

Jan. 21, 1969

P. KAISER

3,422,764

RIFLED PROJECTILE FUZE FOR PRACTICE PROJECTILES

Filed April 26, 1965

Sheet 1 of 5

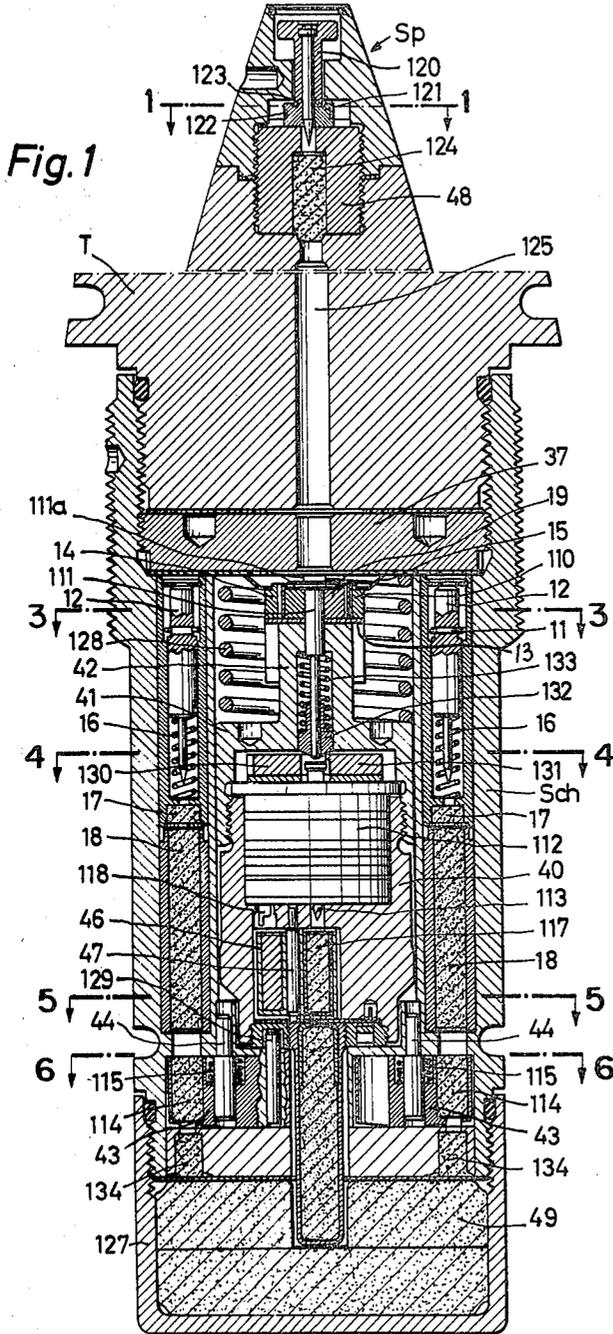


Fig. 1

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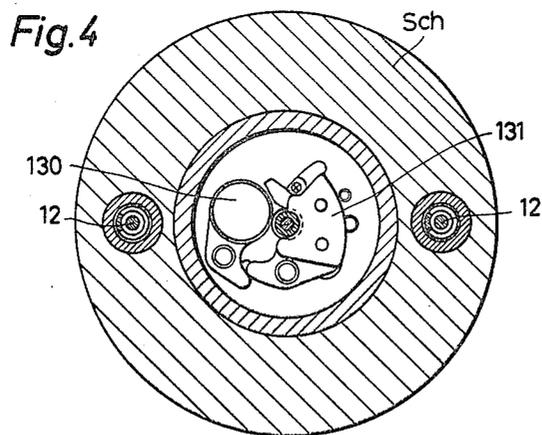
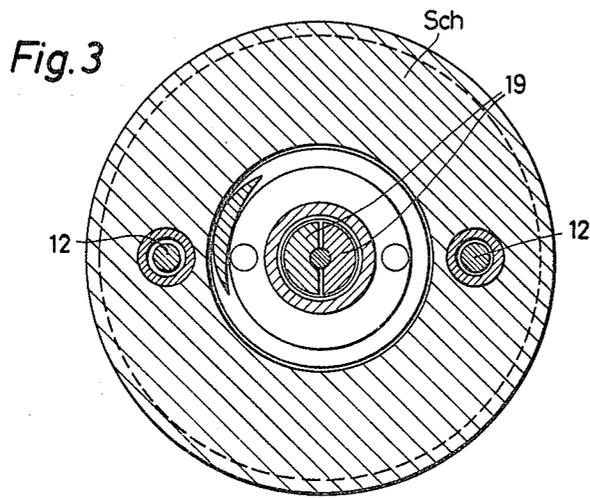
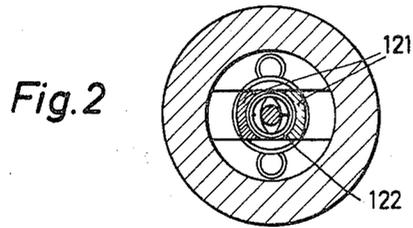
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Sheet 3 of 5



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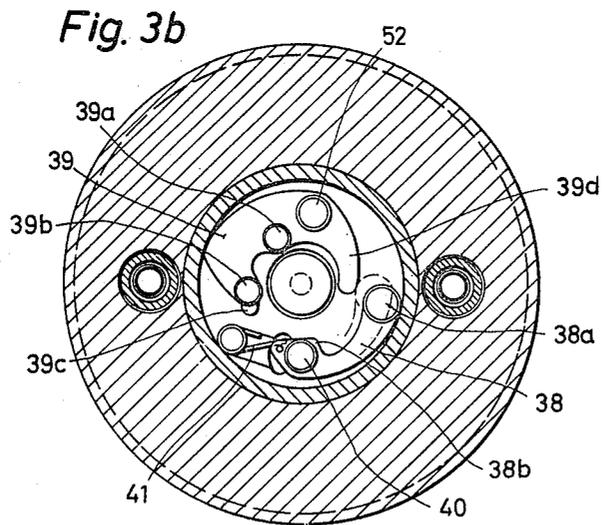
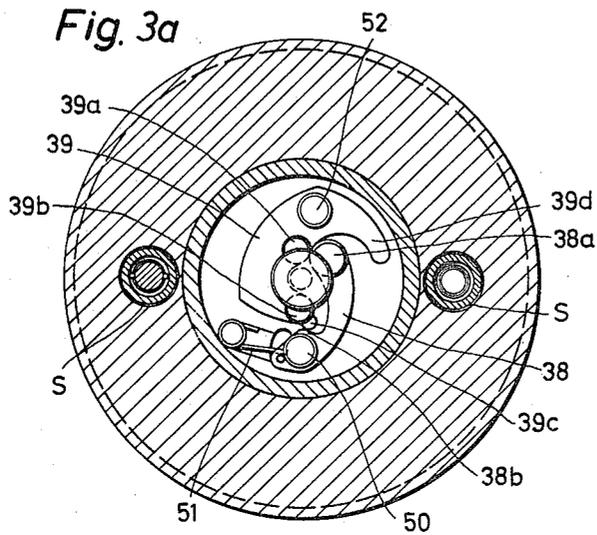
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Sheet 5 of 5

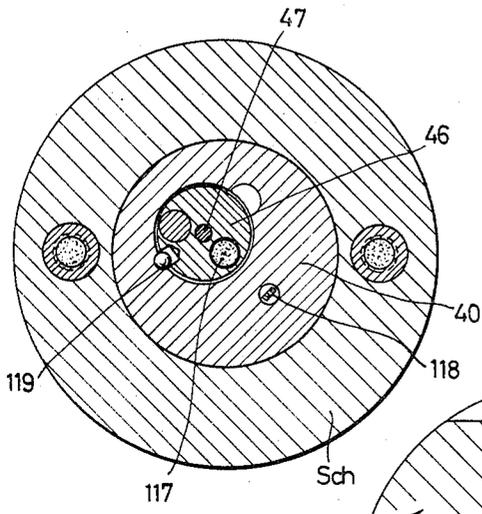


Fig. 5

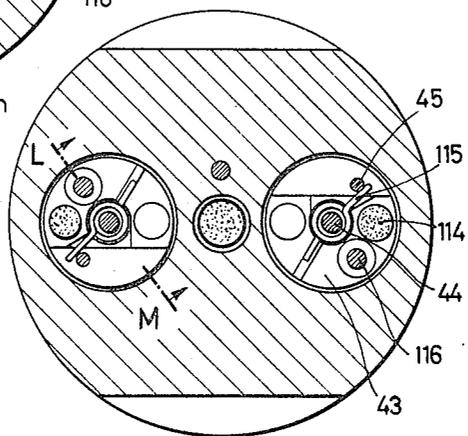


Fig. 6

Fig. 6a

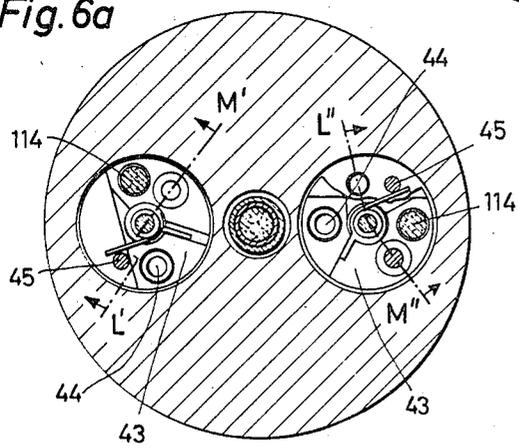
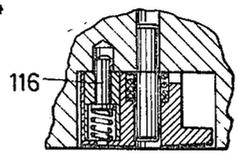


Fig. 7



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RIFLED PROJECTILE FUZE FOR PRACTICE PROJECTILES

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1 Claim

Int. Cl. F42c 9/00

The invention relates to a rifled projectile fuze for practice projectiles. This must ensure maximum safety, that is, enable the practice projectile to be fired also on shooting ranges of very restricted area. For this purpose it is not sufficient to fit as many as possible safety devices independent of each other for superquick and slowaction impact detonation. A deciding factor is also where these devices are arranged in the fuze. In solving this problem it has been obvious to keep as near as possible to known examples of fuze constructions intended for war purpose, if only to take advantage of the experiences gained therewith and to be able to use as far as possible also structural elements which have been tried out in practice. Nevertheless the invention has not followed this obvious course but, on the contrary, has produced an arrangement which at first appears exceptional but has proved satisfactory in practice.

According to the invention the fuze is so constructed that, as is known per se, a superquick or sensitive impact fuze is arranged in the fuze point of the fuze head which is otherwise solid and through which a pressure transmission channel leads to the main detonation mechanism, which in turn is accommodated together with all safety devices in a fuze shaft casing located in the interior of the projectile casing and mounted on the fuze head.

Thus all elements which ensure the safety of the double fuze and which in the case of a fuze intended for war purposes are normally accommodated in the fuze head, are displaced to a place where they are reliably protected against external violent action, especially in the case of rebound impact.

As by such construction the space for the safety elements normally accommodated in the fuze head, is no longer present, the elements necessary for obtaining the desired maximum safety had to be accommodated in the fuze shaft, the volume of which must be restricted in the interests of a slim projectile construction. The space conditions here are, however, considerably more restricted than in the case of a fuze for the same caliber projectile intended for war purposes. When using an inertia constructional group, known per se, which consists of a core housing slidable in the fuze shaft casing and containing a time control clockwork mechanism with a centrifugal self-destroying device in front and a pellet holder centrifugal swing slide behind the clockwork mechanism as well as a transmission pellet, a transmission bolt is therefore provided in front of the mouth of the pressure transmission channel and has several functions. Its widened piston-like head, which is locked by known centrifugal segments, is, according to the invention, located in front of the mouth of the pressure transmission channel, whereas the transmission bolt stands with its rear end on the axial pin bolt of a time control clockwork mechanism in such a manner that, in the case of sensitive impact detonation, the transmission bolt cooperates as a pneumatic piston with the transmission channel and drives the pin bolt of the time control clockwork mechanism into the primer or ignition pellet, whereas, when the inertia constructional group shoots forward, it strikes against the bottom in the fuze shaft casing and then acts as abutment for the time control clockwork mechanism pin bolt, which also shoots forward, and drives this into its coordinated primer pellet.

In this manner the functions of the sensitive impact detonation and those of the slow-action or inertia impact detonation lead to a common part at the place where this is admissible for the desired maximum safety and most favorable for the utilization of the restricted constructional space.

In the main detonation mechanism it is attempted to attain a maximum degree of safety in its operation by double arrangement of fuze elements, a measure which is known per se. In particular a double arrangement of the self-destroying detonation charges is employed. At the same time uniform combustion of the two sets of charges must be attempted in order to avoid as far as possible disturbances in the equilibrium of the fuze and consequently of its trajectory. In addition, therefore, the invention also shows a way of producing uniform combustion of these sets of charges by a compensation of pressure between the two.

An example of the new fuze is illustrated in the drawings, in which:

FIG. 1 is a central longitudinal section of the fuze in inoperative or rest position, and

FIG. 1a is a similar view through the fuze shaft casing, with the left half in inoperative and the right half in operative or live position, while

FIGS. 1b and 1c are side and sectional views respectively showing details,

FIG. 2 is a cross-section through the fuze point taken on line 1—1 of FIG. 1, in the direction of the arrows,

FIG. 3 is a cross-section on line 3—3 of FIG. 1 in the direction of the arrows,

FIGS. 3a and 3b are cross-sections through the fuze shaft casing taken on the plane 3a—3b, the fuze being in locked or safety position in FIG. 3a, while in FIG. 3b it is in unlocked or live state,

FIG. 4 is a cross-section taken on line 4—4 of FIG. 1 in the direction of the arrows,

FIG. 5 is a cross-section on line 5—5 of FIG. 1 in the direction of the arrows,

FIG. 6 is a cross-section on line 6—6 of FIG. 1 in the direction of the arrows,

FIG. 6a is a cross-section on plane 6a—6a of FIG. 1a, and

FIG. 7 is a part cross-section.

The fuze consists of a fuze shaft casing *Sch* in which the fuze head *T* is screwed from the front. The shaft casing *Sch* is of such thickness that diametrically opposite axially parallel bores can be arranged therein in each of which a detonation charge **18** is accommodated. A primer or ignition pellet **17** is located in front of each detonation charge set. In front of each primer pellet **17** there is a steadying pin bolt **12** mounted on a known blocking spring **16** and held by a transverse shear pin **11**.

The fuze shaft casing *Sch* is closed at the front by a screw cover **37**. In the casing *Sch* a corepiece **40** is slidable, on the front end of which a cover **41** carrying an axial socket **42** is screwed. In this axial socket **42** an axial transmission bolt **111** is located which is surrounded by a striker spring **133** which bears at its front end against a shoulder of its guide bore and at the rear end against a hammer casing **132** on the transmission bolt **111**. The hammer casing **132** is engaged from behind by centrifugal weights **130** and **131** which maintain the striker spring under tension and are slidably mounted at the front on the housing of a time control mechanism **112**. The time control mechanism **112** is held in the corepiece **40** by the cover **41**.

Two half-ring-shaped centrifugal segments **19** bear against the front end face of the socket **42** and engage behind a disc head **111a** on the front end of the transmission bolt **111**, thereby securing it against movement towards the rear. Both rear surfaces of the centrifugal

segments 19 rest on a shear plate 13 which in turn rests on the front face of the axial socket 42.

The centrifugal segments 19 are held together by a centrifugal coil spring 110 and this is secured from the front on the shear plate 13 by a steadying casing 14 which stands on the edge of the shear plate 13 and by a cup spring 15 which is firmly clamped by the screw cap 37.

According to FIG. 3a this centrifugal safety device can also be differently constructed in that centrifugal levers can be substituted for the centrifugal cheeks or jaws. On the front face of the socket 42 two axle pins 59 and 52 are arranged on each of which a centrifugal lever 38, 39 is freely rotatable. The centrifugal lever 39 has two noses 39a and 39b and the centrifugal lever 38 one nose 38a. The lever 38 is loaded by a spiral spring in swung-in safety position, whereas the centrifugal lever 39 is freely rotatable about its axle 52. In safety position both centrifugal levers 38 and 39 assume the position shown in FIG. 3a in which their noses 38a and 39a engage under the disc head 111a of the transmission bolt 111.

On one end the centrifugal lever 39 has a nose 39c which, in swung-in or safety position of the two levers, hooks in a curved recess 38b in the other centrifugal lever 38.

Through the centrifugal force produced during the rotation of the projectile the centrifugal lever 38 swings out against the action of its spiral spring 51. As a result it unhooks the nose 39c on the lever 39 out of its curved recess 38b so that the centrifugal lever 39 can also swing outwards and entirely frees the transmission bolt 111.

If the rotation and consequently the centrifugal force decrease as the projectile continues its flight, the spiral spring 41 causes the centrifugal lever 38 to again swing inwards. As a result the end of this lever strikes against the nose 39b of the other centrifugal lever 39 and thus blocks it in its swung-out disengaged or unlocked position.

This centrifugal safety device is less sensitive to jolts than a shear plate safety device.

Behind the transmission bolt 111 there is a primer pin 113 which passes through the time control clockwork mechanism in known manner and releases this after a certain time has elapsed. The rundown time of this clockwork mechanism 112 effects a field safety of 50 to 150 metres.

Behind each B or detonation set 18 there is a pellet holder swivel slide 43 (FIG. 6) which turns about an axle 44 mounted in the fuse shaft casing Sch and carries a detonator 114 so that in locked or safety position it is eccentrically displaced in front of a coordinated transmission pellet 134. Wound around the axle 44 is a spiral spring 115 one end arm of which bears against the swivel slide 43 and the other end against a stationary pin 45. These springs tend to hold the slide 43 in safety position, that is with their detonators 114 outside the firing channel coming from the B sets 18. They with their detonators 114 are turned behind the B sets 18 and held in their live position by spring bolts 116 (FIG. 7).

In order to retard the turning of the pellet holder swivel slides 43 into their live position, retarding bolts 44 are loosely inserted in the slides, which, on firing, enter blind holes 45a in the closing bottom and only allow the turning movement 43 to commence under the influence of the centrifugal force after the acceleration of the projectile has terminated (FIGS. 1a and 6a).

In the bottom of the corepiece 40, behind the time control clockwork mechanism 112 there is another centrifugal swivel slide 46 which is rotatable about an axle 47 and carries eccentrically a detonator 117. In locked or safety position, in which the detonator 117 is displaced behind the primer or firing pin 113, this centrifugal swivel slide 46 is held by a control shaft 118 which projects at the rear from the housing of the time control clockwork mechanism 112 and rotatable by the clockwork mechanism. A blocking centrifugal ball 119 in a cell in the outer

wall of the slide 46 is provided for fixing same in the live position.

In the fuze point Sp there is a set pin bolt 120 which engages with its beveled rear edge 123 in two centrifugal jaws or cheeks 121 in known manner which are held together in safety position by a coil spring 122. The centrifugal jaws or cheeks 121 bear against the front face of a screw plug 48 in which a primer pellet 124 is located behind the set pin bolt 120. From the primer pellet an axial fire channel 125 leads to the disc head 11a on the transmission bolt 111. Otherwise the fuze head T is solid.

Screwed in the corepiece 40 behind the detonator 117 in the centrifugal swivel slide 46 is a transmission charge 126 for the impact charge 49 which is located in an impact charge capsule 127 screwed onto the end of the fuze shaft casing Sch.

The corepiece 40 together with the time control clockwork mechanism 112, the centrifugal swivel slide 46 and the socket cover 42 are slidably mounted in the fuze shaft casing Sch and form a slow-action pellet bolt. This unit is supported in front by a blocking spring 128 to prevent unintentional forward movement, the screw cap 37 forming the front abutment for this spring. A guide pin 129 serves for preventing the pellet bolt unit from turning in the fuze shaft casing Sch.

Transmission pellets 134 are located between the detonators 114 in the centrifugal swivel slides 43 and the relay charge 49.

The above-described practice projectile fuze operates in the following manner:

On firing, the two shear pins 11 are sheared by the backward-moving pin bolts 12. At the same time the backward-moving retarding casing 14 shears off the edge of the shear plate 13 on which it rests. The two retarding pin bolts pierce the primer pellets 17 thereby compressing their blocking springs 16. These pellets then ignite the two detonation charge sets 18.

Through the backward movement of the retarding casing 14 the centrifugal segments 19 are liberated and fly out laterally under the action of the initiated rotation of the projectile against the action of the centrifugal coil springs 110 tending to hold them together, so that the transmission bolt becomes free for moving backwards.

When the centrifugal force due to the twist or rotation sets in, the time control clockwork mechanism 112 is also set in operation. After it has run-down a certain time it releases the primer pins 113 so that they are free to move. The running-down time of the clockwork mechanism 112 corresponds to a field safety trajectory of 50 to 100 metres.

Under the action of the centrifugal force the two pellet holder centrifugal swivel slides 43 also swing outwards and turn their detonators 114 behind the B or detonation charge sets 18 of the pyrotechnical self-destroying detonation devices. The pellet holder centrifugal swivel slides 43 are held in live or primed position by the spring bolts 116 (FIG. 7).

Their outward movement can also be retarded somewhat by the braking effect of the loose retarding bolts 44 (FIG. 1a).

After the B-charge sets 18 have burnt out their fire ignites the detonators 114, which in turn ignite the relay charge which releases a detonation charge in the projectile, if present.

As the time control clockwork mechanism 112 runs down, the control shaft 118 rotates in known manner, releases the centrifugal swivel slide 46 in the core piece 40 which turns its detonator 117 behind the firing pin 113 and is held in this live position by its centrifugal locking ball 119.

The pin bolt 120 is held in known manner during the acceleration of the projectile by the centrifugal segments 121, 122 which, when the acceleration ceases, fly outwards and release it, whereupon it creeps forward and bears against the inner side of the head diaphragm.

Now if the projectile strikes with its point, the penetrating target material knocks back the pin bolt 120 so that it pierces the primer pellet 124. The fire gases developed thereby flash back through the axial fire channel 125 onto the disk head 11a of the transmission bolt 111. This throws back the primer pin 113 into the detonator 117 which has been swung into live position in the meantime. This ignites the transmission charge 126 which then ignites the firing or striker charge 127 by which the explosive charge of the projectile is detonated.

If the projectile strikes obliquely, the corepiece 40 with the clockwork mechanism 112 and the centrifugal swivel slide 46 located therein as well as the transmission pellet 126 then act as inertia or time-lag bolt. They all shoot forward against the action of the blocking spring 128. The firing pin 113, which after being freed by the clockwork mechanism 112 is loosely shiftable, strikes with its front end against the rear face of the transmission bolt 111 which bears with its disc-shaped head 111a against the screw cap 37. As the time-lag or inertia pellet bolt unit can now shoot forward a distance equal to the thickness of the swung-out centrifugal segments 19, before the front end face of the central corepiece cover socket 42 strikes against the rear face of the disc head 111a on the transmission bolt 111, the transmission bolt 111 which is now firmly supported, holds the firing pin 113 so that the primer pellet 117 advancing with the inertia pellet bolt unit is impaled on the primer pin 113, that is pierced. It ignites the explosive charge 127 through the intermediary of the transmission charge 126.

If the projectile does not impact within the combustion period of the B-charges 18 and the centrifugal force acting on the centrifugal weights 130, 131 decreases as the projectile continues its flight, the hammer casing 132 loaded by the striker spring 133 strikes back and drives the primer pin 113 into the primer pellet 117.

If the primer pin bolt 120 fires its primer pellet 124 prematurely, the fire channel 125 and the space in which the blocking spring 128 is accommodated act as expansion chambers.

By the above-described arrangement of two diametricaly opposite self-destroying time lag or B charge sets it is not always certain that the two B sets will burn uniformly. This is due to the fact that the gas pressure developed by the B sets is different in each B set casing. As the speed of combustion is dependent upon the gas pressure developed, the duration of combustion of the two sets may be different. This is, however, undesirable because, owing to the unequal reduction of the weights of the sets in the fuze, the equilibrium in the fuze is destroyed, which can have an unfavorable effect on the trajectory of the projectile. The new fuze will remedy this in that it effects a compensation of pressure between the two B-sets.

Its construction for this purpose is recognizable in FIG. 1a. Here the fuze elements hitherto employed have the same reference as in FIG. 1. In the left half of the figure the self-destroying B-set fuze is shown in inoperative position, whereas in the right half it is shown in operative state.

The stabilizing pin bolts are again designated by 12, their primer pellet by 17, the B-charge sets by 18. Between the primer pellet 17 and the B-set 18 a sleeve 35 is now introduced which is shown in top plan view in FIG. 1b and in central longitudinal section in FIG. 1c. It has an intermediate bottom with an axial fire hole 35a and the sleeve wall is slit crosswise below the intermediate bottom. The guide casings for the stabilizing pin bolts 12 are now inserted with external play S in the slot bores in the thick wall of the fuze shaft casing Sch. The play S leads in front to an annular groove 37a which is cut in the rear side of the screw cap 37. The two B-sets are now brought into communication with each other through the intermediary of the cross-slits in the wall of the sleeve 35, the annular spaces formed by the play S and the annular groove 37a in the screw cap 37, so that a compensation of pressure can take place between the B-sets of the two self-destroying B-fuzes.

Consequently the greatest possible guarantee is given for a uniform and simultaneous operation of these fuzes.

What I claim is:

1. Rifled projectile fuze for practice projectile, comprising a casing, a fuze head mounted on the casing, a main fuze ignition mechanism in the casing, said fuze head having a pressure transmission channel therein leading to the main fuze ignition mechanism, safety devices mounted in the casing, a transmission bolt having a disc head at the same end of the transmission channel as the main fuze mechanism and provided in the casing, a time-controlled mechanism in the casing adjacent the transmission bolt and having a primer pin therein in axial alignment with the transmission bolt, and an inertia internal housing in the casing having the time-controlled mechanism mounted therein and having a pellet holding means pivoted therein, the time control mechanism on forward travel of the projectile fuze causing the transmission bolt to cooperate with the transmission channel as a pneumatic piston and upon forward movement of the internal housing by inertia the time controlled mechanism and the pellet holding means strikes against the bottom of a fuze base and acts as an abutment for the primer pin which is driven into the pellet.

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