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LUBRICATING SYSTEM FOR ENGINES

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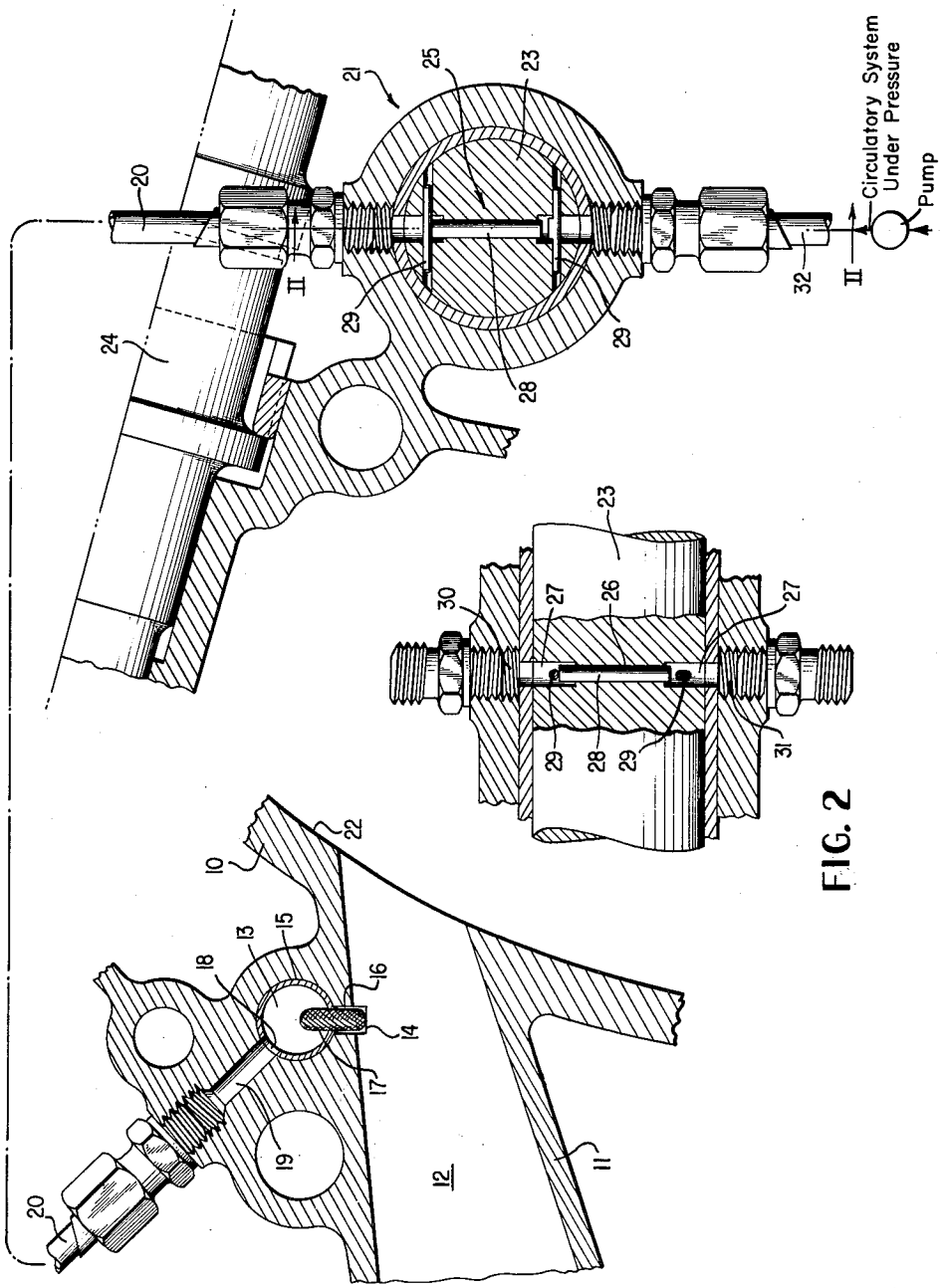

FIG. 2

FIG. 1

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LUBRICATING SYSTEM FOR ENGINES

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The present invention relates to an installation for the lubrication of the contact or bearing surfaces of rotary piston internal combustion engines, especially those operating according to the diesel principle.

As with conventional two-cycle engines, a mixture lubricating system has been used heretofore with rotary piston internal combustion engines operating according to the Otto principle. This type of lubrication however, cannot be used with engines operating according to the diesel principle. Additionally, the oil admixture with mixture-lubrication is excessive and leads to well known inconveniences and shortcomings.

The present invention aims at a universally utilizable lubrication for rotary piston internal combustion engines. For solving this problem, the present invention proposes to introduce continuously into the suction channel the smallest oil quantities that can be accurately metered. In this connection, it is proposed in accordance with the present invention that a distributor device be arranged for the distribution of the lubricating oil in the suction or inlet channel as closely adjacent to the inlet into the combustion spaces as possible and that the distributor device be operatively connected with a supply installation which removes the lubricating oil from the oil circulatory system under pressure and forcibly conducts the lubricating oil to the distributor device in dependence on the rotational speed of the rotary piston engine in an accurately metered manner.

There is appropriately arranged as a distributor device within one wall of the suction channel a slotted tubular element extending at least over a part of the channel width which tubular element receives in a slot thereof a wick which extends or protrudes, on the one hand, into the inside of the tubular element and, on the other, through a slot provided within the channel wall into the suction channel itself. A plunger or piston member, movable in the longitudinal direction thereof within given limits is provided as a supply installation which installation is arranged within a cross bore of a shaft rotating together with the rotor of the rotary piston internal combustion engine. The housing accommodating the shaft is provided with oppositely disposed apertures coaxial to or in alignment with the cross bore of which one of the apertures is operatively connected as a supply with the oil circulatory system and of which the other is operatively connected with the distributor device at the suction channel. The control shaft for the injection pump or for the pump nozzles of the rotary piston internal combustion engine may thereby serve in an advantageous manner as drive shaft and/or for the accommodation of the supply installation.

A very accurately and, in particular, a very fine metering of the lubricating oil is possible by the arrangement in accordance with the present invention. The quantity of lubricating oil supplied is dependent only on the rotary speed of the engine. The value or magnitude of the pressure within the oil circulatory system or of the supply pump plays no significant role whatsoever; it is only necessary that some pressure exist at all times within the oil circulatory system. In this manner, pressure fluctuations cannot affect in any manner the lubrication of the bearing surfaces. Moreover, by the use of the control shaft for the pump nozzles as a shaft for the supply installation, additional installations become unnecessary resulting in savings, and no additional need for space arises as a result thereof. The wick, which may consist of a metal mesh or a metallic fabric of any known conventional construction, is wedged or clamped into the slot of the tubular piece, and is secured in this position by soldering or the like. The tubular piece is appropriately introduced laterally together with the wick during assembly thereof. It is also appropriate to arrange the tubular piece at as narrow a place of the suction channel as possible where the velocity of the air stream passing the same is as large as possible.

There also exists the possibility with the supply installation according to the present invention of effecting a control or at least an adjustment of the supplied quantity of lubricant by changing the stroke of the needle-shaped piston or plunger member. This may be realized, for example, due to the fact that one or both cross pins are provided with an eccentric center section and are adapted to be adjusted in relation to the bores thereof.

Accordingly, it is an object of the present invention to provide a lubricating system for the contact surfaces of rotary piston internal combustion engines which is simple in structure, reliable in operation and which avoids all of the shortcomings and disadvantages encountered with the prior art devices.

It is another object of the present invention to provide a lubricating system for the internal bearing surfaces within the housing of a rotary piston internal combustion engine which is of universal applicability, does not entail excessive admixture of lubricating oil to the fuel charge under diesel operation and has relatively small space requirements.

Still a further object of the present invention resides in the provision of a lubricating system for rotary piston internal combustion engines, and more particularly for the internal bearing surfaces along which glides the rotary piston which assures an accurately metered amount of lubricating oil regulated only in dependence on the rotary speed of the engine but independent of the pressure of the oil circulatory system.

These and further objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein

FIGURE 1 is a partial cross-sectional view through a lubricating installation in accordance with the present invention, and

FIGURE 2 is a partial cross-sectional view taken along line II—II of FIGURE 1.

Referring now to the drawing wherein like reference numerals are used throughout the two views to designate like parts, and more particularly to FIGURE 1, the suction or inlet connecting member **11** is cast integral with the housing **10** of a rotary piston internal combustion engine in which the rotor (not illustrated) carries out rotary movements in a conventional manner. A bore **13** adapted to be closed laterally thereof is disposed transversely to the suction channel **12** within its wall at a place thereof as narrow as possible. The bore **13** serves for the accommodation of the distributor device. The bore **13** extends with a slot **14** into the suction channel **12** itself. While in the illustrated embodiment, the distributor device is shown as accommodated within a part cast integral with the housing, it is, of course, understood that the present invention is not limited thereto since the distributor device in accordance with the present invention

may also be suitably accommodated in a suction line threadably connected to the engine.

A tubular piece **15** serves as distributor device which is introduced into the bore **13** and which itself is also provided with a slot **16** in which is clamped or wedged a wick **17**. The wick **17**, on the one hand, extends approximately over the entire width of the suction channel **12** into the suction channel itself whereas the other part of the wick **17** is disposed within the tubular piece **15**. The wick **17** is suitably secured at the tubular member **15**, for example, by spot welding.

The tubular piece **15** is provided along the circumference thereof with a bore **18** which is operatively connected or in communication through a housing bore **19** and through a line **20**, illustrated in part only schematically, with a supply installation generally designated by reference numeral **21** that will be described more fully hereinafter. The lubricating oil is conducted through line **20** from the supply installation **21** to the distributor device and is supplied into the inside of the tubular piece **15**. The wick **17** thereby becomes saturated with the lubricant. The air or mixture passing the wick **17** within the suction channel **12** continuously draws small oil particles out of the wick **17**. The small oil particles precipitate on the bearing surface **22** on the inside of the housing **10** where they form an oil film.

The supply installation consisting of a single pump generally designated by reference numeral **21** serves for the exact metering of the oil quantity intended for the distributor device. The control shaft **23** rotates with the rotor of the rotary piston engine and serves to actuate the pump nozzles **24**. A cross bore **25** is arranged within the control shaft **23** which bore **25** is provided in the center section **26** thereof with a smaller diameter and in both lateral end sections **27** thereof with larger diameters. A needle-shaped plunger or piston **28** is disposed within the center section **26** which plunger **28** is somewhat longer than the bore section **26**. The plunger **28** is movable in the longitudinal direction thereof within the bore section **26**. The stroke of the plunger **28** is limited by two cross pins **29**. Two mutually oppositely disposed bores **30** and **31** are arranged within the housing accommodating the shaft **23** which bores **30** and **31** are in alignment, i.e., are coaxial with respect to the cross bore **25**. The bore **31** is operatively connected through the line **32** with the oil circulatory system, that is, with the pump normally provided therein. The bore **30** serves for purposes of connection with the aforementioned connecting line **20** leading to the distributor device.

The plunger **28** is normally forced into the position shown in FIGURES 1 and 2 by the pressure prevailing within the oil circulatory system and within line **32**. As a result, the plunger **28** has supplied with the upper portion thereof, as viewed in FIGURES 1 and 2, a predetermined lubricating oil volume through the bore **30** and the line **20** into the distributor device. As the shaft **23** continues to rotate, the plunger **28** carries out the same operation under the pressure prevailing in line **32**, i.e., the plunger **28** is always displaced in the upward direction as viewed in FIGURES 1 and 2 by the pressure force applied to the lower end thereof. In this manner, during each rotation of the shaft **23** a quantity of lubricating oil is supplied the magnitude of which corresponds to twice the stroke volume of the plunger **28**.

The stroke of the plunger **28** can be determined beforehand by a corresponding position of the cross pins **29**. However, it is also within the scope of the present invention to render the stroke of plunger **28** adjustable, for example, by eccentric sections at the cross pins **29**. The cross pins **29** may then be installed in different positions thereof whereby different supply quantities result by reason of the differing stroke produced thereby. The pressure within the oil circulatory system is of no significance for the supply of the lubricating oil to the distributor device. The supply to the distributor device is determined exclusively by the plunger stroke and the rotational speed of the control shaft **23**.

While we have shown and described one embodiment in accordance with the present invention, it is understood that the same is not limited thereto, but is susceptible of many changes and modifications within the spirit and scope thereof, and we therefore do not wish to be limited to the details shown and described herein, but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

We claim:

1. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means consisting of a single metering pump operatively connected with said distributor means for effectively removing the lubricating oil from said oil circulatory means and for forcibly supply the lubricating oil to said distributor means in an accurately predetermined metered amount and substantially independently of the pressure in said circulatory means for a given rotational speed of the rotary piston engine, said distributor means including a slotted tubular member arranged within a wall portion of said suction channel means and extending at least over a portion of the channel width, wick means within the slot of said slotted tubular member, said wick means extending, on the one hand, into the inside of said tubular member and, on the other, through a slot provided within said channel wall portion into said suction channel itself.

2. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for effectively removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner, said distributor means including a slotted tubular member arranged within a wall portion of said suction channel means and extending at least over a portion of the channel width, wick means within the slot of said slotted tubular member, said wick means extending, on the one hand, into the inside of said tubular member and, on the other, through a slot provided within said channel wall portion into said suction channel itself, said wick means being made of metal fabric, being clamped within the slot provided within said tubular member and being secured therein by soldering, said tubular member being provided with a bore intersecting a bore provided within said housing wall portion, and line means operatively connecting said housing bore directly with said supply means, said supply means including a rotating shaft operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said shaft being provided with transverse bore means accommodating therein plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft means which is provided with two mutually oppositely disposed apertures at times substantially in alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means.

3. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under

pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner and substantially independently of the pressure in said circulatory means, said supply means including a rotating shaft operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said shaft being provided with transverse bore means accommodating therein plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means.

4. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means including a speed responsive metering pump operatively connected with said distributor means for effectively removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in an accurately metered amount and substantially independently of the pressure in said circulatory means for a given rotational speed of the rotary piston engine, said distributor means including a slotted tubular member arranged within a wall portion of said suction channel means and extending at least over a portion of the channel width, wick means within the slot of said slotted tubular member, said wick means extending only, on the one hand, into the inside of said tubular member, and on the other, through a slot provided within said channel wall portion into said suction channel itself, said tubular member being provided with a bore intersecting a housing bore provided within said housing wall portion, and line means operatively connecting said pump directly with said housing bore and with said supply means.

5. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner and substantially independently of the pressure in said circulatory means, said supply means including a rotating shaft operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said shaft being provided with transverse bore means accommodating therein needle-shaped plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means, said transverse bore means having a center section of relatively smaller diameter in which is accommodated said plunger means, said transverse bore means having also outer sections of relatively larger diameter, and said needle-shaped plunger means extending with the end sections thereof into said outer sections of relatively larger diameter.

6. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner and substantially independently of the pressure in said circulatory means, said supply means including a rotating shaft operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said shaft being provided with transverse bore means accommodating therein needle-shaped plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means, said transverse bore means having a center section of relatively smaller diameter in which is accommodated said plunger means, said transverse bore means having also outer sections of relatively larger diameter, and said needle-shaped plunger means extending with the end sections thereof into said outer sections of relatively larger diameter, and means for limiting the stroke of said plunger means to said predetermined limits including cross pin means extending through said outer sections of relatively larger diameter.

7. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner and substantially independently of the pressure in said circulatory means, said supply means including a rotating shaft operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said shaft being provided with transverse bore means accommodating therein needle-shaped plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means, said transverse bore means having a center section of relatively smaller diameter in which is accommodated said plunger means, said transverse bore means having also outer sections of relatively larger diameter, and said needle-shaped plunger means extending with the end sections thereof into said outer sections of relatively larger diameter, and means for limiting the stroke of said plunger means to said predetermined limits including cross pin means extending through said outer sections of relatively larger diameter, at least one of said cross pin means having an eccentric center section and being adjustable with respect to its bore to render the stroke of said plunger means adjustable.

8. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating ac-

cording to the diesel principle, provided with suction channel means, with injection means having control shaft means for the injection pump and injection nozzles, and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner, said supply means including said control shaft means operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said control shaft means being provided with transverse bore means accommodating therein needle-shaped plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means, said transverse bore means having a center section of relatively smaller diameter in which is accommodated said plunger means, said transverse bore means having also outer sections of relatively larger diameter, and said needle-shaped plunger means extending with the end sections thereof into said outer sections of relatively larger diameter, and means for limiting the stroke of said plunger means to said predetermined limits including cross pin means extending through said outer sections of relatively larger diameter, at least one of said cross pin means having an eccentric center section and being adjustable with respect to its bore to render the stroke of said plunger means adjustable, said control shaft means serving as drive shaft for and accommodation of said supply means.

9. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means, with injection means having control shaft means for the injection pump and injection nozzles, and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory meanas and for forcibly supplying the lubircating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner and substantially independently of the pressure in said circulatory means, said supply means including said control shaft means operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said control shaft means being provided with transverse bore means accommodating therein plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means, said control shaft means serving as drive shaft for and accommodation of said supply means.

10. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating accordingly to the diesel principle, provided with suction channel means and with lubricant circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricant, and supply means operatively connected with said distributor means for supplying the lubricant to said distributor means from said oil circulatory means including means consisting of a single engine speed responsive pump having a reciprocating member within a rotating part for accurately metering and forcibly supplying the lubricant to said distributor means with the pressure and volume of the supplied lubricant being dependent only on the rotational speed of the rotary piston engine and substantially independent of the pressure of the lubricant within said circulatory means and means for selectively varying the volumetric quantity of lubricant supplied at a given rotational speed of the rotary piston engine regardless of the pressure in said circulatory means by varying the stroke of said reciprocating member.

11. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for effectively removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner, said distributor means including a slotted tubular member arranged within a wall portion of said suction channel means and extending at least over a portion of the channel width, wick means within the slot of said slotted tubular member, said wick means extending, on the one hand, into the inside of said tubular member, and on the other, through a slot provided within said channel wall portion into said suction channel itself, said tubular member being provided with a bore intersecting a bore provided within said housing wall portion, and line means operatively connecting said housing bore with said supply means, said supply means including a rotating shaft operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said shaft being provided with transverse bore means accommodating therein plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times substantially in alignment with said transverse bore means, one of said apertures serving as connection with the oil circulatory means and the other being operatively connected with said distributor means.

12. An installation for the lubrication of bearing surfaces of rotary piston engines, particularly those operating according to the diesel principle, provided with suction channel means, with injection means having control shaft means for the injection pump and injection nozzles, and with oil circulatory means under pressure, comprising distributor means within said suction channel means for distributing the lubricating oil, and supply means operatively connected with said distributor means for removing the lubricating oil from said oil circulatory means and for forcibly supplying the lubricating oil to said distributor means in dependence on the rotational speed of the rotary piston engine in an accurately metered manner, said distributor means including slotted tubular means arranged within a wall portion of said suction channel means and extending at least over a portion of the channel width, wick means within the slot of said slotted tubular means, said wick means extending, on the one hand, into the inside of said tubular means and, on the other, through a slot provided within said channel wall portion into said suction channel means itself, said supply means including said control shaft means operatively connected with the rotor of the rotary piston engine to rotate in unison therewith, said control shaft means being provided with transverse bore means accommodating therein needle-shaped plunger means adapted to move in said transverse bore means within predetermined limits, a housing accommodating said shaft and provided with two mutually oppositely disposed apertures at times in substantial alignment with said transverse bore means, one of said apertures

serving as connection with the oil circulatory means and the other being operatively connected with said distributor means, said transverse bore means having a center section of relatively smaller diameter in which is accommodated said plunger means, said transverse bore means having also outer sections of relatively larger diameter, and said needle-shaped plunger means extending with the end sections thereof into said outer sections of relatively larger diameter, and means for limiting the stroke of said plunger means to said predetermined limits including cross pin means extending through said outer sections of relatively larger diameter, at least one of said cross pin means having an eccentric center section and being adjustable with respect to its bore to render the stroke of said plunger means adjustable, said control shaft means serving as drive shaft for and accommodation of said supply means.

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