Aug. 22, 1967 A. CONHAGEN 3,336,875

DEEP WELL PUMP

Filed Feb. 18, 1966 2 Sheets-Sheet 1

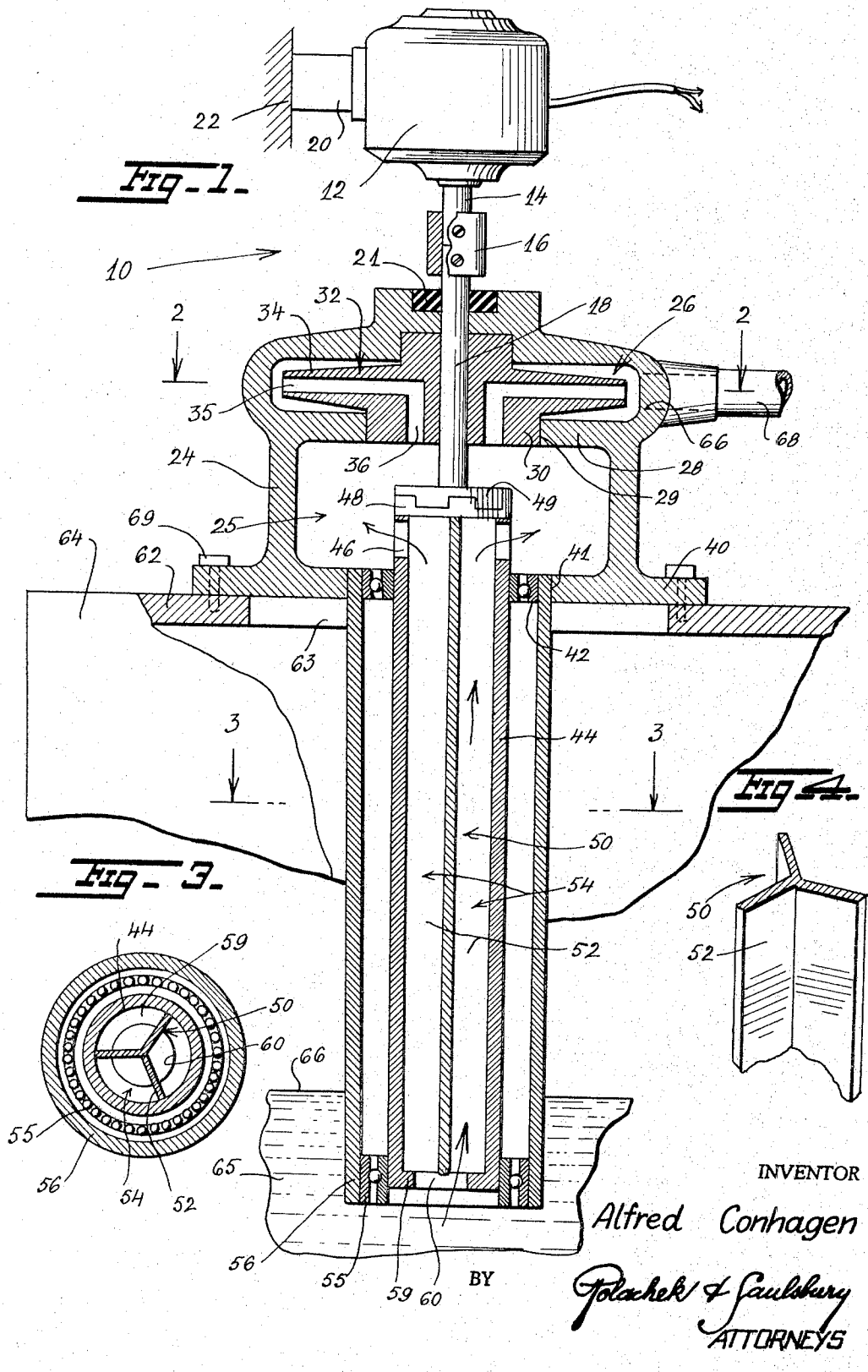


Fig. 1.

Fig. 3.

Fig. 4.

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Fig - 5.

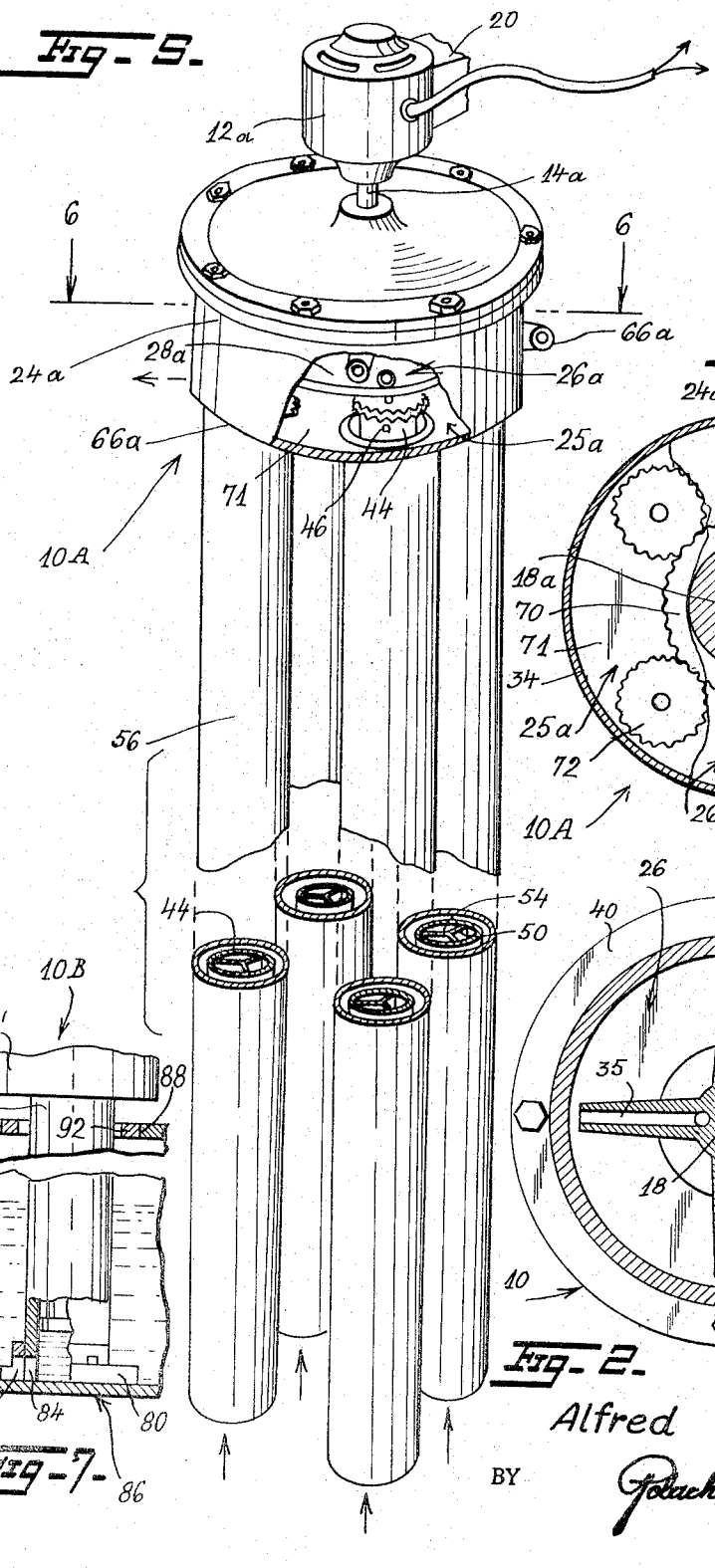
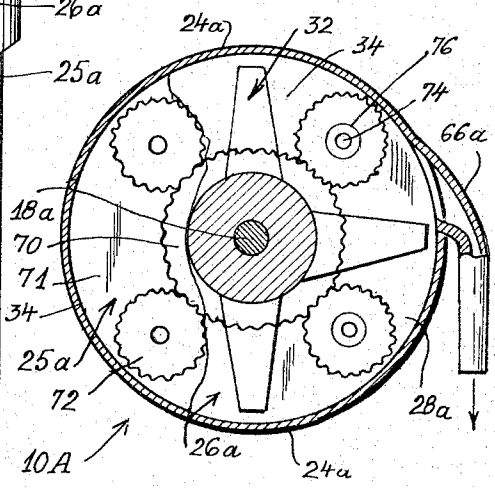


Fig - 7.

Fig - 6.



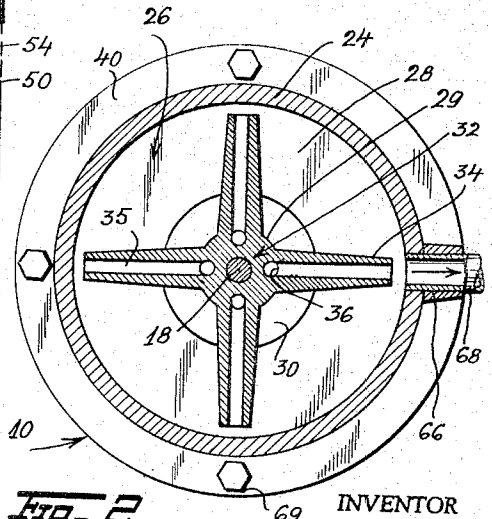


Fig - 2.

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3,336,875
DEEP WELL PUMP

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10 Claims. (Cl. 103—88)

This invention concerns a centrifugal pump adapted to pump liquids from wells or ship tanks without the aid of priming devices.

In the present pump the liquid is raised mechanically by centrifugal force and does not rely upon suction, screw type propellers, rotary cups, etc. The pump is arranged so that a minimum amount of turbulence and liquid friction is introduced.

According to the invention there is provided a rotary tube in which is a multiple wing partition defining passages which guide the liquid upwardly to a reservoir from which the liquid is expelled centrifugally to a rotatable expeller. The expeller discharges the liquid centrifugally under pressure from the reservoir. A plurality of rotary tubes can be disposed in parallel to multiply the pumping capacity of the pump.

It is therefore a principal object of the invention to provide a pump including a rotary tube divided by a partition into passages through which liquid is centrifugally expelled from a tank or well into a reservoir with a rotary centrifugal expeller for discharging the liquid from the reservoir.

A further object is to provide a pump as described with a stationary outer tube surrounding the rotary tube to support the same and to reduce turbulence and liquid friction in the tank and around the rotary tube.

Another object is to provide a pump including a plurality of stationary outer tubes and rotary inner tubes, with partitions in the inner tubes for passing liquid centrifugally from a tank to a common reservoir, with an expeller for discharging the liquid from the reservoir, and with a common prime mover operatively connected by gear means for driving the rotary inner tubes and expeller simultaneously.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

FIGURE 1 is a side elevational view partially in section of a pump embodying the invention,

FIG. 2 and FIG. 3 are horizontal sectional views taken on lines 2—2 and 3—3 of FIG. 1,

FIG. 4 is a fragmentary perspective view of a portion of a partition employed in the pump of FIG. 1,

FIG. 5 is a perspective view, with portions broken away, of another pump embodying the invention,

FIG. 6 is a horizontal sectional view taken on line 6—6 of FIG. 5, and

FIG. 7 is a reduced elevational view partially in section and with portions broken away of another pump embodying the invention.

Referring first to FIGS. 1–4, there is shown pump **10** provided with an electric drive motor **12** having an axially vertical drive shaft **18**. The motor is mounted in a stationary position by a bracket **20** secured to a stationary support **22**. The shaft **18** extends axially of a sealing ring **21** in generally cylindrical axially vertical casing **24** having a

lower reservoir chamber **25** and an upper liquid discharge chamber **26**. An annular horizontal partition **28** in the casing **24** separates the two chambers. Rotatably disposed in an opening **29** in partition **28** is the bottom cylindrical end **30** of a liquid expeller **32**. This member has four discharge nozzles **34** extending radially of the expeller axially horizontally and spaced circumferentially apart around the expeller. Passages **35** in the nozzles communicate with axially vertical inlet ports **36** in the expeller open at the top of the reservoir chamber **25**. The expeller **32** is secured to and rotates with shaft **18**.

The casing **24** has a bottom annular wall **40** in which is a central opening **41**. A thrust ball bearing assembly **42** engages the exterior of an axially vertical rotary tube **44** near its upper end. The upper end of the tube extends into the reservoir chamber **25** and is provided with a plurality of circumferentially spaced ports or openings **46**. The upper end of the tube is closed by a head **48** secured thereto and coupled by a fitting **49** to the lower end of shaft **18**. Affixed to the interior of tube **44** is a vertical partition **50** having three radially extending wings **52** defining three passages **54** through the rotary tube **44**.

The lower end of tube **44** is engaged by a thrust ball bearing assembly **55** near the lower end of a stationary cylindrical tube **56** which concentrically surrounds tube **44**. Tube **56** is open at top and bottom ends. Tube **56** at its upper end is secured to casing wall **40** in opening **41**. Thrust bearing **42** is secured in the upper end of tube **56**. Tube **44** has a bottom flange **59** with a central opening or port **60** which opens into the three passages **54** to admit liquid thereto.

The pump can be mounted on the upper wall **62** of a tank **64** containing liquid **65** with tube **56** extending through tank opening **63**. In order for the pump to be operative, the liquid level **66** must be above the bottom open end of tube **44**. When the electric motor **12** is energized, the expeller **32** and tube **44** with partition **50** are driven at high speed. Liquid enters the tube opening **60** and climbs up the narrow passages **54** from which it is expelled centrifugally through ports **46** into the reservoir chamber **25**. When the chamber **25** is filled, the liquid rises in expeller passages **36** and is then discharged through nozzles **34** centrifugally into chamber **26**.

From chamber **26** the liquid is discharged under pressure through outlet port **66** opening radially of the casing in chamber **26**. An outlet conduit **68** may be connected to port **66** to receive the discharged liquid.

It will be noted that the pump does not require suction to operate. It operates mechanically by centrifugal forces induced by the high speed of rotation of the tube **44** and expeller **32**. The tubes **44**, **56** can be any desired length depending on the lift of liquid required. Use of helically curved vanes, cups and other like mechanical lifting devices is avoided. The rotary tube **44** is radially spaced from liquid **65** by the stationary tube. This prevents turbulence and minimizes friction. The pump thus operates efficiently and is capable of continuous operation at any level of liquid, provided it covers the tube opening **60**.

The ball bearing mounting at the rotary tube **44** in stationary tube **56** insures free rotation without vibration. Bolts **69** may be used to secure casing wall **40** to the top of tank **64**.

In FIGS. 5 and 6 is shown another pump **10A** which is similar in principles of operation to pump **10** and corresponding parts are identically numbered. Pump **10A** has a plurality of axially vertical stationary pipes or tubes **56** which surround and support rotatable inner tubes **44**

spectively. Each of the tubes **44** is divided into passages **4** by a plural wing partition **50**. The tubes **56** are secured upper ends to the bottom **71** of casing **24***a* in circumrentially spaced positions. Casing **24***a* has one discharge onduit or nozzle **66***a* opening from chamber **26***a* in which peller **32** is located.

The pump has a drive motor **12***a* whose shaft **14***a* is oupled to shaft **18***a* which drives expeller **32** in chamber **6***a*. Shaft **18***a* supports and drives a main central drive ear **70** located in chamber **25***a* under partition **28***a*. Gear **0** in turn is engaged by four gears **72** at circumferential- spaced points supported by stub shafts **74** journaled in earings **76** in partition **28***a*. The upper ends of tubes **44** re journaled in bearings in the same manner as illustrated FIG. 1. The gears **72** are secured at upper ends of tubes **4** and may serve as closure heads above discharge openigs **46**.

By the arrangement described and illustrated in FIGS. and 6, liquid drawn up by rotary tubes **44** is discharged entrifugally via ports **46** into chamber **25***a*. The liquid nen passes through expeller **32** into chamber **26***a* from hich the liquid is expelled through nozzle **66***a*.

Pump **10A** operates like pump **10** in drawing water up hrough the inner rotary tubes **44** to the common reservoir hamber **2** and then through the expellers **32** to the discharge conduits or nozzles **66***a*. The motor **12***a* drives all xpellers and rotary tubes simultaneously, and the rotary ubes operate in parallel. Pump **10A** which has four tubes **4** as illustrated in FIG. 5 will have four times the capacity f pump **10** with only one tube **44**. A larger motor will f course be required to drive the expeller and tubes **44** f pump **10A**. The pumps **10** and **10A** can be made up in arious sizes to meet various pumping requirements. More r less than four tube assemblies **44**, **56** may be provided.

In FIG. 7 is shown pump **10B** which is similar to pumps **0** except in an upper floating mounting arrangement for xterior stationary tube **56'**. The bottom end of tube **56'** s provided with an annular flange **80** having circumerentially spaced radial slots **82** registering with slots **84** t the bottom end of tube **56'**. The flange **80** rests on the ottom **85** of the tank **86**. The upper end of the tube **56'** s connected to casing **24'**. The upper end of tube **56'** extends through an opening **88** in the upper wall **90** of the tank. A resilient buffer ring **92** is secured in the opening **88**. The tube **56'** is slightly spaced for the ring to provide annular clearance **94**. This clearance allows for movement of a ship in which the pump may be installed while pumping liquid **65'** out of the tank.

It will be understood that all the pumps described employ just one expeller operating in a chamber which receives liquid from a single common reservoir into which one or more rotating tubes centrifugally discharge liquid. The expeller may have any desired number of nozzles or vanes which may be other than four as illustrated in FIGS. 2 and 6. Instead of an electric motor drive, air or steam turbines may be used and will be preferred when pumping flammable liquids. Instead of a mounting bracket, some other type of mechanical support for the motor can be provided. In any case the construction should be such that the entire unit including motor, pump casing and tubes can be removed. If desired, a thrust bearing may be provided in the pump casing to help support the weight of the motor. Sleeve or drag bearings may be provided at the lower ends of the rotary tubes to permit them to find their own center of gravity. If desired the stationary outer tube can be secured to the top of the tank.

While I have illustrated and described the preferred embodiments of the invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

What is claimed is:

1. A centrifugal pump, comprising a stationary generally cylindrical axially vertical casing, said casing having a first partition therein dividing the casing into a lower reservoir chamber and an upper liquid discharge chamber, said liquid discharge chamber having an outlet port, said casing having a bottom wall with an opening therein, a first axially vertical tube secured nonrotationally to the bottom wall of the casing at said opening, a rotary axially vertical second tube disposed inside the first tube concentric and coaxial therewith, bearings at upper and lower ends of the second tube rotatably engaging the second tube to the first tube, said second tube at its upper end extending into said reservoir chamber, a multiple wing partition secured in and extending longitudinally of the second tube dividing the same into a plurality of narrow passages to admit liquid into said passages, said second tube having lateral ports at its upper end opening from said passages respectively into said reservoir chamber, a head at the upper end of the second tube closing the same, and drive means engaged with said head for rotating the same, whereby liquid is drawn up through said passages and discharged centrifugally into said reservoir chamber.

2. A centrifugal pump as recited in claim **1**, further comprising an expeller disposed in said discharge chamber and arranged to receive liquid under pressure from the reservoir chamber for discharging the liquid through the outlet port.

3. A centrifugal pump as recited in claim **1**, wherein said drive means comprises a motor driven drive shaft disposed axially vertical and connected to said head closing the upper end of the second tube, said shaft extending upwardly through said discharge chamber.

4. A centrifugal pump as recited in claim **3**, further comprising a motor having a shaft coupled to said drive shaft outside the casing.

5. A centrifugal pump as recited in claim **3**, further comprising an expeller rotatably disposed in said discharge chamber and connected to said drive shaft so that the expeller is rotated thereby, said expeller having axially extending ports opening into said reservoir chamber to receive liquid therefrom and radially extending other passages connected to said ports for discharging liquid centrifugally into the discharge chamber under pressure, whereby the liquid passes out of said outlet port.

6. A centrifugal pump as recited in claim **5**, further comprising a motor having a shaft coupled to the drive shaft outside the casing.

7. A centrifugal pump as recited in claim **2**, further comprising a third axially vertical tube secured nonrotationally to the bottom wall of the casing, a rotary axially vertical fourth tube disposed inside the third tube concentric and coaxial therewith, other bearing means at upper and lower ends of the fourth tube rotatably supporting the same in the third tube, said fourth tube extending at its upper end into said reservoir chamber, another multiple wing partition secured in and extending longitudinally of the fourth tube dividing the same into a plurality of other narrow passages, said third tube having an open bottom end, said fourth tube having a bottom opening open to said other passages to admit liquid thereto, said fourth tube having other lateral ports at its upper end opening from said other passages respectively into said reservoir chamber, and another head at the upper end of the fourth tube closing the same, said drive means being engaged with said other head for rotating said fourth tube and other partitions simultaneously with the second tube and first named multiple wing partition, whereby liquid is drawn up through the passages in both rotary tubes simultaneously and is discharged centrifugally into the reservoir chamber.

8. A centrifugal pump as recited in claim **7**, wherein said heads comprise gears on the rotary tubes, said drive means comprising a plurality of drive shafts respectively connected to the gears at the upper ends of the second and fourth tubes, a motor driven shaft extending into the casing, and drive gear on the motor driven shaft in the

casing meshed with said gears and driving the same so that the rotary second and fourth tubes rotate simultaneously.

9. A centrifugal pump as recited in claim **8**, further comprising a drive motor located outside the casing and connected to said motor driven shaft for driving the same.

10. A centrifugal pump as recited in claim **2**, further comprising an annular flange secured to the bottom end of the first tube to support the same on the bottom of a tank, said flange having circumferentially spaced slots registering with slots at the bottom end of the first tube for admitting liquid to the first tube.

References Cited

UNITED STATES PATENTS

635,504	10/1899	Nowacki	103—91
649,332	5/1900	Mattson	103—88
1,390,051	9/1921	Light	103—99
2,671,405	3/1954	Stoors	103—99
3,110,991	11/1963	Boettcher	103—91
3,200,754	8/1965	Burgin	103—88

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