Feb. 28, 1939. C. J. W. HILL 2,148,984

ELECTRICAL INTERFERENCE SUPPRESSING DEVICE

Filed July 17, 1937

Fig. 1

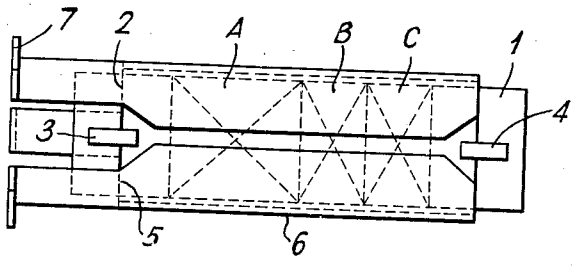


Fig. 2

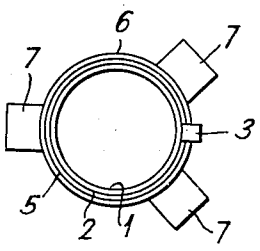
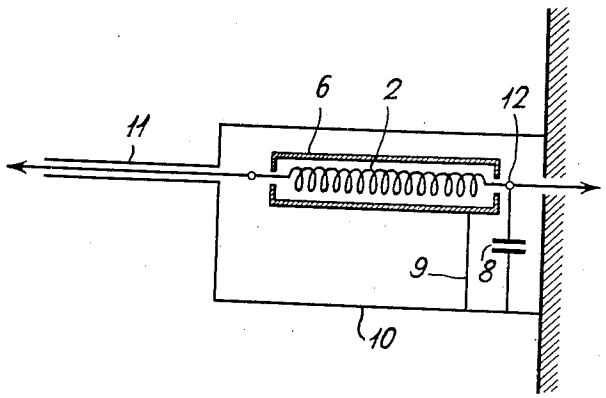


Fig. 3



INVENTOR
CHARLES J. W. HILL
BY H. S. Grover
ATTORNEY

Patented Feb. 28, 1939

2,148,984

UNITED STATES PATENT OFFICE

2,148,984

ELECTRICAL INTERFERENCE SUPPRESSING DEVICE

Charles James William Hill, Sidcup, England, assignor to Electric & Musical Industries Limited, Middlesex, England, a company of Great Britain

Application July 17, 1937, Serial No. 154,138
In Great Britain July 21, 1936

4 Claims. (Cl. 178—44)

This invention relates to electrical interference suppressing devices and more particularly, but not exclusively, to such devices for use on vehicles employing internal combustion engines.

Motor-cars are now frequently fitted with wireless receivers and owing to the proximity of the receiver to the ignition system of the car, interference emanating from sparking plugs and ignition coil or a magneto may cause considerable masking of broadcast or other matter which it may be desired to receive.

It has been found that much of the interference of the nature referred to occupies a frequency band from about 1.5 mega-cycles upwards. The field in which the interference is strongest depends upon the manner in which the wiring of the ignition system is disposed, the interference being radiated mainly by this wiring. Although the frequency range of a large part of the interference is outside the range of frequencies which the tuning circuits of the average wireless receiver are designed to pass, the interference is set up in the circuit by those components outside this range due for example to intermodulation and transference due to stray capacities.

The object of the invention is to provide an effective interference eliminating device which is compact and permits ready fitting to any desired apparatus.

Another object of the present invention is to provide an interference suppressing device which has an upper cut-off frequency of the order of 1.5 mega-cycles per second.

A particular form of interference suppressing device according to the invention is constituted by an inductance coil wound in sections having different natural wavelengths which, when added together, equal the total inductance required to enable the inductance together with some shunt capacity to function as a low pass filter of the desired characteristic. The shunt capacity may be constituted partly by a metallic shield substantially enclosing the inductance coil and provided with a short conductive path to earth, the shield being designed to screen the ends of the inductance coil from each other in order to reduce the setting up of stray capacitances.

In order that the invention may be more clearly understood and readily carried into effect, the same will now be described with reference to the drawing accompanying the present specification in which:—

Figure 1 is a side elevation of an inductance unit, for use in an interference suppressing device constructed in accordance with the invention.

Figure 2 is an end elevation of the inductance shown in Figure 1, seen from the right of Figure 1, and Figure 3 is a circuit diagram of an arrangement according to the invention.

Referring to Figures 1 and 2 of the drawing, it will be seen that the inductance unit shown in Figures 1 and 2 includes coil former 1, of insulating material about 2'' long and about ½'' in diameter having wound upon it an inductance coil 2, wound in three series connected sections, A, B and C. The section A is about ½'' long and is closely wound. The section B is about a ¼'' long and is wound with 27 spaced turns and the section C is also about a ¼'' long and is wound with 9 spaced turns. The ends of coil 2 are provided with tags 3 and 4 to permit external connections to be soldered. The wire used may be, for example, 42 standard wire gauge enamelled copper. The dimensions stated above are typical values and may of course be varied.

The wound coil is covered with a piece of oiled silk 5, and placed within a split cylindrical copper sheath 6, one end of which is formed with mounting feet 7. The sheath forms a tight fit over the coil former and thus holds the latter firmly in position.

Figure 3 shows the method of connecting the coil. From this it will be seen that the coil is connected in position with a condenser 8 forming a shunt capacity which acts with the shunt capacity due to the copper sheath 6, and the inductance of the coil 2 to form a low pass filter. A conductor 9 formed by the mounting feet 7 on the sheath already mentioned, connects the sheath directly to a screening box 10 which encloses the coil and condenser assembly and is earthed to the radio receiver and hence to the chassis of a motor-car. A screened lead 11 connects one end of the coil 2 with an aerial or other signal pick up surface. The opposite end 12, of the coil is connected to the aerial terminal of a wireless set carried on the car, the set and screening box being preferably mounted near to each other.

In designing the suppressor device described, account is taken of the fact that while the construction of a filter which will attenuate all frequencies above a certain value might appear to present no difficulties, in fact, filters designed in accordance with elementary theory, are found to pass frequencies two or three times the theoretical cut-off frequency. This is thought to be due to the fact that elementary theory does not

take account of resonances of isolated parts of the inductive branches of the filter due to the presence of self capacities in shunt or of inductive reactance of the capacitative branches which at the higher frequencies becomes serious from a consideration of conductor length alone, or again, of stray transfer from one end of the filter to the other by reason of the small, but at high frequencies important, shunt capacities.

These effects can be accounted for by calculation but it is preferred to eliminate them by the arrangement shown. Thus the coil **2** is designed so that, in conjunction with the condenser **8** and the capacity due to the sheath **6**, it has the inductance required to give the desired low pass characteristic. The division of the coil into three sections of different pitch and inductance avoids the effect of serious local resonances in the winding. Again, the effect of the inductive nature of external shunt condensers is reduced by employing the distributed capacity due to the sheath **6**, connected to earth, the motor-car chassis, through the short lead **9** of low inductance. Further, the sheath **6** encloses the whole of the filter coil **2** so as to decrease the number of lines of electric force extending from one end of the coil to the other and so decreasing the leakage transfer from one end of the system to the other.

I claim:

1. An electrical interference suppressing device adapted to be connected in a lead from which electrical interference is to be eliminated comprising a low pass filter, said low pass filter being formed by an inductance unit comprising a coil housed in a conducting sheath whereby the electrostatic leakage transfer from one end of the coil to the other is reduced, the distributed capacity of said sheath forming at least a part of the shunt capacity with which said inductance unit is associated, and the said inductance coil being wound in a plurality of sections of different pitch and inductance whereby the occurrence of serious local resonances in the coil are avoided.

2. An electrical interference suppressing device according to claim 1 wherein the low pass filter has an upper cut-off frequency of the order of 1.5 megacycles per second whereby interference such as is produced by the ignition system in a motor-car may be suppressed.

3. A coupling device adapted to be connected between an antenna and a receiver in a motor-car installation for suppressing interference caused by the ignition system, comprising an inductance coil, one end of which is connected to the antenna and the other end to the input of the receiver, a conducting sheath surrounding the conductance coil, and grounded metallic screen enclosing the conducting sheath, a short conductive connection between the sheath and the screen, and a condenser connected between one end of the coil and the grounded screen, the coil in conjunction with the condenser and the distributed capacity of the sheath forming a low pass filter.

4. A coupling device according to claim 3 wherein the inductance coil is wound in a plurality of sections of different pitch and inductance whereby the occurrence of serious local resonances in the coil are avoided, said coil and the capacity associated therewith constituting a low pass filter having an upper cut-off frequency of the order of 1.5 megacycles per second.

CHARLES JAMES WILLIAM HILL.