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(54) **Road sweeping vehicle**

(57) A suction-type road sweeping vehicle (100) with a forward air blast capability formed using a blow mechanism (142), which redirects an exhaust flow of a rearward debris suction mechanism (114) to a blow nozzle (144) mounted forwardly of the front wheels (104) of the vehicle. The blow mechanism acts to blow material away from the path of the vehicle before the vehicle passes, whereafter the suction mechanism performs conventional cleaning on the cleared path. The direction of the blow nozzle may be controllable from the driver's cab of the vehicle.

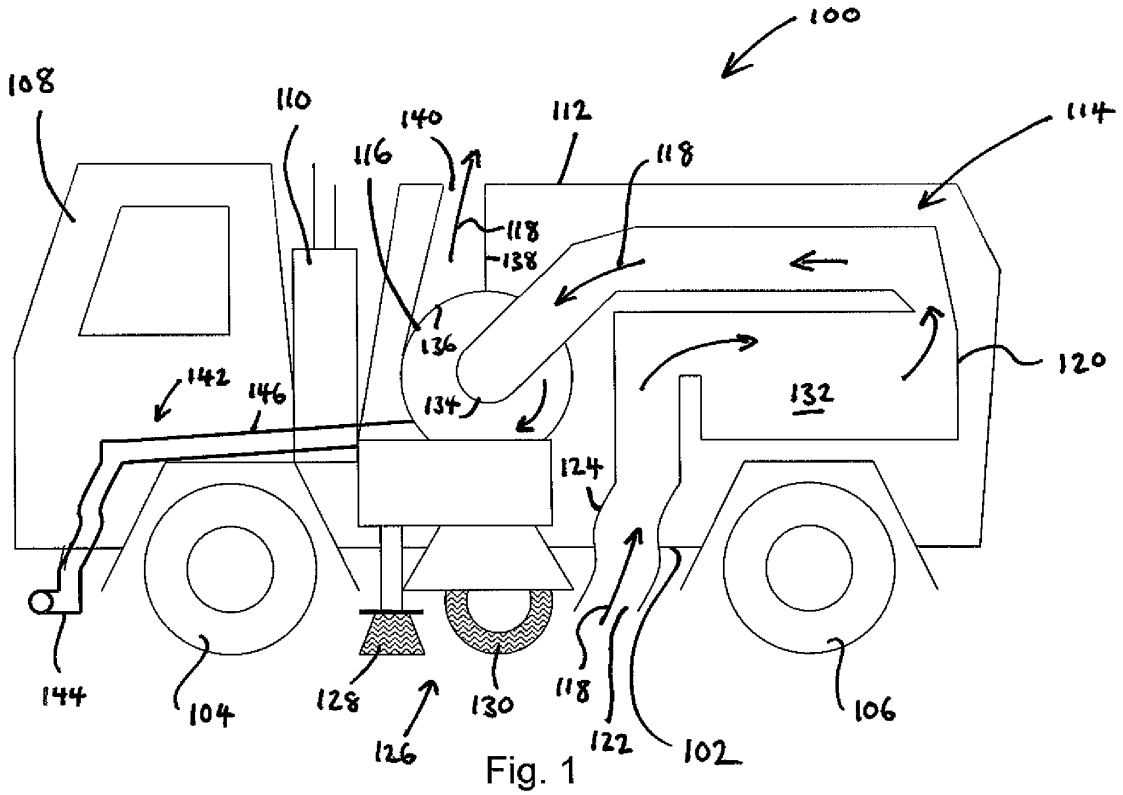

Fig. 1

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Description

[0001] The invention relates to road sweeping vehicles which have a suction device for removing material, e.g. dirt, litter or other debris, from a road surface.

[0002] Many types of road sweeping vehicle exist for the purpose of cleaning road or paved surfaces. Typically, such vehicles comprise a motorised debris collection mechanism mounted on a vehicle chassis, which is supported on a set of drivable wheels. The debris collection mechanism typically includes both a mechanical sweeping device, such as rotating brushes or the like, and a suction device, which may act to draw material into a collection chamber housed on the vehicle. Sweepers of this type are manufactured, for example, by Johnston Sweepers Limited and Schwarze Industries, Inc., and are well know to a person skilled in the art.

[0003] In some circumstances it is desirable to blow debris away from the vehicle, e.g. to clear snow, rather than collect it. In this case, it is known to add to a road sweeper an air blast mechanism, which provides an outward flow of air. US 7,621,018 discloses an example of a road sweeper with an air blast capability. In this example, an air flow from a high-velocity radial flow fan travels to a debris intake hood located at the side of the vehicle between its front and rear wheels. An operator can choose the direction of the air flow to be either (i) outwardly from the intake hood as an air blast, or (ii) inwardly on a recirculation path, where material drawn up from the road surface by the air flow is swept into a container.

[0004] In other cases, an outward flow of air is used to blow material into the path of a mechanical sweeper in order to prevent the sweeper leaving a trail.

[0005] The present invention arises from the realisation that it is desirable in some cases to blow material away from the path of the vehicle (especially the wheels) before the vehicle passes, and also perform normal (i.e. mechanical and/or suction) cleaning on the cleared path. For example, at certain times of year it may be desirable to blow fallen leaves away from a roadway and perform cleaning of the surface beneath the leaves.

[0006] At its most general, the present invention provides a road sweeping vehicle with a forward air blast capability that is operable simultaneously with a rearward suction mechanism. In one embodiment, the air blast may be achieved by redirecting an exhaust flow of the suction mechanism.

[0007] According to the invention, there may thus be provided a road sweeping vehicle having a chassis carried on a set of front and rear wheels, a debris suction mechanism supported on the chassis for generating an air flow path between an inlet suction port located between the front and rear wheels and an outlet exhaust port, whereby debris located around the inlet suction port is entrained in the air flow path; a collection chamber on the air flow path between the inlet suction port and the outlet exhaust port for receiving the entrained debris; and a selectively operable blow mechanism comprising an intake port located downstream of the collection chamber on the flow path and a blow nozzle mounted forwardly of the front wheels. The blow mechanism may thus be activated to capture exhaust air flow from the suction mechanism and redirect it to the blow nozzle.

[0008] The suction mechanism may be of a conventional type, e.g. comprising a rotatable fan (e.g. driven by an auxiliary motor via a gearbox) to cause air to flow rapidly along the air flow path from the inlet suction port to the outlet exhaust port.

[0009] The air flow path may be defined by a passageway, e.g. formed from flexible hosing or the like. The air flow path may be directed into the collection chamber in a manner to permit the entrained debris to drop from the flow of air. This may be achieved in a conventional manner by widening the passageway for the air flow, which reduces its velocity. Alternatively or additionally a filtering or other separation device may be used.

[0010] The inlet suction port may comprise a suction nozzle or intake aperture. The inlet suction port may be located immediately rearwardly of a mechanical sweeping device, e.g. a cylindrical brush extending across the underside of the vehicle. One or more circular brushes (known as kerb or gutter brooms) may also be mounted between the front and rear wheels.

[0011] The suction mechanism discussed above is conventional, as described in GB 2 276 853, for example.

[0012] The intake port of the selective blow mechanism is preferably incorporated e.g. as a aperture into a housing that encases the fan of the suction mechanism, but in principle may be located at any point downstream of the collection chamber. Effectively the blow mechanism is operable to divert some or all of the exhaust air flow from the outlet exhaust port to the blow nozzle.

[0013] The blow mechanism may comprise a conduit for conveying the exhaust air to the blow nozzle. The conduit may comprise flexible hosing and/or steel ducting. As the blow nozzle is located forwardly of the front wheels, the conduit may pass close to the vehicle engine. In this case it may be preferably to use a robust, e.g. heat resistant, material for the conduit. Heat-resistant rubber materials may be suitable for this purpose. Moreover, the conduit may be exposed as it travels from the suction mechanism towards the front of the vehicle. Any exposed parts of the conduit are preferably formed from a rigid material, e.g. steel ducting or the like.

[0014] The blow mechanism may be switchable ON/OFF by a blocking device for selectively inhibiting air flow through the conduit. The blocking device may be operated manually, e.g. to insert a plug into the conduit or to cover the intake port. In a preferred embodiment, the blocking device comprises a valve (e.g. shut off valve or butterfly valve) mounted in the conduit. The valve may be a rotatable flap that is movable between a first position where it blocks air flow through the conduit and a second position where it permits air flow through the conduit.

[0015] To facilitate air flow through the conduit when the valve is open, the blow mechanism may include a

controllable baffle operable to control air flow towards the outlet exhaust port. The baffle may be mounted in a passageway linking the fan housing to the outlet exhaust port. In operation, the baffle may be switchable between a closed position for inhibiting air flow to the outlet exhaust port and a open position for permitting air flow to the outlet exhaust port. The operation of the baffle may be cooperably linked to operation of the blocking device such that when the conduit is open the baffle is in the closed position and when the conduit is closed the baffle is in the open position.

[0016] As the blow mechanism may not require all of the exhaust air to be diverted into the conduit in order to operate, the baffle may be arranged to partially block air flow through the conduit when in the first position. In one embodiment, the baffle may comprise a pivotable flap, e.g. formed by a planar sheet of rigid material (e.g. metal) mounted in the passageway between the fan housing and the outlet exhaust port. The pivotable flap may rotate about an axis, which alters the orientation of the plane of the piece of material relative to the passageway. In the closed position the plane of the flap may be orientated against the air flow path to inhibit air flow out of the outlet exhaust port. In the open position the plane of the flap may be substantially aligned with the air flow path. The flap thus acts to vary the open cross-sectional area of the passageway. The pivoting motion of the baffle may be performed by actuating a suitable lever using an air ram or the like.

[0017] The blow nozzle may comprise a tube mounted on the side of the chassis in front of the front wheels. The tube may be shaped to direct the airflow sideways out from the vehicle. Preferably, the tube is movable, e.g. pivotable, relative to the chassis, to permit the direction of blown air to be varied.

[0018] The chassis may be that of a commercial truck, e.g. with a driver cabin located over the front wheels. In this case, a lever may extend upwards from the tube into the driver cabin to permit the direction of the blown air to be directly controlled.

[0019] The selective blow mechanism of the invention may be capable of retrofitting to conventional suction-type road sweeping vehicles because it require minimal interference with the suction air flow path.

[0020] An embodiment of the invention is discussed below in more detail with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view of a road sweeping vehicle that is an embodiment of the invention; and Fig. 2 is schematic side view of the selective blow mechanism used in the embodiment shown in Fig. 1.

[0021] Fig. 1 shows a side view of a suction-type road sweeping vehicle 100 that is an embodiment of the invention. The vehicle 100 comprises a chassis 102 supported by a pair of front wheels 104 and a pair of rear wheels 106. A driver cabin 108 is mounted on the chassis 102 over the front wheels 104. The vehicle engine (not shown) is located under the driver cabin 108 and has an engine exhaust 110 mounted on the chassis 102 behind the driver cabin 108. Mounted on the chassis behind the engine exhaust 110 and driver cabin 108 is a container 112, which may be an airtight container, which contains a debris suction mechanism 114. To assist a description of the debris suction mechanism, the container 112 is made transparent in Fig. 1. In normal use the debris suction mechanism 114 would be not be visible in use.

[0022] The debris suction mechanism 114 comprises an exhauster fan that is rotatable in fan housing 116 under the action of an auxiliary engine and gearbox (not shown). In operation, the exhauster fan creates an air flow (indicated by arrows 118) through a passageway 120 inside the container 112 which draws air in from an inlet suction port 122 mounted on the chassis 102 between the front wheels 104 and rear wheels 106. The inlet suction port 122 may be an opening at the end of a flexible hose 124. The inlet suction port 122 is positioned behind (i.e. closer to the rear wheels 106 than) a mechanical sweeping mechanism 126 for disturbing debris on the road surface so that it is picked up in the air flow sucked into the inlet suction port 122. In this embodiment, the mechanical sweeping mechanism 126 includes a rotatable gutter broom 128 and a cylindrical brush 130.

[0023] The air flow from the inlet suction port 122 travels through the passageway 120 to a collection chamber 132 in the container 112. The passageway 120 widens into the collection chamber 132, which may encourage the debris entrained in the air flow to be deposited. Alternatively or additionally a filter (not shown) may be mounted in or at the entrance to the collection chamber 132, as is conventionally known.

[0024] The fan housing 116 includes an annular air flow passage (shown in Fig. 2) which circulates the air flow from a central entrance aperture 134 connected to receive air from the passageway 120 to an exit aperture 136, which is connected to an exhaust passageway 138 that terminates at an outlet exhaust port 140 on the roof of the vehicle 100.

[0025] The road sweeping vehicle 100 shown in Fig. 1 is characterised by a blow mechanism 142, which acts to divert air from the fan housing 116 to a blow nozzle 144 mounted forwardly of the front wheels 104. Thus, the annular air flow passage in the fan housing 116 may have an additional aperture in the invention, which is connected to a conduit 146 that guides the air flow to the blow nozzle 144. The conduit 146 need not connect directly to the fan housing 116. For example, it may be drawn off the passageway 138 that leads to the outlet exhaust port 140. It is preferable for the conduit to receive air flow downstream from the collection chamber 132 so that entrained debris does not block the blow nozzle 144.

[0026] In this embodiment, the conduit 146 carries the air flow from the fan housing 116 away from the container 112, under the driver cabin 108, past the vehicle engine and above the front wheel axle to the blow nozzle 144.

The conduit 146 comprises a rigid section (e.g. made from metal ducting) where it is exposed to the outside, i.e. as it passes from the container 112 to the driver cabin 108, and a flexible section (e.g. made from rubber ducting or hosing) that connects the rigid section to the blow nozzle 144. The flexible section permits the position of the blow nozzle 144 (i.e. the angle of airflow relative to the chassis) to be adjusted. The movement may be controlled via a hydraulic cylinder (not shown) that can be operated using an appropriate control element (e.g. joy stick or the like) mounted in the driver cabin 108.

[0027] Fig. 2 is a view showing the components of the blow mechanism 142. The fan casing 116 is shown in partly in cross-section to illustrate the internal annular passageway 150. The air flow path enters the fan casing 116 from passageway 120, which connects to one side of the fan casing and opens into it via aperture 134. The fan (not shown) drives air in a clockwise direction (as viewed in Fig. 2) around an annular path 150 towards the periphery of the fan casing 116 towards the exit aperture 136. In this embodiment, there is an additional aperture 152 in the fan casing 116 to which the conduit 146 of the blow mechanism is attached. The blow mechanism 142 may be retrofitted onto existing road sweeping vehicles by created such an additional aperture in either the fan casing 116 or exhaust passageway 138.

[0028] As in Fig. 1, the conduit 146 shown in Fig. 2 has a rigid section 154 leading to a flexible end section 156. The rigid section 154 may be mechanically attached to the chassis 102, leaving the flexible section 156 free to move. The blow nozzle 144 may have attachment portion 158 (e.g. hook or the like) for engaging the chassis 102 at the front of the vehicle to hold the blow nozzle 144 in position. The attachment portion 158 may include a hinge (not shown) that permits the blow nozzle 144 to pivot relative to the chassis. A hydraulic arm (not shown) may be actually to permit the angle of the blow nozzle 144 to be controlled, e.g. via a control lever in the driver cabin 108. The blow nozzle 144 may pivot between a forwards facing direction, i.e. aligned with the vehicle body or even slightly angled (e.g. by 10°) away from the side of the vehicle into the roadway, and a rearward facing direction, i.e. pointing backwards and angled slightly outwardly relative to the side of the vehicle (e.g. by 30-40°). The angle range of the pivot may thus be 100-120°, preferably 110°.

[0029] In the embodiment shown in Fig. 2, the blow mechanism 142 is selectively activatable through operation of a valve 160. The valve 160 comprises a rotatable plate mounted in the rigid section 154 of the conduit. The rotatable plate is movable under the action of a lever 161 between a first position in which the conduit 146 is open and a second position in which the conduit 146 is closed. The valve 160 is actuated using an appropriate controller located in the driver cabin 108. To facilitate air flow through the conduit 146 when it is open, a controllable baffle 162 is mounted at the exit aperture 136 in the exhaust passageway 138. The baffle 162 is similar to the safety valve seen in conventional road sweeping vehicles. However, in contrast to the conventional safety valve, which are spring loaded to close automatically when the container 112 of the vehicle is raised, the baffle 162 is mechanically controlled to permit it to be movable manually, e.g. via a control switch in the driver cabin 108.

[0030] The baffle 162 comprising a flap that is pivotable about an axis through its centre. The flap is switchable between a closed position (shown as a solid line in Fig. 2) in which air flow into the exhaust passageway 138 is inhibited (although not completely prevented) and an open position (shown as a dotted line in Fig. 2) in which it is angled to reduce or minimise the extend by which it blocks the exhaust passageway. The flap may be rotated by actuating a lever (not shown) located outside the passageway, e.g. via an air ram or the like.

[0031] The baffle 162 and valve 160 may operate in a complementary manner, e.g. via a single control switch, such that when the valve 160 is open, the baffle 162 is closed, and when the valve 160 is closed, the baffle 162 is open.

Claims

1. A road sweeping vehicle having:

   a chassis carried on a set of front and rear wheels;
   a debris suction mechanism supported on the chassis for generating an air flow path between an inlet suction port located between the front and rear wheels and an outlet exhaust port, whereby debris located around the inlet suction port is entrained in the air flow;
   a collection chamber on the flow path between the inlet suction port and the outlet exhaust port for receiving the entrained debris; and
   a selectively operable blow mechanism comprising an intake port located downstream of the collection chamber on the flow path and a blow nozzle mounted forwardly of the front wheels.

2. A road sweeping vehicle according to claim 1, wherein the debris suction mechanism comprises a rotatable fan for causing air to flow along the air flow path from the inlet suction port to the outlet exhaust port, the air flow path being directed into the collection chamber.

3. A road sweeping vehicle according to claim 2, wherein the intake port of the selective blow mechanism is located to divert to the blow nozzle some or all of exhaust air flow travelling to the outlet exhaust port.

4. A road sweeping vehicle according to claim 2, wherein the intake port of the selective blow mechanism comprises an aperture in a fan housing that encases the fan of the suction mechanism.

5. A road sweeping device according to any preceding claim, wherein the selective blow mechanism comprises a conduit connecting the intake port to the blow nozzle, and wherein the selective blow mechanism is switchable ON/OFF by a blocking device for selectively inhibiting air flow through the conduit.

6. A road sweeping device according to claim 5, wherein the blocking device is a shut off valve.

7. A road sweeping device according to claim 6 having a pivotable baffle mounted on the air flow path between the fan housing and the outlet exhaust port.

8. A road sweeping device according to claim 7, wherein the pivotable baffle is manually switchable between a closed position and an open position.

9. A road sweeping device according to claim 8, wherein the shut off valve and pivotable baffle are arranged to operate in a complementary manner such that if the shut off valve is open, the pivotable baffle is in the closed position and if the shut off valve is closed, the pivotable baffle is in the open position.

10. A road sweeping device according to any one of claims 5 to 9, wherein the conduit comprises a flexible section at a distal end connected to the blow nozzle.

11. A road sweeping device according to any preceding claim, wherein the position of the blow nozzle relative to the chassis is adjustable.

12. A road sweeping device according to claim 11, wherein the blow nozzle is rotatable relative to the chassis through an angle of at least 100°.

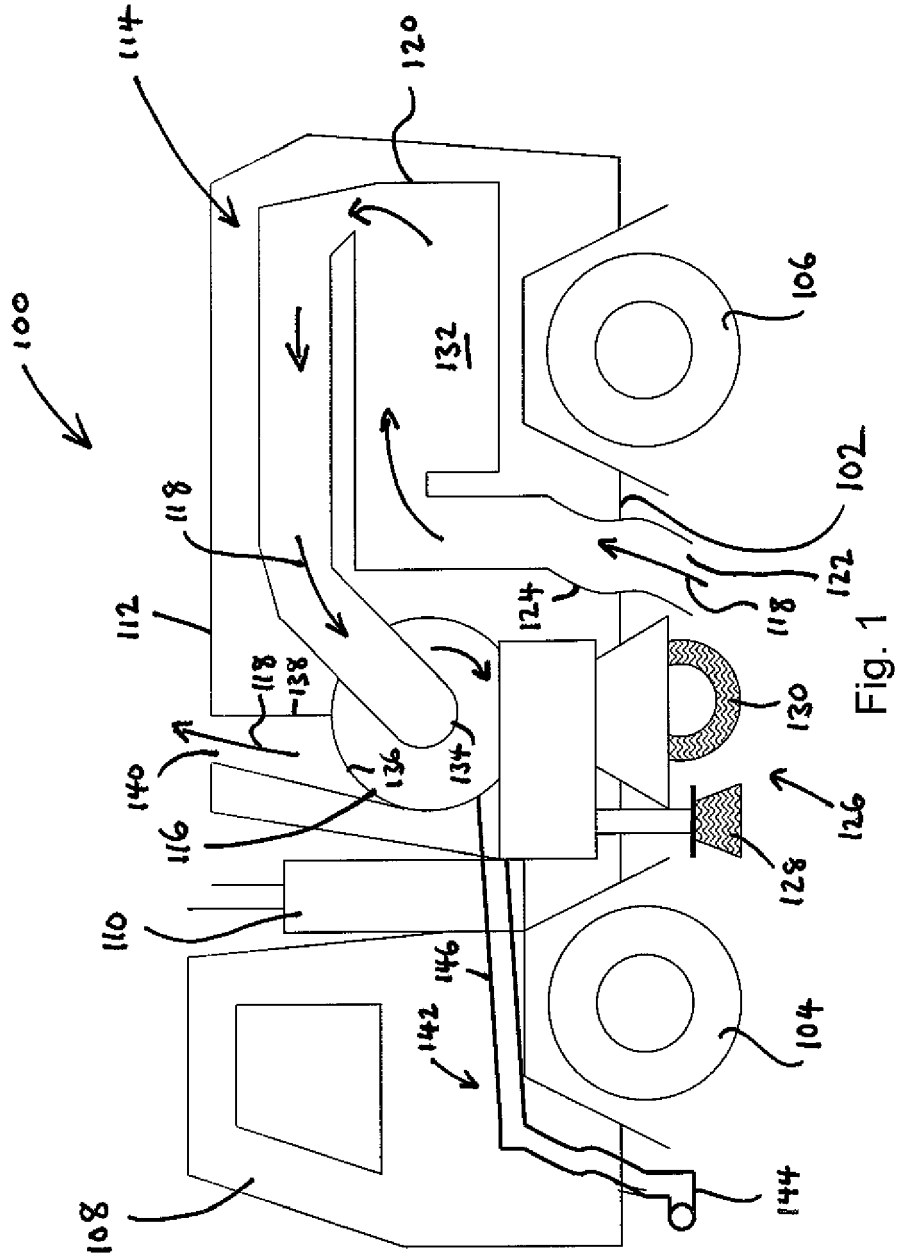
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Fig. 1

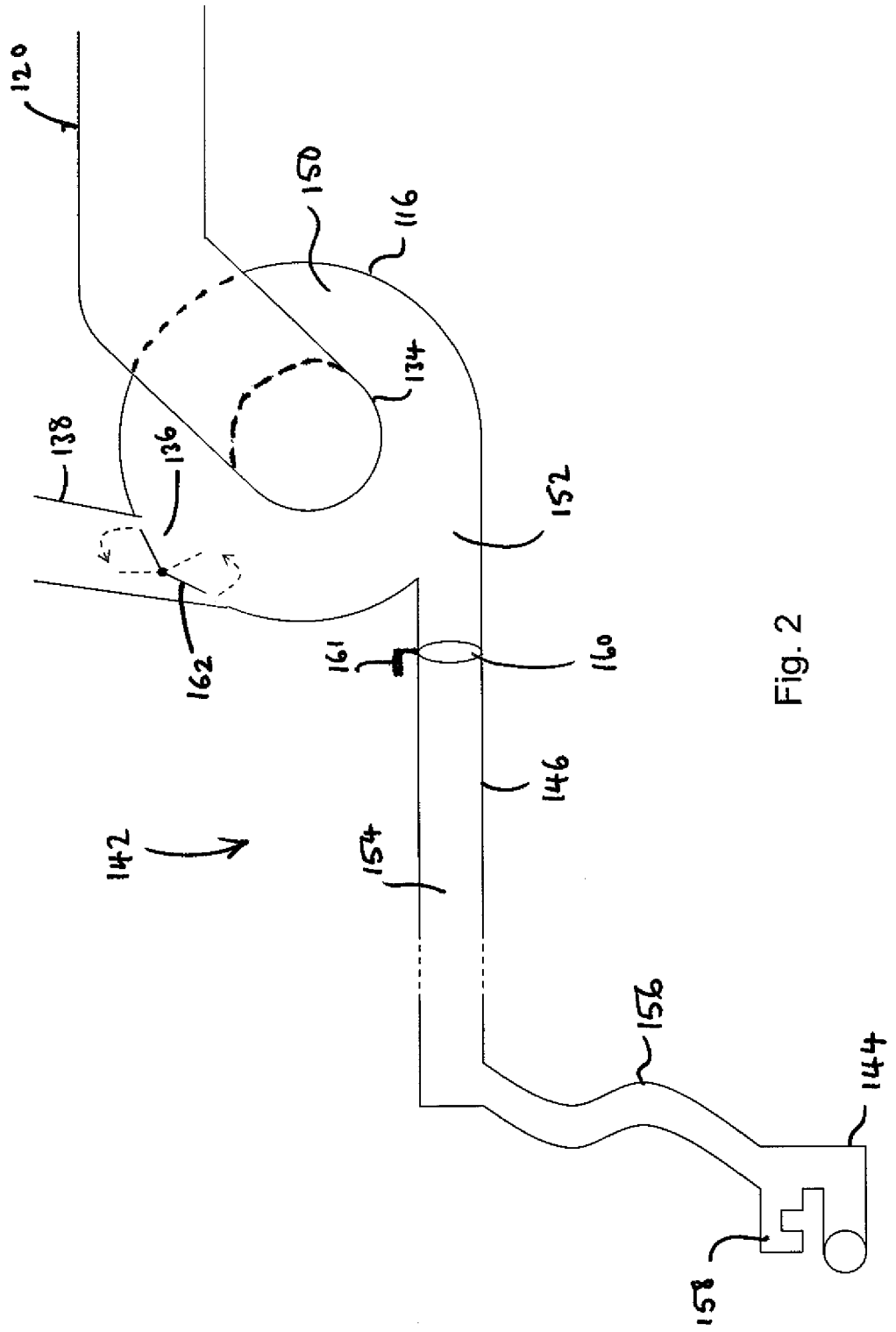

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7621018 B **[0003]**
- GB 2276853 A **[0011]**