Feb. 27, 1962 H. JUNGHANS ETAL 3,022,733

ROTARY SHELL FUZE

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Fig. 1

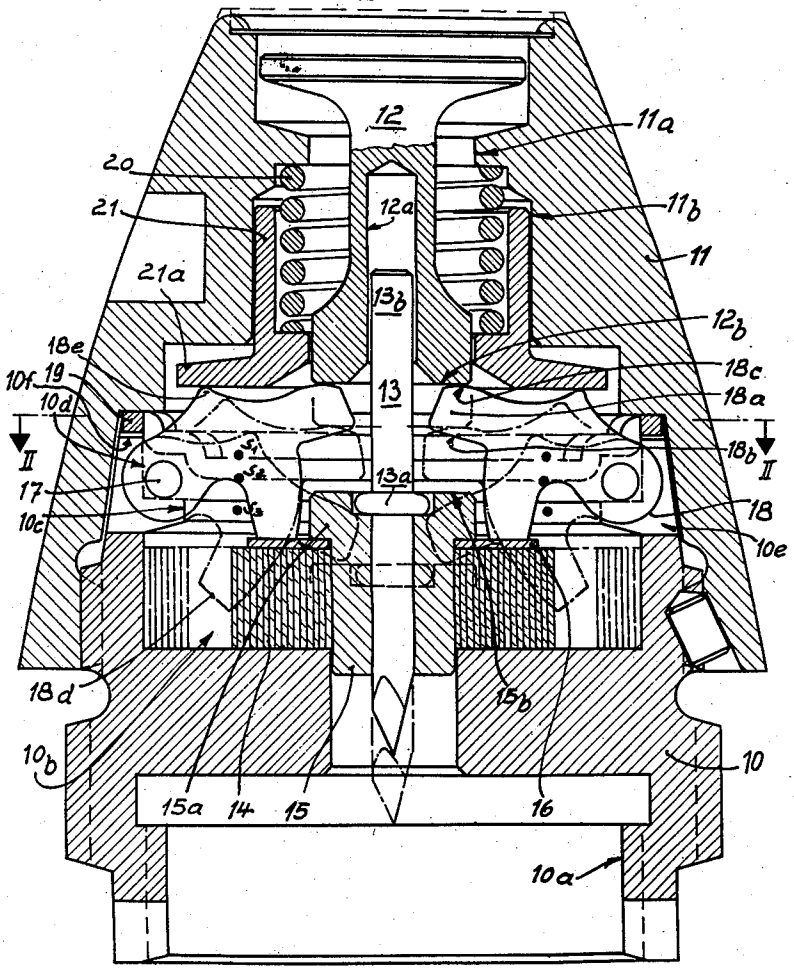

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Fig. 2

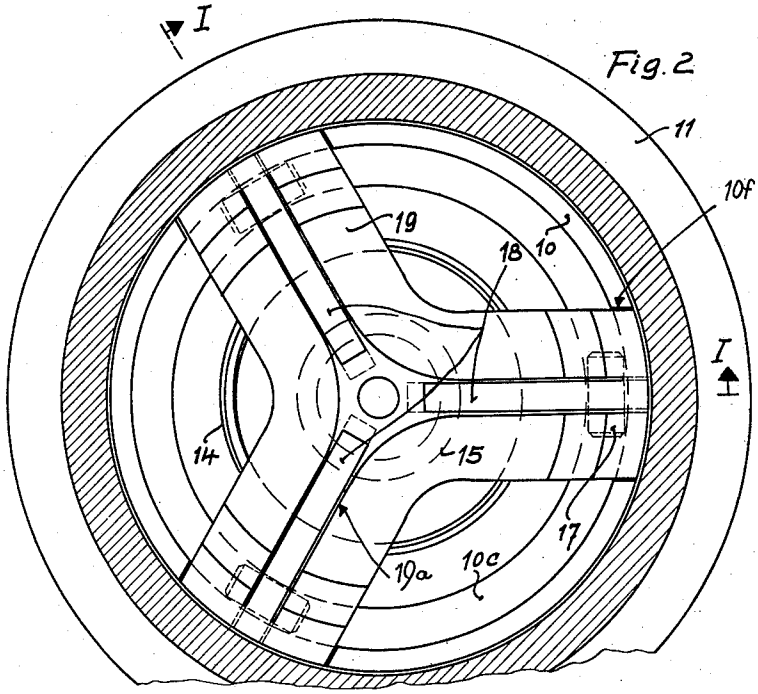

Fig. 3

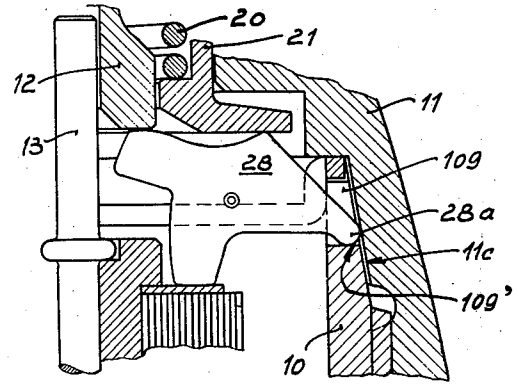

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Fig. 4

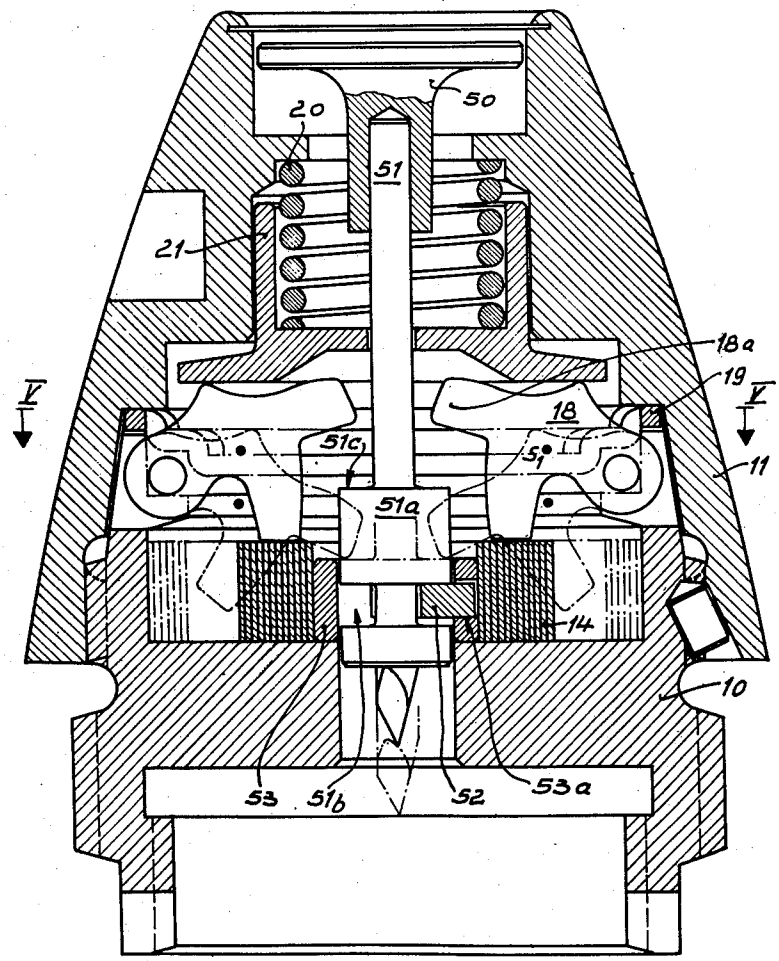

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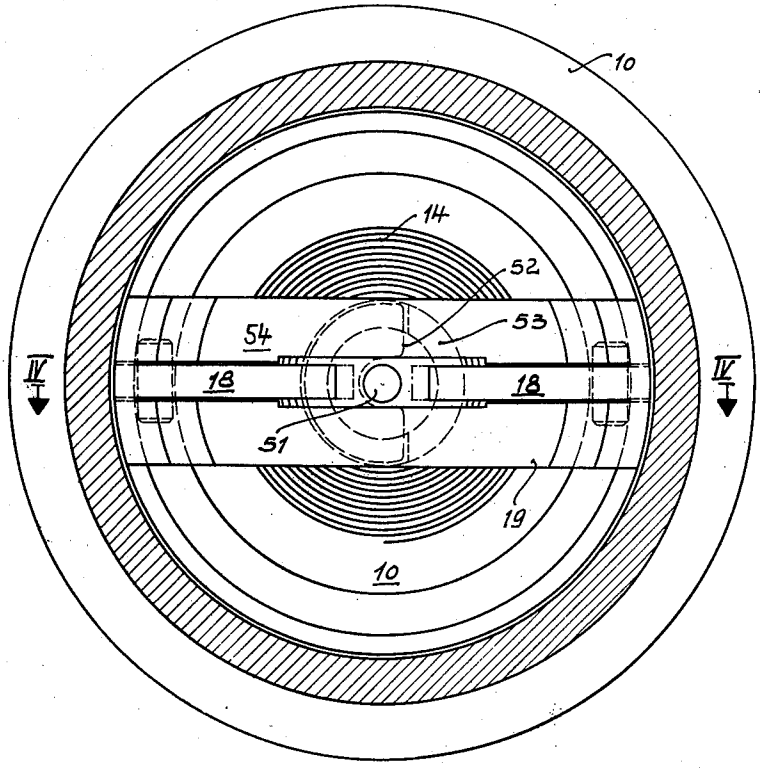
Fig. 5



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ROTARY SHELL FUZE

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7 Claims. (Cl. 102—71)

The invention relates to a rotary shell fuze with sensitive impact ignition and a self-destroying device dependent upon the number of revolutions. The object of the invention is to produce a self-destroying system for which the weakest possible self-destroying spring is required, because in the known systems the objection has been found that a strong self-destroying spring, which as is known is fitted under pretension, becomes sluggish and fatigues in the course of time. The invention is characterized in that centrifugal levers of the self-destroying device are pivotable about axes which lie in a plane at right angles to the axis of rotation of the fuze so that the inwardly directed radial arms of these levers can act in the firing direction on a pressure surface provided on the firing pin when liberated by a timing mechanism arranged under and supporting them, and that above these centrifugal levers the spring of the self-destroying device cooperating with the backs of these levers is arranged in the fuze head, the adjustment of the self-destroying system being such that in the initial safety position the center of gravity of a centrifugal lever lies above the plane determining its pivot axis which it traverses in the point of self-destruction.

The arrangement according to the invention of centrifugal levers between the pretensioned spring of the self-destroying device and the firing pin, presents the advantage that the centrifugal force participates and assists in the forward thrust of the firing pin and as a result the spring of the self-destroying device can be kept correspondingly weaker and its pretension be less, whereas in the known systems the springs of the self-destroying device have to be stressed to the maximum limit of elasticity on account of the limited structural space available. In the preferred embodiment of the invention a centrifugal spiral is employed for temporarily locking the centrifugal levers of the self-destroying device. A simple form of construction of the fuze is obtained if the centrifugal levers of the self-destroying device are mounted with their pivot axles in open bearings which are formed by recesses in the fuze head and/or in the fuze base, and slotted plates are provided for laterally guiding these centrifugal levers, which plates cover the above-mentioned recesses. The spring of the self-destroying device preferably cooperates with the centrifugal levers through the intermediary of a wide flanged sleeve, whereby the lever arms at these points of engagement are shorter than those acting on the firing pin, preferably one-third to one-quarter thereof.

According to another feature of the invention the striker ram, instead of being rigidly connected with the firing pin in the striking direction, can be freely movable independently thereof and so constructed that in striking it encounters the centrifugal levers of the self-destroying device, that is drives the firing pin into the ignition pellet indirectly through the intermediary of these levers. With this construction a certain delayed action is attained as compared with the normal construction—which is likewise possible in the present instance—where the striker ram and the firing pin are rigidly interconnected. In the case of some purposes for which the shells here under consideration are used, a certain delay is desirable when detonation is dependent upon impact, because the shell should only explode after it has penetrated the target.

Other features and advantages of the invention will become apparent from the several embodiments hereinafter described by way of example, from the drawings and from the claims.

The drawings show these embodiments on a considerably enlarged scale and those parts which are not essential for the understanding of the invention are omitted.

FIG. 1 shows the first form of construction in longitudinal section taken on line I—I of FIG. 2, the functional parts in the safety position being indicated in solid lines and in different operative positions in dot-dash lines;

FIG. 2 is a section taken on line II—II of FIG. 1;

FIG. 3 is a part longitudinal section showing a different way of mounting the centrifugal levers of the self-destroying device;

FIG. 4 shows the second form of construction in longitudinal section on line IV—IV of FIG. 5, the functional parts being indicated in a similar manner to that used in FIG. 1, and

FIG. 5 is a section taken on line V—V of FIG. 4.

In the case of the first embodiment illustrated in FIGS. 1 and 2, the fuze base is designated by **10**, the fuze cap by **11**, the striker ram by **12**, the firing pin by **13** which pierces an ignition pellet which is not shown in the drawing but which is to be screwed into the compartment **10***a*. In a recess **10***b* formed in the fuze base a centrifugal safety spiral **14** of known type is arranged and serves as bore-safe and projection-safe fuze. As long as the centrifugal spiral **14** is wound tightly around the core **15**, the collar **15***a* of the winding core **15** rests on a thin disk **16** above the centrifugal spiral **14**. The disk **16** serves for protecting the centrifugal spiral against damage under high firing pressures and may therefore be omitted under favorable circumstances. The firing pin **13** is inserted in the winding core **15** until its collar **13***a* rests on the core. It can be seen that the upper end **13***b* of the pin shaft is free in the bore **12***a* of the striker ram **12**; consequently movement of the striker ram **12** in the piercing direction cannot be directly transmitted to the firing pin. The object of this arrangement will be hereinafter described. The inwardly projecting annular step **10***c* extends from the recess **10***b* in upward direction; which together with the peripheral surface of the recess **10***d* serve as supporting bearing for the centrifugal levers **18** of the self-destroying device. The lateral guiding of these centrifugal levers **18** is effected partly by slots **10***e* formed in the edge of the fuze base **10** and partly by guide slots **19***a* in a guide plate **19** fitted in the upper edge of the fuze base **10**.

The arms **18***a* of the centrifugal levers **18** project radially inwards and their noses **18***b* can rest on the upper side **15***b* of the winding core **15** rigidly connected with the firing pin **13**. At the same time the backs **18***c* of the lever arms **18***a* are located in the striking range of the end face **12***b* of the striker ram **12**. Another arm **18***d* of the centrifugal levers **18** rests on the disk **16** which is inserted between the collar **15***a* on the winding core and the centrifugal spiral **14**.

The spring **20** of the self-destroying device is fitted in a bore **11***a* in the fuze cap and the sleeve **21** is guided in a widened portion **11***b* of this bore. This sleeve **21** has a wide flange **21***a* which bears against the pressure points or projections **18***e* under the pressure exerted by the spring **20**. It will be seen from the drawing that the lever arms at these pressure points are much shorter than the effective lever arms with which the centrifugal levers engage the primer.

The construction, arrangement and adjustment of the centrifugal levers is so chosen that in safety position

(see FIG. 1, solid lines) the center of gravity of the levers in the positions S_1 is located above the imaginary plane extending through the pivot axles **17** of the levers and in such a manner that the initial speed of rotation of the shell is still sufficient to overcome in conjunction with the centrifugal force acting on the centrifugal levers, the force of the pretensioned spring of the self-destroying device and to lift the sleeve **21** slightly.

During this stage the centrifugal spiral **14** can fly out into the position shown in broken lines so that the disk **16** loses its support.

As the number of revolutions decreases, the system enters the state of equilibrium; the position of the center of gravity is then designated by S_2. In the event of impact in this state, the striker ram **12** would first be forced inwardly independently of the firing pin **13**, its striking surface **12***b* would then come into contact with the backs of the levers at **18***c*, carry these along and through their intermediary when the noses **18***b* come into contact with the winding core **15** at **15***b*, drive the firing pin **13**, which is rigidly connected therewith, into the ignition pellet. Thereby three forces act jointly, namely the force caused on the striker ram **12** by the impact, the centrifugal force acting on the levers after passing the state of equilibrium and the force of the spring of the self-destroying device.

If the shell misses its target, the state of equilibrium between the centrifugal force acting on the centrifugal levers of the self-destroying device and the pretension of the spring of self-destroying device continues to change as the number of revolutions of the shell decreases, in the sense that the centers of gravity of the centrifugal levers **18** are forced out of the state of equilibrium S_2 and the effective centrifugal forces can force the levers **18** downwards as the lever arm increases in length, so that, shortly after leaving the position of equilibrium, their noses **18***b* come into contact with the winding core **15** and, assisted by the spring **20** of the self-destroying device, drive the firing pin **13** into the ignition pellet with increasing speed.

As can be seen from FIG. **3**, the centrifugal levers of the self-destroying device, which are here designated by **28**, instead of being pivotally mounted on pins or axles, are provided with rounded supporting arms **28***a*. With the aid of these supporting arms they bear partly on the bottom surface **10***g'* of slots **10***g* worked in the edge of the fuze base **10** and partly against the recess **11***c* in the fuze cap **11**.

In the embodiment illustrated in FIGS. 4 and 5, the self-destroying system of the first embodiment is retained. The difference is that the impact does not act indirectly through the intermediary of the centrifugal levers of the self-destroying device **18**, but directly. That is, the striker mushroom **50** is rigidly connected with the firing pin **51** in the direction of thrust. Instead of the winding core **15** of the first form of construction, the firing pin is in this instance provided with a collar **51***a* which is recessed at **51***b* so as to receive a half-disk **52**. This half-disk **52** is in turn introduced through a lateral slot **53***a* in the winding sleeve **53** so far that the centrifugal band **14** is wound smoothly on the sleeve **53**. This arrangement is known per se. The case in question is constructed so that the centrifugal levers of the self-destroying device also bear directly on the centrifugal band winding without any disk being interposed.

The self-destroying arrangement operates in the same manner as in the first embodiment, that is, after the initial flying out of the winding band **14** and of the safety half-disk **52**, the centers of gravity of the levers, when the target is missed and the number of revolutions of the shell decreases to a predetermined figure, pass out of the

safety position S_1 through their labile central position (not shown) and continue to move, the force of the spring of the self-destroying device being supplemented by the centrifugal force, until finally their arms **18***a* contacting the end face **51***c* of the firing pin **51** entrain this until the ignition pellet is pierced. The responsive blow takes place without the cooperation of the centrifugal levers **18** in that the centrifugal force acting on the striker mushroom **50** is directly imparted to the firing pin **51**.

In the second embodiment only two centrifugal levers are provided instead of three; these levers are laterally guided in the slotted plate **54**, FIG. 5.

We claim:

1. A rotary shell self-destroying fuze comprising a base having a recess therein and a central axial opening, a fuze cap mounted on the base and having a bore therein, a core mounted in the central axial opening and having an axial bore therein, a firing pin in the fuze cap and extending through the axial bore in the core, a guide plate in the fuze cap and having a plurality of spaced and radially arranged slots therein, a centrifugal lever rotatably mounted in each slot with a pivot point near the outer peripheral edge of the fuze base, each lever having an upper arm and a projection and a lower arm, a safety coil spring normally coiled around the core and in this position forming an abutment for the lower arms of the centrifugal levers, and a sleeve mounted in the bore of the fuze cap and having a flange to contact the projections of the levers, said spring flying radially due to centrifugal force to pass from under the levers to force the upper arms of the levers to contact the core to permit the sliding actuation of the firing pin.

2. A fuze according to claim 1, in which the centrifugal levers are mounted in the slots with play, and guided by the slotted plate inserted in the fuze.

3. A fuze according to claim 1, in which an inner shoulder is mounted in the fuze base serving as a bearing for the centrifugal levers, and in which pivot pins are provided one for each centrifugal lever.

4. A fuze according to claim 1 in which the radial slots provided in the guide plate of the fuze base serve as bearings for the centrifugal levers and the slots being covered on one side by the inner wall of the fuze cap.

5. A fuze according to claim 1, in which the lever arm between the pivot point of each centrifugal lever and the engagement point of the sleeve with the projection being smaller than the upper arm of the centrifugal lever and ranging from one-third to one-quarter of the length of the latter.

6. A fuze according to claim 1, in which a cover disk is provided on the coil spring to support the centrifugal levers by contact with the lower arms when the spring is tightly wound around the core.

7. A fuze according to claim 1, in which a striker ram is provided in the cap for the firing pin and contacting the projection of each of the centrifugal levers.

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