Nov. 28, 1944. W. L. HART 2,363,961

ROTARY PUMP

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Fig. 1.

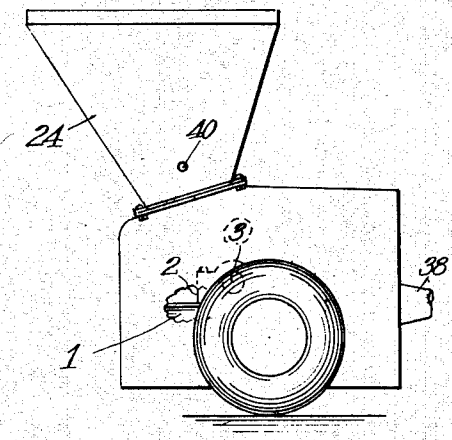


Fig. 6.

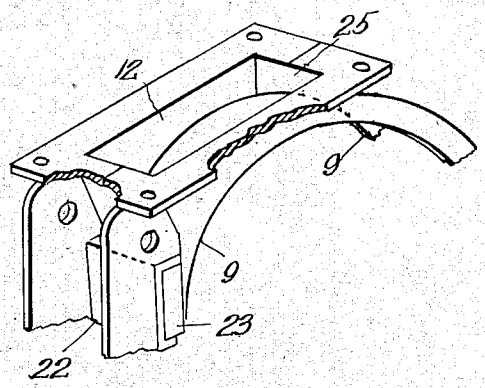
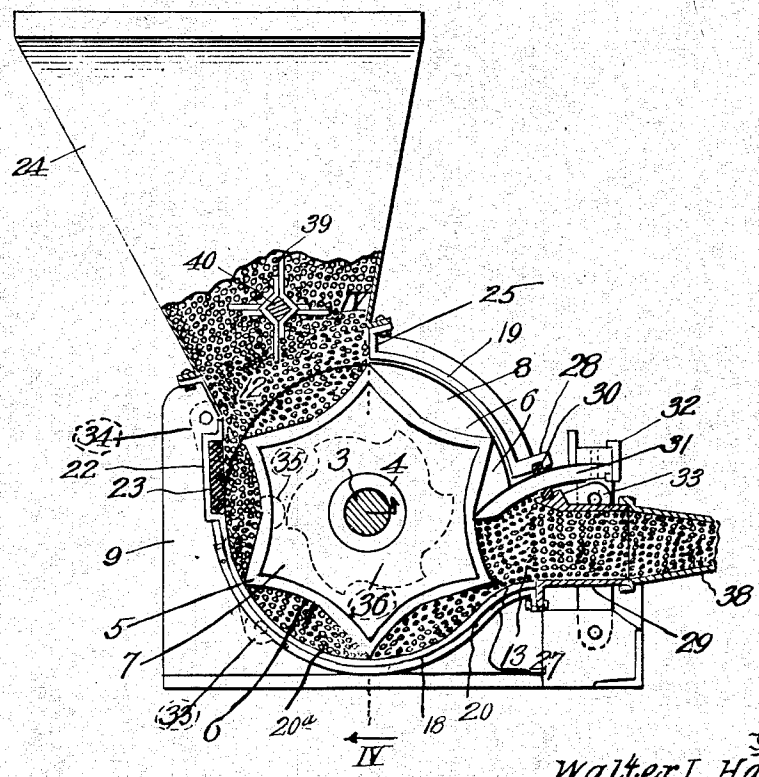


Fig. 2.



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Fig. 3.

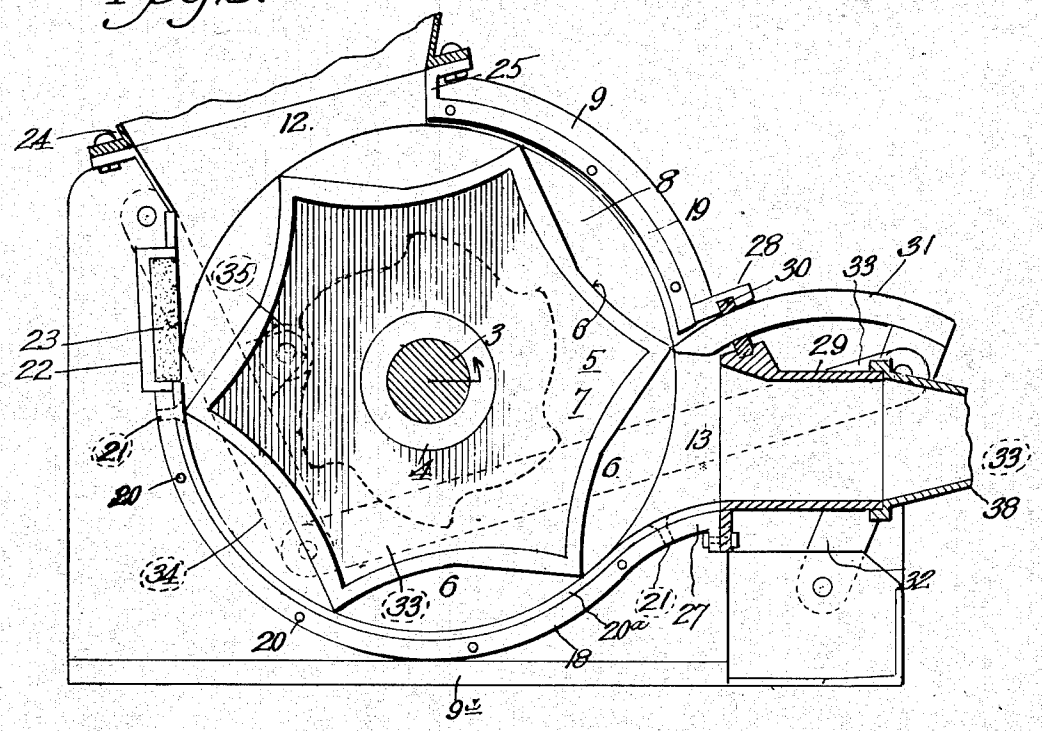


Fig. 4.

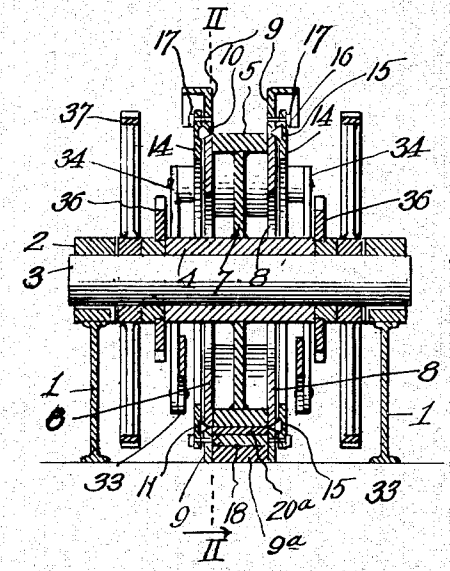
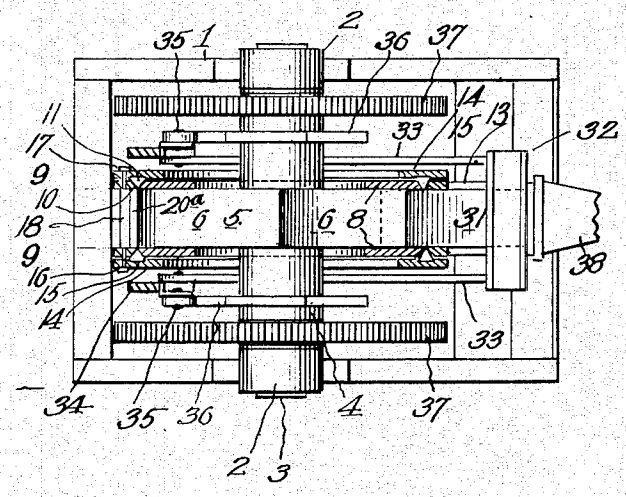


Fig. 5.



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UNITED STATES PATENT OFFICE

2,363,961

ROTARY PUMP

Walter L. Hart, Milwaukee, Wis.

Application December 5, 1942, Serial No. 468,173

2 Claims. (Cl. 103—124)

This invention relates to pumps for semi-fluid or plastic materials, such as concrete or liquid materials of various kinds containing a volume of solids, such as, soups, peanut butter, etc. The general object of the invention is to produce a more efficient pump than that shown in my Patent No. 2,045,081, issued June 23, 1936, where efficiency was lost due to friction between the material being pumped and the casing of the pump.

With the general objects named in view and others as will hereinafter appear, the invention consists in certain novel and useful features of construction and organization of parts as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawings, in which:

Figure 1 is a side elevation of a housed pump embodying the invention and mounted on wheels for convenience of portability.

Figure 2 is an enlarged side view with the wheels, housing and near sides of the casing and rotor omitted, and certain parts shown in central vertical longitudinal section, the gate or deflector appearing in side view and engaging a pocket of the rotor for directing the contents thereof through the discharge throat of the pump. The parts shown in elevation are those shown at the right-hand side on the line II—II of Figure 4.

Figure 3 is a view corresponding to, but larger, than Figure 2, and disclosing the gate in its withdrawn position, and the cams, rotatable with the rotor, positioned relatively to effect quick projection of the gate into the approaching pocket, to the position in which the gate appears in Figure 2.

Figure 4 is a central vertical cross section of the pump and certain operative and supporting parts thereof, on the same scale as Figure 2, the housing being omitted. The section is taken on the line IV—IV of Figure 2.

Figure 5 is a view on the same scale as Figure 4, showing the pockets of the rotor and the discharge throat thereof, in top plan view, the sides of the pockets of the rotor and the sides of the casing, and certain of the operative parts, appearing in central horizontal section and others in plan view.

Figure 6 is a perspective view of the upper portions of the sides of the casing.

In the said drawings, 1 indicates a pair of parallel I-beams carrying opposite bearings 2 for a transverse shaft 3, and rigid with said shaft between the bearings is a sleeve 4. Centrally between the bearings is a rotor 5 in the form of an endless ribbon bent to provide a series of peripheral pockets of similar size and form, and shown in this instance, of generally hexagonal contour, the high or crest points of the pockets occupying a circular plane concentric of the shaft, the ribbon between the said points defining external concave-bottomed pockets 6. The bottoms of the pockets, while generally arcuate in form, are each flattened at the end advanced with respect to the direction of rotation of the rotor, the flat portions extending in straight lines from the high points, preferably to or slightly beyond the mid-way points of the respective pockets. To insure rigidity of the ribbon and its rotation with the shaft, it has a central solid or skeleton web 7, welded or otherwise secured to it and to the sleeve 4, as shown in Figure 4, and to constitute sides of and hence complete the pockets, rings 8 are bolted or otherwise secured to opposite sides of the ribbon, the external diameter of the rings 8 corresponding to the circular plane in which the outer or high points of the pockets lie, and the internal diameter line of the rings lying in or slightly inward of the bottoms of the pockets.

A casing for the rotor consists of a pair of sides 9, preferably mounted upon a base 9a in any suitable manner, the sides having circular openings snugly receiving the rings 8, the adjacent or outer edges of the latter and the inner edges of the openings of the sides being reversely bevelled (see Figure 4) to provide V-shaped grooves 10 containing packing rings 11 to seal the circular joint between the said rings and sides. At two points, i. e., where the material handled is received and discharged respectively, the sides have extensions 12 and 13, respectively forming sides of a feed opening and a discharge throat, as hereinafter identified, and to hold the packing rings 11 adjustably clamped in place to compensate for wear, there are two rings 14 having grooves 15 receiving the packing rings 11. Stud bolts 16 secured to the casing sides 9, extend through the rings 14 and are engaged by nuts 17. To complete the casing, the sides, except where the extensions 12 and 13 occur, are peripherally connected to arcuate sections 18 and 19 struck from the axis of the shaft, and said sections are bolted to the rings 14 at suitable intervals by through bolts 20. A wear plate 20a lines the section 18, and is screw-bolted or fastened thereto as at 21.

At the rear of the rotor and extending upwardly from about the level of the shaft, a bracket 22 is superimposed on section 18, and holds a resilient or compressible block 23, in close proximity to the path of the high points of the ro-

tor. The block 23 preferably slopes upwardly and rearwardly slightly, and the bracket 22 forms the lower part of the rear side of the feed opening hereinbefore mentioned, which opening is adapted to receive material from a hopper 24, surmounting and rigid with the casing. The front side of said opening is formed by an upward extension 25 of the section 19 of the casing. The feed opening from front to rear, preferably exceeds the distance between adjacent high points of the pockets, as shown in Figures 2 and 3.

The sides of the discharge throat are formed by the forward extensions 13 of the sides 9 of the casing, and to insure smooth passage of the material handled through the throat, the section 18, with its lining 20a, terminates forwardly in a reversely curved lip 27, the section 19 above the throat, having a forwardly-projecting flange 28. A tubular section 29 is bolted to the reversely curved extension 27, and forms an extension of the throat, and secured in opposite sockets of the flange 28 and the top wall of the section 29, is a gasket 30 through which extends an arcuate gate 31, carried by a rocker frame 32, the latter being connected by links 33 to the lower ends of swing-bars 34, pivotally suspended from the external sides of the casing, and the swing-bars are equipped with bracket-carried rollers 35 riding upon a pair of cams 36 on and rotatable with the sleeve 4. The sleeve also carries gear wheels 37 to which suitable power mechanism, not shown, imparts slow rotation to effect movement of the rotor in the direction indicated by the arrows on Figures 2 and 3. In this rotation, the cams, through the engaging rollers 35, swing-bars, links and rocker frame, effect oscillatory movement of the gate, causing the same to move into the pockets as said rollers are moved outwardly toward the high points of the cams, the proper proportioning of the latter and the gate, resulting in the latter scraping downwardly frm the high or crest points of the pockets as the rotation of the rotor successively presents them for contact by the gate, the contour of the cams being such that the gate maintains frictional relation with the straight peripheral faces of the pockets to the bottoms thereof, at which time the rollers 35 having reached the related points of the cams furtherest from the axis thereof, and hence exert no power to continue movement of the gate. As the movement of the rotor is continuous, the bottoms of the pockets apply force to reverse the movement of the gate, and this withdrawal movement, through the rocker-frame, links and swing bars, causes the rollers 35 to move inwardly to the low points of the cams, attaining this position at the same time the gate reaches the rear high point or crest of the particular pocket.

The contour of the cams is such that the gate when fully advanced into a pocket, is substantially stationary until the rear crest of the engaged pocket has reached the pointed or free end of the gate, so that the latter shall fully evacuate the pocket of its contents, into the throat 13. The pocket charges are therefore utilized successively under the power of the rotor, to keep the material passing through a tapered nozzle 38 to a distributing pipe, not shown, leading to a more or less remote point of delivery.

To insure continuous gravitative passage of the contents of the hopper through the feed opening and into the successively presented pockets of the rotor, an agitator 39 within the hopper is mounted on a shaft 40, and the latter is operated by any suitable means, such as pulleys on the rotor and agitator shafts, and a belt connection on the pulleys, the pulleys and connection belt being omitted as a conventional power transmission mechanism.

It will be noted that there is practically no frictional resistance offered by the stationary sides of the casing to the rotation of the rotor, as, when once in a pocket, the material never again contacts the casing sides until it is forced out of the pocket and enters the discharge throat. In the interim between entering and leaving the pocket, the only contact with a stationary part, is momentarily with the compressible block to guard against the chance of a jamb at that point, and that with the wear plate 20a.

From the above description and drawings, it will be apparent that I have produced a mechanism embodying all of the features of advantage set forth as desirable; and it is to be understood that while I have described and illustrated the preferred embodiment, I reserve the right to all changes within the spirit and scope of the appended claims.

I claim:

1. In a rotary pump, a base, parallel beams at opposite sides of the base, a shaft journaled on the beams, a sleeve on the shaft between said beams, a circular rotor secured on the sleeve, comprising a series of similar peripheral pockets and rings forming sides for the pockets, a casing for the rotor having circular openings snugly receiving said rings and secured to said base and providing entry and exit openings for material supplied to and discharged from the said pockets, rings secured to the base and flanking and bridging the joints between the rotor sides and the first-named openings, gasket rings carried by said flanking rings and closing the joints between the rings forming the sides of the rotor and the circular casing openings receiving said sides, the casing of the rotor including arcuate sections above and below the rotor and spaced apart at their ends to form the entry and exit openings for the rotor pockets, the inner sides of said sections being in close proximity to the perimeters of the ring-shaped sides of the rotor, a feed hopper communicating with said entry opening, a material discharge tubular member communicating with the said exit opening, an arcuate oscillatory gate projecting into the rotor casing and closing the space between the rotor and the upper side of said tubular member, a linkage connecting the gate with the rotor casing, a pair of cams on the said shaft, at opposite sides of the rotor casing and provided with lobes in radial planes intersecting the mid points of the rotor pockets, and a pair of rollers carried by the said linkage for engagement by said lobes to cause the gate to enter a pocket and scrape half the bottom of the pocket and be reversely operated under pressure applied by the remainder of the bottom of the pocket.

2. In a rotary pump, a base, bearings at opposite sides of the base, a horizontal shaft journaled on said bearings, a rotor mounted on the shaft, having peripheral pockets, the sides of the pockets being in the form of rings of the same diameter as the maximum diameter of the pockets through opposite high points thereof, a casing having circular openings closely receiving the ring-shaped sides of the pockets; said casing comprising rings in fixed relation to and flank-

ing the base and the said circular openings, and a pair of arcuate sections below and above the rotor respectively, and spaced apart at their ends to provide entry and exit openings, a bracket superposed upon the section underlying the rotor, an elastic block carried by said bracket in close proximity to the perimeter of the rotor sides and susceptible of yielding to pressure applied by material interposed between it and the rotor, to avoid clogging of the rotor, and means for evacuating material from the pockets as they successively register with the said exit opening.

WALTER L. HART.