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Fussner et al.

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[54] **PUMPING UNIT FOR LIQUIDS**

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[30] **Foreign Application Priority Data**

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

[58] **Field of Search** 417/423, 366, 368, 369; 310/43, 87

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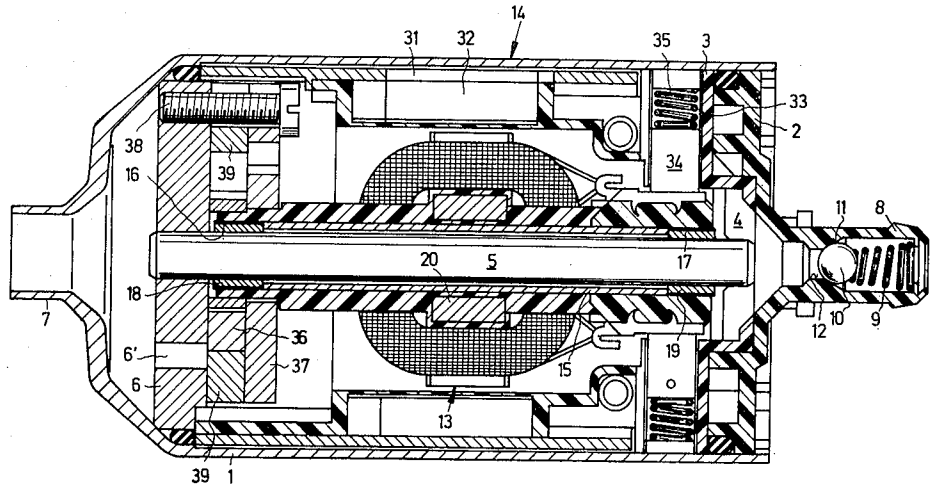
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[57] **ABSTRACT**

A pump is mounted in a housing, and also mounted in the housing is an electromotor which drives the pump. The electromotor has a stationary shaft, a sleeve which surrounds the shaft and is turnable relative to the same, being journalled thereon, an armature which is mounted on the sleeve and a collector which is also mounted on the sleeve. This arrangement facilitates the lubrication of the movable components of the electromotor as compared with constructions wherein the collector and armature are mounted directly on the shaft and it also provides for a more rigid construction.

7 Claims, 2 Drawing Figures



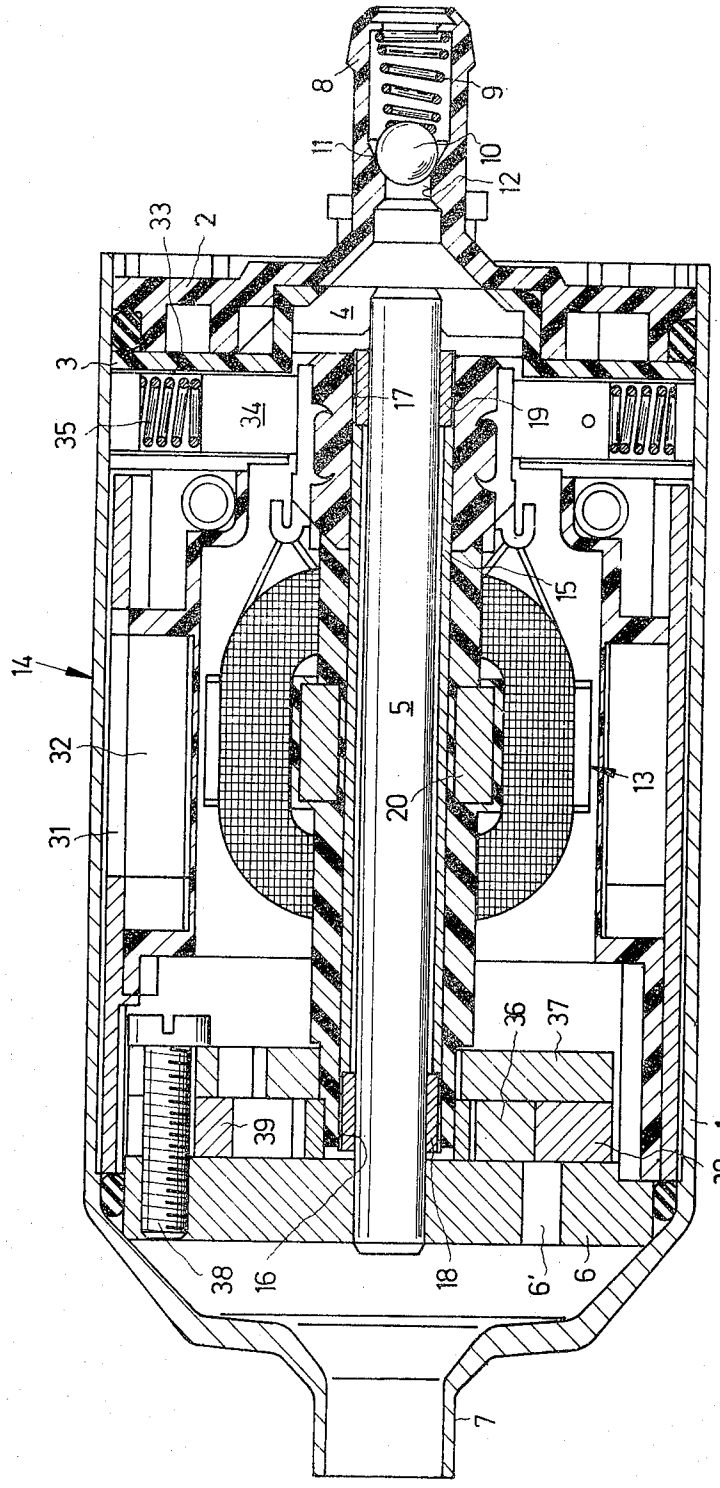

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Fig. 1

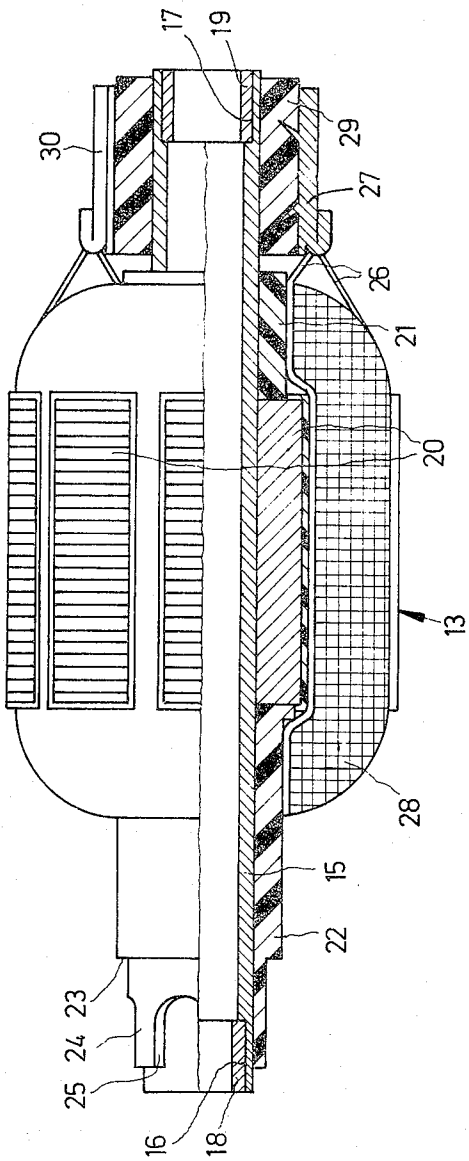


Fig. 2

PUMPING UNIT FOR LIQUIDS

BACKGROUND OF THE INVENTION

The present invention relates generally to a pumping unit for liquids, and more particularly to a pumping unit which is particularly suitable for liquid fuels, such as a fuel pump in an automotive vehicle.

Units of the type in question are already known. Generally speaking they utilize a housing, a pump located in the housing, and an electromotor which is also located in the housing and drives the pump. One prior-art construction of the type here in question has a shaft that is stationarily mounted in the housing and on which the armature of the electromotor is directly journalled. Experience has shown, however, that with this prior art construction the lubrication of the rotating component leaves much to be desired and that the armature as a whole is not as resistant to deformation as is desirable.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to overcome the disadvantages of the prior art.

More particularly, it is an object of the present invention to provide a pumping units of the type identified above wherein the armature is particularly strong and resistant to deformation and wherein the problem of lubricating the rotary components finds an optimum solution.

In keeping with the above objects and with others which will become apparent hereafter, one feature of the invention resides, in a pumping unit for liquids, especially for liquid fuels, in a combination which comprises a housing, a pump in the housing, and an electromotor also in the housing and connected with the pump for driving the same. The electromotor comprises a stationary shaft, a sleeve surrounding the shaft and being turnable relative to the same, an armature mounted on the sleeve, and a collector also mounted on the sleeve.

The construction according to the present invention has the advantage of facilitating greatly the lubrication of the rotary components as will become evident from the detailed description of the invention and furthermore, provides a construction of the armature which is rather strong and resistant to flexing and other deformation, because the sleeve on which the armature is mounted is, of course, very resistant to such deformation.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an axial section through a unit according to the present invention; and

FIG. 2 is a fragmentary section through the armature of the unit in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing now the drawing in detail, wherein a single embodiment has been shown by way of example in

FIGS. 1 and 2, it will be seen that the novel pumping unit according to the present invention has an elongated housing 1 which is of approximately cup-shaped configuration and has an end that is closed by means of a cover 2. A portion 3 is mounted on the inner side of the cover 2 and formed with a bearing seat 4 for a shaft 5 which extends through the entire housing 1. At the other end of the housing the shaft 5 is journalled in a disc 6 which is located adjacent the transverse end wall of the housing where the latter continuously converges to form an inlet 7 for the liquid to be pumped. The outlet for the pumped liquid is identified with reference numeral 8 and is provided at the cover 2.

As FIG. 1 shows most clearly, the outlet 8 is provided with a one-way valve 10 which is biased by a spring 9 and cooperates with a valve seat 11, which is formed by the element 3. The latter is provided with a bore 12 which is closed by the one-way valve 10.

Mounted approximately midway in the housing 1 is the armature 13. Unlike conventional constructions of this type, the armature 13 of the electromotor 14 is not mounted directly on the shaft 5. Instead, the armature 13 is mounted on a support sleeve 15 in form of an elongated tube which is provided with a constant outer diameter over its entire length. The inner diameter of the sleeve 15 is enlarged cylindrically at 16 and 17, that is at each end of the sleeve 15. These enlargements 16 and 17 each accommodate a journal 18 and 19, respectively, which are pressfitted in the respective enlargements. It is currently preferred that the journals 18 and 19 be of a sintered material, for instance, sintered metal or the like. The inner diameters of the journals 18 and 19 is somewhat smaller than the inner diameter of the sleeve 15 where the latter is not provided with the enlargements 16 and 17. This means that the sleeve 15 is in contact with the shaft 5 only by means of the journals 18 and 19; in the axial space intermediate the journals 18 and 19 there is no contact between sleeve 15 and shaft 5, so that these latter two elements define with one another a slight gap which can either be filled by a lubricant or through which lubricant can be circulated which is supplied through the porous sinter-material journals 18 and 19.

The armature 13 is mounted on the sleeve 15 by first pressing a stack or package 20 of lamellae so that it is located approximately midway between the ends of the sleeve 15. To the right of this package 20 (as seen in FIG. 2) is a short sleeve 21 of synthetic plastic material, whereas to the left of it there is an elongated sleeve or bushing 22 which extends close to the associated end of the sleeve 15 and is provided with a shoulder 23 adjacent which there is located a coupling element 24 with a groove 25. These components are integrated with the sleeve 22. Accommodated in grooves so as to be insulated between the lamellae of the package 20 are copper windings which are entirely conventional and whose ends 26 lead to a collector 27 which is press-fitted onto the right-end portion of the sleeve 15. The entire package 20 is encapsulated in a layer 28 of synthetic plastic material which can be sprayed onto it or molded (e.g. injection molded) about it. The collector 27 has a synthetic plastic sleeve 29 which is press-fitted onto the sleeve 15 and in which the collector sleeve 30 is anchored. The collector 27 faces the cover 2.

A rolled sheet-metal member 31, which is rolled to form a tubular configuration extends between the element 3 and the disc 6; it is of magnetically conductive

material and has connected to it the permanent magnets **32** of the electromotor **14.** The element **3** is formed with radial recesses **33** which accommodate carbon brushes **34.** Springs **35** push these carbon brushes against the collector **27.**

The groove **25** of the sleeve **22** is connected with an impeller **36** of the pump. The impeller is located between the disc **6** and a further disc **37** which is connected with the disc **6** by means of screws **38** and an intermediate member **39.** The impeller is constructed in known manner and its particular construction is not of importance for the purposes of the present invention and known per se to those skilled in the art. A slot **6'** is formed in the disc **6** which communicates with the pumping chambers of the impeller **36.** It will be appreciated when the impeller **36** is rotated by the electromotor **14,** it creates suction in the inlet **7,** drawing in the liquid to be pumped, and expelling it along the armature to the outlet **8** where it passes the one-way valve **10** and advances to the user. The valve **10** of course prevents a return flow of the pressurized liquid into the unit.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a pumping unit for liquids, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a pumping unit for liquids, particularly for liquid fuels, a combination comprising a housing; a pump in said housing; an electromotor in said housing and connected with said pump for driving the same, said electromotor comprising a stationary shaft, a sleeve surrounding said shaft and being turnable relative to the same, said sleeve having opposite axial end portions, each provided with a recess in an inner circumferential surface of said sleeve, an armature mounted on said sleeve, and a collector also mounted on said sleeve; and a pair of journals, each received in one of said recesses and journalling said sleeve on said shaft, said journals being of sintered material and being press-fitted into the respective recess and having respective inner diameters slightly smaller than the inner diameter of said sleeve so that the latter surrounds said shaft with a slight clearance.

2. A combination as defined in claim **1,** said sleeve being of constant outer diameter, and said armature comprising a stack of lamellae which is press-fitted onto said sleeve exteriorly of the latter.

3. A combination as defined in claim **2,** wherein said collector is press-fitted onto said sleeve exteriorly of the latter.

4. A combination as defined in claim **2,** wherein said collector is press-fitted onto said sleeve exteriorly of the latter and adjacent one axial end of said armature.

5. In a pumping unit for liquids, particularly for liquid fuels, a combination comprising a housing; a pump having a rotary impeller in said housing; an electromotor in said housing and connected with said pump for driving the same, said electromotor comprising a stationary shaft, a sleeve of constant outer diameter surrounding said shaft and being turnable relative to the same, an armature including a stack of lamellae which is press-fitted onto said sleeve exteriorly of the latter, a collector also press-fitted onto said sleeve exteriorly of the latter and adjacent one axial end of said armature; and a bushing press-fitted onto said sleeve adjacent an opposite axial end of said armature and provided with a groove for mutual engagement with said impeller.

6. A combination as defined in claim **5,** wherein said bushing is of synthetic plastic material.

7. In a pumping unit for liquids, particularly for liquid fuels, a combination comprising a housing; a pump in said housing; an electromotor in said housing and connected with said pump for driving the same, said electromotor comprising a stationary shaft of constant diameter, a sleeve surrounding said shaft and being turnable relative to the same, said sleeve having opposite end portions and being of relatively larger diameter than said shaft so as to define an axial space therewith, an armature mounted on said sleeve, and a collector also mounted on said sleeve; and a pair of journals of porous sinter material provided on said opposite end portions and journalling said sleeve on said shaft and communicating with said axial space, so that the pumped liquid can permeate through said journals into said axial space and lubricate said turnable sleeve.

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