April 7, 1959 H. J. LUTZ ET AL 2,880,671

INITIATOR PRIMER

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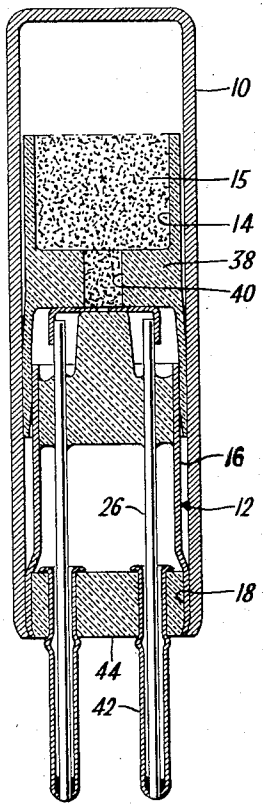


Fig. 1

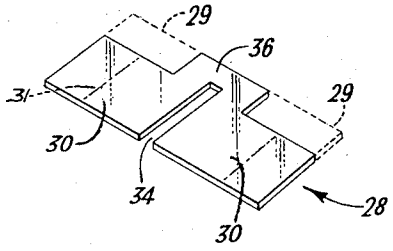


Fig. 3

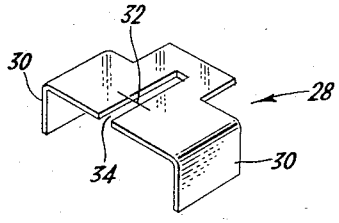


Fig. 4

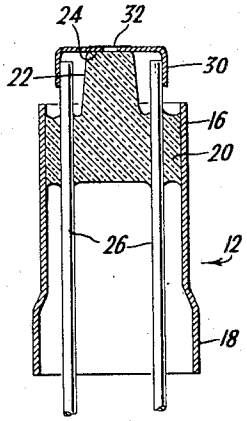


Fig. 2

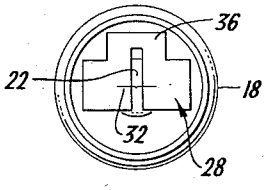


Fig. 5

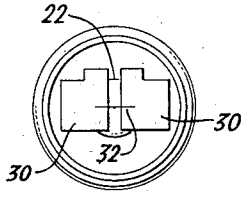


Fig. 6

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INITIATOR PRIMER

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Application October 5, 1954, Serial No. 460,439

1 Claim. (Cl. 102—28)

This invention relates to primers for initiating explosive discharges.

In many industries and in warfare it is desired to fire a bulk of an explosive mass by initial firing of a much smaller charge of explosive. Where the explosive material is expensive or the unit to be exploded is expensive to produce or where it is desired to ensure the absence of duds, great care is involved in the construction of the initial primer.

In a certain type of primer a measured charge of primary explosive is ignited by an electrically heated very fine wire. This wire in an intended application of the primer is a tungsten wire of the order of .0001" in diameter, and has a length of .125"±.062" with a resistance of close to 275 ohms to the inch. The effective length of the wire in the finished primer, i.e, the length of wire effective to fire the charge, would be of the order of .015". To insure uniform results, the electrical potential applied to the wire, the diameter of the wire, and its length are precisely set forth in specifications. In the past it has been difficult to maintain these specifications principally because the length of the wire is small and small variations in length create large percentage differences in heat. Consequently erratic results with respect to the explosion of the primary charge were obtained. An insufficient amount of heat in the wire would create a dud and an excess amount of heat developed might cause undesired premature explosion of both the primary charge and the main explosive mass. In the case of a missile embodying the explosive, this might cause failure to strike the target.

It is an object of this invention to provide a method for forming primers which shall insure uniform results as to firing of an initial explosive charge.

It is a further object of the invention to provide a primer in which the effective portion of the heating element is maintained at a definite length.

It is a still further object of the invention to provide a construction of heating element and associated parts such that there is little likelihood of breakage of the element in assembling the primer, particularly when the explosive charge is loaded into the primer.

These and other objects will be apparent after reading the following specification in conjunction with the accompanying drawing in which—

Fig. 1 is a vertical cross section through an assembled initiator primer.

Fig. 2 is a vertical sectional view through the inside shell assembly of the initiator prior to assembly within the outer shell.

Fig. 3 is a perspective view of the filament carrier in an initial stage of manufacture.

Fig. 4 is a similar view in an intermediate stage of manufacture, the filament being added.

Fig. 5 is a plan view of the filament and carrier mounted in place on the inner shell assembly with the carrier still in an intermediate stage of manufacture and

Fig. 6 is a similar view with the carrier processed to its final form.

Referring to the figures in greater detail, it will be seen that the initiator primer is comprised of four main portions. These are an outer metallic shell **10**, an inner shell assembly **12**, a charge retaining insulating sleeve **14** and an explosive charge **15**.

The outer shell **10** comprises a cylindrical tube closed at the upper end and having the lower edge turned in to grip inner parts, as later described.

The inner shell assembly comprises a metallic cylinder **16** with a flared cylindrical skirt portion **18**. Within the upper end portion of the cylinder, opposite the flared portion, is an insulating plug **20**, as for example of polystyrene, said plug having a central frusto conical protuberance **22**, the upper face **24** of the truncated cone being perfectly flat. Traversing the plug and secured thereto is a pair of conductors **26**, to the upper ends of which are secured a pair of plate members **30, 30** carrying a heater wire **32**. The plate members are secured to the conductors by means of flanged portions soldered, spot welded or cold swaged to the conductors. The lower ends of the conductors may be left free for soldering to other portions of the device with which the primer is to be used or may be finally associated with plug-in pins, as will be described later. The flanged plates and heater wire are formed as follows: Initially a flat rectangular metallic plate **28**, see Fig. 3 has its corners **29, 29**, shown in dotted lines, cut away leaving end sections **30**. The free ends of these end sections are then bent down on the dotted lines indicated at **31** to form downwardly depending flanges. A slot **34** having parallel edges is cut across the width of the plate and substantially midway of its length, the width of said slot being precisely selected in accordance with the effective length of wire desired. This slot although it may be cut prior to bending of the plate, is preferably cut after the bending operation described to prevent distortion of the slot as might occur if the bending were performed subsequent to slot formation. Next, the wire **32** is laid perpendicularly across the slot and cold swaged into good electrical contact with the end portions **30** of the plate. Obviously, other definite angles for laying the wire across the slot may be selected to give other definite effective lengths of wire. It will be noted that during all of the operations so far described the tab **36** holds the parts **30, 30** in fixed relationship to one another to maintain the solt **34** unaltered in width. After the cold swaging operation the formed assembly is mounted on the protuberance **22** with the under face of the plate resting on the protuberance. The flanges on the plate portions **30** are then soldered or otherwise electrically and mechanically secured to the conductors **26**. At this time, it will be noted, the bridge portion of the heater wire **32** is spaced very slightly above the upper face **4** of the protuberance. In this stage of manufacture, the heater wire **32** is short circuited by the tab **36**. Now, however, the tab is cut off on a line crossing the slot **34**, as on a line following the closed end of the slot, to remove the short circuit around the wire. The resultant structure is shown in Fig. 6. By the method and means hereby described the effective portion of the heater wire **32** has been maintained straight and at a fixed length, since the slot **34** has been maintained unaltered in width throughout the process of forming the plate and mounting it on the conductors **26**.

After the plate assembly has been put in place, as described, the insulating sleeve **14**, which may be of polystyrene, is slipped over the shell assembly **12**. This sleeve **14** has a cross partition wall **38** about midway of its length, the wall being perforated at **40** to allow explosive powder **15** to sift into the area below and above the heater wire. The bottom of the wall abuts the

swaged-in wire 32 and end pieces 30. It should be understood that the swaging operation has left the upper surface of the wire in substantially coplanar relationship to the upper surfaces of the end pieces. A measured amount of the explosive 15 is packed in the upper cup like portion of the sleeve 14. This when exploded by the heat from the wire 32 will rupture the outer shell 10 and fire the main charge. The outer shell 10 is slipped over the polystyrene sleeve 14 and suitably fastened to the skirt portion 18 of the cylinder 16. A convenient way to do this is by rolling or peening over the lower edge of the outer shell against the lower edge of the skirt portion. If desired, the lower ends of the conductors 26 may be soldered to plug-in pins 42 suitably mounted in an insulating plug 44 retained in the skirt portion, as for example by reason of the rolling in of the lower edges of the outer and inner shells and the flare immediately above the skirt portion 18.

It should be understood that various modifications in the above described method and structure may be made without departing from the principles of this invention as defined by the appended claim and it is intended that all such modifications as fall within the terms of the claim shall be covered by the claim.

Having thus described our invention, what we claim as new is:

In an initiator primer, a heater wire assembly comprising an insulating body and a protuberance extending thereabove, said protuberance having a planar top, a pair of conductors supported by and extending above the insulating body and alongside of the protuberance, a pair of plate members extending parallel to said planar top with the lower surfaces thereof resting on said protuberance but spaced apart on said protuberance to leave a gap between the members, said members having flanges extending along the conductors and electrically and mechanically joined thereto, and a heater wire on the upper surfaces of said plate members and spanning the gap therebetween to leave a space between the protuberance and the wire for retention of explosive.

References Cited in the file of this patent

UNITED STATES PATENTS

2,226,988	Woodworth	Dec. 31, 1940
2,230,080	Johnson et al.	Jan. 28, 1941
2,269,195	Finlayson	Jan. 6, 1942
2,279,451	English et al.	Apr. 14, 1942
2,481,696	Seavey	Sept. 13, 1949
2,596,325	Cerny	May 13, 1952
2,762,302	MacLeod	Sept. 11, 1956

FOREIGN PATENTS

284,085	Switzerland	Nov. 1, 1952