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SMOKE POT IGNITER

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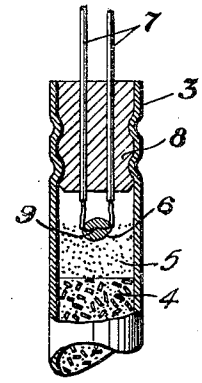


Fig. 2

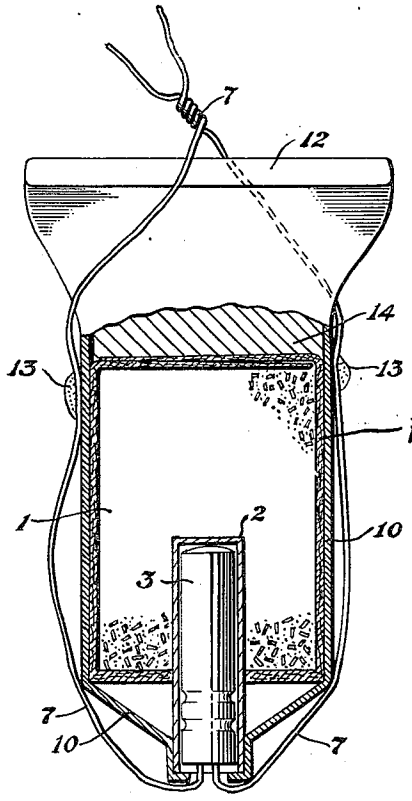


Fig. 3

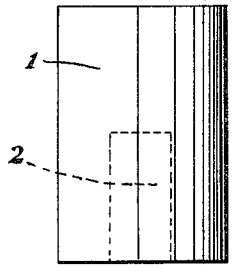


Fig. 1

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SMOKE POT IGNITER

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This invention relates to a novel ignition assembly, and particularly one adapted for use where the ready ignition of fuel oils or other combustible materials is desired by remote control, without the necessity of personal supervision of each device.

Occasions arise frequently where the controlled firing or lighting of units of combustible materials is tedious and where individual attention to each of such units would be too time-consuming or would require an excessive amount of labor. Orchard heaters, for example, are used for the protection of fruit trees against frost, and delay in the lighting of a large number of such heaters may be serious because of the waste of fuel in the case of those first lighted, or undue exposure to cold in the case of trees last protected. Similar problems may be met in the lighting of warning lights in road construction or repair work, in the ignition of smoke pots for obscuring purposes, in the instantaneous lighting of a large number of signals, and in other fields.

Electric ignition would be a desirable solution to the above problem, but difficulties are met when it is desired to ignite electrically a large number of bodies of difficultly-ignitible heavy oil for example. It is necessary that ignition be assured, regardless of weather conditions, wind, precipitation, and the like. Commercially available electric squibs are not suitable because of the short duration of the flame, and it is essential that a considerable source of heat be applied for an appreciable time interval at the spot where ignition is to take place. No practical assembly or device is now available for accomplishing the foregoing purposes.

An object of the present invention is an ignition assembly suitable for use where difficultly-ignitible materials are present. A further object is such an assembly adapted to bring about the substantially simultaneous ignition of a number of bodies of such materials without the necessity of attention to the individual operation. A still further object is such an assembly sufficiently protected from the influence of weather and water to assure its proper functioning. Additional objects will be disclosed as the invention is described more at length hereinafter.

We have found that the foregoing objects are attained when we employ an ignition assembly comprising a main charge of a deflagrating explosive having a cavity therein, an electric initiator within this cavity, and confining means about the charge of deflagrating explosive,

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particularly on the sides removed from the initiator cavity. By this means the flame from the deflagrating charge, upon initiation, will be directed out on the side adjacent to the initiator cavity toward the material to be ignited. Preferably the main deflagrating charge will comprise black powder in block or pellet form, and we desirably enclose this in a wrapping of a flexible metal.

The apparatus of our invention may be understood more clearly by reference to the accompanying drawing, in which one embodiment is shown by way of illustration. Figure 1 is an elevation of a black powder pellet adapted to serve as the main deflagrating charge. Figure 2 is a cross-sectional view of an electric squib, suitable for use in initiating the combustion. Figure 3 is a vertical elevation cut-away of the ignition assembly according to the invention.

Referring in more detail to the drawing, 1 in Fig. 1 shows a substantially cylindrical black powder pellet having within it a cavity 2. A convenient size for such pellet is a length of 2 inches and a diameter of approximately 1¼ inches.

In Fig. 2, an electric squib or igniter is shown of a type suitable for use in bringing about the deflagration of the black powder pellet. The metal shell 3, for example of a copper alloy, having a length of 1⅛ inches and a diameter of about ¼ inch, contains a 5-grain base charge 4 of a mixture adapted to give a very high temperature on ignition, for example 87.5 parts of barium peroxide and 12.5 parts of finely divided magnesium. On this base charge is a superposed ignition charge of 10 grains of a blend of 83.3 parts of barium peroxide, 14.7 parts of selenium, and 2 parts of powdered aluminum. The leg or leading wires 7 from the electric igniter are held firmly in a predetermined position by passage through a plug 8 of tightly fitting material, such as a sulfur composition or rubber, the ends of the wires being connected by a smaller diameter wire of high resistance 9. This fine wire is surrounded by a bead of combustible material 6 adapted to yield a hot flame on ignition. The firing of this bead is brought about by the passage of an electric current through the wires 7, which causes the heating of the bridge wire 9 to incandescence and the consequent inflammation of the bead material. This, in turn, initiates the charge 5 and brings about the ignition of the base charge 4.

Fig. 3 shows an assembly of elements that act in conjunction with one another to produce the

desired results. The black powder pellet 1 has a cavity 2 into which the electric squib 3 is inserted. The leg wires 7 are shown emerging from the squib and pass up on opposite sides of the pellet, being joined above in a twisted relationship. These wires serve to support the pellet and assembly in the desired position, with the igniter entering the pellet cavity from below. The black powder pellet is tightly enclosed within a substantially cylindrical container of a flexible metal 10, for example a lead alloy containing a low percentage of antimony. This container tube may be made by any desired method, such as extrusion, and the method of preparation is no part of the invention. This flexible metal tube comprises at its bottom a circular piece of a similar metal, for purposes of support, having a watertight well 2 of like metal extending upward in the center into the cavity in the pellet. This well serves to contain the electric igniter. The entire metal cylinder is desirably closed at the top by having the edges folded over and crimped, as shown at 12, so that a waterproof container for the black powder charge is provided. The rigidness of the assembly is promoted also, and more particularly continued support of the igniter when the wires have burned through below, by securing the leading wires of the igniter to the sides of the assembly, for example by small pieces of adhesive tape near the top of the metal tube on both sides, as shown at 13. Since it is desired that the flame be directed downward, or at least in the direction toward which the igniter cavity is facing, downward direction of the flame is assured by introducing a body of solid material at the top of the black powder pellet, as shown at 14. A suitable material has been found to be cast sulfur, poured onto the pellet in molten state and allowed to solidify there. In addition to the metal container, the black powder pellet will desirably be enclosed in a paper package.

While the assembly described may be used for the ignition of any desired material, we find it particularly effective in the case of difficultly-combustible materials, such as heavy fuel oils which might be used in smoke pots where obscuring smokes are desired; in smudge pots such as are employed in fruit orchards where the heating effect of the smoke and gases is desired; and in other like instances. The assembly is excellently adapted for use with fuel oils, since it can be suspended at the desired height above the oil, and an intense hot flame from the black powder pellet is directed downward onto the oil for a considerable period of time, sufficient to assure permanent ignition.

In the specific embodiment shown in the drawing, a block or pellet of black powder was designated as the main explosive charge for the assembly. We may use other deflagrating explosives, however, for example suitably shaped blocks of smokeless powder or other readily ignitible compositions giving a long durable flame. It is essential that the deflagrating explosive be in such form that a cavity is available for the electric squib. No specific composition of black powder is required, but we find satisfactory the ordinary blends of sodium nitrate, charcoal, and sulfur, with possible small additions of other ingredients. The black powder pellet, previous to enclosure in the metal tube, will ordinarily be wrapped in heavy paper, with igniter hole exposed.

Various types of electric squibs may be employed as igniters for the deflagrating explosive, but it is essential that the squib charge employed be sufficient to bring about the sure ignition of the main charge. We find it desirable to use in the squib a composition including an oxidizing agent and a finely divided metal characterized by having a high heat of combustion. The use of blends of barium peroxide and finely divided magnesium metal answers this requirement satisfactorily. The exact type of igniter or the compositions included are not essentials of the invention. While we have shown a type in which initiation is effected by means of an inflammable bead, the concave plug type of initiator may be used equally well, that is to say one in which the plug has a concave cavity at its lower end in which an ignition composition is enclosed and brought to ignition by the bridge wire.

Our preferred form of assembly encloses the main explosive charge in a cylindrical sheath of metal. This is desirable because of the waterproofing effect imparted. The metal tube is not essential, however, and the black powder pellet or other explosive may, if desired, be enclosed in a paper receptacle of suitable weight and water resistance, for example a spirally wrapped container arrangement. In such event, the bottom and top of the pellet may be protected by closures in the form of what has been designated as "shotgun crimps," where a heavy paper or cardboard disc is inserted at each end of the wrapped pellet and the side paper is rolled down at the ends to meet the disc and to give a waterproof package. Such a package may be further protected, if desired, by dipping in paraffin, or the pellet itself may be given a paraffin coating.

The preferred embodiment of our invention given in the drawing has shown a prepared electric squib inserted in the internal well of the metal tube, the squib being adapted to fire the pellet of black powder through the metal wall of the well. We may, however, dispense with the separate squib and load the igniting charge directly into the cylindrical cavity formed by the well walls. In such case the ignition may desirably be of the concave-plug type, where the leading wires pass through the plug and the concave end of the plug toward the black powder is filled with the ignition charge. The bridge wire passes through the ignition charge. In an igniter for such an assembly, the concavity would be sufficient to hold a charge sufficiently large to fire the deflagrating explosive.

We have described our ignition assembly at length in the foregoing. It should be understood, however, that many variations may be introduced in the exact procedure followed or in the different materials and compositions used, without departure from the spirit of the invention. We intend to be limited, therefore, only by the following patent claims.

We claim:

1. An electric ignition assembly comprising a main charge of black powder in the form of a cohesive block, a cavity within said block, a thin metal sheath surrounding said black powder charge and in water-tight relationship therewith, said metal sheath being provided with an internal well projecting into the cavity in the explosive, an electric initiator within said internal well, and a reinforcing additional body of solid material at the side of the black powder charge opposite to that through which the cavity enters, whereby upon initiation the direction of the flame from the black powder toward the side adjacent to the internal cavity is favored.

2. An electric ignition assembly for igniting liquid fuel and other combustible materials, comprising a charge of black powder in the form of a cohesive block, a cavity within said block, a thin layer of metal around said black powder charge and in water-tight relationship therewith, said metal layer extending also in the form of an internal well into the cavity in the black powder, an electric initiator within said internal well, the assembly being so supported that the opening of the internal well is on the under side, the leading wires of the electric initiator passing up along the sides of the block of black powder so as to suspend the assembly in the desired position, and a body of solid material at the top of said black powder charge adapted to direct the flame downward.

3. An electric ignition assembly comprising a main charge of a deflagrating explosive in the form of a cohesive block, a cavity within said block, a thin metal sheath surrounding said charge and in water-tight relationship therewith, said metal sheath being provided with an internal well projecting into the cavity in the explosive, an electric initiator within said internal well, and a reinforcing additional body of solid material on the side of the explosive charge opposite to that through which the cavity enters, whereby upon initiation the direction of the flame from the explosive toward the side adjacent to the internal cavity is favored.

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