Title of the Invention: **Improvements in pumping apparatus**

Abstract Title: **Improvements in pumping apparatus**

Pumping apparatus is provided that comprises a housing assembly (17) containing two pumping chambers (20, 21), each with its own impeller. The two impellers are driven by a common driver. Each pumping chamber has an outlet (12, 13) for delivering fluid therefrom. The apparatus further comprises a fluid communication (16) between the two outlets, which is provided within or as part of the housing assembly.
Improvements in pumping apparatus

This invention relates to pumping apparatus.

The invention provides pumping apparatus comprising a housing assembly containing two pumping chambers, each with its own impeller, with the two impellers being driven by a common driver, and with each pumping chamber having an outlet for delivering fluid therefrom, the apparatus further comprising a fluid communication between the two outlets provided within or as part of the housing assembly.

By way of example, embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows an example of pumping apparatus according to the present invention, and

Figure 2 is a cross-sectional view through the pumping apparatus of Figure 1.

The pumping apparatus seen in the drawings is a water pump and comprises a housing assembly 10 in which first and second impellers (not shown) are mounted for rotation in respective pumping chambers. The impellers are driven to rotate by a motor, conveniently an electric motor (not shown). The motor is
interposed between the two impellers, which are keyed or otherwise coupled to respective ends of a shaft (not shown) driven by the motor. The two impellers are thus driven by a common driver.

The housing assembly 10 comprises a number of component parts: a middle section 17, in which the motor is mounted, and end sections 20, 21, which partly define the respective pumping chambers in which the impellers operate and which incorporate a respective outlet 12, 13 from each of the pumping chambers. The component parts are held together by suitable means such as threaded fasteners, and suitable seals are provided between them to ensure that the assembly is fluid tight.

Water is supplied to each pumping chamber separately via a respective inlet 11 (only one of which is seen in Figure 1). The inlets 11 are aligned with the rotational axis of the impellers. Water is delivered from each pumping chamber via its respective outlet 12, 13. These are arranged tangentially relative to their respective impellers, and at right angles to the inlets 11.

Each pumping chamber is formed with a suitable volute section so that rotation of its impeller will cause pressurisation of the water being delivered to it.

In practice, the pump can be used to boost a domestic supply, eg to deliver water to a shower. For this purpose, one of the pumping chambers can
conveniently be connected to the cold water supply, whilst the other is connected to the hot water supply.

It will be understood that since the two impellers here are connected directly to the motor, they are thus constrained always to rotate at the same time and at the same speed. In use of the pump in practice, however, it might be that only one of the pumping chambers is needed to deliver pressurised water at any given time, for example in the case where a cold shower is being taken. In that case, the pumping chamber on the hot water side would not be delivering water. Nevertheless, its impeller would still be driven to rotate. When an impeller is driven to rotate in a pumping chamber that is not delivering water, energy is transferred to the water, which causes its temperature to rise. If this is allowed to continue, the water will eventually boil and turn to steam. Since steam has a greater volume than water, this in turn will create a pressure rise in the system. The rise in pressure will quickly lead to failure of the weakest part of the system. Accordingly, a means of relief is needed to avoid this.

Conventionally, in a twin chamber pump, such a means of relief takes the form of a bypass tube that is connected between the outlets from the pumping chambers, usually some way downstream of the pump. This allows a certain amount of water to circulate and hence avoids the problem of excessive temperature rises.
The pumping assembly shown here also includes a bypass. As will be seen in Figure 2, however, the bypass here is provided within the housing assembly, and conveniently as an integral part of it. In particular, each outlet 12, 13 has a bleed hole 14, 15 as part of its respective end cover 20, 21 and the bleed holes are arranged to communicate with each other via a passageway 16 in the housing assembly 10.

Conveniently, the passageway 16 is formed as an integral part of the middle section 17, which will typically be a die cast component. The bleed holes 14, 15 are conveniently formed in bosses 18, 19, which form integral parts of their respective end sections 20, 21, also typically die cast components. This means that when the component parts of the housing assembly 10 are fitted together, the passageway 16 automatically connects the two bosses 18, 19 and thus puts the two outlets 12, 13 in communication with each other via their bleed holes 14, 15. The bosses 18, 19 are arranged to fit into the ends of the passageway 16 with suitable seals 22, 23 providing a fluid tight connection.

It will be appreciated that the fluid communication between the outlets could be provided by means other than the integral passageway described above and yet still be within the housing assembly. It will also be appreciated that the fluid communication could be provided by means outside the housing assembly and yet still forming part of it, preferably an integral part.
The provision of a bypass that is incorporated as part of a pump housing assembly is a neat solution, because it avoids the additional clutter that is normally associated with a conventional separate, external connection. Incorporating the bypass as an integral part of the housing assembly provides an advantage in that it facilitates making provision for suitable sealing against leakages. A further advantage is that it readily lends itself to the positioning of sensors, eg for use in detecting fluid pressure within the bypass, with the sensors being able to be located as part of the housing assembly, and preferably within it. This again helps to avoid the clutter that is typically to be found around a conventional pump installation.
CLAIMS

1. Pumping apparatus comprising a housing assembly containing two pumping chambers, each with its own impeller, with the two impellers being driven by a common driver, and with each pumping chamber having an outlet for delivering fluid therefrom, the apparatus further comprising a fluid communication between the two outlets provided within or as part of the housing assembly.

2. Pumping apparatus as claimed in claim 1 wherein the fluid communication is in the form of a passageway in the housing assembly.

3. Pumping apparatus as claimed in claim 1 or 2 wherein the fluid communication is in the form of a passageway that is formed as an integral part of the housing assembly.

4. Pumping apparatus as claimed in claim 3 wherein the housing assembly is formed from component parts, with a middle section and end sections to either side thereof, with the passageway being formed as part of the middle section.

5. Pumping apparatus as claimed in claim 4 wherein each outlet is formed as part of a respective end section, with a respective bleed hole in each end section being arranged to extend in use between each outlet and the passageway.
6. Pumping apparatus as claimed in claim 5 wherein each end section has a boss formed integrally therewith, with its respective bleed hole extending therethrough.

7. Pumping apparatus as claimed in claim 6 wherein the bosses of the end sections are arranged to fit in the ends of the passageway when the component parts of the housing assembly are assembled together.

8. Pumping apparatus substantially as herein described with reference to the accompanying drawings.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

<table>
<thead>
<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1 &amp; 2</td>
<td>WO01/94786 A (POWERCELL) A submersible circulation system has a single motor 12 driving two pumps 38,44 enclosed in a casing 62, tube 53 connects outlets 36 &amp; 42. Fig 1.</td>
</tr>
<tr>
<td>X</td>
<td>1 &amp; 2</td>
<td>US2814254 A (LITZENBERG) Fig 1, parallel impellers 55 driven by common motor within housing 40, outlets 13 &amp; 13 are in fluid communication.</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>GB2465392 A (SALAMANDER) Pumping apparatus having two parallel impellers 16 &amp; 17 driven by common motor 10 and mounted within integral housing 30. Figs 1 &amp; 2</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>GB2205129 A (POWERED SHOWERS) A water pump for pumping hot and cold water with two pumps 13 &amp; 16 mounted either end of an electric motor 10. Fig 1</td>
</tr>
</tbody>
</table>

Categories:

| X | Document indicating lack of novelty or inventive step |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. |
| & | Member of the same patent family |

| A | Document indicating technological background and/or state of the art. |
| P | Document published on or after the declared priority date but before the filing date of this invention. |
| E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

Worldwide search of patent documents classified in the following areas of the IPC:

F04D

The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC,
### International Classification:

<table>
<thead>
<tr>
<th>Subclass</th>
<th>Subgroup</th>
<th>Valid From</th>
</tr>
</thead>
<tbody>
<tr>
<td>F04D</td>
<td>0013/14</td>
<td>01/01/2006</td>
</tr>
<tr>
<td>F04D</td>
<td>0013/12</td>
<td>01/01/2006</td>
</tr>
<tr>
<td>F04D</td>
<td>0015/00</td>
<td>01/01/2006</td>
</tr>
</tbody>
</table>