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ELECTROMECHANICAL FILTER WITH CENTER DRIVE OF DISK

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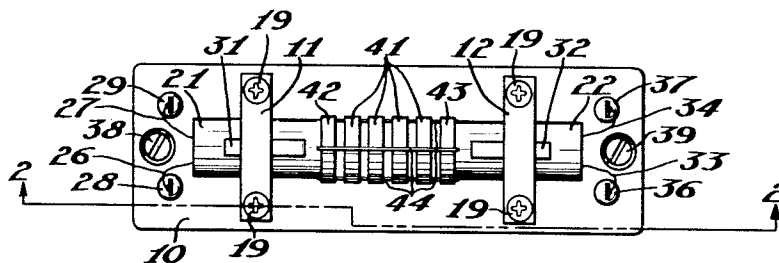


Fig 1

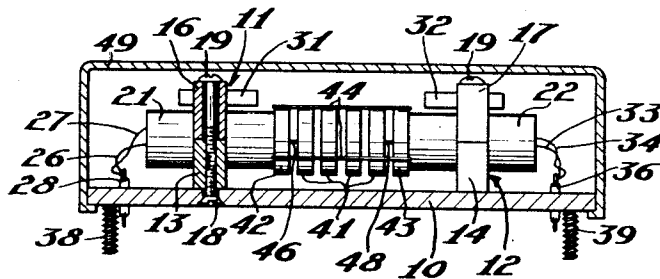


Fig 2

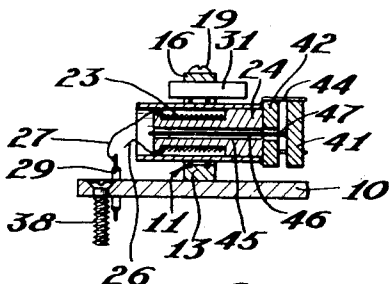


Fig 3

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ELECTROMECHANICAL FILTER WITH CENTER DRIVE OF DISK

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3 Claims. (Cl. 333-71)

This invention relates in general to electromechanical filters and in particular to a filter which is driven at the center of a resonating disc.

The co-pending patent application entitled "Longitudinal Support of Mechanical Filter," Serial Number 283,340, filed April 21, 1952, discloses an electromechanical filter wherein a plurality of discs are supported by longitudinal coupling wires and the active discs are driven by connecting a magnetostrictive rod to the periphery.

The present invention relates to an improved method of driving a filter assembly. It is an object, therefore, to provide a new support means for an electromechanical filter.

Another object of this invention is to provide an improved driving system for an electromechanical filter.

Further objects, features and advantages of the invention will become apparent from the following description and claims when read in view of the drawings, in which:

Figure 1 is a top view of the invention with the top cover removed;

Figure 2 is a side sectional view taken on line 2-2 of Figure 1; and

Figure 3 is an enlarged detailed sectional view of the driving means of this invention.

Figure 1 is a view of the filter with the top cover removed and illustrates a base plate 10 upon which are mounted a pair of stand-offs 11 and 12, respectively. As best shown in Figure 2, the stand-offs 11 and 12 are formed in two parts with lower parts 13 and 14, and top parts 16 and 17, respectively. The lower parts 13 and 14 are attached to the base plate by set screws 18, and the top parts 16 and 17 are attached by set screws 19 to the lower parts.

At the junction between the upper and lower parts of the stand-offs circular openings are formed. They are lined with a suitable gasketing material through which cylinders 21 and 22 extend. The cylinders are hollow as shown in Figure 3, and contain therein a magnetic coil form 24. A driving coil 23 is mounted in cylinder 21 and has output leads 26 and 27 which are connected, respectively, to output terminals 28 and 29 that extend through the base plate 10. Polarizing magnets 31 and 32 are supported by the stand-offs 11 and 12 adjacent the cylinders 21 and 22. The cylinders 21 and 22 are made of non-magnetic material, as for example, brass.

The output cylinder 22 contains therein a structure similar to that within cylinder 21 and comprises an output coil that has output leads 33 and 34 which are connected to output terminals 36 and 37 mounted in the base plate 10. The base plate 10 may be attached to a suitable chassis by threaded pins 38 and 39 connected thereto.

Mounted between the cylinders 21 and 22 is the vibrating filter assembly comprising a plurality of active discs 41 and a pair of end discs 42 and 43, respectively. The discs 41, 42 and 43 are connected together by longitudinal coupling wires 44. The end discs 42 and 43 are attached to the cylinders 21 and 22.

As pointed out in the Doelz application, Serial Number 248,011, filed September 24, 1951, the thickness and diameter of the active discs 41 determine the frequency of operation of the filter.

As shown in Figure 3, the cylinders 21 and 22 are formed with axial openings in which the coil forms 24

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are received. The coil forms 24 are formed with central axial openings 45. A driving rod 46 extends through the coil form within cylinder 21. The disc 42 is also formed with a central opening through which the driving rod 46 extends. One end 47 of the driving rod 46 is connected to the center of the first active disc 41 by staking or welding.

An output rod 48 may be seen in Figure 2 and extends from the last active disc 41 to within the confines of the cylinder 22 wherein the output coil is mounted. The disc 43 is also formed with a central opening through which the rod 48 extends.

A cover member 49 is shown in Figure 2 and is generally rectangular in shape and has downwardly extending sides which are attached to the base plate 10.

The driving rod 46 and output rod 48 may be attached to the end active discs by staking.

Due to the symmetry of the driving points, spurious frequency responses are eliminated. The impedance at the center of the disc is very low so that the filter is driven at a low impedance point. Impedance is defined as the ratio of force to velocity.

In operation, the input signal is supplied to leads 26 and 27 to excite the magnetostrictive rods 46 and 48 which causes them to expand and contract. If the incoming signal has frequency components within the resonant passband of the filter, the first active disc 41 will vibrate, thus, transferring energy through the wires 44 to the last active disc 41, which will in turn couple the energy to the output magnetostrictive wire 48 which will induce an output signal in the output coil connected to the leads 33 and 34.

The apparatus is particularly useful as a bandpass filter which might, for example, have a center frequency of 455 kilocycles. The entire structure at this frequency is only about two and one-half inches long and has an extremely high Q which is unobtainable with electrical filters of comparable size.

Although this invention has been described with respect to a preferred embodiment thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of the invention, as defined by the appended claims.

What is claimed is:

1. An electromechanical filter comprising, a base plate, a pair of stand-offs mounted on said base plate, a pair of cylinders supported by said stand-offs, a driving coil mounted within the first cylinder, an output coil mounted within the second cylinder, a plurality of longitudinal coupling wires, a pair of end discs connected, respectively, to the ends of the cylinders, said coupling wires attached to the peripheries of said end discs, a plurality of active discs attached to said coupling wires between said end discs, said end discs formed with a central opening, a driving rod passing through the hole in the first end disc and within the confines of said driving coil and attached to the center of the first active disc, an output rod attached to the center of the last active disc and passing through the hole in the second end disc and within the confines of the output coil, and a pair of polarizing magnets supported by said stand-offs adjacent said cylinders.

2. An electromechanical filter comprising, a base plate, a pair of stand-offs mounted on said base plate, a pair of cylinders supported by said stand-offs, a driving coil within the first cylinder, an output coil within the second cylinder, a first end disc connected to the end of the first cylinder, a second end disc connected to one end of the second cylinder, a plurality of longitudinal coupling wires attached to the peripheries of the first and second end discs, a plurality of active discs attached to the coupling wire and mounted between the first and second end discs, the first and second end discs formed with a central opening, a driving rod attached to the center of the first active disc and extending through the opening in the first end disc and within the confines of the driving coil, and an output rod attached to the center of the last disc and extending through the opening in the second end disc and within the confines of the output coil.

3. An electromechanical filter comprising, a base plate,

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a pair of stand-offs mounted on said base plate, a pair of cylinders supported by said stand-offs, a driving coil within the first cylinder, an output coil within the second cylinder, a first end disc connected to the end of the first cylinder, a second end disc connected to one end of the second cylinder, a plurality of longitudinal coupling wires attached to the peripheries of the first and second end discs, a plurality of active discs attached to the coupling wire and mounted between the first and second end discs, the first and second end discs formed with a central opening, a driving rod attached to the center of

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the first active disc and extending through the opening in the first end disc and within the confines of the driving coil, an output rod attached to the center of the last disc and extending through the opening in the second end disc and within the confines of the output coil, a pair of coil forms mounted, respectively, within the first and second cylinders, and said first and second coils wound, respectively, about them.

No references cited.