Dec. 19, 1967 E. P. CHABICA 3,358,608

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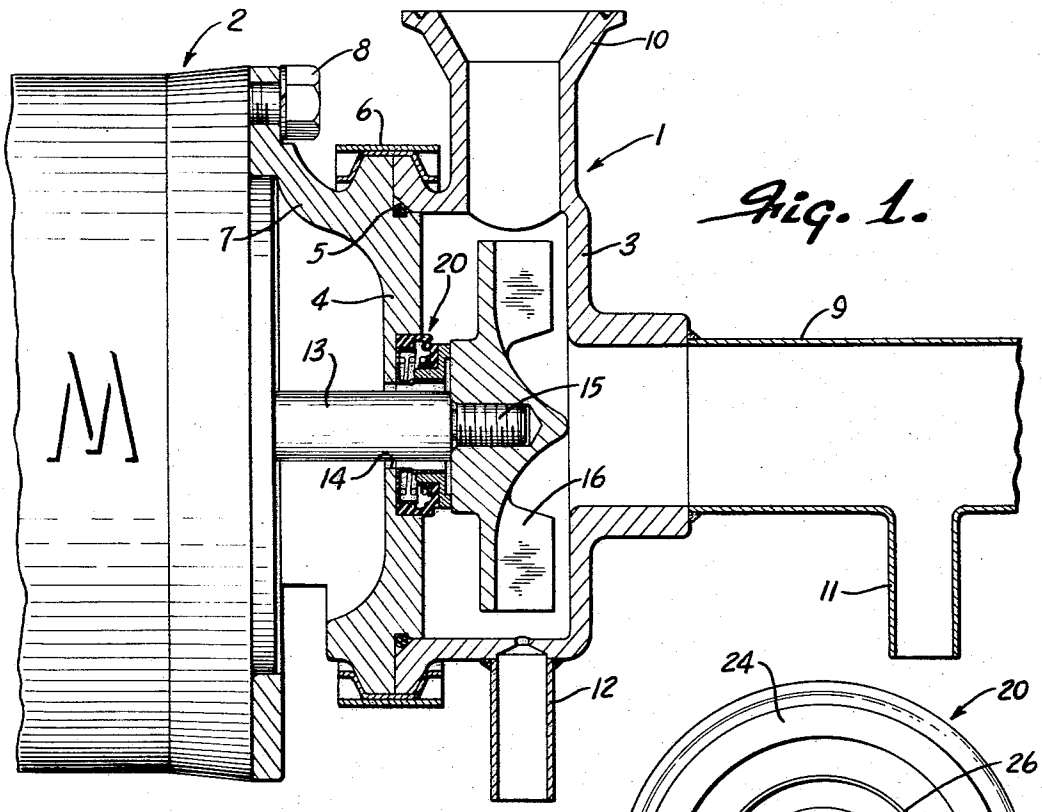


Fig. 1.

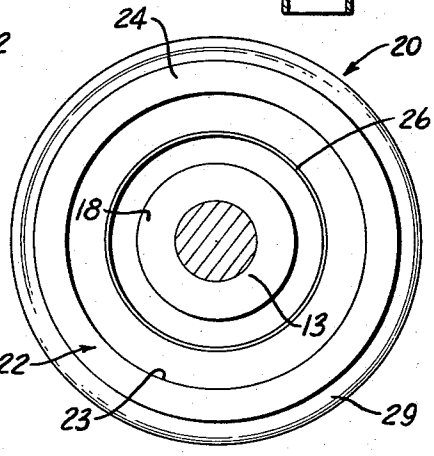


Fig. 3.

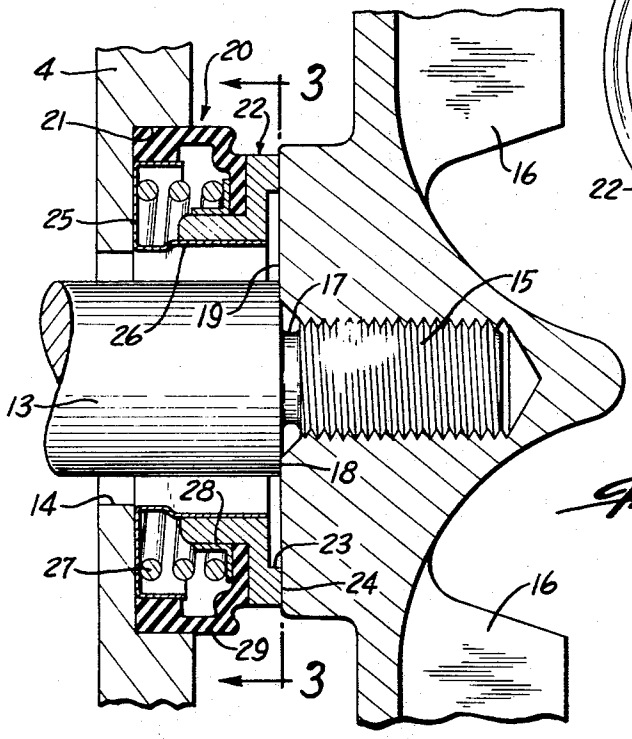


Fig. 2.

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This invention relates to a pump and more particularly to a sanitary pump for use in dairy or food processing industries.

To comply with sanitary standards, pumps used for pumping milk on a dairy farm are cleaned after each milking operation by passing a cleaning solution through the pump and milk line. As a further sanitary safeguard, the pumps must be disassembled periodically and cleaned.

In the conventional pump used in the dairy industry, the motor drive shaft is connected to an adapter which extends within the pump housing and is attached to the impeller by a pin. The conventional type of pump is difficult to clean in place, for the adapters, pins and other hardware tend to collect foreign matter from the milk, such as straw and cow hair, which wedges between the parts and must be manually removed. Thus, to adequately clean the pump, the housing must be disassembled and the pin must be removed to thereby enable the impeller to be removed for cleaning.

The present invention is directed to an improved pump design for dairy operations which can be readily cleaned in place. The pump housing includes a body having an inlet opening to receive thet liquid being pumped and an outlet opening for discharging the liquid. The open rear end of the pump body is enclosed by a back plate which is connected directly to the motor housing. The motor drive shaft extends through an opening in the back plate and is threaded directly to the impeller located within the housing.

To prevent leakage of the pumped fluid, a seal assembly is located in a recess formed in the inner surface of the back plate and the seal extends within the housing and includes a sealing element positioned in sealing engagement with the flat back surface of the impeller. With this seal construction, milk cannot pass outside of the pump housing and therefore the unit is substantially easier to clean than the conventional pump used for milking operations.

The pump construction of the invention can be disassembled by merely removing the pump body from the back plate and the impeller can then be readily unthreaded from the drive shaft.

As the seal assembly is located within the pump housing, the flow of milk outwardly beyond the pump housing is restricted and this results in a unit which can more readily be cleaned in place. This differs from the conventional pump design in which the shaft seal is normally located outside of the pump housing, with the result that the milk can flow within numerous crevices or clearances until reaching the shaft seal, and the milk located within these crevices in the conventional pump cannot generally be completely removed by the customary clean-in-place techniques.

In addition, the back surface of the impeller functions as one of the mating parts of the seal. This simplifies the seal design and again reduces the number of parts which are required for the overall pump structure.

As the impeller is threaded directly on the motor drive shaft, adapters, pins, and other hardware are eliminated which simplifies the cleaning operation as well as eliminating joints, or crevices where foreign materials, such as straw, cow hair and the like, can collect.

Other objects and advantages will appear in the course of the following description.

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

FIG. 1 is a vertical section of the pump construction of the invention;

FIG. 2 is a fragmentary enlarged vertical section showing the connection of the impeller to the drive shaft and the seal constructcion; and

FIG. 3 is a section taken along 3—3 of FIG. 2.

The drawings illustrate a pump **1** to be used for sanitary applications such as in the dairy industry or food processing industries. The pump **1** is driven by a motor **2** and the pump housing includes a body **3** having an open rear end which is enclosed by a back plate **4**. The joint between the body **3** and back plate **4** is sealed by an O-ring **5** and the two members are secured together by a conventional clamping band **6**.

The inner portion of the back plate **4** is provided with a flange **7** which is connected by a series of bolts **8** to the housing of the motor **1** to thereby support the pump from the motor.

Liquid is supplied to the pump housing through an inlet pipe **9** and the liquid is discharged from the pump housing through an outlet **10**. Nipples **11** and **12** are connected to the inlet pipe **9** and the pump body **3**, respectively. The nipples are normally closed off during the milking operation and are connected by flexible hosing to wash lines during the cleaning operation.

According to the invention, the motor drive shaft **13** extends through an opening **14** in back plate **4** and the outer threaded end **15** of the drive shaft has a reduced diameter and is threaded directly within an opening in the impeller **16**. As best shown in FIG. 2 the drive shaft is provided with a relief or recess **17** to enable the impeller to be threaded down tightly against the shoulder **18** on the drive shaft.

As best shown in FIG. 2 the back surface **19** of the impeller is machined and bears against a seal assembly **20** which is located within a recess **21** formed in the inner surface of the back plate **4**.

The seal assembly **20** includes a carbon sealing member **22** formed with a recess **23** and an outer annular sealing surface **24** which bears against the back surface **19** of the impeller **16**. The sealing member **22** is retained in position by a retaining cup **25** having ribs **26** which engage grooves within the seal to prevent relative rotation between the members.

The seal **22** is urged outwardly toward the impeller **16** by a coil spring **27** which is interposed between the bottom of the retainer **25** and an angle ring **28**. The space between the seal **22** and the back plate **4** is sealed by an annular rubber shield **29** which is cemented to the members.

The seal assembly **20**, which is located within the recess **21** in back plate **4**, is stationary and during operation of the impeller the back surface **19** of the impeller will rotate against the surface **24** of seal **22** to provide a liquid seal between the rotating and stationary parts of the pump.

The pump of the invention can be readily disassembled by merely removing the clamping band **6**, and the pump housing body **3** can then be removed from the back plate **4**. With the body **3** removed, the impeller **16** can be unthreaded from the drive shaft end **15**. By connecting the impeller directly to the motor drive shaft the present design eliminates the conventional adapters, pins and other hardware which are employed to connect the drive shaft to the impeller. This not only reduces the number of

parts in the pump design but also simplifies the in-place cleaning operation.

The seal assembly **20** is located within the pump housing rather than being located outside of the pump housing as in the conventional construction. By locating the seal within the pump housing, the flow of milk is restricted to the pump housing and this again simplifies the cleaning operation.

During cleaning in-place, a washing or sanitizing liquid is passed through the pump and flushes away milk and other foreign material which may have collected within the pump housing or on the impeller. As the entire seal **20** is located within the pump housing there are no passages or joints, other than sealing surfaces, within which milk can collect and which have to be cleaned during the cleaning operation.

As the back surface of the impeller serves as one of the mating parts of the seal this not only simplifies the seal design but also restricts the flow path of milk so that during the pumping operation milk will not be able to pass out of the pump housing.

While the above description is directed to the use of the pump in a milking system, it is contemplated that the pump can be used to pump any type of liquid and it has particular adaptation to pumping liquid food products or other materials in which the pump requires periodic cleaning or sanitizing.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A pump, comprising a pump housing including a body having a liquid inlet and a liquid outlet and including a back plate enclosing an open end of the body, an impeller located within the housing and having a planar back surface facing said back plate, said back surface having a threaded recess therein, a motor having a motor drive shaft extending within an opening in the back plate with the outer end of the shaft being threadedly received within said recess, said motor shaft having a radially extending shoulder disposed in bearing engagement with said back surface, said back plate having an internal recess bordering the opening therein, and a stationary sealing assembly located within the recess in the back plate and extending within the housing, said sealing assembly including an annular seal having an axially extending inner section spaced from said shaft and a central section extending outward from said axial section, said seal also including an outer sealing section extending longitudinally from the outer end of said central section in the opposite direction from said inner section, said outer sealing section disposed at a location spaced radially outward of said shoulder, said sealing assembly also including resilient means disposed in engagement with said central section for urging said sealing section into engagement with the back surface of the impeller.

2. The pump construction of claim **1**, wherein said sealing section is disposed adjacent the outer periphery of said back surface.

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