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(54) **Countermeasure lauch tube shutter**

Abdichtung eines Abschussrohres für das Erbringen von Gegenmassnahmevorrichtungen

Obturateur de tube de lancement de contre-mesures

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Description

[0001] The present invention relates to a countermeasure launch tube shutter.

[0002] Countermeasure (jammer or decoy) launch devices are known comprising a launch tube housing the countermeasure; a compressed-gas cylinder; and a system for feeding gas from the cylinder to the launch tube.

[0003] Known countermeasures are divided into two categories:

- jammers, which produce a high-intensity, wide-band signal to prevent reception/pickup of the echo produced by a vessel hit by a search signal from an attaching torpedo;
- decoys, which simulate the physical behaviour of a vessel with respect to an incident search signal from an attacking torpedo; the received signal is processed to produce a response signal, which is transmitted by an output transducer on the countermeasure so as to be mistaken by the attacking torpedo for an echo from a real target.

[0004] Countermeasures of the above types comprise an elongated cylindrical casing with an ogival front end, and a rear end housing propulsion means.

[0005] Currently used launch systems employ extremely high-pressure gas (of 300 bars or more) to impart a high degree of acceleration to the cylindrical casing as it leaves the launch tube.

[0006] In fact, for safety reasons, and for it to be effective, the countermeasure must be distanced as far and as fast as possible from the launch tube.

[0007] The thrust exerted on the elongated cylindrical casing is such as to fire it at high speed from the launch tube.

[0008] Launch tubes are fitted with shutters, which are kept closed when the countermeasure is in storage (to keep seawater out of the launch tube), and which are opened to fire the countermeasure, and then closed again.

[0009] The shutters are operated by mechanical actuators, with the aid of sensors for determining the open/closed position of the shutter.

[0010] As a result, the shutters are fairly complex electromechanically, and are intrinsically fragile.

[0011] EP-2.107.330 discloses a shutter as set in the preamble of claim 1.

[0012] It is an object of the present invention to provide an all-mechanical shutter, which comprises a small number of component parts, is of sturdy, straightforward design, and is highly watertight and cheap to produce.

[0013] According to the present invention, there is provided a countermeasure launch tube shutter as claimed in Claim 1.

[0014] A preferred, non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows an exploded view in perspective of a countermeasure launch tube shutter in accordance with the teachings of the present invention;

Figure 2 shows a view in perspective of the shutter in a first operating position;

Figure 3 shows a view in perspective of the shutter in a second operating position;

Figure 4 shows a larger-scale cross section of a portion of the shutter.

[0015] Number 1 in Figure 1 indicates as a whole a shutter in accordance with the teachings of the present invention.

[0016] Shutter 1 is designed to fit to a front end portion 3a of a launch tube 3 (shown schematically in Figure 1) for launching a known countermeasure 4 (e.g. a jammer or decoy).

[0017] Launch tube 3 is cylindrical, and houses countermeasure 4, which comprises an elongated cylindrical casing 5 with an ogival front portion 6.

[0018] Shutter 1, when closed, must keep seawater out of launch tube 3, to prevent corrosion of the countermeasure, and must open to fire countermeasure 4 from launch tube 3.

[0019] Launch tube 3 is equipped with a gas feed system (not shown) for feeding high-pressure (e.g. 300-bar) gas from a cylinder (not shown) to expel casing 5 from the launch tube in known manner.

[0020] Examples of gas feed systems are described in European Patents EP-B-2.019.035 and EP-B-2.022.716 filed by the Applicant.

[0021] Shutter 1 comprises a flat, rectangular supporting wall 10 (preferably with a square perimeter) with a circular central through opening 12 (Figure 3) of a diameter D substantially equal to the inside diameter of launch tube 3.

[0022] According to the present invention, shutter 1 comprises:

- a first flexible panel 15 fitted to supporting wall 10, and which, when undeformed and at rest, closes a first portion of central opening 12; and
- a second flexible panel 16 fitted to supporting wall 10, and which, when undeformed and at rest, closes a second portion of central opening 12.

[0023] First and second panel 15, 16 have facing edges forming an overlap 17, so that, when undeformed, the first and second panel fully close central opening 12.

[0024] As front portion 6 of countermeasure 4 moves through central opening 12, first and second panel 15, 16 flex and deflect to permit expulsion of countermeasure 4 through shutter 1, which is opened by the forward movement of countermeasure 4.

[0025] Once countermeasure 4 is expelled, panels 15, 16 spring back to the undeformed position to close central opening 12 automatically.

[0026] Opening and immediate closure of shutter 1 are

both achieved passively, the former by passage of countermeasure 4, and the latter using panels 15, 16 of appropriate, highly resilient plastic material with a poor deformation memory, so shutter 1 functions entirely with no need for dedicated actuators or electronic components.

[0027] First and second panel 15, 16 are typically rectangular, and each comprise an edge 15a, 16a, opposite overlap 17, fixed firmly to supporting wall 10 along a straight axis H perpendicular to the axis of launch tube 3 and defining an instantaneous hinge axis of panel 15, 16. More specifically, each edge 15a, 16a is fixed firmly by an elongated C-shaped wall 20 placed along edge 15a, 16a and fixed by screws 21 to supporting wall 10. Elongated C-shaped wall 20 also serves to support respective flexible panel 15, 16, part of which, when deformed, rests on elongated C-shaped wall 20.

[0028] More specifically, the facing edges of first and second panel 15, 16 forming the overlap have complementary profiles, so that second panel 16 rests on first panel 15.

[0029] First panel 15 has a characteristic dimension L1 measured, perpendicularly to axis H and in the plane defined by supporting wall 10, between the fastening point of panel 15 to supporting wall 10 and the free edge facing panel 16.

[0030] Second panel 16 has a characteristic dimension L2 measured, in the same direction, between the fastening point of panel 16 to supporting wall 10 and the free edge facing panel 15.

[0031] Characteristic dimension L1 is smaller than characteristic dimension L2, so that, when the panels move back into the undeformed position, second panel 16 (of dimension L2 larger than L1) always closes after and over panel 15.

[0032] To ensure the undeformed panels 15, 16 rest firmly on flat supporting wall 10, second panel 16 (which rests on top of first panel 15) has two permanent magnets 30a, 30b (Figure 3) embedded in the plastic material of panels 15, 16, close to the edge of panel 16 at overlap 17. Permanent magnets 30a, 30b engage respective magnets 31a, 31b, of opposite polarity, fitted to supporting wall 10, close to the edge of central opening 12. The attraction of magnets 30a, 30b and respective magnets 31a, 31b grips panel 16 firmly to supporting wall 10, and so also holds panel 15 firmly in position underneath.

[0033] Flexible panels 15 and 16 are conveniently made of plastic material impervious to radar waves, so countermeasure 4 inside the launch tube is "invisible" to, i.e. undetectable by, radar.

[0034] This is achieved by inserting inside the molds of panels 15, 16 a polyester fabric 32 (Figure 4) with electrodeposited nickel, over which the plastic material of the panels is poured. Fabric 32 is highly conductive and of such tight mesh as to reflect even very highfrequency radar waves in any direction, and prevent correct reading of the return wave.

[0035] The supporting wall can be fitted easily to launch tube 3 using a flat, square flange 35 (Figure 1), which fits firmly to the end portion of launch tube 3, and has a central opening 36 (at least equal to D in diameter) positioned, in use, coaxial with and facing central opening 12.

[0036] Along one straight edge 37, square flange 35 has two rectangular seats 38 fitted with respective "cylindrical hinge pins 39 coaxial with an axis parallel to straight edge 37, and which fit to respective hinges 40 projecting from an edge of supporting wall 10.

[0037] Along a straight edge 41 opposite edge 37, square flange 35 has a rectangular slot 43 for a T-latch 45 projecting from an edge of supporting wall 10 opposite the edge from which hinges 40 project.

[0038] Square flange 35 is fitted with a mechanism, operated manually by a handle 50, for locking T-latch firmly inside slot 43, and so locking supporting wall 10 to flange 35; in which position, hinges 40 engage hinge pins 39.

[0039] Fluidtight sealing between flange 35 and wall 10 is ensured by an O-ring 60, which is fitted inside an annular seat coaxial with opening 36, and is pressed down by an annular appendix 61 on wall 10.

[0040] Using handle 50, T-latch 45 is released from slot 43 to detach supporting wall 10 from flange 35.

[0041] Fully passive shutter 1 as described above is simple in design, and quick to assemble and disassemble (a vital feature when loading weapons).

[0042] The simple design of the shutter makes it much cheaper to produce than similar known types (only a few low-cost component parts, and no high-cost electronic components or fragile dedicated actuators, are used), and also simplifies maintenance in terms of work and frequency.

Claims

1. A shutter for a launch tube (3) for launching a countermeasure (4), the shutter comprising a support (10) having a central through opening (12) of a diameter (D) substantially equal to the inside diameter of the launch tube (3), the shutter comprising :

   - a flexible first panel (15) fitted to the support (10) and which, when undeformed and at rest, closes a first portion of the central opening (12); and
   - a flexible second panel (16) fitted to the support (10) and which, when undeformed and at rest, closes a second portion of the central opening (12) the first and second panel (15, 16) flexing and deflecting, as a front end portion (6) of the countermeasure (4) moves through the central opening (12), to permit expulsion of the countermeasure (4) through the shutter (1), which is opened by the forward movement of the countermeasure,

   characterized in that

said first and second panel (15, 16) have an overlap (17) so that, when undeformed, the first and second panel fully close the central opening (12).

2. A shutter as claimed in Claim 1, wherein each panel has a first edge (15a, 16a) opposite a second edge defining the overlap (17), and which is fixed firmly to the support (10) by fastening means.

3. A shutter as claimed in Claim 2, wherein said fastening means define a supporting surface for the respective flexible panel (15, 16), part of which, when deformed, rests on the supporting surface.

4. A shutter as claimed in Claim 3, wherein the first and second panel (15, 16) are rectangular.

5. A shutter as claimed in any one of the foregoing Claims, wherein the first panel (15) has a characteristic dimension L1, measured between the fastening point of the first panel to the support (10) and the free edge facing the second panel (16);
the second panel (16) has a characteristic dimension L2, measured between the fastening point of the second panel to the support (10) and the free edge facing the first panel (15);
characteristic dimension L1 being smaller than characteristic dimension L2, so that, as the first and second panel spring back into the undeformed position, the second panel (16) always closes after and on top of the first panel (15).

6. A shutter as claimed in Claim 5, wherein said facing edges of the first and second panel (15, 16) defining the overlap have complementary profiles.

7. A shutter as claimed in any one of the foregoing Claims, wherein at least one of said first and second panel (15, 16) has first permanent magnets (30a, 30b) which, when the panel is undeformed, engage respective second magnets (31a, 31b), of opposite polarity, fitted to the support (10), to produce a force by which to hold one panel (15) firmly on the support (10).

8. A shutter as claimed in Claim 7, wherein said second magnets (31a, 31b) are located close to the edge of the central opening (12).

9. A shutter as claimed in Claim 7 or 8, wherein said first magnets are embedded in the plastic material of said second panel (16).

10. A shutter as claimed in any one of the foregoing Claims, wherein one panel rests on the other panel at said overlap (17).

11. A shutter as claimed in any one of the foregoing Claims, wherein the flexible said first panel (15) and the flexible said second panel (16) are made of plastic material impervious to RADAR waves, so the countermeasure (4) in the launch tube (3) is undetectable by RADAR.

12. A shutter as claimed in Claim 11, wherein said first and second panel (15, 16) comprise, internally, a metalized fabric embedded in the plastic material; said fabric having a tight mesh to reflect RADAR waves.

Patentansprüche

1. Verschluss für ein Abschussrohr (3) zum Abschießen einer Gegenmaßnahme (4), der Verschluss umfasst einen Träger (10) mit einer zentralen Durchgangsöffnung (12) mit einem Durchmesser (D) im Wesentlichen gleich dem Innendurchmesser des Abschussrohres (3), der Verschluss umfasst:

- ☐ eine an dem Träger (10) angebrachte flexible erste Platte (15), die einen ersten Teil der zentralen Öffnung (12) schließt, wenn sie unverformt und in Ruhe ist; und
- ☐ eine an dem Träger (10) angebrachte flexible zweite Platte (16), die einen zweiten Teil der zentralen Durchgangsöffnung (12) schließt, wenn sie unverformt und in Ruhe ist, wobei die erste und die zweite Platte (15, 16) sich verbiegen und ausgelenkt werden, wenn ein vorderer Endabschnitt (6) der Gegenmaßnahme (4) sich durch die zentrale Öffnung (12) bewegt, um einen Abschuss der Gegenmaßnahme (4) durch den Verschluss (1) zu gestatten, der durch die Vorwärtsbewegung der Gegenmaßnahme geöffnet wird,
  dadurch gekennzeichnet, dass die erste und zweite Platte (15, 16) eine Überlappung (17) aufweisen, so dass die erste und die zweite Platte die zentrale Öffnung (12) vollständig schließen, wenn sie unverformt sind.

2. Verschluss nach Anspruch 1, wobei jede Platte eine erste Kante (15a, 16a) entgegengesetzt zu einer die Überlappung (17) bildenden zweiten Kante aufweist, die durch Befestigungsmittel fest am Träger (10) befestigt ist.

3. Verschluss nach Anspruch 2, wobei die Befestigungsmittel eine Stützfläche für die jeweilige flexible Platte (15, 16) bilden, von der ein Teil auf der Stützfläche ruht, wenn sie deformiert ist.

4. Verschluss nach Anspruch 3, wobei die erste und zweite Platte (15, 16) rechteckig sind.

5. Verschluss nach einem der vorstehenden Ansprüche, wobei die erste Platte (15) eine zwischen dem Befestigungspunkt der ersten Platte am Träger (10) und der der zweiten Platte (16) gegenüberliegenden freien Kante gemessene charakteristische Dimension L1 aufweist,
wobei die zweite Platte (16) eine zwischen dem Befestigungspunkt der zweiten Platte am Träger (10) und dem der ersten Platte (15) gegenüberliegenden freien Kante gemessene charakteristische Dimension L2 aufweist,
die charakteristische Dimension L1 ist kleiner als die charakteristische Dimension L2, so dass die zweite Platte (16) immer nach und über der ersten Platte (15) schießt, wenn die erste und zweite Platte zurück in ihre unverformte Position springen.

6. Verschluss nach Anspruch 5, wobei die einander gegenüberliegenden Kanten der ersten und zweiten Platte (15, 16), die die Überlappung festlegen, komplementäre Profile aufweisen.

7. Verschluss nach einem der vorstehenden Ansprüche, wobei zumindest eine der ersten und zweiten Platte (15, 16) erste Permanentmagneten (30a, 30b) aufweist, die, wenn die Platte unverformt ist, mit entsprechenden zweiten Magneten (31a, 31b) mit entgegengesetzter Polarität in Eingriff stehen, die an dem Träger (10) angebracht sind, um eine Kraft zu erzeugen, durch die eine Platte (15) fest am Träger (10) gehalten wird.

8. Verschluss nach Anspruch 7, wobei die zweiten Magneten (31a, 31b) nahe dem Rand der zentralen Öffnung (12) gelegen sind.

9. Verschluss nach Anspruch 7 oder 8, wobei die ersten Magneten im Kunststoffmaterial der zweiten Platte (16) eingebettet sind.

10. Verschluss nach einem der vorstehenden Ansprüche, wobei eine Platte auf der anderen Platte im Bereich der Überlappung (17) ruht.

11. Verschluss nach einem der vorstehenden Ansprüche, wobei die flexible erste Platte (15) und die flexible zweite Platte (16) aus für Radarwellen undurchlässigem Kunststoffmaterial hergestellt sind, so dass die Gegenmaßnahme (4) im Abschussrohr (3) nicht durch Radar detektierbar ist.

12. Verschluss nach Anspruch 11, wobei die ersten und zweite Platte (15, 16) innen ein metallisiertes Gewebe aufweisen, das im Kunststoffmaterial eingebettet ist, das Gewebe weist eine enge Maschenweite auf, um Radarwellen zu reflektieren.

Revendications

1. Obturateur pour un tube de lancement (3) pour lancer une contre-mesure (4), l'obturateur comprenant un support (10) ayant une ouverture centrale traversante (12) d'un diamètre (D) sensiblement égal au diamètre intérieur du tube de lancement (3), l'obturateur comprenant :

   - un premier panneau souple (15) ajusté sur le support (10) et qui, lorsqu'il est non déformé et au repos, ferme une première portion de l'ouverture centrale (12) ; et
   - un second panneau souple (16) ajusté sur le support (10) et qui, lorsqu'il est non déformé et au repos, ferme une seconde portion de l'ouverture centrale (12),
   les premier et second panneaux (15, 16) fléchissant et déviant, lorsqu'une portion d'extrémité avant (6) de la contre-mesure (4) traverse l'ouverture centrale (12), pour permettre une expulsion de la contre-mesure (4) à travers l'obturateur (1), qui est ouverte par le mouvement d'avance de la contre-mesure
   caractérisé en ce que lesdits premier et second panneaux (15, 16) ont un chevauchement (17) de telle sorte que, lorsqu'ils sont non déformés, les premier et second panneaux ferment entièrement l'ouverture centrale (12).

2. Obturateur tel que revendiqué dans la revendication 1, dans lequel chaque panneau a un premier bord (15a, 16a) opposé à un second bord définissant le chevauchement (17), et qui est fermement fixé au support (10) par des moyens de fixation.

3. Obturateur tel que revendiqué dans la revendication 2, dans lequel lesdits moyens de fixation définissent une surface de support pour le panneau souple (15, 16) respectif, dont une partie, lorsqu'elle est déformée, repose sur la surface de support.

4. Obturateur tel que revendiqué dans la revendication 3, dans lequel les premier et second panneaux (15, 16) sont rectangulaires.

5. Obturateur tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel le premier panneau (15) a une dimension caractéristique L1, mesurée entre le point d'attache du premier panneau au support (10) et le bord libre dirigé vers le second panneau (16) ;
le second panneau (16) a une dimension caractéristique L2, mesurée entre le point d'attache du second panneau au support (10) et le bord libre dirigé vers le premier panneau (15) ;
la dimension caractéristique L1 étant plus petite que la dimension caractéristique L2, de telle sorte que,

lorsque les premier et second panneaux reviennent élastiquement dans la position non déformée, le second panneau (16) se ferme toujours après le premier panneau (15) et au-dessus de celui-ci.

6. Obturateur tel que revendiqué dans la revendication 5, dans lequel lesdits bords en face-à-face des premier et second panneaux (15, 16) définissant le chevauchement ont des profils complémentaires.

7. Obturateur tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel au moins un desdits premier et second panneaux (15, 16) a des premiers aimants permanents (30a, 30b) qui, lorsque le panneau est non déformé, viennent en prise avec de seconds aimants respectifs (31a, 31b), de polarité opposée, montés sur le support (10), pour produire une force par laquelle un panneau (15) est fermement maintenu sur le support (10).

8. Obturateur tel que revendiqué dans la revendication 7, dans lequel lesdits seconds aimants (31a, 31b) sont situés près du bord de l'ouverture centrale (12).

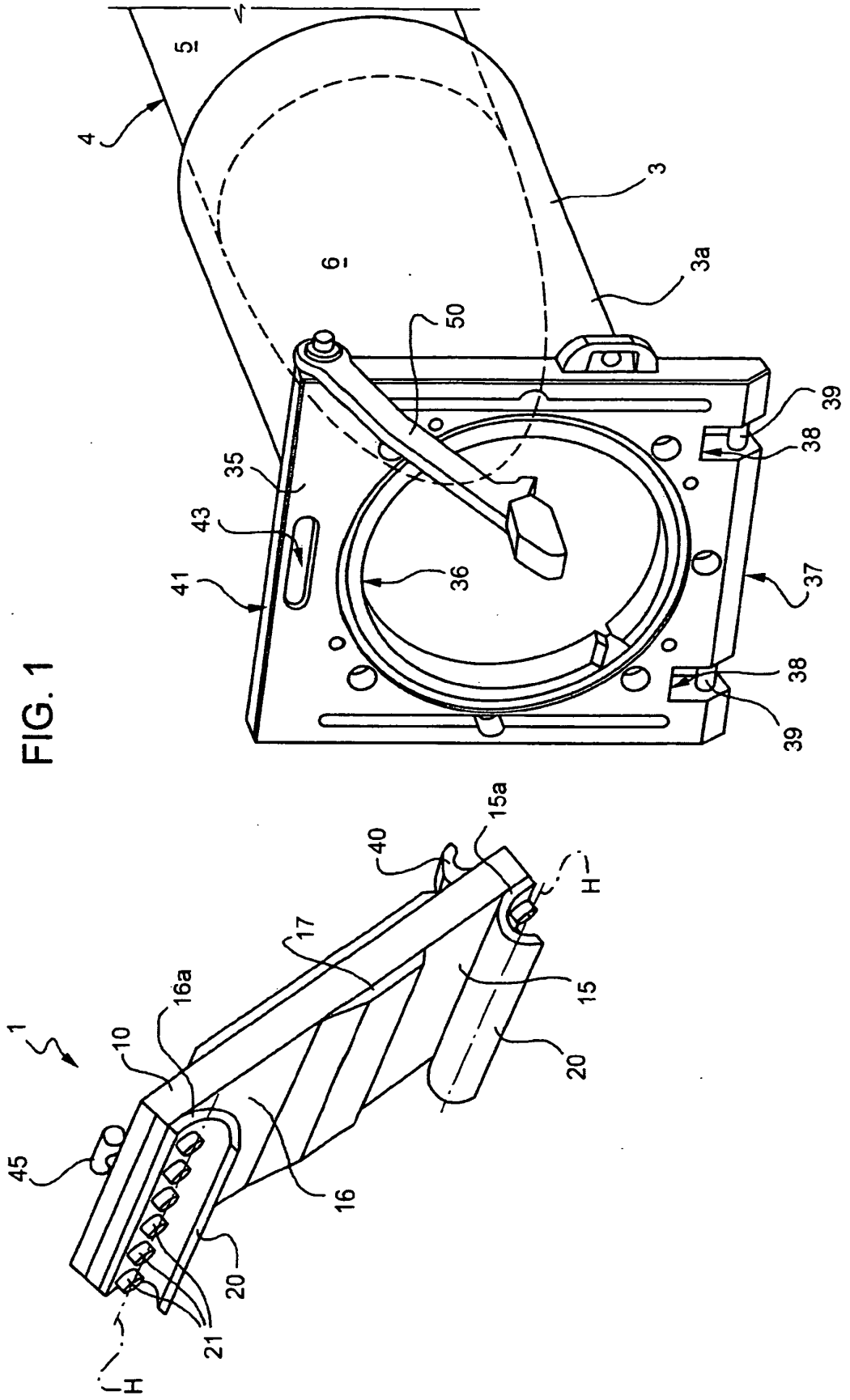
9. Obturateur tel que revendiqué dans la revendication 7 ou 8, dans lequel lesdits premiers aimants sont noyés dans la matière plastique dudit second panneau (16).

10. Obturateur tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel un panneau repose sur l'autre panneau sur ledit chevauchement (17).

11. Obturateur tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel ledit premier panneau souple (15) et ledit second panneau souple (16) sont constitués d'une matière plastique imperméable aux ondes RADAR, de sorte que la contre-mesure (4) dans le tube de lancement (3) est indétectable par RADAR.

12. Obturateur tel que revendiqué dans la revendication 11, dans lequel lesdits premier et second panneaux (15, 16) comprennent, intérieurement, un tissu métallisé noyé dans la matière plastique ; ledit tissu ayant un maillage serré pour réfléchir les ondes RADAR.

FIG. 1


5
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3a
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41
36
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1
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20
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21
H

FIG. 2

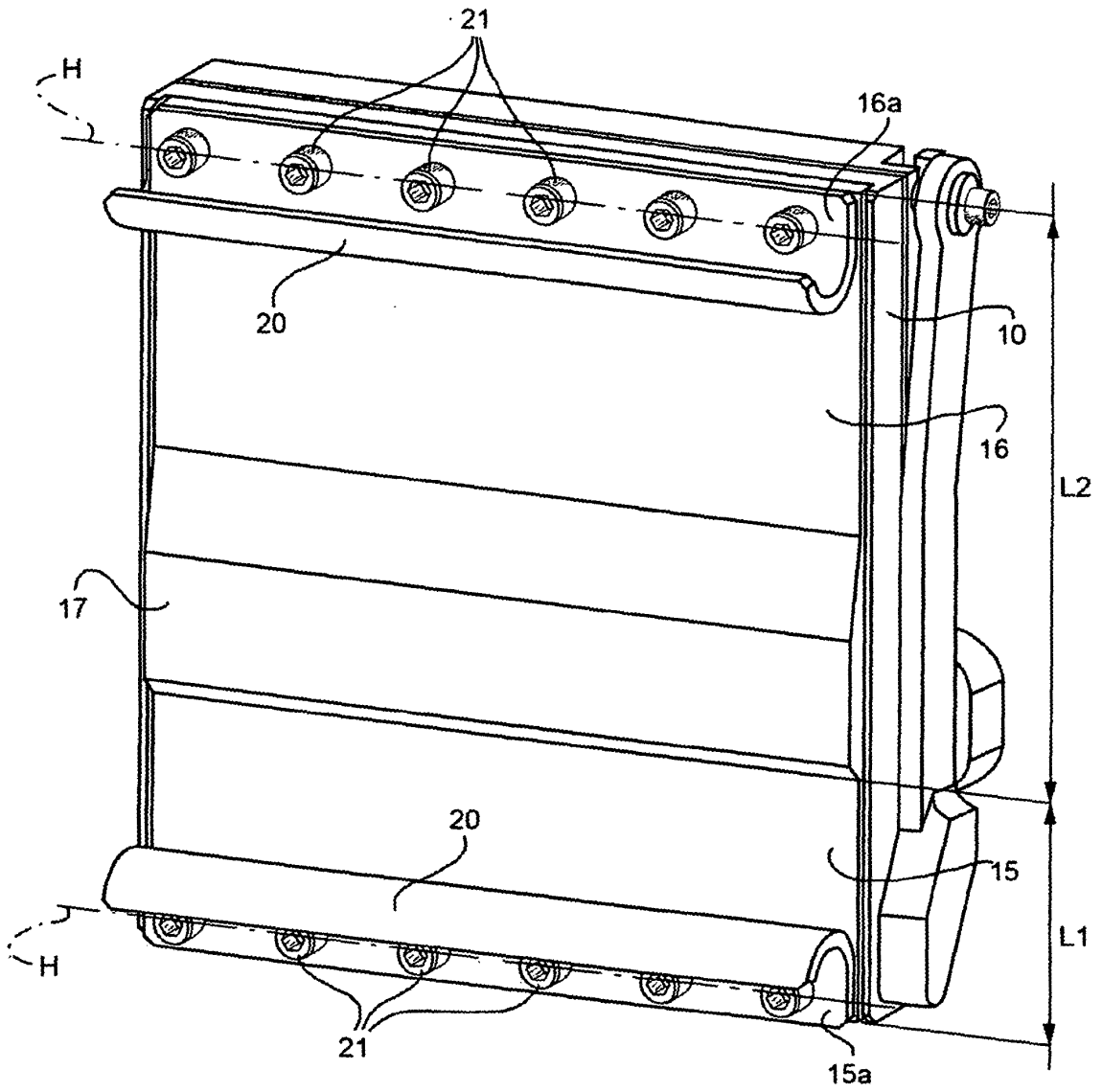


FIG. 3

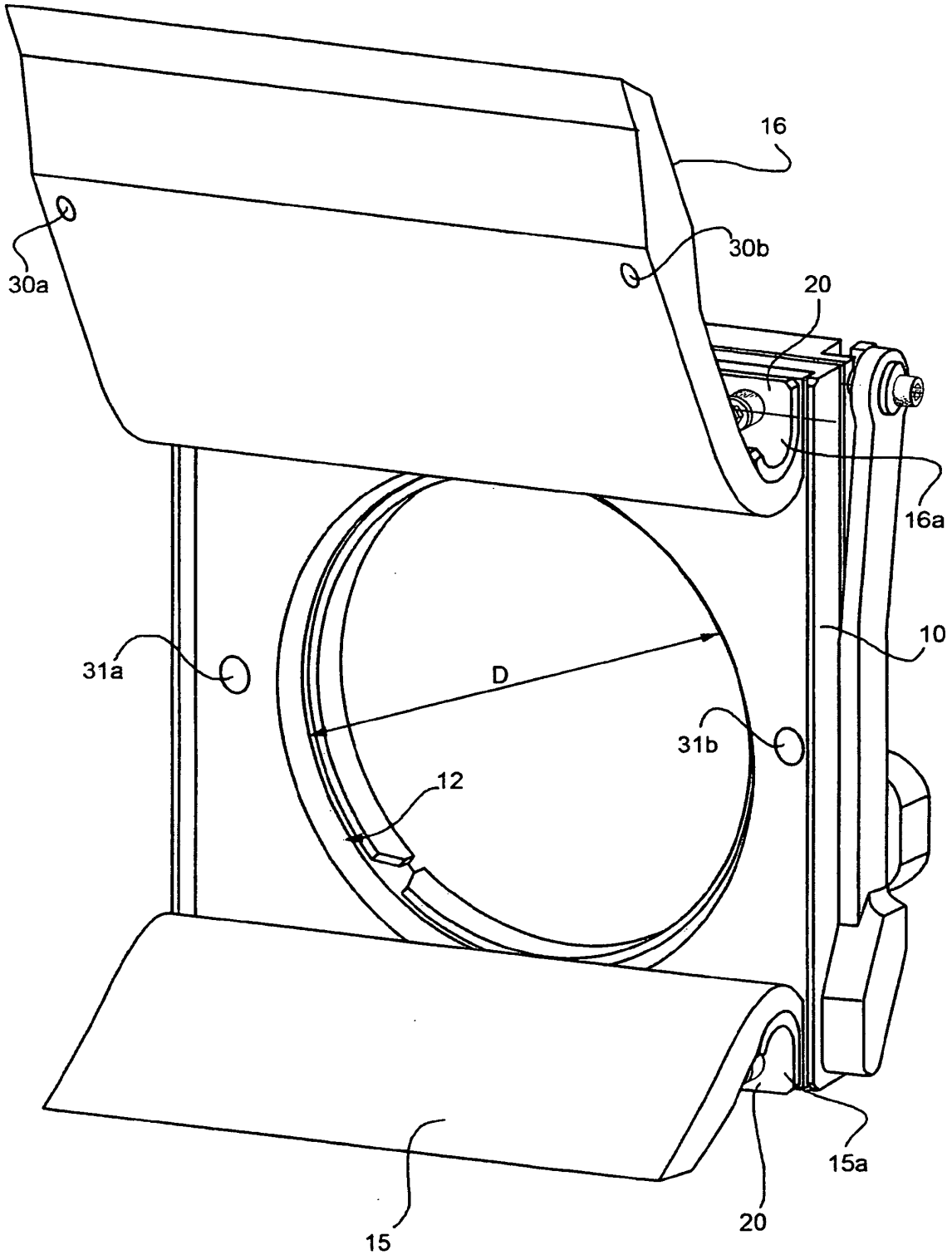
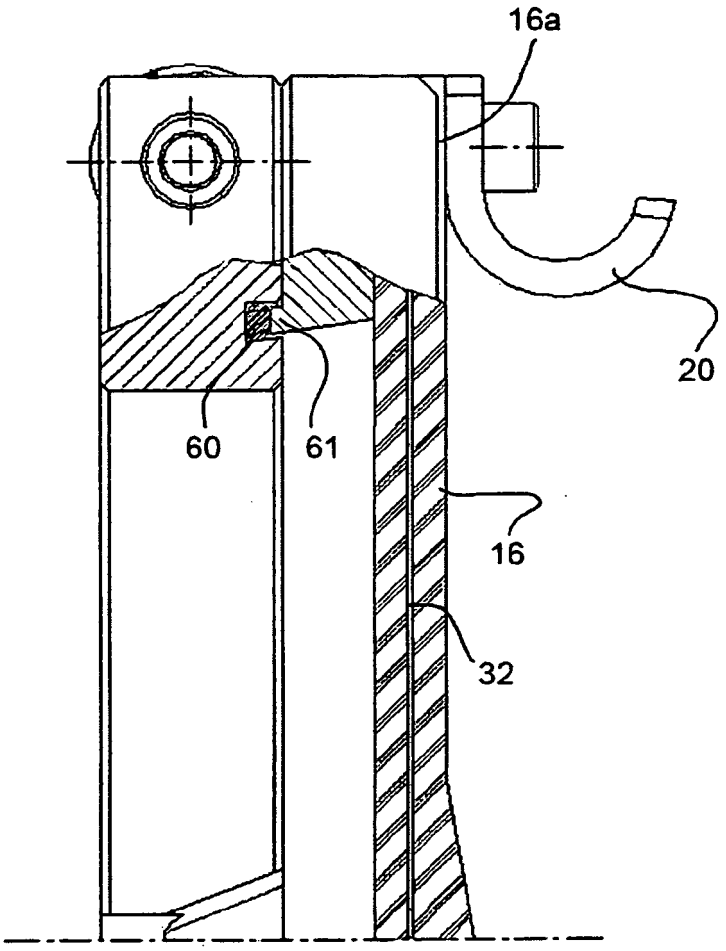


FIG. 4



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