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GB-A- 191 125 850
US-A- 4 242 961
US-A- 4 384 529

ARTILLERY SHELL WITH A SEALING RING**DESCRIPTION**

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The invention concerns an artillery shell with a redesigned sealing ring.

From DE 10 2010 006 221 A1, a generic artillery shell is known that is described in detail below using Fig. 1. The artillery shell 1 that is represented is spin-
10 stabilised and comprises a shell casing 10 enclosed by a guide band 20 for transmitting spin. The shell casing 10 is further encompassed by a sealing ring 30. The sealing ring 30 is disposed at the rear of the guide band 20. The sealing ring 30, which comprises a peripheral seal profile, is retained in an outer groove 40 of the shell casing 10. The outer groove 40 comprises a groove base adjacent to a
15 front-side groove flank and a rear-side groove flank.

The artillery shell 1 illustrated in Fig. 1 is loaded by means of a semi-automatic loader in the case of the Armoured Howitzer 2000. During loading, the guide band 20 is pressed into the rifling of the barrel of the weapon 2. The sealing ring 30 is
20 made larger than the calibre for sealing and has the function of preventing the propellant gases from flowing past during the firing process. Said sealing ring 30 must engage in the rifling of the barrel of the weapon when loading the shell in order to guarantee a seal. This can result in stripping of or damage to the sealing ring 30. This can be caused by a plurality of individual faults that, if occurring in
25 combination, can promote the occurrence of a pattern of damage:

When feeding the ammunition into the barrel of the weapon, the shell 1 with the protruding guide band 20 or with the protruding sealing ring 30 is in contact with the loading cradle, so that the shell 1 does not come to lie exactly parallel to the
30 loading cradle. In combination with a non-optimally adjusted loading cradle, this can cause the shell 1 to not be loaded cleanly, i.e. not centrally.

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Consequently, increased jarring of the sealing ring 30 can occur in the transition region from the loading area into the barrel of the weapon 2. In the worst case, the sealing ring 30 can be jammed by the shell 1 or in the extreme case even broken. The latter represents a significant hazard to the operators in the loading area.

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- Destruction of the sealing ring 30 can be promoted by ageing-induced embrittlement of the plastic sealing ring, but also by low temperatures.

- In addition, it cannot be excluded that the fitting process also contributes to embrittlement of the sealing ring 30, because the sealing rings 30 are soaked to spread them.

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It is the object of the invention to design a sealing ring for a generic artillery shell in such a way that it is functionally reliable with a good sealing function even under extreme conditions.

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This object is achieved according to the invention by the features of Claim 1.

The advantages of the invention are based on a new form of the peripheral seal profile of the sealing ring. The peripheral seal profile of the sealing ring comprises a V shape that is open at the rear with a first leg and a second leg connected thereto. The V shape that is open at the rear causes the sealing effect to be increased with increasing pressure of the rear-side propellant gases. The first leg is a groove base leg that encloses the groove base. The second leg is a sprung sealing leg, the free end of which is sprung radially outwards, but that can be compressed until it can be fully accommodated by the outer groove and does not protrude. This avoids destruction, stripping from the shell or other damage.

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According to one embodiment of the invention, in a loading position, when the artillery shell is received by a barrel of the weapon before firing, a peripheral annular gap is formed between the groove-base leg and the sprung sealing leg, which enables propellant gases to flow in. The influx of the propellant gases causes

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the pressure of the propellant gases to spread the sprung sealing leg further, whereby the sealing effect is boosted by the pressure of the propellant gases.

According to a further embodiment of the invention, the sprung sealing leg is
5 chamfered at the free end thereof with widening of the annular gap. The widening of the annular gap facilitates an influx the propellant gases into the annular gap.

According to a further embodiment of the invention, the sprung sealing leg is made shorter than the groove-base leg with the formation of a peripheral entry opening
10 for propellant gases flowing into the annular gap. This represents a simple design option for making an entry opening for the annular gap.

The drawings are described briefly below. In the figures:

Fig. 1 shows an artillery shell according to the prior art, shown in a longitudinal
15 section,

Fig. 2 shows an artillery shell according to the invention with a redesigned sealing ring, also represented in a longitudinal section,

Fig. 3 shows the sealing ring represented in Fig. 2 and the near surroundings thereof as an enlarged detail.

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An exemplary embodiment of the invention is described below using Fig. 2 and Fig. 3. A spin-stabilised artillery shell 1 comprises a shell casing 10 that is enclosed by a guide band 20 for transmitting spin. The shell casing 10 is further encompassed by a sealing ring 30. The sealing ring 30 is disposed at the rear of the guide band
25 20. The sealing ring 30, which comprises a peripheral seal profile, is retained in an outer groove 40 of the shell casing 10.

Details of the artillery shell according to the invention are described using the enlarged detail in Fig. 3. As Fig. 3 primarily illustrates, the outer groove 40
30 comprises a groove base 41 bounded by a front-side groove flank 42 and a rear-side groove flank 43. The peripheral seal profile of the sealing ring comprises a V shape that is open at the rear with a first leg and a second leg connected thereto.

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The first leg is a groove-base leg 31 that encompasses the groove base 41. The second leg is a sprung sealing leg 32, the free end of which is sprung radially outwards. The V shape has a seal-assisting effect that increases with higher pressure of the propellant gases. The sprung sealing leg 32 can be compressed until it can
5 be fully accommodated by the outer groove 40 and does not protrude. Damage to the sealing ring 30 is avoided by this.

In the loading position that is represented in Fig. 3, when the artillery shell 1 is received by the barrel of the weapon 2 before firing, a peripheral annular gap 33 is
10 formed between the groove-base leg 31 and the sprung sealing leg 32 that enables the influx of propellant gases.

The sprung sealing leg 32 is chamfered at the free end thereof to widen the annular gap 33, whereby the propellant gases can penetrate into the annular gap 33 more
15 easily.

The sprung sealing leg 32 is made shorter than the groove-base leg 31 to form a peripheral entry opening 34 for propellant gases flowing into the annular gap 33.

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OPERATION:

Before loading the artillery shell 1, the sprung sealing leg 32 is spread wider than
5 in the loading position that is represented in Fig. 3. During the loading process, the
sprung sealing leg 32 is pressed against the sprung action thereof towards the
groove-base leg 31 and contacts the groove-base leg 31. In said position, there is
an annular gap 33 between the sprung sealing leg 32 and the groove-base leg 31.
During the firing process, the propellant gases flow into the annular gap 33. The
10 sprung sealing leg 32 is forced outwards into the rifling of the barrel of the weapon
2 by the increasing gas pressure in the annular gap 33. An initial reverse flow at
the sprung sealing leg 32 boosts the sealing effect owing to the Bernoulli effect,
because according to Bernoulli the reverse flow causes a contact pressure of the
sprung sealing leg 32 onto the inside of the barrel of the weapon.

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REFERENCE CHARACTER LIST

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1	artillery shell
2	barrel of the weapon
10	shell casing
20	guide band
30	sealing ring
31	groove-base leg
32	sprung sealing leg
33	annular gap
34	peripheral entry opening
40	outer groove
41	groove base
42	front-side groove flank
43	rear-side groove flank

P A T E N T K R A V

1. Artilleriprojektil (1) med følgende træk:

- 5 a) artilleriprojektilet (1) er spinstabiliseret og udviser et projektilhylster (10), der er omsluttet af et styrebånd (20) til spinoverføring,
- b) en tætningsring (30) griber endvidere om projektilhylsteret (10),
- c) tætningsringen (30) er anbragt bag styrebåndet (20),
- 10 d) tætningsringen (30), der udviser en rundtgående tætningsprofil, fastholdes i en ydre rille (40) i projektilhylsteret (10),
- e) den ydre rille (40) omfatter en rillebund (41), op til hvilken støder en rilleflanke (42) på bagsiden og en rilleflanke (43) på forsiden,

kendetegnet ved følgende træk:

- 15 f) tætningsringens (30) rundtgående tætningsprofil har en på bagsiden åben V-form med et første ben og et hermed forbundet andet ben,
- g) det første ben er et rillebundben (31), der omslutter rillebunden (41),
- h) det andet ben er et fjedrende tætningsben (32), hvis fri ende fjedrer radialt udad, men imidlertid kan trykkes så meget sammen, at det kan optages fuldstændigt af den ydre rille (40) og ikke rager ud.

20 2. Artilleriprojektil (1) ifølge krav 1, **kendetegnet ved, at** der i en ladestilling, når artilleriprojektilet (1) er optaget af et våbenløb (2) forud for en affyring, mellem rillebundbenet (31) og det fjedrende tætningsben (32) er dannet en rundtgående ringspalte (33), der muliggør indstrømning af drivgasser.

25 3. Artilleriprojektil ifølge krav 2, **kendetegnet ved, at** det fjedrende tætningsben (32) på sin fri ende er affaset under udvidelse af ringspalten (33).

30 4. Artilleriprojektil ifølge et af kravene 1 til 3, **kendetegnet ved, at** det fjedrende tætningsben (32) under dannelse af en rundtgående indløbsåbning (34) til i ringspalten (33) indstrømmende drivgasser er udformet kortere end rillebundbenet (31).

Fig. 1 (prior art)

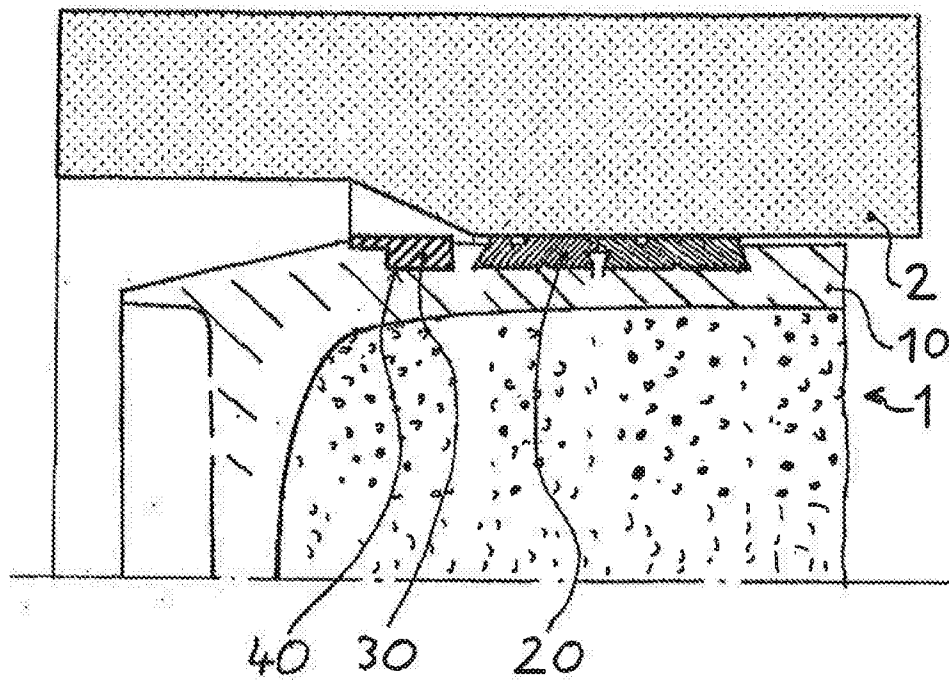


Fig. 2

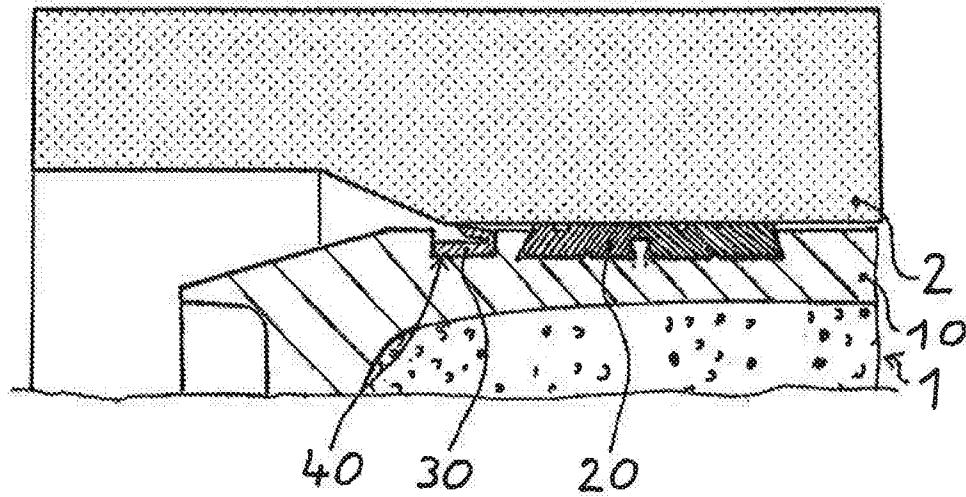


Fig. 3

