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L. E. REMONDY

1,781,556

PERCUSSION FUSE FOR ARTILLERY AND AIRCRAFT PROJECTILES

Filed Feb. 13. 1930

Fig. 1.

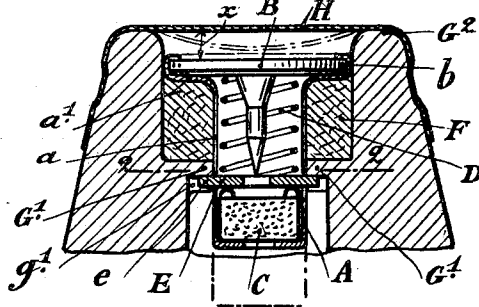


Fig. 2.

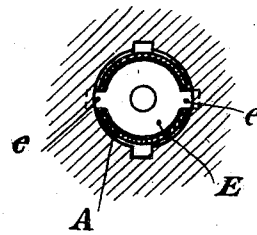


Fig. 3.

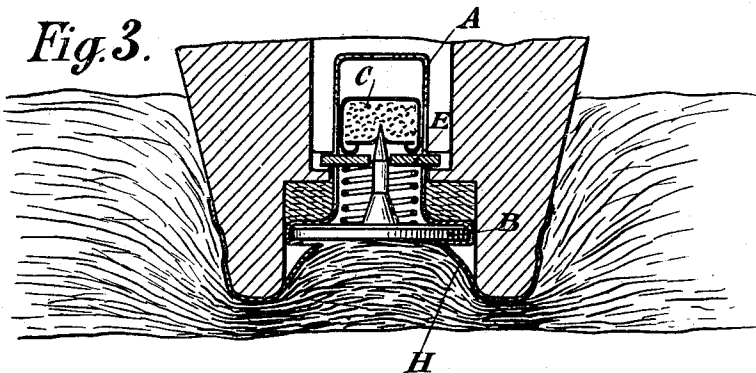


Fig. 4.

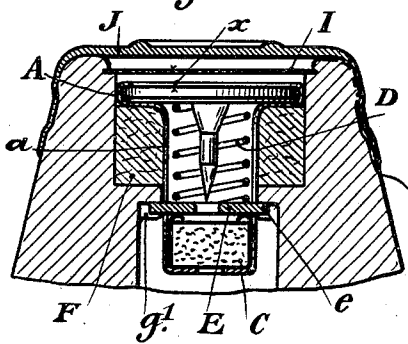


Fig. 5.

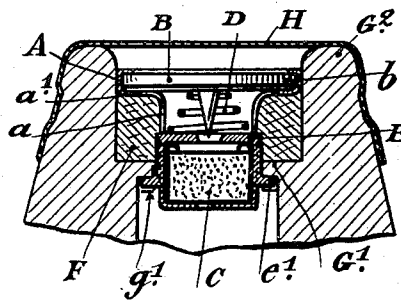
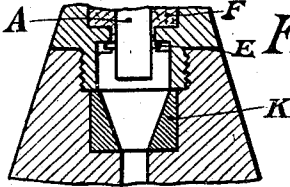


Fig. 6.



Fig. 7.



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UNITED STATES PATENT OFFICE

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PERCUSSION FUSE FOR ARTILLERY AND AIRCRAFT PROJECTILES

Application filed February 13, 1930, Serial No. 423,189, and in France April 29, 1929.

In previous specifications, and in particular in U. S. Letters Patent Nos. 1,459,075 and 1,562,054, the applicant has described and illustrated numerous forms of construction of a sensitive percussion fuse comprising a movable carriage in which the elements of the firing mechanism are contained (striker and percussion cap) one of these elements, the front element, being most frequently rigid with the casing of the carriage and the carriage being retained if desired on the fuse body by a member such as a pin adapted to be broken easily under the effect of an impact with an obstacle.

In specification No. 1,562,054, the applicant has described forms of construction of a supersensitive fuse in which the height of the carriage and of its contents are reduced considerably on account of a particular mode of construction of the carriage casing and of the fixed member of the firing mechanism. The striker (fixed member) is engaged in a stamping on which the other stamping forming the body of the carriage is effected.

The fuse forming the subject of this invention presents features of great similarity with that forming the subject of that specification No. 1,562,054, but it permits the various disadvantages of the latter to be overcome, which disadvantages may in a good number of cases become very serious. In the fuse forming the subject of specification No. 1,562,054, the striker which is the front member formed by a stamping, receives the direct action of the air during the flight of the projectile, thus permitting a compression of the compressible sleeve on which the carriage presses and placing the members of the firing mechanism in a relatively defective position with the risk of producing misfires when an obstacle is struck. Moreover the formation of the striker by a stamping from a light metal such as aluminium or an aluminium alloy does not permit this member to be given the desired rigidity. In order to remove the two above mentioned disadvantages it has been sought to increase somewhat the strength of the compressible material forming a support for the carriage, but this result is then obtained to the detriment of the

sensitiveness of the fuse. It will be understood in fact that the rigidity of the compressible bearing sleeve has the effect of facilitating a deformation of the striker before it operates, which striker is itself easily deformable.

Here the two main disadvantages which have been recalled are entirely removed in the new form of construction of the percussion fuse operating by driving in and inertia, constructed according to the general principles of my prior specification No. 1,459,075, and forming the subject of the present invention.

According to the invention a rigid striker having a wide or large diameter head forming the front element of the mechanism, bears by means of this head on a corresponding flange on the carriage casing, which is crimped, hooked or fixed on the said striker head. Moreover, the carriage is set back with respect to the mouth of the fuse body in order to form a space between this mouth and the outer face of the flange on the firing system, the mouth being closed by a cap or a diaphragm preventing the direct action of the air on the striker system, while being sufficiently weak to be able to break as the result of an impact with an obstacle even with one offering little resistance. The said cap also permits a preliminary settling of soft or loose materials such as grass, leaves, moss, etc. to be caused which settling causes the carriage to be driven in more strongly for operating the fuse.

The invention finally provides in one of its forms of construction, a particular shape for the washer which is provided with tenons and is placed on the percussion cap, the new washer permitting the length and the weight of the striker system to be reduced.

Various practical embodiments of the invention are illustrated in the accompanying drawing.

Figure 1 shows a first form in longitudinal sectional elevation.

Figure 2 is a plan section taken along the line 2—2 in Figure 1.

Figure 3 shows the position of the members when the fuse operates, the projectile

being assumed to strike an obstacle formed by a material of low density such as dry grass.

Figures 4 and 5 show other forms of construction of the invention in longitudinal sectional elevation.

Figure 6 is a perspective view of the washer provided with tenons or lugs employed in the arrangement shown in Figure 5.

Figure 7 shows a form of construction of a damping member for the percussion cap in combination with the fuse.

In all these examples the striking system of the fuse is formed in accordance with the principle which the applicant has made known, by a movable carriage comprising a casing A carrying a striker B fixed in the latter, the percussion cap C movable in the casing body, a spacing ring D between the two elements of the firing mechanism and bearing at one end on the head of the striker and at the other end on a washer E provided with lugs *e* guided on the casing body A by slots *a*. By means of these lugs *e* the carriage body bears when at rest on a shoulder *G*¹ on the fuse body. The fuse comprises also in accordance with the principle which the applicant has made known in specification No. 1,562,054, which is a patent of addition to specification No. 1,459,075, a sleeve F of a suitable compressible and elastic material such as cork, felt, etc.

According to the present invention the wide headed striker B is made rigid by construction, and bears by the shoulder *b* of this head upon a corresponding flange *a*¹ on the carriage casing. The head of the striker and the flange on the carriage upon which it bears may be made rigid with each other by crimping, as shown in the drawing, by hooking or by any other suitable method of attachment.

The rigid flange of the head of the striker lined with its support *a*¹ formed by the carriage body, bears upon the front face of the compressible sleeve F.

According to the present invention a space *x* is provided between the front face of the carriage and the mouth *G*² of the fuse body *G*, and this mouth is closed by a cap or a diaphragm. In the example shown in Figures 1 and 3, the mouth is closed by a cap H which prevents the direct action of the air on the striking system while being weak enough to fracture upon impact against an obstacle even one offering little resistance.

As shown in Figure 3, in the case when the projectile falls on an obstacle of low density, formed for example by grass, leaves, moss, etc., the closing cap in breaking causes this material to be rammed in, which ramming action causes the carriage to be driven in more strongly for operating the fuse. It will be understood that with low residual speeds, at the moment of impact, it is neces-

sary to ensure a suitable operation of the fuse even when the obstacle encountered does not act strongly on the mechanism on account of its low density and its great compressibility. The cap H then permits a ramming action to be obtained which increases the density of the obstacle, and fracture of the cap under the effect of this crushing causes the carriage to be driven violently inward. During the flight of the projectile the cap prevents the movable carriage from being driven in under the action of the air. The said carriage may therefore be placed on an elastic sleeve F of very small initial tension, with a view to making the fuse extremely sensitive in operation without there being any fear of the fuse becoming partly or totally uncocked by the carriage being driven in under the action of the air.

Naturally the space *x* must be sufficiently large for the cap to be able, even at very high speeds, to yield without breaking and without driving the carriage in, as shown in dotted lines in Figure 1.

In the example shown in Figure 4, the function of the cap H is performed by a diaphragm I mounted at a suitable distance *x* from the front face or edge of the carriage A. This diaphragm may be employed alone or in combination with a removable cap J. The cap J may as desired be removed at the moment of firing, or left on the projectile according to the uses envisaged. Thus the cap may if desired be preserved in normal field artillery firing. It will be removed for firing upon aircraft and for firing with very low residual speeds.

The form of construction shown in Figures 5 and 6 is characterized by the feature that the lug washer E—*e* is formed in a particular manner. The lugs *e*, provided with a foot *e*¹ are bent over parallel to the axis of the carriage and the body of the lug is thus engaged in the apertures *a*.

The lugs press upon the shoulder *G*¹ provided on the fuse body by means of feet *e*¹. The lugs thus take support at a distance from the body of the ring *e* corresponding to the whole height of the body of the lugs *e*. This permits the whole height of the carriage casing A to be shortened by the whole height of the lug *e*. Consequently the weight and space occupied by the whole of the mechanism are reduced.

The feet *e*¹, instead of taking support at any point on the shoulder *G*¹ may be engaged in notches *g*¹ in this shoulder, the engagement of the feet *g*¹ being obtained by a bayonet joint provided in the shoulder *G*.

The fuse described, mounted at a suitable distance *x* from a cap H or a diaphragm I, may naturally be combined with a varying number of caps or diaphragms arranged in stages or suitably superposed at a distance from each other and in this way, according

to the nature of the application, the resistance offered by the spacing cap or diaphragm may be varied by dispensing with one or more of these elements, and thus forming safety devices the resistance of which can be varied at will.

In practice the different superposed caps may be given different colours or marked with figures or letters, or they may be provided with any other marks in relief, permitting them to be distinguished in darkness by touch.

The caps or diaphragms may be employed at the same time if desired, to make the device fluid tight, but they must be designed in such a way as to provide in addition the three new functions set forth above, which consist in providing an additional safety element, a screen against the action of the air, and a member for obtaining a preliminary compression of the obstacle.

The caps or covers should preferably be constructed of a material of low density.

As this general purpose fuse is capable of being fired from cannon or machines giving rise to very high accelerations, the applicant foresees the case when the considerable reactions at departure would cause the carriage body A to be fractured if the latter were constructed by mistake of a material of poor quality. This fracture would have the consequence of causing the percussion cap to be thrown back and strike violently against the end of its lodgement. In order to absorb the shock and avoid the accidental explosion of the percussion cap, a special safety member is provided at the back of the mechanism. This member may be formed by a conical, cylindrical or other shaped element secured in the fuse body, made of a deformable plastic or elastic material such as a soft metal (aluminium, lead, copper not cold hardened, etc.) or of any other material (fibre, cork, felt, etc.).

Figure 7 shows by way of example a member K for resiliently supporting the percussion cap, this member being made of a soft material and fitted in the fuse body in combination with the fuse.

Claims.

1. A supersensitive percussion fuse comprising a movable carriage (A) containing the elements of the firing mechanism (striker B and percussion cap C) with a spacing member (spring D) interposed between these members one of which, the front element (B) is virtually integral with the casing (A) of the carriage, which casing is pierced with apertures (a) through which the latter is guided on the lugs of a washer (E) bearing under the action of the spacing spring (D) on a shoulder (G¹) on the fuse body (G), the fuse being characterized by the feature that the rigid striker forming the front element of the mechanism comprises a wide head

(b) bearing on a corresponding flange (a¹) on the casing of the carriage, which flange is crimped, hooked or secured on the said head, the carriage bearing by means of the head of the striker covered or lined by the flange on the carriage on a sleeve F made of a compressible material (cork, felt or other suitable material having a very small initial compression) and the carriage thus constructed and supported being set back with respect to the mouth of the fuse body in order to form between this mouth and the outer face of the head on the percussion system of a space (x), the mouth being however closed by a cap (H) or a diaphragm (I) of small mass preventing the direct action of the air upon the said percussion system, while being sufficiently weak to be capable of breaking upon impact against an obstacle even against one offering little resistance, the said cap also permitting a preliminary settling of loose materials such as grass, leaves or humus, to be obtained upon impact with a view to driving the carriage in more strongly in order to operate the fuse.

2. A fuse according to claim 1, in which the mouth of the fuse body is closed by a diaphragm (I), characterized by the feature that the latter is covered by one or more removable caps forming additional safety devices particularly during handling and transport.

3. Fuse as claimed in claim 1, comprising a shock absorber for the percussion cap formed by a separate element made of a plastic or elastic material.

In testimony whereof I have signed this specification.

LÉON EMILE RÉMONDY.