



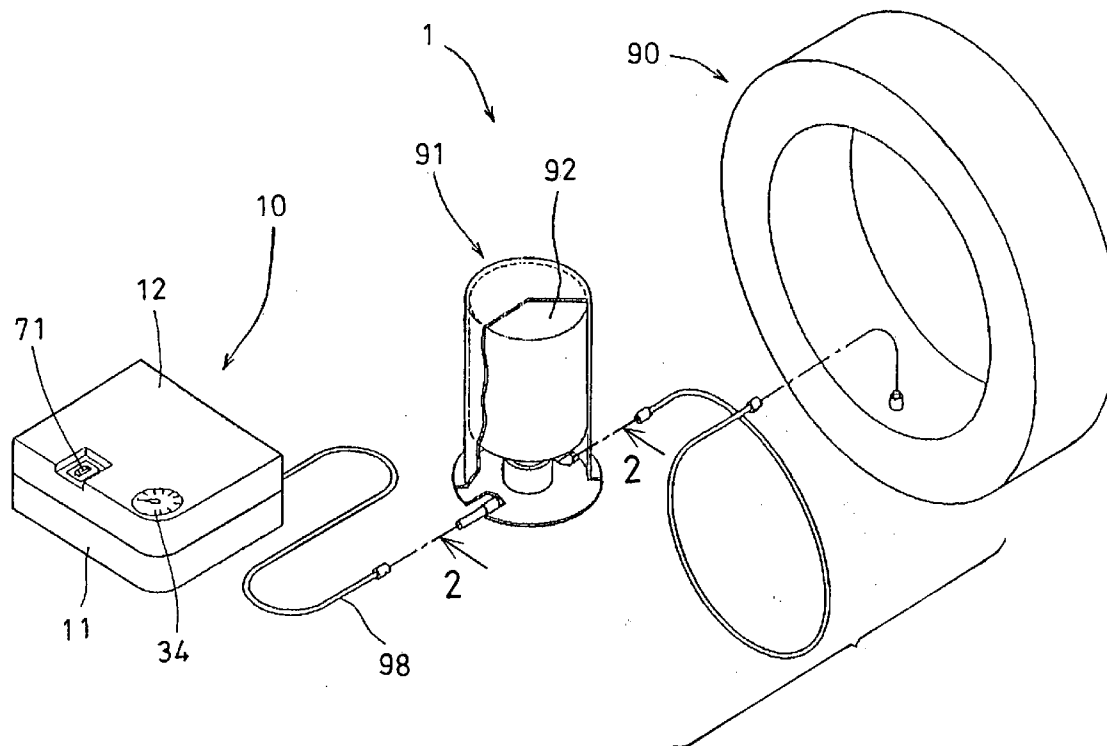
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(19) **United States**(12) **Patent Application Publication**
Chou(10) **Pub. No.: US 2008/0145245 A1**(43) **Pub. Date: Jun. 19, 2008**(54) **COMPRESSOR FOR TIRE INFLATING
COMBINATION****Publication Classification**(51) **Int. Cl.**
F04B 35/00 (2006.01)(52) **U.S. Cl.** **417/415**(57) **ABSTRACT**

An air compressor device includes a piston slidably engaged in a cylinder housing and having an outer peripheral groove formed by a base peripheral surface and two side surfaces, to form an outer opening and an inner recess, a motor is coupled to the piston to move the piston in the cylinder housing in reciprocating action, and a sealing ring is engaged in the outer peripheral groove of the piston, for making an air tight seal between the cylinder housing and the piston. The sealing ring includes a peripheral channel to form a base segment, an inner leg and an outer leg, the outer leg is extended out of the outer opening of the piston, for slidably engaging with a tilted or inclined inner peripheral surface of the cylinder housing, even when the piston is tilted relative to the cylinder housing.

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(21) Appl. No.: **12/070,411**(22) Filed: **Feb. 19, 2008****Related U.S. Application Data**(63) Continuation-in-part of application No. 11/022,349,
filed on Dec. 22, 2004.

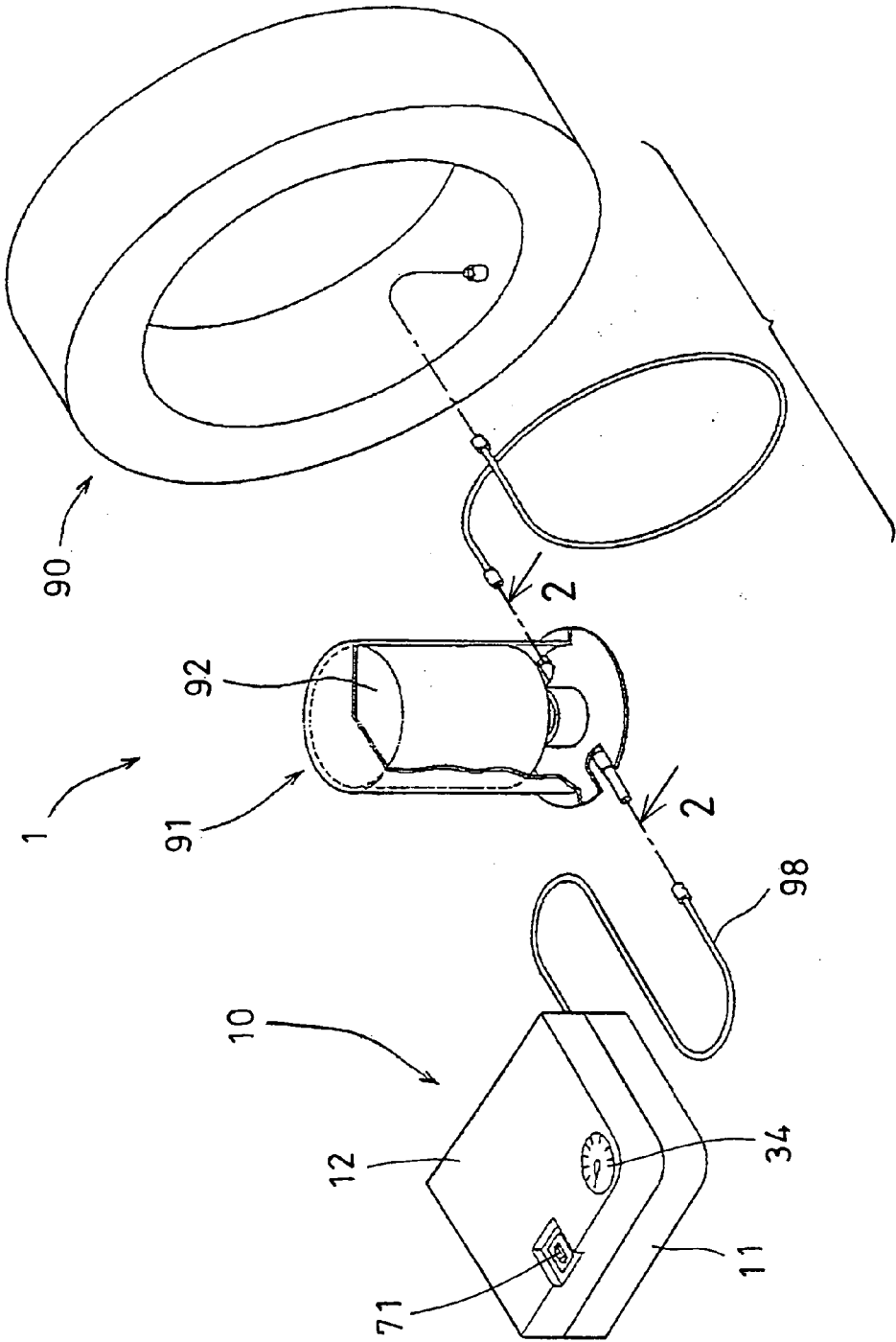


FIG. 1

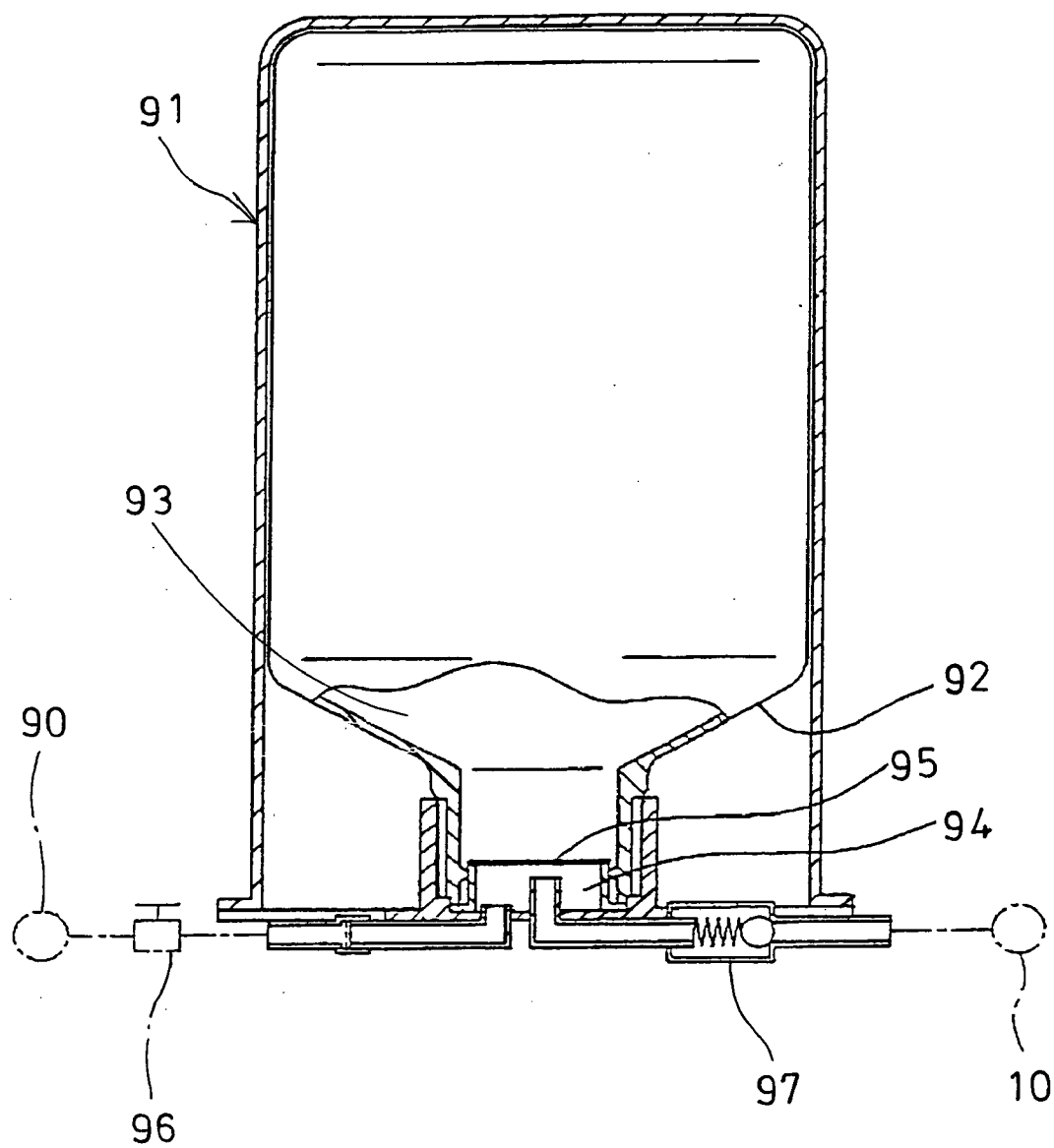


FIG. 2

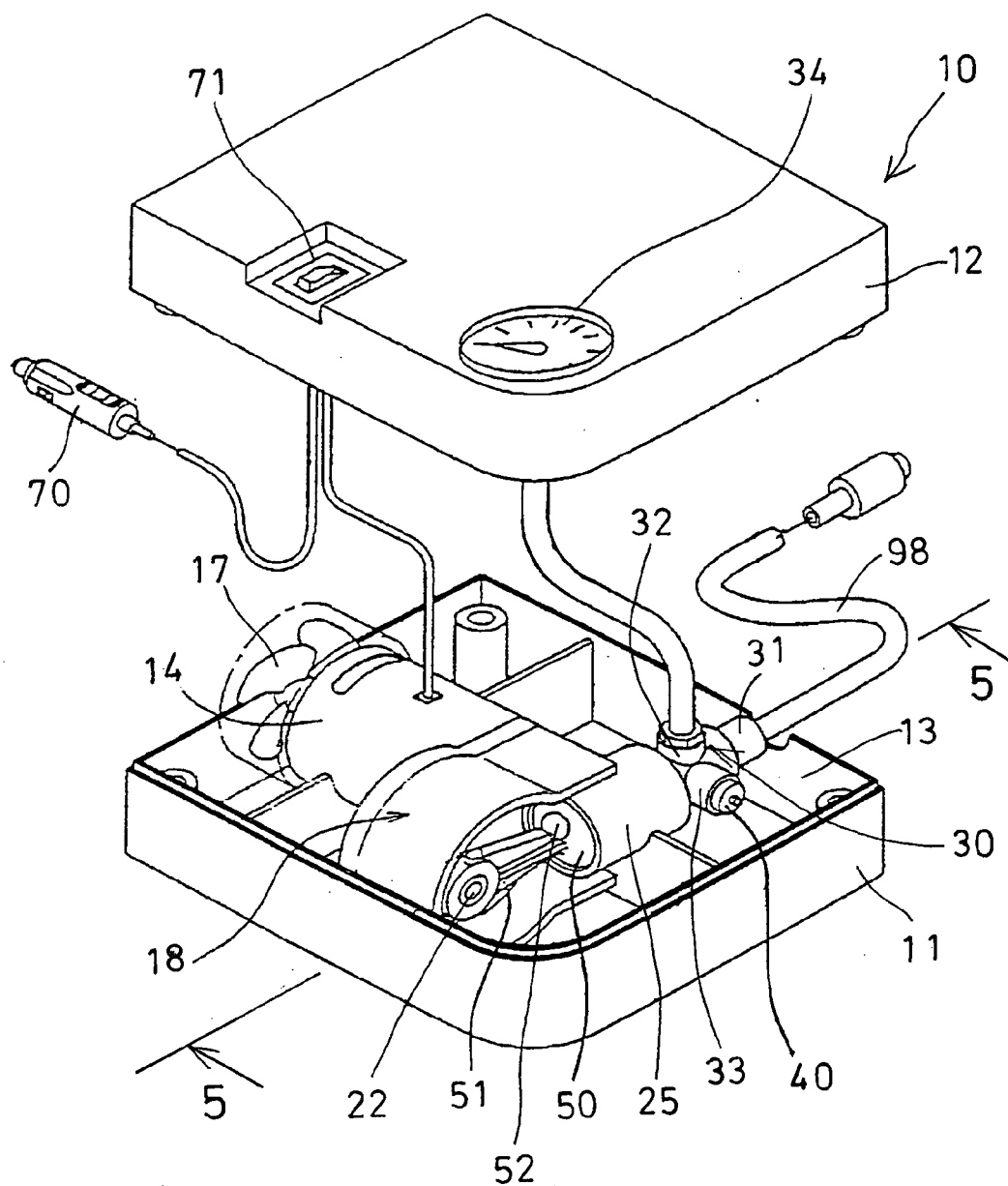


FIG. 3

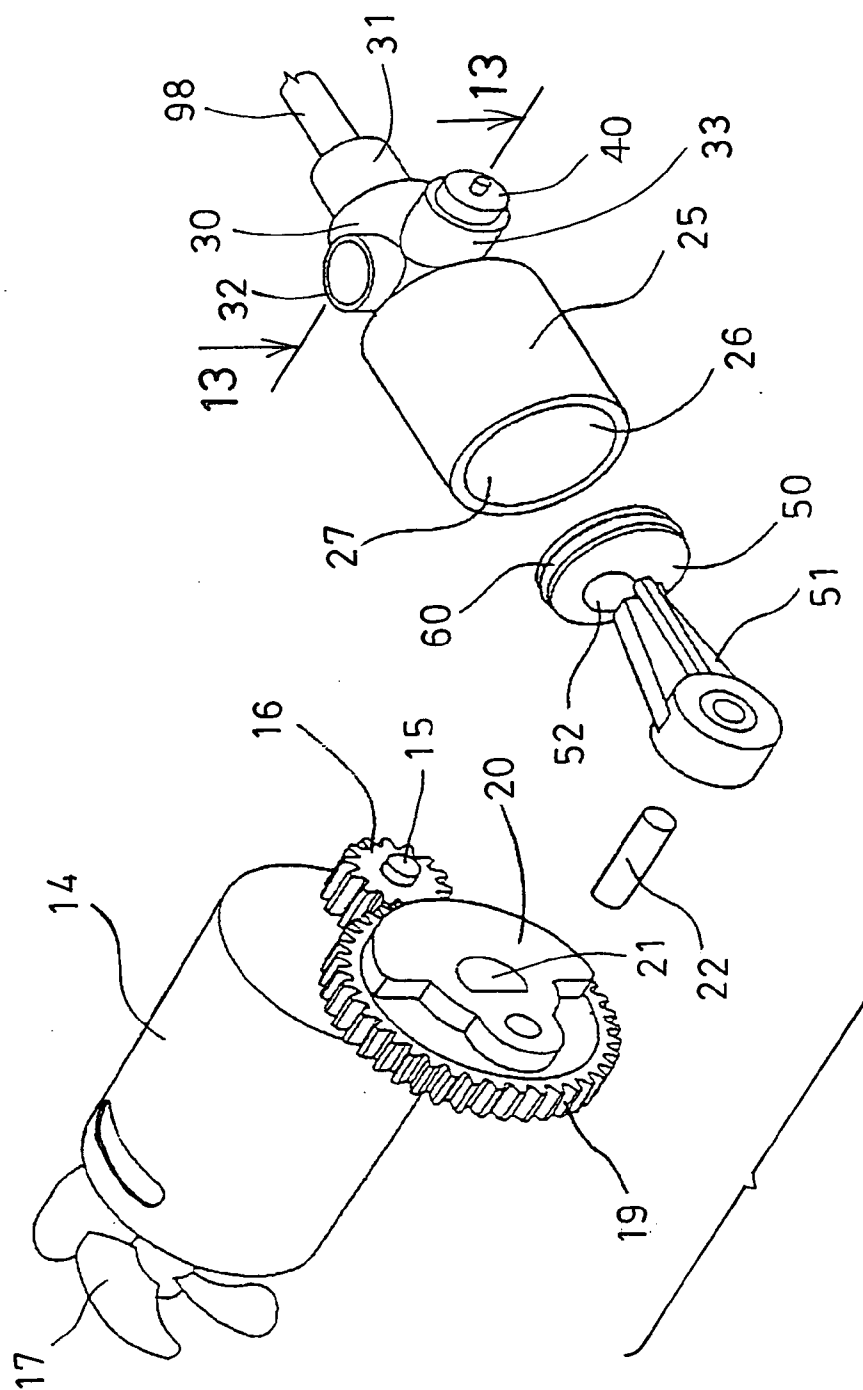


FIG. 4

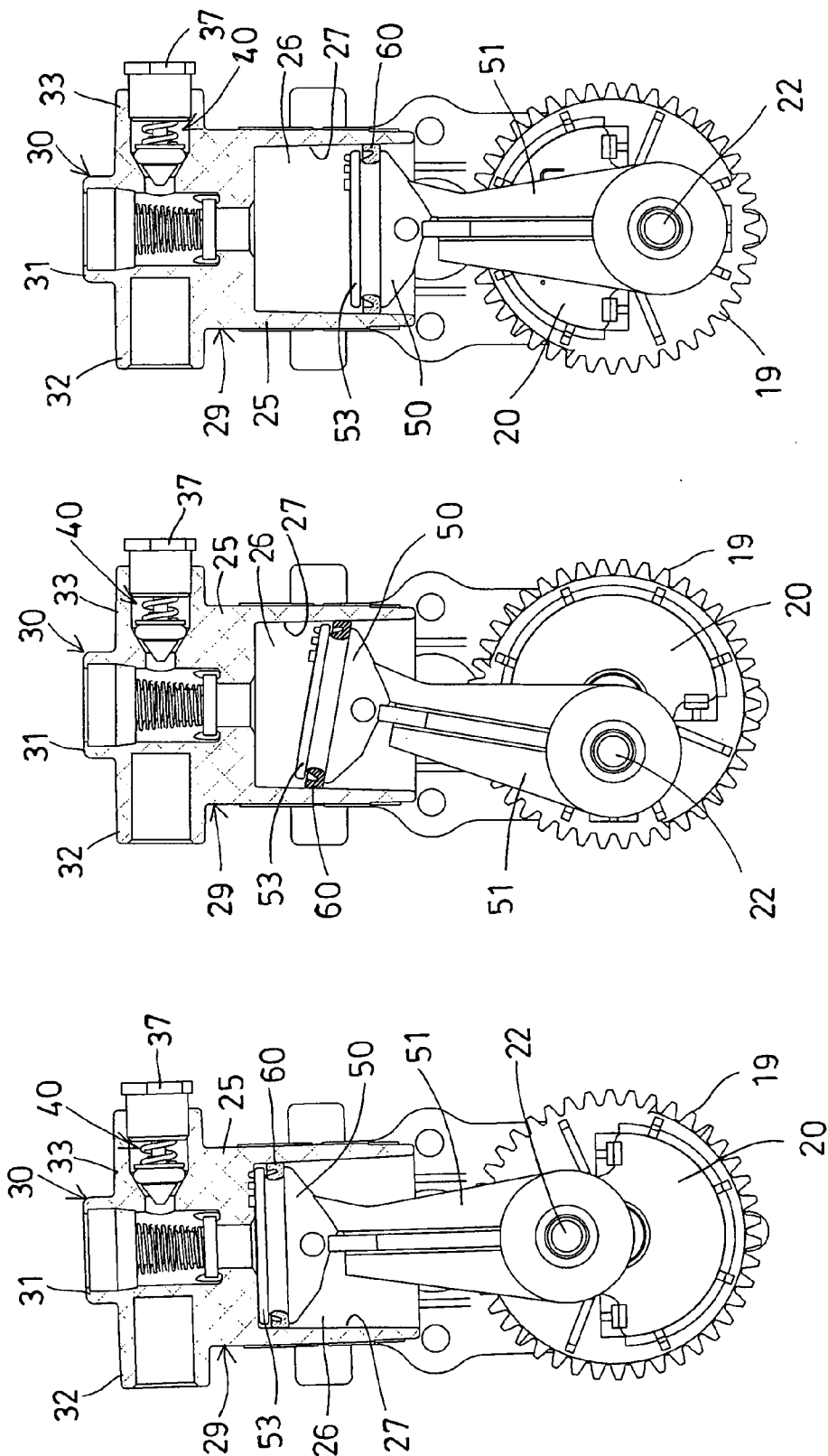


FIG. 5

FIG. 6

FIG. 7

FIG. 8

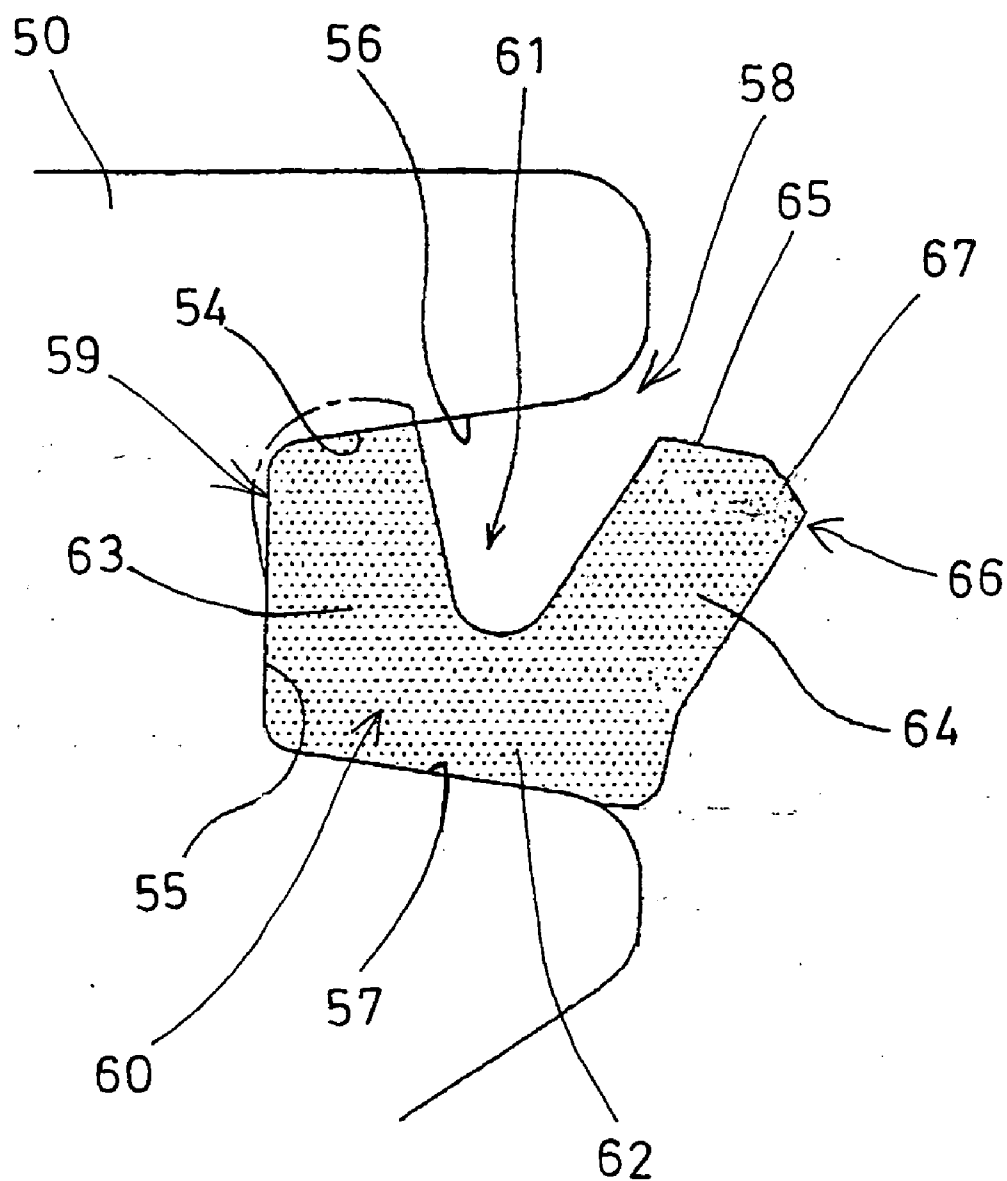


FIG. 10

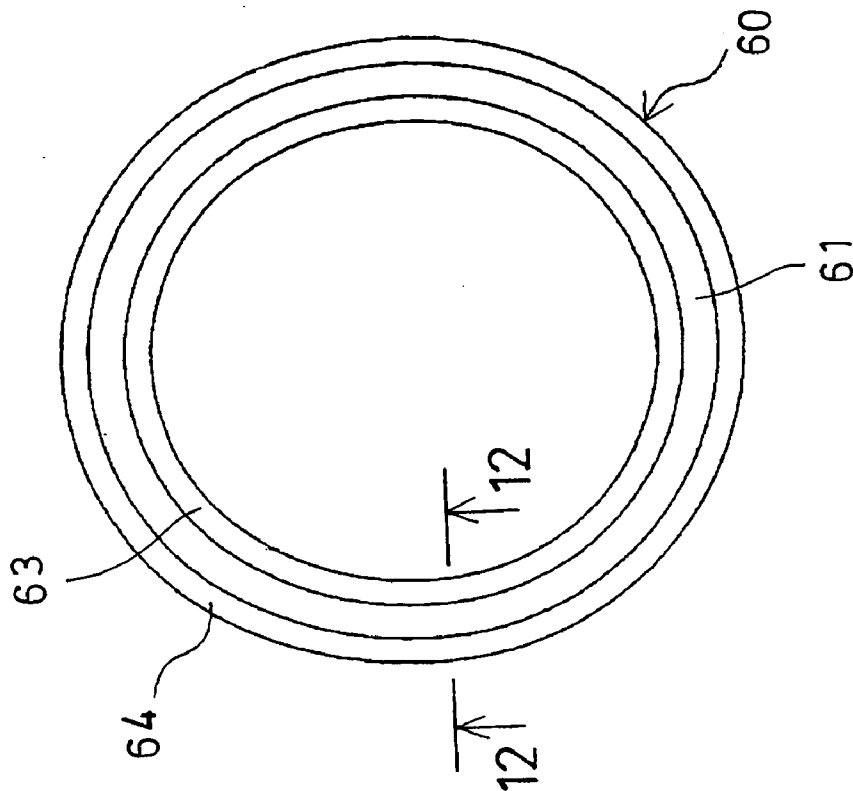


FIG. 11

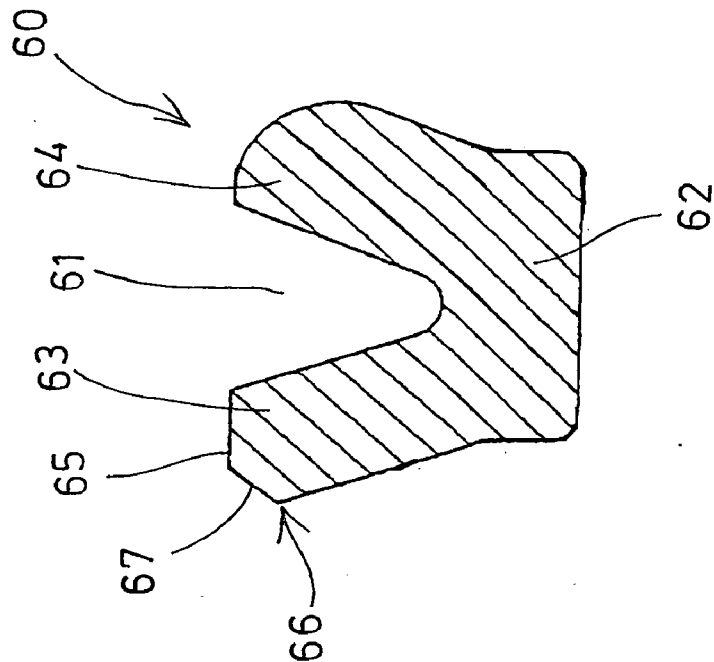


FIG. 12

FIG. 14

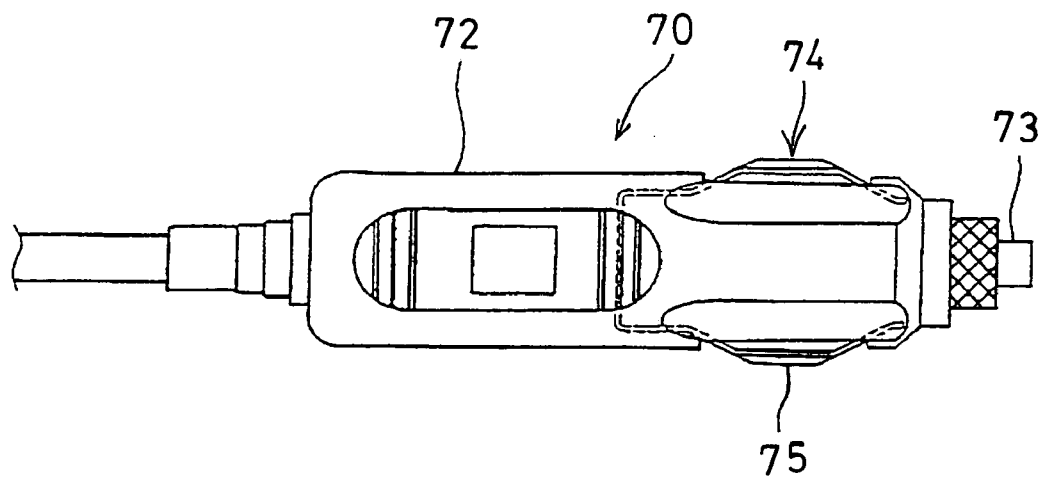


FIG. 15

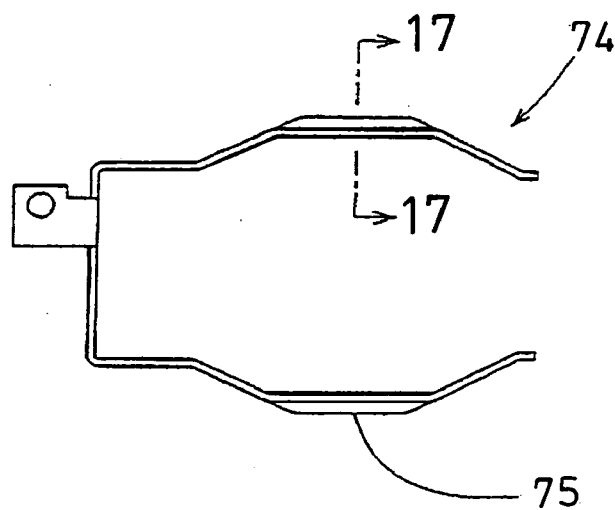


FIG. 16

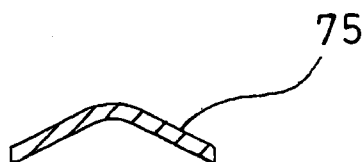


FIG. 17

COMPRESSOR FOR TIRE INFLATING COMBINATION

[0001] The present invention is a continuation-in-part of U.S. patent application Ser. No. 11/022,349, filed 22 Dec. 2004, pending and to be abandoned.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a tire inflating combination, and more particularly to a tire inflating combination including an air compressor assembly having an improved sealing ring for facilitating a sliding engagement between a piston and a cylinder housing which includes an inclined inner peripheral surface.

[0004] 2. Description of the Prior Art

[0005] Various kinds of typical air compressors have been developed and comprise a piston slidably engaged within a cylinder housing and movable relative to the cylinder housing in a reciprocating action, to pump air and/or to generate pressurized air, for inflating tires, or the like.

[0006] For example, U.S. Pat. No. 6,205,918 to Kumai et al., and U.S. Pat. No. 6,213,725 to Chou disclose two typical air compressors each comprising a piston slidably engaged with an inner peripheral surface of a cylinder housing, and a sealing ring engaged between the cylinder housing and the piston, for making an air tight seal between the cylinder housing and the piston.

[0007] In these typical air compressors, the piston is solidly secured to the piston rod, and will be moved in concert with the piston rod, and thus will be tilted relative to the cylinder housing when the piston rod is driven by a motor. However, the sealing ring may be disengaged from the cylinder housing when the piston is moved to bottom or outer end of the cylinder housing, due to tilting or inclined status of the piston rod relative to the cylinder housing, such that the sealing ring may not be used to suitably make an air tight seal between the cylinder housing and the piston.

[0008] In addition, the inner peripheral surface of the cylinder housing is straight and may not be suitably made an air tight seal between the inner peripheral surface of the cylinder housing and the sealing ring of the piston.

[0009] The present invention has arisen to mitigate and/or obviate the afore-described disadvantages of the compressors.

SUMMARY OF THE INVENTION

[0010] The primary objective of the present invention is to provide a tire inflating combination including an air compressor assembly having an improved sealing ring for facilitating a sliding engagement between a piston and a cylinder housing which includes an inclined inner peripheral surface, and for suitably making an air tight seal between the cylinder housing and the piston.

[0011] In accordance with one aspect of the invention, there is provided an air compressor assembly comprising a base holder, a casing disposed in base holder, a cylinder housing including a chamber formed therein and defined by an inner peripheral surface, and including an outlet tube provided thereon, and a passage formed therein and communicating with the outlet tube, the outlet tube including a first outlet port formed therein for coupling to a hose, a second outlet port

provided therein for coupling to a pressure gauge, and a third outlet port provided therein for coupling to a relief valve, the inner peripheral surface of the cylinder housing being tilted from one end to the other to form a frustum-shaped chamber, a piston slidably engaged in the cylinder housing, the piston including an outer peripheral groove formed therein and defined by a base peripheral surface and two side surfaces, to form an outer opening and an inner recess, the piston including a pathway formed therein for air flowing purposes and including a spring blade attached to block the pathway thereof when the piston is moved relative to the cylinder housing in a compressing stroke, the spring blade being forced to open the pathway of the piston when the piston is moved relative to the cylinder housing in a returning stroke, a motor for coupling to the piston, to move the piston in the cylinder housing in reciprocating action, the motor including a spindle having a pinion attached thereto, a gear rotatably received and engaged in the casing and rotatably engaged with the pinion for allowing the gear to be rotated and driven by the motor with the pinion, an eccentric member attached to the gear, and a shaft attached to the eccentric member and offset from an axle of the gear and coupled to the piston with a piston rod, the motor including a fan device attached thereto and rotated and driven by the motor to generate a cooling air, and a sealing ring engaged in the outer peripheral groove of the piston, for slidably engaging with the tilted inner peripheral surface of the cylinder housing, and for making an air tight seal between the cylinder housing and the piston, the sealing ring including a peripheral channel formed in an upper portion thereof, to form a base segment, an inner leg and an outer leg, the inner leg being engaged in the inner recess of the piston, and the outer leg being extended out of the outer opening of the piston, for slidably engaging with the inner peripheral surface of the cylinder housing, even when the piston is tilted relative to the cylinder housing, and the outer leg of the sealing ring including a flat surface formed in a free end portion thereof and parallel to the base segment thereof, and including an inclined surface formed in the free end portion thereof and formed beside the flat surface thereof,

[0012] The third outlet port of the outlet tube includes an inclined valve seat provided therein, and an inner thread formed therein for threading with a cap, the cap includes a bore formed therein and communicating with the outlet tube and the cylinder housing, for relieving over-pressurized air.

[0013] The relief valve includes a valve element slidably engaged in the outlet tube, and engageable with the valve seat of the outlet tube, and a spring member engaged between the valve element and the cap, for biasing the valve element to engage with the valve seat of the outlet tube.

[0014] 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.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is an exploded view of a tire inflating combination including an air compressor assembly;

[0016] FIG. 2 is a partial cross sectional view taken along lines 2-2 of FIG. 1;

[0017] FIG. 3 is a partial exploded view of the air compressor assembly for the tire inflating combination;

[0018] FIG. 4 is a partial exploded view of the air compressor assembly;

[0019] FIG. 5 is a partial cross sectional view taken along lines 5-5 of FIG. 3;+

[0020] FIGS. 6, 7 are partial cross sectional views similar to FIG. 5, illustrating the operation of the air compressor assembly;

[0021] FIG. 8 is an enlarged partial plan view of a piston for the air compressor assembly;

[0022] FIG. 9 is an enlarged partial plan view similar to FIG. 8, illustrating the operation of the air compressor assembly;

[0023] FIG. 10 is a further enlarged partial plan view of the piston for the air compressor assembly;

[0024] FIG. 11 is a top plan view of a sealing ring for the piston of the air compressor assembly;

[0025] FIG. 12 is a partial cross sectional view taken along lines 12-12 of FIG. 11;

[0026] FIG. 13 is a partial cross sectional view taken along lines 13-13 of FIG. 4;

[0027] FIG. 14 is a partial cross sectional view similar to FIG. 13, illustrating the operation of a safety valve or relief valve for the air compressor assembly;

[0028] FIG. 15 is a partial plan view illustrating a plug for coupling the air compressor assembly to an electric power source;

[0029] FIG. 16 is an enlarged partial plan view illustrating a conductor device of the plug for coupling to the electric power source; and

[0030] FIG. 17 is an enlarged partial cross sectional view of the conductor device of the plug.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0031] Referring to the drawings, and initially to FIGS. 1 and 2, a tire inflating combination 1 in accordance with the present invention comprises an air compressor assembly 10 for generating pressurized air to pump or to inflate tires 90 or the like. A sealant container 91 may further be provided and coupled between the air compressor assembly 10 and the tire 90, for selectively supplying sealant into the tire 90.

[0032] For example, as shown in FIG. 2, a bladder or a receptacle 92 is disposed or engaged in the sealant container 91, and includes a chamber 93 formed or provided therein for receiving sealant that is provided to be selectively supplied into the tire 90. The receptacle 92 includes a mouth 94 having a film or cap 95 attached thereto, to enclose or to seal the chamber 93 thereof, and to prevent the sealant from flowing out of the receptacle 92 of the sealant container 91.

[0033] It is preferable that the mouth 94 of the receptacle 92 is coupled to the air compressor assembly 10 via a control valve 96, which may be selectively opened or actuated to allow the pressurized air generated by the air compressor assembly 10 to flow into the mouth 94 of the receptacle 92 before flowing or supplying into the tire 90.

[0034] The pressurized air may force to open the cap 95, to blow and to supply the sealant into the tire 90. A check valve 97 may further be provided and coupled between the air compressor assembly 10 and the sealant container 91 or the receptacle 92, for limiting the sealant to flow into the tire 90 only, and to prevent the sealant from flowing backward from the tire 90 into the sealant container 91 or the receptacle 92.

[0035] As shown in FIGS. 3-5, the air compressor assembly 10 includes a base holder 11, a cover 12 attached onto the base holder 11, to form or define a chamber 13 in the base holder 11 or between the base holder 11 and the cover 12, and

includes a motor 14 disposed in the chamber 13 of the base holder 11 and having a pinion 16 attached to a spindle 15 thereof, for rotating or driving the pinion 16.

[0036] A fan device 17 may further be provided and attached to the motor 14, for being rotated or driven by the motor 14 to generate cooling or heat dissipating air. A casing 18 may further be provided and disposed in the chamber 13 of the base holder 11, and a gear 19 may be rotated received or engaged in the casing 18, and engaged with the pinion 16, for allowing the gear 19 to be rotated or driven by the motor 14 via the pinion 16.

[0037] A weight or an eccentric member 20 is attached to the gear 19, and preferably secured to the axle 21 of the gear 19, and a shaft 22 is attached to the eccentric member 20 and offset from the axle 21 of the gear 19, such that the shaft 22 is located or arranged eccentrically relative to the eccentric member 20 and the axle 21 of the gear 19.

[0038] A cylinder housing 25 is also disposed in the chamber 13 of the base holder 11, and includes a chamber 26 formed or provided therein and defined by an inner peripheral surface 27, and includes a passage 28 formed or provided in one end 29 thereof, for coupling to or for communicating with an outlet tube 30, the inner peripheral surface 27 is inclined or tilted from the one end 29 toward the other end or the free end portion of the cylinder housing 25 for forming a frustum-shaped inner peripheral surface 27 and/or a frustum-shaped chamber 26. The outlet tube 30 includes an outlet port 31 formed or provided therein for coupling to the tire 90 or to the sealant container 91 with a hose 98.

[0039] The outlet tube 30 further includes another outlet port 32 formed or provided therein for coupling to a pressure gauge 34 (FIG. 3), for example, and further includes a further outlet port 33 formed or provided therein for coupling to a safety valve, a relief valve 40 (FIGS. 3-4 and 13-14), or the like, for air relieving purposes, and for preventing the outlet tube 30 and the cylinder housing 25 from being over-pressurized.

[0040] For example, as shown in FIGS. 13-14, the outlet port 33 of the outlet tube 30 includes an inclined peripheral surface or valve seat 35 formed or provided therein, and includes an inner thread 36 formed or provided in the outer portion thereof for threading with a cap 37 which includes a bore 38 formed therein and communicating with the outlet tube 30 and the cylinder housing 25, for allowing over-pressurized air to flow out or to relieve from the outlet tube 30 and the cylinder housing 25.

[0041] The safety valve or relief valve 40 includes a valve element 41 slidably engaged in the outlet tube 30, and engageable with the inclined peripheral surface or valve seat 35 of the outlet tube 30, for selectively enclosing or blocking the outlet tube 30, and a spring member 42 engaged between the valve element 41 and the cap 37, for biasing the valve element 41 to engage with the inclined peripheral surface or valve seat 35 of the outlet tube 30. The spring member 42 includes a predetermined spring biasing force or resilience to allow air of a predetermined air pressure to flow out through the outlet tube 30 against the spring member 42.

[0042] As shown in FIGS. 4-12, a piston 50 is slidably received or engaged in the cylinder housing 25, and coupled to the shaft 22 of the eccentric member 20 or of the gear 19, to allow the piston 50 to be caused to move or to slide in the cylinder housing 25 in reciprocating action, by the motor 14 via the pinion 16 and the gear 19 and the shaft 22.

[0043] The piston 50 includes a pathway 52 formed therein for air flowing purposes, and includes a spring blade 53 attached to top thereof, and arranged to block or to shield the pathway 52 thereof when the piston 50 is moved toward the passage 28 of the cylinder housing 25 or toward the outlet tube 30 (FIG. 7) in a compressing stroke or process. The spring blade 53 may also be forced to open the pathway 52 of the piston 50 when the piston 50 is moved away from the passage 28 of the cylinder housing 25 or away from the outlet tube 30 (FIG. 6) in a returning stroke or process.

[0044] The piston 50 further includes a peripheral groove 54 formed in the outer peripheral portion thereof, and defined by a base peripheral surface 55 and two outwardly opened or inclined side surfaces 56, 57, to form or define a wider outer opening 58 in the outer peripheral portion thereof and a narrower inner recess 59, best shown in FIGS. 8-10, and further includes a sealing ring 60 engaged in the peripheral groove 54 thereof, as shown in FIGS. 4-12.

[0045] As also shown in FIGS. 8-12, the sealing ring 60 includes a peripheral channel 61 formed in the upper and middle portion thereof, to form or define a bottom or base segment 62, an inner leg 63 and an outer leg 64, in which the inner leg 63 is provided in a radially inner portion of the sealing ring 60, for force-fitting in the narrower inner recess 59 of the piston 50, and the outer leg 64 is provided in a radially outer portion of the sealing ring 60, for slightly extending out of the wider outer opening 58 of the piston 50.

[0046] For example, the outer leg 64 of the sealing ring 60 includes a flat surface 65 formed in the outer or free end portion 66 thereof, and preferably parallel to the bottom or base segment 62 thereof (FIG. 12), and further includes an inclined surface 67 also formed in the outer or free end portion 66 thereof, and formed beside or adjacent to the flat surface 65 thereof. The outer leg 64 of the sealing ring 60 is provided for slidably engaging with the inclined or tilted inner peripheral surface 27 of the cylinder housing 25 (FIGS. 5-7) and for suitably making an air tight seal between the inclined or tilted inner peripheral surface 27 of the cylinder housing 25 and the sealing ring 60 of the piston 50.

[0047] In operation, as shown in FIGS. 5-7, when the piston 50 is forced to move or to slide in the cylinder housing 25 in reciprocating action, by the motor 14 via the pinion 16 and the gear 19 and the shaft 22, the piston 50 may be slightly inclined or tilted relative to the cylinder housing 25. The outer leg 64 that is slightly extended out of the wider outer opening 58 of the piston 50 may be slidably engaged with the inner peripheral surface 27 of the cylinder housing 25, to make a suitable air tight seal between the piston 50 and the cylinder housing 25 even when the piston 50 is inclined or tilted relative to the cylinder housing 25.

[0048] As shown in FIGS. 3 and 15-17, a coupler or a plug 70 may further be provided for coupling the air compressor assembly 10 to an electric power source of vehicles (not shown) or the like, to energize the air compressor assembly 10. For example, the plug 70 may be coupled to the motor 14 of the air compressor assembly 10 via an operating switch 71 which may thus be used to control or to actuate the motor 14 of the air compressor assembly 10.

[0049] The plug 70 includes a plug body 72 having a central electrode 73 provided or disposed therein, and a case or peripheral electrode 74 attached to the plug body 72 and having two or more conductor arms 75 provided thereon or extended therefrom, for allowing the central electrode 73 and

the conductor arms 75 of the case or peripheral electrode 74 to be suitably coupled to the electric power source of the vehicles or the like.

[0050] Accordingly, the air compressor in accordance with the present invention includes an improved sealing ring for facilitating a sliding engagement between a piston and a cylinder housing which includes an inclined inner peripheral surface, and for suitably making an air tight seal between the cylinder housing and the piston.

[0051] 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.

I claim:

1. An air compressor assembly comprising:

a cylinder housing including a chamber formed therein and defined by an inner peripheral surface, said inner peripheral surface of said cylinder housing being tilted from one end to the other to form a frustum-shaped chamber,

a piston slidably engaged in said cylinder housing, said piston including an outer peripheral groove formed therein and defined by a base peripheral surface and two side surfaces, to form an outer opening and an inner recess,

a motor for coupling to said piston, to move said piston in said cylinder housing in reciprocating action, and

a sealing ring engaged in said outer peripheral groove of said piston, for slidably engaging with said tilted inner peripheral surface of said cylinder housing, and for making an air tight seal between said cylinder housing and said piston,

said sealing ring including a peripheral channel formed in an upper portion thereof, to form a base segment, an inner leg and an outer leg, said inner leg being engaged in said inner recess of said piston, and said outer leg being extended out of said outer opening of said piston, for slidably engaging with said tilted inner peripheral surface of said cylinder housing, even when said piston is tilted relative to said cylinder housing.

2. The air compressor assembly as claimed in claim 1, wherein said outer leg of said sealing ring includes a flat surface formed in a free end portion thereof, and parallel to said base segment thereof.

3. The air compressor assembly as claimed in claim 2, wherein said outer leg of said sealing ring includes an inclined surface formed in said free end portion thereof, and formed beside said flat surface thereof.

4. The air compressor assembly as claimed in claim 1, wherein said piston includes a pathway formed therein for air flowing purposes, and includes a spring blade attached to block said pathway thereof when said piston is moved relative to said cylinder housing in a compressing stroke, said spring blade is forced to open said pathway of said piston when said piston is moved relative to said cylinder housing in a returning stroke.

5. The air compressor assembly as claimed in claim 1, wherein said motor includes a spindle having a pinion attached thereto, a gear rotatably engaged with said pinion, for allowing said gear to be rotated and driven by said motor via said pinion, an eccentric member attached to said gear,

and a shaft attached to said eccentric member and offset from an axle of said gear, and coupled to said piston via a piston rod.

6. The air compressor assembly as claimed in claim 5, wherein said motor includes a fan device attached thereto and rotated and driven by said motor to generate cooling air.

7. The air compressor assembly as claimed in claim 5 further comprising a base holder, a casing disposed in base holder, and said gear is rotatably received and engaged in said casing, and engaged with said pinion.

8. The air compressor assembly as claimed in claim 1, wherein said cylinder housing includes an outlet tube provided thereon, and passage formed therein and communicating with said outlet tube, said outlet tube includes a first outlet port formed therein for coupling to a hose, a second outlet port

provided therein for coupling to a pressure gauge, and a third outlet port provided therein for coupling to a relief valve.

9. The air compressor assembly as claimed in claim 8, wherein said third outlet port of said outlet tube includes an inclined valve seat provided therein, and an inner thread formed therein for threading with a cap, said cap includes a bore formed therein and communicating with said outlet tube and said cylinder housing, for relieving over-pressurized air.

10. The air compressor assembly as claimed in claim 9, wherein said relief valve includes a valve element slidably engaged in said outlet tube, and engageable with said valve seat of said outlet tube, and a spring member engaged between said valve element and said cap, for biasing said valve element to engage with said valve seat of said outlet tube.

* * * * *