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FILTER CONDENSER AND BRUSH HOLDER

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FIG. 1.

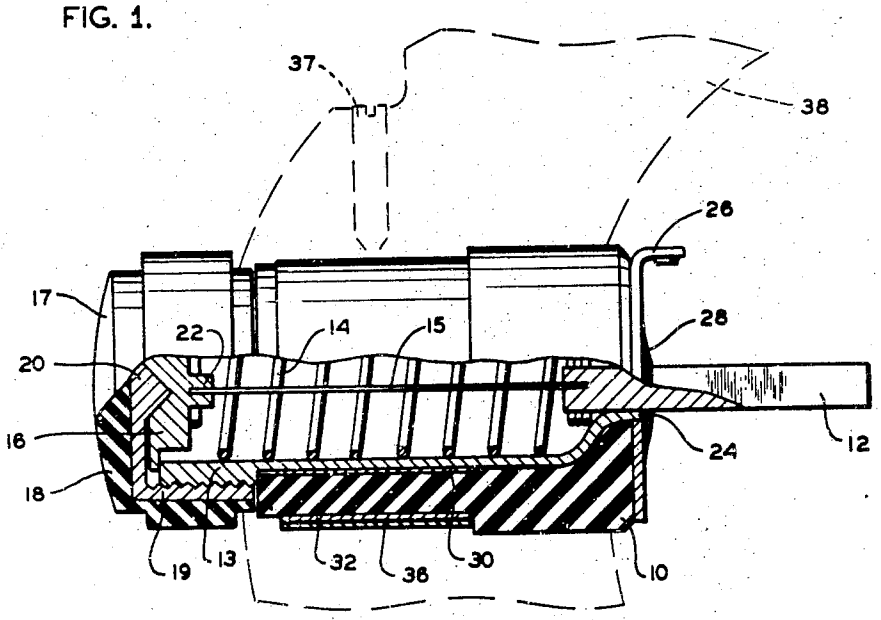
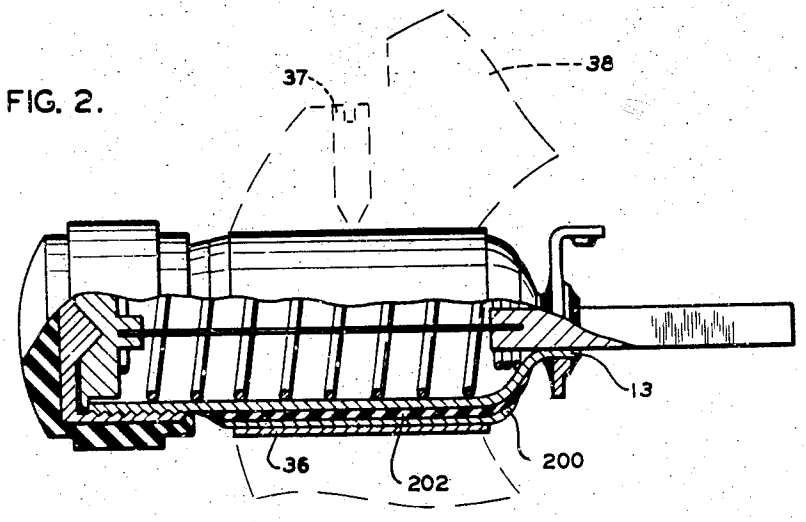


FIG. 2.



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FILTER CONDENSER AND BRUSH HOLDER

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10 Claims. (Cl. 171—324)

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

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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.

This invention relates to fixed capacitors which are especially suitable as filter capacitors for electrical systems used in vehicles and airplanes. The electrical systems such as ignition systems, generating and starting equipments, etc., produce considerable interference with the radio communication equipment also used on these vehicles, unless these radio-interference producing systems are provided with the interference-suppressing filters; the condenser disclosed in this application is particularly suitable for this purpose, and it is incorporated into a brush holder of a generator or a motor, the temperatures of which ordinarily produce a considerable amount of interference.

In order to accomplish proper suppression of the interference frequencies produced by the various auxiliary equipment used in connection with internal combustion engines, it is necessary that the filter, which, in this case, consists of a shunting condenser, should have sufficiently large capacitance for filtering low frequencies, and a minimum inductance and resistance components in the shunting path of the condenser, so that the shunting path would provide a very low impedance path to ground for the interference-producing high frequencies. In the past, it has been customary to use condensers connected by means of conducting leads between a line carrying the useful current as well as the interference signals and ground. When filtering of high frequencies is required, such arrangement is not satisfactory, since the conducting leads on both sides of the condenser, as well as the foil of the condenser, itself, have sufficient inductance and resistance so as to preclude this shunting path from having sufficiently low shunting impedance for high frequencies.

The invention discloses a filtering condenser which is so constructed that it forms an integral part of a brush holder, the structure of the brush holder and of the condenser being so arranged that the condenser is closely coupled electrically to the outgoing or incoming circuit of the machine producing the interference signals. Accordingly, the filtering condenser has high resonance frequency, since it is not handicapped by the inductance and resistance components ordinarily introduced by the connecting leads; it thus offers a low impedance shunting path for the interference signals. Moreover, the condenser is constructed to withstand high temperatures, so that it can be mounted in proximity of the engines and operated over a large temperature range, is capable of withstanding vibration, and is not adversely affected by moisture, oil, grease, or gasoline.

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It is, therefore, an object of this invention to provide a combination of a brush holder and a filter condenser, the condenser being incorporated into the structure of the brush holder.

It is an additional object of this invention to provide a combination of a brush holder and a filter condenser, in which the filter condenser has high resonance frequency, large temperature range, and which is unaffected by vibrations incident to vehicular, aircraft, and other mechanical equipment installations.

These and other features of the invention will be more easily understood from the following detailed description and the accompanying drawing, in which:

Figure 1 is a side view of a brush holder and condenser with the lower portion of the brush holder sectionalized, in order to illustrate more clearly the construction of the combination, and

Figure 2 is a modified structure of the brush holder and condenser illustrated in Fig. 1.

Referring to Fig. 1, a hollow casing 10 made of insulative material, preferably ceramic, acts as a holder for a brush 12, brass insert 13, and a brush spring 14 which resiliently hold the brush outwardly projecting by being connected to its inner end in any suitable manner. The brush is provided with a pig tail 15 which is connected on one side to the brush, and on the other side to a brass contact plate 16, which is held in tight electrical engagement with insert 13 by means of a threaded cap 17. Cap 17 consists of an outer, insulative casing 18 and an inner brass insert head 19 which is molded into cap 18, so that the brass insert head 19 and cap 18 represent an integral structure. Brass insert head 19 is provided with a conical member 20 which engages the conical recess in cap 18, so that the latter makes a tight electrical contact with brass insert 13, and is properly centered by the cone. Pig tail 15 is soldered to an extension 22 of cap 16, with the result that there is a low resistance path between pig tail 15 and insert 13. The latter protrudes beyond the ceramic casing 10 at 24, and the protruding portion of the insert is used as a guiding means for the brush, and also as a connecting frame between the insert and a terminal brass lug 26 which is used for connecting the brush to the outgoing conductor (not indicated in the fig-

ure). The lug is soldered to extension 26 of the insert by means of a soldering joint 28 which insures positive contact between the lug and the insert. Portions 30 and 32 of the inner and outer walls of the ceramic casing 10 are provided with metallic coatings, which may be silver, copper, aluminum, etc., the inner coating 30 making positive electrical contact with insert 18, while the outer coating 32 is connected by means of a lead gasket 36 and a set screw 37 to ground through the outer casing 38 of the machine. Accordingly, the condenser is formed by the inner and outer metal coatings on the ceramic casing 10, the inner coating being connected to the commutator of the machine through brush 12, while the outer coating is grounded by casing 38. Suitable dielectric ceramics having proper dielectric constants, proper thermal coefficient of expansion, and capacitance-temperature characteristics may be obtained by using such materials as titanium oxide, or a mixture of titanium oxide with any of the following oxides: barium oxide, strontium oxide, lead oxide, or calcium oxide. Either amorphous or crystalline ceramics may be used, and, in either case, high Q condenser may be obtained by proper blending and processing of the ceramic materials, according to well known methods in the art. Positive electrical contact between metallic layer 30 and insert 18 may be improved by soldering layer 30 to insert 18.

Fig. 2 discloses a modified structure of the brush-holder-condenser combination, the modification residing in the fact that bushing 10 has been eliminated completely, and the condenser is formed now between a metallic casing 13 and the outer metallic layer 200, which is deposited on a ceramic coating 202, the latter, in turn, being deposited on casing 13. The outer metallic layer 200 is grounded through casing 38 of the machine, lead gasket 36, and a set screw 37, in the manner identical to that disclosed in fig 1. The advantage of the structure disclosed in fig. 2 resides in the fact that it eliminates casing 10 and the capacitance of the condenser now formed between casing 13, and the outer, metallic layer 200 is larger than the capacitance of the condenser illustrated in Fig. 1, since the spacing between the condenser plates in Fig. 2 is considerably smaller than the same spacing in Fig. 1.

The capacitance of the condenser in Fig. 2 may be increased still further, if so desired, by depositing a plurality of ceramic and metallic layers in alternate succession in accordance with the methods disclosed in my co-pending application for patent titled "Capacitance and methods and apparatus for making the same," Serial Number 547,094, filed July 28, 1944. When this is the case, then one series of the metallic layers is connected to casing 13 and the alternator series of the metallic layers is connected to ground in the manner illustrated in Fig. 2.

The advantages of the disclosed condensers are: they may be operated over a large temperature range; they have high resonance frequency because of the inherently low inductance and high C/L ratio, simplicity of construction, ability to resist vibrations, and the use of materials which resist moisture, oil, and abrasion—the factors which must be always considered when filtering condensers for use in connection with D. C. or A. C. machines are considered. This is especially the case when such machines are a component part of an internal combustion engine.

It is believed that the construction and operation of the brush-holder-condenser combination as well as the advantages thereof will be apparent from the foregoing description. It should be understood that while the invention has been shown in two preferred forms reasonable changes and modifications may be made without departing from the spirit of the invention, as sought to be defined in the following claims.

I claim:

1. A combination of a brush holder and a filter condenser including a metallic casing, a brush slidably mounted within and protruding through and fitting said casing, said brush being electrically connected to said casing, a dielectric sleeve surrounding the outer surface of said casing, and a metallic layer deposited on the outer surface of said dielectric sleeve and capacitatively adjacent to said casing, whereby said metallic casing and said metallic layer form said filter condenser, said layer being adaptable for electrical connection.

2. In an electromagnetic machine, a combination of a brush holder and a filter condenser including a metallic casing, a brush slidably mounted within and protruding through and fitting said casing, said brush being electrically connected to said casing, and said casing extending outwardly beyond the outer end of said brush, a dielectric layer deposited on the outer surface of said casing, and a metallic layer deposited on said dielectric layer, whereby said metallic casing and said metallic layer form said filter condenser integrally with said brush holder.

3. A combination as defined in claim 2 which further includes a metallic sleeve surrounding said metallic layer, and a direct contact connection between said metallic sleeve and a metallic casing of said machine while inserted therein.

4. In an electromagnetic machine a combination of a brush holder and a filter condenser including a metallic casing attached to and extending beyond the casing of said machine, a helical spring mounted within said casing, a brush slidably mounted within and protruding through said casing, said helical spring being connected to the inner end portion of said brush, a dielectric layer deposited over the entire outer surface of said casing, and a metallic layer capacitatively adjacent to said casing deposited on said dielectric layer, whereby said metallic casing and said metallic layer form said filter condenser said casing and layer being adapted for low impedance shunting therethrough.

5. A combination of a brush holder and a filter condenser including a hollow casing made of insulative material, a brush slidably mounted within and protruding through said casing, an inner metallic lining within said casing electrically connected to said brush, and an outer metallic lining on said casing, said casing and said inner and outer linings being capacitatively arranged and forming said filter condenser.

6. A combination as defined in claim 5 in which said casing comprises a cylindrical ceramic barrel, and said inner and outer linings comprise two layers of metal deposited on the inner and outer surfaces of said barrel.

7. A combination as defined in claim 5 in which said casing comprises a cylindrical ceramic barrel, said inner and outer linings each comprise a layer of metal baked on the surface of said barrel, and a metallic band surrounding said outer metallic lining for grounding said condenser.

8. A combination of a brush holder and a filter condenser including a hollow ceramic casing having portions of its inner and outer surfaces coat-

ed with inner and outer metal coatings, respectively, a hollow, metallic insert mounted within said casing, said casing making electrical contact with said inner coating, a brush slidably mounted within and protruding through said insert, and instrumentalities for electrically connecting said brush to said inner lining, and said outer lining to ground, whereby said linings are capacitatively arranged to form said filter condenser.

9. A brush holder of the class described comprising in combination, a brush, a pigtail attached to said brush, a cap of conducting material electrically attached to another portion of said pigtail and having a groove formed in its structure, a brush spring resting against said cap and resiliently acting upon said brush in a direction away from said cap, an inner conducting casing for containing said spring and for engagement with the inner surface of said cap at one end and having an orifice for the brush to actuate through at the other end, a conducting insert head coupled to said inner casing and including a member adapted to fit into said groove and against said cap to make electrical and mechanical contact therewith, a dielectric element encasing the external surface of said inner casing, and a conducting coating covering a portion of said element in capacitative alignment with said casing to complete a condenser structure, said brush being in series with a capacitative path formed by said condenser to an extraneous source.

10. A brush holder of the class described comprising in combination a commutator brush, a straightened pigtail with one end portion electrically attached to said brush, a cap of conducting material electrically attached to the opposite end portion of said pigtail and having an

apexed groove formed in its external surface structure, a coil brush spring resting against said cap and resiliently acting upon said brush in a direction away from said cap and contacting the casing throughout its length, an inner conducting casing for containing said spring and for engagement at one end with the inner surface of said cap and having an orifice for the brush to actuate therethrough at the other end, a conducting insert head coupled to said casing and having an apexed member fitting into said groove and against said cap to make electrical and mechanical contact therewith, a dielectric element peripherally encasing the external surface of said casing, and a conducting coating covering a predetermined portion of said casing in capacitative alignment with said casing to complete a capacitor structure, said brush being in series with a capacitative path through said casing and coating to an extraneous source for shunting radionic interference effects therethrough, said capacitative structure being incorporated in the structure necessary to support and hold the brush.

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