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(54) **Torpedo launch device**

Torpedoabschussvorrichtung

Dispositif de lancement de torpilles

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Description

[0001] The present invention relates to a torpedo launch device, in particular for launching torpedoes from a surface vessel.

[0002] Pneumatic torpedo launch devices are known which substantially comprise a launch tube, into which the torpedo is inserted; and a system for feeding compressed air into the rear of the launch tube to fire the torpedo. The compressed air is contained in a high-pressure cylinder.

[0003] Known devices of the type briefly described above have various drawbacks.

[0004] In particular, compressed air must be made available on the launcher; maintaining the given compressed-air pressure may pose problems; and, finally, the pneumatic system calls for routine maintenance.

[0005] US-A-4 944 210 discloses a missile launcher including an inflatable bag housed within the launch tube and an explosive device for producing a gas by which to inflate said bag. The bag contacts a rear surface of the missile and, when inflated by the explosive device, expands and exerts an axial thrust on the missile.

[0006] As the inflatable bag is in direct contact with the object to be launched, this system is not adapted for launching a torpedo provided with a back propeller.

[0007] WO 01/92095 discloses a torpedo launching mechanism using explosive devices that generate gas for directly propelling the torpedo.

[0008] US2004/0031381 discloses a device for launching an object in a fluid environment. The device includes a piston-like contact element defining an interior space in which a gas-generating propellant device is disposed and configured to contact the object to be launched under the thrust generated by the gas. DE 2962267C describes a device for launching a torpedo forming a starting point for independent claim 1.

[0009] It is an object of the present invention to provide an improved launch device designed to eliminate the aforementioned drawbacks associated with known devices.

[0010] According to the present invention, there is provided a launch device as claimed in Claim 1.

[0011] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows an axial section of a launch device in accordance with the present invention;

Figures 2 and 3 show larger-scale, partly sectioned details in perspective of the Figure 1 device in two different operating conditions;

Figure 4 shows a cross section of a launch tube of the Figure 1 device;

Figure 5 shows a section along line V-V in Figure 4.

[0012] Number 1 in Figure 1 indicates as a whole a launch device for launching a torpedo 2.

[0013] Launch device 1 comprises a substantially cylindrical launch tube 3 having a front muzzle end 3a and a rear end 3b; and a expulsion assembly 4 housed inside launch tube 3, close to rear end 3b.

[0014] In the tube-launch configuration, torpedo 2 is fitted at the rear with a shank 9 with a spherical end 9a.

[0015] Expulsion assembly 4 comprises a base disk 5 connected to rear end 3b of launch tube 3; a thrust disk 8 connectable releasably to shank 9 of torpedo 2 housed inside launch tube 3; and an explosive-actuated bag 7 interposed axially between base disk 5 and thrust disk 8.

[0016] Base disk 5 is preferably connected to rear end 3b of launch tube 3 by a fast-fit, e.g. bayonet, connecting device not shown.

[0017] Bag 7 is substantially cylindrical, and has a rear base wall 11 secured to base disk 5 by fast-fit, e.g. bayonet, connecting means not shown. At rest, as shown in Figure 1, bag 7 is folded accordion-fashion and lashed in place by a calibrated-release binding not shown.

[0018] Bag 7 is fitted with and inflated by an explosive gas generator 10.

[0019] Bag 7 also comprises a relief valve 12 and a safety valve 13 housed in respective seats in base disk 5 to communicate with the outside of launch tube 3.

[0020] Thrust disk 8 is connected releasably to torpedo shank 9 by a lock device 14 shown in Figures 2 and 3.

[0021] Lock device 14 substantially comprises a gripper 16 having a central body 18 housed in axially sliding manner inside a central cavity 17 of thrust disk 8, and to which are hinged two substantially L-shaped jaws 19, which cooperate with shank 9 of torpedo 2 and are held in the closed position gripping the shank by the walls of cavity 17. Central body 18 has an axial push-rod 22 which cooperates with spherical end 9a of shank 9 of torpedo 2; and central body 18 is connected, by an actuating rod 20 fitted through thrust disk 8, to a pressure sensor plate 21 facing bag 7. A first spring 48, externally coaxial with actuating rod 20, is compressed between plate 21 and thrust disk 8; and a second spring 49, externally coaxial with push-rod 22, is compressed between central body 18 and jaws 19 (when closed) of gripper 16, so as to push the jaws into the open position.

[0022] Lock device 14 also comprises a number of stop assemblies 24 housed in respective radial holes 23 formed in, and communicating with central cavity 17 of, thrust disk 8.

[0023] Each stop assembly 24 substantially comprises a rod 25 which interacts with central body 18 of gripper 16; and a push-rod 26 connected telescopically to rod 25, and which clicks inside a respective seat 27 in launch tube 3 to axially lock thrust disk 8.

[0024] More specifically, rod 25 comprises a tubular portion 28 (partly removed in Figure 2) housing in sliding manner one end of push-rod 26 forming a plate 29. Push-rod 26 is subjected to the action of two counteracting springs 30, 31 : spring 30 is compressed axially between rod 25 and plate 29 of push-rod 26 to push push-rod 26 outwards, i.e. towards the wall of launch tube 3, and rod

25 inwards, i.e. towards cavity 17; and spring 31 is compressed between an inner shoulder of hole 23 and plate 29 to hold push-rod 26 in the withdrawn position inside hole 23.

[0025] Rods 25 of stop assemblies 24 and central body 18 of gripper 16 have respective bevels 34, 35, which interact with one another, when central body 18 is inserted inside cavity 17, to push rods 25 outwards.

[0026] Thrust disk 8 and torpedo 2 are guided inside launch tube 3 by a number of inner longitudinal guides 40, 41 inside the tube (Figure 4). More specifically, launch tube 3 has four grooves 40 spaced 90° apart and engaged in sliding manner by respective fins 42 on torpedo 2, and by respective guide fins 44 on thrust disk 8; and four grooves 41 spaced 45° from grooves 40 and engaged in sliding manner by respective outer radial projections 45 on thrust disk 8 (Figure 5).

[0027] As shown in Figures 4 and 5, grooves 41 dead-end on the side facing end 3a of tube 3; and shock-absorbing stop devices 46 are provided at the end of grooves 41 to arrest thrust disk 8.

[0028] Close to front end 3a, a bayonet system (not shown) conveniently permits extraction of thrust disk 8 from end 3a of launch tube 3.

[0029] Launch device 1 operates as follows.

[0030] Firstly, torpedo 2 is configured for launching from the tube by fitting on interface shank 9.

[0031] Thrust disk 8 is then fixed onto shank 9 of torpedo 2 by means of lock device 14.

[0032] In Figure 2, lock device 14 is shown in the deactivated position. When inserted between jaws 19, shank 9 pushes push-rod 22 of central body 18 axially to back up central body 18 inside cavity 17; jaws 19 close onto shank 9 by interaction with the walls of cavity 17; and bevels 34, 35 push stop assemblies 24 outwards.

[0033] Torpedo 2 and thrust disk 8 as a whole are then inserted inside launch tube 3 through rear end 3b, and are locked inside the tube by the ends of push-rods 26 clicking inside respective seats 27.

[0034] Base disk 5, already fitted with bag 7, is fitted inside rear end 3b of launch tube 3, as shown in Figure 1.

[0035] At which point, launch tube 3 is ready for launching.

[0036] To launch the torpedo, gas generator 10 is activated by a control signal.

[0037] The gas produced inflates bag 7, which snaps off the calibrated-release binding holding it in the folded position, begins to expand, and presses on plate 21 to move gripper 16 axially and so release body 18 from rods 25.

[0038] Push-rods 26 are thus withdrawn by springs 31 to release thrust disk 8 from launch tube 3.

[0039] As bag 7 continues inflating, thrust disk 8 advances to expel torpedo 2 from launch tube 3, and comes to rest against shock-absorbing stop devices 46 at the end of launch tube 3.

[0040] Once the torpedo is launched, launch device 1 is restored by :

- deflating bag 7 by means of relief valve 12 on base disk 5;
- extracting thrust disk 8 from front end 3a of tube 3 by means of the bayonet connector;
- removing base disk 5 by means of the bayonet connector, and extracting bag 7 connected to it;
- repeating the operations described above to replace the base disk 5/explosive-gas generator 10/bag 7 assembly with a new or reconditioned one. The used one may be reconditioned by replacing the explosive-gas generator and restoring bag 7 if still serviceable.

[0041] The advantages of launch device 1 according to the present invention will be clear from the above description.

[0042] Using an explosive-gas generator eliminates the need for compressed air and the drawbacks this entails.

[0043] Clearly, changes may be made to device 1 as described herein without, however, departing from the protective scope as defined in the accompanying Claims.

Claims

1. A device for launching a torpedo (2), the device comprising a launch tube (3) for housing said torpedo (2); and an expulsion assembly (4) for generating thrust on, to launch, the torpedo (2) and comprising an inflatable bag (7) an explosive device (10) for producing a gas by which to inflate said bag (7), a base disk (5) connected to rear end (3b) of launch tube (3) and a thrust disk (8) connectable releasably to shank (9) of torpedo (2) housed inside launch tube (3), said bag (7) being interposed axially between base disk (5) said and said thrust disk (8).

2. A device as claimed in Claim 1, **characterized by** comprising a lock device (14) in turn comprising jaw means (16) associated with said thrust disk (8), and a shank (9) carried by said torpedo (2) and cooperating with said jaw means (16).

3. A device as claimed in Claim 2, **characterized in that** said lock device (14) comprises stop means (24) for releasably locking said thrust disk (8) with respect to said launch tube (3).

4. A device as claimed in Claim 3, **characterized in that** said lock device (14) comprises pressure sensor means (21) for deactivating said jaw means (16) and said stop means (24); said pressure sensor means (21) being controlled by said bag (7) when inflated.

5. A device as claimed in one of the preceding Claims, **characterized by** comprising shock-absorbing stop means (46) located close to a front end (3a) of said

launch tube (3) to arrest said thrust disk (8) after the launch.

6. A device as claimed in one of the preceding Claims, **characterized in that** said bag (7) is fitted to said base disk (5).

7. A device as claimed in Claim 6, **characterized in that** said bag (7) is fixed releasably to said base disk (5).

8. A device as claimed in Claim 6 or 7, **characterized by** comprising a relief valve (12) and a safety valve (13) on said base disk (5).

Patentansprüche

1. Vorrichtung zum Abschießen eines Torpedos (2), die Vorrichtung umfasst ein Abschussrohr (3) zum Aufnehmen des Torpedos (2); und eine Ausstoßanordnung (4) zum Erzeugen von Schub auf das Torpedo (4), um dieses abzuschießen, diese umfasst einen aufblasbaren Sack (7); eine Explosionsvorrichtung (10) zum Erzeugen eines Gases, durch welches der Sack (7) aufgeblasen wird; eine mit einem Ende (3b) des Abschussrohrs (3) verbundene Basisscheibe (5) und eine Stoßscheibe (8), die mit einem Zapfen (9) des innerhalb des Abschussrohrs (3) aufgenommenen Torpedos (2) lösbar verbunden ist, wobei der Sack (7) zwischen der Basisscheibe (5) und der Stoßscheibe (8) axial angeordnet ist.

2. Vorrichtung nach Anspruch 1, **gekennzeichnet durch** eine Verriegelungsvorrichtung (14), die wiederum Klemmmittel (16), die der Stoßscheibe (8) zugeordnet sind, und den Zapfen (9) aufweist, der von dem Torpedo (2) getragen wird und mit den Klemmmitteln (9) zusammenwirkt.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** die Verriegelungsvorrichtung (14) Stoppmittel (24) zum lösbaren Verriegeln der Stoßscheibe (8) gegenüber dem Abschussrohr (3) aufweist.

4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** die Verriegelungsvorrichtung (14) Drucksensormittel (21) zum Deaktivieren der Klemmmittel (16) und der Stoppmittel (24) aufweist; die Drucksensormittel (21) werden von dem Sack (7) gesteuert, wenn dieser aufgeblasen ist.

5. Vorrichtung nach einem der vorstehenden Ansprüche, **gekennzeichnet durch** Schockabsorptionsstoppmittel (46), die in der Nähe eines vorderen Endes (3a) des Abschussrohrs (3) angeordnet sind, um die Stoßscheibe (8) nach dem Abschuss zu arretieren.

6. Vorrichtung nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Sack (7) an der Basisscheibe (5) befestigt ist.

7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** der Sack (7) mit der Basisscheibe (5) lösbar verbunden ist.

8. Vorrichtung nach Anspruch 6 oder 7, **gekennzeichnet durch** ein Ablassventil (12) und ein Sicherheitsventil (13) auf der Basisscheibe (5).

Revendications

1. Dispositif pour lancer une torpille (2), le dispositif comprenant un tube de lancement (3) pour loger ladite torpille (2) ; et un ensemble d'expulsion (4) pour générer une poussée sur la torpille (2), afin de lancer celle-ci, et comprenant une poche gonflable (7), un dispositif explosif (10) pour produire un gaz par lequel ladite poche (7) est gonflée, un disque de base (5) relié à une extrémité arrière (3b) du tube de lancement (3) et un disque de poussée (8) pouvant être relié de manière libérable à une queue (9) de la torpille (2) logée à l'intérieur du tube de lancement (3), ladite poche (7) étant interposée axialement entre ledit disque de base (5) et ledit disque de poussée (8).

2. Dispositif selon la revendication 1, **caractérisé en ce qu'**il comprend un dispositif de verrouillage (14) comprenant à son tour des moyens à mâchoire (16) associés audit disque de poussée (8), et une queue (9) supportée par ladite torpille (2) et coopérant avec lesdits moyens à mâchoire (16).

3. Dispositif selon la revendication 2, **caractérisé en ce que** ledit dispositif de verrouillage (14) comprend des moyens d'arrêt (24) pour verrouiller ledit disque de poussée (8) de manière libérable par rapport audit tube de lancement (3).

4. Dispositif selon la revendication 3, **caractérisé en ce que** ledit dispositif de verrouillage (14) comprend des moyens capteurs de pression (21) pour désactiver lesdits moyens à mâchoire (16) et lesdits moyens d'arrêt (24) ; lesdits moyens capteurs de pression (21) étant commandés par ladite poche (7) lorsqu'elle est gonflée.

5. Dispositif selon l'une des revendications précédentes, **caractérisé en ce qu'**il comprend des moyens d'arrêt d'absorption de choc (46) positionnés près d'une extrémité avant (3a) dudit tube de lancement (3) pour arrêter ledit disque de poussée (8) après le

lancement.

6. Dispositif selon l'une des revendications précédentes, **caractérisé en ce que** ladite poche (7) est ajustée sur ledit disque de base (5).

7. Dispositif selon la revendication 6, **caractérisé en ce que** ladite poche (7) est fixée audit disque de base (5) de manière libérable.

8. Dispositif selon la revendication 6 ou 7, **caractérisé en ce qu'**il comprend une soupape de décharge (12) et une soupape de sûreté (13) sur ledit disque de base (5).

FIG. 1

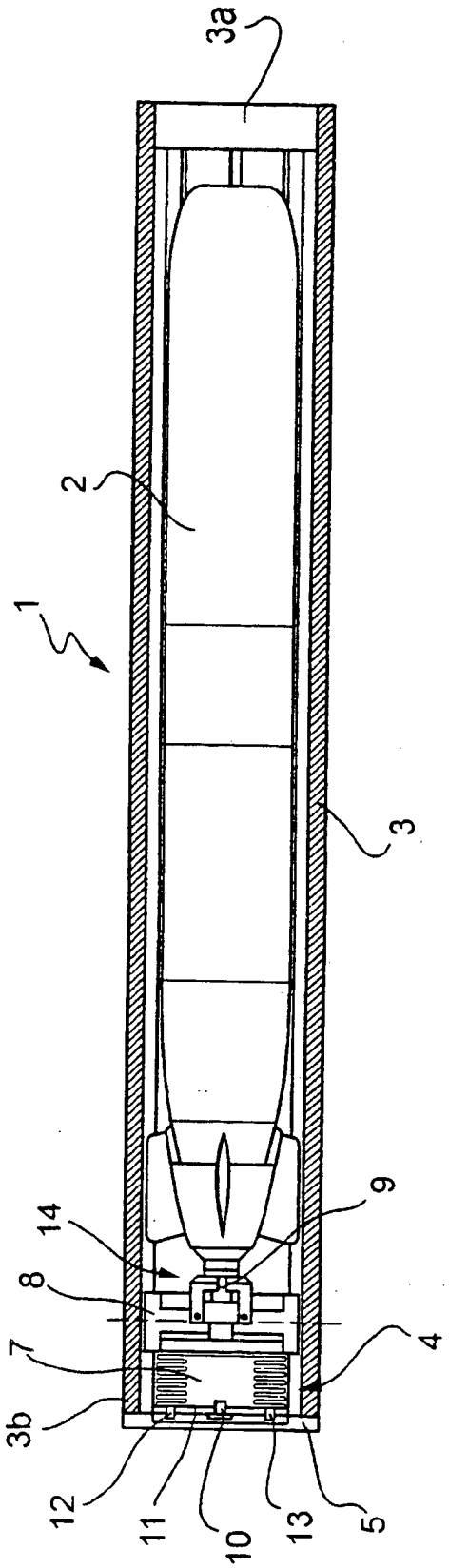

FIG. 2

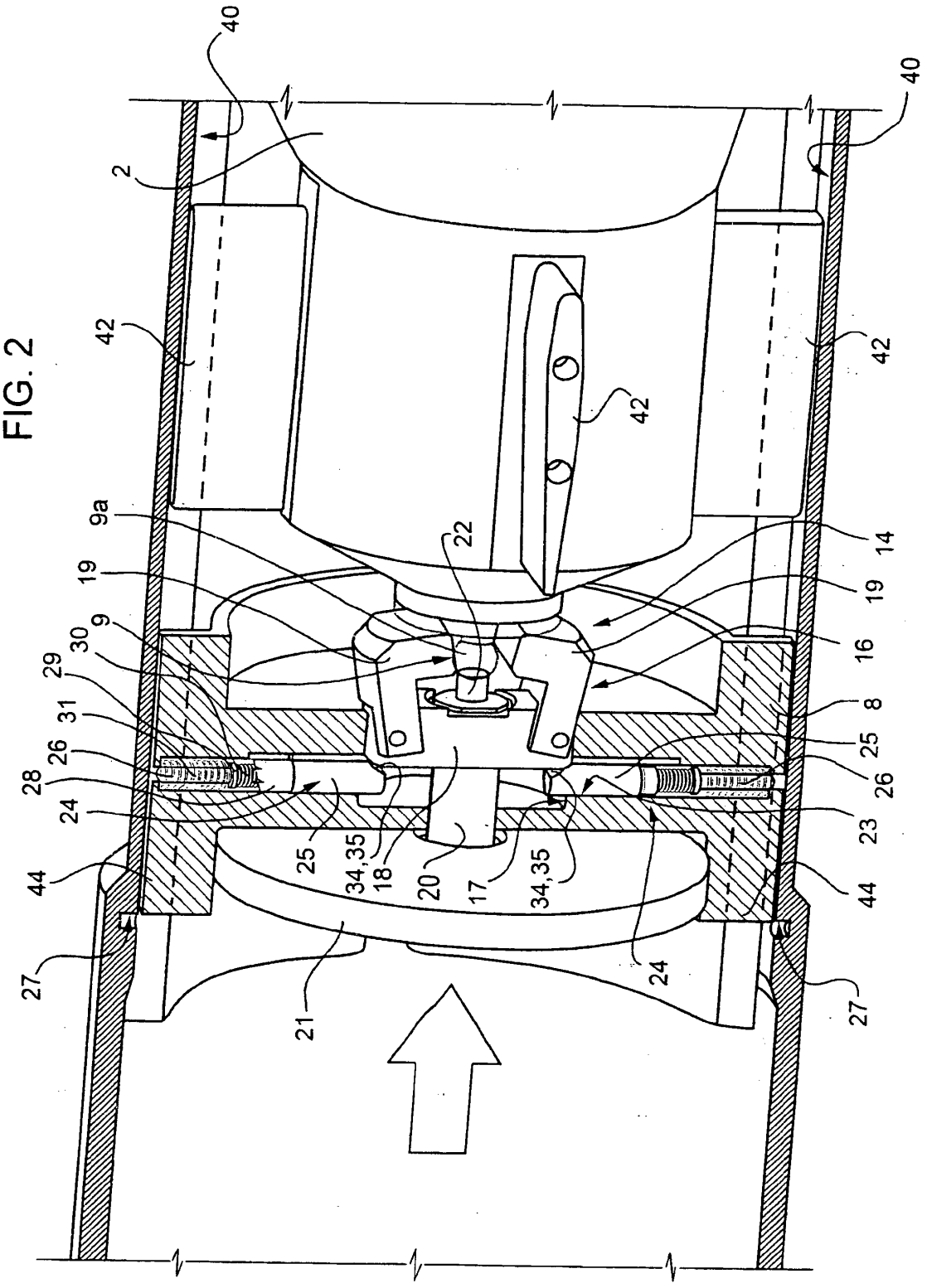
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FIG. 3

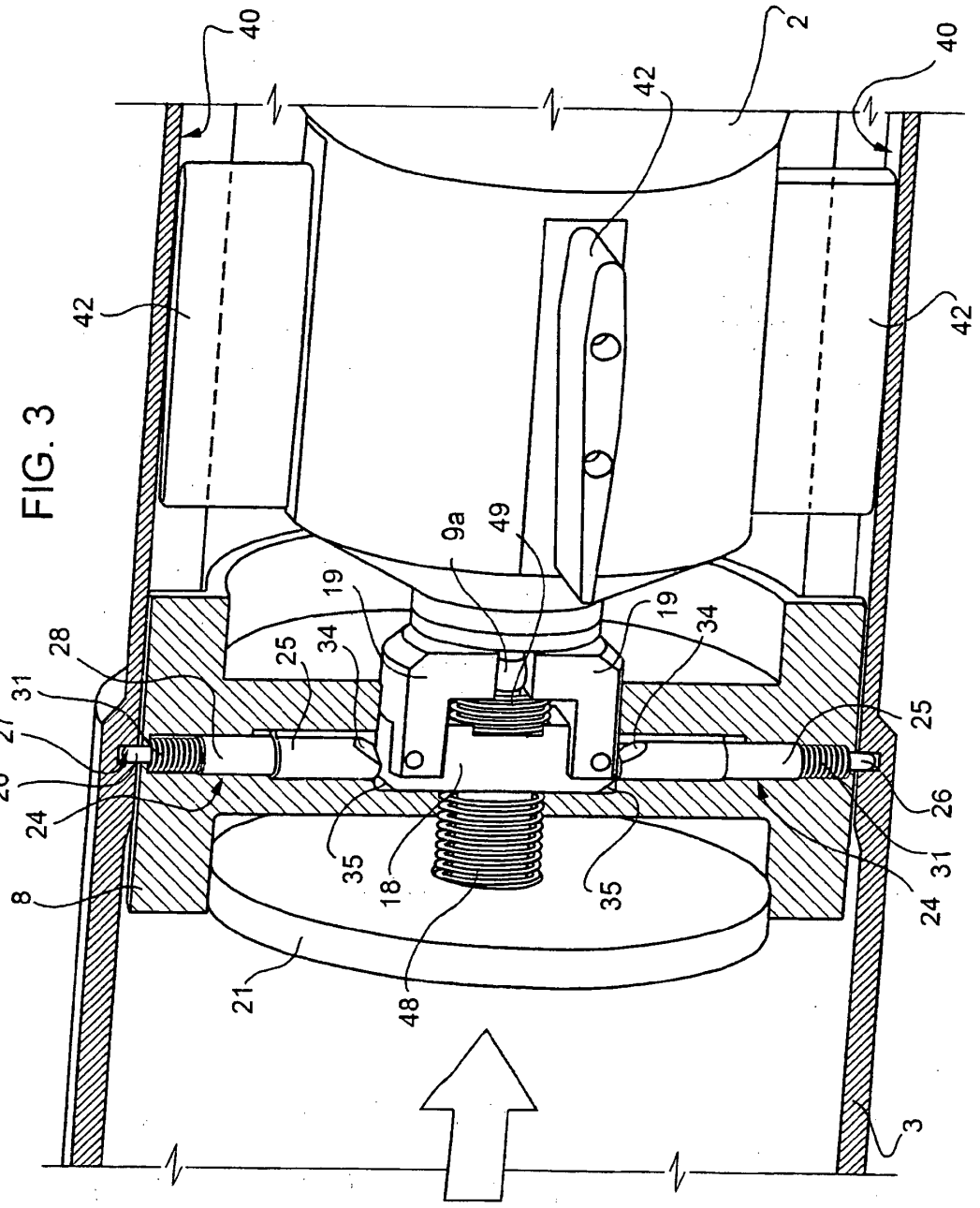
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FIG. 4

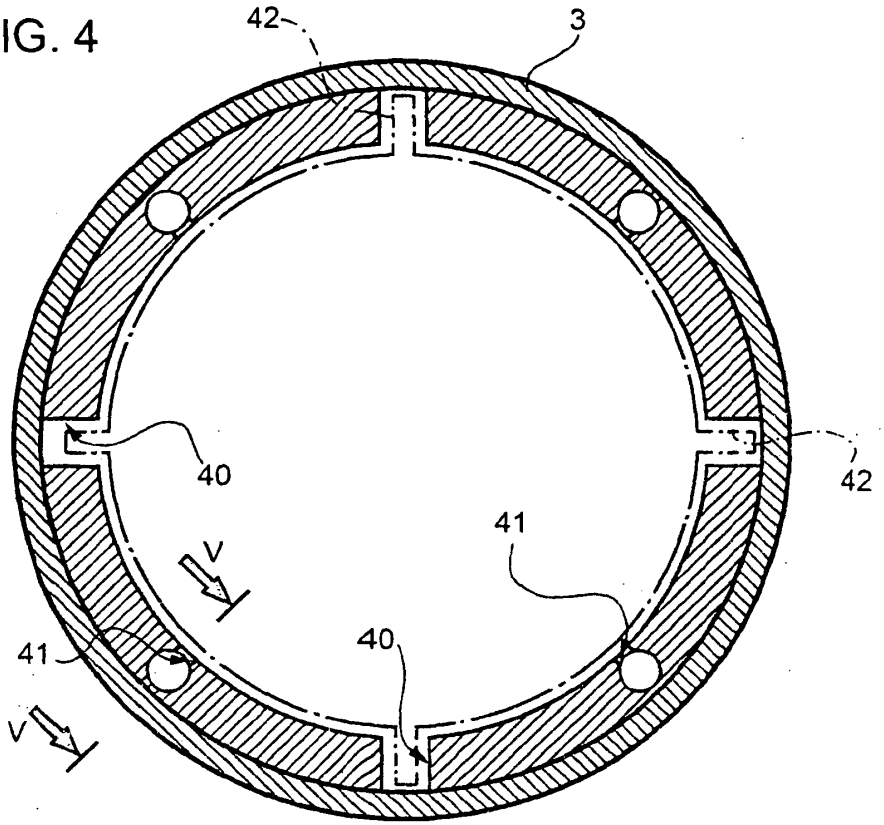
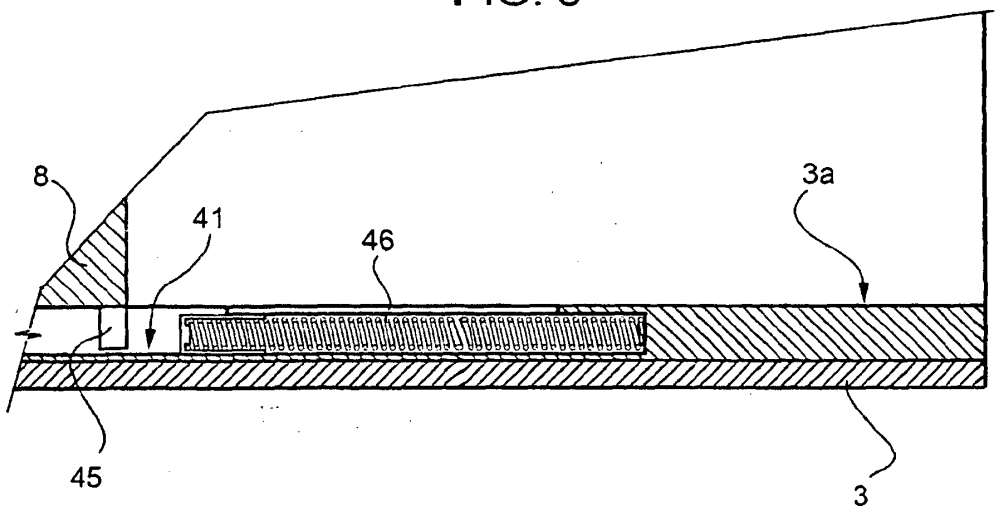


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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- WO 0192095 A **[0007]**
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- DE 2962267 C **[0008]**