

DESCRIPTION

**Projectile having a guide sabot and a pusher plate with
an acceleration-optimized opening**

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The invention relates to a projectile, in particular a sub-caliber dart projectile, having a drag-stabilizing, conical fin assembly with a truncated-conical recess.

10 In practice, sub-caliber projectiles have a discarding sabot in order to pull the projectile through the weapon barrel, and therefore to transmit force from the discarding sabot to the projectile.

15 A discarding sabot such as this is disclosed, for example, in DE 43 30 417 C2. This has a segmented, essentially hollow-cylindrical guide sabot and a driving element which is arranged on the guide sabot at the rear. The driving element is in this case formed by
20 a metal plate which has essentially the same contour as the truncated-conical recess in the fin assembly, and has a relatively small aperture hole in order to ignite the tracer charge, which can be initiated by pressure and is arranged at the rear in the projectile, when the
25 projectile is fired.

This known discarding sabot has the disadvantage that the production of the driving element is relatively complex and that this driving element is heavy (and the
30 proportion of dead load is therefore high).

DE 37 35 481 A1 furthermore discloses a sub-caliber dart projectile having an end area in the form of a solid cone which is arranged in a discarding sabot
35 which, at the rear, contains a solid metal plate, in the form of a disk, as a driving element. This metal plate is screwed into a segmented, cylindrical guide sabot.

This known driving element is also heavy and requires a relatively large amount of assembly effort for connection to the guide sabot.

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Finally, DE 33 18 972 A1 discloses a discarding sabot for a sub-caliber spinning projectile, which has a guide sabot and a driving element which is connected to it and is in the form of a cup. In this case, the base
10 of the driving element has a relatively thick wall and has an aperture bore, such that the propellant gases on firing the corresponding munition can act directly on the rear planar end surface of the projectile. The side walls of the driving element extend over more than 20%
15 of the length of the entire spinning projectile. This driving element in the form of a cup is also relatively complex to produce, and is heavy.

The invention is based on the object of specifying a
20 possible way to produce the driving element easily and such that its weight is lighter than that of known comparable discarding sabots.

According to the invention, this object is achieved by
25 the features of claim 1. Further particularly advantageous refinements of the invention are disclosed in the dependent claims.

The invention is essentially based on the idea that a
30 driving element is arranged behind the projectile and is designed such that it pushes the projectile through a weapon tube or barrel, and is not drawn out of the weapon barrel by a discarding sabot, in the known manner. The driving element is simply in the form of a
35 preferably metal plate which extends transversely with respect to the longitudinal axis of a sabot which acts only as a guide sabot, which metal plate is in the form of a disk and is mounted at the edge in a recess, which

is in the form of an annular groove, in the inner wall of the guide sabot, with the metal plate which is in the form of a disk having a central aperture hole whose diameter is as large as possible, but is less than the maximum diameter of the internal cone of the truncated-conical recess in the fin assembly. The inclusion of a pusher plate constructed in this way uses the gas pressure for the acceleration of the projectile in addition to the plate, and drives the projectile through the weapon barrel. The guide sabot therefore now acts only as a guide for the sub-caliber projectile and can be made lighter in weight than conventional discarding sabots. Particularly in the case of blank projectiles, this means that lighter-weight blank projectiles can be made available.

A driving element such as this in the form of a separate annular disk is produced easily and is light in weight. Furthermore, particularly when using a guide sabot composed of plastic, it can be connected in a simple manner to the material used for production of the guide sabot by extrusion coating its edge with the material that is used for production of the guide sabot. The aperture hole, which is as large as possible, in the annular disk results in the gas pressure forces acting on a considerably larger area of the conical fin assembly than if it were to act only on a closed metal plate in the form of a disk.

If a slotted conical fin assembly is used as the fin assembly, in which slots which are in the form of grooves and are inclined at the edge are incorporated in order to provide the projectile with a certain compensating spin after being fired, the diameter of the aperture hole in the metal plate which is in the form of a disk can be chosen such that it is smaller than the maximum diameter of the truncated-conical recess in the fin assembly which is not provided with

slots. This avoids the possibility of propellant charge gases emerging through the slots, which are in the form of grooves, at the side when the discarding sabot projectile is fired.

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In order to ensure good centering of the sub-caliber projectile, it has been found to be advantageous for the metal plate which is in the form of a disk to have a recess on its side facing the fin assembly of the corresponding projectile, for interlocking accommodation of the rear end area of the fin assembly.

The metal plate which is in the form of a disk can preferably be composed of a lightweight metal, for example an aluminum alloy or a magnesium alloy, or else may be composed of steel. It can be used not only for acceleration of sub-caliber live projectiles, but also for acceleration of sub-caliber blank projectiles.

In the case of projectiles in which the guide sabot is connected to the casing of the drive part via a casing cover, it is preferable for the metal plate which is in the form of a disk to have a tubular attachment at the rear for force-fitting connection to the casing cover, with the attachment being extrusion-coated with the material of the casing cover.

A type of pusher plate with an acceleration-optimized opening is proposed.

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Further details and advantages of the invention will become evident from the following exemplary embodiments, which will be explained with reference to figures, in which:

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Figures 1 and 2 show longitudinal sections through two exemplary embodiments of discarding sabots according to the

invention, with dart projectiles arranged in them.

In Figure 1, 1 denotes a projectile which, for example, is a 120 mm blank projectile which can be fired from a tank gun. The projectile has a sub-caliber dart projectile 2, for example composed of steel, and a sabot 7 which partially surrounds the dart projectile 2. At the rear, the dart projectile 2 has a conical fin assembly 4, with a truncated-conical recess 5. In addition, a tracer charge 6 is located in the rear end area of the dart projectile 2, and is preferably adhesively bonded in.

As a guide sabot for the projectile 1, the sabot 7 is essentially composed of an essentially hollow-cylindrical plastic, for example a glass-fiber-reinforced plastic, comprising two half shells (segments). A driving element 8 which is surrounded by the guide sabot is located at the rear of the guide sabot 7. The driving element 8 is formed by a metal plate (for example composed of an aluminum alloy) which extends transversely with respect to the longitudinal axis 9 of the guide sabot 7 (and therefore of the dart projectile 2 as well), and is in the form of a disk. The driving element 8 is mounted at the edge in a recess 10, which is in the form of an annular groove, in the guide sabot 7, for example by extrusion coating with the material of the guide sabot 7.

The driving element 8, which is in the form of a disk, has a central aperture hole 11 whose diameter 12 is as large as possible but is less than the maximum diameter 13 of the truncated-conical recess 5 in the fin assembly 4.

As can be seen from Figure 1, the driving element 8 which is in the form of a disk has a recess 14 on its side

facing the fin assembly 4 of the dart projectile 2, for interlocking accommodation of the rear end area of the fin assembly 4.

5 After the discarding sabot projectile 1 has been fired, the propellant charge gases which are formed in the corresponding weapon barrel push against the driving element 8, which is in the form of a disk, and against the inner walls of the conical fin assembly 4, as a
10 result of which the dart projectile 2 is accelerated both indirectly via the driving element 8 and directly by the propellant charge gases acting on the inner walls of the fin assembly 4.

15 Figure 2 shows a further exemplary embodiment of a projectile 1' with a guide sabot 7' according to the invention. In this case, the same reference symbols have been used for those components which carry out the same function as the components in the exemplary
20 embodiment illustrated in Figure 1.

As can be seen from Figure 2, the driving element, which is identified by the reference symbol 80 there, has a tubular attachment 15 at the rear on the metal
25 plate 8', which is in the form of a disk. A casing cover 16, which is composed of plastic or rubber, is molded onto this attachment 15 and, during the assembly of the prefabricated discarding sabot projectile 1', is connected to the outer surface of the casing of a
30 projectile drive part, which is not illustrated, in a manner which is known per se.

Furthermore, the reference symbol 17 denotes slots which are in the form of grooves and are incorporated
35 on the outside in the edge of the conical fin assembly 4' in order to produce a compensating spin during the flight of the dart projectile 2'. However, these slots 17 do not extend into the truncated-conical

recess 5, which means that the diameter 12 of the aperture hole 11 is not influenced by these slots 17.

List of reference symbols

	1,1'	Projectile
5	2,2'	Projectile, dart projectile
	4,4'	Fin assembly, conical fin assembly
	5	Truncated-conical recess
	6	Tracer charge
10	7,7'	Guide sabot
	8	Driving element, metal plate
	8'	Metal plate
	9	Longitudinal axis
	10	Recess in the form of an annular groove
15	11	Aperture hole
	12	Diameter (aperture hole)
	13	Maximum diameter (truncated-conical recess)
	14	Recess
	15	Attachment
20	16	Casing cover
	17	Slot
	80	Driving element

CLAIMS:

1. A sub-caliber projectile for a dart projectile, having a drag-stabilizing, conical fin assembly provided with a truncated-conical recess, wherein the sub-caliber projectile comprises:

- (a) a segmented, essentially hollow-cylindrical guide sabot; and
- (b) a driving element connected to the guide sabot at a rear portion of the sub-caliber projectile;

wherein the driving element is a flat, annular metal disk having first and second flat, parallel major surfaces that both extend transversely with respect to a longitudinal axis of the guide sabot;

wherein the disk is mounted at an edge of the sub-caliber projectile in a recess, wherein the recess is an annular groove formed in an inner wall of the guide sabot;

wherein the disk has a central aperture hole extending between the first and second flat, parallel major surfaces; and

wherein the diameter of the central aperture hole is as large as possible but is less than a maximum diameter of the truncated-conical recess formed in the fin assembly.

2. The projectile as claimed in claim 1, wherein the fin assembly is a slotted conical fin assembly, and wherein the diameter of the central aperture hole formed in the disk is less than the maximum diameter of that portion of the

truncated-conical recess formed in the fin assembly that is not provided with slots.

3. The projectile as claimed in claim 1, wherein the disk has a recess disposed on a side of the disk facing the fin assembly of the dart projectile for interlocking accommodation of a rear end area of the fin assembly.

4. The projectile as claimed in claim 1, wherein the disk comprises a lightweight metal.

5. The projectile as claimed in claim 1, wherein the hollow-cylindrical guide sabot comprises plastic.

6. A sub-caliber projectile for a dart projectile, having a drag-stabilizing, conical fin assembly provided with a truncated-conical recess, wherein the sub-caliber projectile comprises:

(a) a segmented, essentially hollow-cylindrical guide sabot; and

(b) a driving element connected to the guide sabot at a rear portion of the sub-caliber projectile;

wherein the driving element is a metal disk that extends transversely with respect to a longitudinal axis of the guide sabot,

wherein the disk is mounted at an edge of the sub-caliber projectile in a recess, wherein the recess is annular groove formed in an inner wall of the guide sabot;

wherein the disk has a central aperture hole, wherein the diameter of the central

aperture hole is as large as possible but is less than a maximum diameter of the truncated-conical recess formed in the fin assembly, and wherein the disk has a tubular attachment disposed at a rear portion of the disk for providing a force-fitting connection to a casing cover in order to connect the guide sabot to a projectile drive part.

7. The projectile as claimed in claim 2, wherein the disk has a recess disposed on a side of the driving element facing the fin assembly of the dart projectile for interlocking accommodation of a rear end area of the fin assembly.

8. The projectile as claimed in claim 2, wherein the disk comprises a lightweight metal.

9. The projectile as claimed in claim 3, wherein the disk comprises a lightweight metal.

10. The projectile as claimed in claim 7, wherein the disk comprises a lightweight metal.

11. The projectile as claimed in claim 5, wherein the plastic of the hollow-cylindrical guide sabot is a fiber-reinforced polyamide.

12. The projectile as claimed in claim 1, wherein the first and second major surfaces extend radially inward from an outer peripheral edge of the disk.