A. WRATZKE.

IMPACT FUSE.

APPLICATION FILED MAR. 9, 1908.

913,343. Patented Feb. 23, 1909.

Fig. 3.

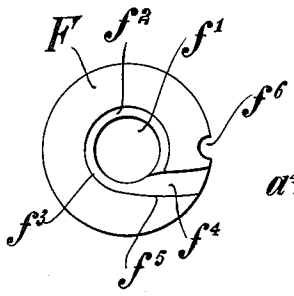


Fig. 4.

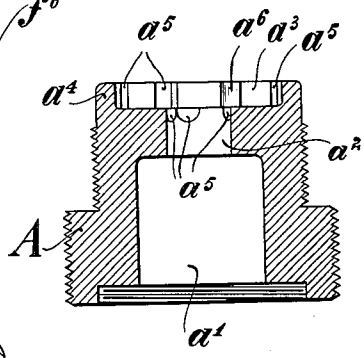


Fig. 5.

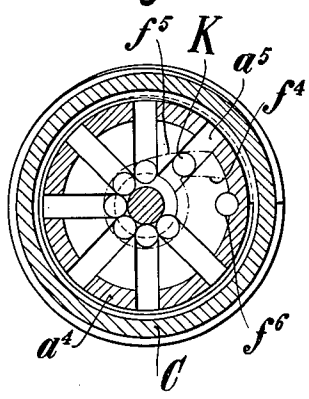


Fig. 1.

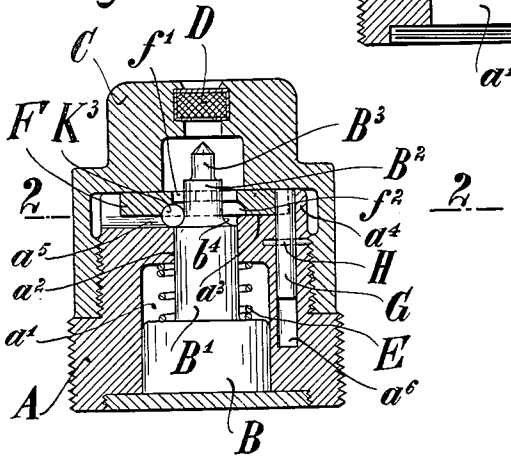


Fig. 6.

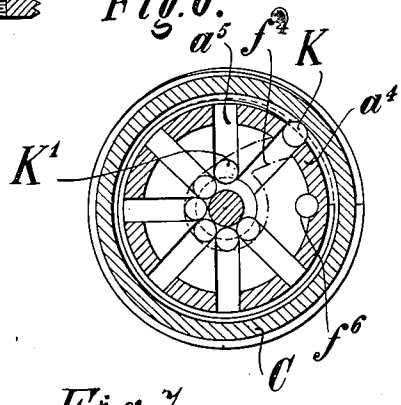


Fig. 2.

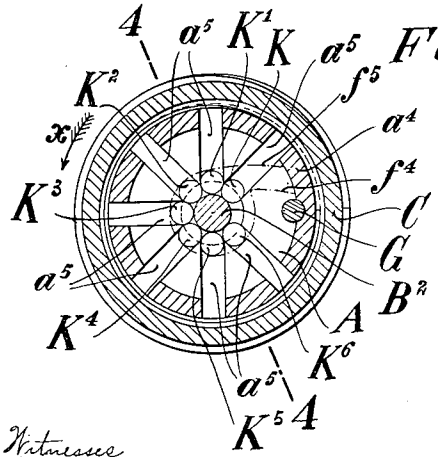
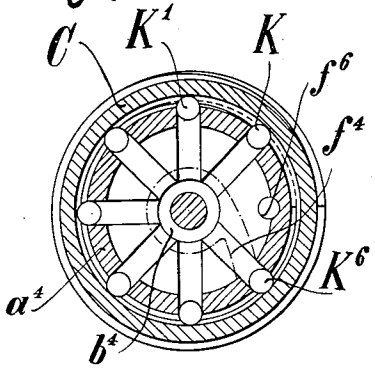


Fig. 7.



Witnesses
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UNITED STATES PATENT OFFICE.

ALFRED WRATZKE, OF ESSEN-ON-THE-RUHR, GERMANY, ASSIGNOR TO FRIED. KRUPP AKTIENGESELLSCHAFT, OF ESSEN-ON-THE-RUHR, GERMANY.

IMPACT-FUSE.

No. 913,343. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed March 9, 1908. Serial No. 419,997.

To all whom it may concern:

Be it known that I, ALFRED WRATZKE, 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.

The invention relates to the type of impact fuses in which the parts effecting the ignition are held apart by a plurality of balls until the balls have left their safety position under the action of the centrifugal force. In accordance with the present invention, the release of this type of fuses is retarded by the fact that a part of the fuse after firing moves relatively to the balls which are in the safety position, and during this movement of the fuse-part the balls gradually leave the safety position through the medium of a ball-track provided in the fuse-part.

One embodiment of the invention is, by way of example, shown in the accompanying drawings applied to a base-fuse.

Figure 1 is an axial longitudinal section through the fuse in safety position; Fig. 2 is a section on line 2—2, Fig. 1, looking from above; Fig. 3 shows a detail in bottom view; Fig. 4 shows a detail in section on line 4—4, Fig. 2, and Figs. 5 to 7 are views corresponding to Fig. 2, but showing some of the parts in different positions.

The needle-bolt is slidably mounted in the fuse-body A (see also Fig. 4) and is composed of the firing-needle B^3 and three cylindrical parts B, B′, B^2 of different diameters. The parts B, B′, of the needle-bolt are loosely guided in bores a', a^2 in the fuse-body. The firing-needle B^3 projects into a cap C which is screwed on the fuse-body and in which is arranged the primer D. A spring E tends to prevent the needle-bolt from moving towards the primer.

The fuse-body A is provided with a central recess a^3 (see especially Fig. 4) in which is arranged a disk F (Figs. 1 and 3) which is adapted to hold the balls K K′ . . . K^6 in the safety-position (Figs. 1 and 2). The disk F lies loosely against the cap C and against the walls of the recess a^3 so as to be capable of turning easily relatively to the fuse-body while it is incapable of moving in the axial direction. The disk F is provided with a central bore f' of a diameter corresponding to that of the bore a^2 of the fuse-body. Toward the bottom surface of the disk F the bore f' is enlarged to form a recess f^2 which is concentric with the longitudinal axis of fuse and the depth of which corresponds to the radius of the safety-balls. The recess f^2 is formed in such a manner that the balls lie against its wall when they are in the safety position. The balls then rest against the cylindrical surface of the part B^2 of the needle-bolt and against a shoulder b^4 on the needle-bolt, the shoulder forming the junction between the part B′ having the larger diameter and the part B^2 having the smaller diameter.

In the safety position each of the balls K K′ . . . K^6 projects into a groove a^5 in the fuse-body. The grooves a^5 form tracks for the balls; they are cut in the bottom wall of the recess a^3 of the fuse-body and in the flange a^4 encircling the recess and they extend radially to the longitudinal axis of the fuse. That part of the grooves a^5 which lies between the bore a^2 and the flange a^4 has a depth which corresponds to the radius of the balls. The angular distances between adjacent grooves a^5 are the same, with the exception of one which is greater than the others.

In order to make it possible for the balls to leave the safety position through the medium of the grooves a^5 a groove f^4 (Figs. 2, 3 and 5 to 7) cut in the bottom wall of the disk F leads from the recess f^2 in the disk to the periphery of the disk. The groove f^4, which together with the grooves a^5 serves as track for the balls, extends in such a manner that its wall f^5 is substantially tangential to the edge f^3 of the recess f^2. The groove f^4 therefore practically extends tangential to the annular space f^2 in which the balls lie when in safety-position. The depth of the groove f^4 corresponds to the radius of the balls.

In the transport condition of the fuse the disk F is held against rotation by means of a bolt G (Figs. 1 and 2) which engages in a notch f^6 (see especially Fig. 3) in the disk F. The bolt G is slidably mounted in a bore a^6 (Fig. 1) of the fuse-body A, the bore a^6 extending parallel to the longitudinal axis of the fuse, and the bolt G is normally held against axial movement by means of a pin H (Fig. 1) made from soft metal, such as brass.

When the disk F is in the position in

which it is secured by means of the bolt G, the inner end of the groove f^4 registers with the inner end of that groove a^5 which serves as track for the ball K (see the position of the groove f^4 indicated in dotted lines in Fig. 2). In this position of the groove f^4 the ball K can move outwardly in the corresponding groove a^5 from the position shown in Fig. 2 until it comes to lie against the wall f^5 of the groove f^4. The other balls, however, are held in their safety position through the medium of the disk F, which is in the transport position, and these balls therefore secure the needle-bolt against moving forwardly.

On firing, the bolt G first moves under the influence of the inertia until reaching the bottom of the bolt a^6, the bolt cutting off the part of the pin H located in the bolt. Directly after this has taken place, the ball K moves—if it has not already done so—in the corresponding groove a^5 and in the groove f^4 under the influence of the centrifugal force until it comes to lie against the wall f^5 of the groove f^4. Henceforth the disk F is turned by the ball K relatively to the fuse-body A in the direction of the arrow X (Fig. 2). This turning movement of the disk F is due to the fact that the ball K under the influence of the centrifugal force tends to move in the groove a^5 beyond the position just-mentioned, thereby exerting pressure on the wall f^5 of the groove f^4, the pressure being similar to that exerted by the water on the buckets of a turbine-wheel. The groove f^4 consequently first reaches the position shown in Fig. 5 relatively to the groove a^5 and subsequently the position shown in Fig. 6. In the latter position, the outer end of the groove f^4 registers with the groove a^5 for the ball K which then leaves the disk F and passes into the part of the groove a^5 located in the flange a^4. In the last-named position of the groove f^4, its inner end has just reached the groove a^5 for the ball K′. The ball K′ can then move in its groove a^5 and along the groove f^4 under the influence of the centrifugal force, the ball K′ turning the disk F further in the direction of the arrow X during such movement. This proceeding is repeated for each of the remaining balls K^2, K^3 . . . K^6 which consequently, in the same manner as the balls K and K′, one after another leave their safety position. When the ball K^6 has passed out of the path of the needle-bolt (Fig. 7) the latter is released, that is to say the fuse is active. However, a comparatively long time elapses before the fuse becomes active as the escape of the balls from their safety position is controlled by the disk F.

In the foregoing explanation no attention has been paid to the fact that the disk F and the balls are subject to the action of the inertia during the movement of the projectile. This action however, has no essential effect on the release of the fuse.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:—

1. An impact fuse having a pair of parts one of which is movable longitudinally towards the other to ignite the fuse, a plurality of centrifugally actuated balls located in the path of movement of said longitudinally movable part and normally securing said part against movement, and a member movable after firing and having a track adapted to successively register with said balls to permit of the balls gradually moving thereon out of the path of said longitudinally movable part.

2. An impact fuse having a pair of parts one of which is movable longitudinally towards the other to ignite the fuse, a plurality of centrifugally actuated balls located in the path of movement of said longitudinally movable part and normally securing said part against movement, and a member movable after firing and having a track adapted to successively register with said balls to permit of the balls gradually moving thereon out of the path of said longitudinally movable part; the movement of said member being effected by said centrifugally actuated balls.

3. An impact fuse having an annular chamber concentric with the longitudinal axis of the fuse, a pair of parts one of which is movable longitudinally towards the other to ignite the fuse, a plurality of centrifugally actuated balls normally located in said chamber in the path of movement of said longitudinally movable part and normally securing said part against movement, and a member adapted to be moved by said balls after firing and having a track adapted to successively register with said balls during the movement of the member to permit of the balls escaping through the track.

4. An impact fuse having an annular chamber concentric with the longitudinal axis of the fuse, a pair of parts one of which is movable longitudinally towards the other to ignite the fuse, a plurality of centrifugally actuated balls normally located in said chamber in the path of movement of said longitudinally movable part and normally securing said part against movement, and a member adapted to be moved by said balls after firing and having a track extending tangential to said annular chamber and adapted to successively register with said balls to permit of the balls gradually moving thereon out of the path of said longitudinally movable part.

5. A safety device for impact fuses comprising a plurality of balls normally arranged to prevent ignition of the fuse, and

a member movable after firing and having a track adapted to successively register with the balls during the movement of the member to permit of the balls gradually moving on the track from their safety position.

6. A safety device for impact fuses comprising a plurality of centrifugally actuated balls normally arranged to prevent ignition of the fuse, and a member adapted to be moved by said balls after firing and having a track on which the balls are adapted to successively move from their safety position during the movement of the member.

7. An impact fuse having a part movable on impact to cause ignition of the fuse, a plurality of balls arranged in a circle in the path of movement of said part to normally prevent movement of the part, and a member adapted to rotate after firing and provided with a track successively registering with said balls during the rotation of the member to permit of the balls moving by the centrifugal force out of the path of movement of said part.

8. An impact fuse having a part movable on impact to cause ignition of the fuse, a plurality of centrifugally actuated balls arranged in a circle concentric with the axis of the fuse and in the path of movement of said part to normally prevent movement of the part, and a member adapted to be rotated by said balls after firing and having a track extending tangential to the ball-circle and adapted to successively register with the balls during the rotation of the member to permit of the balls moving thereon by the centrifugal force out of the path of movement of said part.

9. An impact fuse having a part movable on impact to cause ignition of the fuse, a plurality of centrifugally actuated balls arranged in a circle concentric with the axis of the fuse and in the path of movement of said part to normally prevent movement of the part, a disk concentric with the axis of the fuse, adapted to be rotated by said balls after firing and having a track extending tangential to the ball-circle and adapted to successively register with the balls during the rotation of the disk to permit of the balls moving thereon by the centrifugal force out of the path of movement of said part, and a relatively fixed member having a track for each ball extending radial to the axis of the fuse for guiding the balls during their movement.

The foregoing specification signed at Dusseldorf, Germany, this 23rd day of December, 1907.

ALFRED WRATZKE.

In presence of—
WILHELM FLASCHE,
CLEMENT HECKMANN.