May 12, 1931. C. R. D. GROVES 1,805,040

ELECTRICAL WARMING MEANS OR DEVICE FOR USE WITH INTERNAL COMBUSTION ENGINES TO FACILITATE STARTING THEREOF

Filed Nov. 28, 1928 2 Sheets-Sheet 1

Fig.1.

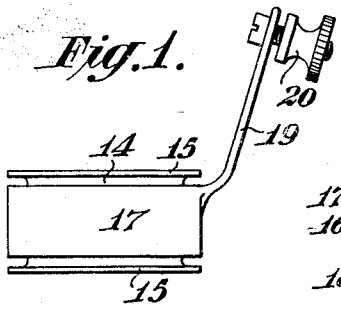


Fig.2.

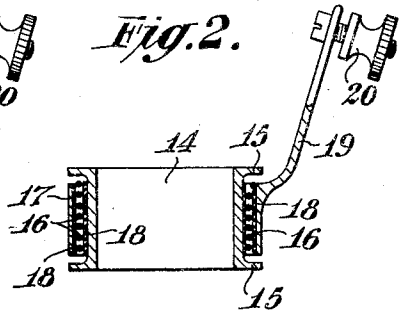


Fig.3.

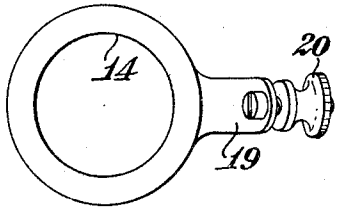


Fig.4.

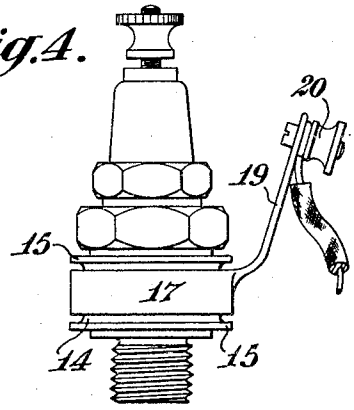


Fig.5.

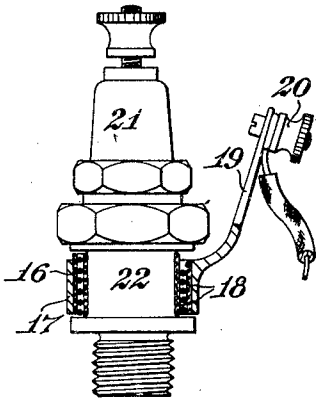
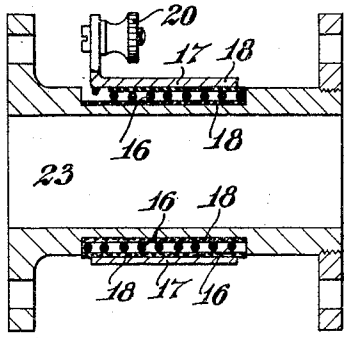


Fig.6.



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Fig. 7.

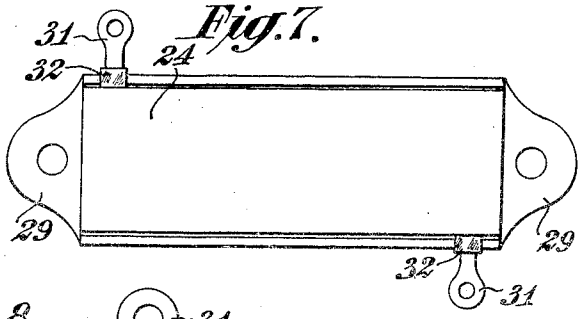


Fig. 8.

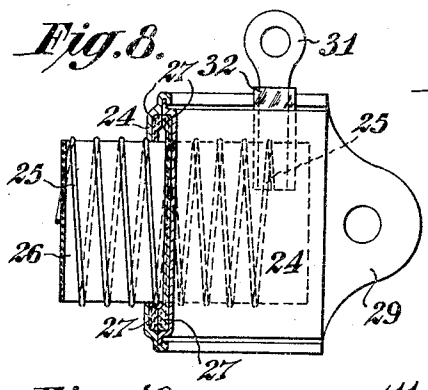


Fig. 9.

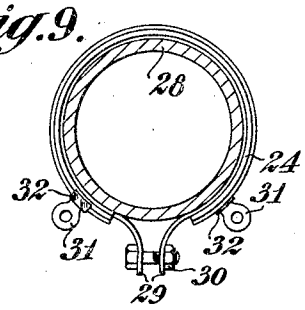


Fig. 10.

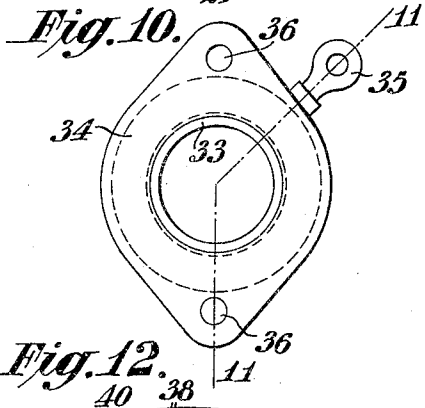


Fig. 11.

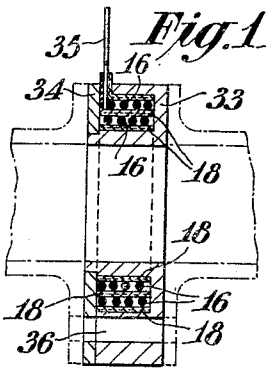


Fig. 12.

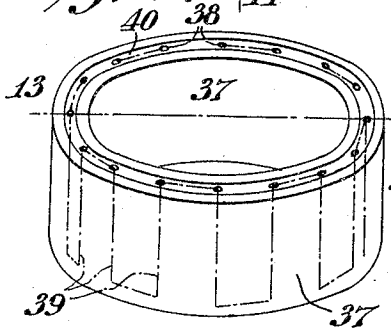
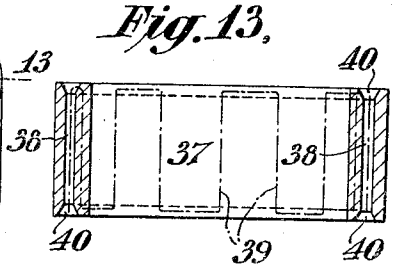


Fig. 13.



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Patented May 12, 1931 1,805,040

UNITED STATES PATENT OFFICE

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ELECTRICAL WARMING MEANS OR DEVICE FOR USE WITH INTERNAL COMBUSTION ENGINES TO FACILITATE STARTING THEREOF

Application filed November 28, 1923, Serial No. 322,502, and in Great Britain January 10, 1928.

This invention relates to an electrical warming means or device for use with internal combustion engines to facilitate starting thereof.

A defect attending internal combustion engines is the difficulty experienced in starting the engine, especially during cold weather, and to overcome this difficulty various schemes and devices have been used, such as, for instance, devices for warming the induction system of the engine which have usually been in the form of a jacket surrounding a part of the induction system or carburetter adapted to be filled with hot water or other heat-liberating agent. A disadvantage which attended such devices, however, was that it was necessary to replenish the heating agent when the heating properties thereof had been exhausted.

Other devices for achieving the said object have effected warming of the sparking plug in the proximity of the sparking electrodes, and devices for this purpose have included a wire coil or filament constituting an electric heating element, embedded in insulation and adapted to impart the necessary heat to the plug when an electric current is passed through the said coil or filament.

The present invention contemplates the use of electrical warming means applied or adapted to be applied to any suitable part of the engine or associate elements or parts where the imparting of heat thereto will facilitate the starting of the engine, such as to the sparking plug, carburetter body or fuel induction system of the engine or to the water-cooling system thereof, or, in the case of a Diesel engine, to the usual ignition tube by means of which ignition is effected during the starting of the engine.

According to the present invention, an annular or clip-like heating element consisting of a wire coil or filament embedded in insulation, surrounds the sparking plug pipe, tube or chamber (e. g. carburetter body) to which the device is applied, or, in cases where convenient, forms a continuation portion of the said pipe or tube.

The invention is particularly applicable to sparking plugs of internal combustion engines to serve as a means for heating same with a view to evaporating moisture, due to condensation, deposited on the plug, on or in the vicinity of the sparking electrodes to facilitate starting of the engine.

In order that the invention may be readily understood, reference is directed to the accompanying drawings forming part of this specification, wherein:—

Figure 1 is an elevation of the device made according to the invention, intended to fit in sleeve-fashion on to a sparking plug induction tube, carburetter body, or on to a pipe of the water-cooling system.

Figures 2 and 3 are sectional and plan views respectively of the device shown in Figure 1.

Figure 4 is an elevation of a sparking plug fitted with the device shown in Figure 1.

Figure 5 is a part-sectional view of a modification wherein the invention is embodied in the construction of a sparking plug.

Figure 6 is a sectional view of an induction tube, or pipe of the water-cooling system, showing the invention embodied in the construction thereof.

Figure 7 is a plan view of a modification wherein the device is in the form of a strip adapted to be bent around the article to which the device is applied in clip-fashion.

Figure 8 is an enlarged fragmentary view of Figure 7; and,

Figure 9 is a sectional view of a tube or pipe illustrating the device shown in Figure 7 applied thereto.

Figure 10 is a face view of a gasket embodying the invention; and,

Figure 11 is a section on line II—II in Figure 10.

Figure 12 is an enlarged perspective view of an alternative form of heating element that may be employed in the device shown in Figure 1; and,

Figure 13 is a cross-section of Figure 12 on line 13—13.

Referring firstly to Figures 1 to 4 of the drawings, the device illustrated therein comprises an inner metal ring or sleeve 14 hav-

ing an external annular channel between external flanges 15 formed on the ends of the said ring or sleeve. The said channel accommodates a heating element composed of a coil of resistance wire 16 embedded in suitable insulation material, the outer metal ring 17 surrounding the said heating element and retaining same in place. Conveniently, the said insulation material may consist of layers of mica 18 between which the wire coil 16 is interposed. The outer ring 17 has no contact with the inner ring 14 except through the wire coil 16, but is insulated therefrom by the heating element.

The outer band is shown having a finger 19 fitted with a terminal 20 adapted for the connection thereto of a lead from a suitable source of electric current. One end of the wire coil 16 is connected to the outer ring 17, whilst the other end of said coil is connected to the inner ring 14, the latter connection earthing the current through the article to which the device is applied. The electric current source aforesaid also has an earthed lead in order to complete the circuit, a suitable switch being incorporated in said circuit, where convenient. Alternatively instead of earthing the coil by way of the inner ring 14, the end thereof above referred to as being earthed may be connected to a second, suitably insulated, terminal, so that in this case there are two terminals for the connection of the respective leads of the circuit.

The device is adapted to slide over the end of and reside on the article to which it is applied, being a close fit thereon, namely carburetter body, induction pipe, water-cooling pipe, sparking plug, or ignition tube, and in the case where it is applied to a sparking plug it is fixed on that portion of the plug body which projects from the engine cylinder but which is in close proximity to the screwed nose of the plug, as shown in Figure 4 of the drawings, and when the circuit is completed through the resistance wire 16, the lower part of the plug becomes heated, thus attaining the objects in view aforesaid.

In the modification illustrated in Figure 5, the invention is incorporated with the sparking plug 21 as a unitary part thereof. That is to say, the lower portion 22 of the plug body is formed with an annular external recess in order to accommodate the heating element so that in effect the plug body is the equivalent of the inner ring 14 shown in Figure 1.

Likewise, in the construction illustrated in Figure 6, the invention is incorporated with a tube 23 forming the induction pipe or a part of the water-cooling circulation system of the engine, as a unitary part of said pipe, the tube 23 being formed with an annular external recess which accommodates the heating element so that in effect the tube 23 is the equivalent of the inner ring 14. The same method of construction would apply in the case of the carburetter body if the device is incorporated therewith as a unitary part.

Although one coil of filament only is shown in the above-described construction, it is to be understood that two or more coils or filaments may be employed if necessary, the number of mica layers being increased accordingly to insulate the adjacent coils from one another.

In cases where the tube, chamber or article to which the invention is to be applied has lateral projections or flanges at each of its ends which would prevent the device hereinbefore described being slid on to said tube, I provide a modified construction, shown in Figures 7, 8 and 9, formed of a pair of flat metal strips or plates 24, seamed, riveted or otherwise united along their opposite longitudinal edges, and bent to provide a cavity between them, the said cavity housing a heating element consisting of a wire filament 25 of a sinuous or other shape wound on a mica coil 26 and arranged between mica layers 27. The said device is bent into an approximately circular shape in use, that is to say, is wrapped around the pipe, chamber or article 28 to which it is applied in clip-fashion, as shown in Figure 9, its ends being suitably connected to retain it in place; for instance, it may have lug-shaped ends 29 drawn together by a bolt or screw 30. A pair of terminal tags 31 mounted and held between the mica layers 27 are connected to the respective ends of the filament, the seamed or riveted edges of the outer strips or plates 24 being slotted to afford passage and clearance for the said terminal tags, and for mica pieces 32 which surround said tags.

The invention may also be incorporated in a gasket or connection between adjacent pipe lengths or sections, for instance, between the carburetter and induction pipe, between flanged ends of said pipe lengths, so as to form in effect a portion of the pipe. Such an embodiment of the invention is shown in Figures 10 and 11. The gasket or connection consists of a thick plate or block 33, recessed on one face to receive a complementary plate 34. An annular cavity in the plate or block 33, which is closed by a plate 34, houses a heating element consisting of a wire filament 16 of a suitable number of coils mounted between mica rings 18. The plate 33 is suitably recessed for the passage of a terminal tag 35 connected to one end of the filament 16, the other end of said filament being earthed to the plate 33. Bolt holes 36 to correspond with the flange bolt holes are formed through both plates 33 and 34.

It is to be understood that in connection

with any of the constructions shown in the drawings, one terminal tag only may be provided, connected to the filament, the other end of said filament being earthed, namely, connected to the part in which it is housed or accommodated; or, alternatively, a pair of terminal tags may be provided, connected to the respective ends of the filament, the lattering being entirely insulated from the element in which it is housed.

Figures 12 and 13 illustrate an alternative form of heating element that may be employed with the constructions shown in Figures 1 and 11, said element consisting of an annular block 37 of fireclay or other suitable refractory or insulating material, through which are formed a number of cavities 38 extending from end to end of said block, being formed in the thickness thereof and opening out at each end of the block. A length of resistance wire 39 is threaded through the cavities 38 in the manner indicated in dot-and-dash lines, the end surfaces of the block 37 each being formed with an annular recess 40 in which the connecting portions of the wire, between adjacent cavities, are accommodated, in order to prevent short-circuiting.

In connection with the construction shown in Figure 1, the outer ring 17 may be suitably contracted after being fitted in place in order to retain same in place, and it is convenient in the manufacture of the device to form the inner ring 14 with one external flange 15 only and to form the outer flange by spinning over the end of the said ring 14 after having pressed the heating element and outer ring thereonto in endwise fashion.

In use, the current feeding the device is kept on for a time sufficient to heat the part to which it is applied, (for instance, in the case of a sparking plug, to heat the plug in order to evaporate condensed moisture on the plug electrodes) to facilitate starting of the engine. Once the engine has started the current is switched off, the device remaining out of action until again required for use.

I claim:—

1. An electrical heating device comprising an inner member of conducting material, a ring of conducting material surrounding said inner member, a resistance coil between said member and said ring connected at one end with the former and at its other end with the latter, and means insulating all portions of said coil between its ends from said member and said ring.

2. An electrical heating device comprising an inner member of conducting material having an external annular channel, a ring of conducting material surrounding the channel in said member and spaced at its ends from the ends of said channel, a resistance coil disposed in said channel and connected at one end with said member and at its other end with said ring, and means insulating all portions of said coil between its ends from said member and said ring.

3. An electric heating device according to claim 2 in which the member of conducting material is constituted by a component part of an internal combustion engine.

In testimony whereof I have affixed my signature hereto this 8th day of November, 1928.

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