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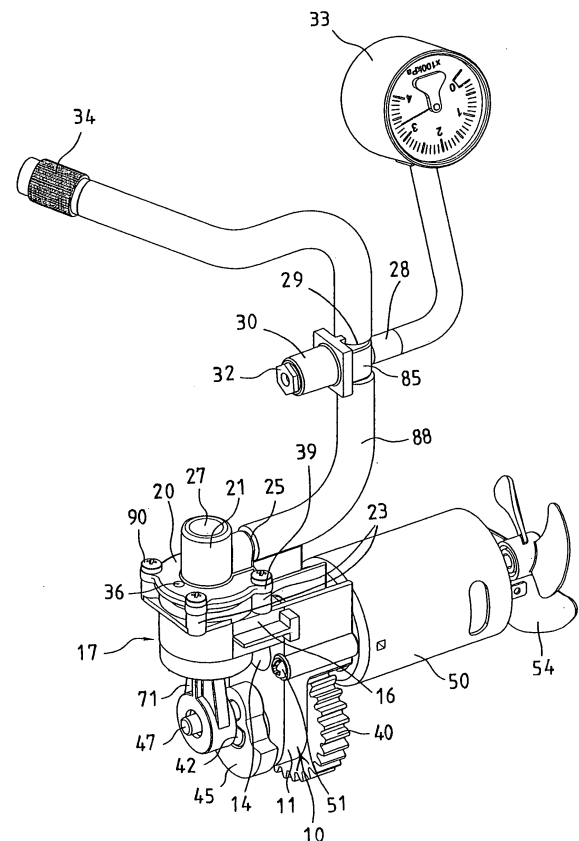
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80335 München (DE)**(54) **Air compressor**

(57) An air compressor includes a piston (70) slidably received in a cylinder housing (17), and a motor (50) coupled to the piston for moving the piston relative to the cylinder housing in a reciprocating action, in order to generate pressurized air. A cover (20) is detachably secured on top of the cylinder housing, and includes an outlet tube (21) having a compartment (22) communicating with the cylinder housing, for receiving pressurized air from the cylinder housing, and includes an inlet (36) blocked by a check valve device (80). The cover may be adjusted and secured to the cylinder housing, to adjust the inlet to different position relative to the cylinder housing, and to prevent the inlet from being blocked by objects.

**FIG. 1**

Description

[0001] The present invention relates to an air compressor, and more particularly to an air compressor having a detachable or changeable structure for allowing an outlet tube of the air compressor to be adjusted to different angular positions or directions, and for allowing the air compressor to be attached to or received within various receptacles.

[0002] Typical air compressors comprise a cylinder housing attached or secured to a base and having a piston slidably disposed therein, and a motor secured to the base and coupled to the piston of the cylinder housing for actuating or driving the piston of the cylinder housing in a reciprocating action.

[0003] The applicant has developed various kinds of typical air compressors, such as U.S. Patent No. 6,846,162 to Chou, which also comprises a piston slidably disposed within a cylinder housing and slidable along or relative to the cylinder housing in a reciprocating action and in a great speed, and an outlet tube extended from and formed integral with the cylinder housing and having one or more ducts extended outwardly from the outlet tube for receiving the pressurized air from the outlet tube.

[0004] The ducts may be coupled to various kinds of facilities that require pressurized air supplied thereto, such as pressure gauges, air nozzles, safety valves, relief valves, etc. However, the outlet tube and the ducts are formed integral with the cylinder housing, such that the outlet tube and the ducts may include a large volume altogether, and may not be adjusted to different directions or positions relative to the cylinder housing, such that the cylinder housing and the outlet tube and the ducts may not be suitably engaged into or received within some of the outer receptacles or packages, or the like.

[0005] The present invention has arisen to mitigate and/or obviate the afore-described disadvantages of the conventional air compressors.

[0006] The primary objective of the present invention is to provide an air compressor including a detachable or changeable structure for allowing an outlet tube of the air compressor to be adjusted to different angular positions or directions, and for allowing the air compressor to be attached to or received within various receptacles.

[0007] Further objectives and advantages of the present invention will become apparent from a careful reading of the detailed description provided hereinbelow, with appropriate reference to the accompanying drawings.

FIG. 1 is a perspective view of an air compressor in accordance with the present invention;

FIG. 2 is a partial exploded view of the air compressor;

FIG. 3 is a perspective view similar to FIG. 1, in which one half of the air compressor is cut off for showing an inner structure of the air compressor;

FIG. 4 is a perspective view similar to FIG. 3, illustrating the operation of the air compressor;

FIG. 5 is a partial perspective view of the air compressor, in which some of the parts or elements have been removed from the air compressor;

FIG. 6 is a partial exploded view as seen from the bottom of a cover of the air compressor;

FIG. 7 is a perspective view similar to FIG. 1, illustrating the operation of the air compressor;

FIG. 8 is a further partial exploded view of the air compressor;

FIG. 9 is a partial exploded view similar to FIG. 2, illustrating the other arrangement of the air compressor;

FIG. 10 is a perspective view of the air compressor as shown in FIG. 9, in which one half of the air compressor is cut off for showing an inner structure of the air compressor;

FIG. 11 is a perspective view similar to FIG. 10, illustrating the operation of the air compressor as shown in FIGS. 9-10;

FIG. 12 is a perspective view illustrating another arrangement of the air compressor;

FIG. 13 is a partial exploded view of the air compressor as shown in FIG. 12;

FIG. 14 is a perspective view of the air compressor as shown in FIGS. 12-13, in which one half of the air compressor is cut off for showing an inner structure of the air compressor;

FIG. 15 is a perspective view similar to FIG. 14, illustrating the operation of the air compressor as shown in FIGS. 12-15;

FIG. 16 is a perspective view similar to FIG. 12, illustrating the further arrangement of the air compressor; and

FIG. 17 is a partial exploded view illustrating the air compressor as shown in FIG. 16.

[0008] Referring to the drawings, and initially to FIGS. 1-8, an air compressor in accordance with the present invention comprises a supporting base 10 including a plate 11 having an aperture 12 formed in a lower portion 13 thereof, and having an orifice 14 formed in an upper portion 15 thereof (FIGS. 5, 8), and having an arm 16 laterally extended from the upper portion 15 thereof, and a cylinder housing 17 provided on or extended from the arm 16 and preferably formed integral with the arm 16 and the plate 11, but the cylinder housing 17 may also be separated from the plate 11 and detachably secured to the plate 11 with such as fasteners 99 (FIG. 8).

[0009] The cylinder housing 17 includes a chamber 18 formed therein (FIGS. 2-4) and having an open top (FIG. 2) and an open bottom (FIGS. 3, 4), and defined by a peripheral wall 19 (FIGS. 2), for slidably receiving a piston 70 therein. The piston 70 is slidably received in the chamber 18 of the cylinder housing 17, and includes an extension or piston rod 71 extended therefrom, for allowing the piston 70 to slide in reciprocating action in the cham-

ber 18 of the cylinder housing 17, and to generate pressurized air. The piston 70 includes a sealing ring 72 attached or secured onto the outer peripheral portion thereof and slidably engaged with the cylinder housing 17, for making an air tight seal between the piston 70 and the cylinder housing 17.

[0010] The cylinder housing 17 includes a cover 20 detachably secured on top thereof with such as fasteners 90, for enclosing or blocking the open top of the chamber 18 thereof (FIGS. 2-4), and a sealing ring 91 is disposed and engaged between the cover 20 and the cylinder housing 17, for making an air tight seal between the cover 20 and the cylinder housing 17. For example, the cover 20 includes a peripheral slot 92 formed in the bottom portion thereof (FIG. 6), for receiving the sealing ring 91 and for partially receiving the peripheral wall 19 of the cylinder housing 17. The cover 20 includes an outlet tube 21 extended upwardly or outwardly from the top thereof, and having a compartment 22 formed therein and communicating with the chamber 18 of the cylinder housing 17, for receiving the pressurized air from the chamber 18 of the cylinder housing 17.

[0011] A spring-biased check valve 24 (FIGS. 2-4) may be disposed in the outlet tube 21, and engaged with a valve seat 26 that is formed or provided between the outlet tube 21 and the cover 20 or the cylinder housing 17, for controlling the inner air to flow from the chamber 18 of the cylinder housing 17 into the compartment 22 of the outlet tube 21 only, and for preventing the inner air from flowing backwardly from the compartment 22 of the outlet tube 21 into the chamber 18 of the cylinder housing 17. A cap 27 may further be provided and attached to the outer or free end of the outlet tube 21 with such as threading engagements, for blocking or enclosing the compartment 22 of the outlet tube 21, and for stably retaining the spring-biased check valve 24 within the compartment 22 of the outlet tube 21.

[0012] A relief valve or safety valve (not shown) may further be provided and attached to the outlet tube 21 when the cap 27 is disengaged from the outer or free end of the outlet tube 21, for relieving the pressurized air when the air pressure within the cylinder housing 17 and the outlet tube 21 is over-pressurized, or when the air pressure reaches a predetermined value. The spring-biased check valve 24 may thus be used as a control means to control the pressurized air to flow from the chamber 18 of the cylinder housing 17 into the compartment 22 of the outlet tube 21, and to prevent the pressurized air from flowing backwardly from the compartment 22 of the outlet tube 21 into the chamber 18 of the cylinder housing 17.

[0013] The cover 20 further includes a port 25 extended therefrom, and communicating with the compartment 22 of the outlet tube 21, for receiving the pressurized air from the compartment 22 of the outlet tube 21. A coupler 85 is further provided and includes one or more ducts 28, 29, 30, 31 extended outwardly therefrom, for coupling to various kinds of facilities that require pressurized air supplied thereto. One or more lids (not shown) may fur-

ther be provided and attached or secured to either of the ducts 28, 29, 30, 31 with such as threading or force-fitting engagements, for selectively enclosing or blocking the ducts 28, 29, 30, 31, when the ducts 28, 29, 30, 31 are not required to be used.

[0014] For example, one of the ducts 31 of the coupler 85 may be coupled to the port 25 of the cover 20 with such as a hose 88, for receiving the pressurized air from the compartment 22 of the outlet tube 21 via the port 25 of the cover 20. A pressure gauge 33 may be provided and attached to the other duct 28, for detecting and showing the air pressure within the cylinder housing 17 and/or the outlet tube 21. A nozzle 34 may be provided and attached to another duct 29, for allowing the pressurized air to be supplied from the chamber 18 of the cylinder housing 17 and the compartment 22 of the outlet tube 21 to various facilities that require pressurized air supplied thereto, with the nozzle 34.

[0015] A relief valve 32 may further be provided and attached to the other duct 30, for relieving the pressurized air when the air pressure within the cylinder housing 17 and/or the outlet tube 21 reaches a predetermined pressure or the highest pressure, and thus for preventing the cylinder housing 17 and/or the outlet tube 21 from being over-pressurized, and/or for safety purposes. The pressure gauge 33 and the nozzle 34 and the relief valve 32 may thus be easily and readily attached to or coupled to the outlet tube 21 with the ducts 28, 29, 30, 31 of the coupler 85, without additional or specialized coupling members or tools.

[0016] A gear 40 is rotatably attached to the lower portion 13 of the plate 11 with one or more bearings and a shaft 42, and an eccentric member 45 is secured to the shaft 42 of the gear 40 and rotated in concert with the gear 40 and includes a crank or an eccentric pin 47 extended therefrom and coupled to the piston rod 71 of the piston 70, in order to actuate or to move the piston 70 relative to the cylinder housing 17 in reciprocating actions.

[0017] A motor 50 may be attached or secured to the upper portion 15 of the plate 11 with such as fasteners 51 (FIGS. 1, 2, 7), and includes a spindle 52 extended into the upper orifice 14 of the plate 11 (FIGS. 3, 4), and includes a pinion 53 secured to the spindle 52 thereof, and engaged with the gear 40, for allowing the gear 40 to be rotated or driven by the motor 50 via the pinion 53, and thus for allowing the piston 70 to be actuated or moved relative to the cylinder housing 17 in reciprocating actions by the eccentric member 45 and the eccentric pin 47. A fan device 54 may further be provided and coupled to the motor 50 for being rotated or driven by the motor 50 to generate circulating or ventilating air.

[0018] In operation, as shown in FIGS. 3 and 4, the piston 70 may be actuated or moved relative to the cylinder housing 17 in reciprocating actions by the motor 50 via pinion 53, the gear 40, the eccentric member 45 and the eccentric pin 47, in order to generate a pressurized air, and to allow the pressurized air to flow into the com-

partment 22 of the outlet tube 21, and then to flow out through either or all of the ducts 28, 29, 30 of the coupler 85, and thus to allow the air pressure within the cylinder housing 17 and/or the outlet tube 21 to be detected and shown by the pressure gauge 33, and to allow the pressurized air to be supplied into the facilities that require pressurized air supplied thereto, with the nozzle 34, and/or to the pressurized air to be relieved via the relief valve 32 when the cylinder housing 17 and/or the outlet tube 21 is over-pressurized or reaches the predetermined pressure or the highest pressure.

[0019] As shown in FIGS. 2-4 and 6, the cover 20 further includes an inlet 36 formed therein and communicating with the chamber 18 of the cylinder housing 17, for allowing outside air to flow into the chamber 18 of the cylinder housing 17, and includes a recess 37 formed in the bottom portion thereof and communicating with the inlet 36 thereof, and includes a catch 38 extended therefrom or extended into the recess 37 thereof. A valve device 80 includes one or first end 81 engaged with or attached to the catch 38 of the cover 20, for attaching or securing the one or first end 81 of the valve device 80 to the cover 20.

[0020] The valve device 80 includes a spring blade structure or is a spring blade for biasing and blocking or enclosing the inlet 36 of the cover 20, and for forming or acting as a check valve means or device to control the outside air to flow into the chamber 18 of the cylinder housing 17 when the piston 70 moves away from the cover 20, and to prevent the inner air from flowing out of the chamber 18 of the cylinder housing 17 through the inlet 36 of the cover 20 when the piston 70 moves toward the cover 20.

[0021] The cylinder housing 17 includes one or more, such as four studs 23 formed or provided on the outer peripheral portion thereof, and the cover 20 further includes one or more, such as four holes or ears 39 formed therein and selectively aligned with the studs 23 of the cylinder housing 17, for receiving the fasteners 90 which may secure the cover 20 on top of the cylinder housing 17.

[0022] It is to be noted that the cover 20 may be rotated or adjusted relative to the cylinder housing 17 to different angular position, before the fasteners 90 secure the cover 20 on top of the cylinder housing 17, and thus to allow the inlet 36 and the outlet tube 21 of the cover 20 to be rotated or adjusted relative to the cylinder housing 17 to different angular position or location, for example, the status of different positions of the cover 20 relative to the cylinder housing 17 are shown in FIGS. 1 and 7, and thus for allowing the air compressor to be attached to or received within various receptacles or packages.

[0023] Alternatively, as shown in FIGS. 9-11, the cylinder housing 17 includes an upper wall 60 provided thereon for enclosing the upper portion of the chamber 18 thereof, and includes the inlet 36 formed therein, and includes a center opening 61 formed therein and defined by a peripheral fence 62, and includes a peripheral groove 63 formed therein and located around the peripheral

fence 62, for receiving a sealing ring 64.

[0024] The cover 20 may be secured on top of the cylinder housing 17, and the spring-biased check valve 24 may be engaged into the compartment 22 of the outlet tube 21 via the lower or bottom portion thereof, and biased to engage with the peripheral fence 62, for controlling the inner air to flow from the chamber 18 of the cylinder housing 17 into the compartment 22 of the outlet tube 21 when the piston 70 moves toward the cover 20, and for preventing the inner air from flowing backwardly from the compartment 22 of the outlet tube 21 into the chamber 18 of the cylinder housing 17 when the piston 70 moves away from the cover 20.

[0025] The compartment 22 of the outlet tube 21 is preferably a blind compartment 22, and the outlet tube 21 includes a peg 66 extended therefrom, or extended into the compartment 22 thereof, for engaging with the spring-biased check valve 24, and for stably anchoring or positioning the spring-biased check valve 24 within the compartment 22 of the outlet tube 21. The sealing ring 64 is engaged between the upper wall 60 of the cylinder housing 17 and the cover 20, for making an air tight seal between the cover 20 and the upper wall 60 of the cylinder housing 17.

[0026] It is also to be noted that the upper wall 60 of the cylinder housing 17 is spaced away from the cover 20, and the inlet 36 of the upper wall 60 of the cylinder housing 17 may thus be kept out of the other objects or receptacles or packages, such that the inlet 36 of the upper wall 60 of the cylinder housing 17 may be prevented from being blocked or shielded when the air compressor is attached to or received within various receptacles or packages. In addition, the outlet tube 21 of the cover 20 may also be rotated or adjusted relative to the cylinder housing 17 to different angular position or location, for allowing the air compressor to be attached to or received within various receptacles or packages.

[0027] Further alternatively, as shown in FIGS. 12-15, the cover 20 of the cylinder housing 17 includes no inlet formed therein. Instead, the piston 70 includes a bore 73 formed therein, and the valve device 80 includes one or first end 81 engaged with or attached to the piston 70, for biasing and blocking or enclosing the bore 73 of the piston 70, and for forming a check valve means or device to control the outside air to intake or to flow into the chamber 18 of the cylinder housing 17 when the piston 70 moves away from the cover 20, and to prevent the inner air from flowing backwardly or outwardly from the chamber 18 of the cylinder housing 17 through the bore 73 of the piston 70 when the piston 70 moves toward the cover 20.

[0028] Further alternatively, as shown in FIGS. 16-17, the cover 20 of the cylinder housing 17 includes no inlet formed therein, and the upper wall 60 of the cylinder housing 17 also includes no inlet formed therein, but also spaced away from the cover 20. Instead, the piston 70 includes a bore 73 formed therein, and the valve device 80 includes one or first end 81 engaged with or attached

to the piston 70, for biasing and blocking or enclosing the bore 73 of the piston 70, and for forming a check valve means or device to control the outside air to intake or to flow into the chamber 18 of the cylinder housing 17 when the piston 70 moves away from the cover 20, and to prevent the inner air from flowing backwardly or outwardly from the chamber 18 of the cylinder housing 17 through the bore 73 of the piston 70, or from flowing out of the chamber 18 of the cylinder housing 17 when the piston 70 moves toward the cover 20.

[0029] It is to be noted that the cylinder housing 17 as shown in FIGS. 9-17 may also be separated from the plate 11, and may also be detachably secured to the plate 11 with such as fasteners 99, similar to that shown in FIG. 8, to allow different cylinder housings 17 of different structures or contours to be detachably or changeably secured to the plate 11 with such as the fasteners 99 (FIG. 8).

[0030] Accordingly, the air compressor in accordance with the present invention includes a detachable or changeable structure for allowing the outlet tube of the air compressor to be adjusted to different angular positions or directions, and for allowing the air compressor to be attached to or received within various receptacles or packages.

[0031] Although this invention has been described with a certain degree of particularity, it is to be understood that the present disclosure has been made by way of example only and that numerous changes in the detailed construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

Claims

1. An air compressor comprising:

a cylinder housing including a chamber formed therein, and defined by a peripheral wall,
a piston slidably received in said chamber of said cylinder housing, and having a piston rod extended therefrom,
a motor coupled to said piston rod, for moving said piston relative to said cylinder housing in a reciprocating action, in order to generate pressurized air, and
a cover detachably secured on top of said cylinder housing, and including an outlet tube having a compartment formed therein and communicating with said chamber of said cylinder housing, for receiving the pressurized air from said chamber of said cylinder housing, said outlet tube including a port extended therefrom, and communicating with said compartment of said outlet tube, for receiving the pressurized air from said compartment of said outlet tube.

2. The air compressor as claimed in claim 1, wherein said cylinder housing includes an open top, and said cover is detachably secured on top of said cylinder housing for enclosing and blocking said chamber of said cylinder housing, said cylinder housing further includes at least two studs provided on an outer peripheral portion thereof, and said cover includes at least two ears formed therein and selectively aligned with said at least two studs of said cylinder housing, for receiving fasteners which adjustably secure said cover on top of said cylinder housing.

3. The air compressor as claimed in claim 1, wherein said cover includes a check valve to control the inner air of said chamber of said cylinder housing to flow into said compartment of said outlet tube when said piston moves toward said cover, and to prevent the inner air from flowing out of said compartment of said outlet tube when said piston moves away from said cover, said outlet tube includes a valve seat provided therein, and said check valve is disposed in said outlet tube and engaged with said valve seat, to control the pressurized air to flow from said chamber of said cylinder housing into said compartment of said outlet tube, and to prevent the pressurized air from flowing backwardly from said compartment of said outlet tube into said chamber of said cylinder housing.

4. The air compressor as claimed in claim 1, wherein said cover includes a valve device to control the outside air to flow into said chamber of said cylinder housing when said piston moves away from said cover, and to prevent the inner air from flowing out of said chamber of said cylinder housing through said valve device when said piston moves toward said cover, said cover further includes an inlet formed therein, and said valve device is secured to said cover, for blocking said inlet of said cover, and for controlling the outside air to flow into said chamber of said cylinder housing, said cover includes a recess formed therein and communicating with said inlet thereof, for receiving said valve device, said cover includes a catch extended therefrom, said valve device includes a first end secured to said catch of said cover, said cover includes a peripheral slot formed therein, for receiving a sealing ring and for partially receiving said peripheral wall of said cylinder housing, and for making an air tight seal between said cover and said cylinder housing.

5. The air compressor as claimed in claim 1 further comprising a supporting base including a plate having an arm extended therefrom to support said cylinder housing, said motor being attached to said plate and including a spindle extended through said plate, and an eccentric member coupled to said spindle of said motor and having a pin extended therefrom and coupled to said piston rod, to move said

piston relative to said cylinder housing in reciprocating action, said plate includes a gear rotatably attached thereto and rotatably attached to said plate with a shaft, said eccentric member is secured to said shaft and has said pin extended therefrom.

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6. The air compressor as claimed in claim 1, wherein said cylinder housing includes an upper wall provided thereon for enclosing an upper portion of said chamber thereof, said upper wall includes a center opening formed therein and defined by a peripheral fence, and said cover is secured on top of said cylinder housing and includes a check valve engaged into said compartment of said outlet tube and biased to engage with said peripheral fence, for controlling the inner air to flow from said chamber of said cylinder housing into said compartment of said outlet tube. 10
7. The air compressor as claimed in claim 6, wherein said upper wall includes an inlet formed therein, and a valve device secured to said upper wall, for blocking said inlet of said upper wall, and for controlling the outside air to flow into said chamber of said cylinder housing. 15
8. The air compressor as claimed in claim 1, wherein said piston includes a bore formed therein, and a valve device secured to said piston, for blocking said bore of said piston, and for controlling the outside air to flow into said chamber of said cylinder housing. 20
9. The air compressor as claimed in claim 1 further comprising a coupler coupled to said port of said outlet tube, and including a first duct, a second duct, and at least one third duct extended outwardly therefrom and communicating with said compartment of said outlet tube, for receiving the pressurized air from said compartment of said outlet tube, a pressure gauge attached to said first duct, a nozzle coupled to said second duct, and a valve attached to said at least one third duct. 25
10. The air compressor as claimed in claim 9, wherein said coupler includes a hose coupled to said port of said outlet tube. 30

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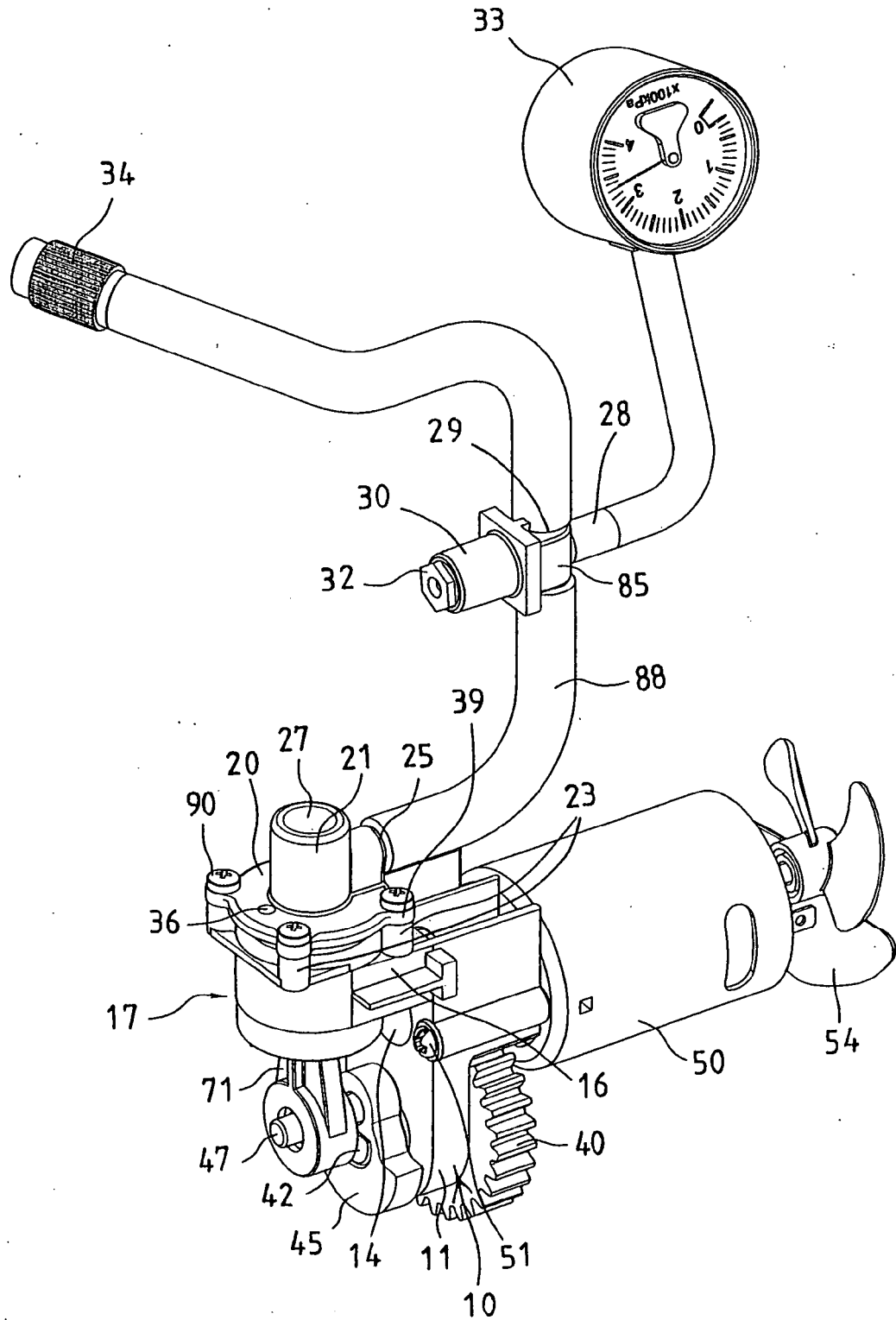


FIG. 1

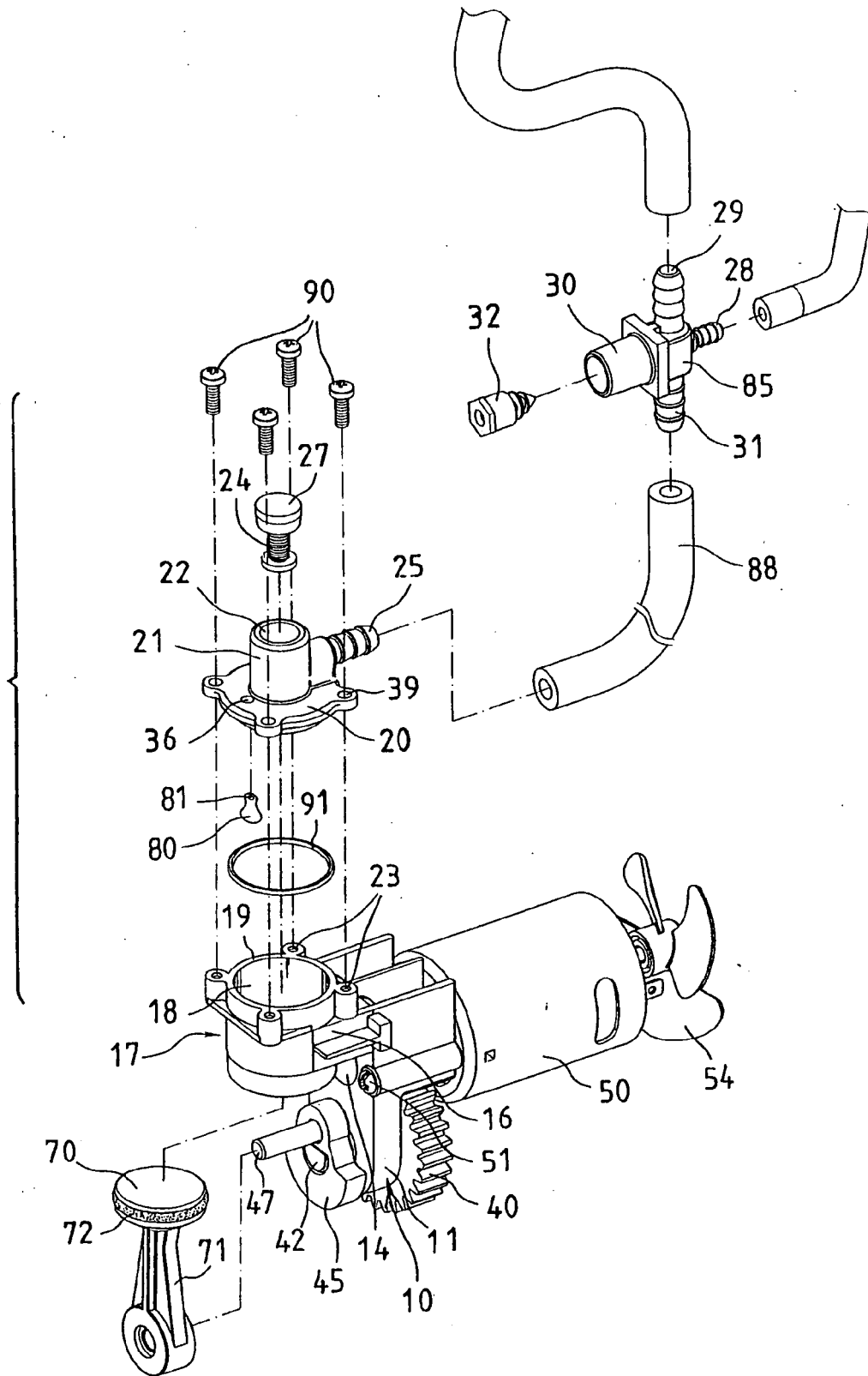


FIG. 2

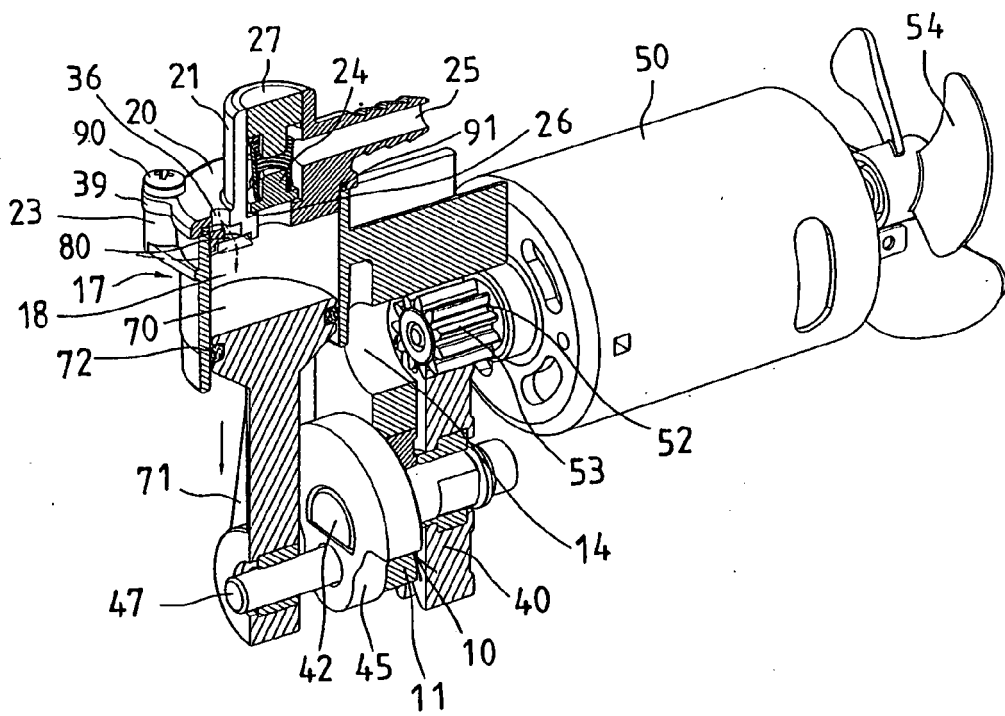


FIG. 3

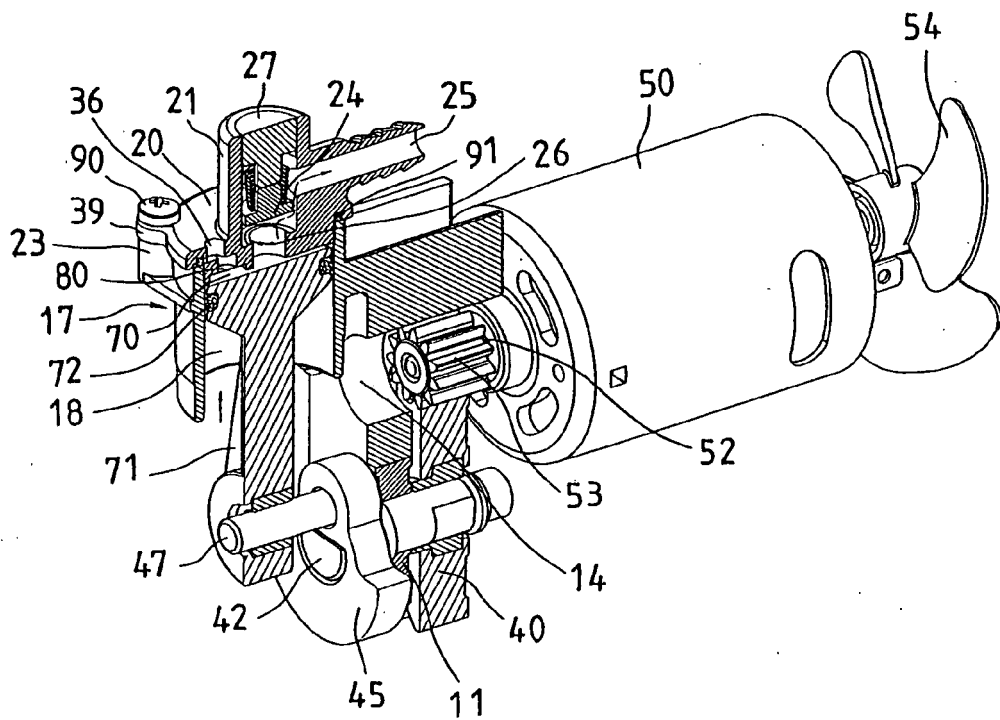


FIG. 4

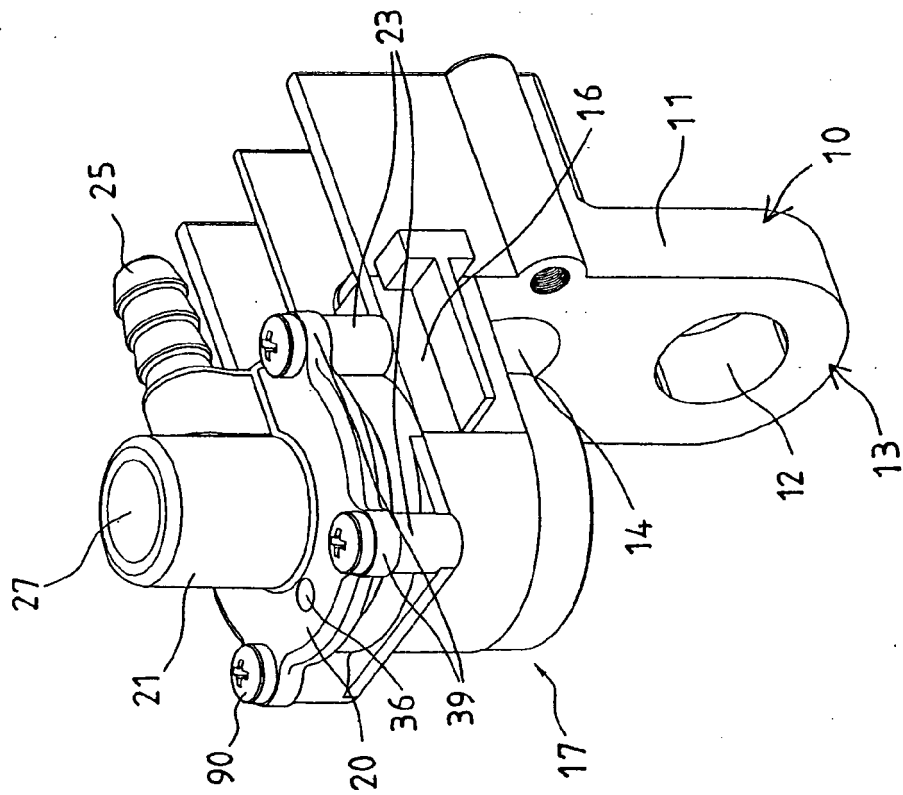


FIG. 5

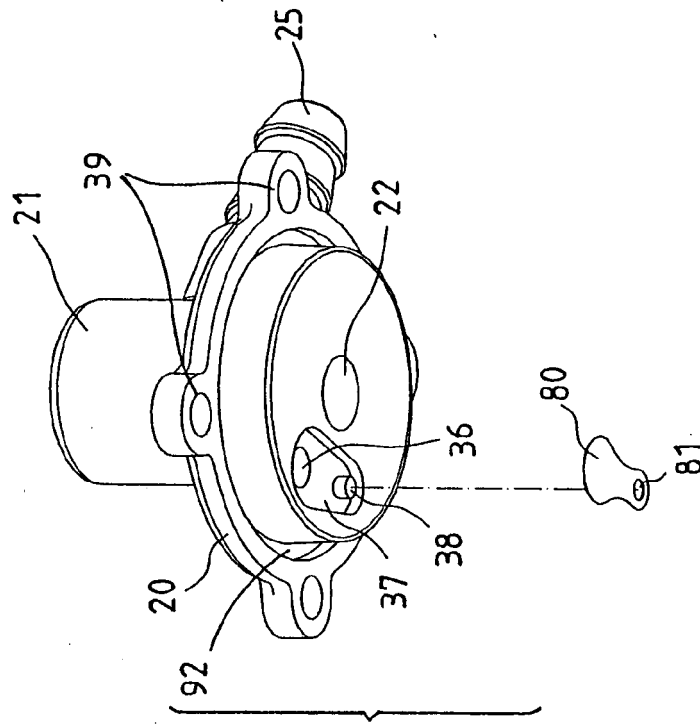


FIG. 6

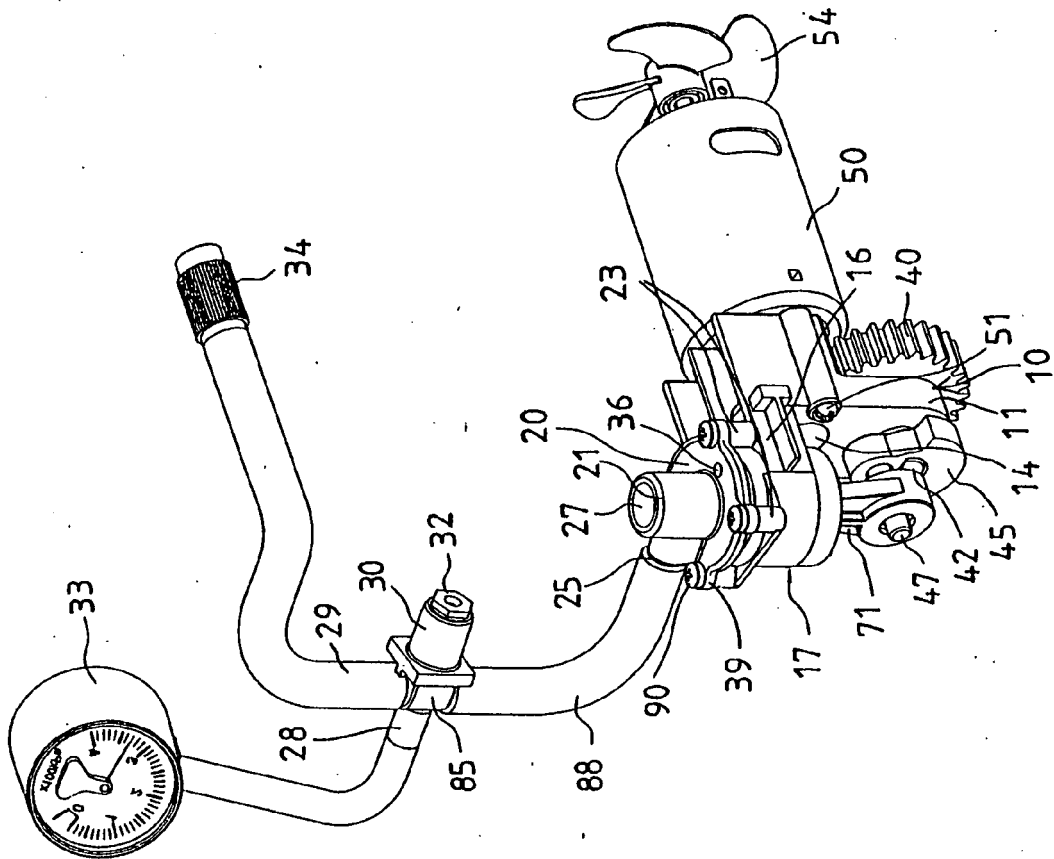


FIG. 7

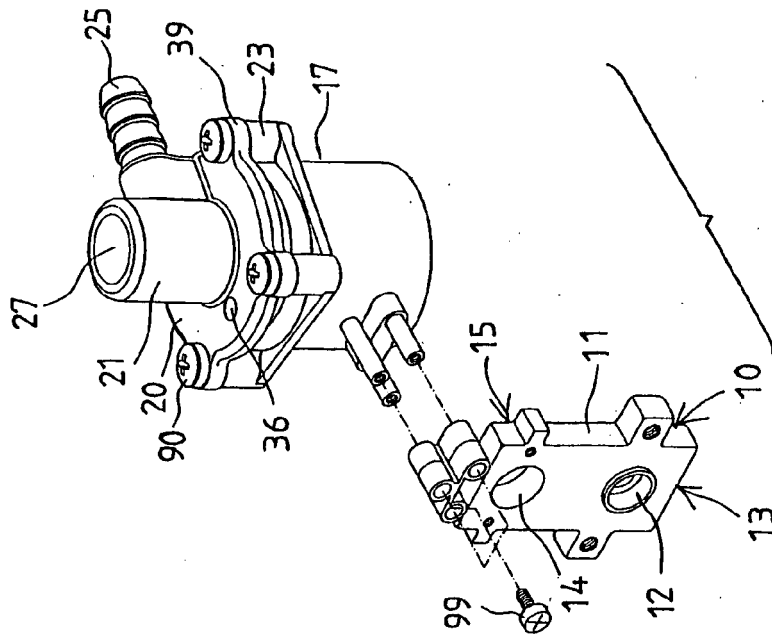


FIG. 8

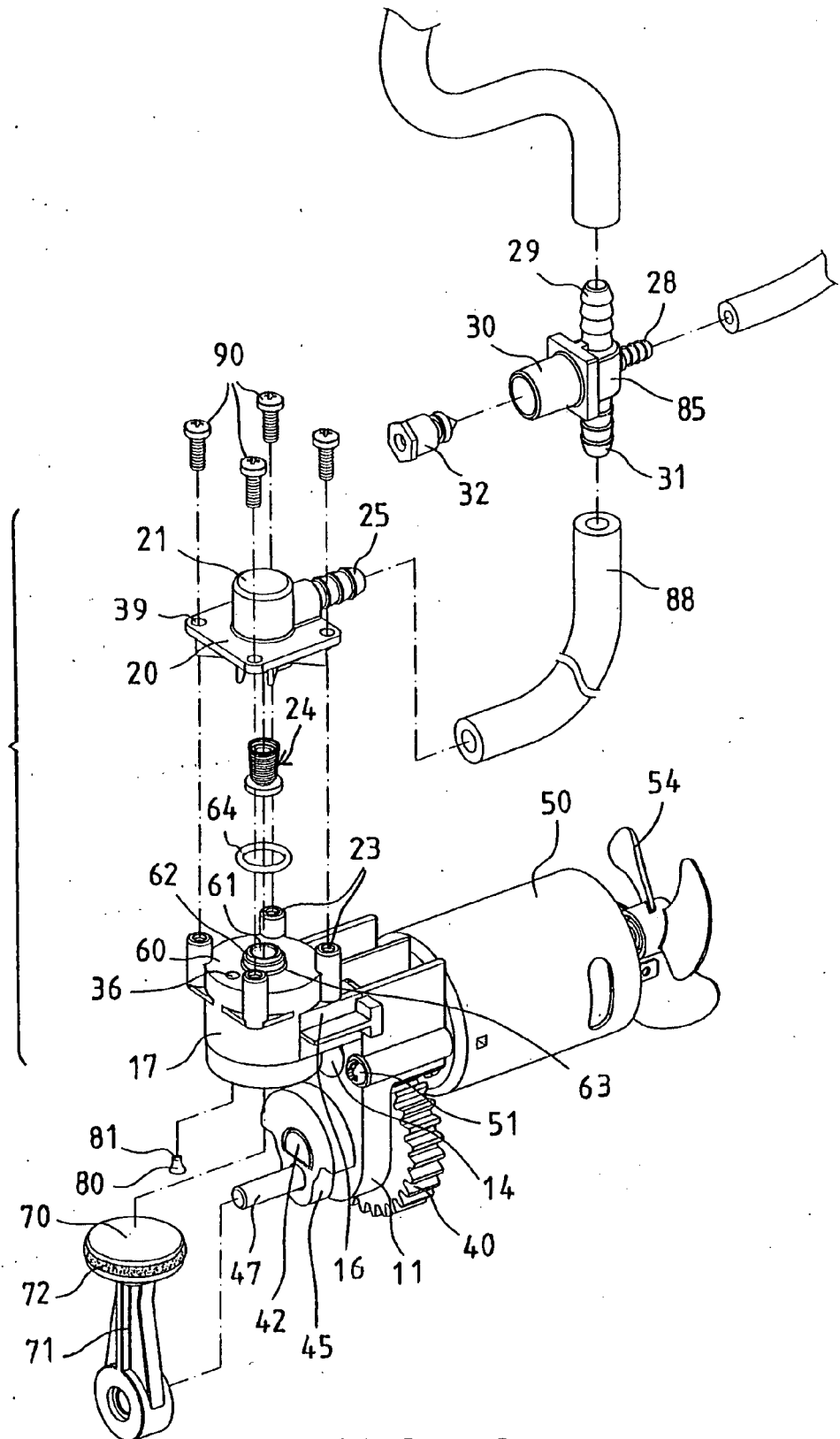


FIG. 9

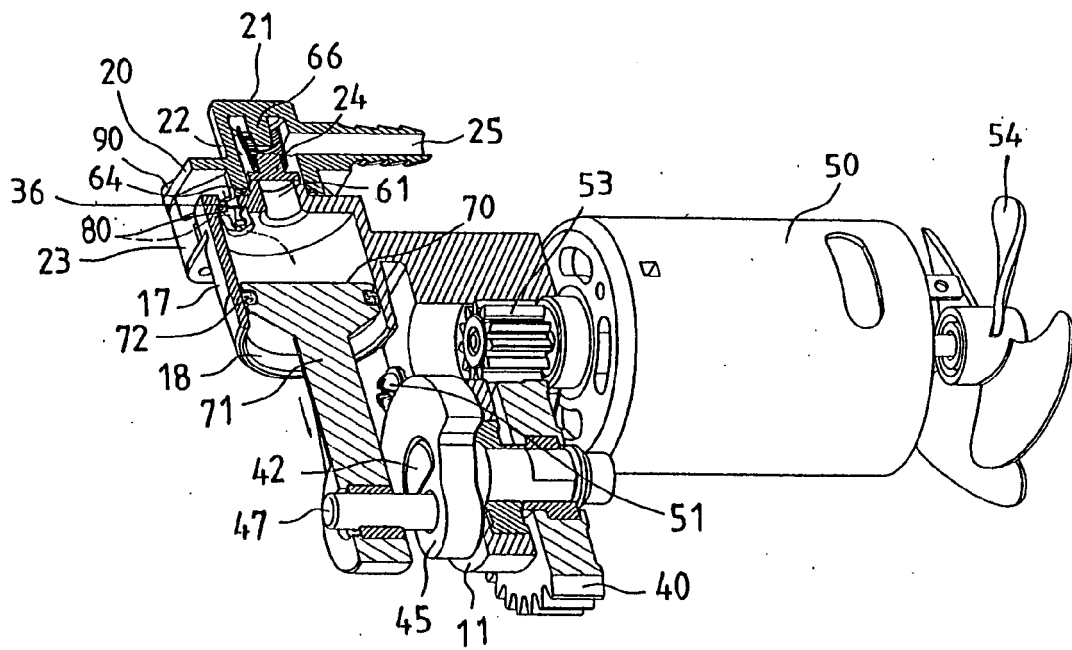


FIG. 10

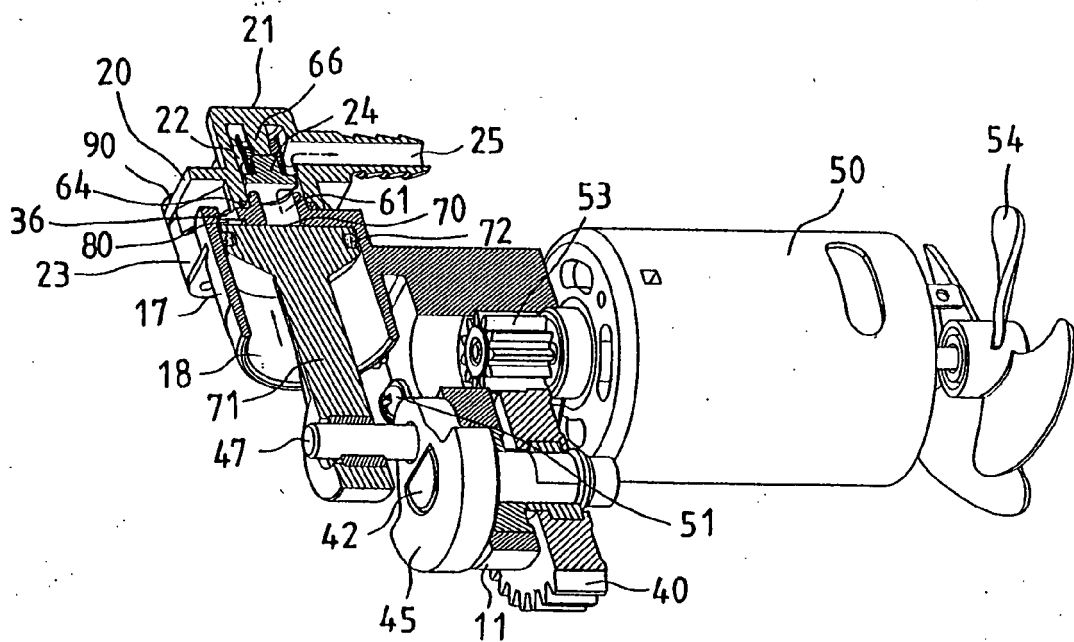


FIG. 11

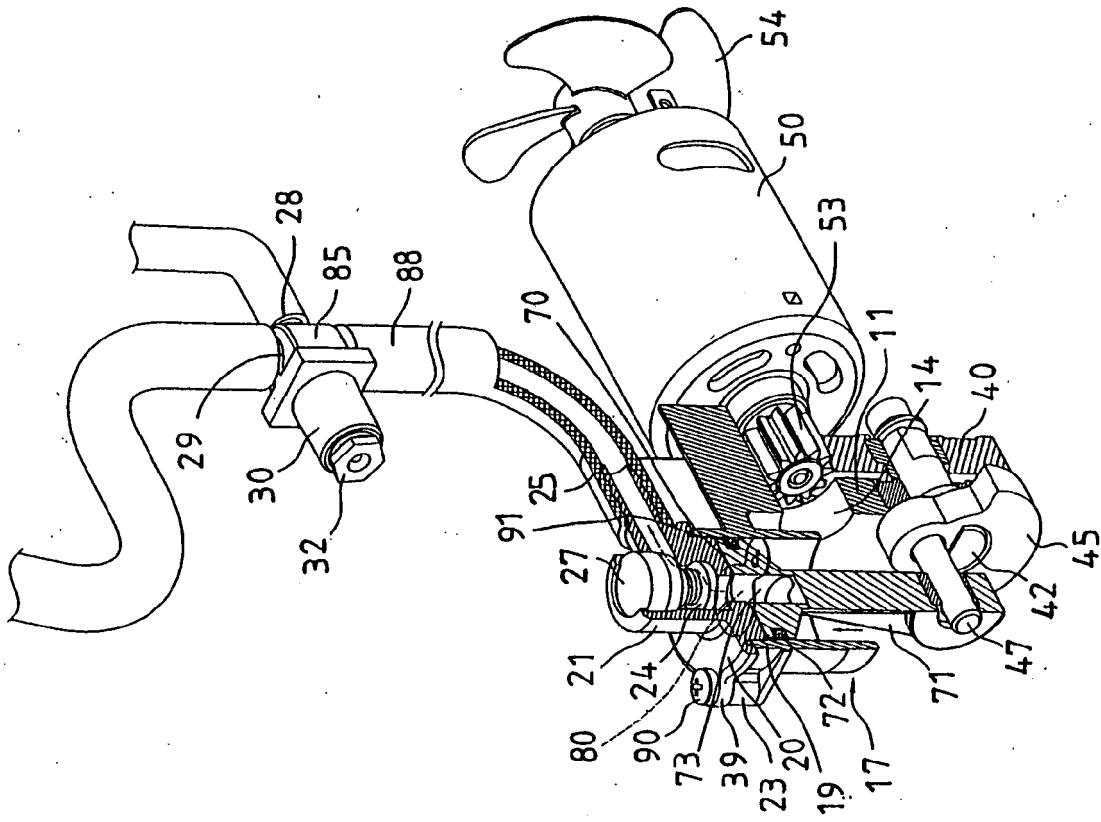


FIG. 14

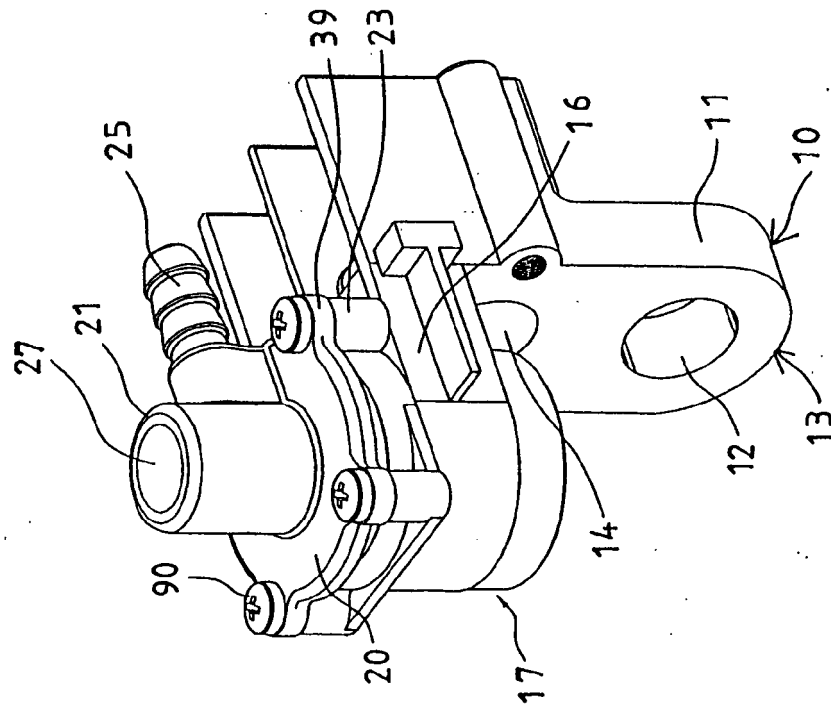


FIG. 12

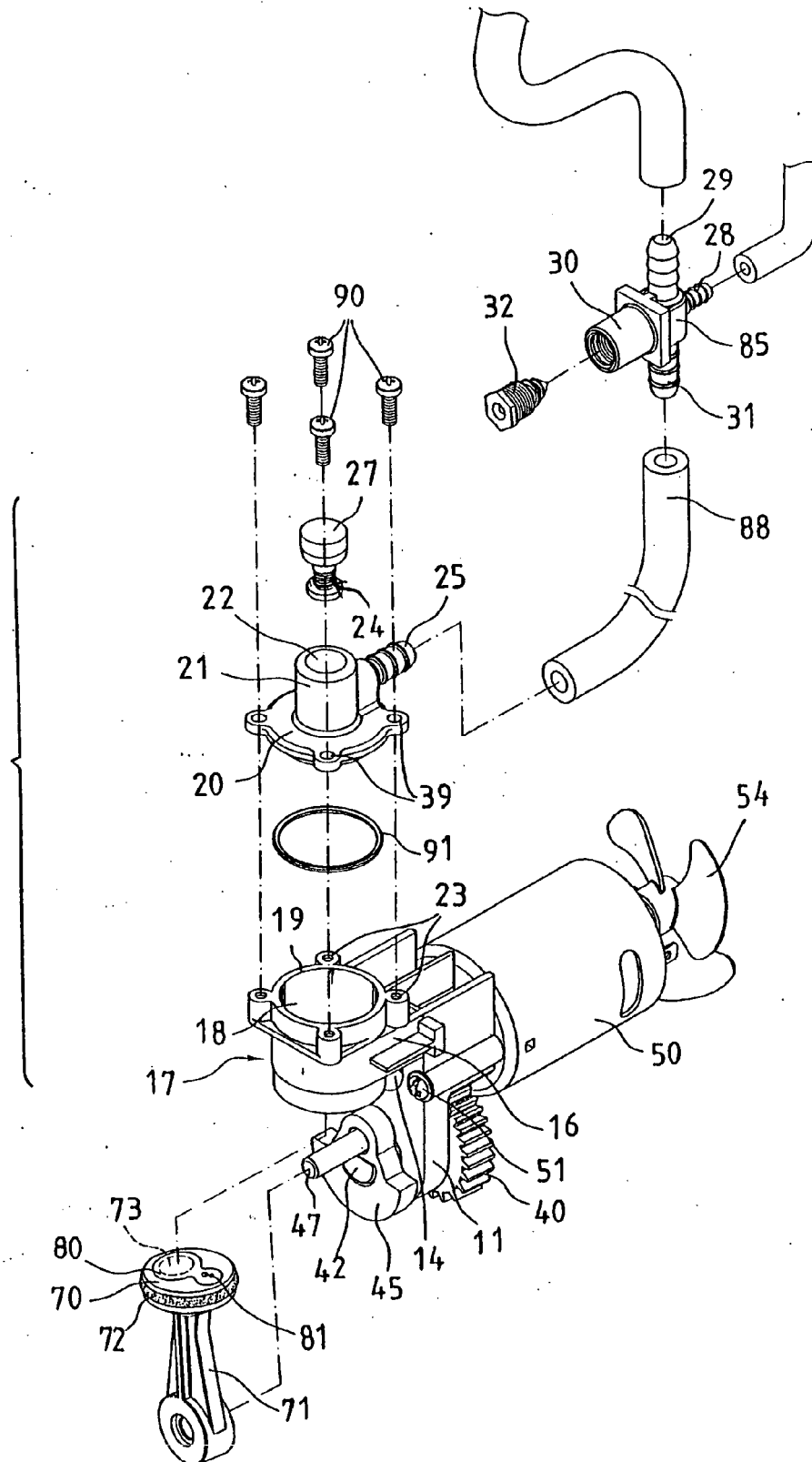


FIG. 13

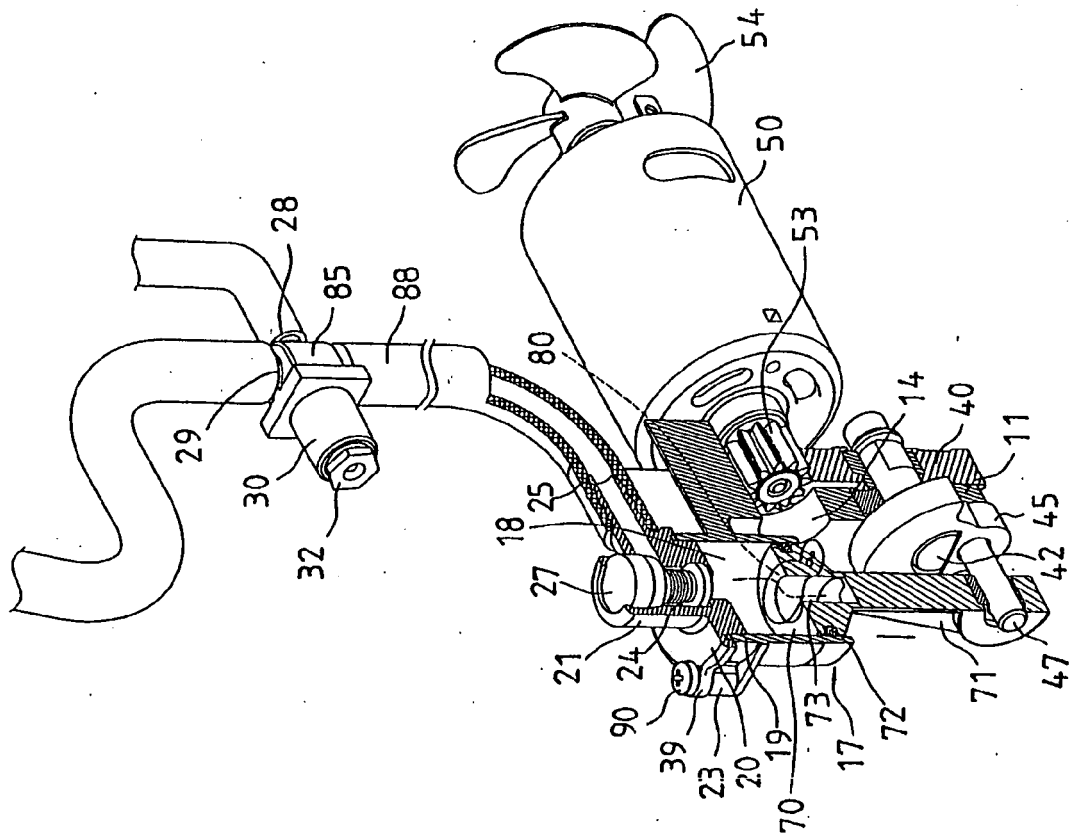


FIG. 15

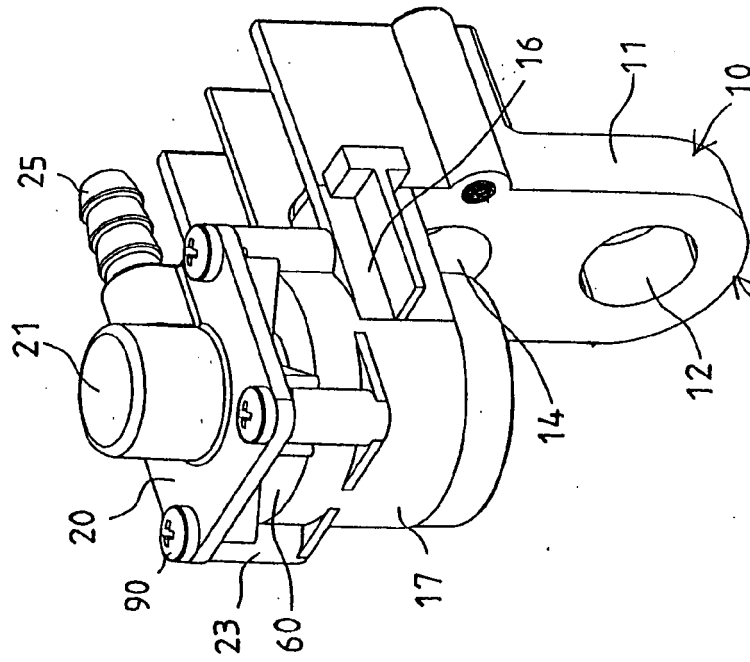


FIG. 16

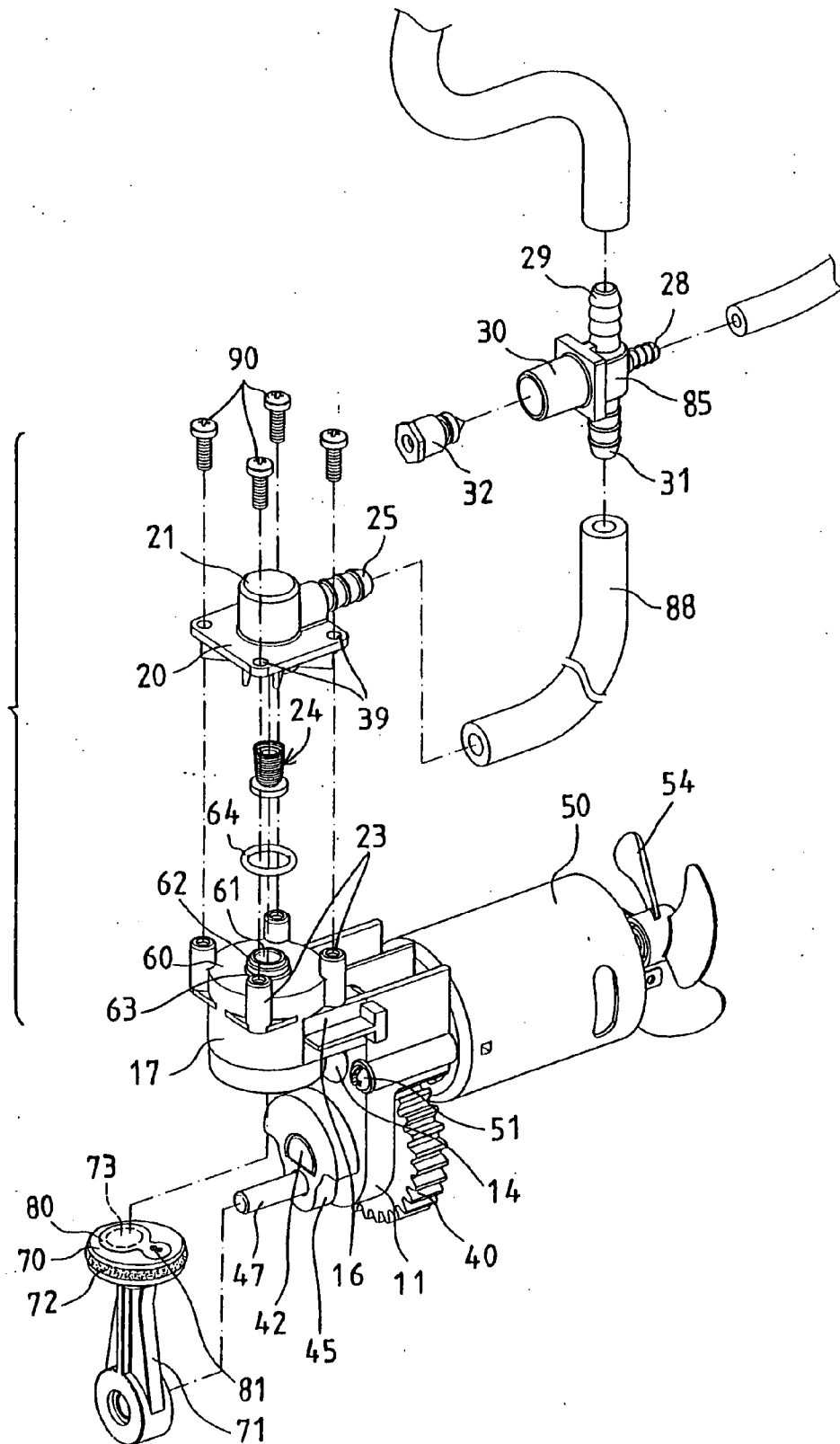


FIG. 17



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 00 9121

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 374 944 A (SCHELDORF OWEN H ET AL) 26 March 1968 (1968-03-26) * column 2, lines 55-61 * * column 2, lines 43-50 * * column 2, lines 23-34 * * figures 1-5 * -----	1-3,5,8	INV. F04B39/12 F04B39/14
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 October 2006	Examiner OLONA LAGLERA, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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10-10-2006

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