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Bottoms et al.

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[54] ELECTRICALLY DRIVEN PUMP

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[51] **Int. Cl.** **F04b 17/00**

[58] **Field of Search** 415/72; 417/356

[56] **References Cited**

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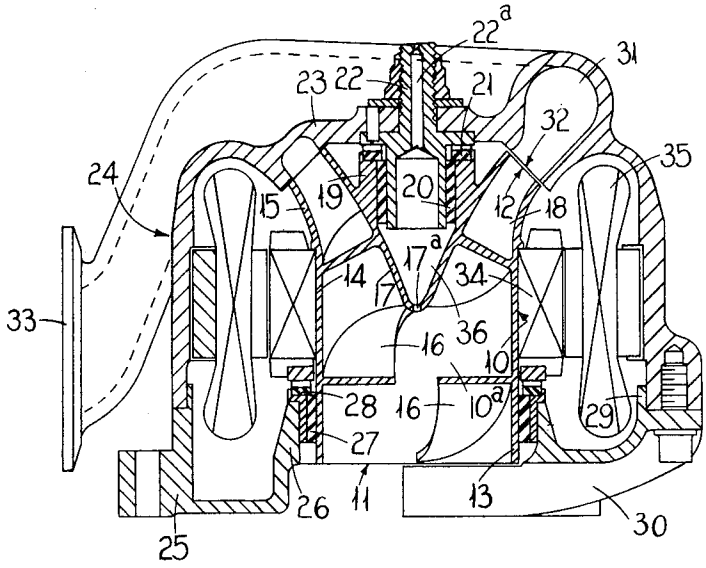
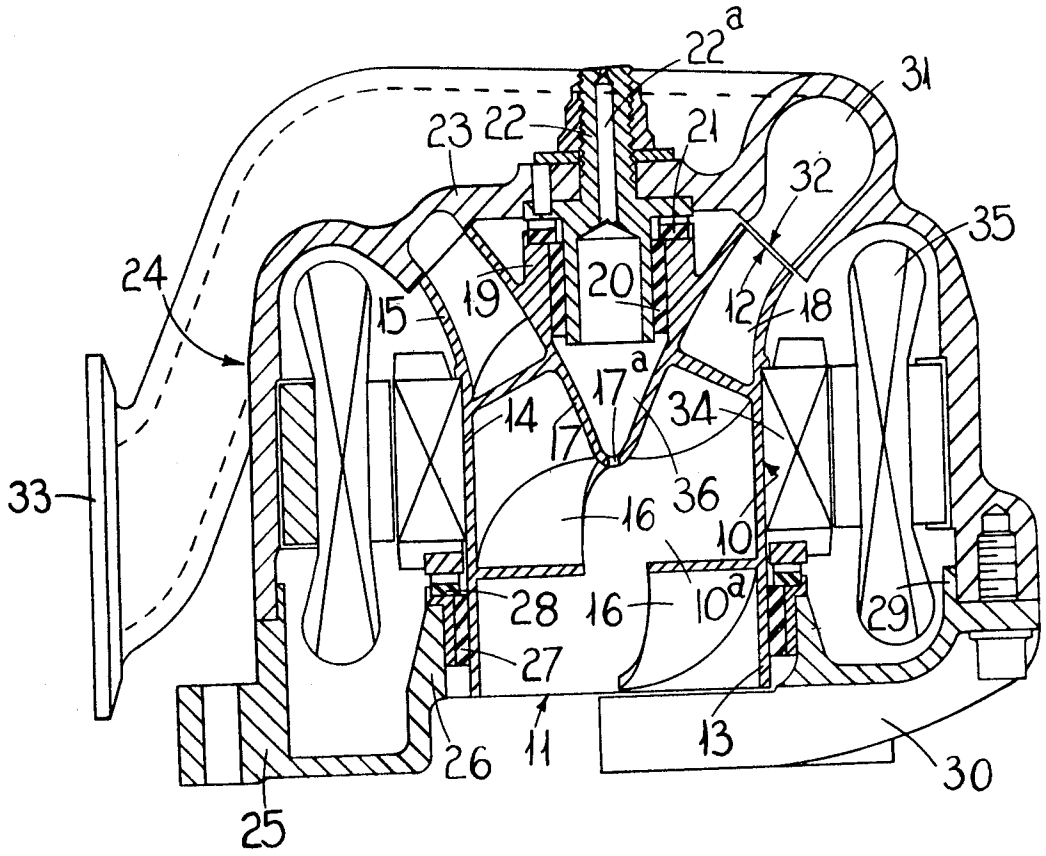
[57] **ABSTRACT**

A pump for liquids has a rotor and a casing which also form part of an induction motor. The rotor has internal helical vanes and includes a conical portion at its downstream end to provide an annular outlet. There are aligned axial through passages in the rotor and casing. The annular rotor outlet is aligned with a volute chamber which communicates with the pump outlet. When pumping the rotor also operates to separate, by centrifugal action, the liquid from any vapor present, the vapor passing out of the pump via the axial passages.

6 Claims, 1 Drawing Figure





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ELECTRICALLY DRIVEN PUMP

This invention relates to electrically driven pumps.

A pump according to the invention comprises a rotor having an inlet and an outlet, the said rotor forming part of the armature of an electric induction motor, one or more impellers of generally helical form mounted within the rotor, a casing forming part of the stator of the induction motor, the said casing having an inlet and an outlet, bearings supporting the rotor within the casing, a volute chamber within the casing and communicating with the outlet thereof, the said chamber being positioned so as to receive liquid discharged, in use, from the rotor outlet and the inlets of the rotor and casing also communicating.

A pump in accordance with the invention will now be described by way of example and with reference to the accompanying drawing in which a rotor **10** having an inlet **11** and an outlet **12** includes an outer wall **13** having a substantially cylindrical portion **14** and a portion **15** of increasing diameter. A plurality of vanes **16** integral with the wall **13** project into the bore of the rotor **10** each said vane **16** substantially describing within the rotor **10** a helix whose axis is concentric with the axis of the rotor **10**. The vanes **16** do not extend to the axis of the rotor **10**. Over a portion of the rotor **10** adjacent the inlet **11** there is thus an unobstructed axial passage **10***a*. A conical member **17** is located and fixedly held, substantially within the bore of the rotor **10**, by the vanes **16** so as to define an annular passage **18** at the rotor outlet **12**.

A spigot **19** carried within the member **17** serves to locate bearings **20**, **21** which in turn engage a flanged member **22** mounted in a body **23**. Member **22** and body **23** together form part of a casing **24** of which an end member forms the other part. Members **17**, **22** define a chamber **36** with which axial passages **17***a*, **22***a* in members **17**, **22** respectively communicate. The end member **25** has a first inwardly directed annular spigot **26** which locates bearings **27**, **28** which in turn engage the outer wall **13** of the rotor **10**. The end member **25** also has a second inwardly directed annular spigot **29** which locates the end member **25** on the body **23**. The end member **25** has a plurality of vanes **30** which tend, in use, to produce an axial flow of liquid at the rotor inlet **11**. Mountings **36** for attachment to an external apparatus (not shown) are carried by the end member **25**.

The body **23** has formed within it a volute chamber **31** whose form is generally conchate and which has at one end an opening **32** closely aligned with, and which extends round the major part of, the rotor outlet **12**.

The other end of the volute chamber **31** forms a pipe connection **33**.

Electric windings **34**, fixedly mounted on the rotor **10**, an electric windings **35** fixedly mounted within the casing **24** form the rotor and stator windings respectively of an electric induction motor.

The pump is particularly adapted for use in a fuel tank of an aircraft and in use is mounted in the tank with the inlet **11** adjacent the bottom of the tank. Fuel entering the inlet **11** is urged by the impellers **16** towards the rotor outlet **12**, whence it passes into the volute chamber and out through the pipe connection **33**. A small proportion of the fuel leaving the rotor outlet **12** does not enter the opening **32** of the chamber **31** but escapes to provide a lubricating and cooling flow for bearings **20**, **21** and bearings **27**, **28**.

Vapor in the fuel is separated by centrifugal action of the rotor **10**, the heavier, liquid particles passing to the rotor outlet **12** and the lighter, vapor particles remaining centrally within the rotor **10**. The vapor particles thus pass via the passages **10***a*, **17***a*, chamber **36** and passage **22***a* to re-enter the fuel tank.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. A pump comprising a rotor having an inlet and an outlet, the said rotor forming part of the armature of an electric induction motor, one or more impellers of generally helical form mounted within the rotor, a casing forming part of the stator of the induction motors, the said casing having an inlet and an outlet, bearings supporting the rotor within the casing, a volute chamber within the casing and communicating with the outlet thereof, the said chamber being positioned so as to receive liquid discharged, in use, from the rotor outlet, the inlets of the rotor and casing also communicating and the rotor and casing being formed with aligned axial through passages.

2. A pump as claimed in claim **1** in which the internal diameter of the rotor adjacent its outlet is substantially greater than the internal diameter adjacent its inlet.

3. A pump as claimed in claim **2** in which the rotor outlet is of annular form.

4. A pump as claimed in claim **3** in which the rotor is formed with a co-axial conical portion which co-operates with the outside wall of the rotor to define the rotor outlet.

5. A pump as claimed in claim **1** in which the impellers extend from the outside wall of the rotor to positions spaced from the axis of the rotor.

6. A pump as claimed in claim **1** in which a proportion of the liquid delivered, in use, from the rotor outlet is supplied to the bearings.

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