

F. RAUSENBERGER.
 IMPACT FUSE.
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932,173.

Patented Aug. 24, 1909.

Fig. 1.

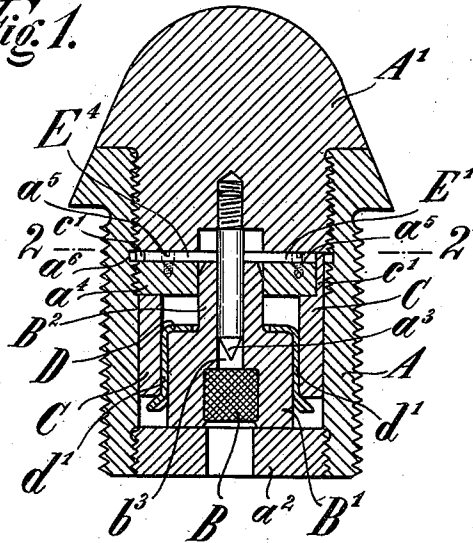


Fig. 5.

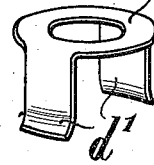


Fig. 2.

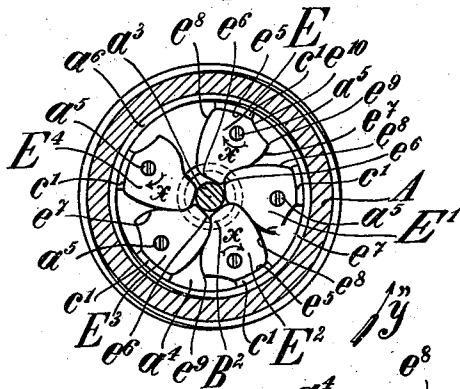


Fig. 3.

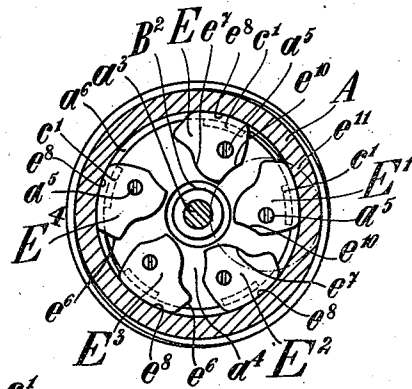
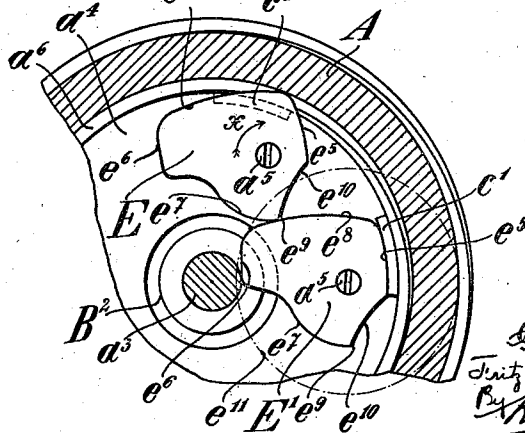


Fig. 4.



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IMPACT-FUSE.

932,173.

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To all whom it may concern:

Be it known that I, FRITZ RAUSENBERGER, a subject of the Emperor of Germany, and a resident of Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Impact-Fuses, of which the following is a specification.

This invention relates to impact fuses having at least two centrifugally released retaining pieces for the parts which carry the igniting means (igniting pellet and igniting needle) and has for its purpose to provide, in a fuse of this kind, a safety means capable of retarding, in a particularly effective manner, the enlivening of the fuse. According to the invention, this purpose is attained by the fact, that the retaining pieces are swingingly arranged and that every retaining piece which, while it leaves the safety position, is capable of holding the adjacent retaining piece still for a time in this position, touches this piece by a surface, which is concentric to the swinging center of the first named retaining piece.

In the drawings, one embodiment of the invention is illustrated by way of example, Figure 1 being an axial longitudinal section of the secured fuse; Fig. 2 a section on the line 2—2 of Fig. 1 seen from above; Fig. 3 a section similar to Fig. 2 with different positions of the several parts; Fig. 4 showing a portion of Fig. 2 on a larger scale likewise with changed position of the several parts, and Fig. 5 a detail perspective view.

The hollow cylindrical fuse body A which is closed at its forward end by the fuse head A^1 and at its rear end, as shown in the drawing, by a base plate a^2 , receives the axially movable pellet bolt $B^1 B^2$, which carries the ignition medium or pellet B. The pellet bolt $B^1 B^2$ is provided with an axial bore b^3 leading to the pellet B (Fig. 1), into which the fuse needle a^3 , secured to the fuse head, projects. When the fuse is in transport position, the head B^1 of the pellet bolt, rests upon the base plate a^2 , as shown in Fig. 1. The pellet bolt is held in this position, in which the pellet B is supported a certain distance from the fuse needle a^3 , by a known (transport-) safety device. This safety device consists of a retaining ring C which bears at its forward end against a plate a^4 screwed into the fuse body A, and at its rear part, rests, as shown in the drawing, upon the deflected

ends of two resilient tongues d^1 , projecting from a disk D, resting upon the head B^1 of the pellet bolt (see also Fig. 5). Upon firing a shot, the retaining ring C, acting under inertia, straightens out the deflected ends of the tongues d^1 and moves axially until it rests with its rear end against the base plate a^2 . The plate a^4 is provided with a central bore through which the cylindrical portion B^2 of the pellet bolt can pass.

On the forward side of the plate a^4 are swingingly mounted five disk formed retaining pieces E, E^1 , E^2 , E^3 and E^4 . These retaining pieces lie, as shown in the drawing, with their forward faces against the fuse head A^1 , so that they are secured against displacement in an axial direction. The position of the pivots a^5 , about which the retaining pieces can swing, is so selected that the several retaining pieces tend to swing, under the influence of centrifugal force, clockwise—seen from the fuse head—outwardly, that is to say in the direction of the arrow x (Figs. 2 to 4). Furthermore, the arrangement is so determined that the retaining pieces, under the influence of inertia incident to angular acceleration developed at the commencement of the projectile's movement, seek to rotate relatively to the plate a^4 , in a direction opposite to the arrows x . It is assumed that the fuse is rotating in the direction of the arrow y , Fig. 2, during the movement of the projectile. When the retaining pieces assume the position shown in Fig. 2, the safety position, they lie against the forward face of the pellet bolt $B^1 B^2$ and thus constitute, in addition to the safety device C, D, d^1 , a further device against the forward movement of the pellet bolt. If, on the other hand, the retaining pieces assume the position shown in Fig. 3, in which they can swing outwardly under the influence of centrifugal force, they lie wholly outside of the path of the pellet bolt. When the fuse is in transport condition, the retaining pieces E to E^4 , are held fast in the position shown in Fig. 2, by the arms c^1 of the retaining ring C, which project through corresponding recesses in the plate a^4 ; at this time, each arm c^1 of the retaining ring C impinges a face e^5 of a retaining piece, which face is so designed that, so long as the arm c^1 is in contact with said face, a swinging of the retaining piece about its pivot a^5 is impossible. The length of the arms c^1 is so

determined that after the retaining ring C has been thrown back at the time of firing, the arms will be out of the path of the retaining pieces E to E⁴. In the position shown in Fig. 2, the several retaining pieces lie with each a face e^6 against the fuse needle a^3 . The faces e^6 are of such form that in the position mentioned, a rotation of the retaining pieces in a direction opposite to the arrows x , is impossible. Furthermore in the position mentioned, each retaining piece E, E¹, E² and E³, lies with a face e^7 against the face e^8 of the adjacent retaining piece E¹, E², E³ and E⁴; the retaining piece E⁴, in the position mentioned, lies fully without the path of the retaining piece E. Each surface e^7 is curved in the arc of a circle whose center coincides with the axis of the pivot a^5 . In consequence of this arrangement, when, for example, the retaining piece E, swings from the position shown in Fig. 2 to the position shown in Fig. 3, the retaining piece E¹ is held fast in the position shown in Fig. 2 so long as the retaining piece E, touches the surface e^8 of the retaining piece E¹, with the edge e^9 on the end of the surface e^7 . In Fig. 4 the two retaining pieces E and E¹ are shown in those positions which they assume when the edge e^9 of the retaining piece E, has just come into contact with the surface e^8 of the retaining piece E¹. Not until this moment can the retaining piece E¹, begin to swing outwardly under centrifugal force. As will be seen from Fig. 4, it is easily possible to so select the proportions, that the swinging of the retaining piece E¹, can first begin when the retaining piece E has nearly attained the position shown in Fig. 3. In the same way the piece E² is held against swinging until piece E¹ has nearly reached its outermost position. After E² has been released to swing into its outermost position, pieces E³ and E⁴ in turn, assume their outermost positions under the action of their centrifugal force. The surfaces e^8 with which the retaining pieces, when in the position shown in Fig. 3, lie against the surface of a cylindrical recess a^6 provided in the fuse body A, are curved in an arc whose center coincides with the axis of the cylindrical recess a^6 , when the retaining pieces are in the position mentioned. The part e^{10} of the periphery of the retaining pieces, lying between the surfaces e^6 and e^7 , is of such form that the retaining pieces E, E¹, E², and E³, lie outside the paths of the adjacent retaining pieces E¹, E², E³, E⁴, in the position according to Fig. 3. In Figs. 3 and 4, the path of the retaining piece E¹ is shown by way of illustration, by a dotted circle e^{11} .

Before the firing of the shot, the several parts of the fuse assume the position shown in Figs. 1 and 2. Upon firing a shot, the retaining ring C immediately snaps back-

ward under the effect of its inertia, straightening out the ends of the tongues d^1 , until it rests against the base plate a^2 . The arms c^1 of the retaining ring C are thereby withdrawn from the path of the retaining pieces E to E⁴, so that they no longer hinder the outward swinging of the retaining pieces. Also the retaining pieces are subjected to the effect of an axially directed force of inertia, which presses them against the plate a^4 . Since the retaining pieces have the form of disks, the surface pressure is relatively small, so that there is no danger of distortion which would restrict the mobility of the retaining pieces. Immediately after firing, the projectile begins to rotate in the direction of the arrow y . The rotation of the projectile is accomplished at first with increasing angular velocity. A force of inertia is thus produced which seeks to turn the retaining pieces in a direction opposite to that indicated by the arrows x , while the simultaneously imposed centrifugal force of the retaining pieces, seeks to turn them in the direction of the arrows x . Since the angular velocity, upon which the measure of centrifugal force depends, is very small at the commencement of the movement of the projectile, whereas the angular acceleration which gives the force of inertia is very great, the force of inertia has the ascendancy over the centrifugal force at the commencement of the projectile's movement and the retaining pieces whose rotation in a direction opposite to the arrows x is prevented by contact of the surfaces e^6 with the fuse needle a^3 , will be held fast, at first, in the safety position shown in Fig. 2, so that the pellet bolt B¹ B² remains still further secured. After a certain time, the centrifugal force which is constantly on the increase by development of angular velocity, overbalances the force of inertia, which decreases as the projectile approaches the muzzle of the gun barrel. Then the retaining piece E swings under the influence of centrifugal force, in the direction of the arrows x , to the position shown in Fig. 3. This takes place unhindered, since the adjacent retaining piece E¹ is completely outside the path of the retaining piece E. The retaining piece E¹, during the swinging of the retaining piece E, will be held fast in the position shown in Fig. 2, by the surface e^7 of the retaining piece E, until the retaining piece E, as shown in Fig. 4, has nearly reached the position of Fig. 3; not until then can the swinging of the retaining piece E¹ commence. Likewise, the retaining pieces E², E³ and E⁴ can first commence to swing only after the preceding retaining pieces E¹, E² and E³ have nearly approached the position shown in Fig. 3. Not until the last retaining piece E⁴ has passed beyond the path of the pellet bolt B¹ B², is the latter released.

that is to say the fuse rendered active. Inasmuch as the retaining pieces E to E⁴ can swing into ineffective position, not simultaneously but only successively, the rendering of the fuse active is delayed in a very effective manner.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

10 1. In an impact fuse a safety device comprising a plurality of swingingly mounted pieces normally held in their safety positions, said pieces being shaped and mounted to interlock one another in their safety positions and to be swung from their locking positions in succession.

2. In an impact fuse, the combination with the fuse-body; of a movable part; and means for holding said part against movement, comprising retaining pieces normally positioned in the path of movement of said part, said pieces being shaped and mounted to interlock each other in their restraining positions and to be swung from their locking positions in succession.

3. In an impact fuse the combination with the fuse-body; of a member slidable therein; and means for holding said member against sliding, said means comprising a plurality of retaining pieces pivotally mounted on a part rigid with said fuse-body, the positions of said pivots being so arranged and the pieces so shaped as to cause the inertia and the centrifugal force to act in opposite directions on said pieces.

4. In an impact fuse, the combination with a slidable member for igniting the fuse; of a plurality of retaining pieces provided with surfaces fitting successively into each other when in locking position and swinging free of each other when in unlocked position; and pivots upon which said pieces are oscillatably mounted, said pivots being arranged to cause the pieces to first move inwardly under their own inertia and then move outward under the action of their centrifugal force.

5. In an impact fuse, the combination with the slidable part for carrying an ignition medium; of a plurality of centrifugally released retaining pieces therefor, said pieces provided with surfaces fitting successively into each other and adapted to restrain each other in a series in safety position and to swing free and release each other successively; and means for securing said

pieces in their interlocked positions, said means being moved from its securing position by the firing of the projectile from the gun.

6. In an impact fuse, the combination with a slidably mounted member for carrying the explosive pellet; of a plurality of retaining pieces pivotally mounted and adapted to be moved successively in series into and out of position to hold said member against sliding, each of said pieces being formed to adapt it during the greater part of its release movement, to hold the next adjacent piece in locked position.

7. In an impact fuse, the combination of a part carrying an ignition medium; a plurality of centrifugally released pieces for holding said part against movement; and means for securing said retaining pieces in locked position, said retaining pieces being swingingly mounted and adapted to move successively by surfaces concentric with their centers of swinging, the shape of said pieces being such as to adapt each during a portion of its swinging movement, to restrain the piece next adjacent thereto; and said securing means being adapted to engage said pieces and to be disengaged therefrom at the commencement of the forward movement of the fuse.

8. In an impact fuse, the combination with a sliding pellet-bolt; of retaining pieces therefor mounted on pivots to swing into and out of position to lock the pellet-bolt against movement, said pieces being provided along a portion of their perimeter with surfaces concentric with the centers of their pivots, said surfaces adapting them to retain adjacent pieces in locking position during a portion of their swinging movement and to permit said pieces to move into unlocking position only one at a time; and means for securing said pieces in locking position, said means comprising an axially movable ring provided with tongues impinging said retaining pieces, said ring and tongues being movable under their own inertia out of securing position when the projectile is fired.

The foregoing specification signed at Barmen, Germany, this 29th day of October, 1908.

FRITZ RAUSENBERGER. [L. s.]

In presence of—

OTTO KÖNIG,

WALTER EZKILSMANN.