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(54) **Weapon of the countermass type and member for the closing off the countermass**

(57) The invention relates to a weapon (1) of the countermass type and to members (9) for closing off the countermass. As a result of the invention, a weapon of the countermass type and an openable closing member are produced which ensure that the same opening area is formed irrespective of generated gas pressure. This produces the least possible spread for the opening proc-

ess of the closing member and creates the optimal conditions for small recoil spreads. According to the invention, the weapon comprises an openable closing member having a ring (10), at least two lobed washers (13, 14) secured in the ring and having at least two lobes each (13.1-13.4 and 14.1-14.4), and a sealing member (11, 12) bearing against the lobed washers (13, 14).

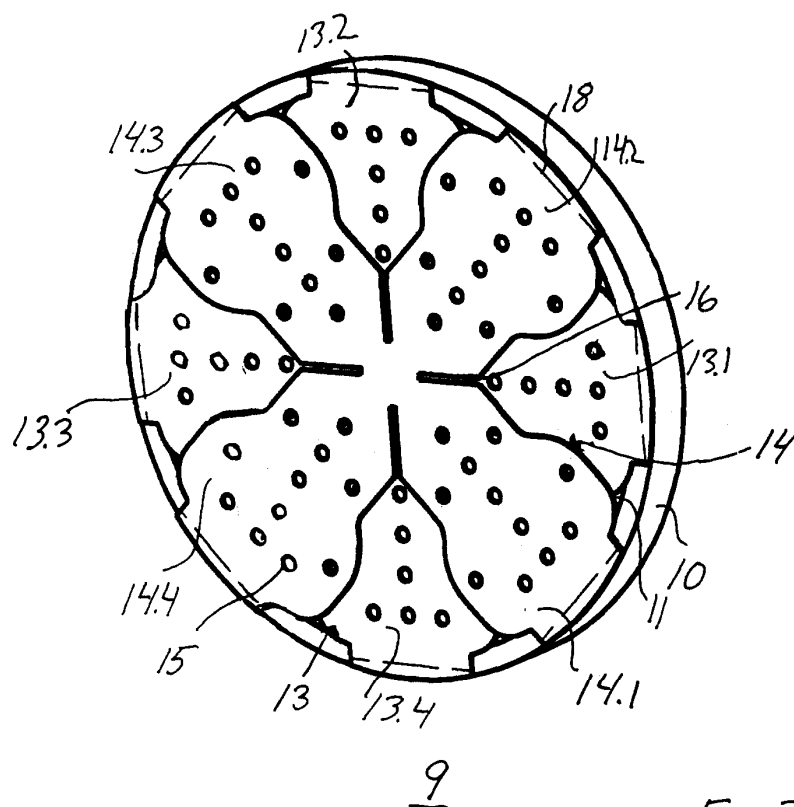


Fig. 2

Description

[0001] The present invention relates to a weapon of the counter-mass type, comprising a gun barrel having an ammunition part, such as a projectile or grenade, a counter-mass for lowering the pressure around the weapon and a loading chamber with charge, which loading chamber is disposed between the ammunition part and the counter-mass, the counter-mass being enclosed in the gun barrel of the weapon between openable closing members. The invention also relates to an openable closing member for closing off a counter-mass in the gun barrel of a weapon.

[0002] In order to increase the rearward momentum and hence allow an increase in the weight of the ammunition part without creating too high a pressure behind the weapon, it has been known for many years to introduce a so-called counter-mass. When the counter-mass leaves the rear part of the gun barrel, it expands and disintegrates. A cloud of liquid is created, which is rapidly slowed and produces a pressure-lowering effect in connection with the weapon. In this context, reference can be made to our SE patent 8205956-9, which shows an example of a weapon with counter-mass. Another example of a weapon with counter-mass is described in our Swedish patent application 0301627-6. Common to the said two patent documents is that the opening which is formed into the space containing the counter-mass, under the influence of the gas pressure emanating from the loading chamber, is smaller than the diameter of the gun barrel and hence has a throttling effect upon the gas flow. The area of the opening tends to vary under different conditions and is, inter alia, dependent on the gas pressure which is generated and which, in turn, inter alia, is dependent on the temperature of the weapon or of the counter-mass container, which can vary between -40° and $+60^{\circ}$.

[0003] A critical moment in a weapon with counter-mass is the opening phase for the counter-mass container. It is here important to obtain a symmetrical opening of the lid and base of the counter-mass can, in which all rupture perforations are simultaneously involved in the opening process. If any part of the lid or base is not opened concurrently with other parts, an asymmetrical flow is created in the counter-mass container, which can produce large transverse forces on the gun barrel and large recoil variations within the temperature range. It can also happen that fragments come away from the lid or base. Detached fragments give rise to high risk behind the weapon.

[0004] The object of the present invention is to produce a weapon of the counter-mass type and an openable closing member which ensure that the same opening area is formed irrespective of generated gas pressure. This produces the least possible spread for the opening process of the closing member and creates the optimal conditions for small recoil spreads.

[0005] The object of the invention is achieved by a

weapon characterized in that at least one of the openable closing members is configured to comprise a ring, at least two lobed washers secured in the ring and having at least two lobes each, and a sealing member bearing against the lobed washers, and by an openable closing member characterized in that it comprises a ring, at least two lobed washers secured in the ring and having at least two lobes each, and a sealing member bearing against the lobed washers. As a result of the invention, a weapon is obtained having an opening area to the counter-mass which is essentially equal in area to the cross-sectional area of the gun barrel and which opening area is independent of generated gas pressure. At the same time, a splinter is effectively prevented from coming away from the closing member and reaching the rear outlet of the gun barrel with risk of damage. As a result of the closing member having been configured with lobed washers, there are good prospects, inter alia, of directing the opening process to open at suitable gas pressure. As a result, inter alia, of the shape, number and material composition of the lobes being variable within broad limits, the configuration of the closing member is highly flexible. Moreover, the number of included lobed washers can also be varied, as can the configuration of the sealing member. All in order to optimize the opening process for the closing member to the particular gas pressure, gun barrel dimensions, etc.

[0006] It is particularly expedient if the closing member which is disposed on the side of the counter-mass lying opposite the loading chamber side is constituted by a closing member with ring, lobed washers and sealing member according to the previous paragraph.

[0007] According to an advantageous embodiment of the invention, the closing member is characterized in that the lobed washers are provided with holes and in that the sealing member is constituted by a sealing plate disposed on each side of the lobed washers, which sealing plates are mutually anchored by connections through the holes in the lobed washers. Advantageously, the sealing plates disposed on each side of the lobed washers are here constituted by vulcanized rubber which has been joined together by vulcanization. The placement of a sealing plate on each side of the lobed washers, with connection through the holes in the lobed washers, ensures that the counter-mass is well sealed during storage and transportation of a weapon, whilst, at the same time, the closing member is guaranteed to open up a large symmetrical opening when the weapon is activated and once appropriate gas pressure is reached. The use of vulcanized rubber for the sealing plates has the advantage that it is easy to apply with good adhesion, whilst, at the same time, the material remains watertight.

[0008] According to an expedient embodiment, the closing member comprises two lobed washers, each comprising four lobes, which lobed washers are arranged mutually rotated by 45 degrees. The arrangement allows the lobed washers secured in the ring to

cover, with partial overlap, the surface area enclosed by the ring, at the same time as the lobes allow a large opening to be formed when the closing member is put under pressure. The connection of the lobes to the ring is further ensured by the fact that each lobe has access to sufficient part of the ring for its connection and hence is in no danger of coming loose when the closing member is opened.

[0009] In order further to facilitate the opening process of the closing member, according to a preferred embodiment the lobed washers are secured in the ring along sections, of straight, rounded inner edge, disposed in the inner periphery of the ring. The straight edges give the lobes a well-defined bending of 90 degrees out from the position of the lobes when the closing member is closed and enable good bonding between lobes and ring, for example by laser welding.

[0010] In order to direct the opening process of the lobes, according to yet another preferred embodiment the central parts of the lobed washers can comprise slots directed toward the centre of the lobed washers.

[0011] The lobed washers of the closing member are proposed to be made of titanium, steel, nickel silver or aluminium, whilst the ring is proposed to be made of steel or aluminium. The proposed choices of material do not, however, preclude other material combinations.

[0012] The invention will be described in greater detail below by means of an illustrative embodiment, with reference to the appended drawings, in which:

Figure 1 shows diagrammatically, in a longitudinal section, a weapon of the counter-mass type according to the invention,

Figure 2 shows, in perspective view, an example of the configuration of a closing member according to the invention.

Figure 3 shows, in a diagrammatic exploded view in perspective, the configuration of a closing member according to Figure 2, somewhat modified in terms of its sealing member.

[0013] The counter-mass-type weapon 1 shown in Figure 1 comprises a diagrammatically illustrated gun barrel 2, comprising an ammunition part 3 in the form of a projectile 4, a loading chamber 5 containing a charge 6, and a counter-mass 7. The counter-mass 7 is enclosed between a front and a rear openable closing member 8 and 9 respectively. A closing member which is especially suitable as the rear closing member will be described in greater detail below with reference to Figures 2-3. A number of suitable materials are available as the counter-mass and salt solutions can be cited as examples of suitable materials.

[0014] The openable closing member 9 is now described in greater detail with reference to Figures 2 and 3.

[0015] As can most clearly be seen from Figure 3, the closing member 9 comprises a ring 10, a sealing member consisting of two sealing plates 11, 12, and two lobed washers 13, 14 enclosed in the sealing member. The embodiment in Figure 2 differs from the embodiment in Figure 3 by virtue of the fact that the sealing member only comprises one sealing plate 11. Alternatively, the embodiment in Figure 2 can be seen as the embodiment in Figure 3 minus one of the sealing plates 12. In the shown illustrative embodiment having two lobed washers 13, 14, each lobed washer has been configured with four lobes 13.1-13.4 and 14.1-14.4, respectively. The lobes are provided with small holes 15. The lobed washers are further provided with slots 16 in central parts and extending toward the centre of the lobed washer. The lobed washers 13, 14 are mutually rotated by 45 degrees and are configured such that the lobes 13.1-13.4 of the lobed washer 13 partially overlap the lobes 14.1-14.4 of the lobed washer 14. The lobes are secured in the ring 10 in a suitable manner, for example by laser welding, in bearing surfaces 17 having straight edges 18. In the embodiment according to Figure 2, the sealing member is constituted by a sealing plate 11 on the rear side of the illustrated lobed washers 14, 15, whilst the sealing member according to Figure 3 is constituted by two sealing plates 11, 12 disposed on either side of the lobed washers 14, 15. The sealing member can be glued in place on the lobed washers. Through the use of vulcanizable material, it is possible, as an alternative, for the sealing plate(s) to be fitted by vulcanization and for the holes 15 made in the lobes of the lobed washers to herein contribute to the bonding of the plates.

[0016] The process of activating the weapon is described in greater detail below with reference to the previously described figures.

[0017] When the weapon is activated, a gas pressure is delivered against the closing member 8 from the loading chamber. When the gas pressure reaches the pressure level at which the closing member 8 is dimensioned to open, the closing member 8 opens up into the counter-mass 7. The counter-mass 7 is now put under pressure. The pressure is relayed by the counter-mass 7 to the rear closing member 9, which is opened once the predetermined bursting pressure has been reached, and the counter-mass 7 is forced out through the outlet 19 of the gun barrel 2. As the closing members are opened, the lobes 13.1-13.4 and 14.1-14.4 of the respective lobed washers will be separated from each other in the central part of the lobed washers under the guiding influence of the slots 16. The lobes are then bent out by approximately 90 degrees against the edges 18 of the bearing surfaces 17. The sealing plates are simultaneously broken open and follow the motion of the lobes when they are bent out.

[0018] The invention is not limited to the embodiments shown above by way of example but can undergo modifications within the scope of the following patent claims.

Claims

1. Weapon of the counter-mass type, comprising a gun barrel having an ammunition part, such as a projectile or grenade, a counter-mass for lowering the pressure around the weapon and a loading chamber with charge, which loading chamber is disposed between the ammunition part and the counter-mass, the counter-mass being enclosed in the gun barrel of the weapon between openable closing members, **characterized in that** at least one of the openable closing members is configured to comprise a ring, at least two lobed washers secured in the ring and having at least two lobes each, and a sealing member bearing against the lobed washers. 5 10 15
2. Weapon according to Patent claim 1, **characterized in that** at least the closing member which is disposed on the side of the counter-mass lying opposite the loading chamber side is constituted by a closing member according to Patent Claim 1. 20
3. Openable closing member for closing off a counter-mass in the gun barrel of a weapon, **characterized in that** it comprises a ring, at least two lobed washers secured in the ring and having at least two lobes each, and a sealing member bearing against the lobed washers. 25
4. Openable closing member according to Patent Claim 3, **characterized in that** the lobed washers are provided with holes and **in that** the sealing member is constituted by a sealing plate disposed on each side of the lobed washers, which sealing plates are mutually anchored by connections through the holes in the lobed washers. 30 35
5. Openable closing member according to Patent Claim 4, **characterized in that** the sealing plates disposed on each side of the lobed washers are constituted by vulcanized rubber which has been joined together by vulcanization. 40
6. Openable closing member according to any one of Patent Claims 3-5, **characterized in that** the closing member comprises two lobed washers, each comprising four lobes, which lobed washers are arranged mutually rotated by 45 degrees. 45
7. Openable closing member according to any one of Patent Claims 3-6, **characterized in that** the central parts of the lobed washers comprise slots directed toward the centre of the lobed washers. 50
8. Openable closing member according to any one of Patent Claims 3-7, **characterized in that** the lobed washers are secured in the ring along sections, of straight, rounded inner edge, disposed in the inner periphery of the ring. 55
9. Openable closing member according to any one of Patent Claims 3-8, **characterized in that** the lobed washers are made of titanium, steel, nickel silver or aluminium and the ring is made of steel or aluminium.
10. Openable closing member according to any one of Patent Claims 3-9, **characterized in that** the lobed washers are secured in the ring by means of weld joints.

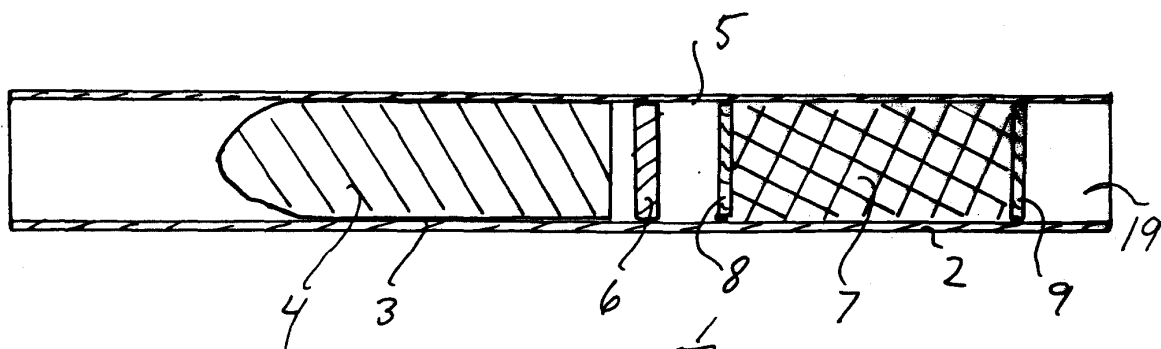


Fig. 1

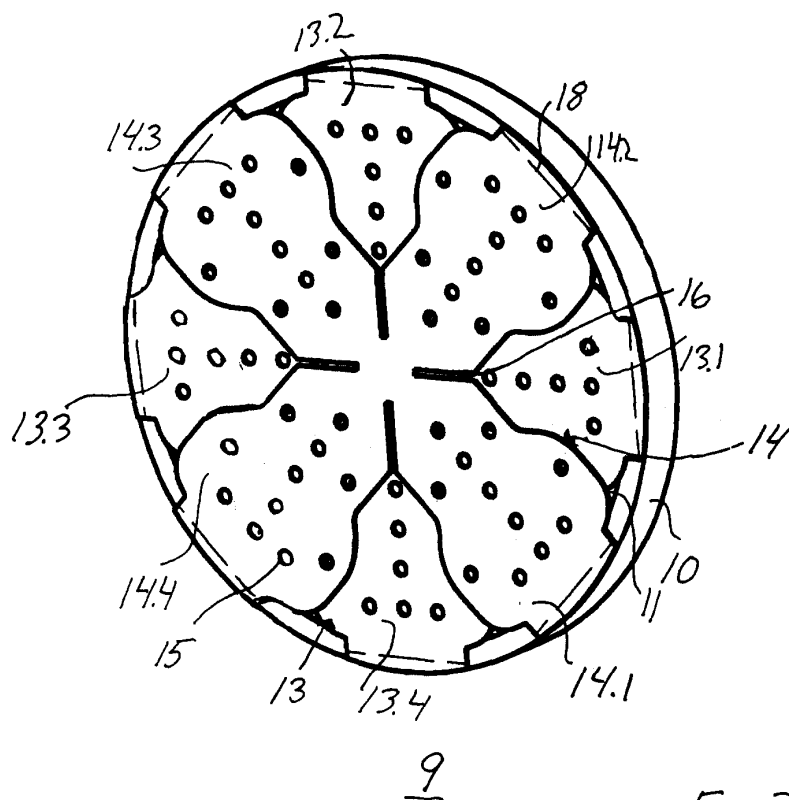
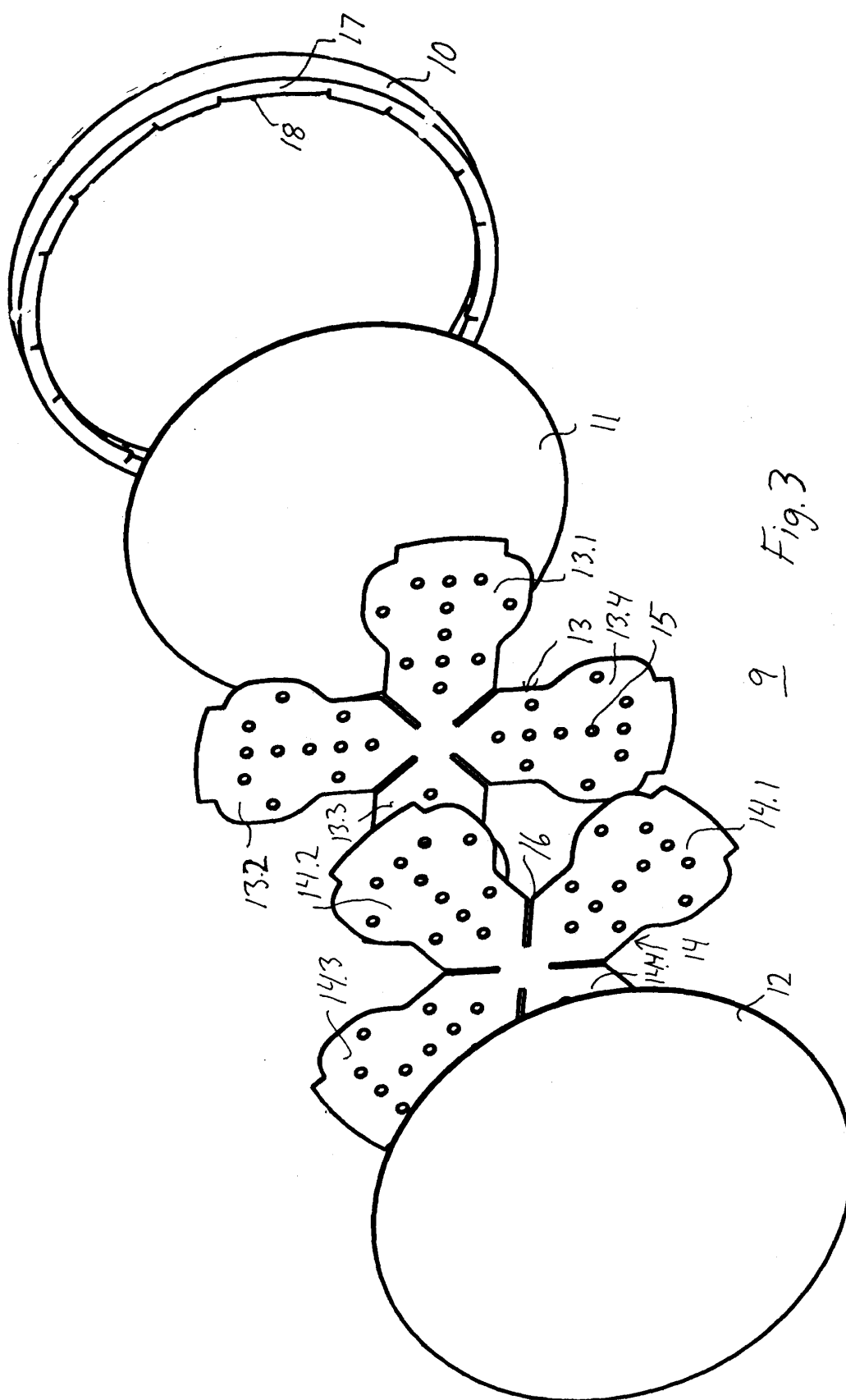


Fig. 2





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 44 5043

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A,D	GB 2 129 105 A (AFFARSVERKET FFV) 10 May 1984 (1984-05-10) * abstract * * page 1, lines 75-83,103-105 * * page 1, line 127 - page 2, line 1 * * page 2, lines 19-48 * * figure 1 *		F41A1/10
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A	US 4 902 043 A (CAROLL ET AL) 20 February 1990 (1990-02-20) * abstract * * column 3, lines 34-49 * * column 4, lines 12-15 * * figures 1,3,4 *		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 August 2004	Examiner Menier, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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