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(71) Applicant: **Whitehead Alenia Sistemi Subacquei S.p.A.**
57124 Livorno (IT)

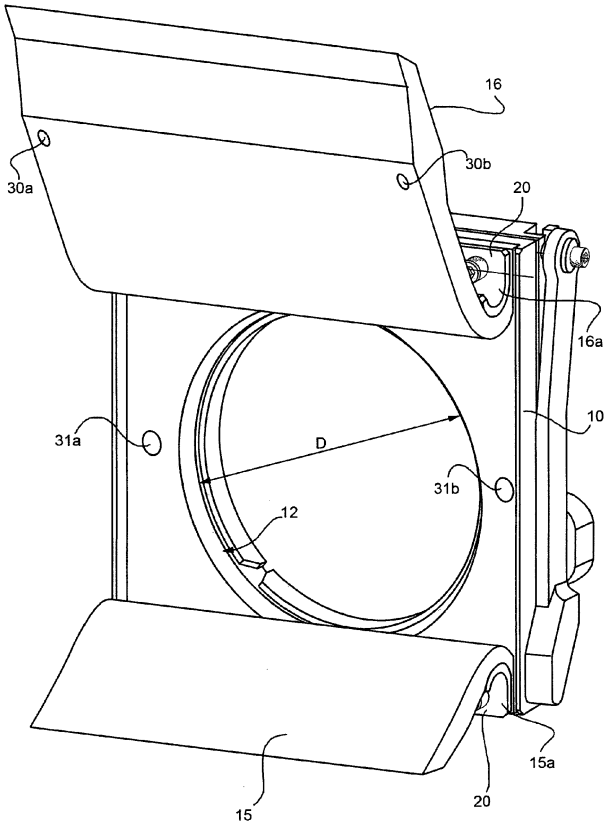
(72) Inventors:
- **Garzelli, Carlo**
  57127 Livorno (IT)
- **Perrone, Gabriella**
  57124 Livorno (IT)

(74) Representative: **Bongiovanni, Simone et al**
STUDIO TORTA
Via Viotti 9
10121 Torino (IT)

(54) Countermeasure lauch tube shutter

(57) A shutter for a launch tube (3) for launching a countermeasure (4), wherein a support (10) has a circular opening (12) of a diameter (D) equal to the diameter of the launch tube (3). The shutter has a first and second flexible panel (15, 16) fitted to the support (10) and which, when undeformed and at rest, close the circular opening. The panels (15, 16) flex and deflect, as a front end portion (6) of the countermeasure (4) moves through the circular opening (12), to permit expulsion of the countermeasure (4) through the shutter (1), which is opened by the forward movement of the countermeasure.

FIG. 3



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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] 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.

[0012] According to the present invention, there is provided a countermeasure launch tube shutter as claimed in Claim 1.

[0013] 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.

[0014] Number 1 in Figure 1 indicates as a whole a shutter in accordance with the teachings of the present invention.

[0015] 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) .

[0016] Launch tube 3 is cylindrical, and houses countermeasure 4, which comprises an elongated cylindrical casing 5 with an ogival front portion 6.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] Once countermeasure 4 is expelled, panels 15, 16 spring back to the undeformed position to close central opening 12 automatically.

[0025] Opening and immediate closure of shutter 1 are both achieved passively, the former by passage of coun-

termeasure 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] 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.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] Using handle 50, T-latch 45 is released from slot 43 to detach supporting wall 10 from flange 35.

[0040] Fully passive shutter 1 as described above is simple in design, and quick to assemble and disassemble (a vital feature when loading weapons).

[0041] 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), and being **characterized by** 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);

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

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.

FIG. 1

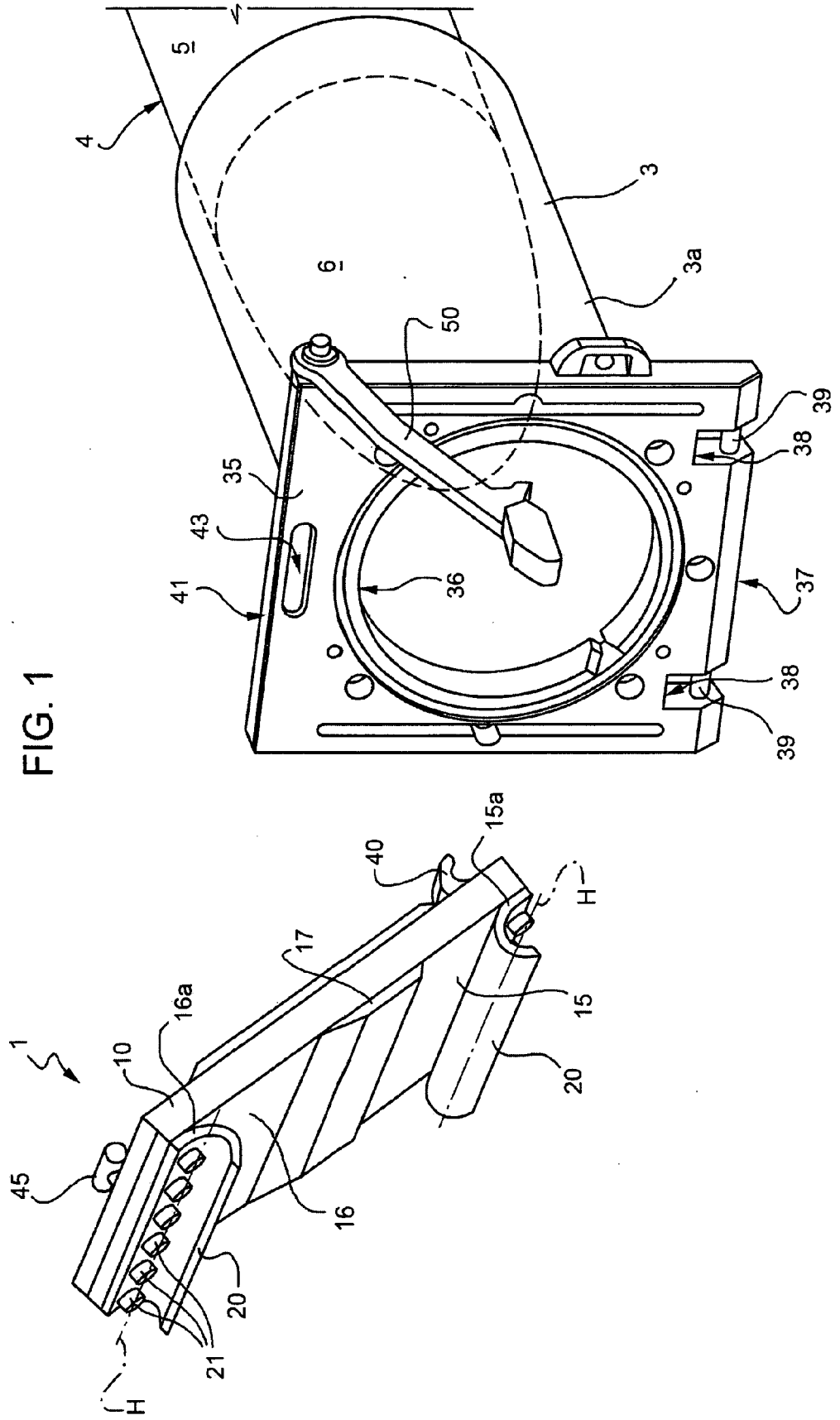
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FIG. 2

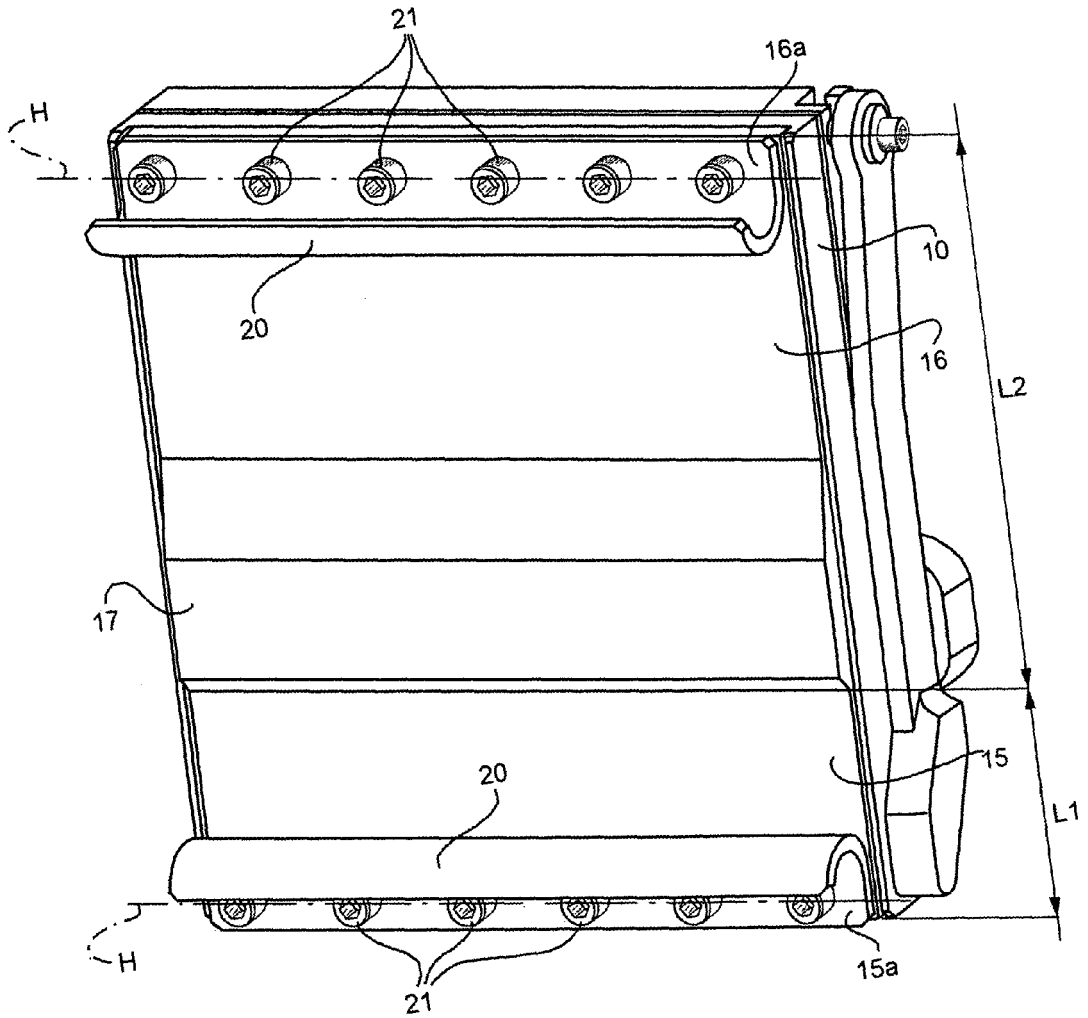


FIG. 3

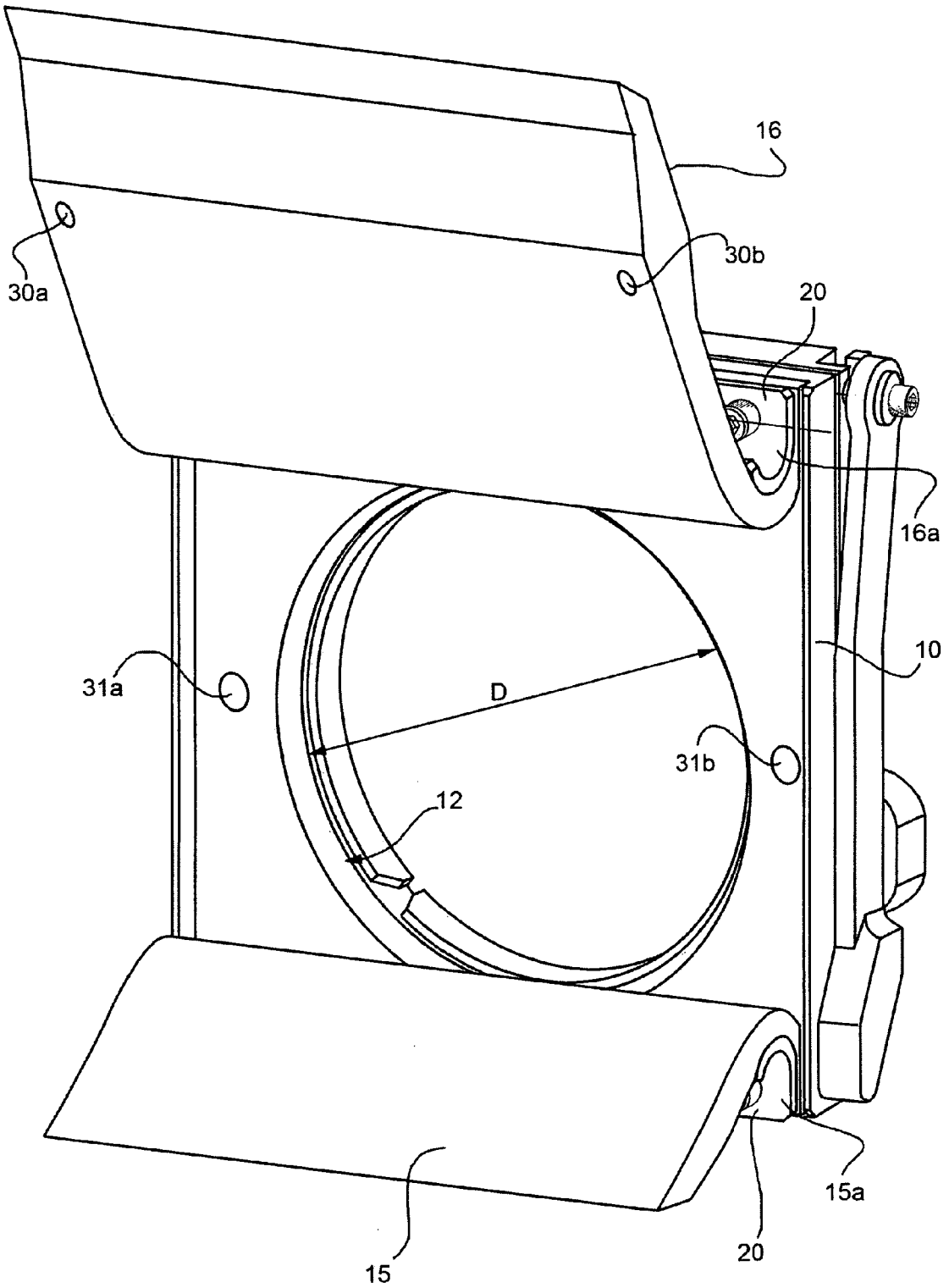
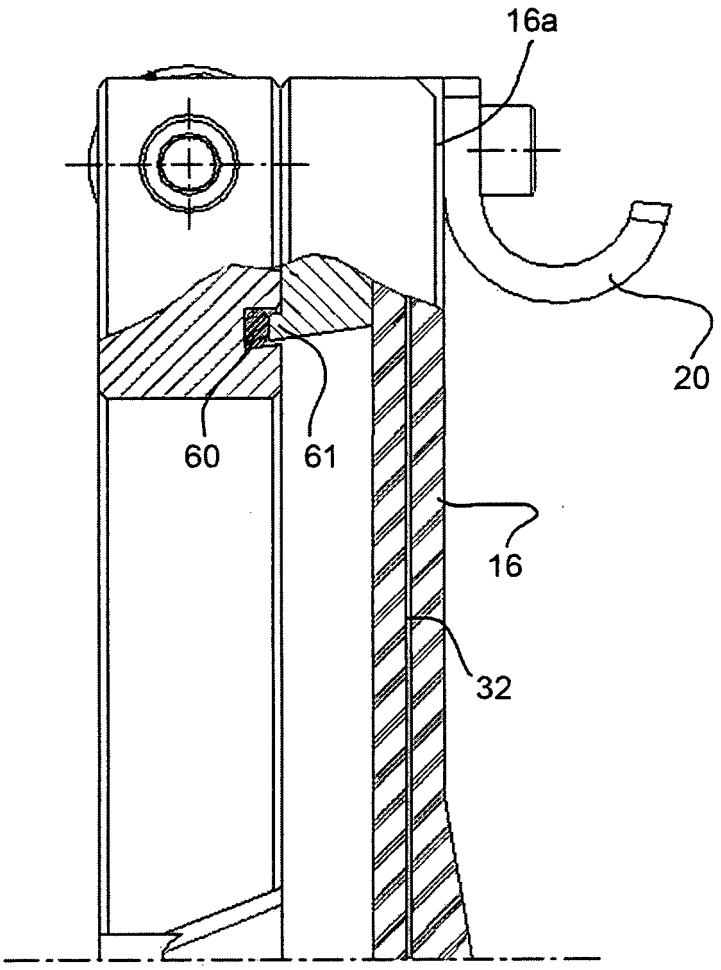


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5418

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 107 330 A1 (WHITEHEAD ALENIA SISTEMI SUBAQCUEI) 7 October 2009 (2009-10-07) * paragraph [0012] - paragraph [0030] * * paragraph [0037]; figures 1-3 * -----	1,3,4	INV. F41F3/077 ADD. F41F3/10
A	JP 11 201696 A (MITUBISHI ELECTRIC) 30 July 1999 (1999-07-30) * figures 6a,6b,6c * -----	1	
A	JP 11 183090 A (MITUBISHI ELECTRIC) 6 July 1999 (1999-07-06) * figures 5a-d,6a-d * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

F41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 May 2010	Giesen, Maarten

CATEGORY OF CITED DOCUMENTS

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04-05-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2107330 A1	07-10-2009	NONE	
JP 11201696 A	30-07-1999	NONE	
JP 11183090 A	06-07-1999	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- EP 2019035 B **[0019]**
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