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NONCORRODING ARCING CIRCUIT INTERRUPTING DEVICE

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Fig. 1.

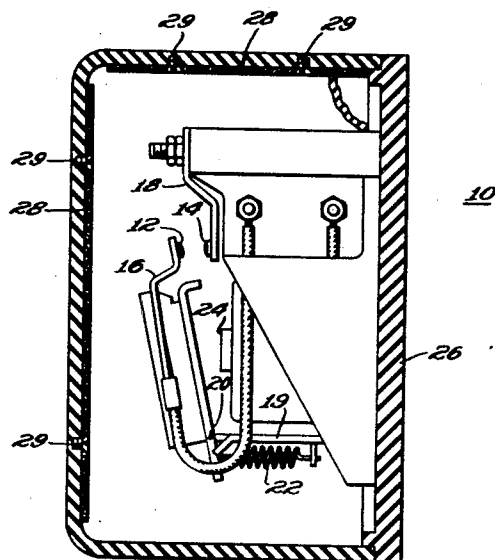
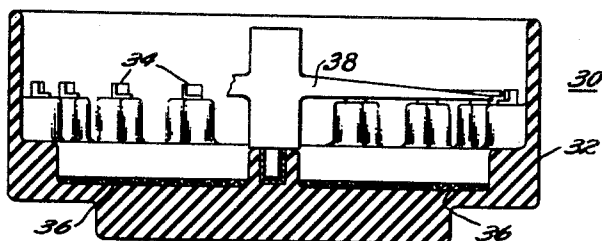


Fig. 2.



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NONCORRODING ARCING CIRCUIT
INTERRUPTING DEVICE

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5 Claims. (Cl. 200—166)

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This invention relates generally to circuit interrupting devices and more particularly to circuit interrupting devices which are subjected to corrosive nitrogen oxides resulting from electrical discharges which occur during operation.

In certain applications of circuit interrupting devices which are subject to arcing during operation, it is necessary that the device be enclosed either in a sealed casing or in a casing which has only a limited supply of ventilating air. For example, mine motor controllers which are subject to considerable arcing in operation must be provided with a casing which will reduce the danger of explosions which might be caused by an exposed arc igniting inflammable gases in the mine atmosphere.

In such applications, it has been found that the electrical contacts and other parts of the circuit interrupting device are subject to considerable corrosion in service. The corrosion is especially severe if the device is operating in a humid atmosphere.

It is believed that this corrosion is caused by compounds of nitrogen which are formed during operation of the device. It is well known that an electrical discharge through air will cause the nitrogen and oxygen of the air to combine to form various nitrogen oxides. These nitrogen oxides are not only extremely reactive themselves but in the presence of water vapor they dissolve or react to form various corrosive acids of nitrogen. These acids of nitrogen when present in the atmosphere in the casing will corrode and may severely damage the electrical contacts and the circuit interrupter mechanism. Although only a small amount of nitrogen compounds may be produced by any one arc, considerable oxides of nitrogen and acids of nitrogen may be produced during long continued operation.

These nitrogen compounds resulting from arcing have other undesirable effects in other types of circuit interrupting devices. For example, in internal combustion engine distributors the nitrogen acids are formed in the atmosphere within the distributor housing by the sparking between the rotor and the spark plug wire terminals. The acids thus formed accumulate upon the walls of the housing, wetting the wall surface, thereby reducing the surface dielectric strength which may result in short circuiting, and thus causing failure of the ignition system.

The object of this invention is to provide for prevention of corrosion in enclosed circuit interrupting devices which are subject to electrical discharges during operation.

A more specific object of this invention is to provide for removing nitrogen oxides and nitrogen acid vapors from encased circuit interrupting devices.

For a fuller understanding of the nature and objects of the invention, reference should be had to the accompanying drawing, in which:

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Figure 1 is a view in elevation partly in cross-section of a circuit interrupter embodying the features of the invention; and

Fig. 2 is a view in elevation partly in cross-section of an internal combustion engine distributor housing which embodies the features of the invention.

It has been found that certain chemical compounds with a strong oxidizing power are capable of reacting with nitrogen oxides and nitrogen acids as rapidly as they are produced in circuit interrupting devices. Such compounds, when present within a casing containing a circuit interrupting device which is subject to arcing and production of nitrogen compounds during operation, will react with the nitrogen compounds to remove them from the atmosphere within the casing rapidly enough to prevent them from damaging the electrical contacts and other parts of the mechanism.

In practicing the invention, it is preferred to use a permanganate of either potassium or silver or a mixture of both as the chemical agent to react with the nitrogen compounds. These compounds are unusual for this purpose in that they are neither corrosive, volatile nor deliquescent, and the product of their reaction with nitrogen oxides or nitrogen acids are likewise neither corrosive, volatile or deliquescent. They react extremely rapidly with the nitrogen compounds produced by electrical discharges.

In one embodiment of the invention, a sheet of asbestos board or other absorbent solid, preferably an inorganic material, is saturated with a concentrated aqueous solution of potassium permanganate or silver permanganate or a mixture thereof, and allowed to dry. In this manner the asbestos board may be impregnated with the dry salt. Glass fiber, mat, refractory sheets, felt, and other porous materials may be so impregnated. This board is then incorporated in an encased circuit interrupting device in any suitable manner.

Referring now to Fig. 1 there is illustrated a circuit interrupting device 10 which comprises a pair of contact members 12 and 14 mounted on contact arms 16 and 18, respectively. The contact arm 16 is suitably mounted on a supporting arm 19 to allow it to pivot about a pin 20 and a spring 22 is provided to bias the contact arm 16 to the open position. An armature 24 is provided to draw the contact arm 16 into the closed position when the armature 24 is energized. Disposed about the circuit interrupting device mechanism is a casing 26 on the inner surface of which is mounted sheets 28 of asbestos board held in place by screws 29, which have been impregnated with potassium or silver permanganate as hereinbefore described.

In operation the contact members 12 and 14 make and break the electrical circuit by movement of the contact arm 16, which movement is

controlled by the armature 24 and the biasing spring 22 in a manner well known in the art. When the contact member 12 is moved out of contact with the member 14 an arc is momentarily formed therebetween due to the sudden interruption of the electric current. The passage of the arc through the air between the members 12 and 14 causes chemical reaction to occur between the nitrogen and oxygen in the air to form corrosive compounds of nitrogen. The air and corrosive gases are heated by the arc and will tend to rise toward the upper surface of the casing 26 and come in contact with the asbestos board 28 where they react with the potassium or silver permanganate embodied therein and are thereby removed from the atmosphere.

To enable the asbestos board to be replaced when required, it is disposed in place by the screws 29 in such a manner as to allow it to be easily removed.

Referring now to Fig. 2 there is illustrated an internal combustion engine distributor 30 having a housing 32 formed of a dielectric material such as mica-impregnated phenol condensate or hard rubber and having individual spark plug terminals 34 arranged around the periphery of the housing 32. One terminal 34 is provided for each spark plug of the engine and is connected thereto by means not shown for simplicity in drawing. Current is conducted to the individual spark plug terminals 34 by means of a conventional distributor rotor 38. Disposed on the inner surface of the housing 32 is a layer of asbestos board 36 which has been impregnated with potassium or silver permanganate as hereinbefore described.

During operation of the distributor, the rapid making and breaking of the circuit to the individual spark plugs by the rotor contact (not shown) with the spark plug terminals 34 causes almost continuous sparking. This sparking forms deleterious nitrogen compounds as previously described which react with the potassium permanganate disposed in the asbestos board thereby preventing them from attacking the contact surfaces of the terminals 34 and from wetting the interior surface of the housing 32.

It is to be understood that the illustrated methods of incorporating the invention into a circuit interrupting device are exemplary only and I do not limit myself to these specific means since other methods may be used. For example, in either embodiment of the invention solid potassium or silver permanganate or a mixture thereof may be encased in a porous container such as a tube made of wire mesh and the container may be suitably positioned within the circuit interrupting device casing, preferably in such a manner to permit it to be easily replaced.

Since numerous changes may be made in the above-described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. An electrical circuit interrupting device comprising, in combination, a casing, electrical contacts disposed in the casing, the electrical contacts being subject to electrical discharges through air therebetween whereby corrosive nitrogen compounds are produced, and a mate-

rial selected from at least one of the group consisting of potassium permanganate and silver permanganate disposed in the casing for contact by the corrosive nitrogen compounds to remove them by reaction therewith to form non-deleterious compounds and thereby prevent them from damaging the circuit interrupting device.

2. An electrical circuit interrupting device comprising, in combination, a casing, electrical contacts disposed in the casing, the electrical contacts being subject to electrical discharges through air therebetween whereby oxides of nitrogen are produced, and an asbestos board impregnated with potassium permanganate disposed in the casing for contact with the oxides of nitrogen produced, whereby the oxides of nitrogen react with the potassium permanganate to form non-corrosive compounds.

3. An electric circuit interrupting device comprising, in combination, a casing, electrical contacts disposed in the casing, the electrical contacts being subject to electrical discharges through air therebetween whereby oxides of nitrogen are produced, and a porous member impregnated with potassium permanganate disposed in the casing for contact with the compounds of nitrogen produced, whereby the compounds of nitrogen react with the potassium permanganate to form non-corrosive relatively inert compounds.

4. An ignition distributor for internal combustion engines comprising spark plug terminals disposed within a housing, a rotor for making and breaking an electrical circuit with the spark plug terminals whereby arcing is produced within the housing by the making and breaking of the electrical circuit, the arcing forming corrosive compounds of nitrogen within the housing, and a material selected from at least one of the group consisting of potassium permanganate and silver permanganate disposed within the housing for contact by the corrosive nitrogen compounds whereby the nitrogen compounds are reacted to non-corrosive, non-deliquescent compounds.

5. An ignition distributor for internal combustion engines comprising spark plug terminals disposed within a housing, a rotor for making and breaking the electrical circuit with the spark plug terminals whereby arcing is produced within the housing by the making and breaking of the electrical circuit, the arcing forming corrosive compounds of nitrogen within the housing, and a fibrous sheet impregnated with a material selected from at least one of the group consisting of potassium permanganate and silver permanganate disposed within the housing for contact by the corrosive nitrogen compounds whereby the nitrogen compounds are reacted to non-corrosive, non-deliquescent substances.

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