

Aug. 26, 1947.

A. WAHLE

2,426,539

COMPOUND ROTARY PUMP

Filed Aug. 21, 1945

2 Sheets-Sheet 1

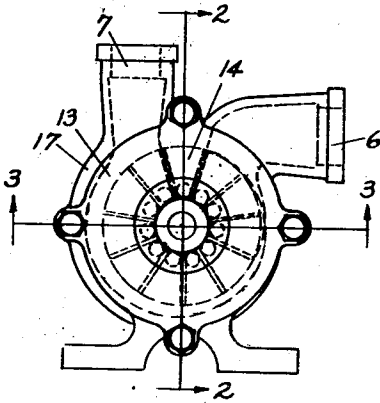


Fig. 1

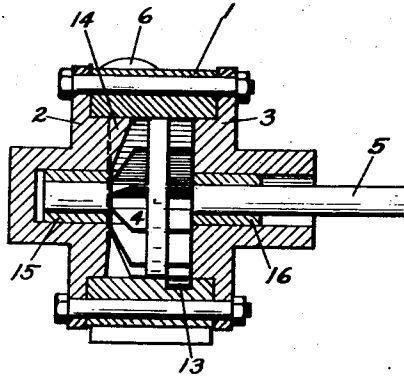


Fig. 2

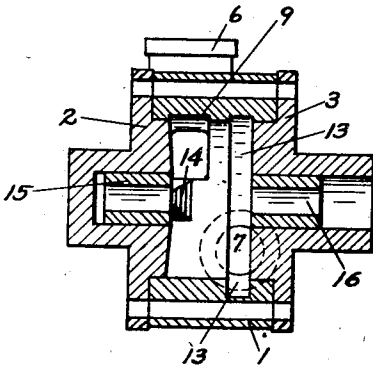


Fig. 3

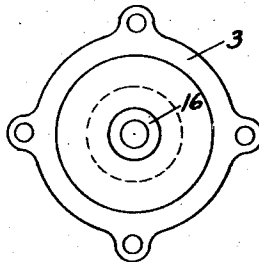


Fig. 4

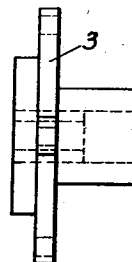


Fig. 5

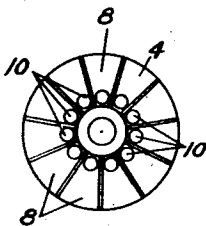


Fig. 6

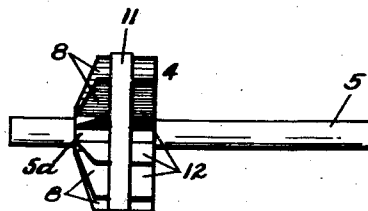


Fig. 7

INVENTOR.

ADOLPH WAHLE

BY

Merrill M. Blackburn.

Att'y.

Aug. 26, 1947.

A. WAHLE
COMPOUND ROTARY PUMP

2,426,539

Filed Aug. 21, 1945

2 Sheets-Sheet 2

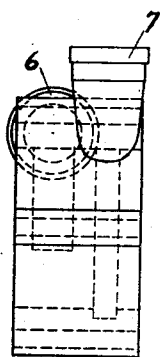


FIG. 8

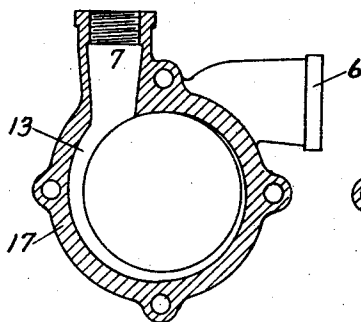


FIG. 9

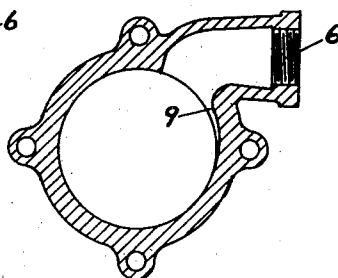


FIG. 10

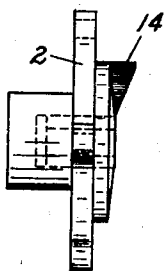


FIG. 11

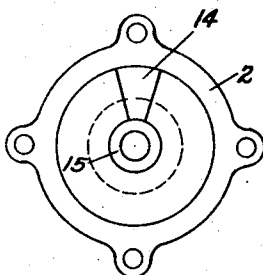


FIG. 12

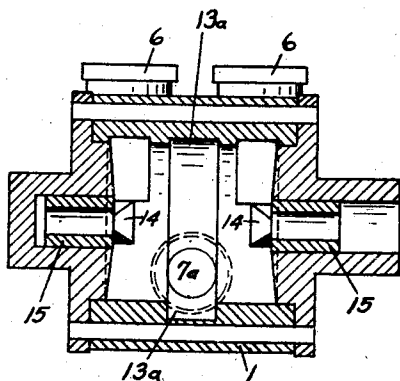


FIG. 13

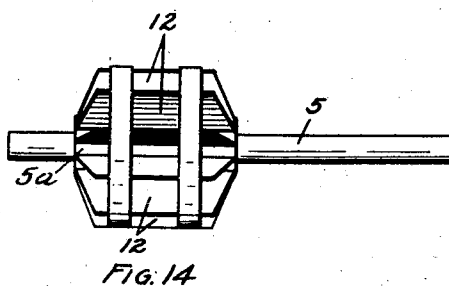


FIG. 14

INVENTOR.
ADOLPH WAHLE
BY
Merrill M. Blackburn
Atty.

UNITED STATES PATENT OFFICE

2,426,539

COMPOUND ROTARY PUMP

Adolph Wahle, Davenport, Iowa, assignor of one-half to W. H. Martin, Davenport, Iowa

Application August 21, 1945, Serial No. 611,863

9 Claims. (Cl. 103—5)

1

My present invention relates to rotary pumps of the type in which the rotor has a transverse web perpendicular to the axis of rotation and in which blades or vanes extend outwardly substantially radially from the rotor hub and are connected thereto and to the transverse web. It relates to a pump in which a turbine type of pump is staged to a centrifugal type of pump.

Among the objects of this invention are the provision of an improved pump of the type stated; the provision of a pump of the type indicated having increased efficiency over prior structures of this kind; the provision of a pump of the type stated in which a regenerative turbine pump and a centrifugal pump are connected in serial relation in a single structure; and such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the structure disclosed herein. My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings and, while I have shown therein what is now regarded as the preferred embodiment of this invention and a modification thereof, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents a side elevation of a pump embodying my present invention;

Fig. 2 represents a vertical longitudinal section substantially along the plane indicated by the line 2—2, Fig. 1;

Fig. 3 represents a horizontal longitudinal section substantially along the plane indicated by the line 3—3, Fig. 1;

Fig. 4 represents an inside face elevation of one of the heads of this pump;

Fig. 5 represents an edge view of the structure shown in Fig. 4;

Fig. 6 represents an end view of the rotor;

Fig. 7 represents the rotor in side elevation;

Fig. 8 represents an elevation of the body of the pump as viewed from the left in Fig. 9;

Figs. 9 and 10 represent transverse sections of the structure shown in Fig. 8 taken, respectively, along the axis of the outlet and the inlet of the pump;

Fig. 11 represents an edge view of the head at the inlet side of the pump;

Fig. 12 represents a face view of the structure shown in Fig. 11;

Fig. 13 represents a longitudinal section of the body and heads of a double pump in accordance with this invention; and

2

Fig. 14 represents an elevational view of the rotor used in a pump of the type shown in Fig. 13.

This pump comprises essentially a body 1, heads 2 and 3, and a rotor 4 carried by a shaft 5. As has been indicated, the body 1 has heads 2 and 3 provided with protruding portions which extend interiorly of the body and fit closely therein. There is shown a water intake connector at 6 and an outlet at 7. Therefore water entering at 6 goes in between the vanes or blades 8 of the rotor and tends to travel around with the rotor. Because of the size of the inlet 6 and the presence of the channel 9 in the body 1, a greater body of water moves with the rotor than can be accommodated in the compartments formed between the vanes 8. Therefore, there is a tendency to put pressure upon the entrapped water, and a part of the water is forced through the openings 10 in the transverse web 11, being received in the compartments or cells 12 on the opposite side of web 11. Continued rotation of the rotor tends to force the water out centrifugally into the channel 13 formed in the inside of the body wall. This channel goes almost completely around the inside of the body, gradually getting deeper as it approaches the outlet 7. This accumulates water thrown off centrifugally by the rotor and permits the passage of more water through the holes 10 in the central web. From this it will be seen that the rotor draws water in through the opening 6, forcing it through the openings 10 into the compartments 12, and from here outwardly into the channel 13 and out of the outlet 7, by centrifugal force.

In order to keep the water on the intake side of the web or partition 11 from circulating around with the rotor, stop member 14 is formed on the inner face of the head 2. This stop member has a close running fit with the blades on the intake side of the rotor. It is somewhat wedge-shaped and is of a width to cover the edges of two adjacent vanes and the compartment located between them. As is clear from Fig. 1, the stop is so positioned that it cuts off the circulation of the water at the rearward side of the inlet and forces it to go out through the openings 10 into the compartments 12.

On account of the channel 13 in the wall of the body member, it is necessary that this wall be reinforced by an external enlargement, this being shown at 17 in Fig. 1. This is also shown clearly in Fig. 9. Bearings 15 and 16 are located in the two heads 2 and 3, respectively, to furnish a proper support for the shaft 5. Upon this shaft 5 is mounted the rotor having a hub 5a.

3

In the modified structure shown in Figs. 13 and 14, there is disclosed a double pump with a set of receiving compartments at each end and, in the middle, a set of compartments 12 of double the size of the corresponding compartments in Fig. 7. The outlet 1a is also larger than the outlet 7 since it must carry the water from the double capacity rotor. The channel in the inner face of the body wall is indicated in Fig. 13 by the numeral 13a and is shown as being wider and having a larger carrying capacity than the corresponding channel 13 of the previously described construction. Except for the two inlets in place of one, the operation is the same in the two constructions.

It will of course be understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention as set forth herein and in the appended claims.

Having now described my invention, I claim:

1. A pump of the type described comprising a casing having a substantially cylindrical bore and inlet and outlet openings thereto and therefrom, said openings being offset relatively to each other longitudinally of the casing, said pump having a rotor mounted substantially axially of the casing, the inner cylindrical wall of the casing having channels formed therein leading from the respective openings, the planes of the channels being substantially perpendicular to the axis of the casing, the head at the inlet end of the casing having a stop projecting inwardly substantially into contact with the rotor, said stop being located adjacent the inlet opening and rearwardly therefrom with reference to the direction of rotation of the rotor, the channel corresponding to the inlet opening having a decreasing cross-section as it recedes from the inlet opening, the rotor comprising a supporting and driving shaft and a hub provided with substantially radially extending blades and a substantially circular web rigidly connected to the rotor hub, perpendicular thereto and dividing the casing into unequal compartments, said web having openings therethrough between the blades and closely adjacent the hub, the channel leading to the outlet increasing in cross-section as it approaches the outlet opening.

2. A pump of the type indicated comprising a casing and a rotor rotatably mounted therein, the casing having an inlet and an outlet in its peripheral wall and heads in its opposite ends, the head in the inlet end having a stop projecting inwardly into proximity to the rotor and occupying substantially the entire space between the rotor and the head corresponding to a limited part of the internal peripheral surface of the casing at the inlet end of the casing, the inlet and outlet openings being staggered both longitudinally and transversely of the casing, the stop being located adjacent the inlet, the internal peripheral wall of the casing having a channel of decreasing cross-section extending from the inlet opening forwardly in the direction of rotation of the rotor, there being in the internal peripheral wall of the casing a channel of increasing cross-section leading to the outlet opening, the rotor having a divider web integral with its hub transversely thereof and extending outwardly into close proximity to the casing wall, the web dividing the casing cavity into unequal compartments, the web having openings therethrough connecting said compartments, the rotor having blades extending outwardly substantially radially, the

4

blades being located between the openings through the web.

3. In a rotary pump, a housing for the reception of a rotor, a rotor comprising a shaft, a transverse web, and a plurality of substantially radial blades, said web being located approximately midway between the ends of the housing, said web having openings therethrough between the blades and in proximity to the hub, said housing having an inlet on one side of said web and an outlet on the opposite side of the web, the side of the pump into which the inlet opens functioning as a turbine pump and the other side functioning as a centrifugal pump.

4. A pump of the type indicated having a casing provided with peripheral inlet and outlet openings and a rotor mounted for rotation therein, said casing having heads, one of said heads being spaced from the rotor and having an inwardly projecting stop member located closely adjacent the inlet opening to prevent circulation of water with the rotor in the space between the rotor and the adjacent head, the stop member extending inwardly from the head substantially into contact with the rotor, the internal peripheral wall having a channel of diminishing size leading from the inlet opening in the direction of rotation of the rotor, the rotor having a web provided on its opposite faces with radial blades, extending, with the web, substantially into engagement with the inner peripheral face of the casing, said web being provided with holes connecting the compartments between adjacent blades upon opposite sides of the web, said holes being located in the angles between the blades and serving to convey water from the inlet to the outlet.

5. A pump of the type indicated having a casing provided with peripheral inlet and outlet openings and a rotor mounted for rotation therein, said casing having heads, one of said heads having an inwardly projecting stop member located closely adjacent the inlet opening to prevent circulation of water with the rotor in the space between the rotor and the adjacent head, the internal peripheral wall having a channel of diminishing size leading from the inlet opening in the direction of rotation of the rotor, and the internal peripheral wall having a channel of increasing size leading in the direction of rotation of the rotor to the outlet opening, the rotor having a web dividing the casing compartment into substantially equal compartments and being provided with transverse openings connecting the compartments upon opposite sides of the web.

6. In a pump of the type indicated, a casing having an internal peripheral surface of approximately cylindrical form, removable heads closing the ends of said casing, a rotor having a shaft rotatably mounted in said heads, said casing having a peripheral outlet and at least one peripheral inlet staggered with relation to the outlet, said rotor having a hub and the hub having blades extending outwardly substantially radially therefrom parallel with the rotor shaft, and at least one web extending outwardly from the hub into close proximity to the inner peripheral surface of the casing, said web having transverse openings connecting the compartments, upon opposite sides thereof, said transverse openings being located between the blades closely adjacent the hub.

7. In a pump, a hollow body of approximately cylindrical form, internally, a rotor therein, said rotor comprising a shaft-supported hub, a web

5

extending radially outward from said hub into close proximity to the body wall and dividing the space within the body into unequal chambers, and blades radiating from said hub secured to said web, the blades including between them tapering compartments, said web having openings therethrough adjacent the hub connecting the compartments on opposite sides of the web, there being, between the body, the blade edges, and the adjacent head, on the intake side of the pump, a channel which is V-shaped in cross-section, and a stop in said channel adjacent the intake opening and having a size and shape to substantially block the space between said head and a passing blade, the channel on the opposite side of the web, in which the blades revolve about the shaft, being rectangular in cross-section.

8. In a pump of the type described, a hollow body of approximately cylindrical form inside, a rotor rotatable therein, said rotor having a hub and radial blades, said rotor including as a part thereof a web extending transversely of the rotor shaft and dividing the body cavity into unequal chambers, a stop in the larger chamber between the rotor and the pump head at the side of the pump, said pump having an intake opening into the body cavity closely adjacent the stop on the forward side thereof, the blades upon opposite sides of the web having substantially equal surfaces exposed to the fluid being pumped, there being between the edges of the blades and the head at the intake side of the web a chamber which is approximately triangular in cross-section, said web being provided with fluid passages, between the blades and adjacent the rotor hub,

6

which connect the chambers upon opposite sides of the web, the blades upon the inlet side of the web being trapezoidal in form and those upon the opposite side thereof being substantially rectangular.

9. In a pump, a hollow body of approximately cylindrical form, internally, a rotor therein, said rotor comprising a shaft-supported hub, a web extending radially outward from said hub into close proximity to the body wall and dividing the space within the body into unequal chambers, and blades radiating from said hub secured to said web, the blades including between them tapering compartments, there being, between the body, the blade edges, and the adjacent head, at one side of the web, a channel which is V-shaped in cross-section, and a stop in said channel of a size and shape to substantially block the V-shaped channel between said head and a passing blade, the channel on the opposite side of said web, in which the blades revolve about the shaft, being rectangular in cross-section.

ADOLPH WAHLE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,861,839	Burks	June 7, 1932
1,162,848	Brush	Dec. 7, 1915
1,418,040	Trane	May 30, 1922
1,973,669	Spoor	Sept. 11, 1934