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Kiralfy

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[54] **CORDLESS ELECTRICALLY OPERATED CENTRIFUGAL PUMP**

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[52] **U.S. Cl.** **222/385;** 415/88; 415/143; 417/424

[51] **Int. Cl.**..... **F04D 1/00;** F04D 1/14; F04D 9/00; F04D 29/16

[58] **Field of Search**..... 222/385; 415/173 R, 173 A, 415/88, 143, 53, 113, 170 A; 417/199 A, 424

[56] **References Cited**

UNITED STATES PATENTS

3,055,304	9/1962	Ziegler	222/385 X
3,228,342	1/1966	Page	415/113
3,519,365	7/1970	Conhagen	415/88
3,523,629	8/1970	Yio Dak Chi	222/385 X
3,647,314	3/1972	Laessig	415/206

FOREIGN PATENTS OR APPLICATIONS

1,101,771	4/1955	France	415/53
643,307	9/1950	United Kingdom	415/173 R

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[57] **ABSTRACT**

A cordless electrically operated centrifugal pump for use in garden sprayers, fuel pumps and other applications. A cylindrical impellor is mounted for rotation within a cylindrical housing by a drive shaft connected to a battery operated motor. The impellor has a pair of diametrically directed passages intersecting at right angles at the center of the impellor. Fluid is supplied to the center of the impellor through a sealed inlet and ejected through the passages by centrifugal force as the impellor is rotated. This develops substantially high pressure within the housing for the ejection of fluid from the housing. The pump provides high pressure with a low volume output and low power requirements.

7 Claims, 3 Drawing Figures

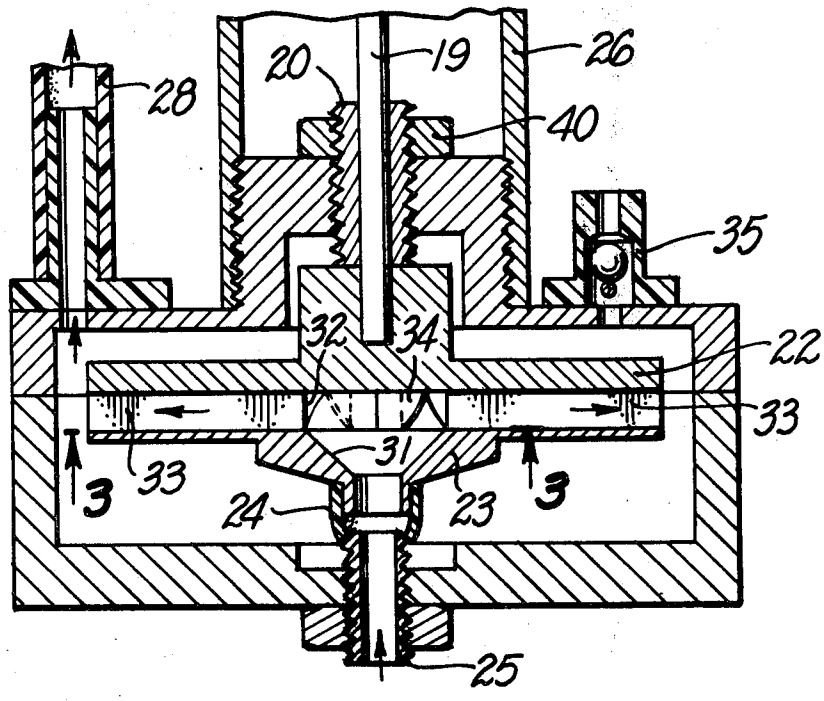


FIG. 1.

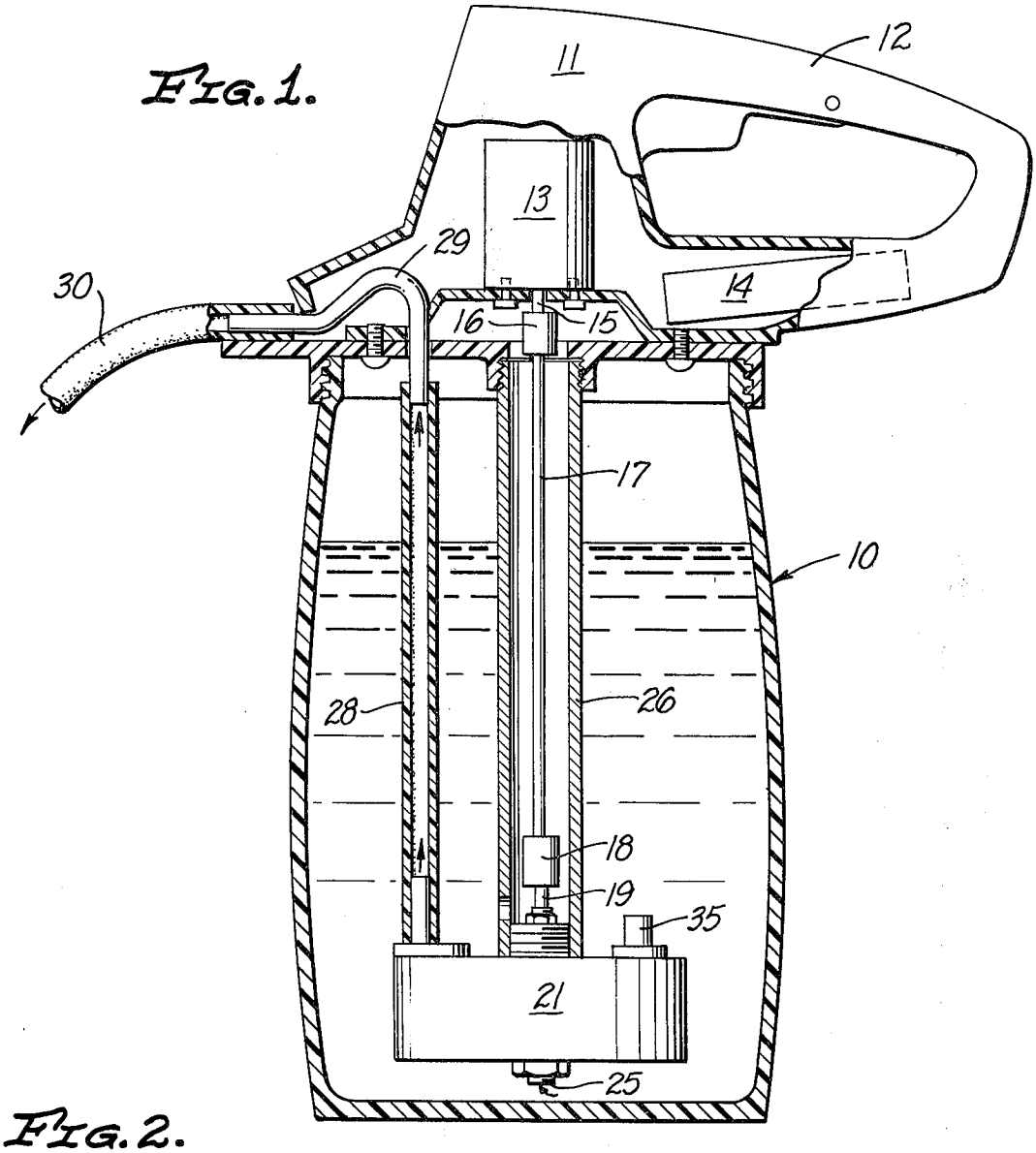


FIG. 2.

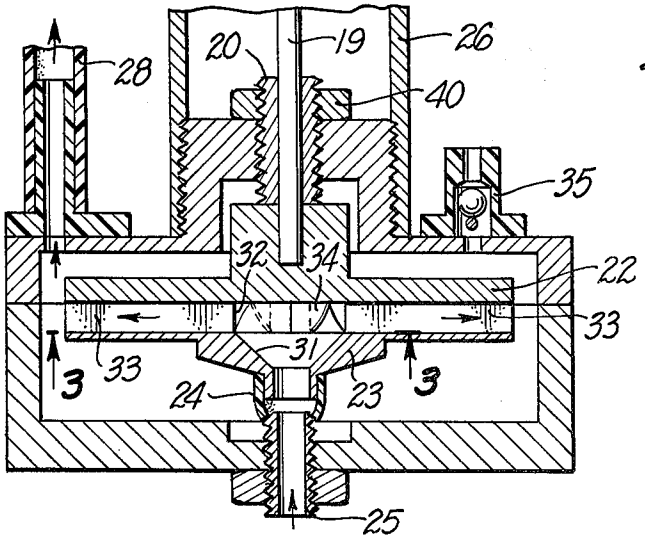
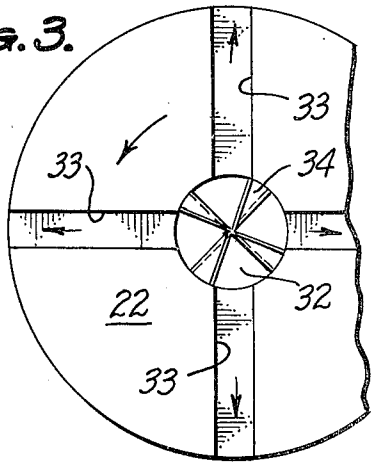


FIG. 3.



CORDLESS ELECTRICALLY OPERATED CENTRIFUGAL PUMP

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a battery operated high pressure, low volume centrifugal pump which is adapted for use in garden sprayers, fuel pumps and various other applications.

2. Description of the Prior Art

Centrifugal pumps are well-known, but most of the type now in use are low pressure with a relatively high volume of output. They require a substantial amount of power to operate and are not adapted to low power, high pressure and low volume applications.

Many centrifugal pumps of the type now in use have back leakage of fluid and use close tolerances to limit the amount of the backflow. This results in a waste of power to an extent which is not permissible where the power supply is limited.

While various type of garden sprayers are on the market, some of which are battery operated, they do not provide the necessary or most desirable volume and fineness of spray.

SUMMARY OF THE INVENTION

It is the primary object of the present invention to provide a cordless (battery operated) centrifugal pump which is capable of developing high pressure for use in a garden sprayer, fuel pump and various other uses for which it may be suitable.

It is a particular object of the invention to provide such a pump which is extremely light in weight and low in friction, so that little power is consumed in the operation of the pump.

A further object of the invention is to provide a pump in which the inlet is sealed, so that there is no leakage or backflow. A related object is to provide a novel type of seal for the inlet.

Another object is to provide such a pump which provides low volume and high pressure.

A further object is to provide a pump which overcomes the deficiencies of prior devices and which is particularly adapted for use in low power applications where substantial power losses cannot be tolerated.

It is another object of the invention to provide such a device which is extremely simple in its construction and operation, so that it can be manufactured and sold at a relatively low price and requires substantially no maintenance or repair.

The invention also comprises such other objects, advantages and capabilities as will later more fully appear and which are inherently possessed by the invention.

While I have shown in the accompanying drawings, a preferred embodiment of the invention, it should be understood that the same is susceptible of modification and change without departing from the spirit of the invention.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is side elevational view mostly in section of a garden sprayer with my pump installed therein;

FIG. 2 is a longitudinal sectional view of the pump assembly at the bottom of the sprayer;

FIG. 3 is a partial sectional view of the impellor taken along line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment which has been selected to illustrate the invention comprises a battery operated garden sprayer which utilizes the centrifugal pump of the present invention.

The sprayer comprises a tank **10**, which is adapted to hold liquid insecticide, fertilizer or other material to be sprayed. Mounted on the top of the tank **10** is a housing **11** having a handle portion **12** and holding a small electric motor **13** which is connected to and operated by one or more batteries **14**. The battery **14** is preferably of the rechargeable type.

A shaft **15** which is rotated by the motor **13** is connected to a coupling **16** which is in turn connected to a main drive shaft **17** which extends downwardly within the tank **10**. The lower end of the drive shaft **17** is connected to a second coupling **18**, which is in turn connected to a pump shaft **19**.

The pump shaft **19** is rotatably mounted in a bearing **20** which extends into a substantially cylindrical pump housing **21**. A locknut **40** extends around the bearing **20** adjacent to the top of the housing **21**. The lower end of the pump shaft **19** is connected to a circular impellor **22**, which is mounted for rotation within the housing **21**.

The lower end of the impellor **22** is provided with a projection **23**, around the lower portion of which the upper end of a tubular plastic seal **24** is friction fit. The lower end of the seal **24** makes a light leak-proof engagement with the upper end of a hollow bearing **25**, which extends upwardly through an opening in the bottom of the housing **21**. A locknut **41** secures the bearing **25** to the housing **21**. The bearing **25** is disposed adjacent to the bottom of the tank **10** and serves as an inlet for fluid entering from the tank **10** into the pump housing **21**. A support tube **26** extends between the housing **21** and the top of the tank **10**, to support the housing **21**.

An outlet **27** extends vertically upwardly from the housing **21**. A hose **28** is connected at its lower end to the outlet **27** and at its upper end to one end of a tube **29**. The opposite end of the tube **29** is connected to a hose **30** which is in turn connected at its opposite end to a conventional spray nozzle.

Liquid entering the inlet bearing **25** flows through the seal tube **24** and then through an outwardly flared opening **31** formed within the projection **23** on the bottom of the impellor **22**. The upper end of the opening **31** is equal in diameter to a starting chamber **32** formed in the center of the impellor **22**. Four narrow liquid flow passages **33** extend radially outwardly from the starting chamber **32** to openings formed in the periphery of the impellor **22**.

Four stationary fan blades **34** may be provided within the starting chamber **32** to assist in the flow of liquid from the inlet **25** to the passages **33**, thereby facilitating the starting operation of the pump.

A normally open ball type air bleed valve **35** may be provided in the upper wall of the housing **21** for the purpose of providing an outlet for air within the pump assembly to facilitate the initial flow of fluid from the housing **21** before the pump is first started. The starting of the pump might otherwise be delayed by air lock if the outlet hoses or tubes are blocked by the presence of stored stationary liquid. Once the pump is in opera-

tion, the pressure within the housing **21** closes the bleed valve **35** and maintains it closed during the time the pump is operating.

In use, liquid flows from the inlet to the impellor **22** and out through the passages **33.** Due to centrifugal force, pressure is quickly built within the housing **21** surrounding the impellor **22,** such area acting as a pressure chamber. This pressure causes the flow of liquid through the outlet **27** under substantially high pressure. The liquid travels through the outlet assembly and passes through the outlet nozzle in the form of a fine spray.

The seal **24** is preferably dimensioned so that it fits loosely around the inlet bushing **25** when the pump of housing **21** is not under pressure. As soon as pressure is generated within the housing **21,** such pressure causes the seal **24** to tighten automatically into sealing engagement with the bushing **25.** This arrangement provides a minimum amount of friction loss during rotation of the impellor. The positioning of the seal **24** can be varied in order to provide a simple means of adjustment to compensate for manufacturing tolerances.

The entire pump assembly and particularly the impellor and other rotatable parts can easily be made of lightweight metal or molded plastic. The parts require no machining and no close tolerances.

With the embodiment illustrated in the drawings, it is possible to operate the impellor at a speed of approximately **8,000** r.p.m. to generate a pressure up to **20** pounds per square inch with a flow rate of **10** to **20** gallons per hour.

I claim:

1. A centrifugal pump which includes a cylindrical housing, a cylindrical impellor mounted for rotation within said housing by a drive shaft connected to a battery operated motor, said impellor having its outer periphery spaced a short distance from the inner periphery of said housing, said impellor having a plurality of passages extending outwardly from the center thereof, inlet means for supplying fluid to the center of said impellor, said impellor upon rotation ejecting said fluid into said passages by centrifugal force to develop substantially high pressure within said housing, and outlet means for ejecting said fluid from said housing under pressure, said inlet means being sealed to prevent any backflow or leakage into the interior of said housing, said seal for said inlet means comprising a piece of plastic tubing disposed within said housing beneath said impellor, said tubing having one end thereof fitting around a projection formed on the bottom of said impellor adjacent to the center thereof and its other end fitting around a fluid inlet extending into the center of the bottom of said housing.

2. The structure described in claim **1,** and a drive shaft extending through the top of said housing adjacent to the center thereof, said drive shaft being connected to said impellor, said drive shaft being substantially aligned vertically with said plastic tubing seal.

3. The structure described in claim **2,** the upper end of said fluid inlet forming a bearing for said plastic tubing seal upon rotation of said impellor, said tubing fitting loosely around said fluid inlet when the interior of said housing is not under pressure, said seal being tightened by pressure within said housing to form a light leak-proof engagement with said inlet.

4. The structure described in claim **1,** said impellor having two diametrically directed passages intersecting at right angles at the center of said impellor.

5. The structure described in claim **4,** and four stationary fan blades disposed at the center of said impellor, said fan blades being constructed and arranged to direct fluid from said inlet into said passages.

6. The structure described in claim **4,** said housing having an air bleed valve which is open when said housing is unpressurized, said bleed valve adapted to be closed by pressure within said housing during operation of said pump.

7. The structure described in claim **4,** said pump being mounted adjacent the bottom of a tank holding a supply of fluid, said battery and motor being mounted adjacent the top of and outside said tank, and spray nozzle means connected to the output of said housing.

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