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(54) **SPIN-STABILIZED PROJECTILE**

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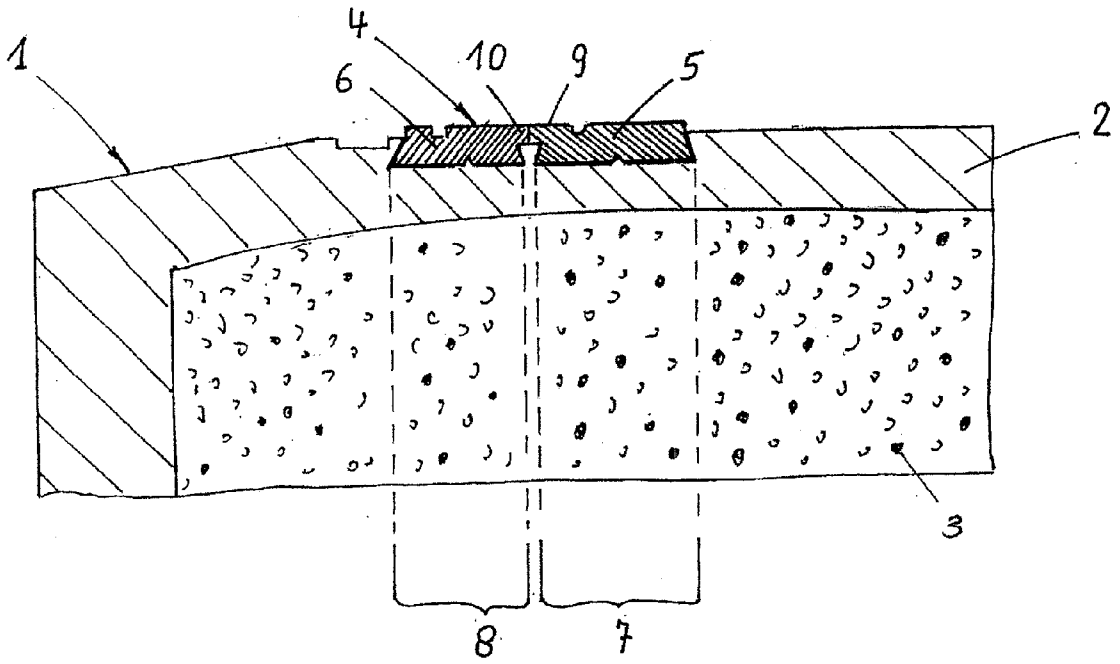
(57) **ABSTRACT**

A spin-stabilized projectile with a guide band which is composed of at least two annular sub-guide bands that lie axially one behind the other is provided. An object of the invention is to ensure a durability of the connection between the multi-part guide band and the corresponding projectile body of the projectile even when high centrifugal forces act on the guide band, such as those centrifugal forces that occur in artillery projectiles. To achieve this, each of the sub-guide bands lies in a separate groove of the projectile.



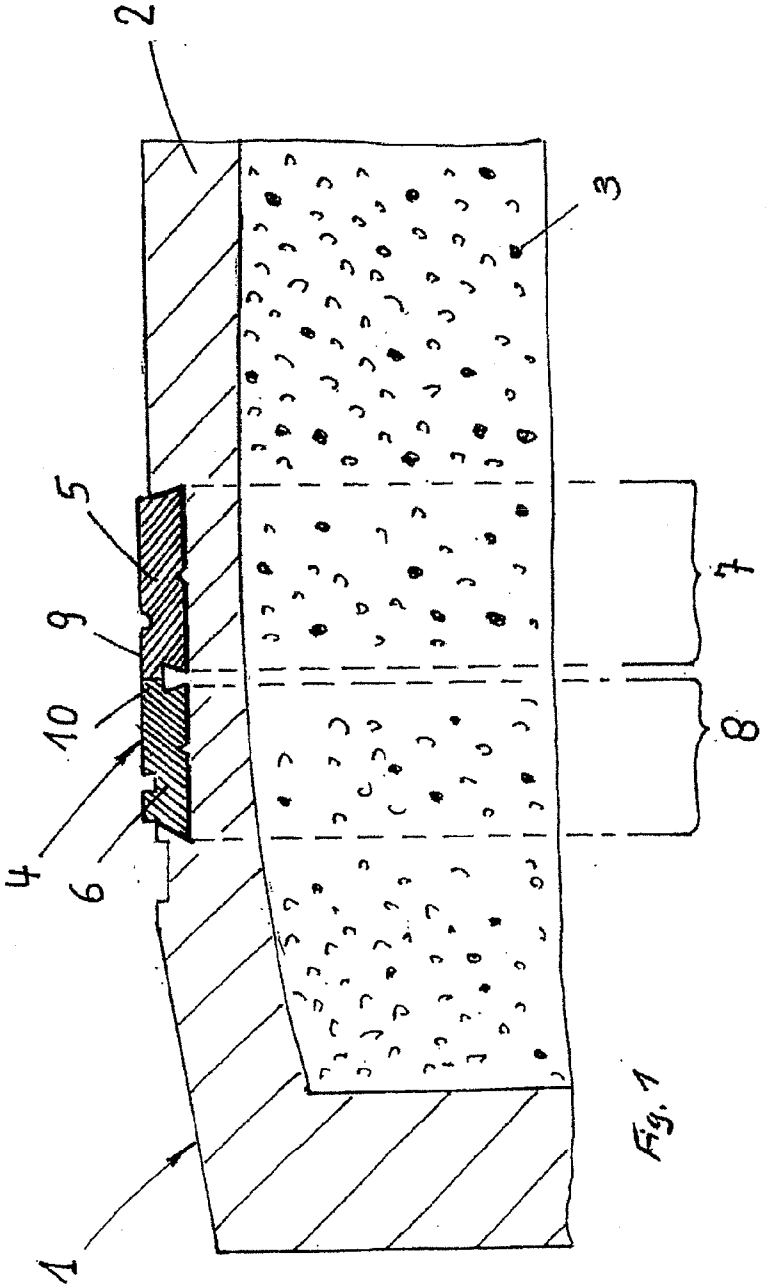


Fig. 1

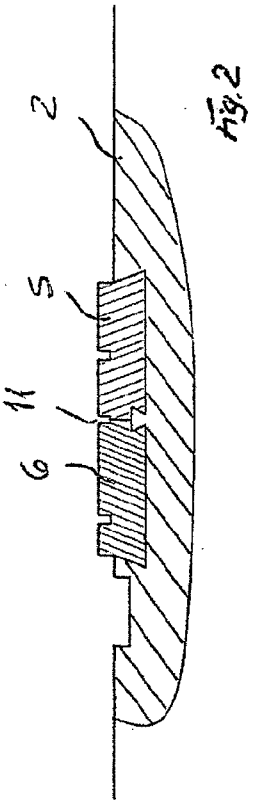


Fig. 2

SPIN-STABILIZED PROJECTILE

[0001] This nonprovisional application is a continuation of International Application No. PCT/EP2011/000033, which was filed on Jan. 7, 2011, and which claims priority to German Patent Application No. DE 10 2010 006 221.9, which was filed in Germany on Jan. 28, 2010, and which are both herein incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a spin-stabilized projectile with a guide band.

[0004] 2. Description of the Background Art

[0005] Spin-stabilized projectiles are used in particular for artillery ammunition with a guide band arranged at the rear that is pressed into a corresponding dovetail groove of the projectile. The guide band can be made of one or more parts, whereby in the event of a multiple part guide band, the axially adjacent annular sub-guide bands are also located within the dovetail groove of the projectile. The sub-guide bands can be made of different materials (e.g. of brass and soft iron) (DE 198 18 411 A1, which corresponds to U.S. Pat. No. 6,536, 353).

[0006] It has proven disadvantageous that with modern artillery projectiles, as a result of the high revolution rate and the resulting high centrifugal force produced, and the relatively large width of the guide bands of approximately 35 to 40 mm with these projectiles, durability of the shape-locking connection between the respective guide band and the projectile body is frequently not achieved. Rather, lifting or tearing of the respective guide band can occur as a result of the high centrifugal force acting on the guide band, which adversely affects the ballistics of the projectile.

SUMMARY OF THE INVENTION

[0007] It is therefore an object of the invention to disclose a spin stabilized projectile, whereby the durability of the connection between a multi-part guide band and the corresponding projectile body is ensured if centrifugal forces act on the guide band such as those that occur with artillery projectiles.

[0008] In an embodiment, each of the sub-guide bands is arranged in a separate groove of the projectile. The shape and arrangement of the grooves is dependent on the respective application, whereby the shape of a dovetail groove presents itself as preferred—indeed inter alia a guide band is known from U.S. Pat. No. 2,809,587 A, which comprises a plurality of thin ribs that are spaced apart and that are filled with a filler material forming the guide band, but the technical implementation is very costly. In addition, this can also lead to tearing of the sub-guide bands.

[0009] It has proven advantageous when the axial separation of adjacent dovetail grooves and/or the respective mutually facing areas of the sub-guide bands are selected in such a way that the sub-guide bands are directly adjacent to each other. However, the sub-guide bands can be designed so as to allow "flowing" of the material during the passage through the pipe when necessary.

[0010] By replacing a single, relatively long (dovetail) groove with several shorter (dovetail) grooves, the centrifugal forces that occur can be distributed better. By selecting suitable materials for the sub-guide bands, both the durability of the connection of the sub-guide bands to the projectile body can be guaranteed and guide band wear can be reduced.

[0011] The sub-guide bands can be made of the same material or of different materials, in order, for example, to ensure both high wear resistance and good slip capability. Thus, for example, the first sub-guide band looking in the firing direction can be made of brass and the second sub-guide band can be made of soft iron.

[0012] It is also possible for at least one sub-guide band of the projectile to use a material that closes (repairs) defective areas of the inner surface of the corresponding weapon barrel when the projectile is fired.

[0013] Thus in order to achieve guaranteed durability of the connection between the multi-part guide band and the corresponding projectile body, even when high centrifugal forces are acting on the guide band, as occurs with artillery projectiles, it is now proposed to arrange each sub-guide band in a separate groove, preferably of dovetail form, of the projectile.

[0014] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus, are not limitive of the present invention, and wherein:

[0016] FIG. **1** illustrates a cross section of a projectile according to an embodiment of the present invention; and

[0017] FIG. **2** illustrates another variant of the bonding.

DETAILED DESCRIPTION

[0018] FIG. **1** shows a longitudinal section through the rear region of a spin-stabilized explosive projectile **1**. Here the projectile casing and the explosive charge of the projectile **1** are identified by reference numerals **2** and **3** respectively.

[0019] The projectile **1** comprises a guide band **4** that includes preferably two annular sub-guide bands **5**,**6** arranged axially one after the other. Here, looking in the direction of firing, the first (leading) sub-guide band **5** can be made of brass and the second (rearmost) sub-guide band **6** can be made of soft iron.

[0020] According to the invention it is now provided that each of the (two) sub-guide bands **5**, **6** is arranged in a separate groove **7**, **8** of the projectile casing **2** on the projectile body side, and this so that the axial separation of the (two) dovetail grooves **7**, **8** and/or the mutually facing regions **9**, **10** of the sub-guide bands **5**, **6** are selected so that the sub-guide bands **5**, **6** are directly joined to each other.

[0021] FIG. **2** shows another variant of the bonding of the sub-guide bands **5**, **6**, which here have a distance **11** between them, at least in the upper region. This arrangement allows the bands to flow during the passage of the projectile **1** through the pipe.

[0022] Naturally, the invention is not restricted to the embodiment described above. On the contrary, more than two sub-guide bands can be arranged in more than two adjoining dovetail grooves. The sub-guide bands in the individual dove-

tail grooves can also be made of the same material if this is appropriate (e.g. when using a certain ammunition or a suitable weapon barrel).

[0023] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are to be included within the scope of the following claims.

What is claimed is:

1. A spin-stabilized projectile comprising:

at least one groove; and

a guide band that has at least two annular sub-guide bands arranged axially one after the other, each of the sub-guide bands being arranged in a separate groove of the projectile;

wherein a shape and arrangement of the groove is based on a respective application,

wherein the groove is a dovetail groove and an axial separation of adjacent grooves and/or mutually facing regions of the sub-guide bands are selected so that the sub-guide bands are directly joined together or have a separation at least in the upper region.

2. The spin-stabilized projectile as claimed in claim **1**, wherein the sub-guide bands are formed of different materials.

3. The spin-stabilized projectile as claimed in claim **2**, wherein, in a case of a guide band having at least two sub-guide bands when viewed in a firing direction, the first sub-guide band is formed of brass and the second, rear sub-guide band is formed of soft iron.

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