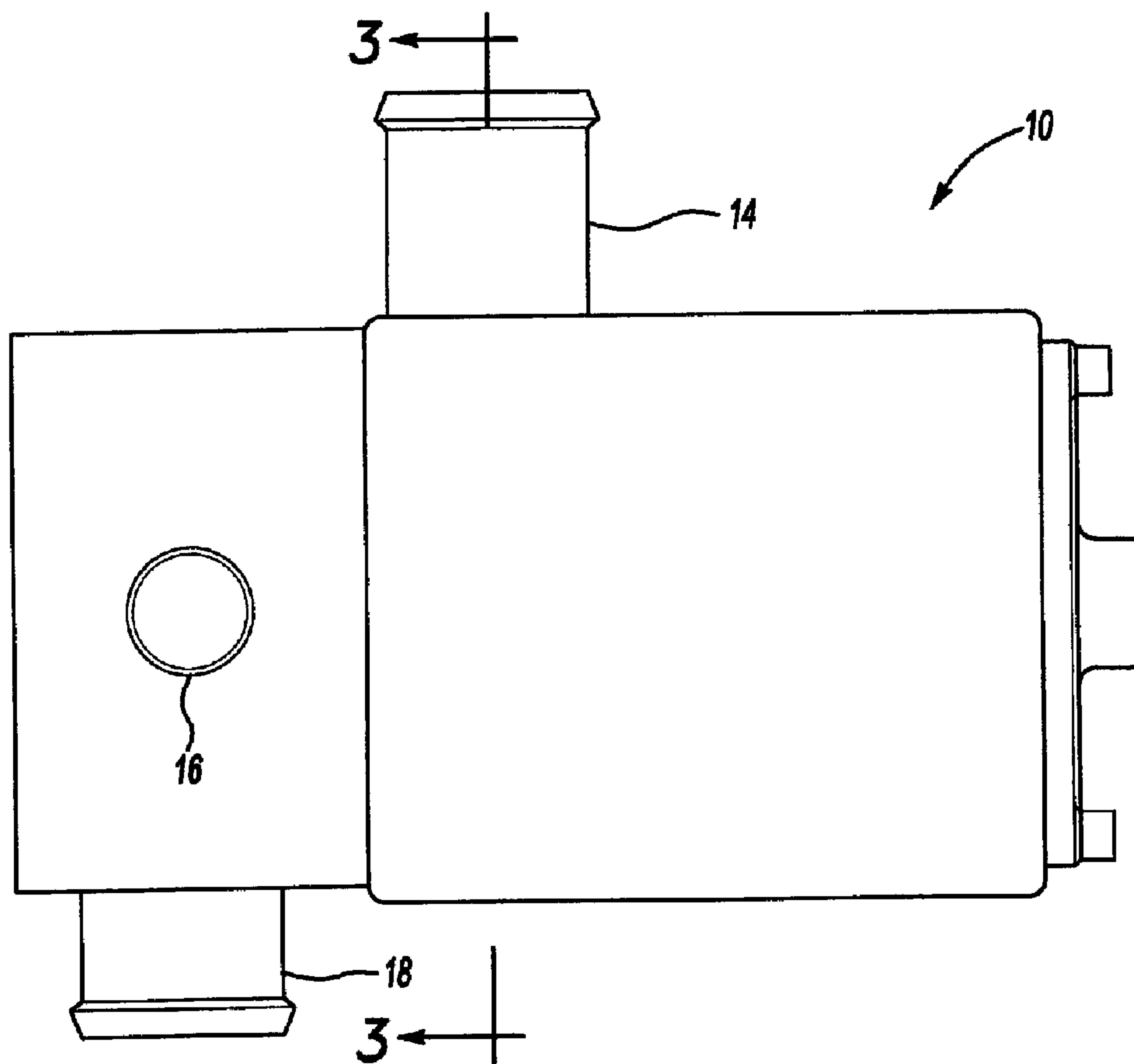




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(54) Titre : SOUPAPE POUR FLUIDES
 (54) Title: FLUID VALVE



(57) Abrégé/Abstract:
 A fluid valve for use in proportioning/mixing fluid between at least one input and at least one output. The fluid valve including a rotary actuated diverter for controlling fluid flow between the inlet(s) and outlet(s). The fluid valve may be configured to support

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proportioning any number of fluids, including liquids and gases, for any number of applications, including automotive and industrial applications.

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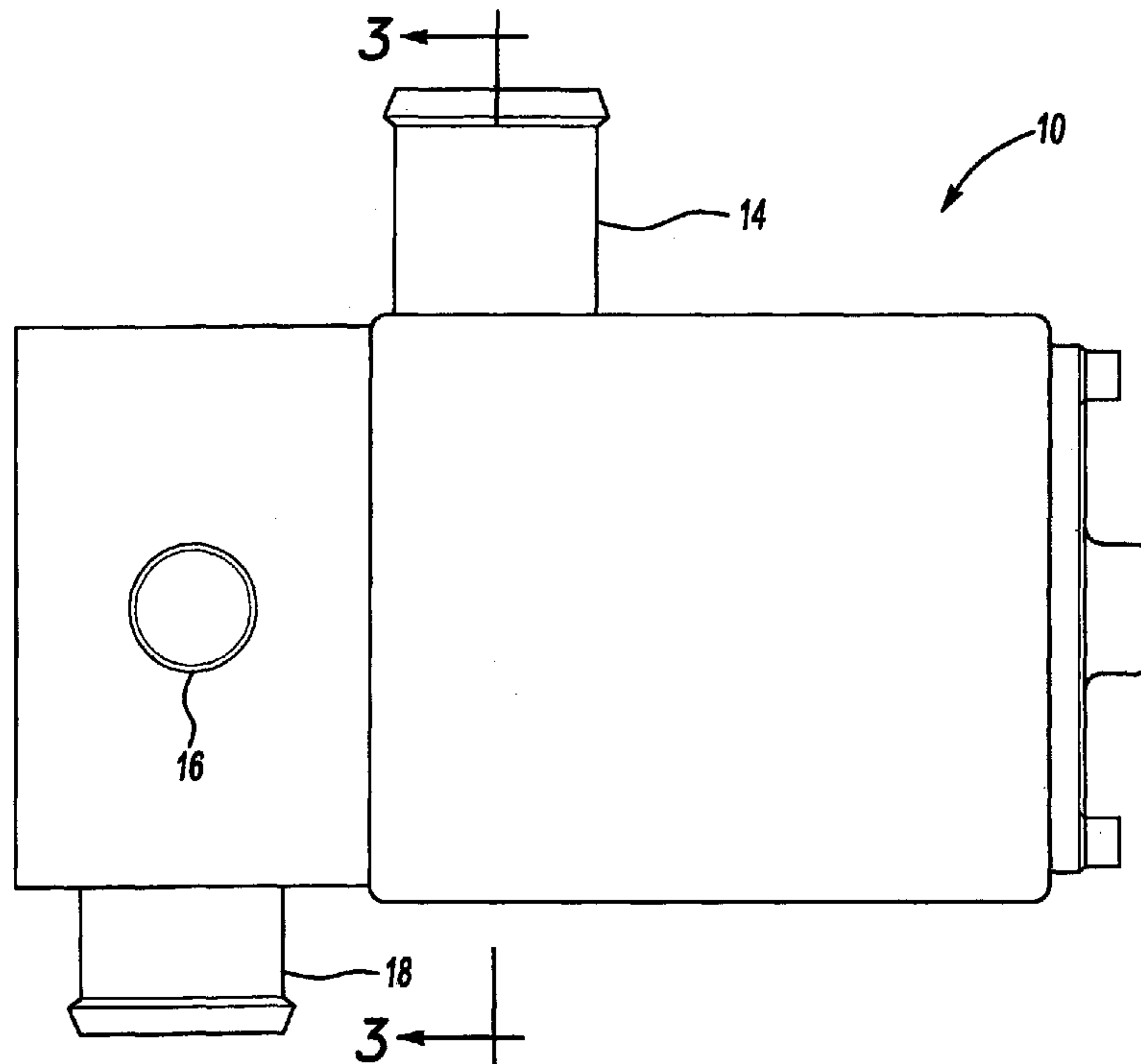
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(54) Title: FLUID VALVE



(57) Abstract: A fluid valve for use in proportioning/mixing fluid between at least one input and at least one output. The fluid valve including a rotary actuated diverter for controlling fluid flow between the inlet(s) and outlet(s). The fluid valve may be configured to support proportioning any number of fluids, including liquids and gases, for any number of applications, including automotive and industrial applications.

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FLUID VALVE

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to fluid valves.

2. Background Art

10 Fluid valves proportion fluid between one or more inlets and one or more outlets. Fluid valves may include a diverter or other feature within a housing defining a fluid flow path between the inlet(s) and outlet(s). Fluid valves can be used to proportion any number of fluids, including liquids and gases. Fluid valves are operable in any number of environments, including industrial and automotive environments.

SUMMARY OF THE INVENTION

15 One non-limiting aspect of the present invention relates to a fluid valve configured to proportion fluid flow entering a housing radially and exiting the housing radially.

 One non-limiting aspect of the present invention relates to a fluid valve having a free-floating diverter configured to proportion the radially entering and exiting fluid flow.

20 One non-limiting aspect of the present invention relates to a cooling system for use with an engine. The system may include a radiator, a radiator bypass, a fluid valve in communication with the engine, radiator, and radiator

bypass. The fluid valve may be controllable to proportion coolant from the engine to one or both of the radiator and radiator bypass in order to control engine cooling.

5 The fluid valve may include a housing having an inlet for receiving coolant from the engine and separate outlets at a common end of the housing for outputting coolant to the radiator and radiator bypass. The inlet and outlets may define radial apertures at opposite ends of the housing such that coolant must enter radially through the inlet and travel axially through the housing for radial output through the outlets.

10 The fluid valve may further include a rotary actuated diverter within the housing between the inlet and outlets. The diverter may be rotatable about an axis defined relative to the axial travel of the coolant and the radial inlet and outlets. The diverter may be rotatable to selectively cover the outlets and thereby proportion coolant between the inlet and outlets associated with the radiator and radiator bypass.

15 Alternatively, the fluid valve may include a free-floating rotary actuated diverter within the housing between the inlet and outlets. The diverter may be rotatable to selectively cover the outlets and thereby proportion coolant between the inlet and outlets associated with the radiator and radiator bypass.

20 The housing may include a gateway extending widthwise across the axis and between the inlet and outlets. The gateway may include an aperture to each of the outlets, wherein the diverter is positioned proximate the gateway and configured to rotate about the gateway apertures to selectively proportion coolant between the outlets. An area of a diameter of the gateway may be greater than a total area of a diameter of the outlets and/or less than twice the total area of the diameter of the outlets. The apertures of the gateway may be of equal size and
25 divided along a center of a diameter of the gateway.

The diverter may be free-floating within the housing and located on an upstream side of the gateway such that pressure of coolant entering the inlet causes the diverter to compress against the gateway.

5 The system may include an electric motor and shaft. The shaft may be connected to the electric motor and configured to rotate with the rotation thereof. The diverter may be connected to the shaft so as to rotate with the rotation thereof such that rotation of the motor selectively positions the diverter relative to the gateway apertures to control coolant flow to the outlets.

10 The system may include a fail-safe feature configured to rotate the diverter to open the radiator aperture if power is lost to the electric motor. The fail-safe feature may be configured to locate the diverter downstream of the inlet in the absence of coolant flow through the inlet.

The system may include an alignment feature configured to located the diverter downstream of the inlet in the absence of coolant flow through the inlet.

15 One non-limiting aspect of the present invention relates to a fluid valve having a housing and diverter. The housing may include an inlet for receiving fluid and an outlet at an opposite end of the housing for outputting the received fluid. The inlet and outlet may define radial apertures at opposite ends of the housing such that coolant must enter radially through the inlet and travel axially
20 through the housing for radial output through the outlet.

The diverter may be rotary actuated and positioned within the housing between the inlet and the outlet. The diverter may be rotatable about an axis defined relative to the axial travel of the coolant and the radial inlet and outlet, the diverter being rotatable to selectively cover the outlet and thereby proportion fluid between
25 the inlet and outlet.

Alternatively, the diverter may be a free-floating rotary actuated diverter and positioned within the housing between the inlet and outlet. The diverter

may be rotatable to selectively cover the outlet and thereby proportion coolant between the inlet and outlet.

5 The fluid valve may include a gateway extending widthwise across the axis and between the inlet and outlets. The gateway may include an aperture to the outlet and a covered aperture. The diverter may be positionable relative to the covered aperture to limit and/or prevent fluid flow through the outlet

10 Alternatively, the fluid valve may include a second outlet at the opposite end of the housing such that both outlets are located at a common end of the housing downstream of the inlet. The housing may include a gateway extending widthwise across the housing and between the inlet and outlets. The gateway may include an aperture to each of the outlets such that the diverter is positioned proximate the gateway and configured to rotate about the gateway apertures to selectively proportion coolant between the outlets.

15 The above features and advantages, along with other features and advantages of the present invention, are readily apparent from the following detailed description of the invention when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

20 The present invention is pointed out with particularity in the appended claims. However, other features of the present invention will become more apparent and the present invention will be best understood by referring to the following detailed description in conjunction with the accompany drawings in which:

FIGURES 1-2 illustrate a fluid valve in accordance with one non-limiting aspect of the present invention;

FIGURES 3a-3c illustrate a cross-sectional view of the fluid valve taken along line 3-3 in accordance with one non-limiting aspect of the present invention;

5 FIGURE 4 illustrates a cross-sectional view of the fluid valve taken along line 4-4 in accordance with one non-limiting aspect of the present invention;

FIGURES 5a-5c illustrate end views of a gateway and outlets in accordance with one non-limiting aspect of the present invention;

FIGURE 6 illustrates a perspective assembly view of the fluid valve in accordance with one non-limiting aspect of the present invention; and

10 FIGURE 7 illustrates a cooling system in accordance with one non-limiting aspect of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

15 FIGURES 1-2 illustrate a fluid valve 10 in accordance with one non-limiting aspect of the present invention. The fluid valve 10 is configured to proportion or otherwise control fluid flow therethrough. The fluid valve 10 may include any number of inlets and outlets for respectively receiving and outputting fluid. The fluid valve 10 may proportion any number of fluids, including liquids, gases, or some combination thereof.

20 For exemplary purposes, the fluid valve 10 is shown to include one inlet 14 and two separate outlets 16-18 such that fluid may be proportioned from the inlet 14 to either outlet 16-18. Optionally, as described below in more detail, the inlet(s) 14 is located upstream from a diverter 22 and the outlet(s) 16-18 are located downstream from a diverter (see Figure 3a-3c) at a common end such that the diverter 22 is free to float in the direction of fluid flow through the fluid valve 10.

FIGURES 3a-3c illustrate a cross-sectional view of the fluid valve 10 taken along line 3-3 in accordance with one non-limiting aspect of the present invention. The cross-sectional view illustrates multiple proportioning positions of the diverter 22 in accordance with one non-limiting aspect of the present invention.

5 The diverter 22 may be disc shaped and configured in the shape of a half circle.

As shown in more detail with FIGURE 4, the diverter 22 is positioned proximate a gateway 30. The gateway 30 is generally defined as a planar portion of a housing 32 or element in the housing 32 that extends widthwise across the housing 32 and includes apertures 34-36 for carrying fluid to each of the outlets

10 16-18. The diverter 22, as shown in Figures 3a-3c, may be positioned relative to the gateway apertures 34-36 to control fluid flow to the corresponding outlets 16-18.

Figures 3a-3c respectively illustrate completely opening the first outlet 16 and covering the second outlet 18, completely opening the second outlet 18 and covering the first outlet 16, and partially opening the first 16 and second

15 outlets 18. The present invention contemplates the diverter 22 having any number of configurations and shapes to simultaneously proportion fluid flow to one or more of the outlets 16-18 or additional outlets (not shown). As shown, the apertures 34-36 are equal sized and divide about the center of the gateway 30 so as to facilitate the sealing thereof with the half-circle shape of the diverter 22.

20 Optionally, in an alternative embodiment and/or if use of one of the outlets 16-18 is unnecessary, one of the apertures 34-36 may be covered with the material of the gateway 30 such that the gateway 30 only includes one aperture for the single outlet or active outlet. In this manner, the diverter 22 can be positioned relative to the covered gateway aperture to facilitate proportioning fluid to the single

25 outlet.

Figure 4 illustrates a cross-sectional view of the fluid valve 10 taken along line 4-4 in accordance with one non-limiting aspect of the present invention. As shown, the fluid valve 10 may include the axially elongated housing 32 having an annular proportioning portion 38 upstream of the gateway 30. The proportioning

portion 38 includes a cavity 40 for defining a fluid flow path from the inlet 14 to the outlets 16-18.

The diverter 22 is positioned downstream from the inlet 14 and upstream of the gateway 30 within the fluid flow path. The fluid enters radially through the inlet 14 and then flows axially through the gateway 30 to exit radially through the outlets 16-18. The positioning of the gateway 30 and diverter 22 along an axis A defined relative to the axial travel of fluid and the radial inlets 14 and outlets 16-18 can be used to allow the diverter 22 to float with fluid pressure from the inlet toward the gateway 30.

An electric motor 48 may be included to control rotation of the diverter 22. A shaft 50 or other feature may be connected to the motor 48 and the diverter 22 may be mounted thereto such that rotation of the motor 48 causes rotation of the diverter 22. The motor 48 may be a rotary type motor controlled by signals received from a controller (not shown). The controller may include an adapter 52 or other feature for receiving signals from a control module or other feature (not shown) configured to control/instruct the operation thereof.

A mechanical seal 56 or other sealing feature may be included to seal the shaft 50 and motor 48 from fluid entering from proportioning portion 38. A fail-safe 60 feature may be included to bias the diverter 22 to a selected position should the ability of the motor 48 to position the shaft 50 be lost, such as through loss of torque associated with motor power or other operational interrupt. The fail-safe feature 60, as shown, may be a spring connected between fingers 64-66 on the housing and diverter 22.

Optionally, the diverter 22 is freely mounted to the shaft 50 such that it may float axially along the shaft 50. This may be advantageous in assembling the fluid valve as it permits better tolerances and ease of assembly. The fail-safe feature 60 may apply pressure against the diverter to position it downstream of the inlet 14 and against the gateway 30. Once so positioned, fluid flow through the inlet 14 then further compresses the diverter 22 against the gateway 30.

An alignment feature 70 may be included to position the diverter 22 downstream of the inlet 14 along the shaft 50. The alignment feature 70 may be a pin or other feature extending through the shaft 50. This feature can be used to insure proper positioning of the diverter 22 downstream from the inlet if the fail-safe feature 60 is omitted and/or if the fail-safe feature 60 is otherwise unable to properly position the diverter.

FIGURES 5a-5c illustrate end views of the gateway 30 and outlets 16-18 in accordance with one non-limiting aspect of the present invention. The leader lines labeled A1, A2, A3, O1, and O2 are included to reference dimensions used by the present invention to determine areas for the apertures associated therewith. Areas A1 and A2 correspond with the gateway apertures 34-36, area A3 corresponds with the area of an outer diameter of the gateway 30, and areas O1 and O2 correspond with the area of the outside of the outlets 16-18 by which a hose or other connecting feature (not shown) may be attached for connection to the fluid valve.

The radial mounting of the inlet 14 and outlets 16-18 to the housing requires fluid to flow radially, axially, and then radially in order to be proportioned by the fluid valve. In some applications, the diameters O1 and O2 associated with the outlets may be critical to insure proper fluid delivery. As such, dimensions O1 and O2 can be design constraints within which the fluid valve must operate. The radial nature of the outlets combined with the axial fluid flow of the present invention allows the present invention to support larger outlets with relatively small valve packaging.

In more detail, the present invention sacrifices a slight pressure drop with the radial outlets 16-18 in exchange for smaller packaging. In more detail, the present invention is able to approximate the cross-section area of the outlets 16-18 with the gateway apertures 34-36 without requiring the gateway 30 to be at least twice the size of the outlets 16-18. In contrast, axial outlets require the gateway 30 to be at least twice the size of the outlets 16-18 in order to facilitate positioning the outlets 16-18 within the circumference of the gateway 30.

FIGURE 6 illustrates a perspective assembly view of the gateway 30, diverter 22, spring 60, seal 56, and electric motor 48 in accordance with one non-limiting aspect of the present invention. The compressive force of the fluid and spring 60 compress the diverter 22 against the gateway 30 to seal the outlets 16-18. Such axial sealing can be beneficial in limiting leakage of fluid through any covered outlet 16-18. Should the gateway 30 and/or diverter 22 wear over time, the compressive forces on the floating diverter cause it move axially with such wear to maintain the desired sealing.

FIGURE 7 illustrates a cooling system 80 in accordance with one non-limiting aspect of the present invention. The cooling system 80 includes the above-described fluid valve 10 for controlling the flow of coolant used to cool an engine 84. The system 80 may include a radiator 86 configured to cool engine coolant and a radiator bypass 88 to direct coolant around the radiator 86 when cooling of the coolant is undesirable.

The fluid valve 10 is positioned downstream of the engine 84 and upstream of the radiator 86 and radiator bypass 88 within the coolant flow path. Ducting and/or other features generally illustrated with leader lines communicate the coolant from one location to another, as one having ordinary skill in the art will appreciate.

In operation, the fluid valve 10 receives coolant pressurized by the engine 84 and proportions it to one of the radiator 86 and radiator bypass 88. The pressure of the engine 84 is advantageous in causing the diverter 22 to float against the gateway 30, as described above. A vehicle control module 90 may be included to instruct operation of the fluid valve according to any number of cooling strategies.

The present invention fully contemplates other configurations and applications for the fluid valve 10 and/or cooling system 80. In particular, the present invention contemplates the fluid valve 10 including any number of inlets and

outlets, with corresponding variations in the fluid valve 10 and diverter 22 to permit rotary proportioning between the various outlets.

5 With respect to the cooling system 80, for example, the fluid valve 10 may include an additional outlet (not shown) for a heater or other element. The additional outlet may operate in conjunction with diverter 22 positioning relative to the bypass outlet 18 and/or independently thereof so as to facilitate use of the coolant fluid for any number of vehicle operations. Such an additional outlet may include a radial configuration similar to the illustrated radial outlets 16-18 such that fluid flows through the additional outlet in a similar manner.

10 As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale, some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for the claims and/or as a representative basis for teaching one skilled in the art to variously employ the present invention.

20 While embodiments of the invention have been illustrated and described, it is not intended that these embodiments illustrate and describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.

WHAT IS CLAIMED IS:

- 1 1. A cooling system for use with an engine, the system
2 comprising:
3 a radiator;
4 a radiator bypass;
5 a fluid valve in communication with the engine, radiator, and radiator
6 bypass, the fluid valve being controllable to proportion coolant from the engine to
7 one or both of the radiator and radiator bypass in order to control engine cooling,
8 the fluid valve including:
9 (i) a housing having an inlet for receiving coolant from the engine
10 and separate outlets at a common end of the housing for outputting coolant to the
11 radiator and radiator bypass, the inlet and outlets defining radial apertures at
12 opposite ends of the housing such that coolant must enter radially through the inlet
13 and travel axially through the housing for radial output through the outlets; and
14 (ii) a rotary actuated diverter within the housing between the inlet
15 and outlets, the diverter being rotatable about an axis parallel to the axial travel of
16 the coolant, the diverter being rotatable to selectively cover the outlets and thereby
17 proportion coolant between the inlet and outlets associated with the radiator and
18 radiator bypass.
- 1 2. The system of claim 1 wherein the housing includes a gateway
2 extending widthwise across the axis and between the inlet and outlets, the gateway
3 including an aperture to each of the outlets, wherein the diverter is positioned
4 proximate the gateway and configured to rotate about the gateway apertures to
5 selectively proportion coolant between the outlets.
- 1 3. The system of claim 2 wherein an area associated with a
2 diameter of the gateway is greater than a total area associated with diameters of the
3 outlets.

1 4. The system of claim 3 wherein the area associated with the
2 diameter of the gateway is less than twice the total area associated with the diameter
3 of the outlets.

1 5. The system of claim 2 wherein the apertures of the gateway
2 are of equal size and divided along a center of a diameter of the gateway.

1 6. The system of claim 2 wherein the diverter is free-floating
2 within the housing and located on an upstream side of the gateway such that pressure
3 of coolant entering the inlet causes the diverter to compress against the gateway.

1 7. The system of claim 6 further comprising an electric motor
2 and shaft, the shaft connected to the electric motor and configured to rotate with the
3 rotation thereof, the diverter being connected to the shaft so as to rotate with the
4 rotation thereof such that rotation of the motor selectively positions the diverter
5 relative to the gateway apertures to control coolant flow to the outlets.

1 8. The system of claim 7 further comprising a fail-safe feature
2 configured to rotate the diverter to open the radiator aperture if power is lost to the
3 electric motor.

1 9. The system of claim 8 wherein the fail-safe feature is further
2 configured to locate the diverter downstream of the inlet in the absence of coolant
3 flow through the inlet.

1 10. The system of claim 1 further comprising an alignment feature
2 configured to located the diverter downstream of the inlet in the absence of coolant
3 flow through the inlet.

1 11. A cooling system for use with an engine, the system
2 comprising:

3 a radiator;
4 a radiator bypass;

5 a fluid valve in communication with the engine, radiator, and radiator
6 bypass, the fluid valve being controllable to proportion coolant from the engine to
7 one or both of the radiator and radiator bypass in order to control engine cooling,
8 the fluid valve including:

9 (i) a housing having an inlet for receiving coolant from the engine
10 and separate outlets at a common end of the housing for outputting coolant to the
11 radiator and radiator bypass, the inlet and outlets defining radial apertures at
12 opposite ends of the housing such that coolant must enter radially through the inlet
13 and travel axially through the housing for radial output through the outlets; and

14 (ii) a free-floating rotary actuated diverter within the housing
15 between the inlet and outlets, the diverter being rotatable to selectively cover the
16 outlets and thereby proportion coolant between the inlet and outlets associated with
17 the radiator and radiator bypass.

1 12. The system of claim 11 wherein the housing includes a
2 gateway extending widthwise across the axis and between the inlet and outlets, the
3 gateway including an aperture to each of the outlets, wherein the diverter is
4 positioned proximate the gateway and configured to rotate about the gateway
5 apertures to selectively proportion coolant between the outlets.

1 13. The system of claim 12 wherein the diverter is located on an
2 upstream side of the gateway such that pressure of coolant entering the inlet causes
3 the diverter to compress against the gateway.

1 14. The system of claim 12 wherein an area associated with a
2 diameter of the gateway is greater than a total area associated with diameters of the
3 outlets.

1 15. The system of claim 14 wherein the area associated with the
2 diameter of the gateway is less than twice the total area associated with the diameter
3 of the outlets.

1 16. The system of claim 11 further comprising an electric motor
2 and shaft, the shaft connected to the electric motor and configured to rotate with the
3 rotation thereof, the diverter being connected to the shaft so as to rotate with the
4 rotation thereof such that rotation of the motor selectively positions the diverter
5 relative to the gateway apertures to control coolant flow to the outlets.

1 17. The system of claim 16 further comprising a fail-safe feature
2 configured to rotate the diverter to open the radiator aperture if power is lost to the
3 electric motor.

1 18. The system of claim 17 wherein the fail-safe feature is further
2 configured to locate the diverter downstream of the inlet in the absence of coolant
3 flow through the inlet.

1 19. The system of claim 11 further comprising an alignment
2 feature configured to locate the diverter downstream of the inlet in the absence of
3 coolant flow through the inlet.

1 20. The system of claim 11 wherein the diverter is rotatable about
2 an axis defined relative to the axial travel of the coolant and the radial inlet and
3 outlets.

1 21. A fluid valve comprising:
2 a housing having an inlet for receiving fluid and an outlet at an
3 opposite end of the housing for outputting the received fluid, the inlet and outlet
4 defining radial apertures at opposite ends of the housing such that coolant must enter
5 radially through the inlet and travel axially through the housing for radial output
6 through the outlet; and

7 a rotary actuated diverter within the housing between the inlet and the
8 outlet, the diverter being rotatable about an axis defined parallel to the axial travel
9 of the coolant, the diverter being rotatable to selectively cover the outlet and thereby
10 proportion fluid between the inlet and outlet.

1 22. The fluid valve of claim 21 further comprising a second outlet,
2 the second outlet being located at the opposite end of the housing such that both
3 outlets are located at a common end of the housing downstream of the inlet, wherein
4 the housing includes a gateway extending widthwise across the housing and between
5 the inlet and outlets, the gateway including an aperture to each of the outlets,
6 wherein the diverter is positioned proximate the gateway and configured to rotate
7 about the gateway apertures to selectively proportion coolant between the outlets.

1 23. The fluid valve of claim 22 wherein an area associated with
2 a diameter of the gateway is greater than a total area associated with a diameter of
3 the outlets.

1 24. The fluid valve of claim 23 wherein the area associated with
2 the diameter of the gateway is less than twice the total area associated with the
3 diameter of the outlets.

1 25. The fluid valve of claim 22 wherein apertures of the gateway
2 are of equal size and divided along a center of a diameter of the gateway.

1 26. The fluid valve of claim 21 wherein the diverter is
2 free-floating within the housing and located on an upstream side of the gateway such
3 that pressure of fluid entering the inlet causes the diverter to compress against the
4 gateway.

1 27. The fluid valve of claim 21 further comprising an electric
2 motor and shaft, the shaft connected to the electric motor and configured to rotate
3 with the rotation thereof, the diverter being connected to the shaft so as to rotate
4 with the rotation thereof such that rotation of the motor selectively positions the
5 diverter relative to the gateway apertures to control coolant flow to the outlets.

1 28. The fluid valve of claim 27 further comprising a fail-safe
2 feature configured to rotate the diverter to open one of the outlets if power is lost
3 to the electric motor.

1 29. The fluid valve of claim 28 wherein the fail-safe feature is
2 further configured to locate the diverter downstream of the inlet in the absence of
3 fluid flow through the inlet.

1 30. The fluid valve of claim 21 further comprising an alignment
2 feature configured to located the diverter downstream of the inlet in the absence of
3 fluid flow through the inlet.

1 31. The fluid valve of claim 21 further comprising a gateway
2 extending widthwise across the axis and between the inlet and outlets, the gateway
3 including an aperture to the outlet and a covered aperture, the diverter being
4 positionable relative to the covered aperture to limit and/or prevent fluid flow
5 through the outlet.

1 32. A fluid valve comprising:
2 a housing having an inlet for receiving fluid and an outlet for
3 outputting the received fluid, the inlet and outlet defining radial apertures at opposite
4 ends of the housing such that coolant must enter radially through the inlet and travel
5 axially through the housing for radial output through the outlet; and
6 a free-floating rotary actuated diverter within the housing between the
7 inlet and outlet, the diverter being rotatable to selectively cover the outlet and
8 thereby proportion coolant between the inlet and outlet.

1 33. The fluid valve of claim 32 further comprising a second outlet,
2 the second outlet being located at the opposite end of the housing such that both
3 outlets are located at a common end of the housing downstream of the inlet, wherein
4 the housing includes a gateway extending widthwise across the housing and between
5 the inlet and outlets, the gateway including an aperture to each of the outlets,
6 wherein the diverter is positioned proximate the gateway and configured to rotate
7 about the gateway apertures to selectively proportion fluid between the outlets.

1 34. The fluid valve of claim 33 wherein an area associated with
2 a diameter of the gateway is greater than a total area associated with a diameter of
3 the outlets.

1 35. The fluid valve of claim 34 wherein the area associated with
2 the diameter of the gateway is less than twice the total area associated with the
3 diameter of the outlets.

1 36. The fluid valve of claim 32 further comprising an electric
2 motor and shaft, the shaft connected to the electric motor and configured to rotate
3 with the rotation thereof, the diverter being connected to the shaft so as to rotate
4 with the rotation thereof such that rotation of the shaft selectively positions the
5 diverter relative to the gateway apertures to control fluid flow to the outlets.

1 37. The fluid valve of claim 36 further comprising a fail-safe
2 feature configured to rotate the diverter to open the radiator aperture if power is lost
3 to the electric motor.

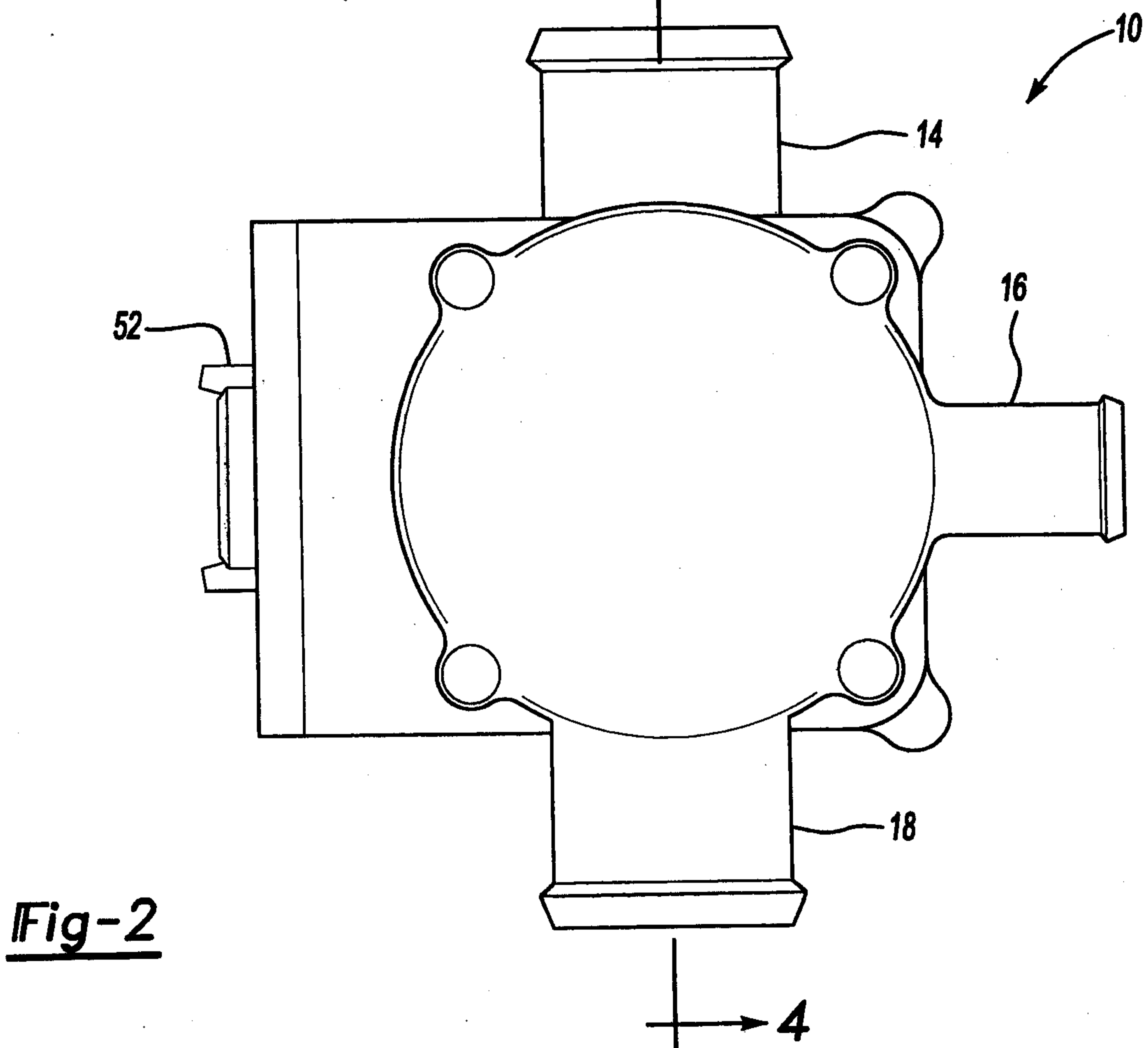
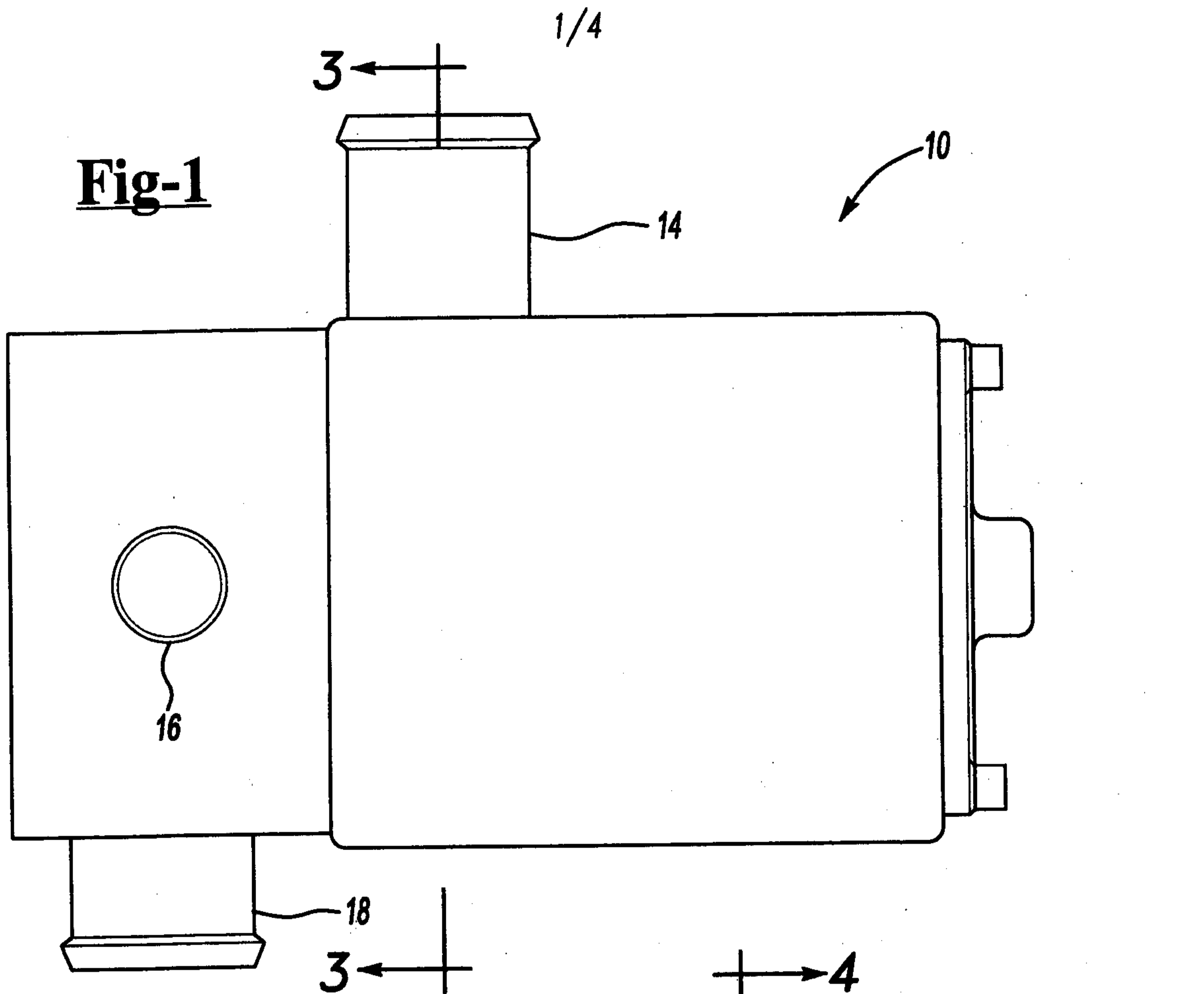
1 38. The fluid valve of claim 37 wherein the fail-safe feature is
2 further configured to locate the diverter downstream of the inlet in the absence of
3 fluid flow through the inlet.

1 39. The fluid valve of claim 32 further comprising an alignment
2 feature configured to located the diverter downstream of the inlet in the absence of
3 fluid flow through the inlet.

1 40. The fluid valve of claim 32 wherein the diverter is rotatable
2 about an axis defined relative to the axial travel of the coolant and the radial inlet
3 and outlets.

1 41. The fluid valve of claim 40 further comprising a gateway
2 extending widthwise across the axis and between the inlet and outlets, the gateway
3 including an aperture to the outlet and a covered aperture, the diverter being

- 4 positionable relative to the covered aperture to limit and/or prevent fluid flow
- 5 through the outlet.



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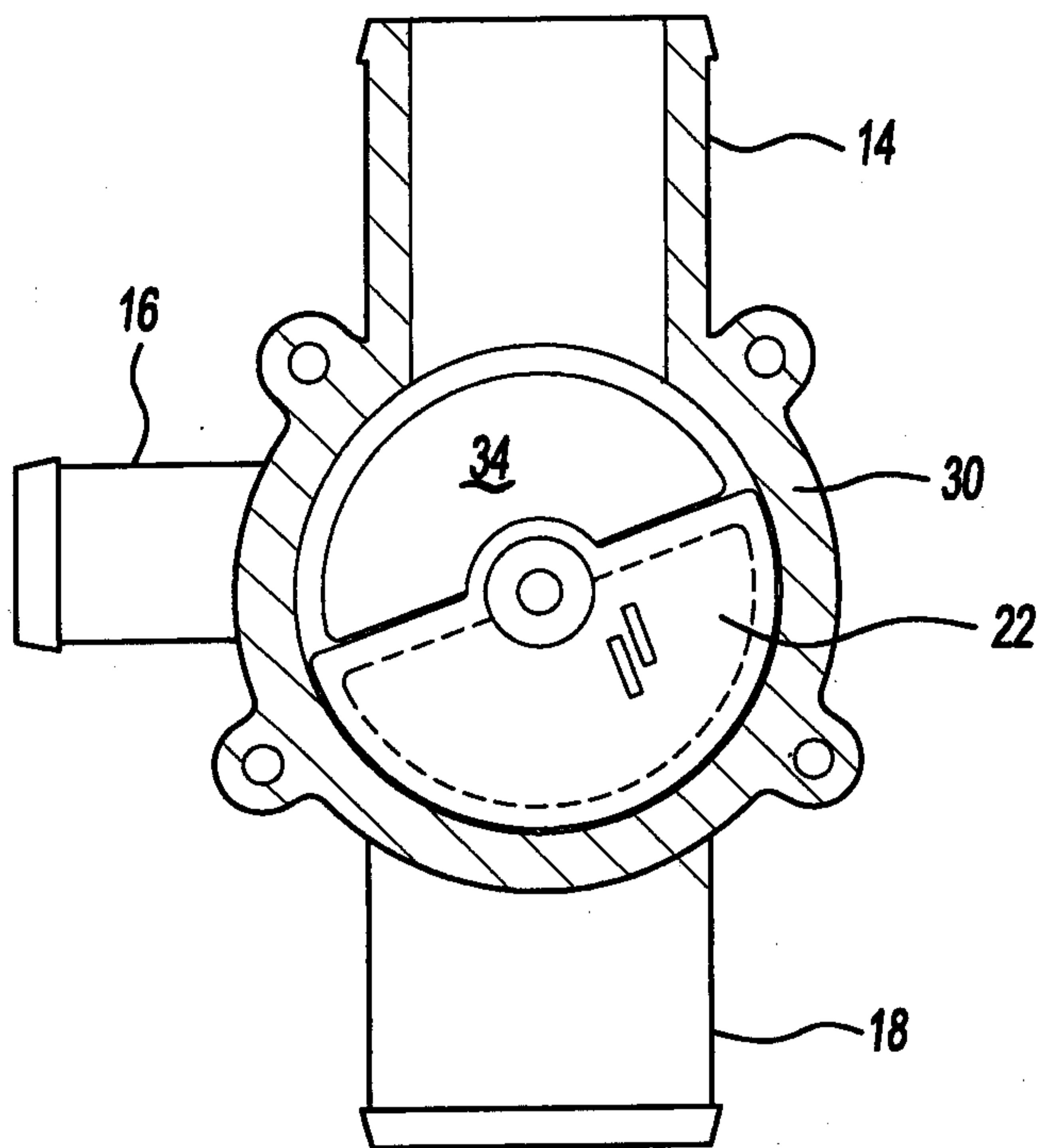


Fig-3A

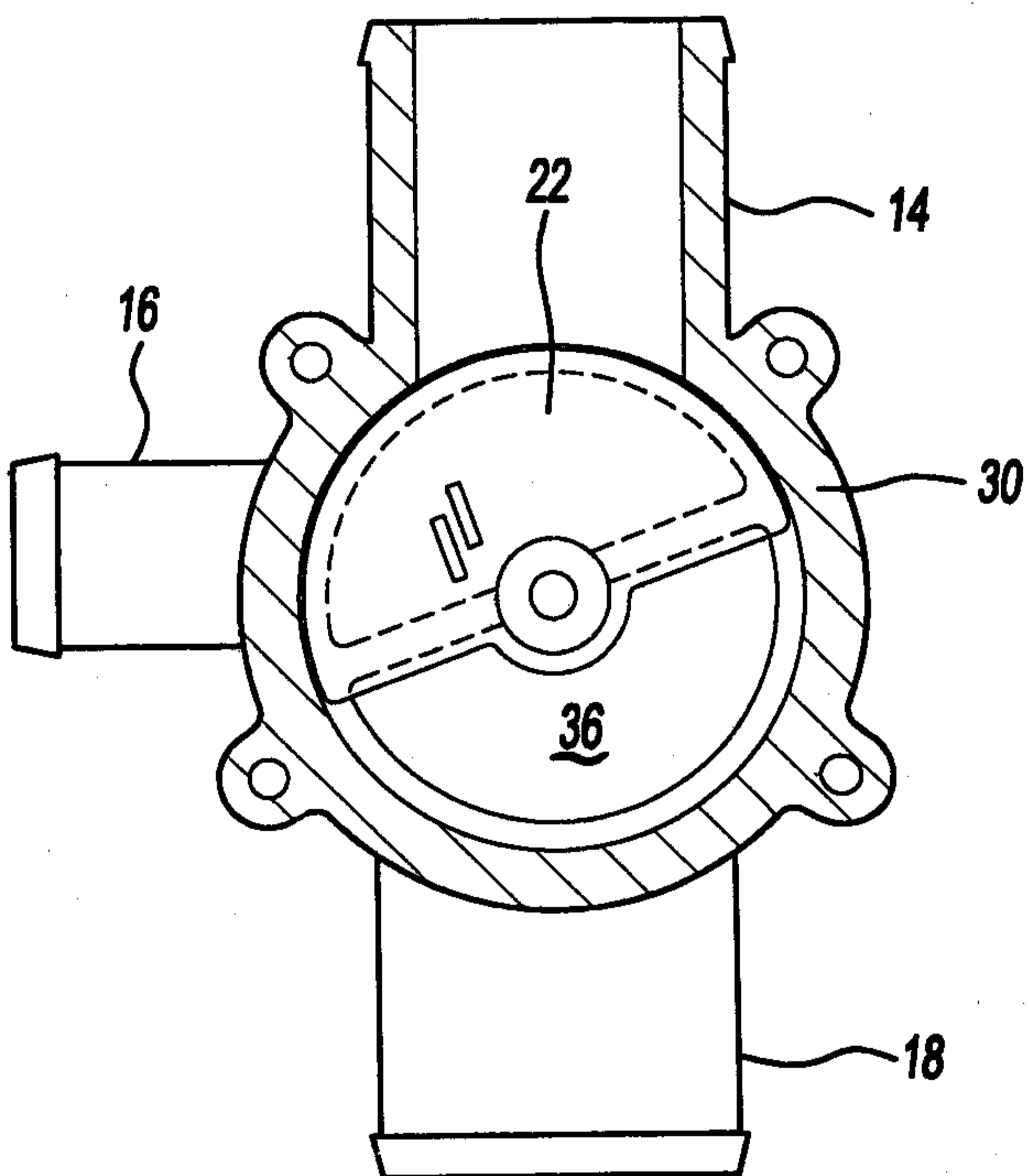


Fig-3B

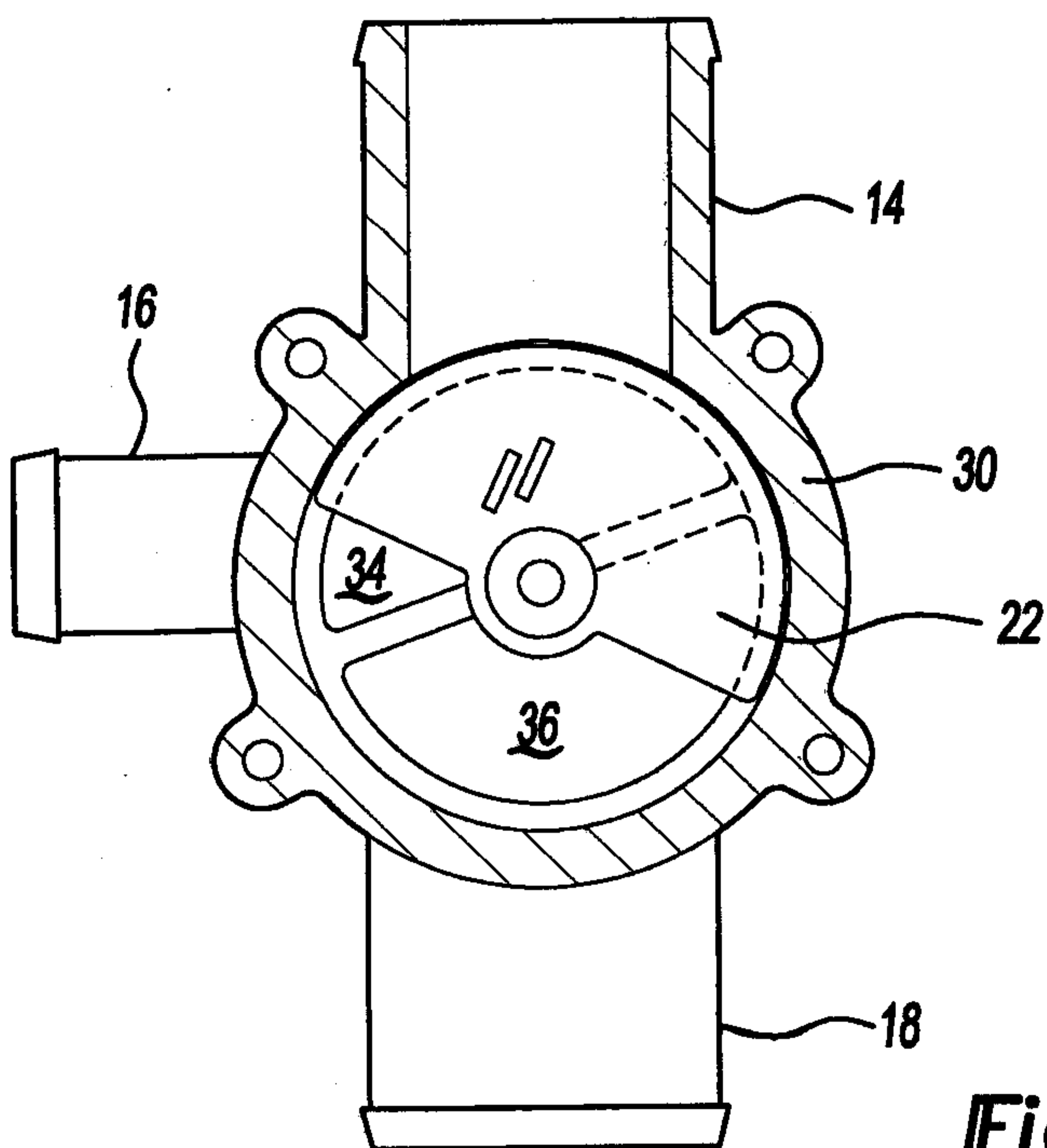


Fig-3C

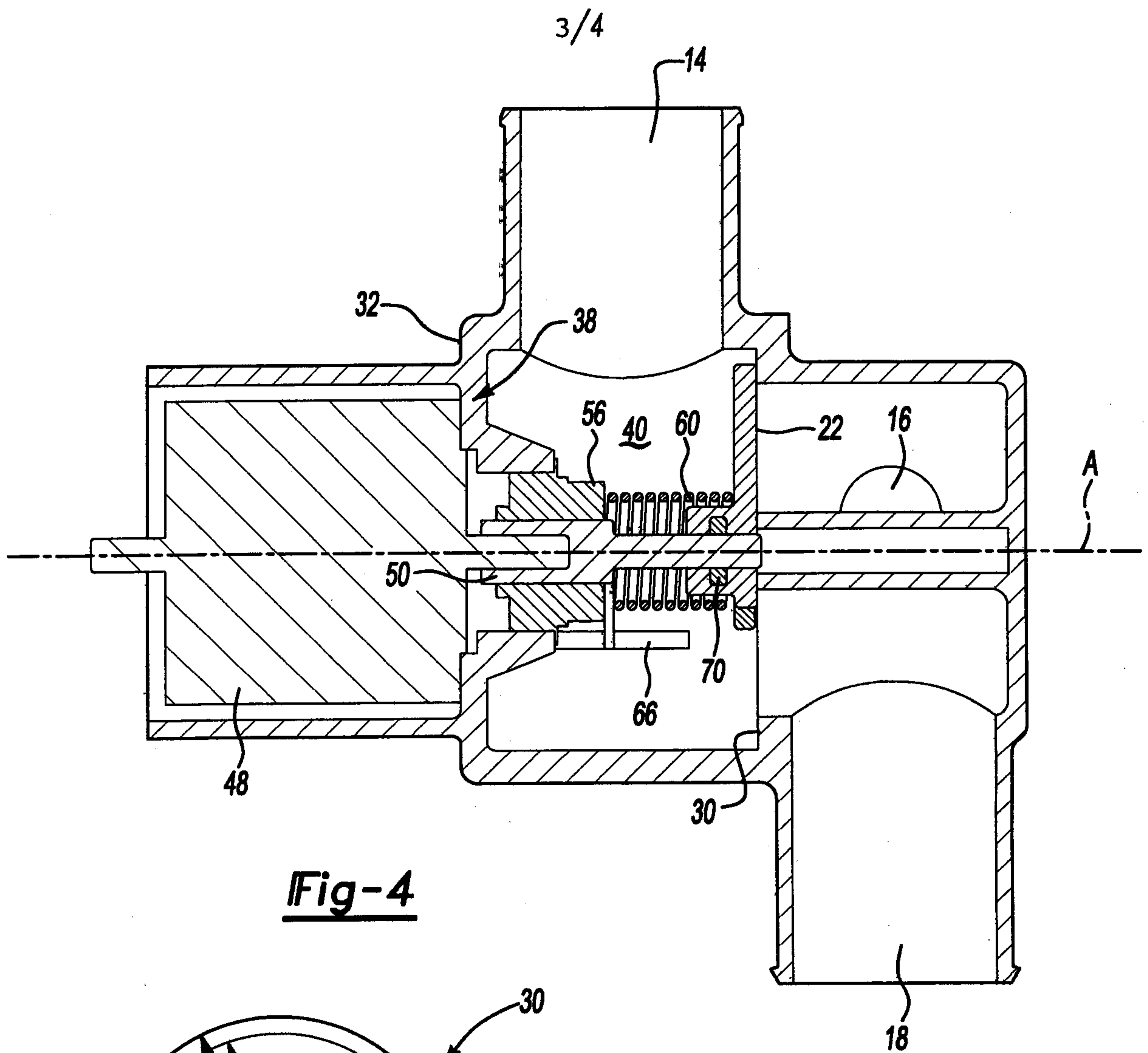


Fig-4

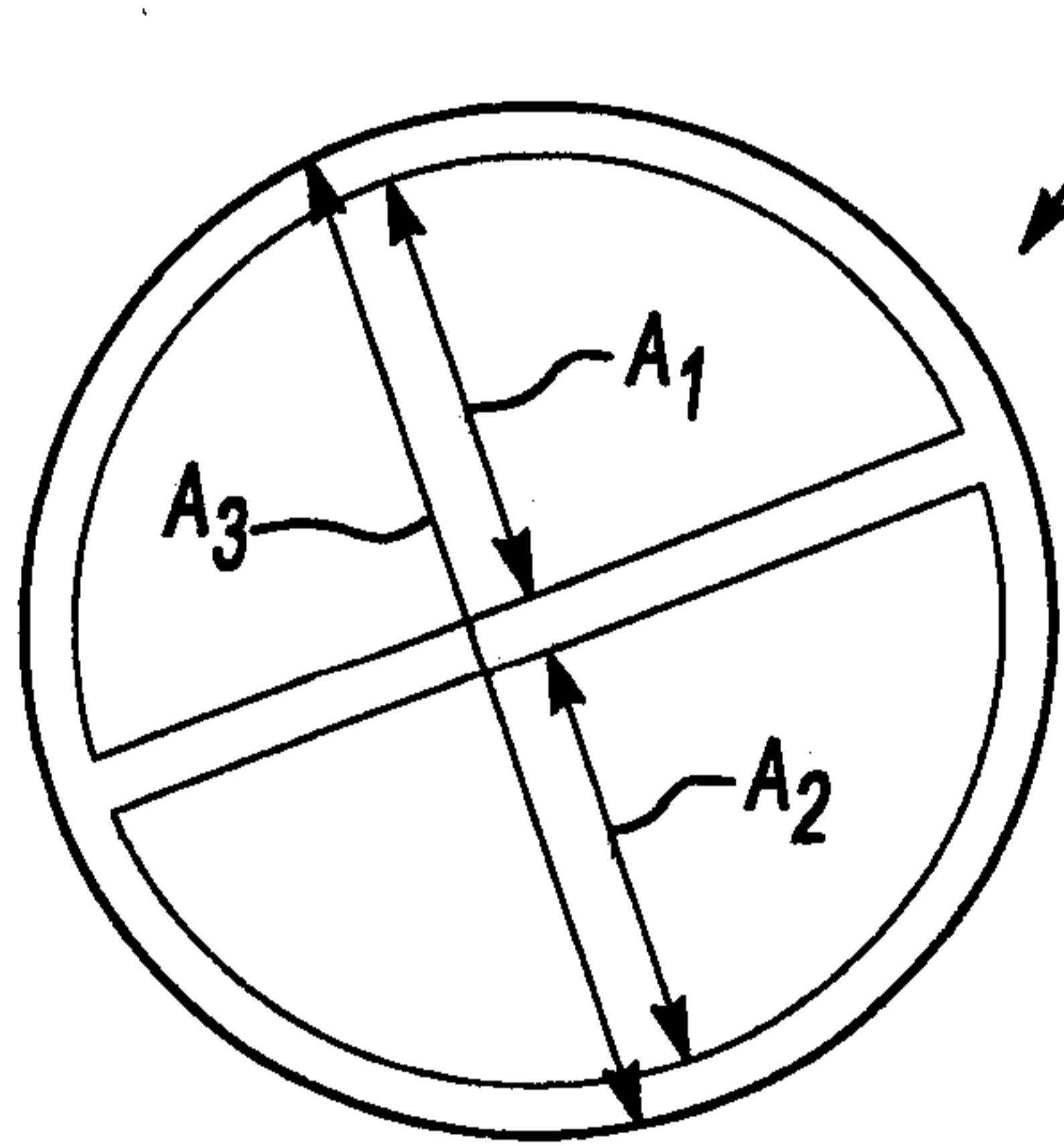


Fig-5A

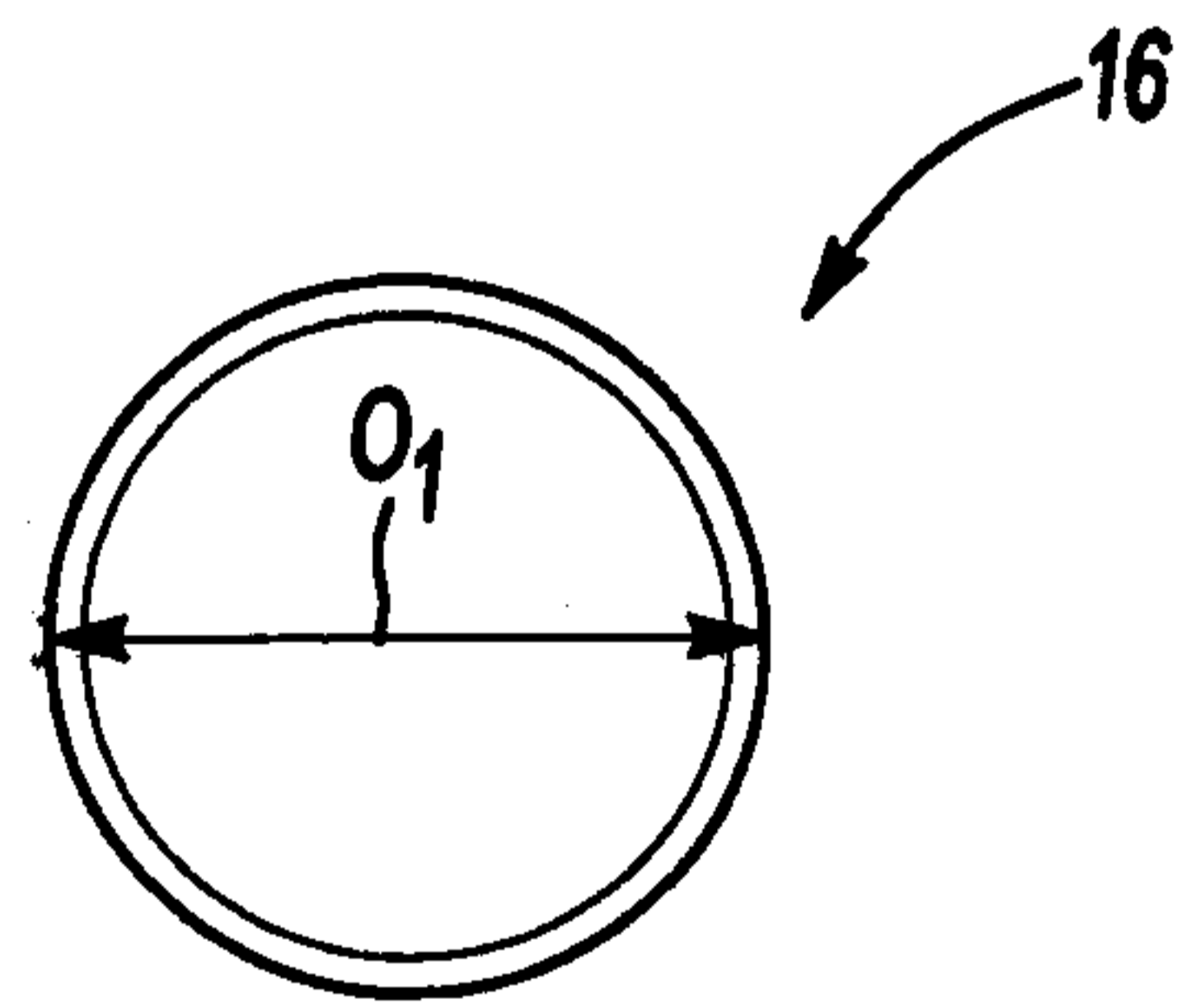


Fig-5B

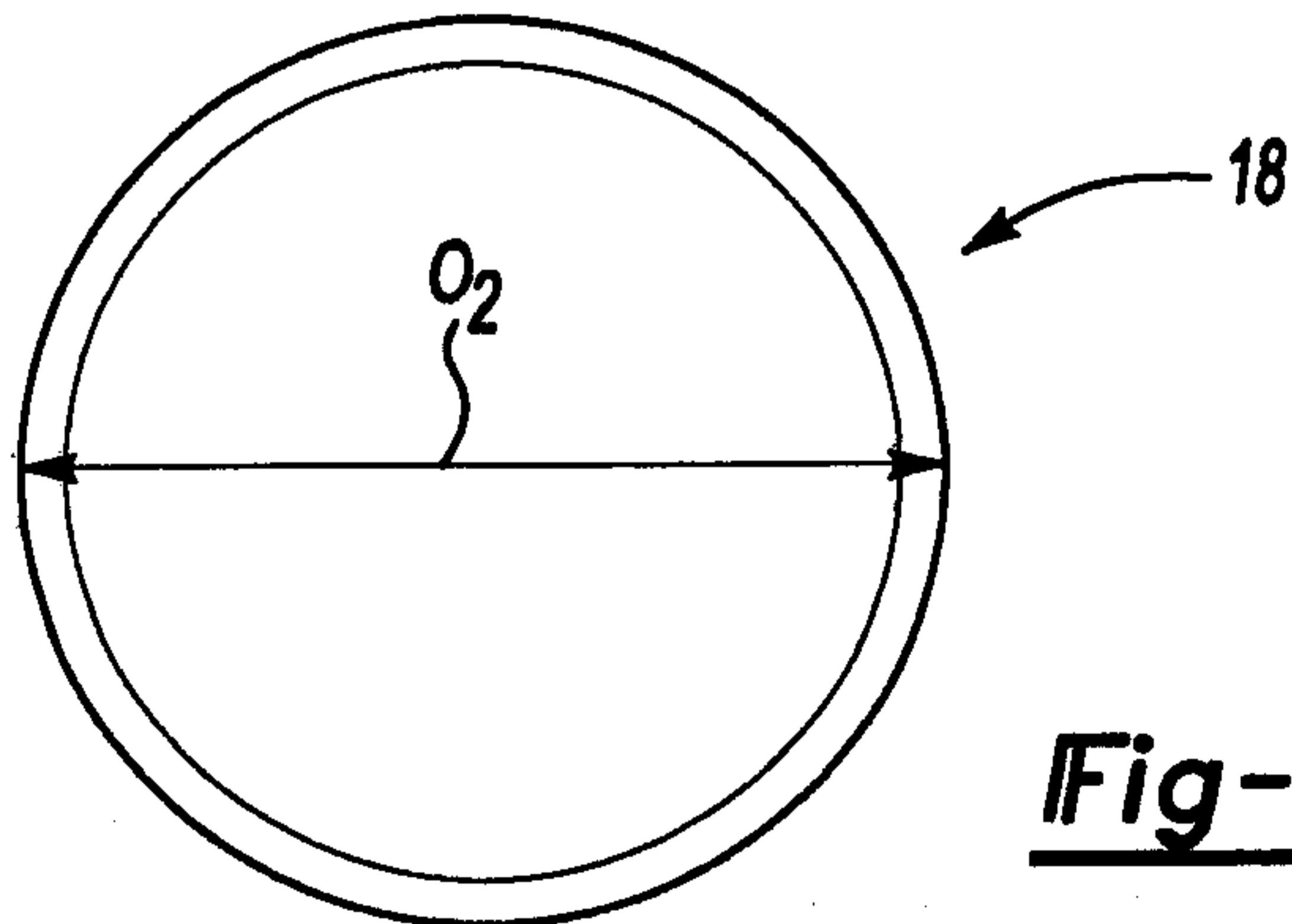


Fig-5C

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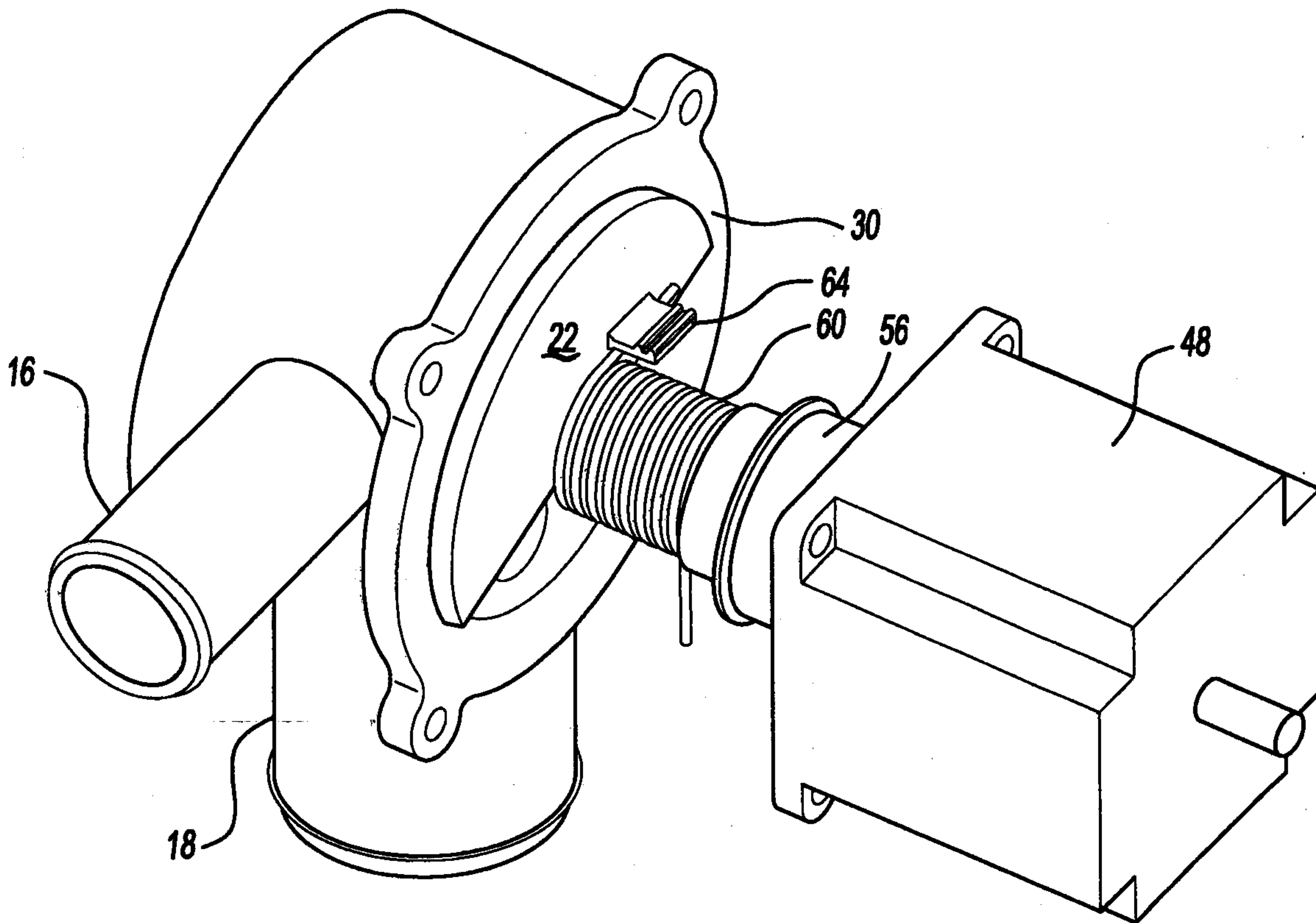


Fig-6

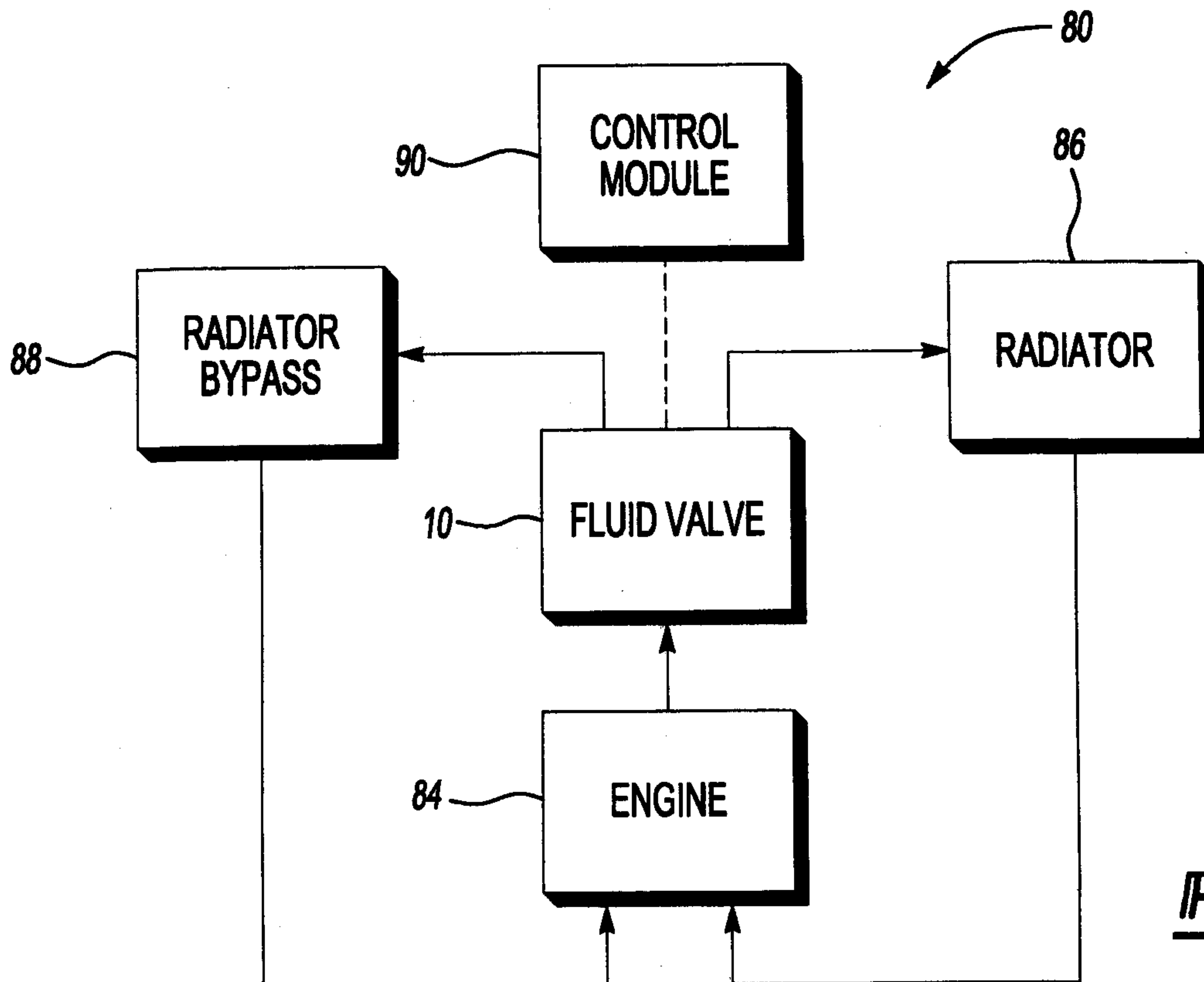


Fig-7

