Dec. 13, 1932. L. BURN 1,890,560

ROTARY PUMP AND THE LIKE

Filed Nov. 30, 1931 2 Sheets-Sheet 1

Fig. 1.

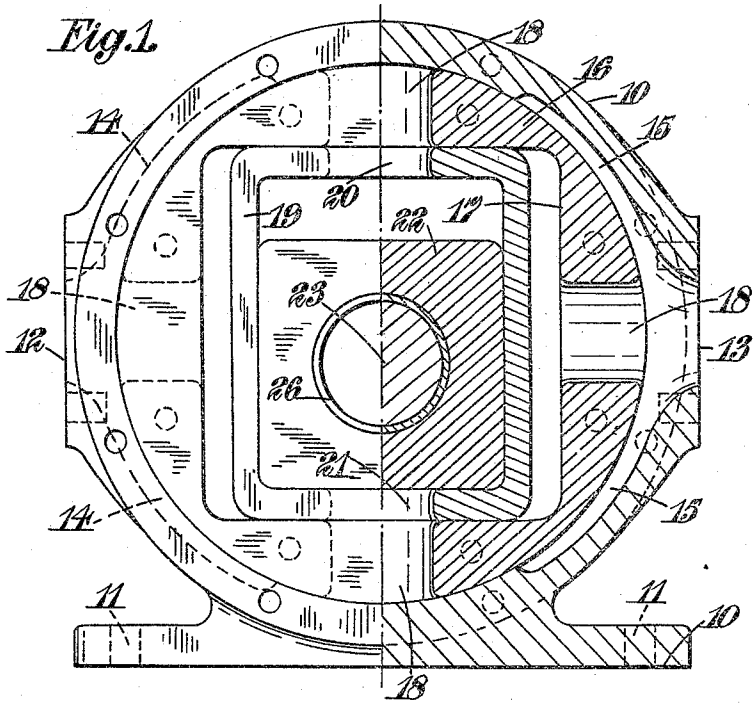
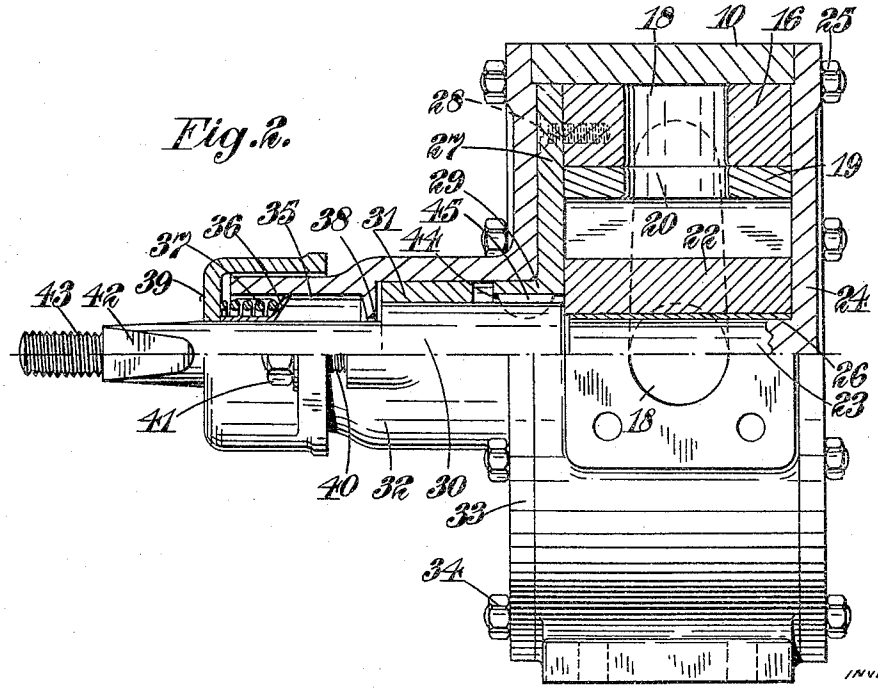


Fig. 2.



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Filed Nov. 30, 1931 2 Sheets-Sheet 2

Fig. 3.

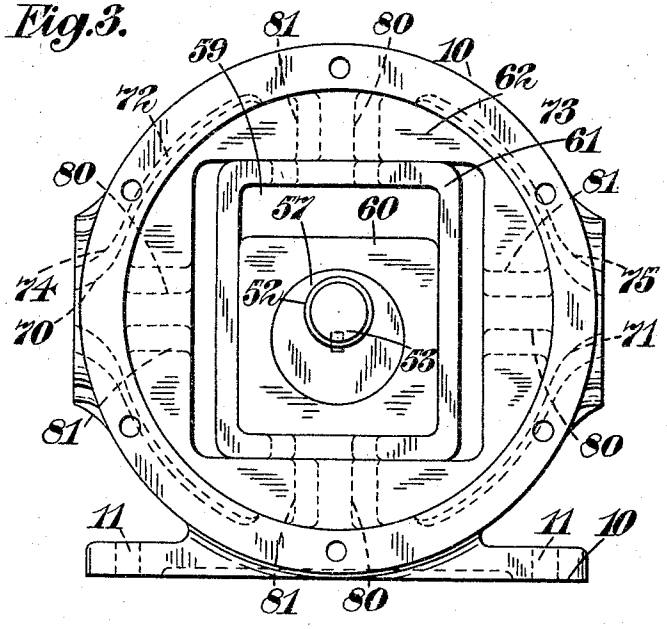
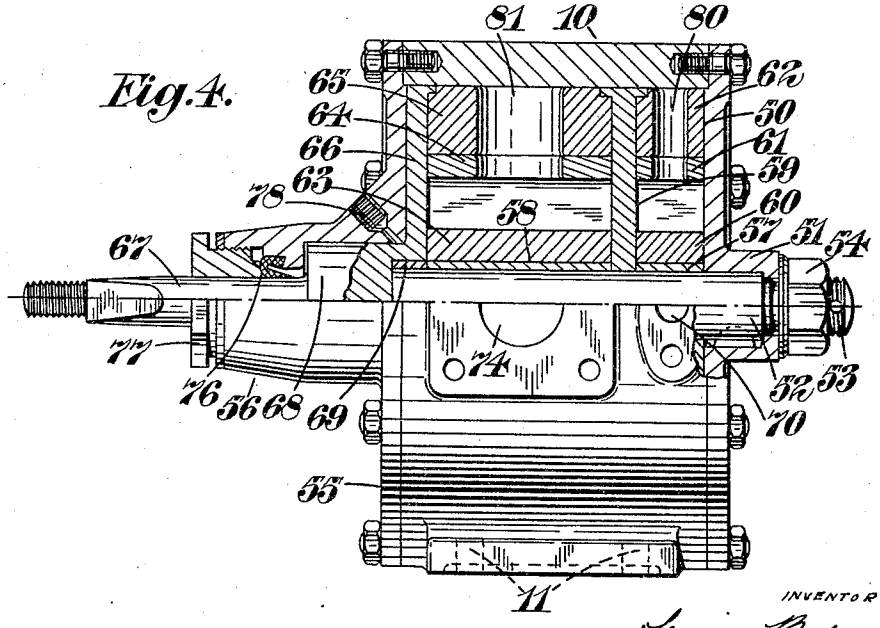


Fig. 4.



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UNITED STATES PATENT OFFICE

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ROTARY PUMP AND THE LIKE

Application filed November 30, 1931, Serial No. 578,086, and in Great Britain December 5, 1930.

This invention is for improvements in or relating to rotary pumps and the like of the kind comprising a pump-casing, an element reciprocable therein to constitute a double-ended pump and a second element reciprocable in the first element at right-angles to the movement thereof, constituting a second double-ended pump.

An object of the present invention is to provide a simplified form of rotary pump of the kind described. A further object is to reduce the leakage between the intake and delivery ports of a pump of this kind.

Heretofore, in a rotary pump of the kind described, the inlet and outlet passages to the various pump chambers have been formed in a central eccentric member and its shaft; according to this invention there is provided a rotary pump or the like of the kind described wherein fluid is admitted to and delivered from the interior of the pump through holes in the pump-casing. The pump-casing may be rotatable about a fixed eccentric inner element, or the pump fixed and the inner element driven. The pump-casing is preferably enclosed by an outer casing having inlet and outlet ports which co-operate with holes in the pump-casing.

Further, according to the invention there is provided a rotary pump or the like of the kind described wherein the pump-casing is a cylinder having four symmetrically disposed radial holes whereof two communicate with the outside of the outer element and whereof the other two communicate with the outside of the inner element by holes in the outer element.

Preferably, the outer element is rectangular in shape and slides inside a square recess formed in the pump-casing and the inner element is a square block pivoted about a fixed eccentric axis and slidable with respect to the outer element. Alternatively, the recess may be rectangular and the inner element may be a rectangular block. It is possible with this arrangement so to design the pump that the same volume of fluid is discharged from each of the four pumping chambers.

In a modification according to the present invention a rotary pump of the kind described comprises a plurality of sets of reciprocable elements within a common outer casing. Each set of reciprocable elements may be adapted to pump a different fluid from the other sets, for example, one set may be adapted to pump air and another petrol.

According to another feature of the invention, a rotary pump of the kind described comprises two or more sets of reciprocable elements, the inner eccentric members of which are mounted on a common shaft or spindle and having a common pump-casing for both or all of the said sets. Preferably, the inner eccentric members are constituted by eccentric bushes mounted on a central spindle and each bush may be disposed with its eccentric axis along a different radius. For example, in a rotary pump comprising two sets of reciprocable members the bushes may be oppositely arranged so that the pumping stroke of the elements of one set takes place during the intake stroke of the corresponding elements of the other set. In a preferred form of construction of this modification, according to the invention, the rotatable pump-casing is formed with one or more transverse partitions separating one set of pump elements from the other or others.

Other features of the invention will appear from the description of specific embodiments thereof which are now given, by way example, with reference to the accompanying drawings, of which:

Figure 1 is an end elevation, half in section the other half being an end view with the cover plate of the pump removed;

Figure 2 is a corresponding side elevation with the upper half in section;

Figure 3 is an end elevation of a modified form of pump according to the invention with the cover plate removed; while—

Figure 4 is a side elevation, half in section, corresponding to Figure 3.

As shown in Figures 1 and 2, the pump comprises an outer casing 10 which may be a casting, consisting of a base plate having holes 11 to receive bolts for fastening the pump to a suitable foundation and a ring-shaped portion having an intake port 12 and

a delivery port 13. On the inner surface of the ring are formed grooves 14 and 15 which co-operate with the ports 12 and 13 respectively in a manner described below. Suitable pipes (not shown) are connected to the casing at the ports 12 and 13 to lead fluid to and away from the pump.

Inside the ring of the outer casing there is a drum 16 having a large square axial hole 17 and radial conduits 18 running from the mid-point of each side of the square 17 to the periphery of the drum. Inside the drum 16 is a rectangular element 19 whereof the shorter sides slidably engage two sides of the square 18. At the mid-points of each of the shorter sides of the rectangular element 19 are holes 20, 21 which communicate with two of the conduits 18.

Inside the rectangular element 19 is a square block 22, two sides of which are a sliding fit between the inner surfaces of the longer sides of the rectangular element. The block 22 has a central hole which engages a stud 23 carried by or formed integrally with an end cover plate 24 which is secured to the ring portion of the outer casing 10 by means of bolts 25. Between the stud 23 and the block 22 is an annular bushing 26.

At one side of the drum 16 (the left-hand side in Figure 2) a circular plate 27 is affixed by means of screws 28. The plate 27 is formed with a short central sleeve 29 having a slot 44 which receives a saddle key 45 by which the drum 16 is keyed to a driving shaft 30. A bearing for the shaft 30 is constituted by a bush 31 which fits into a sleeve 32 formed integrally with a plate 33 which covers the other end of the pump and is secured to the outer casing 10, as is the other cover plate 24, by means of bolts 34. The outer end of the sleeve 32 provides a space 35 for gland packing, which is held in place against a ring 38 formed integrally with the sleeve 32 by means of a flanged ring 36 pressed inwardly by a helical spring 37. The end of the sleeve is closed by a cap 39 which is secured to the sleeve by bolts 40 and nuts 41. The pressure of the spring 37 and thus the tightness of the packing can be adjusted by means of the nuts 41.

The end of the shaft 30 is formed with flats 42 to receive a pulley or gear-wheel and a threaded portion 43 for receiving a locking nut.

The shaft 30 is rotated by any suitable source of power in either direction. Assuming that the shaft 30, and therefore the drum 16, are rotating in a clockwise direction, as seen in Figure 1, there will be relative movement between the rectangular element 19 and the square hole 17 in such sense that the space on the left-hand side of the element 19 will widen while the space on the right-hand side will become narrower. The result of this relative movement is that fluid is drawn in to the pump through the port 12 and expelled from the pump through the port 13. This intake and delivery action continues until the drum has rotated through 90°. In addition to the pumping action of the rectangular element 19 with respect to the square hole 17, rotation of the drum 16 produces a relative movement of the rectangular element 19 with respect to the square block 22 and this relative movement is in such sense as to close up the gap above the square block 22. It will be appreciated that as the drum 16 rotates the hole 20 comes into register with the groove 15 and fluid is thus discharged through the port 13 by way of the hole 20 and the appropriate conduit 18 and also that the hole 21 comes into register with the groove 14 so that fluid is taken in through the port 12, by way of the opposite conduit 18 and the hole 21.

The two pumping actions, that is to say, the action of the relative movement between the rectangular element 19 and the square hole 17, and the relative movement between the rectangular element 19 and the square block 22, combine to produce a steady discharge of fluid from the port 13 and a steady intake of fluid through the port 12.

The modified form of construction of pump illustrated in Figures 3 and 4 comprises, as before, an outer casing 10 having a base-plate and a ring-shaped portion. An end cover plate 50 for the pump comprises an integrally formed short central sleeve 51 into which is fitted a long central stud 52 having a threaded end 53 and a nut 54 for securing it to the sleeve portion 51. Keyed to the stud 52 are two eccentric bushes 57 and 58 which are separated by a circular plate 59 which extends from the stud 52 to the inside wall of the ring of the outer casing 10 and divides the interior of the pump into two separate compartments. Each compartment comprises the elements of a compete pump as described with reference to Figures 1 and 2. That is to say, the chamber on the right-hand side (see Figure 4) of the plate 59 contains a central square block 60 which engages the eccentric bush 57, a rectangular element 61 which is slidable with respect to the block 60 and a drum 62 in which the rectangular element 61 is slidable; the drum 62 is bored with four symmetrically disposed radial conduits 80. On the left-hand side of the plate 59 is another square block 63, rectangular element 64 and drum 65, the drum having four conduits 81. The left-hand compartment is about three times the capacity of the right-hand compartment. The purpose of this difference in size is described hereinafter. At the left-hand side of the drum there is a plate 66 which is formed integrally with a driving shaft 67. The plate 66, the drum 65, the plate 59 and the drum 62 are all bolted together, or otherwise secured, by suitable means (not shown) so that they rotate together as a

whole. The enlarged portion 68 of the shaft 67 is formed with a recess which carries the end of the stud 52 in a circular bush 69.

The right-hand cavity of the pump is provided with inlet and outlet ports 70, 71, which co-operate with the elements 60, 61 and 62 in the manner of the pump illustrated in Figures 1 and 2 and there are grooves 72 and 73 cut on the inner wall of the ring of the outer casing 10 to co-operate with these ports. The left-hand compartment is similarly furnished with intake and delivery ports 74 and 75 and suitably disposed grooves in the inner wall of the ring of the outer casing 10 are cut to co-operate with these ports.

The left-hand end of the pump, as seen in Figure 4, is closed by a cover plate 55 having a sleeve 56 which provides a bearing for the enlarged portion 68 of the shaft 67. A packing leather ring 76 surrounds the shaft 67 and is held in position by means of a gland nut 77. An oil inlet 78 is provided for admitting lubricant to the bearing surfaces.

The pump described with reference to Figures 3 and 4 consists, in fact, of two pumps, and is particularly suitable for use in conjunction with a petrol-dispensing pump of the kind in which two cylindrical vessels are filled alternately with petrol, the petrol being expelled from each vessel in turn by air pressure. The smaller compartment in the pump illustrated is of one-third the capacity of the larger compartment, and deals with the air, while the larger compartment deals with the petrol. The elements in each compartment operate in exactly the same way as the elements in the pump described with reference to Figures 1 and 2. The principal constructional difference is that the stud 52 is central and circular and has the eccentric bushes 57 and 58 surrounding it, whereas in Figure 1 a solid eccentric stud is employed. As shown in Figure 4, the eccentric bushes 57 and 58 are mounted with their axes lying along the same radius, that is to say, a radius projecting vertically downward, but if preferred, the eccentric axes may be set at an angle to each other. In one arrangement, the eccentric axes are placed opposite to, and in line with, each other, so that when one pair of elements in one compartment is performing a delivery stroke, the corresponding elements in the other compartment are performing the suction stroke. In this way a more perfect balance and more even running are achieved.

The pump described with reference to Figures 3 and 4 can be used for any two fluids or for pumping the same fluid to two different receptacles or from two different sources. For example, it could be used for pumping oil and petrol or water and gas.

The invention is not limited to the construction in which there are only two compartments; any number of separate compartments could be used.

In the constructions of pump above described, an eccentric element rotates about a fixed axis while an outer drum is rotated, but in a modification of the present invention, the inner element may be keyed to its eccentric stud and the stud rotated. In this way, the casing will also be rotated and the outer element which lies between the inner element and the casing will be moved in such manner with respect to the inner element and the casing as to perform the same pumping operations as hereinbefore described. For example with reference to Figure 1, the shaft 30 could be constructed to carry the stud 23 and the square block 22 keyed to the stud.

A rotary pump as described above can be used for pumping any fluid and will work in either direction. Also, the pump can be used as a motor if fluid under pressure (for example, compressed air) is supplied to one of the ports in the casing.

It will be seen that by the arrangement of elements and ports according to the present invention, the leakage between intake and delivery of the pump is greatly reduced as compared with those pumps in which intake and delivery ports are built at or near the centre of the pump. Moreover, all the parts employed are simple and inexpensive to construct. In addition, it will be seen that the pump elements slide one against the other on large bearing surfaces and the wear in the pump is thus less than in known constructions. In the particular construction described, the shaft is not only supported by its own bearing but is also supported by the drum which bears in the outer casing.

I claim:—

In a rotary pump, the combination with a plurality of sets of pumping elements, of a common outer casing for said elements, each set of elements comprising a drum supported within said casing for rotation with respect thereto, said drum having a rectangular recess therein, a rectangular frame slidably supported in said recess, a centrally disposed rectangular block supported for sliding movement within said frame and for rotation with respect to said casing about an axis eccentric to the rotational axis of said drum, said casing, drum, and frame being provided with cooperating fluid ports through which fluid may be pumped on relative rotation of said drum and casing, and a radial partition for separating adjacent sets of pumping elements, said partition and drums being connected for unitary rotation.

In testimony whereof I affix my signature.

LEWIS BURN.