July 26, 1938. H. FÖTTINGER 2,124,914

ROTATING BOWL PUMP

Filed July 5, 1934 2 Sheets-Sheet 1

Fig. 1

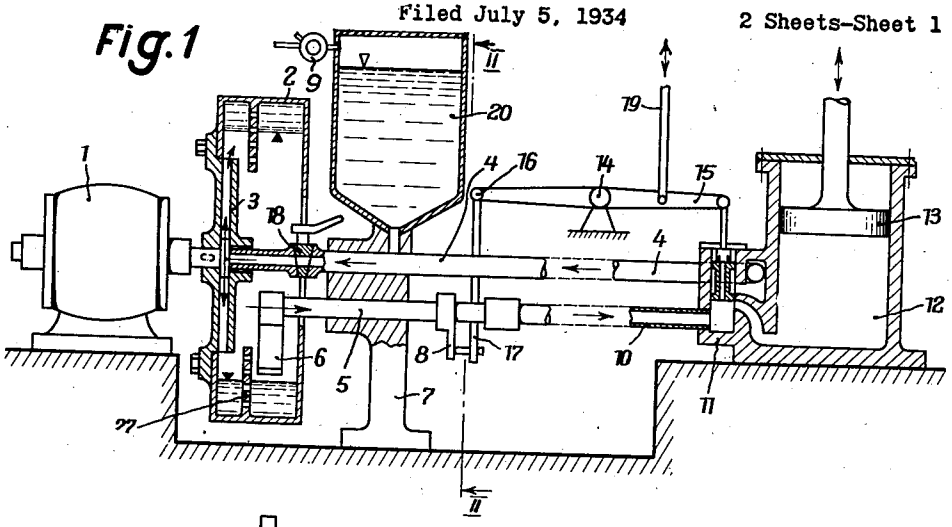


Fig. 2

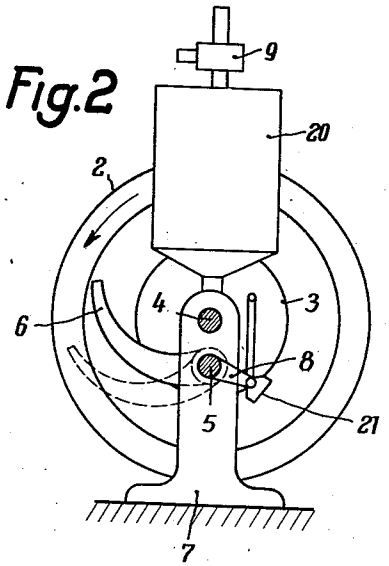


Fig. 3

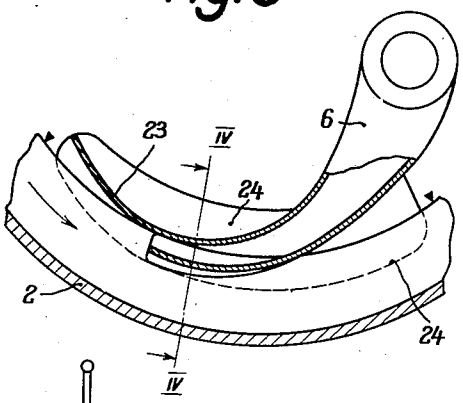


Fig. 5

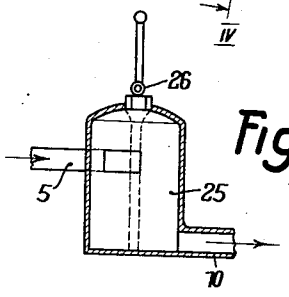
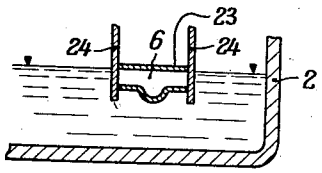


Fig. 4



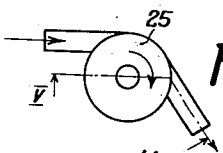


Fig. 6

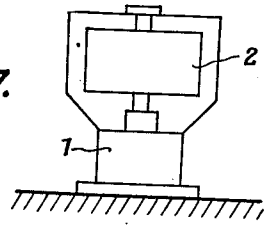
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Filed July 5, 1934 2 Sheets-Sheet 2

Fig.7.



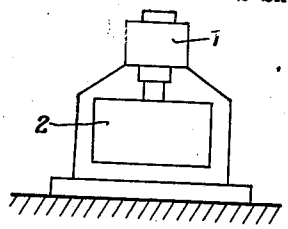


Fig.8.

Fig.9

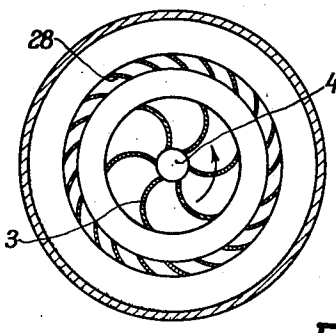


Fig.10

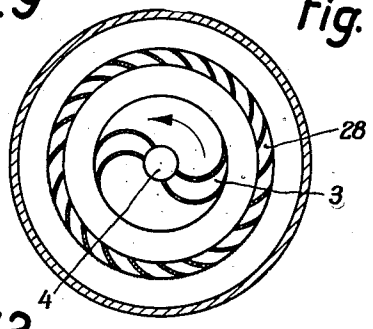


Fig.13

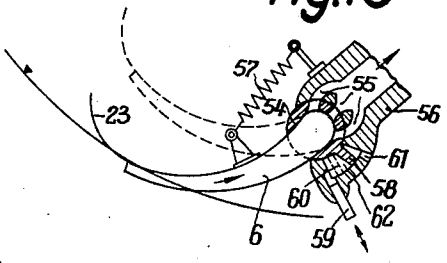


Fig.12

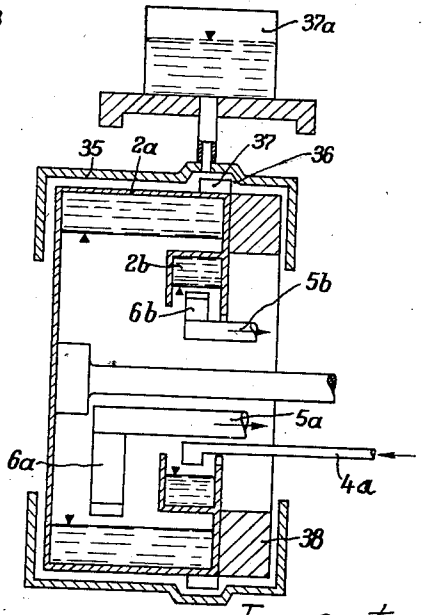
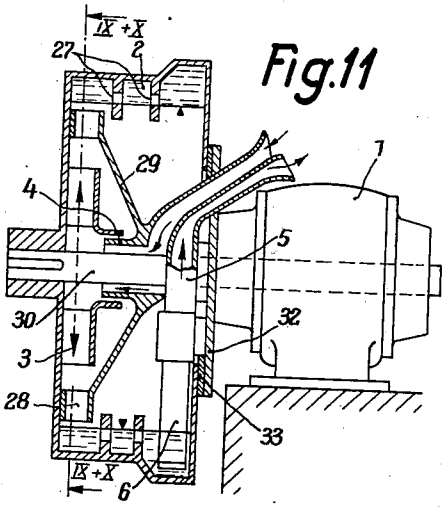


Fig.11



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UNITED STATES PATENT OFFICE

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ROTATING BOWL PUMP

Hermann Föttinger, Berlin-Wilmersdorf, Germany

Application July 5, 1934, Serial No. 733,930
In Germany July 7, 1933

3 Claims. (Cl. 103—101)

The present invention relates to a pump for scooping liquids from rotating liquid rings. The pump according to the present invention comprises a swingable scooping pipe having a hydroplane surface which has a curved portion becoming tangent to the top of the entry end of said pipe, whereby the surface will glide on the liquid ring.

Pumps for scooping liquids from rotating liquid rings are already known, but the scooping pipe of the known construction is not swingably mounted and does not include an equivalent of a hydroplane surface whereby the pipe will glide on the fluid ring.

A further object of the present invention is that lateral surfaces are provided one on each side of the pipe to keep down the wave action on the liquid ring when the pipe dips into the ring.

A still further object of the invention is to provide an air container connected to the scooping pipe to receive any entrapped air from the liquid scooped by the pipe.

Fig. 1 is a partial section through a device with a working space corresponding to a type of pump.

Fig. 2 shows a side elevation thereof partly in section on line II—II of Fig. 1, as seen from the right.

Fig. 3 is a partial section of scooping device provided with a diffuser.

Fig. 4 is a section on line IV—IV of Fig. 3.

Figs. 5 and 6 are vertical and horizontal sectional views of an air separation device.

Figs. 7 and 8 are side views showing accumulators with vertical axes.

Figs. 9 and 10 are sectional views of suitable feeding or pumping devices, taken at right angles to the axes thereof.

Fig. 11 is a section through the accumulator itself with a built-in guide device and a side elevation of the motor.

Fig. 12 shows a sectional view of an accumulator with a plurality of single tanks and delivery means.

Fig. 13 is a partial sectional view of the scooping device of Figs. 2 and 3 but provided with a power control for engagement and disengagement which may be automatic.

In Fig. 1 the shaft of the motor 1 carries the rotating power accumulator 2 with the pumping device 3, the supply pipe 4, the delivery pipe 5 and the scooping device 6, pipes 4 and 5 being mounted on the stationary standard 7. By the lever 8 the said scooping device can be rocked together with its pipe 5. From this delivery pipe 5 the liquid flows through the stationary pipe 10 into the working cylinder 12 where it raises the piston 13 for accomplishing its work for any of the purposes stated.

When the control valve 11 is reversed manually or by any automatic mechanism by means of the control rod 19 and the lever 14, 15 for the discharge of the working cylinder 12 and when moreover, by lever 14, 16 and link 17, the scooping device 6 is withdrawn from the power storage water ring, the piston 13 will, by its own weight or under the pressure of a spring or compressed air, force back the liquid through the supply pipe 4, and in this form of the device through a throttling device 18 interposed, into the pumping device 3 and thus into the accumulator.

The throttling device is provided in order that the motor may not be overloaded when the liquid flows back from 12 into 3 intermittently.

The excess of the liquid forced away by the piston 13 as compared with the amount of liquid allowed by the throttling device 18 to pass into the accumulator 2 then temporarily finds its place in the compensating chamber 20 until it is also permitted to pass into the accumulator through 18. The compensating chamber 20 may also be charged by a three-way cock 9 with compressed air or the like.

In Fig. 2 the scooping tube 6 is designed according to the invention as a slightly tapered diffuser; the position shown by dotted lines being that existent after a partial discharge of the accumulator. For definite purposes the lever 8 of the scooping device may be provided with a counterweight 21 or another suitable element, such as spring 57 (Fig. 13), pressure piston 58 or the like, which withdraws the scooping tube 6 dependent upon a definite degree of discharge of the accumulator, preferably automatically, from the liquid so as to render it absolutely free from resistance, whereby practically the no-load losses are reduced to nil.

Figs. 3 and 4 show an improved scooping device by way of example. At the orifice of the said device 6 the relative flow exerts a very substantial dynamic pressure which tends to press the scooping device below the level of the liquid. In order however, that this may be prevented beyond a definite degree, device 6 is e. g. provided with a hydro-plane-like surface 23 on which the flow exerts a contrary torque. The development of waves may be diminished by the scooper 6, 23 being provided with lateral surfaces 24, which may be perforated if desired, or similar means which e. g. damp the waves by perforated baffles, permeable strainers or the like. Also the ac-

cumulator tank itself may be provided with this type of permeable surfaces **27** (Figs. 1 and 11).

The air which may be carried along into the scooper can be separated out prior to its entrance into the working chamber according to Figs. 5 and 6 by means of an air vessel **25**, preferably centrifugally (production of a circulation) towards the center line and either discharged by discharging means **26** or utilized as compressed air for any useful purpose.

According to Figs. 7 and 8 the center line of the accumulator **2** may also be disposed vertically either above or below the motor **1**.

A particularly important part of the present accumulator is the feeding device or pump **3** for the liquid. According to the invention it is intended for supplying the liquid, for the reason already stated, as far as possible only with the kinetic energy existing in the accumulator, and with the maximum efficiency. Suitable designs are shown in Figs. 9 and 10, in which **4** is the feeding device and **3** the pumping device, the latter being represented in Fig. 9 as a plain action pump and in Fig. 10 as a reaction pump, but in either instance with free discharge into the atmosphere and forward outflow in the direction of revolution of the curved arrow. In order that the liquid supplied may be brought into the liquid ring as free as possible from impact and loss, stationary guide devices **28** may be provided according to the present invention which may be fastened to the supply pipe **4** by means of the disc **29** or the like. In this instance pipe **4** coaxially encloses the accumulator shaft **30**. The extension of the supply pipe **4** and of the discharge pipe **5** pass through the stationary cover **32** which latter seals the aperture of the rotating accumulator by means of a labyrinth packing ring **33**.

According to Fig. 12 also a plurality of dynamic storage tanks may be advantageously disposed within one another. For instance the outside main accumulator **2***a* may be used for producing large working forces in certain devices or machines (Fig. 1) while the interior storage tank **2***b* is to be used for the actuation of small working cylinders or other devices but chiefly for controlling and switching purposes. Accordingly there are available two scooping devices **6***a* and **6***b* and two discharge pipes **5***a* and **5***b*. The supply device **4***a* may at first advantageously supply the interior tank **2***b* entirely or partially, so that the same is always kept filled, as for controlling purposes.

In many cases of use it is desirable to avoid losses of the liquid as resulting from splashing, leakage, etc. To this end the accumulator may be enclosed, as shown in the top half of Fig. 12, by a casing **35** provided with a peripheral groove **36** in which even the smallest amount of leakage liquid is collected. According to the present invention the latter is projected or pumped off along this groove towards any suitable point, e. g. a collector **37***a* placed at a higher level, by small blade-like projections **37** of the rotating tank or simply by the friction of the roughened surface thereof.

In order that a decrease of speed, as resulting from a sudden supply of large amounts of liquid stored, may be restricted as much as possible, an ordinary flywheel **38** can be directly connected, according to Fig. 12, with the shell of the storage tank **2***a*.

The dynamic storage tank can also be advantageously used for damping angular vibrations of combustion engines.

When the accumulator is stopped the liquid ring collapses. If the depth of the water is sufficiently small, the whole amount of liquid will find its place in the bottom half of the tank. In case the quantities stored are larger, a part of the liquid may, according to the invention, be brought into otherwise revoluble spaces such as **2** (Fig. 1) and a part of it in always stationary spaces **20** of the entire set. This is always the case e. g. when the working space (as **12** in Fig. 1) is partly or entirely at a lower level than the center of the accumulator. Preferably, however, a stationary separate container **37***a* (Fig. 12) may be disposed outside the accumulator.

In Fig. 13 the scooping device **6** shown in Figs. 2 and 3 has been combined with a power control for automatic engaging and disengaging. As already described, the orifice of **6** is by the relative flow subjected to a very high dynamic pressure which tends to press the scooping device below the level of the liquid. The hydroplane-like surface **23** prevents this beyond a definite extent. The orifice of the scooping device will therefore always follow the level of the liquid of the revolving storage tank. When now the latter has been emptied, the pressure ceases to act on the orifice of the scooping device and the latter will be drawn by the spring **57** into the position marked by dotted lines in Fig. 13. The scooping device is provided with a rotary slide valve **54** so designed that during operation the liquid is allowed to flow freely through the discharge apertures **55** into the discharge pipe **56**. When inoperative (viz. in the position shown by dotted lines) the rotary slide valve **54** closes the discharge apertures **55** so that the pressure liquid is not allowed to return into the scooping device **6** from the working space thereto connected.

The rotary slide valve **54** is provided with a rotary piston **58** which is adapted to move within a pocket **62**. When it is intended to again place the scooping device **6** into service after the storage tank having been filled anew, the bottom half **60** of the pocket **62** is intentionally placed under pressure by the connecting pipe **59** by means of a control member so that the rotary slide valve together with the scooping device **6** can turn counter-clockwise until the orifice of the device **6** has been immersed in the rotating liquid ring. **61** is an opening intended for the removal of air or leakage water from the pocket **62** when the rotary slide valve is actuated.

I claim:

1. A pump for scooping liquids from rotating liquid rings comprising a swingable scooping pipe having a hydroplane surface having a curved portion becoming tangent to the top of the entry end of said pipe whereby the surface will glide on the liquid ring.

2. A pump for scooping liquids from rotating liquid rings comprising a swingable scooping pipe having a hydroplane surface at the top of the entry end thereof whereby the surface will glide on the liquid ring, and lateral surfaces one on each side of the pipe to keep down the wave action on the liquid ring when the pipe dips into the ring.

3. A pump according to claim 1, in which an air container is provided connected to the scooping pipe to receive any entrapped air from the liquid scooped by the pipe.

HERMANN FÖTTINGER.