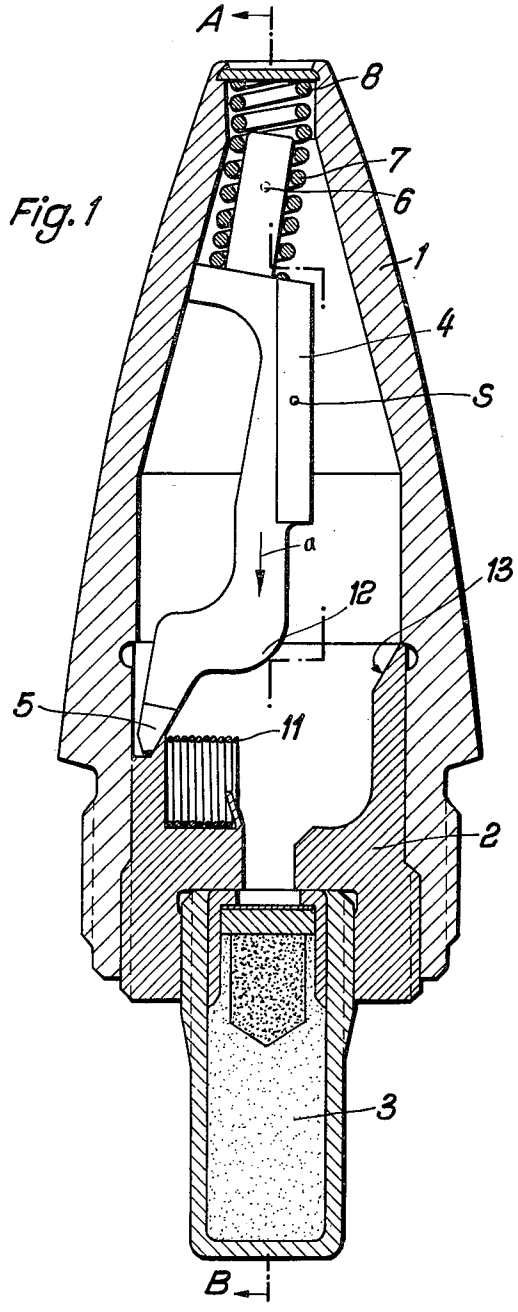
May 21, 1963 F. BERGER 3,090,311

MECHANICAL FUZE FOR PROJECTILES

Filed Sept. 26, 1960 4 Sheets-Sheet 1

Fig. 1



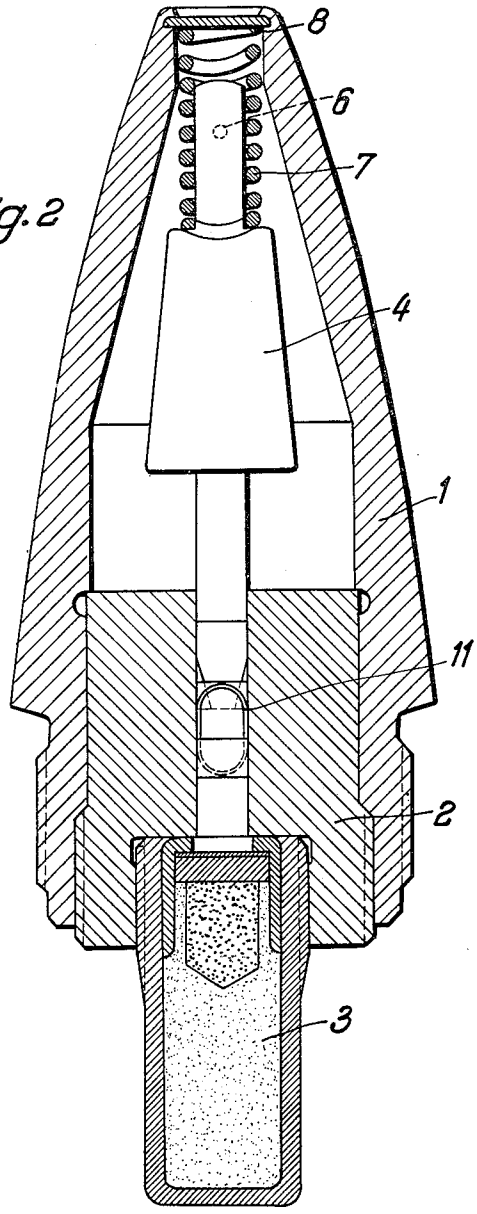
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MECHANICAL FUZE FOR PROJECTILES

Filed Sept. 26, 1960 4 Sheets-Sheet 2

Fig. 2



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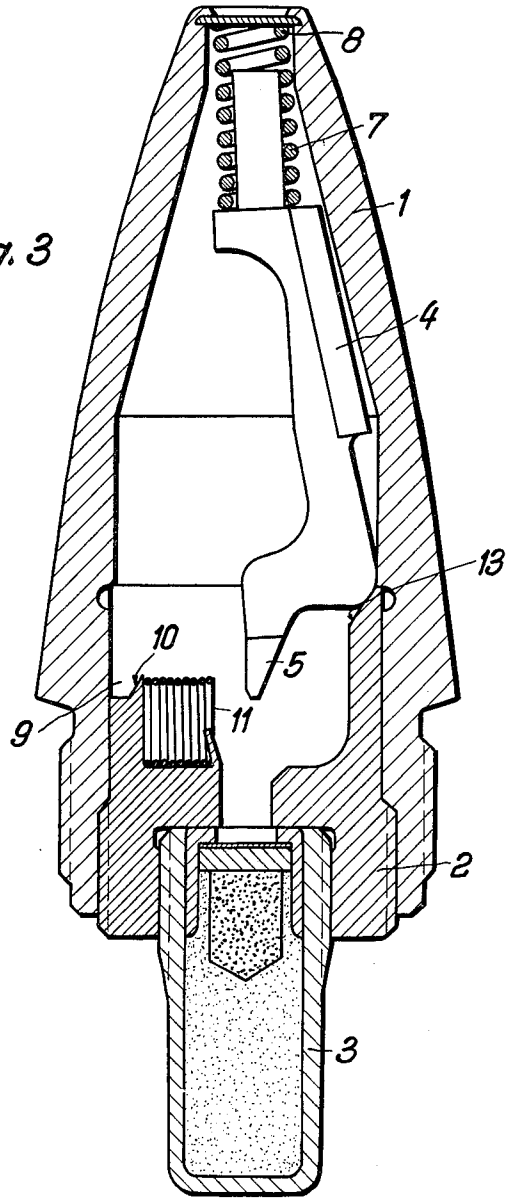
By
Watson, Cole, Grindle & Watson
Attys.

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MECHANICAL FUZE FOR PROJECTILES

Filed Sept. 26, 1960 4 Sheets-Sheet 3

Fig. 3



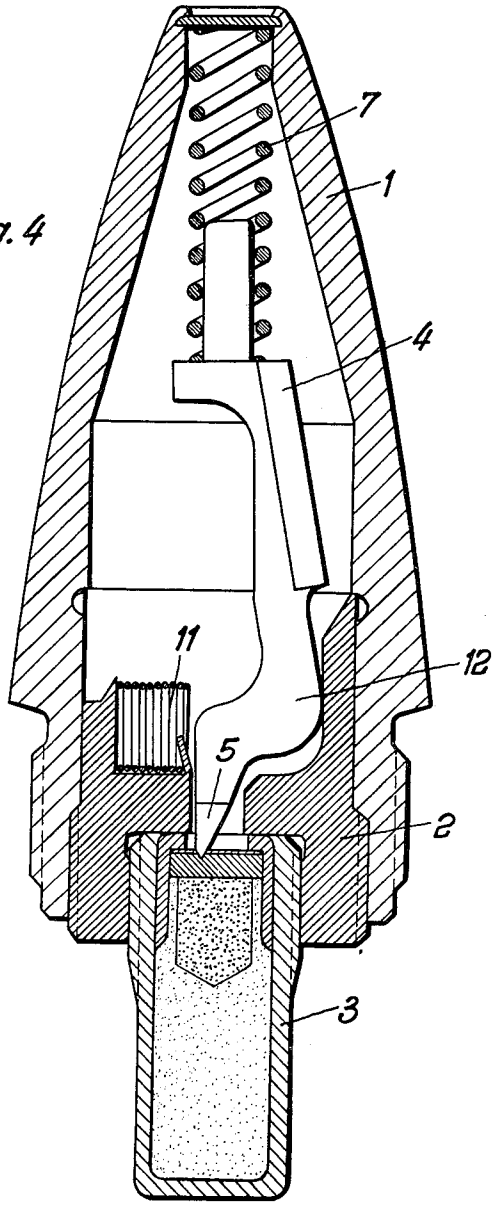
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MECHANICAL FUZE FOR PROJECTILES

Filed Sept. 26, 1960 4 Sheets-Sheet 4

Fig. 4



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3,090,311

MECHANICAL FUZE FOR PROJECTILES

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4 Claims. (Cl. 102—71)

The present invention relates to a mechanical fuze with automatic destruction for spinning projectiles, incorporating a striker pin.

Known mechanical fuzes with automatic destruction for spinning projectiles are actuated by centrifugal controllers. Such known types employ for example movable inertia masses such as balls, cylindrical weights etc. capable of radial displacement and having the purpose of maintaining the striker pin, which is located in the direction of the longitudinal centre line of the projectile, and which acts directly upon the detonator, in position until, as the spin of the projectile reaches a certain magnitude, centrifugal force urges them to move in a radial direction, releasing the striker pin.

Fuzes with automatic destruction of this type suffer from the disadvantage that they are made up of a large number of different components, so that their assembly is complicated and lengthy. It is an object of the invention to overcome these and other drawbacks, not specified here in detail, which occur in practice, and it differs from known types of fuzes with automatic destruction mainly by the provision of a firing pin located in the fuze which is capable of lateral movement and whose point, when in the secured or inoperative position, is located eccentrically with respect to the longitudinal axis of the fuze, in which position it is secured by a locking device which is released by the centrifugal force due to the spin of the projectile thus allowing the firing pin to assume the detonating position.

In a preferred embodiment of the invention the locking device consists of a groove or recess located in the bottom of the fuze or in an insert, eccentrically with respect to the longitudinal axis of the fuze, and a spring, more particularly a compression spring, maintaining the point of the striker pin in the said groove. This spring cooperates with the firing pin striker spring which encloses the end of the firing pin remote from the point of the latter and which is supported, for at least that portion of its length which encloses the said end, by the fuze body in such a manner as to be capable of being bent over sideways.

Further according to the invention, the mass of the firing pin is arranged asymmetrically with respect to its longitudinal axis, its centre of mass being located outside the longitudinal axis of the fuze.

In further development of the invention, a delay device to delay the movement of the firing pin into the firing position is provided between the groove or recess and the longitudinal axis of the fuze. This delay device consists of a helical spring, located at a right or other angle to the longitudinal axis of the fuze, which may be of cylindrical or of conical shape and which is preferably tightly coiled.

It is an essential advantage of the invention that it is of very simple design and that few individual components are required. Furthermore, it provides a high degree of safety in handling during transport and loading, combined with high sensitivity of impact upon the target. In addition there is no need for additional inertia masses; instead, the firing pin, being the main actuator during ignition, fulfils practically all the functions required, namely control of the impact and built-up fuze as well as safety device during transport and loading. The locating of the point of the firing pin of the secured fuze in the space above the detonator, by the side of the latter, ensures a high degree of safety against accidental setting off of the charge. An embodiment of the invention is shown, by way of example, on the drawing in which:

FIG. 1 is a longitudinal section through the fuze, the firing pin being shown in the locking position;

FIG. 2 is a longitudinal section on the line A–B of FIG. 1 in the direction of the arrows; and

FIGS. 3 and 4 are each a longitudinal section through the fuze similar to FIG. 1 and showing different positions of the firing pin, the firing pin being live.

The fuze consists in the known manner of the fuze body **1** and the fuze bottom **2**. The fuze bottom **2** accommodates the detonator **3**. The fuze body **1** contains the firing pin **4** whose mass is arranged asymmetrically with respect to the longitudinal axis of the fuze or to its own longitudinal axis respectively. The end **6** of the firing pin, which is remote from the point **5** of the latter, projects into the striker spring **7**. It will be seen from the drawing, FIG. 1, that that portion of the striker spring **7** which encloses the end **6** of the firing pin can be bent over sideways. The remaining part **8** is inserted into the point of the fuze body **1** and cannot bend over sideways.

The fuze bottom **2** is provided with a groove or recess **9**; one of its sides **10**, located nearest to the longitudinal axis of the fuze, is chamfered as shown on the drawing. Between this groove or recess **9** and the longitudinal axis of the fuze the fuze bottom **2** is provided with a particularly tightly wound helical spring **11** which acts as a delay device.

In the neutral or locking position, the point **5** of the firing pin is located in the groove **9**; hence the firing pin **4** assumes the position as shown in FIG. 1. Its centre of mass S is positioned outside the longitudinal axis of the fuze, for example in the right hand half of the fuze body **1**.

The point of the firing pin **4** is maintained in position in the groove **9** by the pressure due to the striker spring **7**.

When a projectile provided with this type of fuze is fired from a gun, inertia forces acting in the direction of arrow *a* will at first supervene, maintaining the firing pin **4** in the locking position corresponding to FIG. 1. After acceleration has ceased to act upon the projectile, centrifugal forces due to the spin of the projectile will act increasingly upon the centre of mass S of the firing pin **4**, urging the latter in the direction towards the point of the fuze body **1**, against the force of the striker spring **7**. This causes the point **5** of the firing pin to slide forward along the oblique side **10** of the groove **9**, until it leaves the groove. At this instant the bent portion of the spring **7** takes up the straight position; this causes the firing pin to assume the position as shown in FIG. 3. This movement is delayed by the helical spring **11** since the point of the firing pin **5** slides across the turns of this spring which slows down the movement. This provides adequate safety. The projection **12** of the firing pin is securely guided onto the oblique surface **13** at the end of the bottom **2** of the fuze by the last turn of the helical spring **11** which yields to the pressure of the point **5** of the firing pin in the direction in which it acts. When the firing pin is raised up on the oblique surface **13**, the last turn of the helical spring **11** is released again. Now the pin is in the position according to FIG. 3; the fuze is now alive, so that when the tip of the projectile hits the target, the striker spring **7** moves the firing pin **4** from this position into the position as shown in FIG. 4 and pushes it into the detonator without difficulty. Thus the fuze is very sensitive to impact.

If the projectile fails to find the target, the automatic destruction of the projectile will follow soon after; the oblique surface **13**, the striker spring **7** and the projection **12** of the pin are so arranged that when the spin of the projectile slows down, the striker spring **7** overcomes the centrifugal and friction forces, driving the pin **4** into the detonator **3**.

The invention is not restricted to the embodiment here-

in illustrated and described. For example, the firing pin may also be of a different design. Furthermore, the locking device and the delay device may comprise means other than those consisting of the groove 9 and the helical spring 11. Also, the helical spring 11 need not be of cylindrical shape but may also be conical.

What I claim is:

1. A mechanical fuze for spinning projectiles comprising a fuze body having a fuze bottom member in the bottom end of the body, said fuze bottom having an oblique surface therein on one side thereof, a compression spring in the top end of the fuze body, a firing pin mounted in the fuze body with one end in and in contact with the spring and being unsymmetrical relative to its longitudinal axis and also having a contact point at the other end, said fuze bottom having a groove therein on the other side thereof to receive the contact point of the firing pin in the safety position of the projectile fuze, a retarding element on the fuze bottom adjacent the groove and adapted to be contacted by the contact point on the firing pin, said pin having a projection thereon approximately intermediate the ends thereof to slide and be guided by the oblique surface on the fuze bottom, and means on the firing pin operative by centrifugal force to urge the firing pin point out of the groove and over the retarding element, movement of said firing pin being arrested by contact of said projection with the oblique surface on the bottom member during the flight of the projectile and after centrifugal force has forced said projection against said oblique surface the spring force overcomes a diminishing centrifugal force causing the projection to slide on the oblique surface to permit the pin to assume a detonating position due to the force of the compression spring.

2. A mechanical fuze according to claim 1, in which the retarding element is in the form of a helical spring with the turns thereof in helical wound contact over which the point of the pin slides.

3. A mechanical fuze according to claim 1, in which the firing pin has an extension on the end opposite the point and which extends into the spring with a portion of the latter surrounding the extension and capable of being bent when the firing pin is in its initial position.

4. A mechanical fuze according to claim 1, in which the force of the compression spring is such that during the flight of the projectile it is tensioned with the force thereof being sufficient to force the pin into a detonator after the centrifugal force is substantially reduced.

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