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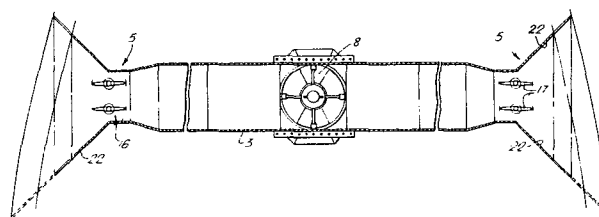
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Valve system for controlling the direction of fluid discharge from a nozzle.

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A valve is provided for a fluid ducting system, particularly a ships bow thruster system, comprising a pair of parallel side-by-side vanes (17) which are pivotally mounted on parallel shafts. A drive (20) to the shafts enables the vanes to be pivoted in unison or in a contradirection. When fitted in a ships bow thruster system (1) and at the outlet ends (5) of opposed ducting, the vanes can be pivoted appropriately for the controlled discharge of pumped fluid in the ducting and thereby permit backwards, forwards or sideways thrust to be created for ship manoeuvring.



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TITLE MODIFIED
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VALVE SYSTEM

The present invention relates generally to a valve system for use in conjunction with the discharge nozzle of a fluid ducting, and more particularly to a valve controlled thruster system for use in marine craft. More especially the system can be used in a ships' bowthrusting system.

In the marine industry it is established practice to fit ships with bow thrusting devices to improve manoeuverability, thereby reducing dependence on tugs when moving in confined waters such as in rivers, canals or when docking or undocking.

Bow thrusting systems typically consist of a pump, which may be driven by a diesel engine, electric or hydraulic motor, discharging through a system of ducting and/or flow control devices.

With these previous bow thruster systems, the direction of thrust obtainable only provided sideways motions, particularly to give a turning action to the ship, or alternatively only fore-and-aft thrusts for forward or reverse motion of the ship.

The present invention provides a valve system for the ducting of a ship thruster device enabling the device to conveniently provide various directions of thrust so as to give selectively forward or reverse motions of the ship or sideways motion of the ship.

According to one aspect of the present invention there is provided a valve system for use in the discharge nozzle of a fluid ducting, said valve system comprising a pair of vanes pivotal about parallel axes, the arrangement being such that the vanes are pivotal in unison to control the direction of fluid discharge from the nozzle and in a contra-direction for closure of the nozzle.

When the above valve system of the present invention is provided in a thruster system for use in marine craft including ducting in or associated with the hull of the craft, which ducting includes a discharge outlet discharging externally of the hull and means for directing a fluid flow through the ducting to the discharge outlet, the valve system is located at the discharge outlet to control the direction of fluid flow from the outlet.

Preferably the ducting leads to two opposed discharge outlets each with an associated valve system. The above thruster system of the

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present invention can be suitably located transversely in the bow of a ship to facilitate manoeuverability and control of the ship.

5 The or each valve means comprises a pair of parallel vanes pivotal about parallel axes: thus the vanes can pivot in unison to control the direction of the fluid discharge or be pivoted in a contra-direction to close the discharge. Thus with opposed transverse discharges in a ship's bow-thrusting system, by selective operation of the valve system it is possible to achieve desired sideways movements and also forward and reverse motions: turning movements are also possible.

10 Fluid or water flow in the ducting can be produced by a pump or impeller, and in a ship this pump is preferably located in a housing at the bottom of the ship and intakes through an aperture in the ships bottom while discharging normally into the fluid ducting which can extend transversely. The ducting discharge is preferably in the form of a frustrum with the vane pivotal axes at the inlet end and the valve vanes can be motor controlled.

15 An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings wherein:-

Fig.1 shows a bottom view of a bow thruster system in a ship, in accordance with the present invention.

20 Fig.2 shows a cross-sectional side elevation of the thruster system of Fig.1, and

Figs. 3 to 8 show various operational modes of the valve means of the thruster system of Figs.1 and 2.

25 Referring to Figs.1 and 2, a transverse thruster 1 is fitted into a ship's hull 2 towards the bow thereof, and comprises a transverse duct 3 close to the bottom 4 of the hull 2 and a pair of venturi-type discharges (or nozzles) 5 at opposite ends of the duct 3 discharging externally of the hull 2. A central lateral duct 6 opens into the

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transverse duct 3 and houses a pump 7 comprising an axial flow
impeller 8, flow to the impeller 8 being via a frustrum inlet 9
at the ships bottom 4. The impeller is mounted on a shaft
rotor 10 and located by a thrust collar 11 and a sleeve bearing
12, and the rotor 10 is driven by a suitable motor (not shown)
e.g. electric or hydraulic motor or a diesel engine, via a right
angle gearbox 13 the outlet 14 from which is connected to the
rotor 10 by coupling 15. The weight of the pump rotating element
and the pump axial hydraulic thrust is carried on a thrust
bearing located in the right angled gearbox. A shaft seal (25)
is fitted to the rotor 10 below the coupling 15.

The pump 7 is set at as low as possible relative to the bottom
of the ship to ensure that the impeller 8 is fully submerged under
all conditions of ship loading. The discharges 5 on the other
hand may or may not be submerged under all loading conditions.

Control of flow from each of the discharges 5 is achieved by
diverter valves 16 each comprising a pair of parallel aerofoil
vanes 17 fixed to parallel rotary shafts 18 supported in bearings
19. The shafts 18 are rotated by motors 20 (e.g. electrical or
hydraulic) via gearboxes 21, and it is a feature of the arrangement
that the shafts 18 (and vanes 17) of each valve 16 can be rotated
in unison or in a contra-direction. As can be seen in Fig. 1
each discharge 5 includes a diverging outlet frustrum 22, and
the axes of the shafts 18 of each valve 16 are located in the plane
containing the frustrum inlet end with a portion of each vane
projecting into the frustrum.

In operation of the thruster 1, e.g. when the ship is manoeuvring
in confined waters or is docking or undocking, the pump 7 is driven
to discharge water into the duct 3 and the desired manoeuvre is

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achieved by controlled thrusting discharge of the water by means of diverter valves 16, as is illustrated in Figs. 3 to 6 and outlined as follows:

5 Fig. 3 For sideways motion to port (leftwards) the port valve 16 is closed by contra-rotation of vanes 17 to bring the vane leading tips into engagement with duct 3 and all the thrusting discharge is in a normal direction via the starboard discharge 5.

Fig. 4 This is similar to Fig. 3 but with the set up for sideways motion to starboard (rightwards).

10 Fig. 5 In this arrangement the vanes 17 of each valve 16 are pivoted in unison but with the vanes of one valve opposite to those of the other to give reverse motion.

Fig. 6 In this case the vanes 17 are oppositely pivoted relative to Fig. 5 for forward motion.

15 It is also possible to impart turning movement by pivoting the vanes 17 in unison as shown in Figs. 7 and 8: this operational mode is more effective where the thruster is located closer to the centre of turning (centre of gravity) of the ship.

20 Where the thruster is at a substantial distance from the centre of turning, it will be appreciated that the arrangements of Figs. 1 and 2 will also impart turning movements.

Valve position selection can be carried out remotely e. g. from the ship's bridge control room. The angle of pivoting of each vane may be varied for fine manoeuvres, and the thrust can be adjusted by varying the pump speed to give alteration of the water flow through the ducting.

The above valve arrangement provides efficient control of the direction of the discharging flow and hence correspondingly efficient thrusting in any of the desired directions as described.

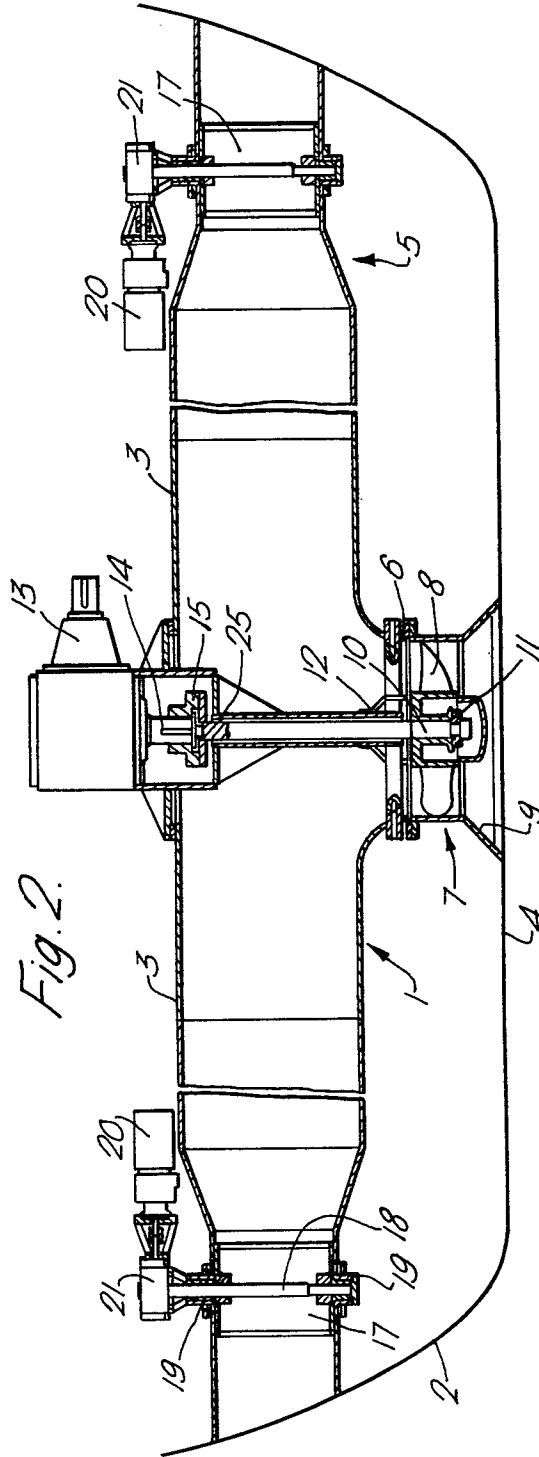
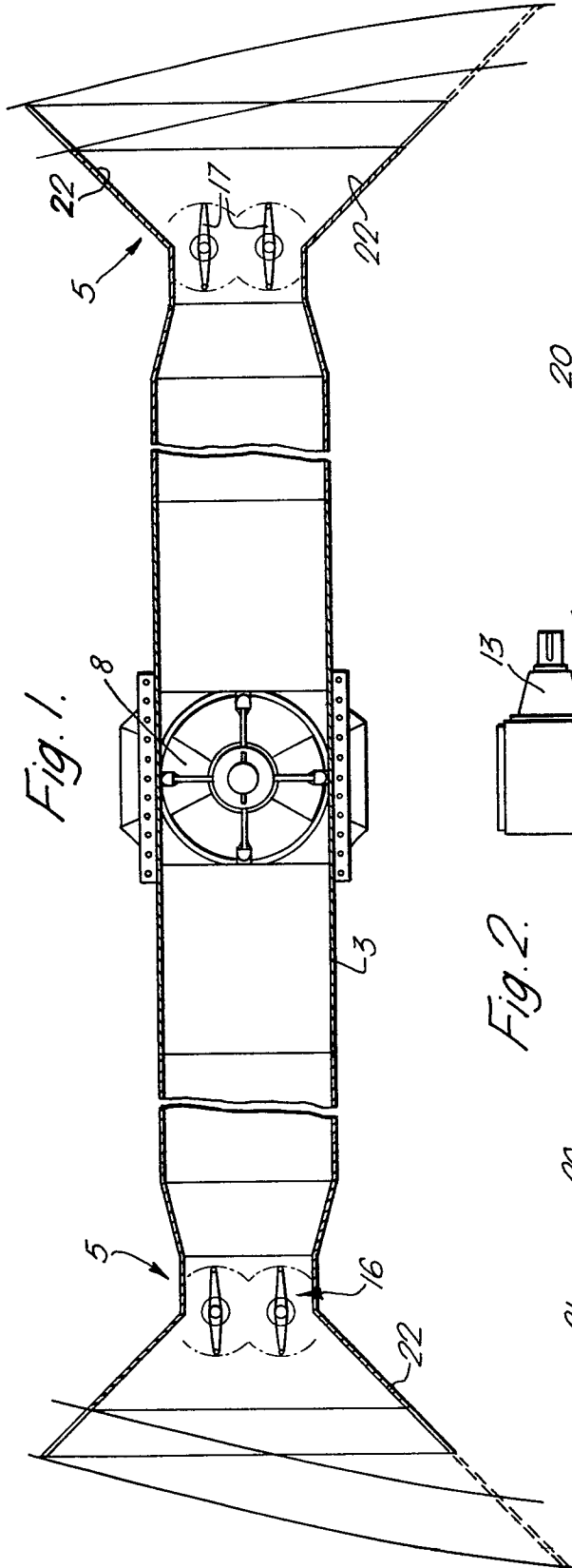
CLAIMS

1. A valve system for use in a discharge nozzle of a fluid ducting including pivotal vane means characterised in that a pair of vanes (17) are provided pivotal about parallel axes (18) the arrangement being such that the vanes (17) are pivotal in unison to control the direction of fluid discharge from the nozzle (5) and in a contra-direction for closure of the nozzle(5).
2. A valve system as claimed in claim 1, characterised in that the vanes (17) are carried by rotatable shafts (18)
3. A valve system as claimed in claim 1 or 2, characterised in that the pivotal vanes (17) are driven by motor means (20,21).
4. A valve system as claimed in any one of the preceding claims, characterised in that the vanes (17) are located at the smaller inlet end of a frustum discharge portion (22) of the nozzle (5).
5. A thruster system for use in marine craft including ducting for location in the hull of the craft, the ducting having a discharge outlet discharging externally of the hull, means for directing a fluid flow through the ducting to the discharge outlet and control means for controlling the flow discharge, characterised in that valve means (16) are provided comprising a pair of parallel vanes (17) at the discharge outlet (22) and pivotal about parallel axis, the vanes (17) being pivotal in unison to control the direction of fluid flow from the discharge outlet (22) and in a contra-direction to preclude fluid discharge from the discharge outlet (22).
6. A thruster system as claimed in claim 5, characterised in that two opposed discharge outlets (22) are provided each including one of said valve means (16).
7. A thruster system as claimed in claims 5 or 6 characterised in that the valve means (16) are located in the throat of a venturi-nozzle discharge (5).

8. A thruster system as claimed in claim 7, characterised in that the axes (18) of the vanes (17) are located at the inlet end of the outlet diverging portion (22) of the nozzle (5) with a portion of each vane (17) projecting into said diverging portion (22).

9. A thruster system as claimed in any one of claims 5 to 8 characterised in that the vanes (17) are mounted on rotatable shafts (18) which are driven by motor means (21, 22).

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Fig. 3.
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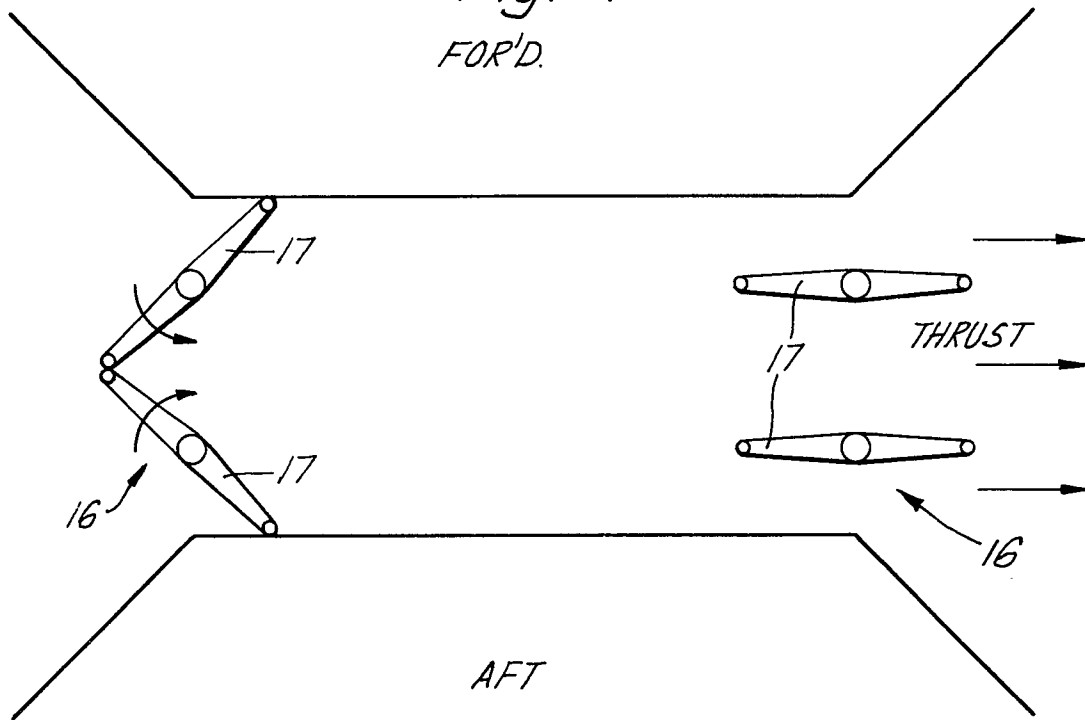
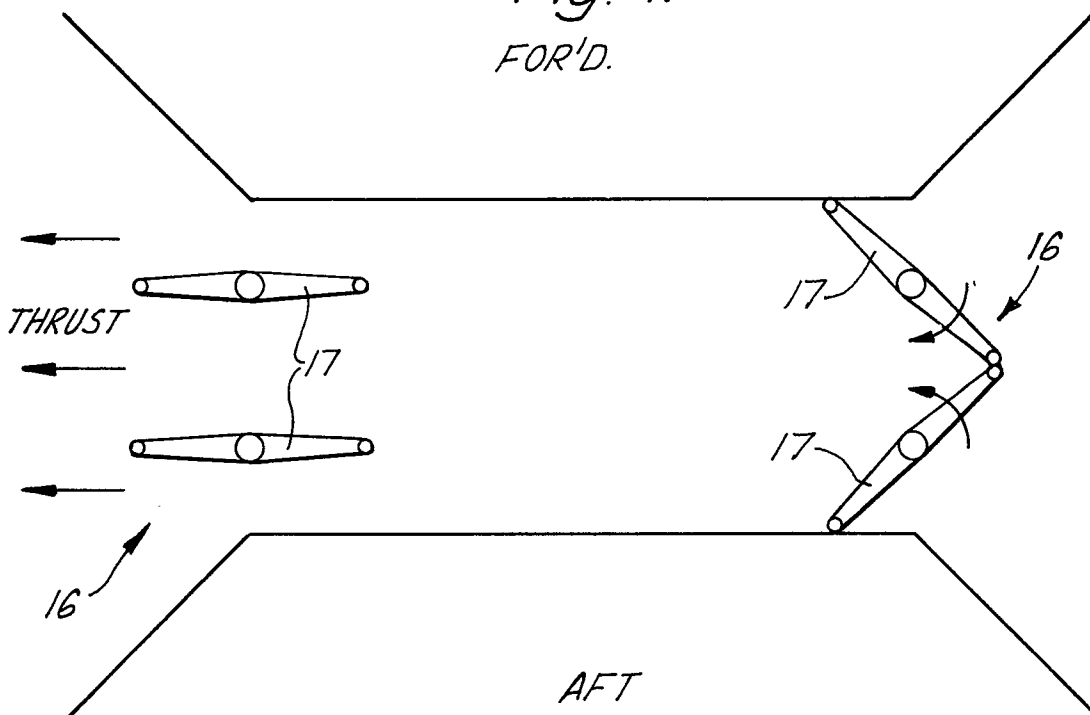


Fig. 4.
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Fig. 5.
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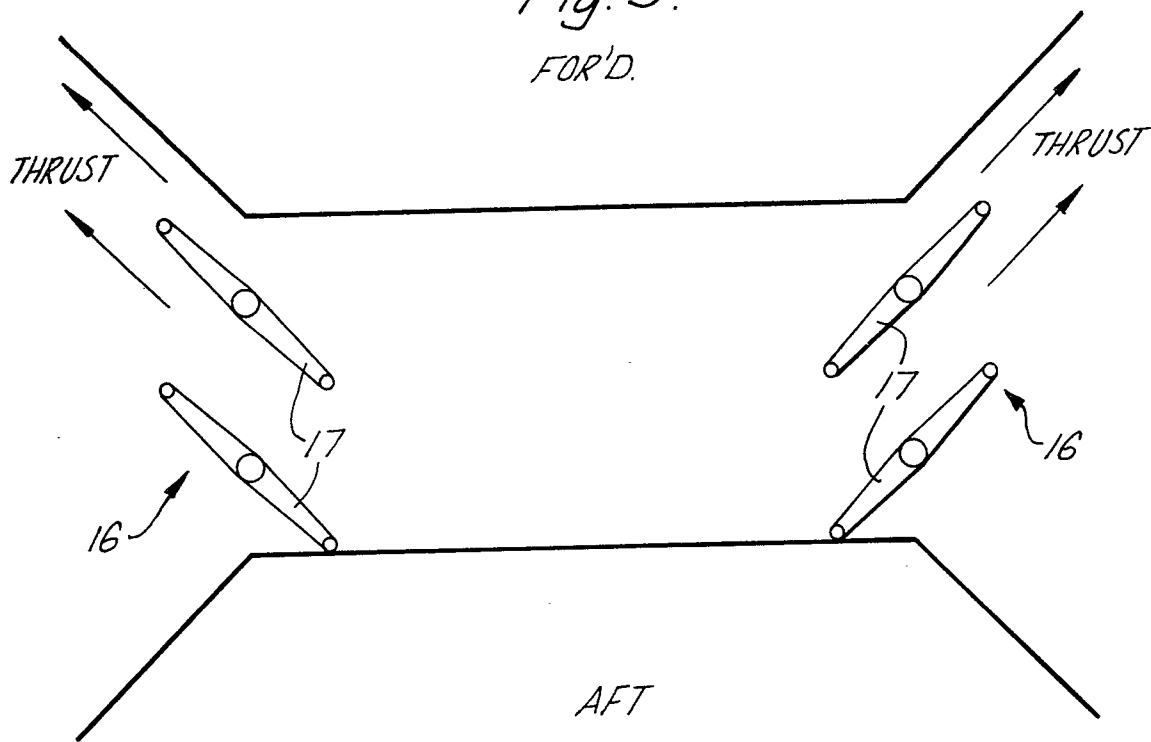
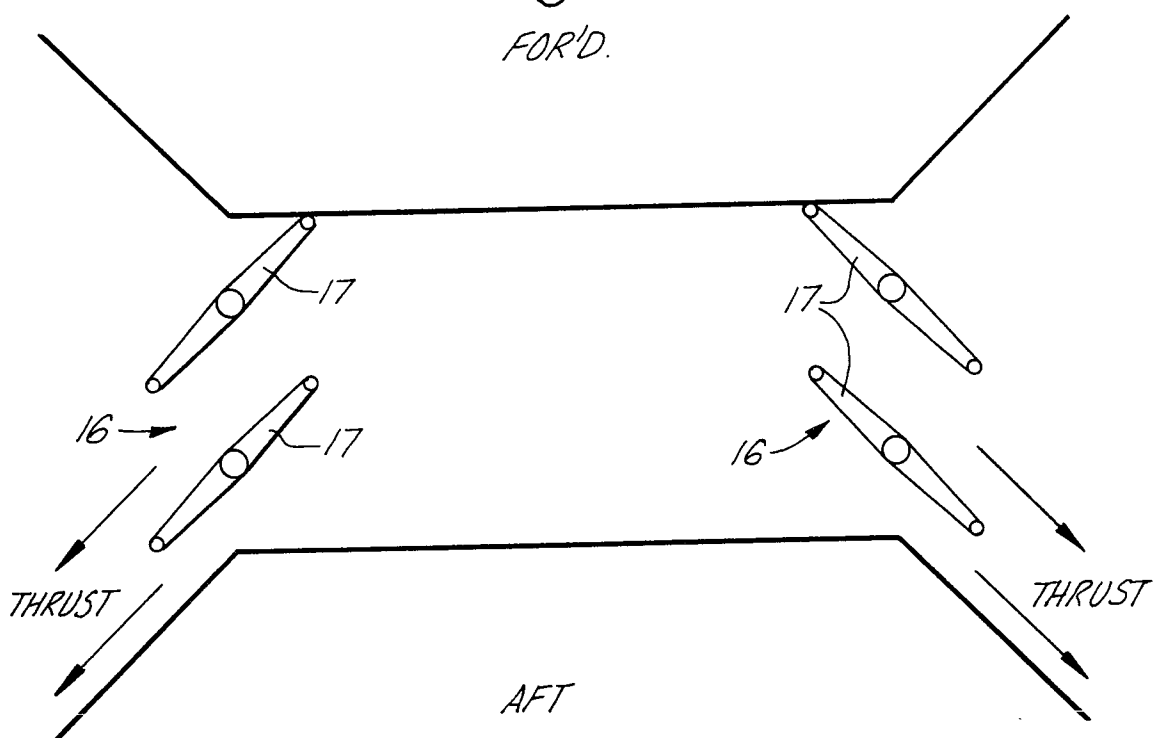


Fig. 6.
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Fig. 7.

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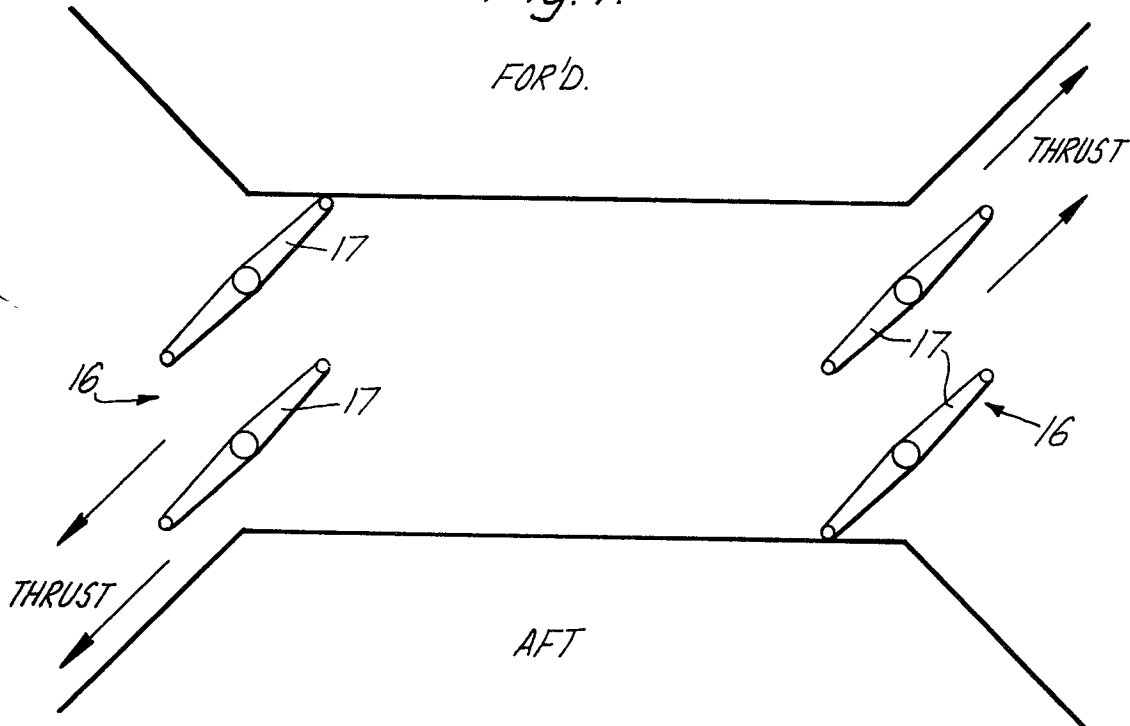


Fig. 8.

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