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P. A. VONADA

2,468,147

HIGH-FREQUENCY SHORTING BLOCK

Filed Sept. 6, 1944

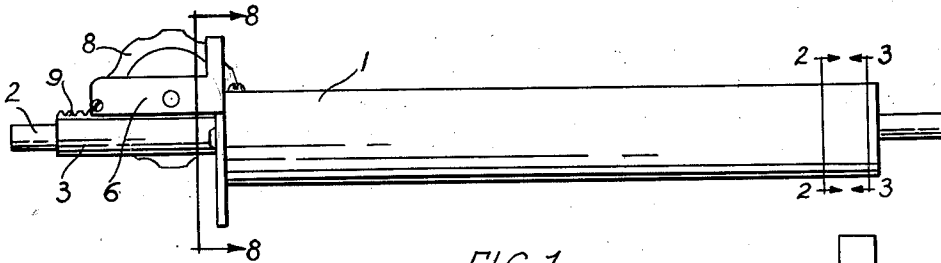


FIG. 1

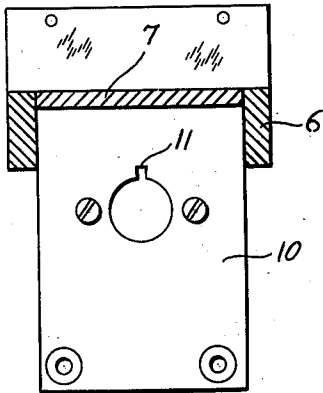


FIG. 8

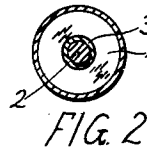


FIG. 2

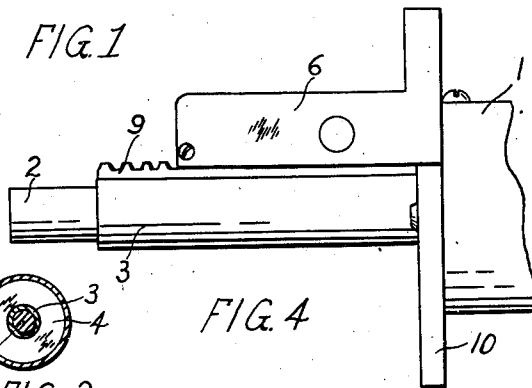


FIG. 4

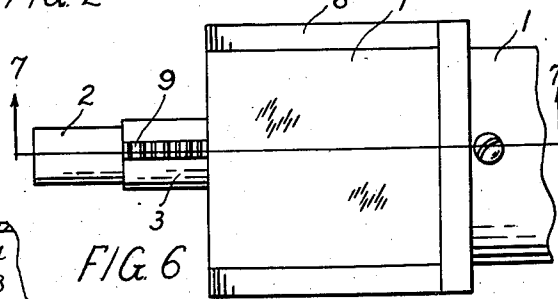


FIG. 6

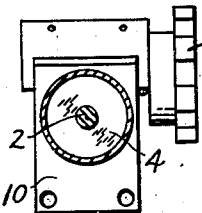


FIG. 3

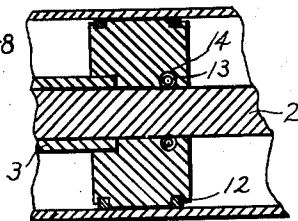


FIG. 9

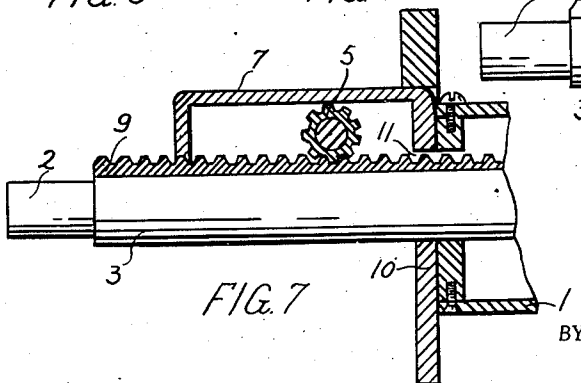


FIG. 7

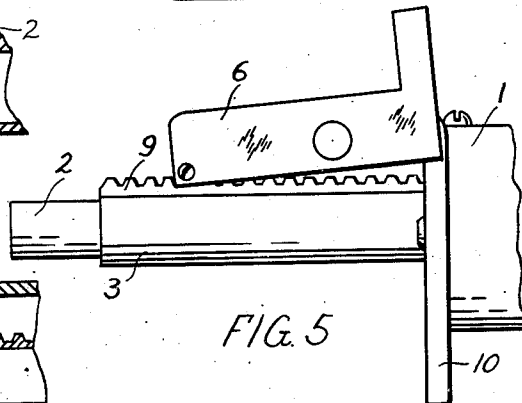


FIG. 5

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HIGH-FREQUENCY SHORTING BLOCK

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1 Claim. (Cl. 178-44)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The invention to be hereinafter described relates to coaxial tuning stubs.

In the radio field tuning devices are widely used and there are several well known types. One of the more widely known types uses a disc, head or plate of considerable diameter reciprocable on a central or inner conductor and carrying a plurality of peripheral leaf spring contacts in sliding engagement with the outer conductor. The usual screw feed is used to travel the disc in tuning the set. To adequately guide the disc, a pair of guide rods is used at considerable distances from the disc center and parallel with the direction of travel of the disc. Frequently there is binding between the disc and guide rods, rendering the device wholly inoperative, seriously inefficient or, at least, greatly impairing the efficiency of the device. Another difficulty in that type is the tendency of the leaf springs to miss engagement or contact thereby changing capacity and correspondingly improperly affecting frequency or tuning.

The main objects of the present invention are to avoid the above and other objections and provide a simple, efficient and compact coaxial tuning stub which may be readily provided in quantity at low cost.

In order to more clearly disclose the construction, operation and use of the invention, reference should be had to the accompanying drawings forming part of the present application.

Throughout the several figures of the drawings like reference characters designate the same parts in the different views.

In the drawings—

Fig. 1 is a side elevation;

Fig. 2 is a lateral cross section on line 2-2 of Fig. 1;

Fig. 3 is a lateral cross section on line 3-3 of Fig. 1;

Fig. 4 is an enlarged side elevation of the swinging frame of the pinion, in operative position;

Fig. 5 is a view similar to Fig. 4, in inoperative position;

Fig. 6 is a plan view of Fig. 4;

Fig. 7 is a cross section on line 7-7 of Fig. 6;

Fig. 8 is a lateral cross section of Fig. 1 on line 8-8, enlarged; and

Fig. 9 is an enlarged longitudinal cross section through the piston head.

2

Referring to the drawings in detail, 1 indicates the outer conductor of the coaxial line and 2 the inner or central conductor. The inner or central conductor is supported concentrically or coaxially within the outer conductor 1 in usual and well known manner. Slidably disposed on said central conductor is a tubular sleeve 3 carrying at its inner end the piston head, block or stub 4 having substantially the same outside diameter as the inside diameter of cylinder 1. It has a free sliding fit within the outer conductor, continuous and a wiping contact throughout its cylindrical wall or face with the inner wall or face of cylinder 1. Sleeve 3 is appreciably longer than conductor 1. Sleeve 3 is provided with a radially extending rack 9 running the greater part of its length and meshing with a pinion 5 journaled in a frame 6 which is pivoted to the lower part of the front portion of a plate 7 which extends outwardly from 1 in the direction of travel of sleeve 3 and is spaced radially from conductor 2, sleeve 3 and rack 4. By this pivotal mounting of frame 6 pinion 5 may be readily swung upwardly or radially to disengage it from rack 4. Normally, the pinion gravitates to engagement or operative driving contact with the rack. Preferably, it is operable by a handle or knob 8 on one end which, of course, may also be used for raising the pinion to disengaged or inoperative position.

Rack 9, extending radially from sleeve 3, provides a key, spline or feather which is used to guide the rack in its reciprocations. Rack 9 passes centrally through the closed end of 1 and the end plate 10 carried thereby, both the closed end and plate 10, being provided with cooperating aligned notches or slots 11 for such free sliding and guiding movement of the rack.

The piston head or tuning stub 4 is of sufficient width or axial extent to assure ample contact at all times and in all positions with the cooperating inner wall of the outer conductor 1. This width, together with the single central or axial guide and longitudinal feed, provide a simple, continuous, definite, sure and non-binding feed of the sleeve 3 and head or stub 4. A single feed rack acting at the center of the stub or head acts equally or is balanced in its action, avoiding canting, twisting and binding.

By eliminating the spring contact fingers, the diameter of the piston 4 may be greatly reduced. That, in turn, enables corresponding reduction in the diameter of the outer conductor 1, with resulting reduction in overall size of the entire device.

By having the entire outer cylindrical wall of stub 4 in smooth sliding continuous contact with the inner cylindrical surface or wall of the outer conductor there will be a definite established uniform contact relationship that will not vary with repeated use. That, obviously, is not the case where the multiple radial spring contact stub is used. With the stub of this invention there is no variation in capacity as with the multiple radial spring contact stub.

Fig. 9 shows, somewhat exaggerated, for clearness, the elements carried by the piston head to doubly assure proper electrical conducting contact between the piston head and the two coaxial conductors 1 and 2. Resilient split rings 12 seated, peripherally in the piston head, in expanded state, project radially very slightly beyond the cylindrical wall of the head. When compressed they are in the same plane as the piston head cylindrical wall. So, when the piston is in place within 1 the spring rings will be compressed and in constantly yielding contact with 1. This provides double assurance of continued good electrical contact with 1 throughout the periphery of the piston head, at all times. Like assurance of continued good electrical contact between the piston head and 2 throughout the periphery of 2 is provided by a very small diameter coil spring 13 seated in the channel or groove 14 in the center of 4 surrounding 2. The depth of that groove is, preferably, about $\frac{1}{1000}$ of an inch less than the diameter of the spring seated therein. Thus, the encirclement diameter of spring 13 is $\frac{2}{1000}$ inch less than the outer diameter of 2 which it encircles so that spring 13 exerts a continuous pressure on 2, being compressed between 4 and 2, with assured continuous contact between 2 and 4 at all times.

Split rings 12, as shown, are seated in narrow shallow channels formed in the edges of 4. The outer walls of these channels, of course, may be compressed against the flat split rings to properly seat them, in well known manner.

In the present construction, the whole stub assembly may be easily and quickly removed and reinserted as a single simple unit without any disassembling and with the minimum disconnection. It is only necessary to lift the frame 6 and pinion 5 by knob 8 from the position of Fig. 4 to the position of Fig. 5, thereby raising pinion 5 clear of and out of engagement with rack 9. Then the center conductor 2 with sleeve 3 and stub 4 and carrying rack 9 may be simply slid out through the open end of 1, the rack moving through the slot 11 on end plate 10. In reassembling, it is only necessary to lift frame 6 and pinion 5 by knob 8 and reverse the disassembling operation.

The most practical axial width or thickness of the stub in the longitudinal direction may be

readily determined in ways well known to those skilled in the art and need not be detailed or elaborated on in this application as that would unnecessarily encumber and enlarge the record of the case with no resulting gain or advantage.

Likewise, the small number of parts, together with the simplicity of each, greatly reduces manufacturing assembling, handling and shipping costs. It also greatly increases durability and efficiency of the construction.

It is thought that the construction, operation and use of the invention will be clear from the preceding detailed description.

Changes may be made in the construction, arrangement and disposition of the several parts of the invention within the scope of the appended claim without departing from the field of the invention and it is meant to include all such within this application wherein only one preferred form of the invention has been disclosed purely by way of illustration and with no thought or intention of, in any degree, limiting the invention thereby.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

A coaxial tuning device comprising coaxial inner and outer conductors, a tubular stub surrounding said inner conductor and positioned within said outer conductor and in sliding contact with the outer and inner cylindrical surfaces respectively of said conductors, first and second channels in the outer and inner cylindrical surfaces respectively of said stub, a split ring in said first channel and in sliding contact with the inner surface of the outer conductor, a coiled spring in said second channel and in sliding contact with the outer surface of said inner conductor, a tubular sleeve secured to said stub and surrounding said inner conductor and movable longitudinally thereof, a longitudinally disposed rack extending outwardly from said sleeve, a pinion engageable with said rack, means to rotate said pinion, and means to sustain said pinion and said rotating means pivotally relative to said outer conductor so as to allow said pinion to be moved into and out of engagement with said rack, said pinion being maintained normally in operable engagement with said rack.

PHILLIP A. VONADA.

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

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