

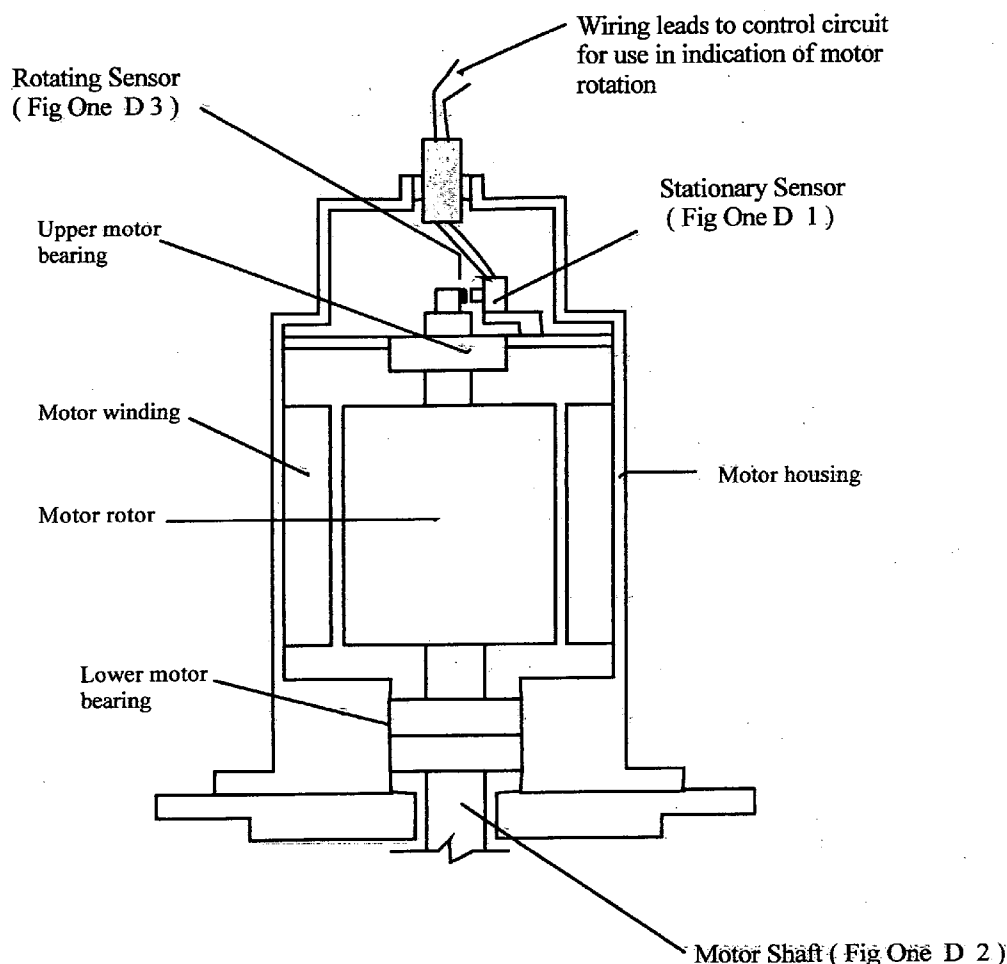


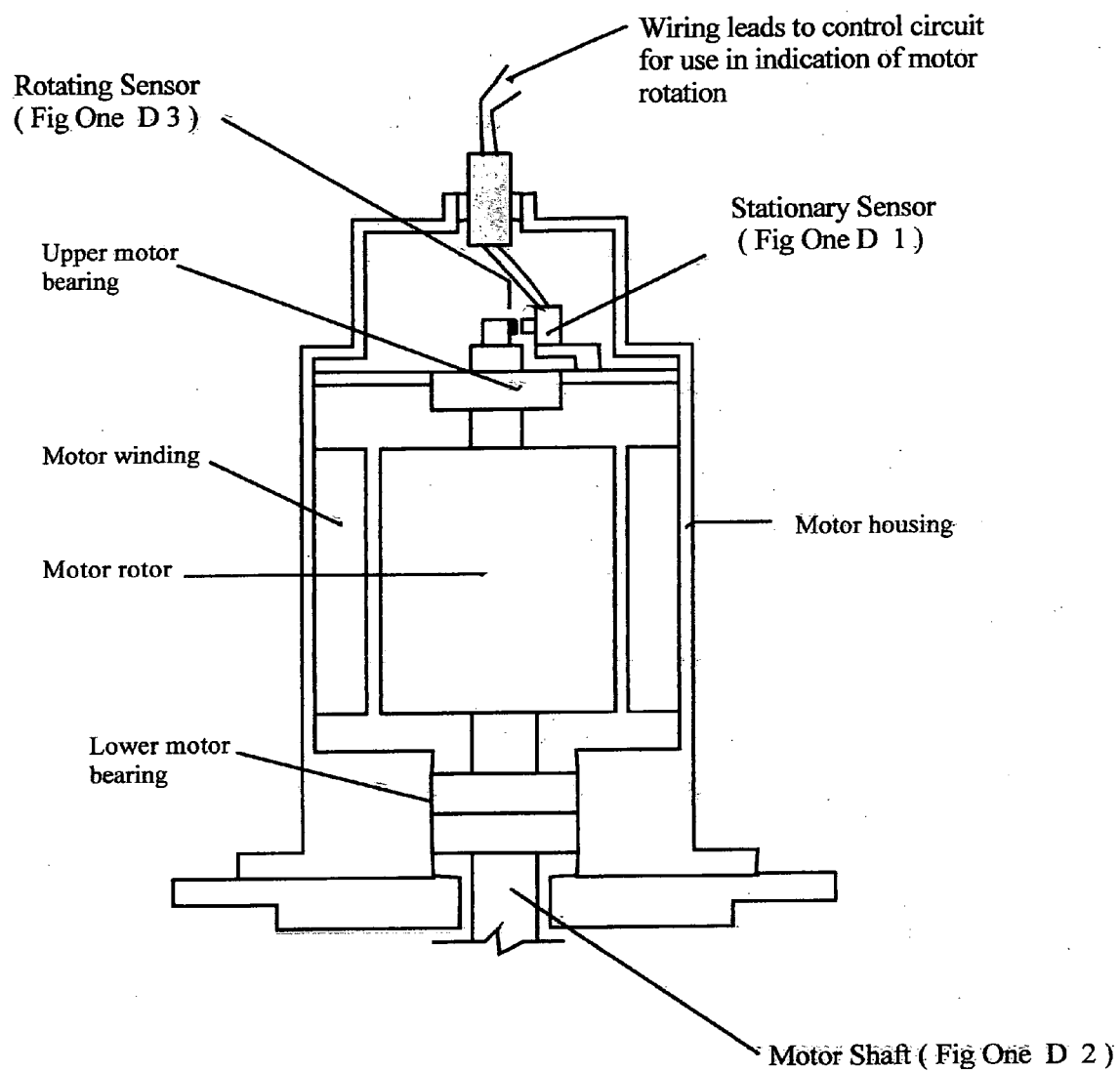
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(19) **United States**(12) **Patent Application Publication**
True(10) **Pub. No.: US 2012/0257995 A1**(43) **Pub. Date: Oct. 11, 2012**(54) **SUBMERSIBLE PUMP AND MOTOR
ROTATION INDICATION CIRCUIT**(76) Inventor: **Bryan R. True, Ocala, FL (US)**(21) Appl. No.: **13/066,234**(22) Filed: **Apr. 11, 2011****Publication Classification**(51) **Int. Cl.**
F04B 35/04 (2006.01)(52) **U.S. Cl. 417/410.1**(57) **ABSTRACT**

This patent addresses a need to be able to tell in which direction of rotation an electric motor is turning when connected to a pump, and in particular, a submersible pump where the direction of the motor shaft is not installed where visual observance of the direction of rotation is possible. This patent covers the modification of any existing motors or pumps to include any device, circuit, or change to sense, measure, or pick up the direction of rotation of an electric pump or motor for the purpose of knowing the direction the motor or pump is turning when operating or bumped for observation.

It is appreciated that there may be ways to sense, transmit, store, or measure the direction of rotation of a pump or motor other than in the embodiments described above, however this patent application is not limited to the embodiments above but cover and include the spirit and intent of the invention as defined in the claims above.

**Typical submersible pump motor**



Typical submersible pump motor

Figure One

SUBMERSIBLE PUMP AND MOTOR ROTATION INDICATION CIRCUIT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Not applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH FOR DEVELOPMENT

[0002] Not applicable

THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT

[0003] Not applicable

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC

[0004] Not applicable

BACKGROUND OF THE INVENTION

[0005] A three phase electric motor may be operated in either direction of rotation. When initially powered for operation, it is not always known in which direction of rotation the electric motor will initially turn. After the initial rotation of an electric motor is determined from observation the direction of rotation may be changed by swapping any two of the incoming three power supply phases. This then reverses the rotation of direction of a three phase electric motor.

[0006] When an electric motor is used to operate a pump, the direction of rotation of the pump and motor must be verified as correct for operation as recommended by the pump manufacturer. Failure to verify the correct direction of rotation of the pump may result in damage to the pump if the pump is operated in the wrong direction of rotation. At a minimum, operation of a centrifugal pump while rotating the wrong direction will result in less performance than as originally designed to provide.

BRIEF SUMMARY OF THE INVENTION

[0007] With the use of a three phase electric submersible motor coupled to pump components, and while the entire assembled pump and motor are located or operating partially or totally submerged in the liquid pumped, the direction of rotation of the pump impeller is not easily determined as to the correct rotation of rotation as intended by the pump component manufacturer.

[0008] This patent covers a way to verify the rotation of a three phase electric motor while coupled to a pump and used in a submerged, or non submerged application for ease of verifying the correct rotation of the pump impeller so as to change the rotation if necessary to prevent damage to the pump or to improve the operation of the pump performance.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0009] Figure One: Figure One shows a typical submersible motor with the motor winding, stator, bearings, and other components all assembled inside a housing which is water proof for operation of a pump under liquid. For the pump to operate as designed very often the direction of rotation must be specific, either clock wise, or counter clock wise. Figure

One shows the typical mounting arrangement of the electric motor rotation sensor on the motor shaft. Shown are a typical rotating sensor half mounted on the motor shaft and a stationary sensor half mounted closely to the motor shaft. The rotating motor shaft sensor transmits a signal to the stationary sensor which conveys the signal through wires out of the motor and up a power cable to a controller mounted out of the sump fluid. The signals are used to indicate the direction of rotation and if the direction of rotation of the motor shaft is wrong, the motor can be instantly shut down after initially starting up.

DETAILED DESCRIPTION OF THE INVENTION

[0010] This patent applies to the use of a sensor attached near the motor shaft of an electric motor that is driving a pump. The sensor shall by the direction of the motor shaft be able to close or open a circuit, or send a signal that would be transmitted by wires out of the submersible pump to a controller or relay that would be used to shut down the pump if the rotation is the wrong direction, or indicate the wrong direction as a light or signal so the direction of rotation of the pump may be changed to correct as defined by the pump manufacturer. The sensor mounted near the shaft could be of the magnetic type that by means of multiple contacts located on the motor shaft must be closed in a certain order to indicate the direction of rotation of the motor shaft. If the motor were to run in a reverse direction the sensors would close in an order to determine that the motor shaft is running in a reverse direction. These circuits when connected would then be used to prevent the motor power supply from energizing the motor when connected to a relay in conjunction with the motor starter if the motor is turning in an undesired direction of rotation. The direction of rotation signal may be used to shut down a pump, send an indicating signal to a remote operator, or indicate the direction of rotation of the submersible pump motor.

[0011] The stationary sensor (Figure One D1) mounted around the motor shaft (Figure One D2) can also be an LED circuit, for example, powered external to the motor which upon rotation of the motor shaft, and with pick up triggers on the motor shaft, would send a signal back up through wires to a controller mounted external to the submersible pump sump of operation.

[0012] This patent applies to any means of picking up and transmitting the direction of rotation of a submersible pump motor to a controller remote to the pump and motor, or a controller mounted inside the pump or motor which then forwards the signal for use in indicating, monitoring, and using the direction of rotation signal as pertains to the operating direction of a pump.

1. A submersible pump which includes an electric motor (Figure One) for use partially or totally submerged in or under a fluid, connected to a pump comprised of a pump housing, or volute, and an impeller which incorporate a pump inlet to the pump housing and impeller and a pump outlet for the purpose of discharging the fluid in which the pump and motor are operating where the direction of the rotation of the pump must be specific as recommended by the pump manufacturer.

2. The application of this patent applies to a manufacturer who either produces just the pump, or just a submersible motor, or both the pump and the submersible motor.

3. A submersible motor (Figure One) driving a pump which includes a device to sense the rotation of the motor shaft (Figure One D1 and D3) driving the pump, whether the motor

shaft (Figure One D2) is one piece with the pump or of a separate piece driving a pump and which includes a rotating sensor (Figure One D3) on the motor shaft (Figure One D2) and a stationary sensor (Figure One D1) located near the motor shaft for the purpose of taking an external power supply, or of creating its own power supply, and taking a signal from an external source or creating its own signal and transmitting the signal to outside the submersible pump/motor for the purpose of using the signal to sense, use, or indicate the direction of rotation of the submersible motor/pump shaft. The sensing of the direction of rotation may also be accomplished by a stationary sensor, powered or non powered, which senses the direction of rotation of the motor and pump shaft by a signal from the motor or pump shaft itself, whether by the metallurgy involved, an electrical or magnetic field created, or by a mechanical tripping, or mechanical indication of the direction of rotation of the pump and motor shaft from an insert into the motor shaft or attached to the rotating motor shaft.

4. A submersible motor/pump which includes a sensor (Figure One D1, D3) to indicate the direction of rotation of the motor/pump shaft so that the performance of the pump will be as designed by the pump parts manufacturer and which sensor circuit will be used so that the pump will only be operated in one direction to prevent damage to the pump components if the direction of rotation is not that as designed by the pump component manufacturer.

5. A submersible motor/pump which incorporates a circuit to be used for the purpose of direction indication as the motor and pump to be used are partially or completely under a fluid and the direction of rotation of the pump or motor cannot be observed to verify that the direction of rotation is as desired for operation of the motor and pump.

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