(54) Title: A DEVICE WITH A SINGLE BODY FOR PUMP AND UNIVERSAL DIFFUSOR FOR MONOBLOCK ELECTROPUMPS

(57) Abstract

The device according to the present invention comprises a single pump body (13) and a single diffusor (7), compatible to each other for a wide range of capacities and power, and that may be coupled to any suitable electric motor (1).
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The present invention concerns a device consisting of a single pump and a single diffusor, hydraulically compatible to each other, for a wide range of capacities and power of monoblock electropumps.

It is already well known that the motor of the monoblock electropumps represents 70% of the weight and 30% of the total value of the product.

The pump bodies of such electropumps are numerous, having inlets and outlets of different diameters and shapes, and therefore request the dealer a wide storage possibility so as to satisfy all possible request combinations of the market.

Also the best known impellers in the power range between 2 and 10 HP are of about 1,000 different kinds, and consequently they have a wide range of possible dimensions, shapes and construction materials and therefore also the running of a storage is extremely expensive.

The aim of the present invention is to realize a device with one single pump body and one single diffusor, compatible to each other for a very vast range of capacities and powers that may
be coupled to any suitable electric motor.

Further characteristics of the invention are:
- the reduced costs for resulting competitive
  with those of other pumps of small capacity;
- the sufficient sturdiness to resist to the
  mechanic and hydraulic tests of high capacities;
- the presence of outlets and inlets such to
  be coupled rapidly and economically to the
  different diameters of the piping of the inter-
  face of the user and with pipe-fittings both
  flanged and threaded.

The device according to the invention, comprises
a range of revolving supports of few unities,
able to:
- transmit the movement from the standard shaft
  of engines to the various impellers;
- cover the engine shaft impeding the contact
  with the pumped liquids;
- allow shafts of different diameters to couple
  themselves with the impellers maintaining
  unaltered the external diameter, seat of the
  sole mechanic seal of the pump body which
  will be thus the same in all versions of the
  pump;
- support all impellers of the produced range.
The advantages of the device are numerous and relevant:
- provides the user with the possibility to use impellers of materials compatible with the liquids pumped;
- allows to perfect one's installation, adapting the hydraulic parameters of the pumps (capacities and pressures) to the real necessities of the installation self;
- provides to perfect the yielding of the pump in function of the hydraulic installation, given the notable number of impellers that can be applied to the pumps;
- allows to have the possibility to obtain from an already installed pump a double use, substituting the impeller only.

Further characteristic of the invention is determined by the fact that, whereas until now the bladed part of the impellers has always been realised solid for the support and thus the substitution because of wear constitutes one of the items that weigh heavily on the costs of the pump, in the present invention, since the bladed part is not solid for the support, in case of wear it is possible to execute the sole substitution
of the bladed part.

Furthermore, inserting on the revolving support, by means of screws, six small blades of special configuration, the pump becomes a vortex centrifugal pump, thus extending the application field.

The invention is exposed in more detail in the following with the aid of drawings which represent an example of its execution.

Figure 1 represents, in exploded perspective, all the components of the device.

Figure 2 represents in vertical section the detail of the revolving support.

Figures 3-4-5-6 represent the engine flange, with two variants of adapter and the indications of the exemplifying scalings.

Figures 7-8 represent a contra-flange welded to the tube.

The figures represent a device with a single body for pump and universal diffusor, for monoblock electropumps, comprising an engine 1 and the following components:

- an engine flange 2
- an oil-screen 3
- a flange diffusor-holder 4
- a screw 5 of blockage flange diffusor-holer to engine flange
- a splash-screen 6
- a diffusor 7
- a fixed part 8 of the mechanic seal
- a rotating part 9 of the mechanic seal
- a revolving support 10
- a screw 11 of the blockage of the revolving support of the engine shaft
- a screw 12 of water-tight seal
- a pump body 13
- a nut 14
- an escape tube 15, configuration with thread
- an entry tube 16, configuration with flange
- a mobile standard flange 17 of connection
- a special flange 18 open for pump body
- a screw 19 of blockage revolving to the support
- an adapter 20 of the pump to the various engines
- a dismantlable impeller 21
- a small dismantlable blade 22 for configuration vortex pump
- a fixed contra-flange 23 welded to the piping.

As regards the revolving support, described in figure 2, this has the aims to:
transmit the movement from the standard shaft of the engines to the various impellers;
cover the engine shaft impeding the contact with pumped liquids;
allow shafts of different diameters to couple themselves with the impellers maintaining unaltered the external diameter, seat of the sole mechanic seal of the pump body which will be thus the same in all versions of the pumps;
centre and render solid for the engine shaft (by means of screws or bolts) the various types of impellers or mobile blades to conform the pump to a centrifugal pump with closed impeller or vortex pump.

The revolving support according to the invention is realised with a range of six supports which allow the centering of the closed impellers by means of reference to the surface L, endowed with suitable holes for the blockage of the impellers and of the mobile small blades by means of six or twelve screws or bolts.

The supports on the surface M accommodate the rotating part 9 of the mechanic seal.
The screw of water-tight seal 12, engaging the threading 20 of the support impedes the liquid from entering into contact with the head of the engine shaft.

The blockage screw 11 positions axially the support as regards to the engine shaft.

The surface N of diameter A accomodates the engine shaft while the movement is transmitted by means of a small key.

It is note that the only dimensions that vary in the support range are those relative to the diameter of the accomodation of the shaft and to the relative small key.

As regards to figures 3-4-5-6 the adapter consents the dimensional coupling between the flange diffusor-holder 4 and the flanges of the framework of the type of engines according to the international norms.

In some types of engine frameworks the flange diffusor-holder 4 is connected directly to the flange of the engine framework, without any need for an adapter.

The adapter consents the coupling with the flange
diffusor-holder centering it to the surface A and with the various engines flanges centering on the surfaces C, B, D.

5 The connection bolts between the flanges and the pump are accommodated in the four holes.

The adapter is built in stainless steel and is manufacturable with pressing or with the removal of shavings.

The aim of the contra-flange welded to the tube, as in figures 7-8 is that to allow the joint by means of bolted flanges between pipings of different diameters and the flanges of the pump body 13.

As regards the realisation of this detail it is foreseen by the invention the building of a range of three contra-flanges, with different scalings that can be welded to the user's pipings, while the connection to the pump body occurs by means of mobile flanges 17-18.
Claims

1) Device for the realisation of the monoblock electro-pumps, characterised by a single pump body and a universal diffusor, endowed with such inlets and outlets to be coupled rapidly and economically to the various diameters of the piping of the user's interfacing and with pipe-fittings both flanged and threaded.

2) Device according to claim 1, characterised by a range of revolving supports of few unities, able to:
   - transmit the movement from the standard shaft of engines to the various impellers;
   - cover the engine shaft impeding the contact with the pumped liquids;
   - allow shafts of different diameters to couple themselves with the impellers maintaining unaltered the external diameter, seat of the sole mechanic seal of the pump body which will be thus the same in all versions of the pump;
   - support all impellers of the produced range.

3) Device according to claim 1, characterised by the fact that the bladed part of the impellers
is not solid for the support so that in case of wear it is possible to effect the replacement only of the bladed part.

4) Device according to claim 1, characterised by the accommodation on the revolving support, by means of screws, of six small blades able to the transformation of the pump in vortex centrifugal pump.

5) Device according to claim 1, characterised by the components:
   - an engine flange 2
   - an oil-screen 3
   - a flange diffusor-holder 4
   - a screw 5 of blockage flange diffusor-holder to engine flange
   - a splash-screen 6
   - a diffusor 7
   - a fixed part 8 of the mechanic seal
   - a rotating part 9 of the mechanic seal
   - a revolving support 10
   - a screw 11 of the blockage of the revolving support of the engine shaft
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5 a screw 19 of blockage revolving to the support
- an adapter 20 of the pump to the various engines
- a dismantlable impeller 21
- a small dismantlable blade 22 for configuration
  vortex pump

10 a fixed contra-flange 23 welded to the piping.

5) Device according to claim 1, characterised by
the fact that the revolving support is realised
with a range of six supports that consent the
centering of closed impellers with reference
to the surface L, endowed with suitable holes
for the blockage of the impellers and of the
small mobile blades by means of six or twelve
screws or bolts.

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7) Device according to claim 1, characterised by
the fact that the adapter consents the dimensional
coupling between the flange diffusor-holder 4
centering on surface A and the flanges of the
engine's frameworks, centering on surfaces C,
B and D.

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8) Device according to claim 1, characterised by a
range of three contra-flanges, with different
scalings, able to be welded to the pipings of the user, while the connection with the pump body occurs by means of mobile pumps 17-18.

All the above substantially as described and illustrated and for the specified aims.
**INTERNATIONAL SEARCH REPORT**

**Classification of Subject Matter**

According to International Patent Classification (IPC) or to both National Classification and IPC

| Int.C1.5 | F 04 D 29/62 | F 04 D 29/40 | F 04 D 29/20 |

**Fields Searched**

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Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched

**Documents Considered to be Relevant**

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**Certification**

Date of theActual Completion of the International Search: 07-11-1991

Date of Mailing of this International Search Report: 09. 12. 91

International Searching Authority: EUROPEAN PATENT OFFICE

Signature of Authorized Officer: [Signature]

Form PCT/ISA/210 (second sheet) (January 1985)
V. **OBSERVATION WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim numbers. Authority, namely because they relate to subject matter not required to be searched by this

2. ☒ Claim numbers 3-8 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

- Parts of the description and the claims are drafted in an incomprehensible English language. Insufficient disclosure of the invention. Lack of conciseness, e.g., in claim 5.
- Claims 1, 2 are searched completely: The inventive concept understood as being concerned with a centrifuge pump design such that it can be easily connected to drive motors and fluid supply pipes of varying sizes.

3. ☐ Claim numbers the second and third sentences of PCT Rule 6.4(a). because they are dependent claims and are not drafted in accordance with

VI. **OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING**

This international searching authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the international searching authority did not invite payment of any additional fee.

**Remark on Protest**

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.
This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 25/11/91.

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For more details about this annex: see Official Journal of the European Patent Office, No. 12/82.