

[54] **POSITIVE DISPLACEMENT PUMP**

[75] Inventors: **Henry P. Clouts**, Oconomowoc;  
**James A. Neumann**, East Troy, both  
of Wis.

[73] Assignee: **Waukesha Foundry Company, Inc.**,  
Waukesha, Wis.

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[51] Int. Cl. .... **F01c 1/18**

[58] Field of Search ..... **418/206**

[56] **References Cited**

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*Primary Examiner*—C. J. Husar

*Attorney, Agent, or Firm*—Wheeler, Morsell, House &  
Wheeler

[57]

**ABSTRACT**

Parallel pump shafts are inter-gearred to rotate in opposite directions having 90° offset arcuate heads of crescent form as in Roots pumps, the periphery of each head having a close approach to a bearing support for the opposing head, there being a unique port design which permits axial and radial flow into the area where volumes are being created and destroyed, the object being to eliminate undesirable hydraulic effects, particularly cavitation.

**3 Claims, 4 Drawing Figures**

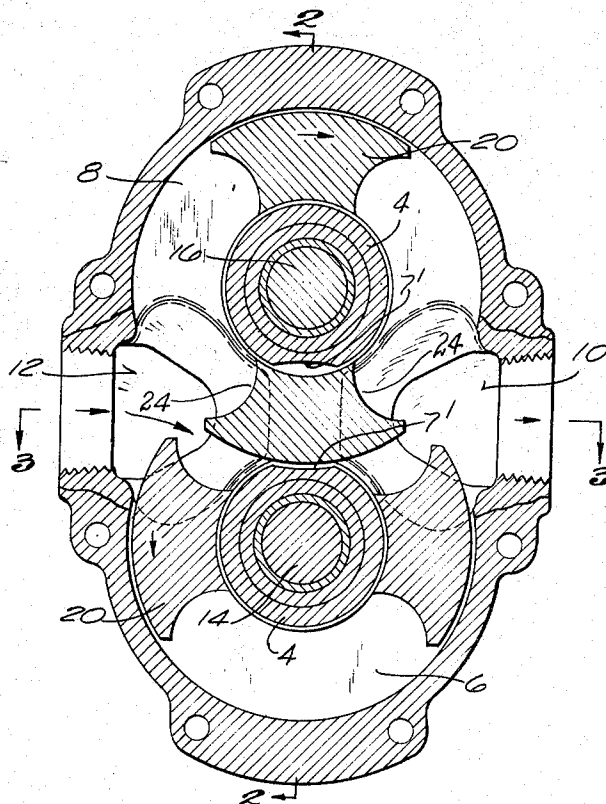


Fig. 2

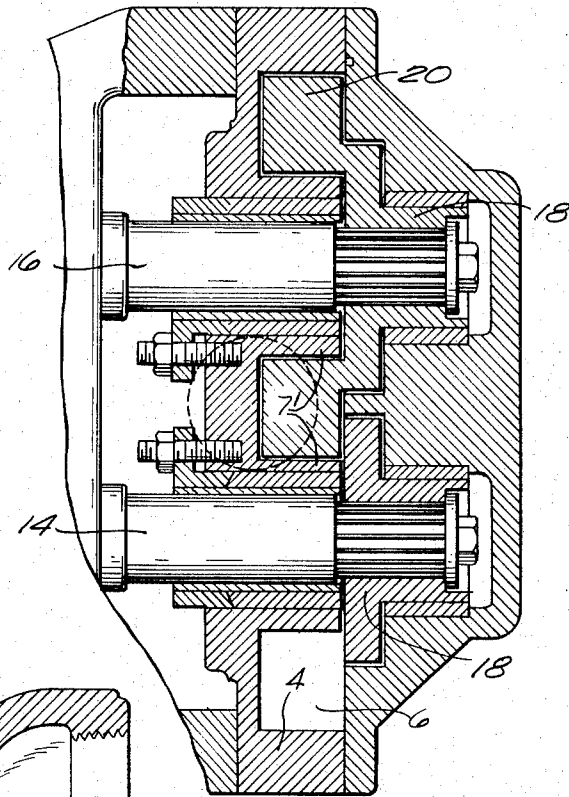


Fig. 3

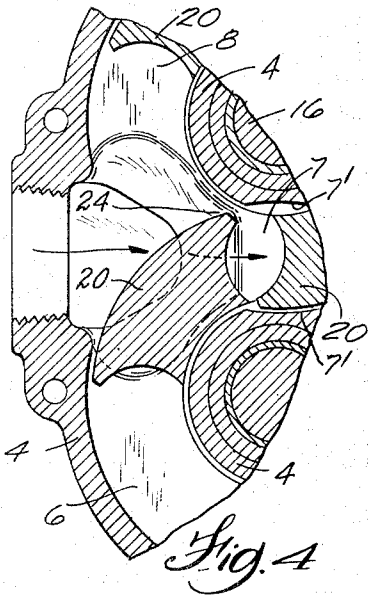
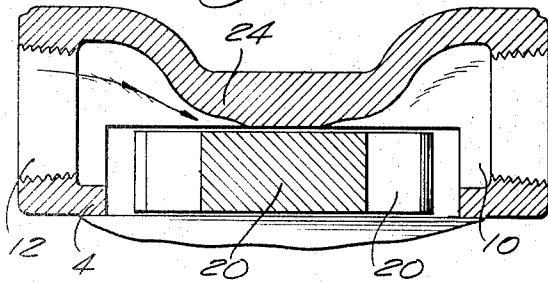


Fig. 4

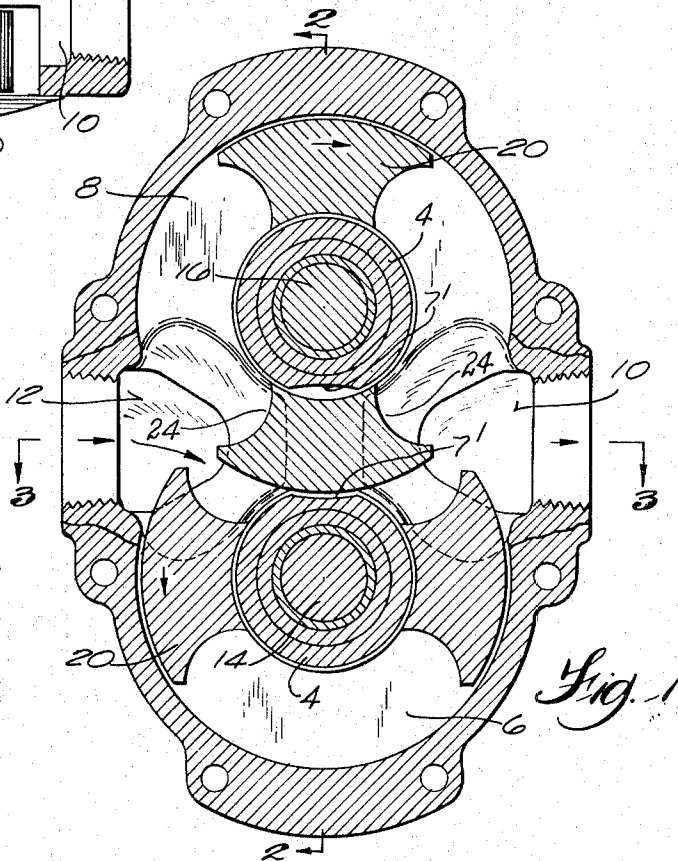


Fig. 1

## POSITIVE DISPLACEMENT PUMP

## SUMMARY OF INVENTION

The pump has advantages of a rotary pump in smooth flow, high volumetric efficiency, low shear, low velocity and wide viscosity range, yet being made in substantial part of ductile iron. The parts have great wear life, lower cost than stainless steel, are non-lubricating and only mildly corrosive or abrasive. The ports are particularly important being high flow generally, but in particular they extend to the side of the plane in which the heads rotate to the area in which the paths of the tips of the periphery of each crescent shaped head diverges from the fixed bearing support (see FIGS. 1, 3 and 4) so that in the areas where volume is first created and last destroyed axial flow is available in addition to flow around the tip in the exceedingly narrow gap to the bearing support (FIG. 4). This greatly assists in avoiding extreme pressure changes causing cavitation. Thus applicant provides a pump with no rotor-to-rotor contact, close running clearances and high efficiency and a wide range of speeds.

## IN THE DRAWINGS

FIG. 1 is a view through the pump casing in transverse section.

FIG. 2 is a view taken in section in the lines 2—2 of FIG. 1.

FIG. 3 is a view taken in section on the line 3—3 of FIG. 1.

FIG. 4 is a fragmentary view similar to FIG. 1 except that the impellers have rotated to a critical point where it is important to relieve cavitation.

The pump casing 4 comprises intersecting chambers 6 and 8 communicating with ports 10 and 12 which may comprise interchangeable inlet or outlet ports according to the direction of rotation of the shafts 14 and 16. Each of the shafts carries a rotor comprising well-defined hub and impeller parts 18 and 20 respectively, each impeller being crescent shaped and being 90° angularly offset with respect to the other impeller, hubs 18 being offset out of the plane of chambers 6 and 8 as shown in FIG. 2. The casing 4 includes a stationary bearing support at the center of each of chambers 6 and 8 for shafts 14 and 16, between which is the area 7 in which chambers 6 and 8 intersect. The bearing supports may desirably be relieved at 7' to provide a larger area of the bearing support adjacent to heads 20, as shown in FIG. 2.

It is always a problem in a pump of this character to eliminate cavitation. The present pump accomplishes this result by the way in which the inlet and outlet ports 10 and 12 communicate with the pump chambers 6 and 8, attention being called to FIGS. 1 and 2. FIG. 2 shows how the rotors come close to the inwardly concave wall 24 without actual contact, attention being called to FIG. 2. The flow comes across the apices in a generally axial direction instead of being obliged to make its way peripherally around the apex. The unique port design as shown permits both axial and radial flow into the area which would otherwise be constricted. As best shown in FIGS. 1 and 4, the ports extend to the area axially adjacent the point where the path of the periphery of a head 20 leaves the bearing support surface 7'. FIG. 4 has a broken arrow indicating how fluid enters the increasing volume between heads 20 axially at this position. At the other side of intersecting chamber portion 7 volume is destroyed and fluid leaves by an axial path.

## We claim:

1. A positive displacement pump with reduced cavitation and improved volumetric efficiency having twin counter-rotating shafts with crescent-shaped heads mounted on said shafts and staggered from each other to successively pass through the space between said shafts, a fixed bearing support around each said shaft adjacent the periphery of the path of the heads on the other shaft, and a casing having separate intersecting chambers between said shafts in substantially the same plane swept by said heads and having opposed inlet and outlet ports which are scoop-shaped having wall surfaces extending over the plane of the axial walls of said chambers to the zone of intersection whereby said ports permit axial flow into said zone, said ports terminating outside of the space between said shafts whereby to seal adequately.

2. A pump according to claim 1 in which such ports extend past the plane of the axial wall of the chamber at a single side of the casing.

3. A pump according to claim 1 in which a wall portion of the intersection of said chambers is a bearing support, and the shape of the ports is such as to permit axial flow between the ports and the space enclosed by successive heads passing through the intersecting portion of the chambers between the shafts at the point where the path of a tip of a crescent-shaped head begins receding from proximity with a said bearing support.

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