

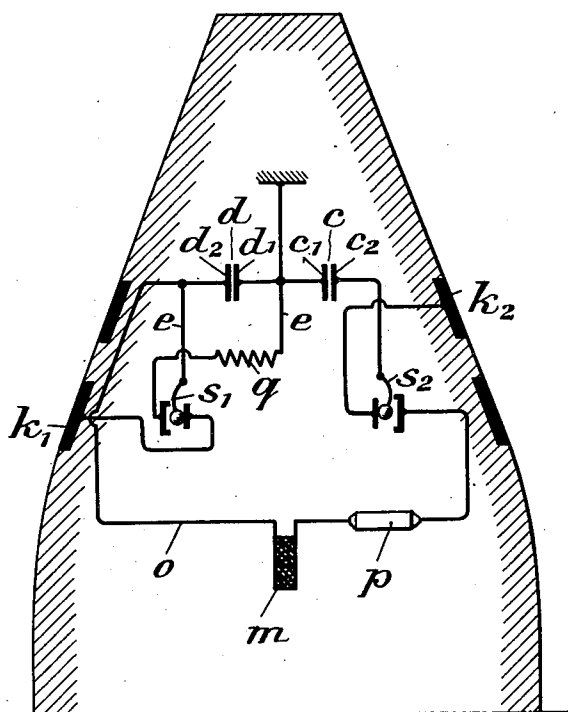
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ELECTRICAL PROJECTILE IGNITER

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UNITED STATES PATENT OFFICE

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ELECTRICAL PROJECTILE IGNITER

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The electrical fuse of my U. S. Patent No. 1,711,693, comprises two opposed condensers with means for varying the potential of their discharges, the difference of potential gradually increasing until it is sufficient to ignite the ignition substance of the fuse. The object of the present invention is to provide a safety means for such fuses, the condensers of which are charged from an outside source either before or at the time of firing. Such means prevents a premature building up of the ignition potential between the two condensers, that is, before the projectile is fired and starts to move, which premature ignition might cause a back-fire of the gun or even its destruction.

According to the present invention, the discharge circuit of one of the two condensers, which furnishes the ignition potential through a high resistance, and, in some cases, at the same time also, the balancing (ignition) circuit, leading through the ignition medium from one condenser to the other, is or are broken at a switch before the gun is fired, said switch, as shown, being in the form of an inertia or centrifugal switch, which is closed only at or after the firing, i. e., is or are automatically closed by the shock of firing or by the rotation of the projectile. Preferably, these switches are formed as double switches, so that, in one position, they connect, prior to firing, the outer charging contacts of the fuse leading to the source of energy, with the condenser ignition circuit poles, and at the same time disconnect the discharge circuit of one of the condensers and the ignition circuit between the two condensers, while after their automatic movement into the second position, at or after the firing, they disconnect the outer charging contacts from the condenser poles and, at the same time, close the discharge circuit of one condenser and the balancing (ignition) circuit between the two condensers. In this way, electric fuses with condensers, as ignition current feeders and receiving their energy from an outside source, are afforded a high degree of safety, in a very simple manner, against premature ignition, and also against an undesired accidental back dis-

charge of the condenser potential through the discharge circuit when it has not been previously short-circuited, which might occur, for example, during the flight of the projectile on account of atmospheric moisture or some other electric conductive substance bridging the charging poles.

The drawing is a diagrammatic representation of a projectile fuse constructed in accordance with the invention.

The fuse, shown as a head fuse although it might as well be a bottom fuse, contains, as usual, the two condensers c and d , like poles d' and c' of which are directly connected together through the igniter body, while their other poles d^2 and c^2 are connected together by the balancing circuit o through an electrical ignition substance m and a spark gap p , acting as an automatic switch and preferably of the rare gas type. The condenser d can discharge itself, to automatically vary the potential of its charge relatively to that of the condenser c , through the conductor e and a high resistance q . The energy is supplied to the fuse by a charging device before the firing, or in some cases, at the time of firing in the barrel itself, from an outside source of current, not shown. The fuse is provided with contact rings k' and k^2 , insulated from each other and from the body of the fuse, and connected for charging, for example, with the positive pole of the battery. Ring k' is connected to the condenser coating d^2 and ring k^2 to the condenser coating c^2 . The negative pole of the battery is then, in charging, brought into contact with the fuse body and through it with the condenser coatings d' and c' .

In accordance with the present invention, a centrifugal switch s^2 , consisting, for example, of a spring wire with a ball on its free end, is so mounted between the outer charging contact ring k^2 , the condenser coating c^2 and the circuit o , leading to the ignition medium m , that, in the normal position of rest before firing, it interrupts the circuit o between the coatings d^2 and c^2 of the two condensers, but at the same time closes the outer charging contact ring k^2 to the coating c^2 . Furthermore, a second similar switch s'

maintains connection, before the firing, between the outer charging contact ring k' and the coating d^2 of the condenser d while at the same time it interrupts the discharge circuit e through the high resistance g . In transporting the igniter, therefore, its outer charging contact rings k' and k^2 are connected to the condensers c and d , but the ignition circuit o and the discharge circuit e of the condenser d are broken. There is no possibility, therefore, of the formation of a potential sufficient for ignition between the condenser coatings d^2 and c^2 through the ignition substance m , during the charging of the condensers, nor of the building up of an ignition sufficient for ignition after disengagement of the contacts of the battery from the charging contacts k' and k^2 , as long as the projectile is not rotated for any reason.

After the firing and at the commencement of rotation of the projectile, the centrifugal switches s' and s^2 swing outwardly, due to centrifugal force, thereby automatically disconnecting the outer charging contact rings k' and k^2 of the fuse from the condensers c and d , and close the balancing circuit o between the two condensers through the ignition medium m , as well as the discharge circuit e of condenser d through the high resistance g . Then condenser d is discharged, by its short circuit, to equalize its potential with that of condenser c , and a potential, sufficient to pass through the gas gap p and the ignition medium m and to ignite the latter, is built up after a certain time, corresponding to the potential, produced by the charging of the condenser system, in the equalizing circuit o between the condenser coatings d^2 and c^2 . In the event that, during the flight of the projectile before the said necessary potential is reached, the charging contact rings k' and k^2 should be conductively connected by any outside effects, for example, rain, then no equalization of the potential, already built up between the condensers d and c , around the ignition circuit o through the charging circuits, can take place.

The safety switches, according to the present invention, which alternatively connect either the outer charging poles of the fuse or the ignition circuit to the condensers, are advantageously used in all electrical fuses containing condensers of any kind and connected up in any way.

I claim as my invention:—

1. Electrical fuse for projectiles, comprising two condensers connected in opposition, one condenser being short circuited on itself, a high resistance in said short circuit, through which said condenser may discharge to equalize its potential with that of the other condenser, an inertia switch in said discharge short circuit, a second inertia switch in the circuit connecting the two condensers, and an

ignition medium in said last-mentioned circuit, said switches acting automatically after the firing of the gun.

2. Electrical fuse for projectiles, comprising two condensers connected in opposition, one condenser being short circuited on itself, a high resistance in said short circuit, through which said condenser may discharge to equalize its potential with that of the other condenser, charging contacts, circuits leading therefrom to the condensers, a discharge short circuit around one of the condensers, a high resistance in said short circuit, a circuit connecting the two condensers, an ignition medium and a high resistance in said last-mentioned circuit, an inertia switch in said short circuit, and a second inertia switch in said connecting circuit, whereby said switches in normal position close the circuits from the charging contacts to the condensers and open said short circuit and said connecting circuit, respectively, while in their second position, after the projectile is fired, they open said charging circuits and close said short circuit and said connecting circuit.

3. In an electrical fuse provided with two condensers and with charging contacts connected to said condensers, a short circuit, including a high resistance, around one of said condensers, a circuit connecting opposite poles of said condensers, an ignition medium in said connecting circuit, an inertia switch in the latter, and a similar switch in said charging circuits and in said short circuit, whereby the connections are automatically charged for ignition when the projectile is fired.

4. An electric fuse for projectiles and the like, comprising two condensers, charging circuits for the same, a discharge circuit from the condensers, an ignition medium in said discharge circuit, an inertia switch in said charging circuits and an inertia switch in said discharge and short circuits, whereby the charging circuits are automatically opened and the discharge and short circuits closed by the movement of the projectile.

In testimony whereof, I affix my signature.

HERBERT RÜHLEMANN.