Aug. 1, 1950 A. C. DAVIS 2,517,180

STRAIGHT LINE ATTENUATOR

Filed May 15, 1950

Fig. 1.

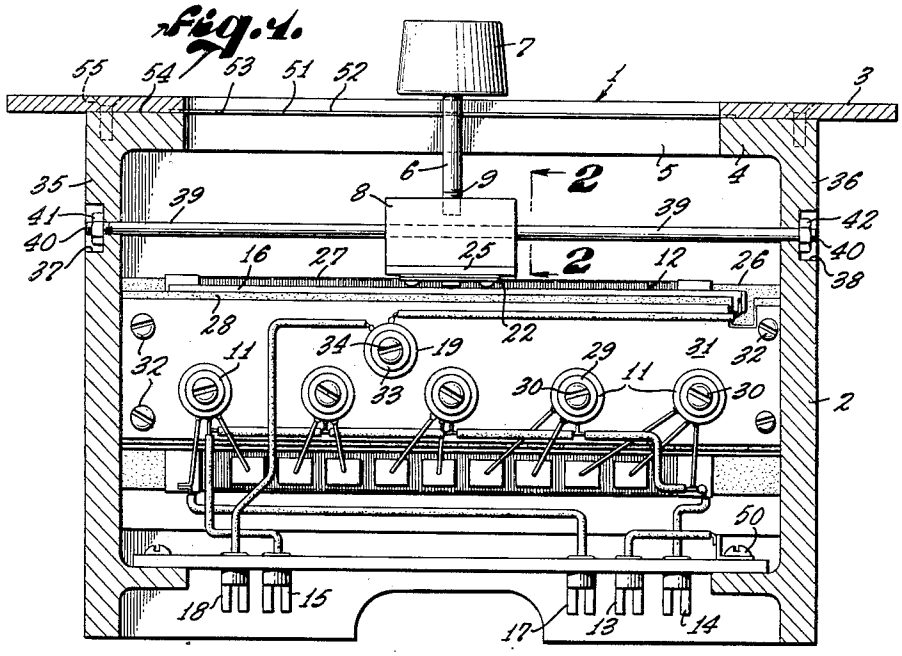


Fig. 2.

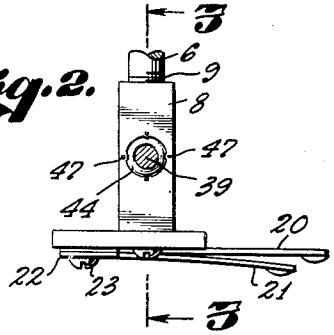


Fig. 3.

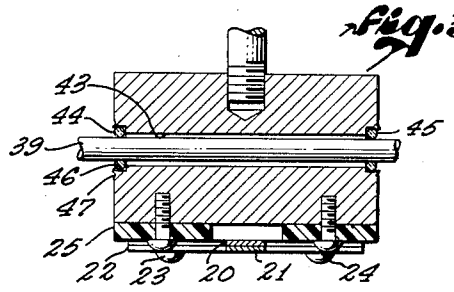
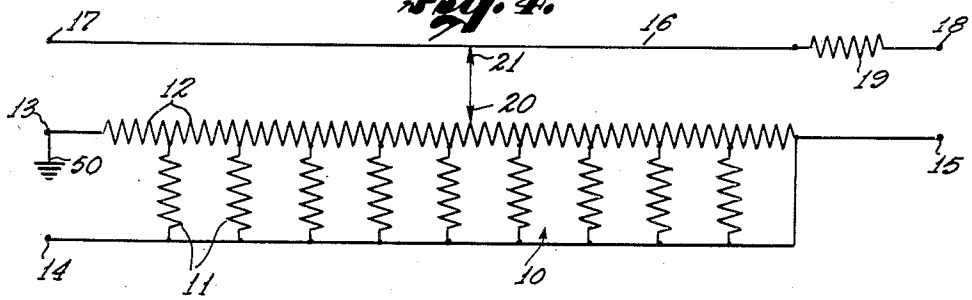


Fig. 4.



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STRAIGHT-LINE ATTENUATOR

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5 Claims. (Cl. 201—62)

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The invention relates to a straight line attenuator and more particularly to improvements in an adjustable member movable in a straight line to vary the attenuation.

It has heretofore been proposed to provide a circular array of contacts, such as the exposed turns on a choke coil or resistance wire, with a radius arm having a cooperating sliding contact. This requires a pivotal support for the contact arm and other features more complicated than provided by the present invention.

It has also been proposed to provide a contact arm movable in a straight line for varying the amount of attenuation or impedance in circuit, but such arrangements have not proven entirely satisfactory as the sliding contact either does not make proper contact with the stationary contacts, or it has a tendency to bind in certain places in its travel, requiring more effort to move it at certain places than others. The tendency to bind is particularly true in the case where aluminum or one of its alloys is used as the bearing members for the sliding contact. Aluminum is preferred because it is light in weight, but two aluminum members in sliding contact with each other provide an unsatisfactory bearing support because of the high and irregular coefficient of friction.

The object of the invention is to overcome the above defects and provide a slide bearing for the movable contact of an attenuator or the like, wherein the bearing is largely composed of dural and has a uniform and exceedingly small coefficient of friction, whereby the sliding contact can be adjusted with a force which is exceedingly small and uniform for all points in the travel of the contact, while maintaining firm sliding electrical contact with the variable resistance elements of the attenuator.

For further details of the invention, reference may be made to the drawings wherein Fig. 1 is a side view in elevation of a straight line attenuator according to the present invention.

Fig. 2 is an enlarged sectional view with parts broken away, on line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a sectional view on line 3—3 of Fig. 2, looking in the direction of the arrows.

Fig. 4 is a schematic wiring diagram of the attenuator support of the device in the other figures.

Referring to the drawings, the straight line attenuator 1 comprises a metal frame 2 having a panel 3 at the top or front thereof. The end 4 of frame 2 and the panel 3 have aligned slots indicated at 5, through which projects a short piece of aluminum rod 6. On the outer end of rod 6 is suitably secured a knob 7. The inner end of rod 6 is threaded into a dural block 8 as indicated at 9. The knob 7 is movable in a straight line along the slot 5 and there are cooperating index marks, not shown, on the knob 7 and on the panel 3, showing the amount of attenuation provided by the well-known ladder network 10 in Fig. 4.

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The ladder network 10, as well-known, comprises a group of shunt resistance elements indicated at 11, and a group of series resistance elements indicated at 12. As shown in Fig. 4, the left end of the ladder network is provided with terminals 13 and 14, while at its other end is provided with one terminal as indicated at 15. Terminal 13 may be connected to ground on frame 2 as indicated at 50. There is also provided a straight slide wire 16 having terminals 17 and 18 and a fixed series resistance 19. As shown in Fig. 2, block 8 has fixed thereto a contact spring having two arms 20 and 21, one of which is longer than the other. The springs 20 and 21 are in contact with each other at their base 22 which is held by screws 23, 24 to the bottom of block 8, with an intervening strip 25 of insulation.

The series resistance 12 is in the form of a flat coil of wire mounted on an insulating card 26, see Fig. 1, suitably supported in the frame 2. The longer contact arm 20 slides on the contacts provided by the linear array of exposed ends of these turns as indicated at 27 in Fig. 1.

The shorter contact arm 21 slides on the straight wire 16 which is parallel to contacts or turns 27. As shown in Fig. 1, wire 16 is suitably mounted on an insulating card 28 at the front of card 26, wire 16 being at a lower level than the turns 27. The shunt resistances 11 are mounted on insulating spools like 29, held by bolts like 30, on an insulating strip 31 mounted by screws like 32 on the frame 2. The series resistance 19 is in a form of similar spool 33 held by bolt 34 on the strip 31.

The frame 2 has opposite ends 35 and 36 having aligned bores 37 and 38 in which is mounted a dural rod 39. The opposite ends of rod 39 are provided with threads like 40 for nuts 41 and 42, countersunk as shown. The nuts 41 and 42 are tightened to rigidly hold the rod 39 parallel to slot 5 to exposed resistance turns 27 and to straight slide wire 16. Block 8 has an enlarged bore 43 substantially larger than the diameter of rod 39 as in Fig. 3. At each end of bore 43 is mounted a ring 44, 45, preferably of sapphire, although it could be of glass or other hard sub-

stance having a low coefficient of friction with dural. One end of block 8 is provided with a recess 46 slightly larger than the outside diameter of ring 44 and of the same depth as the thickness of ring 44, and the latter is held in place by upsetting the adjoining material of the block, for example, with a prick punch as indicated at 47, four such upsets spaced around ring 44 being shown by way of example in Fig. 2. The ring 45 is similarly held in the opposite end of bore 43.

The internal diameter of the coaxial spaced rings 44 and 45 is substantially the same as the diameter of rod 39 on which they are slidably mounted. The block 8 can be held in position, and then the rod 39 passed through the rings 44 and 45 and held in position by the fastening nuts 41 and 42.

The straight line movement of block 8 is assisted by a guide for the outer end of the rod 6. This guide is in the form of two straight pieces of clock spring which are parallel and spaced apart slightly more than the diameter of rod 6, defining a slot 51 parallel to the rod 39. One of these springs is indicated at 52 and each thereof like spring 52 is retained in a milled slot 53 on the under side of the panel 3. The springs like 52 are held in slots like 53 by the top 54 of the frame 2. The panel 3 is held in place by screws like 55.

The attenuator shown in Fig. 1 is full scale and the pressure on knob 7 to operate the sliding block 8 is about one and one-half ounces.

In the particular device shown in Fig. 1, the range of db. is from zero to 45, although various other arrangements of series and shunt resistances may be used for other values or ranges of attenuation.

Various other modifications may be made in the invention without departing from the spirit of the following claims. For example, other metals or insulating materials may be used for block 8 and rod 39.

I claim:

1. A straight line attenuator comprising a ladder type network having a linear array of contacts, a straight wire parallel to said contacts, a linear support parallel to said wire and said contacts, a block slidable on said support, contact arms on said block for said wire and for said linear array of contacts, said block having a bore substantially larger than said support and spaced rings fixed to said block, said rings constricting said bore and slidably fitting said support.

2. A straight line attenuator according to claim 1 wherein said support and said block are composed of aluminum and said rings are sapphire.

3. A sliding contact device comprising a frame, a rod supported at its ends by said frame, a block slidably mounted on said rod, said block having a bore substantially larger than said rod, said block having a recess at each end of said bore, a ring fixed in each of said recesses, each of said rings slidably fitting on said rod, a spring contact on said block and cooperating contacts carried by said frame, and a handle on said block.

4. A sliding contact device according to claim 3 wherein said rod and said block are dural, said rings being harder than dural.

5. A sliding contact device comprising a rod, and a sliding contact having a ring encircling and slidably fitting said rod, and means for operating said sliding contact.

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No references cited.