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DRIVE CAGE FOR WING-STABILIZED LOW CALIBER SHELLS

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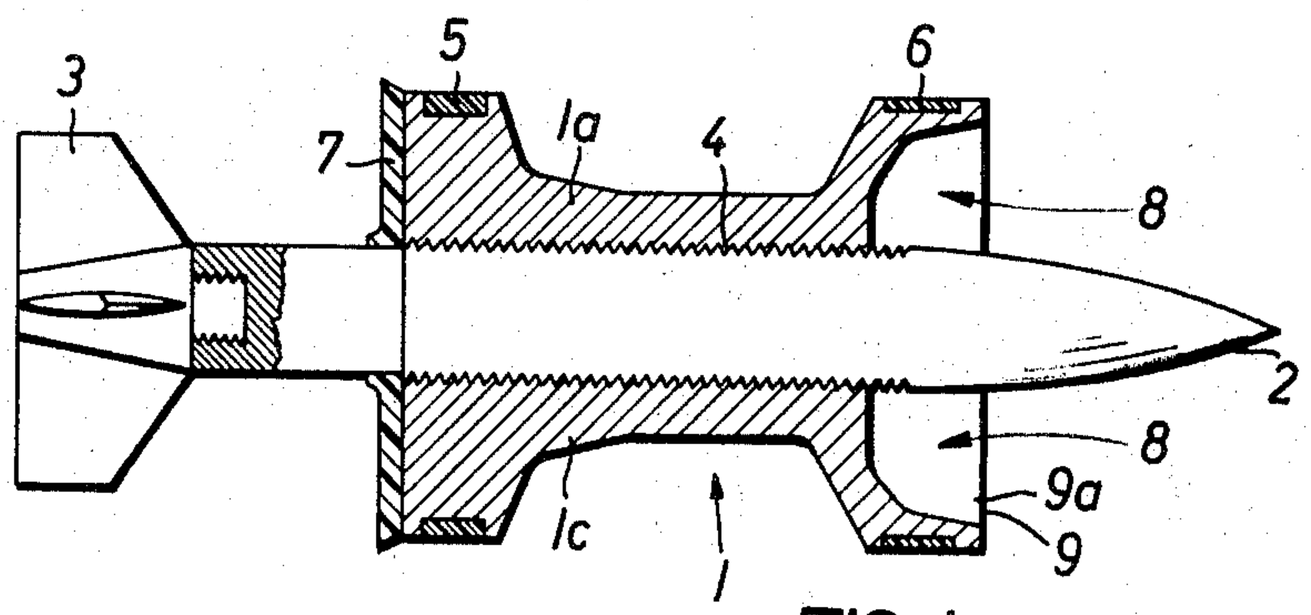

FIG. 1

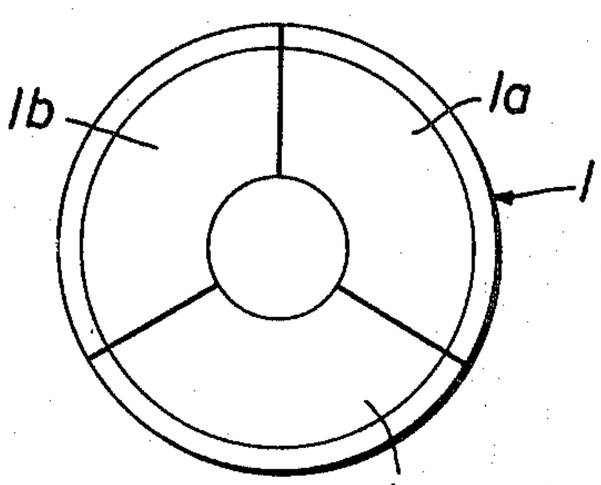

FIG. 2

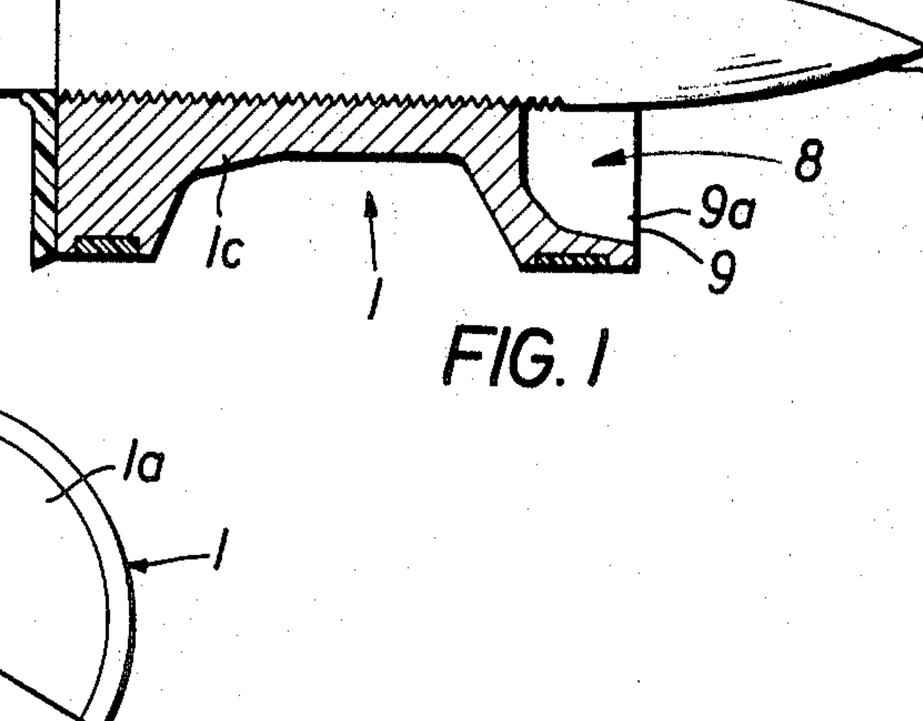

FIG. 3

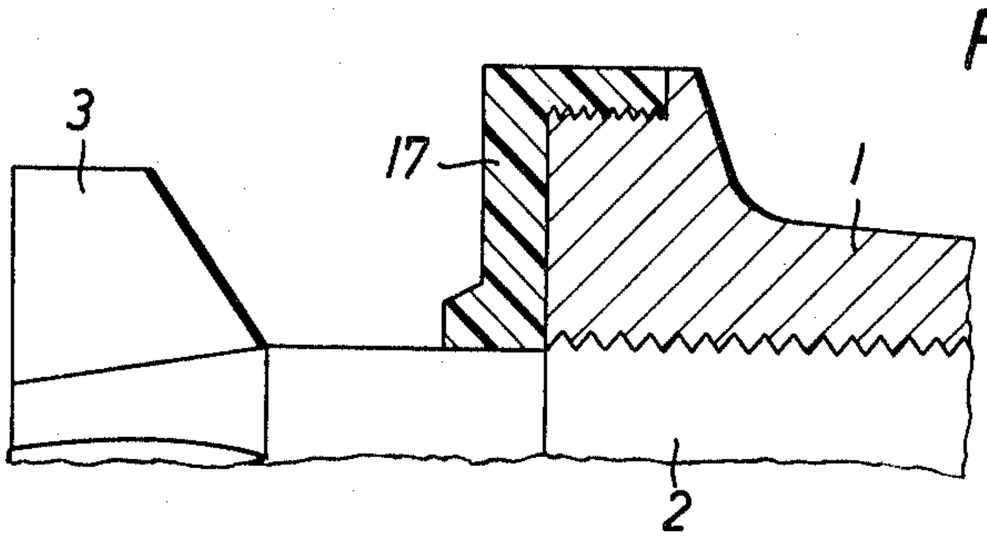

FIG. 4

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DRIVE CAGE FOR WING-STABILIZED LOW-CALIBER SHELLS

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ABSTRACT OF THE DISCLOSURE

A wing-stabilized low-caliber shell, which comprises a shell body and a drive cage surrounding in the center range the shell body and comprising segments including loosely joined parts. At least one annular guide band holds together the segments. A tail unit is secured to the shell body and the drive cage has an end face opposite the tail unit. A sealing disc is disposed at the end face of the drive cage, and the guide band is disposed adjacent the sealing disc.

The present invention relates to a drive cage for wing-stabilized low-caliber shells, in general, and to such shells in which the drive- and guide-elements are disposed at the center portion of the shell body, in particular.

In such shells, the drive- and guide-elements comprise generally one or a plurality of annular bodies, which are divided by a longitudinal division into two or more segments. The sub-division into individual segments is necessary, in order that the drive- and guide-elements can release themselves from the shell body, when the shell has left the barrel. The segments are held together as a rule by an annular band, which has to assume in addition a guiding- and sealing-function for the shell in the barrel. When the driving- and guide-elements are disposed at about the center of the shell body, as is the case in the present embodiment, they are called frequently a "drive ring" or a "drive cage." For this reason the term "drive cage" is used herebelow.

A difficulty in all wing-stabilized low-caliber shells resides in the fact to design the drive cage such, that it releases itself on the one hand quickly from the shell, as soon as the latter has left the barrel. On the other hand, by this releasing process the flight of the low-caliber shell shall be influenced as little as possible, in order not to interfere with the target exactness. These difficulties are particularly great if the firing takes place from smooth barrels, thus without any twist. These difficulties exist already however, when wing-stabilized shells are fired such from rifle barrels, that they assume only a slight twist. The centrifugal forces caused by the twist are then not as great, in order to bring about a fast radial removal of the segments from the low-caliber shell.

In the shells known until now, the release of the segments is brought about mainly by the powder gases. For this purpose, the rear part of the segments is designed such, that the powder gases open the drive cage from the rear, as soon as the drive cage has left the barrel. In another known shell, the dynamic pressure, effective at the front of the shell, is supposed to pry open simultaneously from the front the drive cage, so that the segments remove themselves without or with only a slight rotary movement radially from the low caliber shell. The prying open of the segments by means of the powder gases leads to the abovementioned difficulties such, that the powder gases shortly surpassing the shell at the barrel mouth, do not amount to a regular quiet stream, rather contain strong turbulences, which lead to irregular release and for this

reason frequently interfere often with the target exactness.

It is one object of the present invention to provide a drive cage for wing-stabilized low caliber shells, in which the segments joined by at least one annular guide band to a drive cage in the center range of the shell body, upon leaving the barrel release themselves uniformly from the shell body such, that the shell is characterized by low starting oscillations and a high target exactness.

It is another object of the present invention to provide a drive cage for wing-stabilized low caliber shells, wherein a sealing disc disposed at the end face of the drive cage pointing towards the tail unit and a guide band adjacent the sealing disc are arranged, which both are separated from each other or comprise a single piece.

Another guide band is provided on the drive cage pointing towards the head of the shell. In connection with an end face pointing towards the head of the shell having a trough-like recess, the releasing process of the drive cage sets in with the shell, as soon as it has left the barrel, by air streaming in from the front. Only upon reaching a predetermined angular position of opened segments to the axis of the shell, the lifting of the rearward portion of the segments starts such, that an interference with the tail unit by the segments is in any case avoided.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawing, in which:

FIG. 1 is a partly axial section of a wing-stabilized low caliber shell;

FIG. 2 is an end elevation of the shell disclosed in FIG. 1 looking towards the head of the shell;

FIG. 3 is an elevation of a shell indicating the state in which the drive cage is released; and

FIG. 4 is a fragmentary axial section of a drive cage with a sealing disc having a guide band consisting of one piece at the rear end.

Referring now to the drawing, the present invention comprises a drive cage **1** which is divided into at least two, preferably three or more segments **1***a*, **1***b* and **1***c*. These segments are rigidly connected with the shell **2**, as long as the shell **2** equipped with a tail unit **3** is disposed in the barrel (not shown), by the non-positive connection means **4**, which are known in the form a thread or of grooves. The segments **1***a*, **1***b*, and **1***c* are held together by at least an annular band **5**, and additionally by a further band **6**, respectively. The bands **5** and **6** assumes simultaneously also the guidance of the drive cage **1** in the barrel. The tail unit **3** has preferably a smaller diameter than that of the barrel. It can have, however, also the same diameter as the bands **5** and **6** of the drive cage **1** and as the barrel, respectively, so that it contributes likewise to the guidance in the barrel. At the rear end of the drive cage **1** is secured a sealing disc **7**, which by gluing, injection molding or by other means is rigidly connected with the outswept tail of the drive cage **1**. The holding together of the segments during the transportation, the so-called transport safety, is assured as is the barrel safety by the bands **5** and **6** and/or the sealing disc **7**.

A particularly advantageous arrangement resides in the fact, that the sealing disc **7** and the adjacent band **5** are produced of a single part **17**. The advantage resides in the amplification of the out-swept tail of the drive cage and in an improved guiding- and sealing-function, as well as in a better securing possibility.

The operation of the present device is performed as follows:

As soon as the drive cage **1** has left the barrel mouth, powder gases rush up to about the point of the shell **2** or, depending upon the level of the mouth gas pressure and of the shell speed, still beyond that. The shell **2** to-

gether with the drive cage **1** receives thus a stream at first from the rear. The rear band **5** of the drive cage **1** in combination with the sealing disc **7** is designed such, that by the stream from behind no release of the drive cage **1** from the shell **2** can yet occur.

The releasing process starts only, when the front part of the drive cage **1** finds itself again in a uniform stream originating from the front and indicated by the stream lines **8**. The release, which is enhanced by the great, trough-like recess **9** of the drive cage **1** takes place by prying open the drive cage segments **1***a*, **1***b* and **1***c* from the front, as shown in FIG. 3. By the sealing disc **7** or by the band **5** provided at the rear end of the drive cage **1**, or by the combination of both elements in form of the part **17**, the drive cage segments are still held together in the rear, while they have been removed already from the shell **2** at the front. By variation of the thickness and rigidly of the sealing disc **7** and/or the band **5** and their combination, respectively, in form of the part **17**, the angular position α can be varied, in which also the rear part of the drive cage segments start to loose themselves. It is, thus, possible to influence the movements of the drive cage segments relative to the shell in desired manner.

As material for the sealing disc **7**, preferably the same synthetic material as used for the guide bands **5** and **6** is provided.

While we have discolsed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense.

We claim:

1. A wing-stabilized low-caliber shell, comprising

a shell body,

a drive cage surrounding in the center range said shell body and comprising segments including loosely joined parts,

at least one annular guide band holding together said segments,

a tail unit secured to said shell body,

said drive cage having a rear side end face adjacent said tail unit,

a sealing disc disposed on said rear side end face of said drive cage and disposed on said shell body forming on said shell body a rear inner edge,

said shell body having a head, and

said drive cage including a head side end face pointing to the head of said shell body, said head side end face having a trough-like recess extending over the entire diameter of said drive cage, whereby upon emergence of said shell body from a gun barrel the forming atmospheric pressure drives apart said segments away from said shell body pivotally about said inner edge constituting a pivot point until said sealing disc of the drive cage cooperates to form a destroying air wedge, which drives apart the segments into a position approximately parallel to the longitudinal axis of said shell body so that the distance spaced from each other is greater than the diameter of said tail unit.

2. The shell, as set forth in claim **1**, wherein

said sealing disc and said guide band are separated from each other.

3. The shell, as set forth in claim **1**, wherein

said sealing disc and said guide band are integral.

4. The shell, as set forth in claim **1**, which includes

a second guide band disposed on said drive cage and pointing to the head of said shell body.

References Cited

UNITED STATES PATENTS

2,998,778	9/1961	Hablutzel	102—93
3,107,615	10/1963	Brady	102—93 X
3,125,957	3/1964	Lipinski	102—93 X
3,262,391	7/1966	Shober	102—93
3,435,768	4/1969	Engel	102—93 X

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