Jan. 19, 1960 G. SCHALLER 2,921,534

SPIRAL POSITIVE DISPLACEMENT PUMP

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Fig. 1

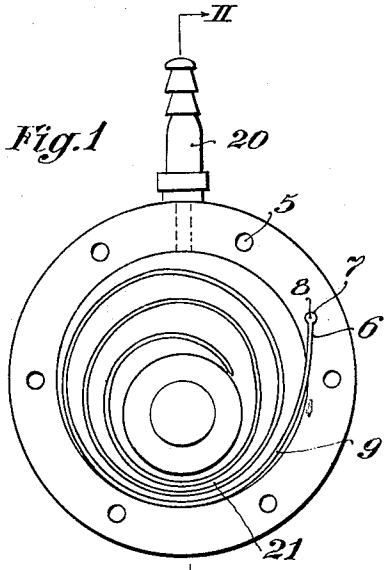
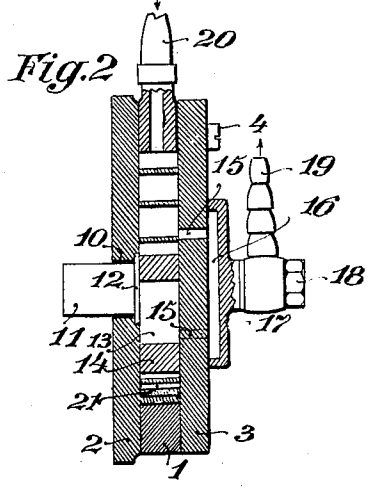


Fig. 2



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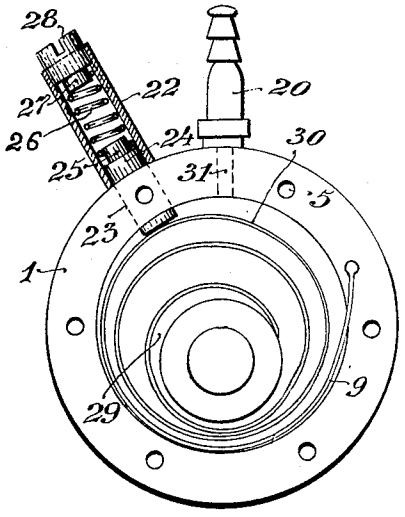
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Fig. 3.



Inventor

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SPIRAL POSITIVE DISPLACEMENT PUMP

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Claims priority, application Germany May 6, 1955

4 Claims. (Cl. 103—117)

The present invention relates to a spiral positive displacement pump. Spiral positive displacement pumps, particularly for gaseous matters are known, wherein a spiral is arranged within a cylindrical housing, this spiral being secured to the inside of housing wall. An eccentric driven from the outside acts upon this spiral, whereby a periodical suction and discharge of fluid is obtained.

In these known positive displacement pumps, the spiral is not only secured with its outer end to the inside of the housing, but is also secured with its inner end to the eccentric, so that it is necessary to provide a complicated multiple crank mechanism in the inside of this eccentric to ensure that the outer circumference of the eccentric formed as a drum does not participate in the continuous movement.

Contrary to this known positive displacement pump, the invention consists in that the inner end of the spiral rests on the eccentric freely sliding under the action of its own stress, the pressure line being arranged directly at one front end of the housing, while the suction line is provided, in a manner known per se, at the circumference of the cylinder. The advantage of a considerably simpler construction of the pump is obtained by this arrangement since an eccentric of simple design may be used, because its circumference may perform, apart from the eccentric movement, also continuous movements since the spiral rests freely sliding on its circumference. A further advantage consists in the automatic pressure control and as a result thereof automatic discharge regulation, which is caused by the fact that upon rise of the pressure in the pressure space the free inner end of the spiral slides backwardly on the eccentric in such manner that the spiral windings, particularly in the outer regions, approach the inner wall of the housing and get closer together until, in the extreme case, the outer winding of the spiral sealingly rests on the inner wall of the housing entirely closing the suction opening.

In the known device, the fluid sucked in entered first through an opening at the outer circumference of the hollow eccentric into the interior of the eccentric and was then only conducted through an opening at the front end of the housing into the delivery line. Compared thereto, the invention offers the possibility to discharge the fluid directly from the pressure space between the inner windings of the spiral into the pressure line arranged at one front end, the eccentric being formed as end crank on the side opposite to the pressure line.

A further embodiment and development of the invention consists in that on the outer wall a socket is mounted within which a spring-controlled pin is so positioned that it will rest on the outer spiral winding of the spiral spring and may be urged adjustably against the spiral spring by means of a setting screw. In this manner it is brought about that the spring action is increased proportionately so that upon rise of pressure, not only the spiral spring will be compressed, but the helical spring as well. Thus, an additional adjustment of pressure is made possible.

The pump according to the invention has the added advantage that it automatically adjusts the pressure, the spiral being outwardly expanded when the pressure rises so that the inlet opening in the inner casing wall is throttled. In the extreme case, this opening is fully closed.

This process of automatic pressure regulation is made possible simply by the fact that the inner end of the spiral rests freely sliding on the eccentric solely by its own stress. If the pressure rises in the pressure space, this spring is expanded in overcoming the spring force, the individual spring windings approaching more and more the outer circumference until, in the extreme case, the outermost winding rests closely on the inner wall of the housing and the suction opening is entirely closed. This expansion is possible merely if the inner end of the spiral is not fastened to the eccentric at all.

The pump controls thus automatically the supplied amount of fluid, the pressure rising in case of lesser consumption in the pressure line so that the supply line is throttled and less oil is sucked in. Contrary to the partly conventional controls, the excessive oil quantities supplied are not returned by a side outlet into the supply line, but only as much oil is sucked in at a time as is actually required. Consequently, only as much oil is circulated as actually is used, consumption being automatically regulated in response to the rising pressure. This offers the advantage that the oil is neither unnecessarily heated, nor is there any formation of foam.

The drawing shows an embodiment of the invention by way of example.

Fig. 1 is a side view of the pump housing with cover removed;

Fig. 2 is a cross-section of the pump housing in assembled state, the section being made along the line II—II in Fig. 1, and

Fig. 3 shows another embodiment of the invention, wherein an adjustable pin is provided.

In the embodiment of Figs. 1 and 2, the housing made of steel comprises three parts, namely the central annular portion **1**, the base portion **2** and the cover portion **3**. These parts are concentrically arranged with respect to each other and are fastened together by six hollow bolts **4**, which are passed through bores **5** of the annular portion **1**. An enlarged end **8** of a band spiral **9** is inserted from one end into a tangential recess **6** with an inner enlarged cavity **7**. An end crank shaft **11** is supported in a central bore **10** of the base **1** of the housing and is secured in outward direction against axial displacement by a shoulder **12**. A crank disc **14** is positioned on the crank pin **13** of the crank shaft **11**. The cover portion **3** is provided adjacent the center with three pressure bores **15**, the upper bore being shown in section in the drawing and one of the lower bores in dotted lines. The bores open into a hollow space **16** of a cap **17** which is connected to the outlet socket **19** by a screw **18**.

The central annular portion **1** is held by the screws **4** between the cover and base portions. It is provided with a suction socket **20**.

The operation of the pump is as follows: driven by the crank shaft **11** by means of the crank pin **13**, the crank disc **14** performs an eccentric movement in the hollow space of the annular portion **1**. The individual windings of the spiral **9** are thereby tightly pressed toward each other at the spot where the circumference of the crank disc **14** closest approaches the outer wall of the housing. Upon rotation of the crank shaft, this spot of closest compression continuously travels around the interior of the hollow space in the housing, whereby the crescent-shaped spaces lying between the individual portions of the spiral winding, likewise, perform a circular movement. Thereby, a suction effect is generated adjacent the suction socket **20**, and a pressure effect in

the interior adjacent the discharge openings **15**, so that the fluid, such as oil, is sucked in through the socket **20** and discharged through the socket **19**.

The spiral may be made of soft iron, brass and other metals or if desired, of synthetic material. It need not have elasticity since the windings are pressed to the outer wall by means of the eccentric disc. A small clearance may also exist between the individual windings and the wall. Outer sealing is ensured in all cases by the spring tension, since the spring always has the tendency to abut on the outside, even when there still is some clearance in the inner windings, as indicated in the drawing at **21**. The central ring may also be pressed integrally with the spiral of synthetic material in order to reduce the expense of production. In this case, however, the base and the cover must be made separately. In the preparation of the extrusion tool, the spiral groove is simply formed by pressing or is subsequently inserted.

The pump may be driven with any high speed, it is not sensitive to the number of revolutions, so that it will discharge fluid just as well at low speeds as at high speeds and will have a very good suction and pressure effect at all speeds.

The pump is not affected by dirt, since the spring yields resiliently if dirt enters. Due to the comparatively great clearances at the inner windings, any existing dirt may press the outer windings against the inner windings so that the dirt may be discharged without trouble. On account of the peculiarity of the strain relations between the outer and inner windings, the tendency of the outward spring effect is smaller at the outer windings than at the inner windings so that there is no clearance between the outer windings, while normally a small clearance exists between the inner windings. Since the curvature is greater in the interior, the spring is more rigid in its inner windings and thus has a greater spring force, so to speak, in the inner portions.

The pump according to the invention has the further advantage that only the pressure space is in connection with the single bearing, while in other pumps the suction space, too, is in connection with at least one bearing so that there is the danger of air being sucked in from the outside. In the pump according to the invention, nothing but oil may leak from the pressure space through the bearing. In the worst case, this may cause some leakage loss which is never a disadvantage. However, when air is drawn in and this air enters the oil circulation, this can be of considerable disadvantage.

The pump may be used not only for oil, but for any desired liquid.

Since this pump is not provided with any valves or other sensitive parts, it is very sturdy in operation and very little affected by operational disturbances.

According to the embodiment illustrated in Fig. 3, a tubular socket **22** is arranged at the circumference of the central ring member **1** of the housing angularly spaced from the suction socket **20**; socket **22** extends into a coaxially extending bore **23** at the outer annular member **1**. In this tubular socket and in the bore **23**, a pin **24** is guided which is provided at the inner end with a recessed plug **25**, one end of a helical spring **26** bearing thereon. The other end of this helical spring **26** is

wound around a recessed plug **27** of an adjusting screw **28**. The force exerted by the spring **26** may be regulated by adjustment of the screw **28**.

When the pressure rises in the pressure space **29**, the spiral spring **9** expands so that the outer winding **30** approaches the opening of the suction bore **31**. The higher the pressure rises in the pressure space **29**, the more the outer winding **30** approaches the inner opening of the suction line **31** and seals this opening in the extreme case. This approach of the winding **30** may be adjusted by the control pin **24** so that the output of the pump may be adjusted also independently of the pressure.

While the invention has been illustrated and described in the aforesaid embodiments, it is not intended to be limited to the details shown since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A spiral positive displacement pump, comprising a disc-like housing having a central annular portion provided with a radial bore therethrough, and a suction line connected to said radial bore, and a pair of outer members secured to said annular portion, a spiral supported within said housing and secured with one end to said annular portion, said spiral having a free end, the sides of said spiral engaging with the outer members, an eccentric for actuating said spiral and mounted in said housing, said eccentric being rotatably supported in one of said outer members, the free end of the spiral resting freely slidable on said eccentric, a pressure line mounted on the other of said outer members of the housing and communicating with the interior of said housing.

2. The spiral positive displacement pump as claimed in claim 1, further provided with means for controlling the expansion of said spiral, said means comprising a tubular socket having a closed end and an open end, and mounted radially with its open end on said annular ring portion adjacent said radial bore, a pin slidable in said socket and extending with its one end into said housing and bearing against said spiral with said one end, an adjusting screw extending into said socket through the closed end of said socket and a helical spring having one end secured to the other end of said pin, the other end of said spring bearing against said adjusting screw.

3. The spiral positive displacement pump as claimed in claim 2, wherein the outer member of the housing disposed opposite the pressure line has a central bore therethrough, a crank shaft journalled in said bore, said crank shaft being provided with a crank pin rotatable in said housing, said eccentric being mounted on said crank pin.

4. The spiral positive displacement pump as claimed in claim 3, wherein the suction line is disposed between the socket for the spring and the attachment point of the spiral on the annular portion of the housing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,527,807 Loguin ..... Feb. 25, 1925