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P. SCHAUER

ROTARY COMPRESSOR

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Fig.2.

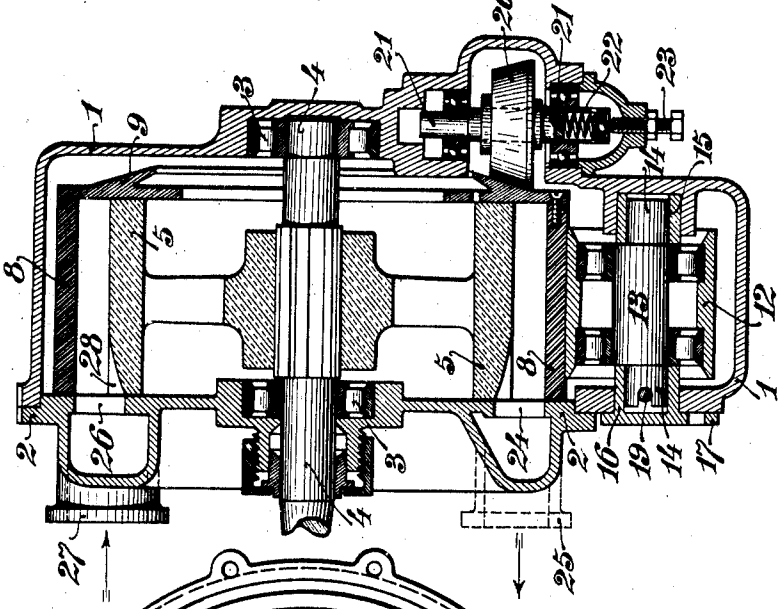


Fig.1.

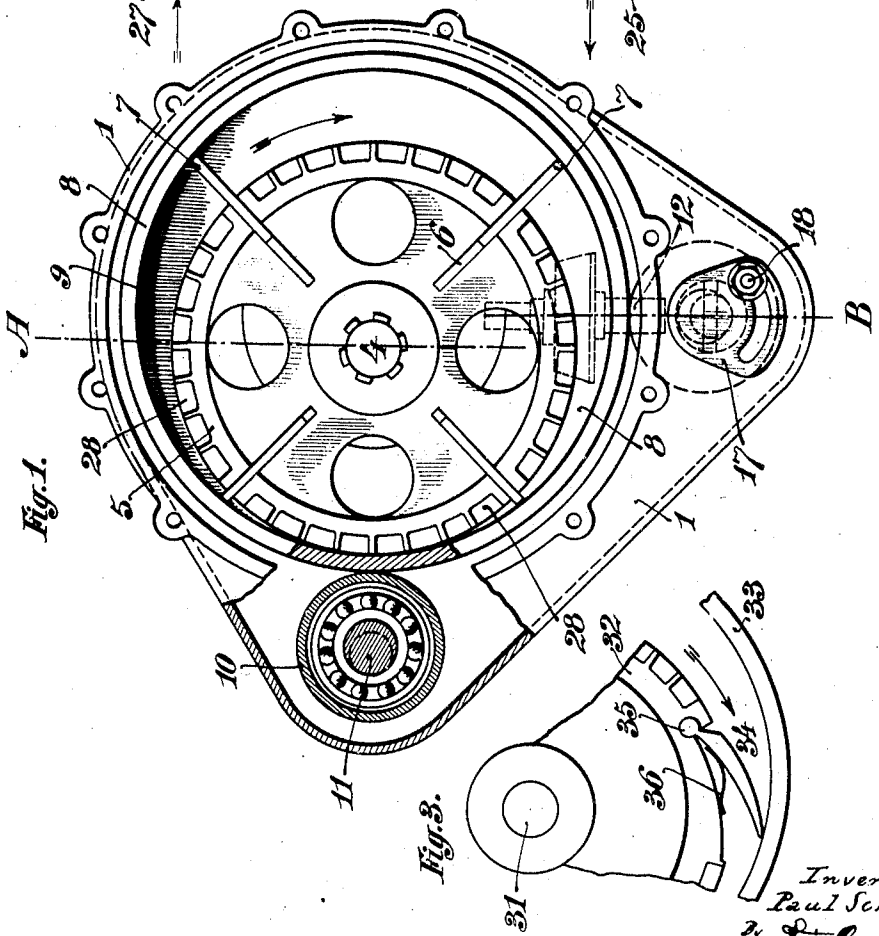


Fig.3.

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ROTARY COMPRESSOR.

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The present invention relates to rotary compressors of the kind used in connection with power engines of automobiles, and more particularly to a compressor in which an inner casing surrounding the rotor is caused to revolve therewith and provided on the one side only with a closing wall or cover adapted to participate in the rotary movement of the casing.

The object of my invention is to provide a rotary compressor of the last mentioned type for supplying the motor with air or an explosive mixture in compressed condition for the purpose of increasing the charge of the cylinders and thereby causing the torque of the motor to increase accordingly.

With this object in view my improved compressor is, when coupled with the motor, adapted to be efficient even at the lowest speed of revolution, to supply the motor with a preliminarily compressed charge so that an increased motor torque will even prevail on starting the vehicle, and in order to realize this result I provide means for tightening the working parts perfectly or to such a degree that the unavoidable wear and tear will not do any harm in this respect.

With the above recited and other objects in view the invention resides in the novel construction set forth in the following specification, particularly pointed out in the appended claims and illustrated in the accompanying drawings, it being understood that the right is reserved to include embodiments other than those actually illustrated herein, to the full extent indicated by the general meaning of the terms in which the claims are expressed.

In the accompanying drawings forming a part of this specification and wherein like characters designate like parts throughout the several views:—

Figure 1 is a front view of the improved compressor partly in section and with the cover removed;

Figure 2 is a vertical section taken on the line A—B in Figure 1; and

Figure 3 is a fragmentary view of a constructional modification.

Referring to the construction shown in Figures 1 and 2 the compressor comprises a stationary outer casing 1 adapted to be closed by a circular cover 2 roller bearings 3 being provided in both the cover and the wall of the casing, and a shaft 4 is duly supported in the two bearings 3. Keyed to the shaft 4 is a rotor 5 of double T or I section having four diametrically opposed radial grooves or slots 6 each extending over the full length of the rotor, for the reception of four sliding plates 7. The rotor 5 is encased in a cylindrical inner casing 8 of the very same length as the rotor and the slides 7. The casing 8 is open at the one side, that is towards the cover 2, and closed at the other side only by an annular plate or cover 9, having a wide central aperture and an outer annular flange of conical shape, as will be clearly seen in Figure 2.

In the part of the outer casing 1 shown in section in Figure 1 a roller 10 is provided to permanently hold the inner casing 8 in linear contact with the rotor 5. The roller 10 is mounted on roller bearings suitably supported by a shaft 11 duly journalled in bearings of the casing 1. In the lower end of the outer casing a similar roller 13 is provided to support the inner casing 8 and the roller 12 is likewise mounted on roller bearings supported by a shaft 13 duly journalled in bearings of the casing 1. The journals 14 of the two shafts 11 and 13 are eccentrically disposed in respect to the axes of the shafts and duly fitted in boxes 15 and 16, respectively.

The box 16 is provided with an outer plate 17 and adapted to be turned about the journal 14 therein, an arcuate slot in the plate and a threaded bolt with a nut 18 serving to secure the plate 17 in its position. Riveted in the box 16 is a pin 19 so as to extend diametrically therein and to engage in a longitudinal slot of the journal 14. Upon unscrewing the nut the plate 17 with the box 16 may be turned to any desired position and when turned, the pin 19 will cause the journals 14 and the shaft to turn simultaneously therewith to the like extent. In consequence thereof the roller 12 may be raised or lowered depending upon the direction in which the plate 17 is turned, owing to the eccentricity of the journals 14. The roller 10 being constructed and arranged in the same manner as described with regard to the roller 12, it will be possible to adjust the roller 10 in a similar way to hold the inner casing 8 in intimate contact with the roller 10 and with the rotor 5.

In a compartment formed in the rear of

the outer casing 1 a conical roller 20 is provided. The journals 21 of the roller 20 are supported in roller bearings mounted in the wall of the casing 1 forming the said compartment. The lower journal 21 is bored and a small coiled spring 22 is lodged in the bore, a screw 23 being provided in the cap enclosing the free end of the journal, to exercise a pressure on the spring 22 and to thereby hold the roller 20 in contact with the conical annular flange of the plate or cover 9. Due to the conical shape of the roller 20 the latter exercises, under the action of the spring 22, an axial pressure on the plate or cover 9 thus causing the cover 9 in turn to contact with the rear end of the rotor 5, and at the same time the inner casing 8 and the front end of the rotor 5 to be held in contact with the cover 2.

The cover 2 has two slots 24 and 26 with ducts or passages in front thereof leading to flanged sockets 25 and 27, respectively. The front end or edge of the rotor 5 is cut out to form tapering recesses 28 on its outer side throughout the whole of the periphery thereof and it will be seen that these recesses 28 giving the front end or edge of the rotor a toothed appearance, are adapted to communicate with the aforestated slots 24 and 26.

In the embodiment or modification shown in Figure 3 the slides 7 adapted to reciprocate in the radial slots 6 are dispensed with and in substitution therefor flap valves 34 are provided in the rim portion of the rotor 32 keyed to the shaft 31. Each valve 34 is pivotally connected to the rim by means of pins 35 and adapted to snugly fit a recess of the rim so that when the valve is closed, the outer surface thereof will lie flush with the peripheral surface of the rotor. The several valves 34 are equipped with springs 36 on the inner sides thereof in order to be continually held in linear contact with the inner casing 33 revolving along with the rotor.

As regards the dimensions of the slot 24 in the cover 2 for emitting the compressed gases, the radial length thereof is equal to the distance between the periphery or rim of the rotor 5 and the inner surface of the inner casing 8, at the place of communication plus the greatest depth of the recess 28 as will be seen in Figure 2. Supposing the recesses 28 were not provided in the rim of the rotor, the free sectional area of the slot 24 would be too small in case of the compressor running at high speed, so that very high gas speeds in the slot necessarily would result therefrom and consequently very high gas pressures would be produced in the condensing chamber. By suitably dimensioning the depth of the recesses 28 the free sectional area of the emitting slot 24 may be increased to twice the efficiency of a slot without any cooperating recesses. It will be advisable, however, to give the single recesses a limited or moderate peripheral length only in order to not interfere with the tightening requirement at the point where the roller 10 holds the inner casing 8 in linear contact with the rotor 5. It goes without saying that the recesses may just as well be provided in the inner surface of the cylindrical casing 8 instead of in the outer surface of the rotor 5, as shown.

The plate or cover 9 is firmly connected with the inner cylindrical casing 8 by means of screws or the like, as shown, but as an alternative such connection may be dispensed with and the cover 9 may be rigidly attached to the rotor 5 instead, or the cover may be provided with a suitable hub supported by the shaft so as to be revoluble thereon without having any mechanical connection with the casing 8 or the rotor 5. In all of these eventualities the cover 9 will be forced against and held in contact with the inner casing 8 and the rotor 5 through the agency of the conical roller 20 or any equivalent means to be provided for the purpose and will constitute a closing wall fitted to the rear of the revolving inner caing 8 and rotating together therewith.

In order to provide, in case of high rotary speeds, short ways for the gas flowing in and out of the compressor, two narrow rotors may be employed in lieu of the wide rotor 5 shown in the drawings and the two rotors may be mounted, each in a separate cylindrical inner casing, on a common shaft close adjacent to each other.

The bottom part of the compressor casing 1 may be filled with a suitable oil in order to ensure an automatic lubrication of the working member and to obtain a better cooling of the compressor.

The operation of the compressor is as follows:

Supposing the rotor 5 is revolved by the power-driven shaft 4 in the direction of the arrow shown in Figure 1, it will be seen that the inner cylindrical casing 8 will, at the same time, be caused to rotate with the same peripheral speed owing to the pressure exerted by the roller 10 to hold the casing 8 in contact with the rotor 5. At higher speeds the slides 7 will act in a similar manner to revolve the casing 8 since they are pressed towards and against the inner surface of the casing 8 by centrifugal action. At the same time the slides 7 will perform reciprocating movements in accordance with the eccentrical position of the cylindrical inner casing 8. The gas to be compressed is sucked in through the tubular socket 27 and flows through the duct and the slot 26 into the upper part of the crescent-shaped working chamber of the machine, subsequently the sucked in gas is compressed in the lower

part or half of the working chamber and then emitted through the slot 24, the duct, and the tubular socket 25 to be conveyed to the place of application by means of suitable piping and the like.

If valves 34 are provided as in Figure 3 in substitution for the slides 7, the valves will act to the same effect as the slides, for it will be understood by those skilled in the art to which my invention relates, that the valves 34 will turn about their pivots 35 in accordance with the increasing and decreasing sectional area of the crescent-shaped chamber formed between the rotor 32 and the rotating inner casing 33, so as to always occupy the full sectional area thereof. When, however, a valve 34 approaches, during the continued revolution of the rotor 32, the place where the rotor and the rotating casing 33 meet or come in contact with each other, the same will be forced down against the action of the spring 36, to lie embedded in the recess provided in the rim or periphery of the rotor. The springs 36 mainly act to ensure a tight contact between the valves 34 and the inner face of the rotating casing 33 when the machine is running at lower speeds.

At higher speeds the slides 7 abut on the inner casing 8 with great pressure, but as the casing 8 continuously revolves together with the rotor, expenditure or loss of power due to the frictional engagement between the slides 7 (or valves 34) and the inner cylindrical casing is inconsiderable only. The pressure produced by the compression of the gases in the lower part of the compressing chamber tends to force the cylindrical casing 8 of the rotor 5, but such pressure is resisted or received by the two rollers 10 and 12. On the other hand the conical roller 20 engaging the rear cover or wall 9 will act to intercept the pressure resulting from the gas compression and acting on the cover 9, in the direction of the axis of the revolving system. At the same time the counter-pressure of the roller will ensure a reliable tightening between the open end faces of the rotor and the two covers 2 and 9 closing the same. The spring 22 will automatically control the proper closure of the parts even in compensation for wear and tear should the lateral sliding faces of the rotor and the rotating casing wear away in the course of time.

As a gas pressure prevails only on the lower part of the cover 9 which confines laterally the compressing chamber, whereas in the upper part of the chamber a partial vacuum or underpressure exists in consequence of the sucking action therein, it will be seen that the provision of a counter-acting roller 20 is not required for the tightening purpose except in the lower part of the machine, as shown. As the roller 20 is located at a point where the cover 9 is subjected to the full action of the compressed gases, and as the roller 20 thus is adapted to counteract the gas pressure in the best possible way, it will be seen that a least possible counter-pressure only is utilized for the tightening purpose and therefore the unvoidable losses due to frictional wearing are minimized.

What I claim is:—

1. A rotary compressor comprising an outer stationary casing; a power-driven shaft journalled in said casing; a rotor mounted on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith; and a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing.

2. A rotary compressor comprising an outer stationary casing having bearings therein; a power-driven shaft journalled in said bearings; a rotor keyed on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; means in said rotor and contacting with said cylindrical casing forming compression chambers therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith; and a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing.

3. A rotary compressor comprising an outer stationary casing; a power-driven shaft journalled in said casing; a rotor mounted on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith; and a spring-pressed roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing.

4. A rotary compressor comprising an outer stationary casing having bearings therein; a power-driven shaft journalled in said bearings; a rotor keyed on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; means in said rotor and contacting with said cylindrical casing forming compression

chambers therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith; a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing; and an inlet and an outlet in the stationary casing for conveying the air to and from the rotor.

5. A rotary compressor comprising an outer stationary casing; a power-driven shaft journalled in said casing; a rotor mounted on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith; a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing; and a plurality of supporting rollers for the cylindrical casing, one of said supporting rollers holding the cylindrical casing in contact with the periphery of the rotor.

6. A rotary compressor comprising an outer stationary casing having openings therein; a power-driven shaft journalled in said casing; a rotor keyed on said shaft and having recesses in the periphery thereof adapted to cooperate with the openings in the casing; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; and a plate for closing the cylindrical casing at one end thereof.

7. A rotary compressor comprising an outer stationary casing having inlet and outlet openings for the air; a power-driven shaft journalled in said casing; and a rotor keyed on said shaft and having recesses in the periphery thereof adapted to cooperate with the openings in the casing.

8. A rotary compressor comprising an outer stationary casing having inlet and outlet openings for the air; a power-driven shaft journalled in said casing; a rotor keyed on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; and a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith, said rotor having recesses in the periphery thereof opposite the plate adapted to cooperate with the openings in the casing.

9. A rotary compressor comprising an outer stationary casing having inlet and outlet openings for the air; a power-driven shaft journalled in said casing; a rotor keyed on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith, said rotor having recesses in the periphery thereof opposite the plate adapted to cooperate with the openings in the casing; and a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact wtih the outer stationary casing.

10. A rotary compressor comprising an outer stationary casing having inlet and outlet openings for the air; a power-driven shaft journalled in said casing; a rotor keyed on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith, said rotor having recesses in the periphery thereof opposite the plate adapted to cooperate with the openings in the casing; a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing; and a plurality of supporting rollers for the cylindrical casing, one of said supporting rollers holding the cylindrical casing in contact with the periphery of the rotor.

11. A rotary compressor comprising an outer stationary casing having inlet and outlet openings for the air; a power-driven shaft journalled in said casing; a rotor keyed on said shaft; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith, said rotor having recesses in the periphery thereof opposite the plate adapted to cooperate with the openings in the casing; a roller in the stationary casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and one end of the rotor and causing the cylindrical casing and the other end of the rotor to be held in contact with the outer stationary casing; a plurality of supporting rollers for the cylindrical casing, one of said supporting rollers holding the cylindrical casing in contact with the periphery of the rotor; and means in said rotor and contacting with said cylindrical casing forming compression chambers therewith.

12. A rotary compressor comprising an outer casing; a power-driven shaft journaled in said casing; a rotor mounted on said shaft having a front and a rear end, the front end of said rotor being adjacent the outer cas-

ing; an inner cylindrical casing surrounding said rotor and adapted to rotate therewith; a plate for closing the cylindrical casing at one end thereof and adapted to rotate therewith; and a roller in the outer casing for exerting an axial pressure on the plate thereby causing the plate to contact with the cylindrical casing and the rear end of the rotor and also causing the cylindrical casing and the front end of the rotor to be held in contact with the outer casing.

In testimony whereof I affix my signature.

PAUL SCHAUER.