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ELECTRIC MATCH AND EXPLOSION INITIATOR
CONTAINING THE SAME
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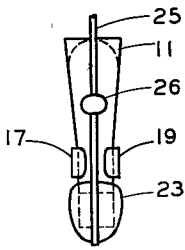


Fig. 1

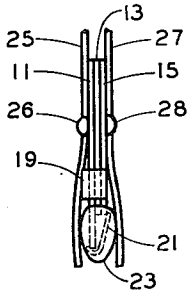


Fig. 2

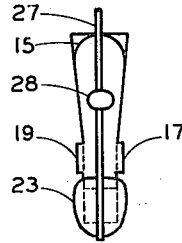


Fig. 3

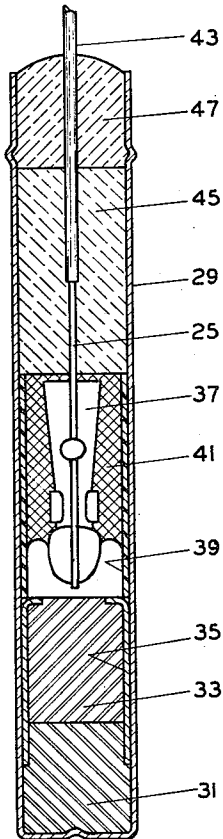


Fig. 4

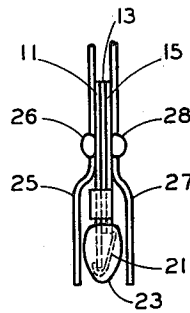


Fig. 5

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ELECTRIC MATCH AND EXPLOSION INITIATOR CONTAINING THE SAME

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3 Claims. (Cl. 102—28)

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The present invention relates to electric matches and to electric explosion initiators containing them.

An object of the present invention is an improved electric match which is resistant to static electric discharges.

Another object of the present invention is an improved electric explosion initiator which is resistant to static electric discharges.

Further objects of the invention will be apparent from the following description:

Electric explosion initiators usually include a shell into which is charged an explosive material, a firing circuit including a bridge wire, and an ignition composition in contact with at least the bridge wire portion of the firing circuit. An electric current passing through the bridge wire, heats the bridge wire to the point where the ignition composition fires and the initiator is exploded.

One type of firing circuit which has found considerable use is the electric match. An electric match customarily includes two elongated terminal sheets separated by insulating material and electrically connected by means of a bridge wire. The terminal sheets form tabs to which leg wires are fastened, and a match head is formed around the bridge wire portion of the match by dipping it in ignition composition.

For some time it has been recognized that electric explosion initiators may prematurely explode if static electric charges accumulate and pass between the firing circuit and the initiator shell through the ignition composition.

The present invention provides an electric match of improved static resistance which may be simply manufactured.

According to the present invention, at least one of the leg wires instead of being merely fastened to a terminal sheet also extends beyond the point of fastening and over the match head. When a match of this form is used in an initiator, the shortest path between firing circuit and shell lies between the extended leg wire and the shell wall, rather than between a portion of the match covered by ignition composition and the shell wall. Since static electric charges usually jump through the shortest possible path, the ignition composition is protected and a high degree of static protection is obtained by use of the present match.

The invention will be particularly described in connection with the drawing in which is shown a specific embodiment of the invention and in which Figures 1, 2, and 3 represent front, side,

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and back views of the match of the present invention, in which Figure 4 is a sectional view of a detonator assembled with a match of the present invention, and in which Figure 5 is a view of a modified match of the present invention.

Referring to Figures 1, 2, and 3 of the drawing, 11 represents a front terminal sheet in the form of a metal plate; 13 represents an insulating material which is usually a heavy paper, and 15 represents a back terminal sheet which also is a metal plate. Plate 15 is provided with ears 17 and 19 which are bent around so as to clip plate 11, insulating material 13, and plate 15 together. Insulating material 13 is shaped so as to bend around with ears 17 and 19 separating them from plate 11. Between plates 11 and 15 runs fine bridge wire 21 which is soldered to each of these plates. The plate and bridge wire assembly is then dipped in an ignition composition which forms head 23 about the bridge wire. Many materials are known to the art as suitable ignition compositions. Usually employed are lacquer suspensions of such materials as copper acetylide or lead styphnate. After match head 23 is formed, leg wires 25 and 27 are soldered by drops of solder 26 and 28, or otherwise fastened, onto terminal plates 11 and 15 respectively. It is particularly to be noted that according to the present invention these leg wires, instead of terminating at the point of fixation to the terminal plates, extend down and over match head 23.

A detonator assembled with the match just described is shown in Figure 4. Metal shell 29 contains in its bottom portion a charge of secondary detonating explosive 31 and a superposed charge of primary detonating explosive 33. Commonly used secondary detonating explosives are such material as tetryl and pentaerythritol tetranitrate, and usual primary detonating explosives are such materials as nitromannite, lead azide, and diazodinitrophenol. Of course, other primary or secondary detonating explosives may be used, or the detonator may be of the single charge type. Over primary detonating explosive 33 is placed metal inner capsule 35. This element may be omitted when primary detonating explosives such as diazodinitrophenol are used, but it is preferably employed for materials such as nitromannite which function better with some confinement. The match, which is generally represented by 37 is located inside an insulating tube 39. Insulating tube 39 is usually made of such materials as paper although other insulating materials may be employed. Match 37 is

preferably held in insulating tube 39 by means of a plastic material 41, such as sulphur. Leg wire 25, covered by insulation 43, is fastened to match 37. Leg wire 27 is obscured in Figure 4 by leg wire 25. The leg wire and match assembly is sealed in the detonator by means of two pours of sealing compounds represented by 45 and 47. Asphaltic compositions and sulphur are commonly employed for this purpose.

To insure maximum protection against static discharges, it is usually preferred that leg wires 25 and 27 extend over match head 23 to a point approximately flush with its lower end. However, it is only essential that they extend sufficiently far that the shortest electrical path between the shell and firing circuit lies to the extended leg wires, rather than to a portion of the match which is covered with ignition composition. When metal inner capsules are used, care should be taken that the leg wires do not extend so far that they become grounded upon the capsule.

The match of the present invention provides particularly definite advantages for assembly in the initiators for any positioning of the match head toward the shell wall such as would occur by inaccurate centering results in a similar movement of a discharge point and, therefore, protection is afforded regardless of the location of the match head in the initiator assembly.

While it is preferred that both leg wires extend over the match head, as is shown in the drawing, the benefits of the invention are substantially obtained if but one leg wire is so constructed.

In the modification of the invention illustrated in Figure 5, the leg wire extensions are bent so that they are spaced somewhat from the match head. By this means the gap between the firing circuit and the shell wall is considerably shortened. This modification shown in Figure 5, however, requires somewhat more care when inserting the match into an initiator shell to avoid contact of the extended leg wires with the shell and consequent undesirable grounding.

In another modification of the invention, the extended ends of the leg wires are broadened as by hammering, or by attaching plate-like members so that protection is provided over a large portion of the match head. Usually, however, the simpler form shown in Figures 1, 2, and 3 will be entirely adequate, and easier to construct and to assemble in an initiator.

Matches of the present invention may be used with electric explosion initiators of other varieties than that specifically described and shown in Figure 4 of the drawing. For example, the matches may be used with detonators having charges and sealing mechanisms of other descriptions. The matches also find application in other electric explosion initiators such as metal electric squibs, and in other devices where electric matches are employed as in electric fuse lighters.

It is to be noted that the matches of the present invention, because the sensitive match head is so directly protected, are especially useful in initiators having plastic or other non-conductive shells. In plastic shell initiators, the static electricity tends to discharge between the firing circuit and some conductor lying outside the shell, rather than between the firing circuit and the shell.

The description in the present specification has

centered chiefly around static electric charges because they are the type of charge from which the principal difficulties have been experienced. However, it is apparent that the present invention provides protection against discharging electric currents of other sorts.

The invention has been specifically discussed in connection with the plate type electric match. It is to be clearly understood, however, that it may be employed with any similar type of match as, for example, the foil type, in which the terminal sheets are metal foils pasted onto the opposite sides of a sheet of insulating material.

It is readily seen that the present invention provides a means for the simple and easy production of electric matches, and of electric explosion initiators containing them, which are resistant to firing by undesired electric discharges.

What is claimed is:

1. An electric match comprising a pair of terminal sheets separated by insulating material, a bridge wire connecting said sheets, a match head surrounding said bridge wire, and a separate leg wire fastened to each of said terminal sheets, each leg wire extending beyond its point of fastening over said match head and to a point approximately flush with the end of said match head.

2. An electric explosion initiator containing an explosive charge, an electric match positioned above said explosive charge, said electric match comprising a pair of terminal sheets separated by insulating material, a bridge wire connecting said sheets, a match head surrounding said bridge wire, and a separate leg wire fastened to each of said sheets, each said leg wire extending beyond its point of fastening over said match head, and to a point approximately flush with the end of said match head.

3. An electric explosion initiator comprising a metal shell containing an explosive charge, a metal inner capsule over said explosive charge and contacting said metal shell, an electric match positioned above said explosive charge, said electric match comprising a pair of terminal sheets separated by insulating material, a bridge wire connecting said sheets, and a match head surrounding said bridge wire, and a separate leg wire fastened to each of said sheets, each said leg wire extending beyond its point of fastening over said match head, and to a point approximately flush with said match head.

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