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Lemstra

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[54] **DISINTEGRATING PROJECTILE**

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[52] **U.S. Cl.** **102/92.7**; 102/92.4

[51] **Int. Cl.**[2] **F42B 13/20**

[58] **Field of Search** ..... 102/92.7, 92.4, 42 C, 41, 102/38, 91

[56] **References Cited**

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Assistant Examiner—C. T. Jordan
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[57] **ABSTRACT**

A disintegrating projectile provided with a number of cores of compressed metal powder arranged axially one behind the other and enclosed within a shell of synthetic plastics material, said cores being provided with recesses or cavities and with plug means or dowels arranged in said cavities to locate and fix the cores relative to one another in the radial direction of the projectile.

4 Claims, 4 Drawing Figures

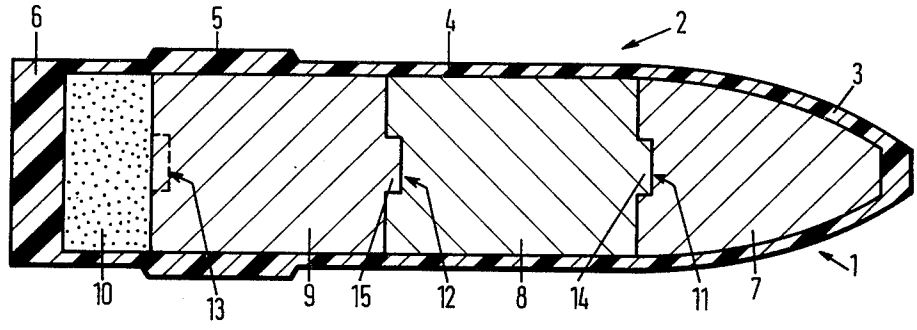


FIG. 1

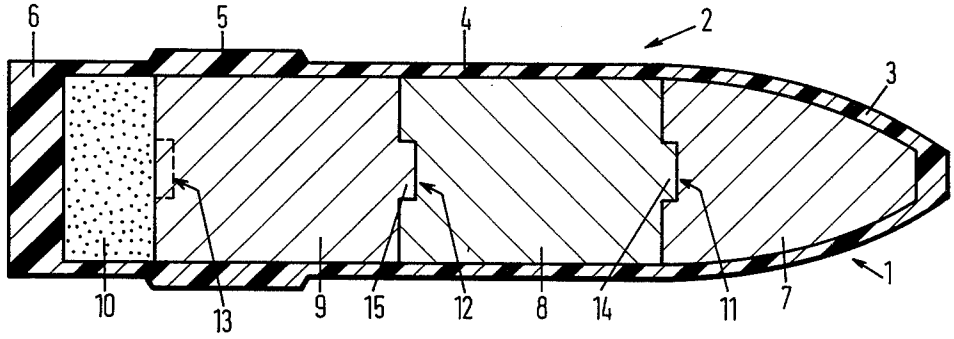


FIG. 2

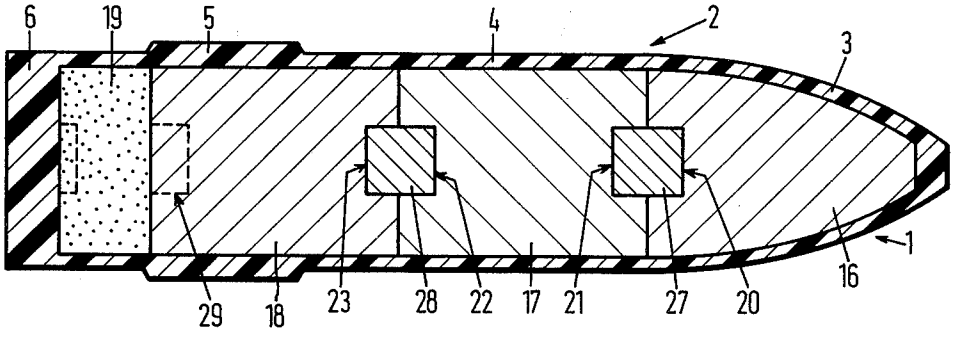
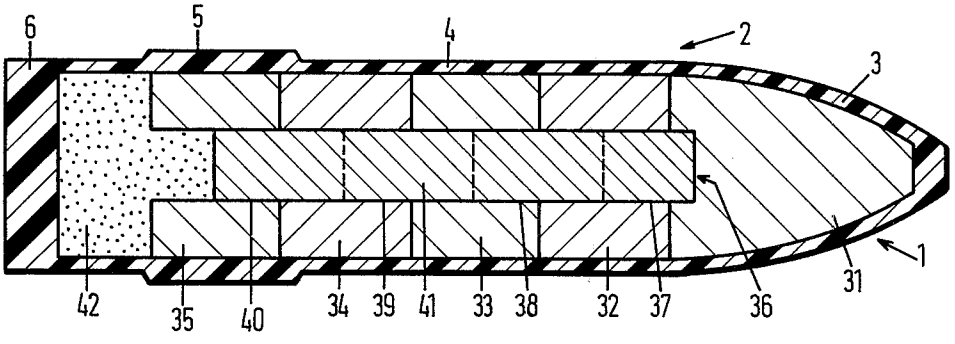


FIG. 3



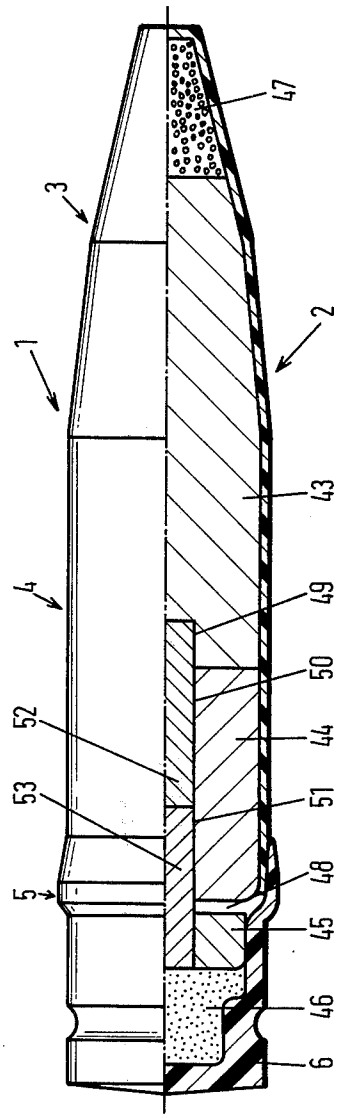


FIG. 4

DISINTEGRATING PROJECTILE

The present invention relates to a disintegrating projectile which comprises a number of cores of compressed metal powder arranged axially one behind another and enclosed within a shell of synthetic plastics material.

Such disintegrating projectiles, commonly termed 'break-up shot', are known from U.S. Pat. No. 3,385,215-Jungermann issued May 28, 1968 and in particular are adapted as practice ammunition for artillery pieces having high rates of fire, these projectiles disintegrating at a short distance from the barrel after emergence therefrom due to the exercise of centrifugal force thereon.

To achieve break-up of the shell of the disintegrating projectile through disintegration of the cores after firing, and consequent complete disintegration, the shell has a limited thickness and thus limited strength in the radial direction.

With artillery pieces having high rates of fire the rounds are loaded at a rapid rate, mostly first sideways and then continuously round-by-round in the axial direction thereof until the instant that the round has been rammed into the chamber of the barrel in the firing position therefor. As a result of the high rate of loading, large inertial forces develop in each round consequential to the rapid acceleration of the round followed by rapid deceleration to a dead stop.

During feeding of the round sideways to the ramming position, only the projectile case and hence the rear end of the projectile clamped therein are supported. Through this, a real danger exists that the cores of a projectile, located outside the confines of the case, can be displaced radially with respect to one another due to the lateral load imposed by the large inertial forces acting thereon. Consequently the shell of the projectile can split open or become damaged in places corresponding to the contacting end surfaces of adjacently located cores therein, which cores displace themselves in a radial direction with respect to one another.

The present invention seeks to eliminate this danger by providing a disintegrating projectile of improved construction. To this end, according to the invention, the above described projectile is designed in such a way that the cores are provided with recesses into which filler plugs or dowels are inserted to fix the cores relative to one another in the radial direction. The filler plugs or dowels are necessarily made of compressed metal powder.

In doing so, it is achieved that a considerably greater lateral load can be imposed on the projectile without adjacently bordering cores being displaced in the radial direction with respect to one another and that thereby the danger of the projectile shell prematurely split or damaged is prevented.

An inherent advantage of the embodiment in which the cores and the dowels are manufactured separately is that this type of cores is thus easily manufactured and homogeneous density of the cores can be better assured.

Other features of the invention will become apparent from the following description with reference to the accompanying drawings, which show examples of a number of embodiments of the invention, and in which:

FIG. 1 shows a longitudinal section along the axis of a disintegrating projectile in which the dowels are integral with the cores.

FIG. 2 shows a longitudinal section, corresponding to FIG. 1, of another embodiment which is provided with loose dowels.

FIG. 3 shows a longitudinal section, corresponding to FIG. 1, of yet another embodiment and,

FIG. 4 shows partially in longitudinal section and partially in side view a preferred embodiment of a projectile according to the present invention.

The disintegrating projectile 1 according to the invention mainly comprises a projectile shell 2 manufactured of synthetic plastics material, and a filling enclosed within the shell and comprising compressed metal powder cores and a filling. The projectile shell has a converging leading portion 3 with a substantially cylindrical integral or joined center portion 4. This center portion of the projectile shell 2 is rigidly affixed to the rear portion 6 by means of, for example, an adhesive bonding medium, screw means, or by welding. Such means are irrelevant in this connection and therefore are not illustrated in FIGS. 1 to 3 inclusive.

The rear portion 6 can also be formed as one piece with the cylindrical center portion 4, when, at some position along the center portion, a junction point exists between the leading and center portions of the projectile shell 2. In the illustrated examples of the embodiments, the cylindrical center portions 4 of the projectile shells 2 are each provided with a driving band 5 which is of a somewhat greater diameter than the cylindrical center portion 4 and which is located on the rear half of the projectile shell.

The projectile shell 2 illustrated in FIG. 1 is filled with three cores 7, 8 and 9 and a metal powder filling in the rear end. The rear end 10 of each core, behind which another core lies, has an axial recess 11, 12 therein, into which a dowel like protrusion 14 and 15 forwardly extends from the core immediately to the rear thereof. Each of the dowels 14, 15 can fill the corresponding recess 11, 12 completely or partially but care should be taken that at least the branch of the dowel is a good fit in the corresponding recess. To limit the number of moulds used to produce the cores, the rearmost one of the cores 9 can have the same form as the core 8 lying forwardly thereof, and hence is also provided with an axial recess 13, which can be filled by the metal powder filling 10. These cores are then interchangeable positionwise.

The projectile shell illustrated in FIG. 2 is filled with three cores 16, 17 and 18 with a metal powder filling 19 in the rear end of the shell. In the adjacent end surfaces of two adjacent cores, axially opposite recesses 20, 21, 22 and 23 are provided. In the adjacent recesses of the adjacent cores, dowels 27 and 28 are arranged, respectively. These dowels can completely, and also partially, fill the recesses provided care is taken that the dowels or at least the part in the region of the end surfaces, are a good fit in the recesses corresponding thereto. In this case, also the number of moulds used to produce the cores can be limited. When the rearmost one of the cores 18 has the same form as the core 17 lying forward thereto it can then be provided with an axial recess 29, which in this case can be filled with the metal powder filling 19.

The projectile shell illustrated in FIG. 3 is filled with five cores 31, 32, 33, 34 and 35 and a metal powder fill-

ing **42** in the rear end thereof. All of the cores, with the exception of the leading portion of the foremost one of the cores, are provided with axial recesses **36, 37, 38,** 39 and **40** respectively. One, or more, of the dowels **41** are inserted in these recesses. The end surfaces of these dowels are not co-planar with those of the cores. The dowel, or dowels, **41** do not need to completely fill the recesses **36, 37, 38, 39** and **40** to the rear surface of the rearmost core. The remaining portion of the rearmost recess **40** can be filled with the metal powder filling **42.**

In the preferred embodiment illustrated in FIG. **4,** the cylindrical center portion **4** is bonded to the rear portion **6** by means of an adhesive or by welding. The projectile shell produced in this manner is filled with three cores **43, 44** and **45,** and with a metal powder filling **46** in the rear portion and a filling **47** in the foremost portion of the projectile shell.

In connection with the joining of the center and rearmost portions, there may be provided a small gap between the cores **44** and **45.** In all of the cores, with the exception of the foremost portion of the foremost core **43,** axial recesses or cavities **49, 50, 51** are provided, into which two dowels **52** and **53** are inserted.

The invention is not limited to the details described above. In particular a random number of cores and/or dowels may be provided. An inherent advantage of the embodiment in which the cores and the dowels are manufactured separately, is that this type of projectile is thus easily manufactured and homogeneous density can be better assured.

It is, of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawings but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. A disintegrating projectile comprising a shell of plastics material which includes a number of cores of compressed metal powder arranged axially one behind the other and enclosed within said shell, said cores being provided with cavities, and plug means also of compressed metal powder arranged in said cavities and locating and fixing said cores relatively to one another in the radial direction of said projectile.

2. A projectile according to claim **1,** in which each plug means extends into a cavity in a core and is integral with an adjacent core.

3. A projectile as claimed in claim **1,** in which each plug means extends into at least two recesses, located axially one behind the other, of two cores.

4. A projectile according to claim **1,** in which the said cavities and plug means are cylindrical and have substantially the same inner and outer diameters.

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