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SPIN-STABILIZED PROJECTILE WITH A PAYLOAD

The invention relates to a spin-stabilized projectile with a payload according to the concept of Patent Claim 1.

The practical use of such a projectile has become known in conjunction with an anti-missile system in which an airborne target is detected by a fire-control system, tracked and a gun is automatically guided. The projectile flight-time calculations are carried out, and on firing the actualized fuse-setting time is inductively transmitted for each projectile via a programming coil to the time fuse so as to ensure ejection of the payload, for example sub-projectiles, directly in front of the airborne target. However, there is a danger on ejection of the payload that the payload is unfavourably affected in its trajectory by portions of the projectile body or by excessive pressure-loading of the ejection charge.

It is an object of the invention to ensure that the ejection of the payload is essentially free of interference and even. This is achieved according to the invention by the features in the characterizing portion of Patent Claim 1.

It is advantageous to place nominal breaking points in the longitudinal direction in the operational chamber and, when a payload of sub-projectiles is used, a special coaxial arrangement of the sub-projectiles and to secure them against rotation during acceleration of the projectile by way of recesses in the projectile body in the region of the operational chamber.

An exemplary embodiment of the spin-stabilized projectile with a payload will now be described in detail, based on drawings. Shown are, in

Fig. 1: a longitudinal cross-section of an inventive spin-stabilized projectile with a payload of sub-projectiles;

Fig. 2: a cross-section along the line II - II of Fig. 1; and

Fig. 3: a dispersion picture of a projectile as in Figs. 1 and 2.

According to Fig. 1, a spin-stabilized projectile comprises a projectile body 1, a ballistic cap 2 attached to the front of the projectile body 1 and a fuse 3 attached to the aft section of the projectile body 1, in the

present example designed as a programmable time fuse 3. However, it is feasible to use a different type of fuse, for example a range fuse which is triggered by transmission means. The projectile body 1 further comprises an operational chamber 4 for a therein fixed payload 5, a fuse chamber 6 which is arranged behind the operational chamber 4 and partially separated by a web 7, a guide band 8 and grooves 9 for mounting to a conventional cartridge (not illustrated). A holding bolt 10 fixes the payload 5 in the axial direction and connects the projectile body 1 and ballistic cap 2. A conventional time-delay fuse 3, which is mounted in the fuse chamber 6, comprises a fuse housing 11, a data receive coil 12, a power supply 13, for example with power generator, an electronic time-fuse module 14, a fuse 15, a detonator 16 and an ejection charge 17.

According to the invention, the ejection charge 17 is provided in the form of an explosive charge 17 which is fitted in the radial direction with saturated contact in the fuse or time fuse 3 and/or in the projectile body 1 and in the axial direction with a cushioning gap 18 to the web 7. The explosive charge 17 can be arranged directly in the projectile body 1, in which case the explosive train to the fuse or the time fuse 3 or the detonator 16 is to be guaranteed. The cushioning gap 18 can be established in the form of an air gap between web 7 and explosive charge 17 as in Fig. 1 or, for example, in the form of a material with cushioning properties for the detonation shockwave arranged between web 7 and explosive charge 17.

According to Figs. 1 and 2, the payload 5 of this exemplary embodiment consists of a plurality of cylindrical sub-projectiles 20 of heavy metal which form coaxially arranged sub-projectile columns 21 in the operational chamber 4. Eight sub-projectiles arranged on top of each other form a respective column 21, and nineteen such columns 21 as in Fig. 2 are fixed in the axial direction in the operational chamber 4 by the holding bolt 10. The projectile body 1 is then preferably designed as a hollow cylinder 22 in the area of the operational chamber 4 and provided with additional recesses 23. According to Fig. 2, six recesses 23 are provided which are cross-sectionally eccentric and in the shape of a sector of a circle. These



recesses 23, on the one hand, hold the sub-projectiles 20 or the sub-projectile columns 21 alongside each other, and they are in addition to the holding bolt 10 secured against rotation and, on the other hand, longitudinal breaking points 24 are formed at the thinnest wall thickness on the projectile body.

The spin-stabilized projectile operates as follows: When the fuse 15 is ignited, the payload 5 or the sub-projectiles 20 are ejected by the detonator 16 and the explosive charge 17. Due to the arrangement of the explosive charge 17, the shockwaves of the detonation act in the radial direction at the time and in the axial direction with a time delay. This causes the projectile body 1 to be laterally torn open in the area of the guide band 8 and the operational chamber 4 is laterally opened from the rear along the nominal breaking points 24 from the rear, for example the way a banana is peeled, and its lateral portions are hurled away assisted by centrifugal loads. Due to the cushioning gap 18, the payload 5 is only slightly pressure-loaded, causing the sub-projectiles 20 to be released with a time delay and practically without interference. The heavy metal sub-projectiles illustrated as a payload 5 then fly individually and spin-stabilized at an acute dispersion angle towards the target.

The dispersion picture of such a projectile with 152 sub-projectiles 20 as illustrated in Fig. 3 very nicely documents the coaxial arrangement of the nineteen sub-projectile columns 21 with their respective eight sub-projectiles 20 in the operational chamber 4 and a practically interference-free ejection. For example, the framed point spiral 25 originates from a sub-projectile column 21 with greater coaxial distance to the projectile axis, and point 26 originates from a sub-projectile 20 on web 7.

It is also possible to provide a payload 5 in the form of sub-projectiles of a different design and arrangement or CHAFF or FLARE payloads for the purpose of producing decoy targets or flaring an airborne target.



Patent Claims

1: A spin-stabilized projectile with a payload (5), comprising:

- a projectile body (1),
- a ballistic cap (2) accommodated at the front of the projectile body (1),
- an operational chamber (4) within the projectile body (1) for a therein fixed payload (5),
- a fuse chamber (6) arranged in the projectile body (1) behind the operational chamber,
- a fuse (3) mounted in the fuse chamber (6), and
- an ejection charge (17) for ejecting the payload (5), arranged to be separated from the operational chamber (4) by a web (7),

characterized in that the ejection charge (17) is an explosive charge (17) which is arranged in the radial direction with saturated contact to the projectile body (1) and in the axial direction with a cushioning gap (18) towards the web (7).

2: A spin-stabilized projectile according to claim 1, characterized in that nominal breaking points (24) are provided on the projectile body (1) in the area of the operational chamber (4) so as to achieve lateral opening of the operational chamber (4) from the rear by means of the explosive charge 17.

3: A spin-stabilized projectile according to claim 2, characterized in that the payload (5) is composed of a plurality of cylindrical sub-projectiles (20) of heavy metal, which establish coaxially arranged sub-projectile columns (21) in the operational chamber (4).

4: A spin-stabilized projectile according to claim 3, characterized in that the projectile body (1) has in the area of the operational space (4) as a hollow cylinder (22) additional recesses (23) in the axial direction so as to, on the one hand, hold the sub-projectiles (20) rotationally secured together and, on the other hand, to form the nominal breaking points (24).



- 5: A spin-stabilized projectile according to claim 4, characterized in that the sub-projectiles (20) are in the axial direction fixed by a holding bolt (10) provided at the front of the projectile body (1).

**Legend**

- 1 Projectile Body
- 2 Ballistic Cap
- 3 Fuse, Programmable Time Fuse
- 4 Operational Chamber
- 5 Payload
- 6 Fuse Chamber
- 7 Web
- 8 Guide Band
- 9 Grooves
- 10 Holding Bolt
- 11 Fuse Housing
- 12 Data Receive Coil
- 13 Power Supply
- 14 Electronic Time-Fuse Module
- 15 Igniter
- 16 Detonator
- 17 Ejection Charge, Explosive Charge
- 18 Cushioning Gap
- 19
- 20 Sub-Projectiles
- 21 Sub-Projectile Columns
- 22 Hollow Cylinder
- 23 Recesses
- 24 Breaking Points
- 25 Point Spiral
- 26 Point

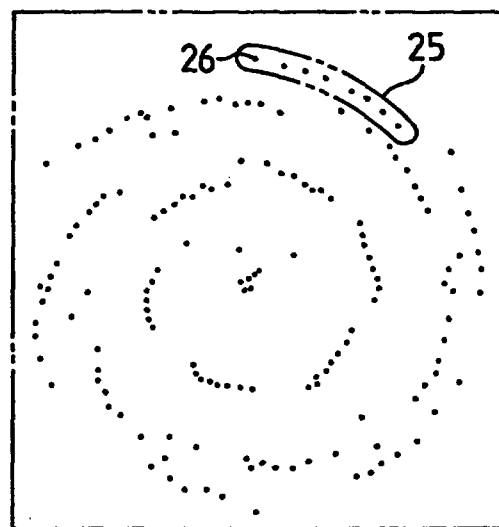
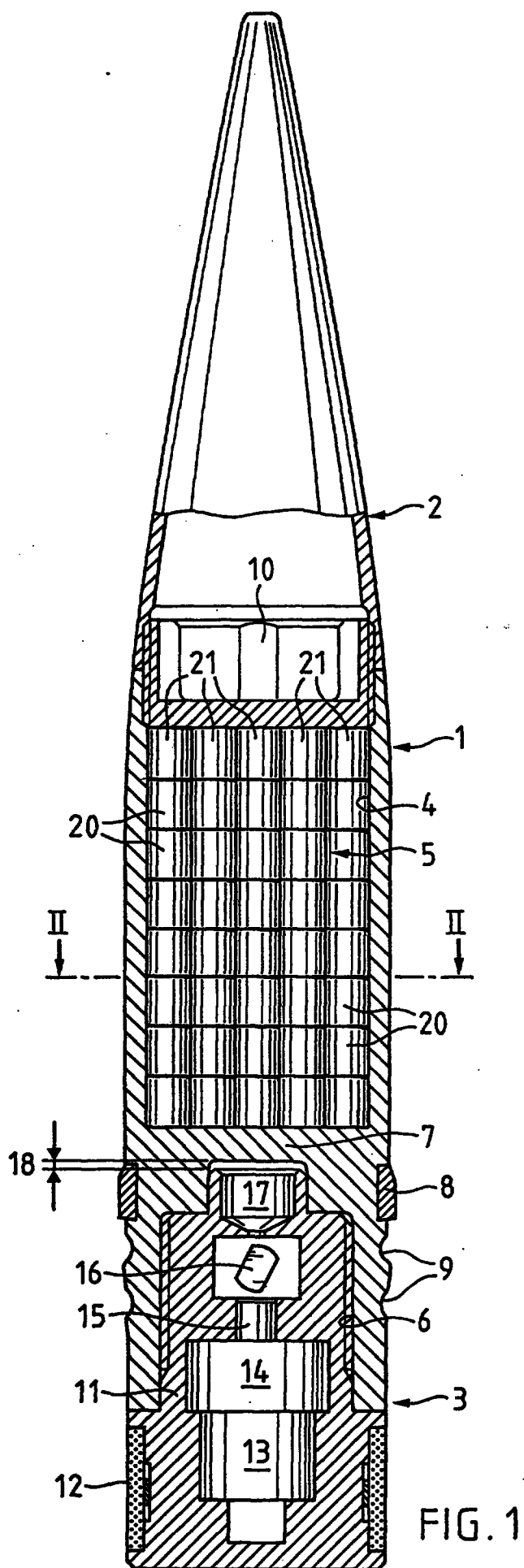


FIG. 3

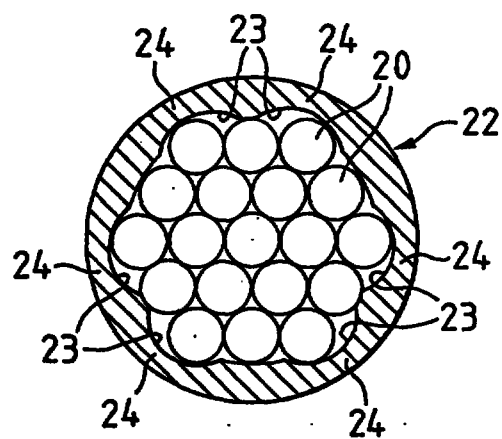


FIG. 2



Abstract

Spin-stabilized Projectile with Payload

The payload (5) of a projectile of this type should not be unfavourably affected in its further trajectory by portions of the projectile body (1) during ejection. In order to achieve virtually interference-free ejection of the payload (5), it is suggested according to the invention to provide an ejection charge in the form of an explosive charge (17) which is arranged in the radial direction with saturated contact to the projectile body (1) and in the axial direction to a cushioning gap (18) to a web (7).

Fig. 1

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The practical use of such a projectile has become known in conjunction with an anti-missile system in which an airborne target is detected by a fire-control system, tracked and a gun is automatically guided. The projectile flight-time calculations are carried out, and on firing the actualized fuse-setting time is inductively transmitted for each projectile via a programming coil to the time fuse so as to ensure ejection of the payload, for example sub-projectiles, directly in front of the airborne target. However, there is a danger on ejection of the payload that the payload is unfavourably affected in its trajectory by portions of the projectile body or by excessive pressure-loading of the ejection charge.

It is an object of the invention to ensure that the ejection of the payload is essentially free of interference and even. This is achieved according to the invention by the features in the characterizing portion of Patent Claim 1.

It is advantageous to place nominal breaking points in the longitudinal direction in the operational chamber and, when a payload of sub-projectiles is used, a special coaxial arrangement of the sub-projectiles and to secure them against rotation during acceleration of the projectile by way of recesses in the projectile body in the region of the operational chamber.

An exemplary embodiment of the spin-stabilized projectile with a payload will now be described in detail, based on drawings. Shown are, in

Fig. 1: a longitudinal cross-section of an inventive spin-stabilized projectile with a payload of sub-projectiles;

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Fig. 3: a dispersion picture of a projectile as in Figs. 1 and 2.

According to Fig. 1, a spin-stabilized projectile comprises a projectile body 1, a ballistic cap 2 attached to the front of the projectile body 1 and a fuse 3 attached to the aft section of the projectile body 1, in the

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present example designed as a programmable time fuse 3. However, it is feasible to use a different type of fuse, for example a range fuse which is triggered by transmission means. The projectile body 1 further comprises an operational chamber 4 for a therein fixed payload 5, a fuse chamber 6 which is arranged behind the operational chamber 4 and partially separated by a web 7, a guide band 8 and grooves 9 for mounting to a conventional cartridge (not illustrated). A holding bolt 10 fixes the payload 5 in the axial direction and connects the projectile body 1 and ballistic cap 2. A conventional time-delay fuse 3, which is mounted in the fuse chamber 6, comprises a fuse housing 11, a data receive coil 12, a power supply 13, for example with power generator, an electronic time-fuse module 14, a fuse 15, a detonator 16 and an ejection charge 17.

According to the invention, the ejection charge 17 is provided in the form of an explosive charge 17 which is fitted in the radial direction with saturated contact in the fuse or time fuse 3 and/or in the projectile body 1 and in the axial direction with a cushioning gap 18 to the web 7. The explosive charge 17 can be arranged directly in the projectile body 1, in which case the explosive train to the fuse or the time fuse 3 or the detonator 16 is to be guaranteed. The cushioning gap 18 can be established in the form of an air gap between web 7 and explosive charge 17 as in Fig. 1 or, for example, in the form of a material with cushioning properties for the detonation shockwave arranged between web 7 and explosive charge 17.

According to Figs. 1 and 2, the payload 5 of this exemplary embodiment consists of a plurality of cylindrical sub-projectiles 20 of heavy metal which form coaxially arranged sub-projectile columns 21 in the operational chamber 4. Eight sub-projectiles arranged on top of each other form a respective column 21, and nineteen such columns 21 as in Fig. 2 are fixed in the axial direction in the operational chamber 4 by the holding bolt 10. The projectile body 1 is then preferably designed as a hollow cylinder 22 in the area of the operational chamber 4 and provided with additional recesses 23. According to Fig. 2, six recesses 23 are provided which are cross-sectionally eccentric and in the shape of a sector of a circle. These



recesses 23, on the one hand, hold the sub-projectiles 20 or the sub-projectile columns 21 alongside each other, and they are in addition to the holding bolt 10 secured against rotation and, on the other hand, longitudinal breaking points 24 are formed at the thinnest wall thickness on the projectile body.

The spin-stabilized projectile operates as follows: When the fuse 15 is ignited, the payload 5 or the sub-projectiles 20 are ejected by the detonator 16 and the explosive charge 17. Due to the arrangement of the explosive charge 17, the shockwaves of the detonation act in the radial direction at the time and in the axial direction with a time delay. This causes the projectile body 1 to be laterally torn open in the area of the guide band 8 and the operational chamber 4 is laterally opened from the rear along the nominal breaking points 24 from the rear, for example the way a banana is peeled, and its lateral portions are hurled away assisted by centrifugal loads. Due to the cushioning gap 18, the payload 5 is only slightly pressure-loaded, causing the sub-projectiles 20 to be released with a time delay and practically without interference. The heavy metal sub-projectiles illustrated as a payload 5 then fly individually and spin-stabilized at an acute dispersion angle towards the target.

The dispersion picture of such a projectile with 152 sub-projectiles 20 as illustrated in Fig. 3 very nicely documents the coaxial arrangement of the nineteen sub-projectile columns 21 with their respective eight sub-projectiles 20 in the operational chamber 4 and a practically interference-free ejection. For example, the framed point spiral 25 originates from a sub-projectile column 21 with greater coaxial distance to the projectile axis, and point 26 originates from a sub-projectile 20 on web 7.

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Legend

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characterized in that the ejection charge (17) is an explosive charge (17) which is arranged in the radial direction with saturated contact to the projectile body (1) and in the axial direction with a cushioning gap (18) towards the web (7).

2: A spin-stabilized projectile according to claim 1, characterized in that nominal breaking points (24) are provided on the projectile body (1) in the area of the operational chamber (4) so as to achieve lateral opening of the operational chamber (4) from the rear by means of the explosive charge 17.

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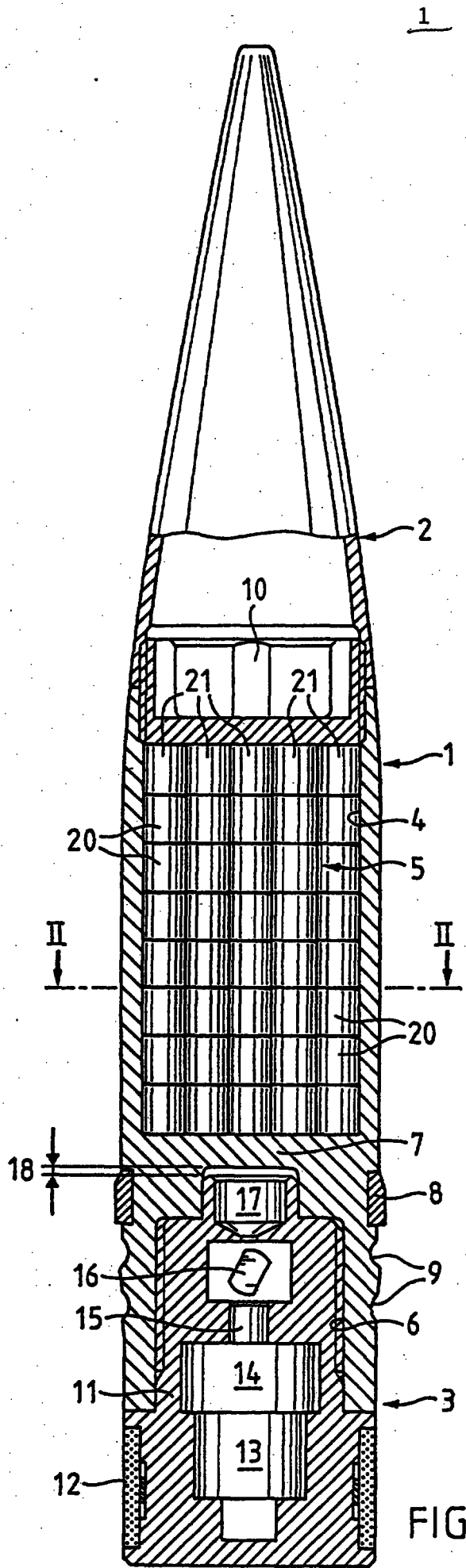


FIG. 1

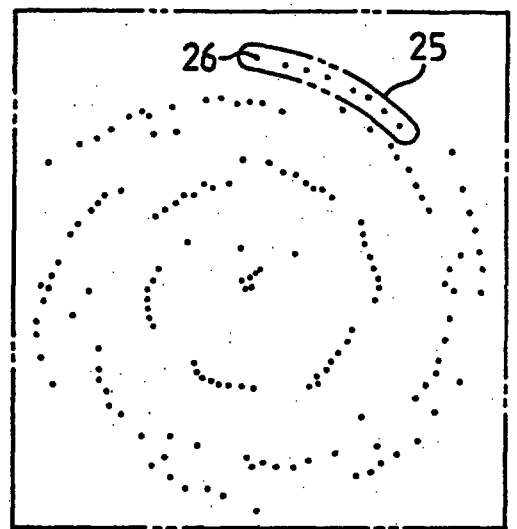


FIG. 3

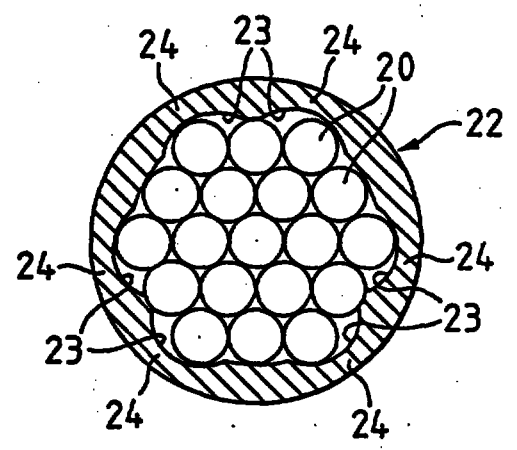


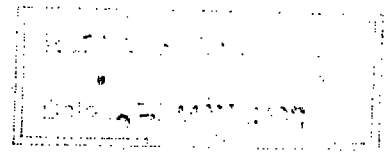
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