Aug. 5, 1952 W. J. HOENECKE 2,605,714

ROTARY OSCILLATING PISTON PUMP

Filed July 24, 1948

FIG. 1.

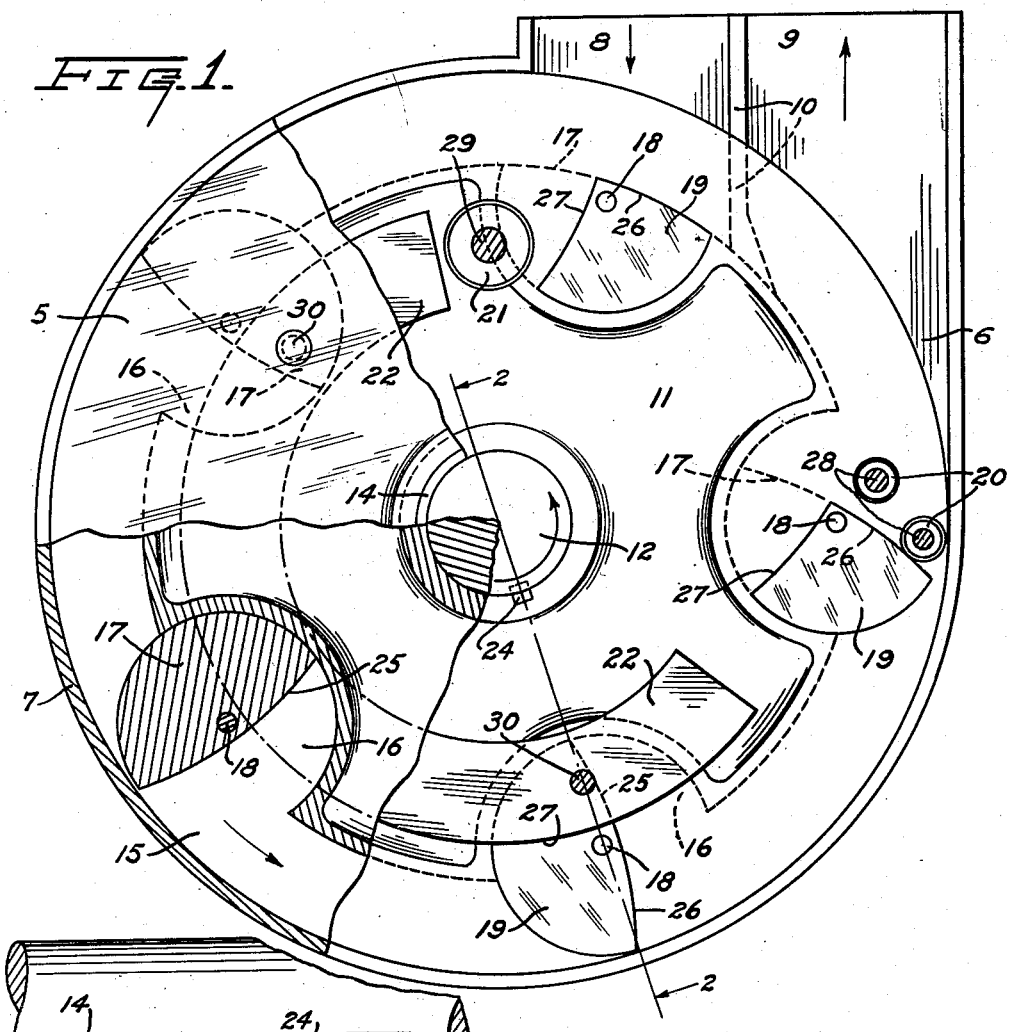
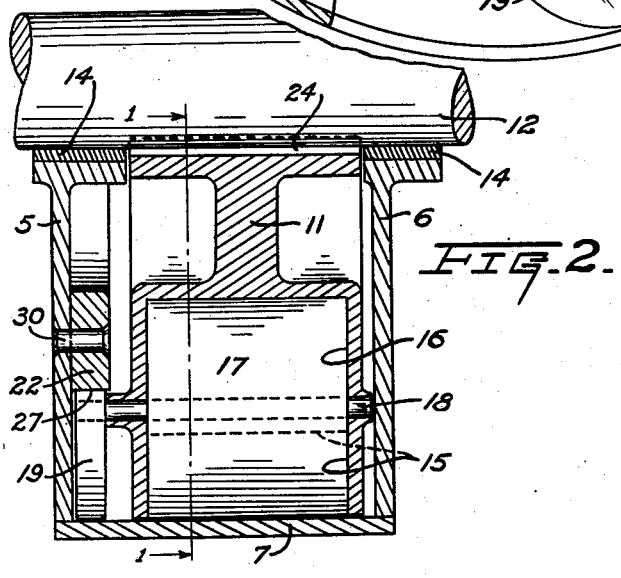


FIG. 2.



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ROTARY OSCILLATING PISTON PUMP

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3 Claims. (Cl. 103—140)

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My present invention relates generally to improvements in the art of transporting relatively dense fluent materials; and relates more particularly to improvements in the construction and operation of positive displacement pumps of the type disclosed generally in my issued patent, No. 2,415,592, dated February 11, 1947, wherein some of the features of the present pump are covered broadly.

It is a primary object of the present invention to provide an improved rotary positive displacement pump of the oscillatory piston type which is extremely simple, durable and compact in construction, and which is furthermore highly flexible in its adaptations and efficient in operation.

Another important object of my invention is to provide an improved rotary oscillating piston pump adapted particularly for the handling of relatively dense materals, such as food products of various types, paper pulp, sludge, concrete, and tannery waste, and wherein the working parts are amply protected against possible damage.

Another specific object of this invention is to provide an improved rotary positive displacement pump wherein the material is advanced by a series of piston members adapted to oscillate into and out of the material displacement chamber, the piston members being subjected to uniform pressure throughout the working areas thereof when in active position.

A further specific object of the invention is to provide an improved rotary positive displacement pump adapted to continuously and efficiently aid in the transportation of high density stock at extremely low cost and with minimum attention and repairs.

Still another specific and important object of my present invention is to provide an improved and highly effective rotary oscillating piston type of positive displacement pump which consists of relatively few simple parts all of which are readily accessible, and which may be quickly and easily assembled and dismantled by persons of ordinary mechanical ability.

An additional specific object of the present invention is to provide an improved rotary positive displacement pump wherein a circular rotor member is revolvable within and coaxially of an annular displacement chamber, the rotor member being formed with an annular series of spaced substantially semi-circular pockets, each of which is provided with a similarly shaped semi-circular piston member pivotally mounted therein and adapted to be alternately positively oscillated by means of a cam, into and out of the corresponding pocket during normal rotation of the rotor.

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These and other objects and advantages of the present invention will be apparent from the following detailed description.

A clear conception of the various features constituting the present improvement, and of the mode of constructing and of utilizing rotary oscillatory piston pumps embodying my invention, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the several views.

Fig. 1 is a side view of a typical rotary oscillatory piston positive displacement pump constructed in accordance with my invention, a fragmentary section having been taken along the line 1—1 of Fig. 2 and a major portion of the outer side wall of the main casing having been broken away to reveal normally concealed mechanism; and

Fig. 2 is a fragmentary transverse approximately vertical section through a portion of the improved pump taken along the line 2—2 of Fig. 1.

While the invention has been shown as being advantageously applicable to a pump especially adapted for the transportation of semi-liquid such as fluent concrete, it is not my intention to unnecessarily restrict the utility of the improved features by virtue of this limited embodiment; and it is also contemplated that specific descriptive terms used herein be given the broadest possible interpretation consistent with the disclosure.

With reference to the drawing, the improved rotary pump disclosed therein, comprises in general a sturdy main housing or casing formed of opposite side walls 5, 6 and a peripheral wall 7 having inlet and outlet ports 8, 9 respectively segregated from each other by a partition 10; a rotor 11 secured to a rotary drive shaft 12 journalled for rotation in bearings 14 mounted centrally within the side walls 5, 6 and having therein a peripheral recess coacting with the wall 7 to form an annular displacement chamber 15 spanned by the partition 10, the rotor also having a series of equally spaced externally closed semi-cylindrical pockets 16 in open communication with the chamber 15; an oscillatory semi-cylindrical piston 17 snugly but swingably confined within each of the pockets 16 by a pivot shaft 18 and being revolvable about the axis of the driving shaft 12 with the rotor 11; and an oscillatory quadrant cam 19 swingably secured to an end of each pivot shaft 18 externally of the adjacent pocket 16, the successive cams 19 being cooperable with rollers 20 carried by the casing wall 5 to swing the corresponding pistons 17

entirely into their confining pockets 16 as they approach the outlet port 9, and being subsequently cooperable with a roller 21 and with an arcuate guide plate 22 also mounted within the wall 5 to project and maintain the successive pistons 17 across the chamber 15 after they have passed the inlet port 8.

The main housing or casing walls 5, 6, 7 and the partition 10 may be fabricated of heavy sheet metal, and one or both of the opposite side walls may be firmly but detachably secured to the peripheral wall 7 and partition 10 in any suitable manner so as to normally conceal while still permitting convenient access to the internal mechanisms and parts. The inlet and outlet ports 8, 9 of the main housing should be connected to suitable sources of material supply and utilization and may also be disposed at any desired locality with respect to the outer wall 7 and annular chamber 15; and while the inlet port 8 may be directed approximately radially of the rotor axis, the discharge or outlet port 9 is preferably directed tangentially relative to the rotor 11, as shown in Fig. 1. The rotor 11 may be formed of durable metal in any suitable manner, and is secured to the driving shaft 12 by means of one or more keys 24, this shaft being rotatable in the bearings 14 in any convenient manner with its axis disposed either vertically, horizontally, or at any angle.

The semi-cylindrical pistons 17 which snugly but swingably coact with the similarly shaped rotor pockets 16, have curved material urging faces 25 which conform with the curvature of the bottom of the rotor groove when the pistons 17 are confined entirely within their respective pockets 16 as shown at the top of Fig. 1; and when these faces are in active position as shown at the bottom of Fig. 1 and in Fig. 2, they span or project outwardly entirely across the chamber 15 thus dividing this chamber into a succession of segregated compartments. The piston retaining and pivot shafts 18 are journalled for oscillation in the opposite side walls of the rotor 11, and these shafts 18 extend outwardly beyond one of these rotor walls as clearly shown in Fig. 2, to provide for attachment of the cams 19 thereto. Each piston 17 and cam 19 should be rigidly attached to the corresponding pivot shaft 18 in order that oscillatory motion of the cams will be positively transmitted to the pistons while the rotor 11 is revolving, and the cams 19 are approximately quadrant shaped but have convexly and concavely curved actuating faces 26, 27 radiating from their pivot shafts 18 as depicted in Fig. 1.

The cam actuating rollers 20 are journalled for free rotation on stub shafts 28 secured to the casing side wall 5, and the convexly curved actuating faces 26 of the successive cams 19 are engageable with these rollers 20 as illustrated in Fig. 1, to swing the successive pistons 17 completely into their confining pockets 16 as they approach the outlet port 9 and while they advance past the partition 10 and inlet port 8. The cam actuating roller 21 is also journalled for free rotation upon another stub shaft 29 likewise secured to the casing side wall 5, and the concavely curved actuating faces 27 of the successive cams 19 are engageable with this roller 21 to swing the successive pistons 17 outwardly across the annular chamber 15 as will also be apparent from Fig. 1. The arcuate guide plate 22 is rigidly attached to the interior of the casing side wall 5 by means of rivets 30, and the concavely curved faces 27 of the successive cams 19 are engageable with and are slidable along the peripheral surface of the plate 22 immediately after the successive pistons 17 have passed the inlet port 8 and have been swung into active position, thus positively holding the pistons in such position until the cam faces 27 have passed beyond the end of the plate 22. It is to be noted, that while only one set of cams 19 and rollers 20, 21 and guide plate 22 associated with one side wall 5 of the casing, has been shown, a similar piston actuating and guiding assemblage may also be associated with the opposite casing side wall 6.

When the improved pump has been properly constructed and assembled as hereinbefore described, it may be disposed in any desired position and the main shaft 12 may be drivingly connected to a suitable source of power while the inlet port 8 should be placed in communication with a fluent material supply source and the outlet port 9 should likewise be placed in communication with a source of utilization of the transported material. As the shaft 12 rotates, it rotates the rotor 11 and revolves the pistons 17 and cams 19 within the peripheral casing wall 7, thereby causing the revolving pistons 17 to transport the successive batches of fluent material entering the annular displacement chamber 15 through the inlet port 8, toward the outlet port 9 in the form of a continuous succession of segregated batches each confined between two successive active pistons. The guide plate 22 coacting with the concave cam faces 27 positively holds the pistons 17 in active position across the chamber 15; but whenever a piston 17 has advanced toward the outlet port 9 to a position wherein its cam 19 has moved beyond the end of the retainer plate 22, and the actuating cam surface 26 thereof engages the rollers 20, then the piston is automatically swung entirely into its confining pocket 16 and the batch of material in back of the displaced piston merges with the constant stream of fluid being forced through the outlet. This recession of the successive pistons 17 continues until after they have passed the outlet port 9, partition 10 and inlet port 8, at which time the roller 21 automatically swings them back into active position for subsequent repetition of similar cycles of operation.

From the foregoing detailed description, it will be apparent that my present invention in fact provides an improved rotary oscillating piston pump which besides being simple and compact in construction, is also highly efficient in operation and flexible in its adaptations. The pumping action is effected by positive displacement of the successive batches of material along the displacement chamber 15 by the revolving piston 17, and semi-cylindrical formation of these pistons and the oscillatory mounting of the pistons 17 upon central pivot shafts 18 insures the production and distribution of uniform pressure throughout the entire working faces 25 of the propelling pistons. The batches of material being transported through the displacement chamber 15 fill both the segments of this chamber between the successive pistons and the exposed portions of the pockets 16 so that the central suspension of the pistons obviously causes the pressures acting upon the piston faces 25 on opposite sides of the axes of suspension of the pistons, to be balanced. This fact relieves the actuating cams 19 of heavy duty and avoids excessive wear, and the rollers 20, 21 may be con-

veniently lubricated from the exterior of the housing through their supporting shafts 28, 29 in an obvious manner. The functioning of the improved pump is entirely automatic and the cam and roller mechanisms are amply protected within the casing, while the entire assemblage comprises only few very simple parts which may be durably constructed and readily assembled at moderate cost. The improved pumps may be manufactured in diverse sizes for various uses and are especially adapted for the transportation of relatively dense liquids such as concrete and semi-fluent foods.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of operation and use of the typical concrete pump herein shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. In a rotary positive displacement pump, a casing having therein an annular displacement chamber provided with segregated inlet and outlet ports and with a rotor having a series of semi-cylindrical pockets in open communication with the chamber, a semi-cylindrical piston confined within each of said pockets, each of said pistons having a pivot shaft journalled in and extending through at least one of the side walls of its pocket for oscillation about its central axis and being revolvable with said rotor, a quadrant cam secured to the pivot shaft of each of said pistons externally of its confining pocket for swinging the piston about its axis entirely into its pocket and for projecting it across said chamber, each of said pistons and its actuating cam having coaxial arcuate peripheral faces and each quadrant cam also having a pair of approximately radial bounding edges, and means cooperable with said cam edges to swing said pistons from one extreme position to the other when approaching and leaving said outlet and inlet ports respectively.

2. In a rotary positive displacement pump, a casing having therein an annular displacement chamber provided with segregated inlet and outlet ports and with a rotor having a series of semi-cylindrical pockets in open communication with the chamber, a semi-cylindrical piston confined within each of said pockets, each of said pistons having a pivot shaft journalled in and extending through at least one of the side walls of its pocket for oscillation about its central axis and being revolvable with said rotor, a quadrant cam secured to the pivot shaft of each of said pistons externally of its confining pocket for

swinging the piston about its axis entirely into its pocket and for projecting it across said chamber, each of said pistons and its actuating cam having coaxial arcuate peripheral faces and each quadrant cam also having a pair of approximately radial bounding edges, abutment means cooperable with one of the radial bounding edges of each of said cams to swing said pistons into inactive position when approaching said outlet port, and other abutment means cooperable with the other radial bounding edge of each of said cams to swing said pistons into active position when leaving said inlet port.

3. In a rotary positive displacement pump, a casing having therein an annular displacement chamber provided with segregated inlet and outlet ports and with a rotor having a series of semi-cylindrical pockets in open communication with the chamber, a semi-cylindrical piston confined within each of said pockets, each of said pistons having a pivot shaft journalled in and extending through at least one of the side walls of its pocket for oscillation about its central axis and being revolvable with said rotor, a quadrant cam secured to the pivot shaft of each of said pistons externally of its confining pocket for swinging the piston about its axis entirely into its pocket and for projecting it across said chamber, each of said pistons and its actuating cam having coaxial arcuate peripheral faces and each quadrant cam also having a pair of approximately radial bounding edges, a segmental guide plate mounted on a side wall of said casing and cooperable with one of the radial bounding edges of each of said cams to maintain said pistons in active projected position, and abutment means also mounted on the casing side wall between the ends of said plate and cooperable with the other of said cam edges to swing said pistons into inactive position.

WALTER J. HOENECKE.

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