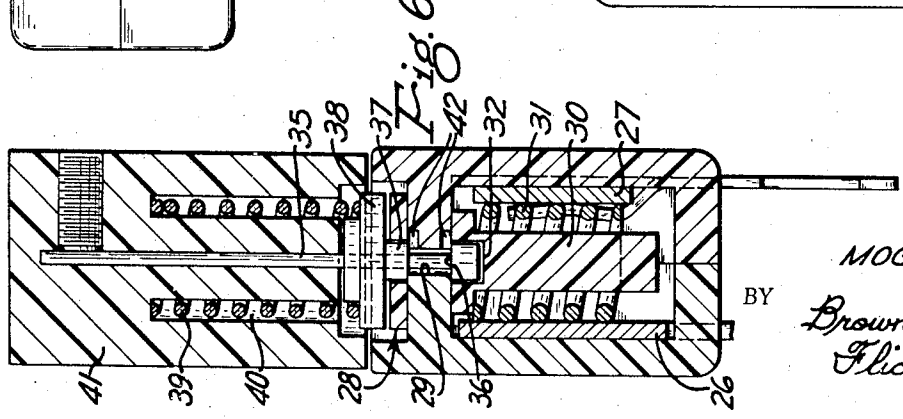


Fig. 6

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FINE ADJUSTMENT VARIABLE RESISTOR

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Int. Cl. H01c 9/00
U.S. Cl. 338—183 11 Claims

ABSTRACT OF THE DISCLOSURE

A slide is disposed in a longitudinal slot in one wall of a case, in which there are parallel resistance and collector elements. The slide carries a bridging contact engaging both elements, and is provided with a passage extending inwardly at least as far as the slot. Rotatably mounted in this passage is a shaft, the inner end of which is pressed against the case at only one side of the slot. A knob on the outer end of the shaft turns it so that the friction of the shaft against the case will cause the slide to move along the slot.

Linear motion variable resistors, such as potentiometers, are well known and often are provided with slides that are manually movable to adjust contacts along resistance elements. In some cases it is desirable to be able to make fine adjustments than can be accomplished conveniently by simply pushing the slides back and forth. It is therefore among the objects of this invention to provide a linear motion variable resistor in which fine adjustments can be made by hand, and in which the fine adjustments can be made by simply turning a knob.

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

FIG. 1 is a side view of a potentiometer with part of it broken away;

FIG. 2 is a fragmentary front view, partly broken away;

FIG. 3 is a cross section taken on the line III—III of FIG. 1;

FIG. 4 is a side view, similar to FIG. 1, of a modification;

FIG. 5 is a fragmentary front view, partly broken away;

FIG. 6 is a cross section taken on the line VI—VI of FIG. 5;

FIG. 7 is a longitudinal section taken on the line VII—VII of FIG. 4; and

FIG. 8 is a fragmentary side view of another modification.

Referring to the drawings, the long rectangular case **1** of a variable resistor, such as a rheostat or potentiometer, may be formed from a molded plastic or other suitable rigid material. The case preferably is made from two molded half sections that have meeting edges extending from front to back across the end walls of the case and lengthwise along its back or base. The half sections are joined tightly together in any suitable manner. Inside the case a metal collector strip **2** and an electrical resistance strip **3** are mounted at the opposite sides and are parallel. The collector strip is provided with an integral terminal **4** that extends through the back of the case, while each end of the resistance strip is connected to a metal terminal **5** likewise extending through the back.

Between the two strips there is a bridging contact **7** that engages both of them. This contact is carried by a slide **8** that is slidably mounted in a central slot **9** extending lengthwise of the case in its front or top. The slide has laterally opening grooves **10** in its opposite sides receiving the side walls of the slot to hold and guide the slide.

It is a feature of this invention that the slide is moved lengthwise of the case by turning a knob and that the

movement can be very slow in order to provide fine adjustment of the electrical resistance. Accordingly, the exposed portion of the slide is provided midway between its ends with a pasage **12** extending inwardly to the front wall of the case. This passage is not midway between the opposite sides of the slide, but is offset so that its axis is between one side of the case slot and the central longitudinal plane of that slot. Rotatably mounted in the passage is a tiny shaft **13**, the inner end of which is tapered, preferably in the form of a cone. The point or apex of the cone projects into the case slot and the side of the cone is exposed and engages the adjacent outer edge of the slot, as shown in FIG. 3. The portion of the slide inside the slot is provided with a notch **14** to prevent it from interfering with the cone.

The shaft cone is pressed against the case by a spring that uregs the shaft inwardly. Preferably, the spring is a leaf spring **16** disposed in a recess **17** in the exposed portion of the slide. The spring is bowed as shown in FIG. 1 and is provided with a central notch **18** that extends inwardly from one edge so that the spring can be inserted in an annular groove in the shaft. The ends of the spring press against the wall of the recess to cause the spring to press inwardly against the shoulder **19** at the inner side of the shaft groove.

In order to turn the shaft, a knob **21** is rigidly mounted on its outer end projecting from the slide. When the knob is turned, the friction of the shaft against the case at the side of the slot will cause the slide to be moved along the slot. Due to the very small circumference of the area of the cone engaging the case as compared with the circumference of the knob, one revolution of the knob will move the slide a very short distance. Since it is easy to turn the knob only a few degrees, it will be seen that the slide can be moved infinitesimal distances when desired, thereby providing extremely fine adjustments.

In the modification shown in FIGS. 4 to 7, the case **25** may be formed substantially as before and contain parallel collector and electrical resistance strips **26** and **27**. A slide **28** is mounted in the longitudinal slot **29** in the front of the case for movement lengthwise of it, and has a post **30** extending inwardly between the strips. A bridging contact, in the form of a wire coil **31**, is mounted on the post. The slide is provided with a passage **32** extending inwardly through its outer portion, the portion within the case slot and into its inner portion. As shown in FIG. 6, the diameter of the ends of this passage inside and outside of the case is greater than the width of the slot.

Extendng into the slide passage is the inner end portion of a rotatable shaft **35** that is provided at its inner end with a laterally projecting annular shoulder **36** that may be formed by a head on the shaft. The head is journaled in the inner end of the passage. The diameter of the head is greater than the width of the case slot so that the head overlaps the front wall of the case at opposite sides of the slot. Slidably mounted on the shaft outside of the case is a collar **37** that is rotatably mounted in the outer end of the slide passage and that has substantially the same diameter as the head of the shaft. The collar has an enlarged head **38** overlying the slide. This head is engaged by a coil spring **39** extending outwardly into a cylindrical recess **40** in a knob **41** that is rigidly mounted on the outer end portion of the shaft. It will be seen in FIG. 6 that the spring not only presses the collar against the front wall of the case, but also pulls the shaft head outwardly against that wall. To prevent the collar and shoulder **36** from engaging the case at both sides of its slot, the front wall at one side of the slot may be made thinner than at the other side or be provided with inner and outer edge grooves **42** extending lengthwise of the case.

When the knob is turned, it will rotate the shaft and its head and the collar. Due to the friction between the case and the collar and shoulder **36** pressed against it, the shaft will travel or roll lengthwise of the case and thereby move the slide along the slot. Since the diameters of the collar and the shaft head are much less than the diameter of the knob, one revolution of the knob will move the slide only a very short distance. It is easy to turn the knob only a few degrees, so the slide can be moved an extremely small amount when desired. This permits very fine adjustments of the potentiometer to be made.

In the further embodiment of the invention disclosed in FIG. 8, the construction is the same as shown in FIGS. 4 to 7, except that the shoulder **45** on the shaft **46**, and the shoulder **47** on the collar **48** are tapered toward each other. Consequently, instead of engaging flat against the inner and outer surfaces of the front wall **49** of the potentiometer case at one side of its longitudinal slot **50**, they engage only the edges of that slot as in FIG. 3, so that their points of engagement with the case are even closer to the axis of the shaft than before. This allows even finer adjustments of the potentiometer to be made.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A linear motion variable resistor comprising an elongated case provided with a longitudinal slot in one of its side walls, resistance and collector elements inside the case extending lengthwise thereof, a slide disposed in said slot for movement lengthwise thereof only, a bridging contact in the case carried by the slide in engagement with both of said elements, the slide being provided with a passage therein extending inwardly therethrough at least as far as said slot, a shaft rotatably mounted in said passage and having an inner end engaging the case at only one side of the slot, a spring pressing the shaft against the case, and a knob rigidly mounted on the outer end of the shaft for turning it, whereby the friction of the rotating shaft against the case will cause the slide to move along the slot.

2. A variable resistor according to claim **1**, in which the inner end of said shaft is tapered, and the side of the tapered end engages the case along the outer edge of the slot at said one side thereof.

3. A variable resistor according to claim **2**, in which

the axis of said passage is located between said one side of the slot and the central longitudinal plane thereof.

4. A variable resistor according to claim **2**, in which the slide is provided with a recess around the shaft, and said spring is in the recess, the spring being connected to the shaft and compressed against the wall of the recess to urge the shaft inwardly.

5. A variable resistor according to claim **4**, in which the shaft is provided with a shoulder in said recess, and said spring is a leaf spring provided with a central notch receiving the shaft and pressing inwardly against the shoulder.

6. A variable resistor according to claim **1**, in which the case-engaging portion of said shaft includes a laterally projecting annular shoulder engaging said one wall.

7. A variable resistor according to claim **6**, in which said shoulder lies flat against the inner surface of said one wall.

8. A variable resistor according to claim **6**, in which said shoulder is tapered lengthwise of the shaft and engages the case along the inner edge of the slot at said one side thereof.

9. A variable resistor according to claim **1**, in which said passage and shaft extend through said slot, and the inner end of the shaft is provided with a laterally projecting annular shoulder overlapping and engaging said one wall at said one side of the slot only, the resistor including a collar slidably mounted on the shaft outside of the case and overlapping and engaging said wall at said one side of the slot only, said spring being compressed between the collar and knob for pressing said shoulder and collar against the opposite sides of said wall.

10. A variable resistor according to claim **9**, in which said wall has a portion that is thicker along said one side of the slot than the other side.

11. A variable resistor according to claim **9**, in which said collar is provided with a head overlapping the slide, and said spring is a coil spring compressed between said head and knob.

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U.S. Cl. X.R.

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