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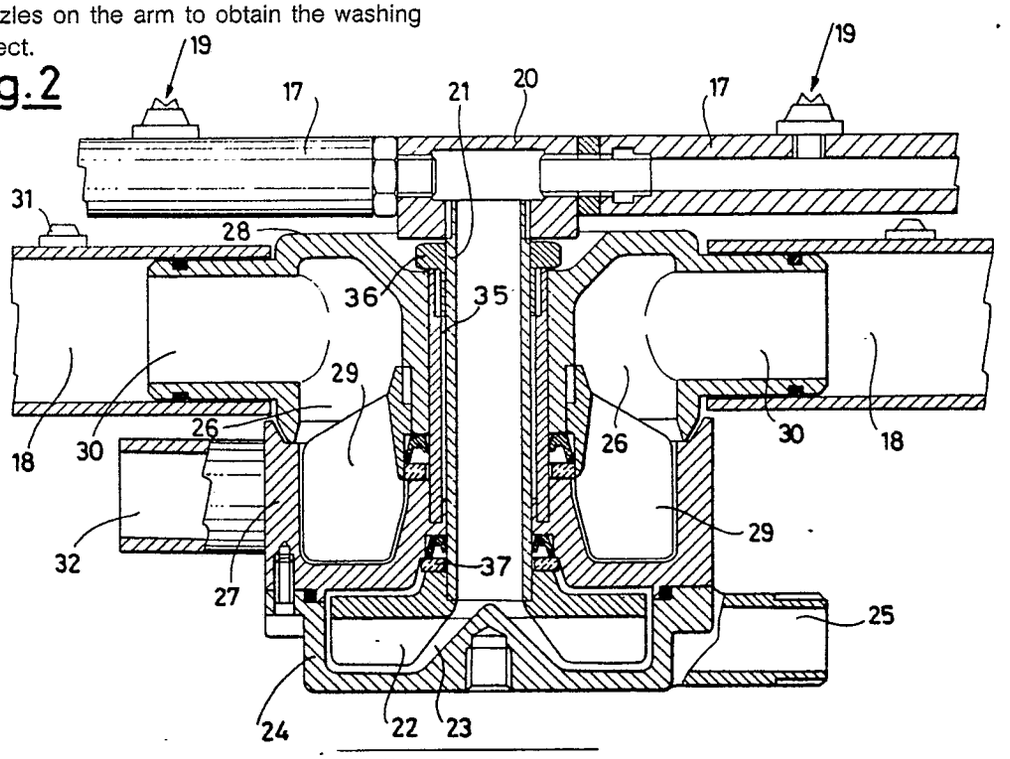
(54) Hydraulic-motor driven rotary spray-arm device for dish-washing machines.

(57) The invention concerns a dish-washing machine of the type comprising at least one spray-arm supported rotably on a shaft. A hydraulic motor, such as a hydraulic turbine, sets in rotation the spray-arms. In a preferred embodiment the flow of water feeding the turbine pass into the spray-arm to be discharged trough the nozzles on the arm to obtain the washing and rinsing effect.

Fig.2



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HYDRAULIC-MOTOR DRIVEN ROTARY SPRAY-ARM DEVICE FOR DISH-WASHING MACHINES

Dish-washing machines usually feature rotary spray-arms which wash and rinse the dishes by the agency of the jets of water emitted by the said arms. The spray-arms are set in rotation by the reaction brought about by the emission of the jets at an appropriate angle with respect to the axis of rotation of the spray-arms.

Although very straighforward and economical to manufacture, such kind of washing and rinsing system suffers from a serious disadvantage that adversely affects its efficiency: to be able to provide an appropriate reaction thrust and so cause the spray-arms to rotate, the jets of water have to be inclined at a certain angle to their rotation axis. This means that, during spray-arm rotation, the said jets always strike the dishes in the dish-washing machine on the same side. In the case of plates, for example, the jets of water directly strike only one of their surfaces, the other surface being struck only indirectly and thus with a considerably diminished washing action. The washing is therefore not uniform and, in particular conditions, even inadequate.

The overall object of the present invention is to obviate the aforesaid disadvantages by embodying a rotary spray-arm device which remains economical to produce, still employs the flow of water within the machine to rotate the spray-arms, but which at the same time can be embodied with the said jets of water orientated in any direction - in particular so as to strike the dishes in a uniform manner.

To achieve the said object, the present invention embodies a device for a dish-washing machine of the type comprising at least one spray-arm supported rotatably on a first shaft, wherein the said first shaft is connected to a second rotary shaft is connected of a hydraulic motor.

The object of the invention, and its advantages over the known art, will become more apparent from the following description of embodiments thereof, with reference to the appended drawings, in which:

- Figure 1 is a cutaway diagrammatic view of a rotary spray-arm device embodied according to the innovative principles of the invention;
- Figure 2 is a cutaway diagrammatic view of a rotary spray-arm device embodied according to the innovative principles of the invention with two sets of spray-arms which rotate independently on one and the same axis;
- Figure 3 is a diagrammatic perspective view of the device of Figure 2;
- Figure 4 is a diagram showing a possible application of the devices of Figure 1 and Figure 2 within a dish-washing machine.

With reference to the appended drawings, Figure 1 shows a first example of embodiment in accordance with the principles of the invention, in the form of a device consisting of a set of spray-arms 10, of generally circular section, on the surfaces of which are bores communicating with the exterior by means of nozzles 11 whose orientation determines the direction in which the jets of water will be emitted. The spray-arms 10 are at one end solidly interconnected by means of a hollow connector 12 which is in turn connected to one end of a hollow shaft 13 disposed at right angles to the surface formed by the spray-arms 10. Proximal to its other end, the shaft 13 carries blades 14 disposed radially to it. The said end carrying the blades 14 is inserted within a container 15 and is supported so as to permit free rotation of the shaft 13 about its own axis. At the level of the blades 14 the container has a filler mouth 16.

The container 15 and the blades 14 thus form a hydraulic turbine; when a line (not shown in the Figures) carrying a flow of water is connected to the filler mouth 16, on entering the container 15 the said flow sets in rotary motion the blades 14, so causing the set of spray-arms 10 to rotate. Not having any other outlet, the water thas has entered the container then flows within the shaft 13 until it reaches the connector 12, from which it deviates along the spray-arms 10 and finally issues in the form of jets from the nozzles 11 given the desired angling.

A second example of application of the principles of the invention is as shown in Figure 2 and 3. In this second example the rotary spray-arms are divided into two independent sets - one set of upper arms 17 and one set of lower arms 18, both comparable to the heretofore described spray-arms 10. The upper arms 17, which on their surfaces carry nozzles 19 communicating with the interior of the said arms, are interconnected by means of a connector 20 which is in turn connected to a shaft 21 carrying blades 22 at its other end (in the same way as in the case of the spray-arms 10, the connector 12, the shaft 13 and the blades 14 of the previously described embodiment). As figur 2 shows, the shaft 21 with blades 22 is inserted into a first cavity 23 of a container 24 and supported by means of a hollow shaft 35 coaxial with and external to the latter, solid with the container 24 and carrying on its top a ring nut 36 and at its base a bush 37 so as to permit the free rotation of the

shaft 21 about its own axis. The first cavity 23 communicates with the exterior by means of a filler mouth 25 positioned at the level of the blades 22, in this way forming with the blades 22 a first hydraulic turbine (comparable to the one hitherto described in the first example of embodiment of Figure 1). A second cavity 26 of form generally annular around the hollow shaft 35, is formed in part by an upper wall 27 of the container 24 that extends above the first cavity 23 and in part by a shell shaped cover 28 rotating about the hollow shaft 35 and having its lateral surface absolutely flush with the upper portion of the wall 27; the cover 28 carries within it second blades 29 which extend into the interior of the part of the cavity 26 formed by the upper wall 27 of the container 24. At its external periphery, the cover 28 features emission mouths 30 to which are connected the lower arms 18 carrying nozzles 31 communicating with the interior of the latter. In the lateral portion of the upper wall 27 of the container 24 there is a second filler mouth 32 which communicates with the cavity 26 at the level of the blades 29. The cover 28 and the blades 29 connected thereto thus come to form a second hydraulic turbine disposed axially with respect to the first hydraulic turbine.

In this manner there are obtained two sets of spray-arms mechanically connected to two independent hydraulic turbines. When the filler mouth 25 is fed with a flow of water, the spray-arms 17 are set in rotation by the first turbine and, at the same time, jets of water are caused to issue from the spray-arms 17 similarly to what took place in the case of the device of Figure 1. If, through the filler mouth 32, the second turbine is fed with a flow of water, the blades 29 are caused to rotate and, with them, the cover 28 and the lower spray-arms 18, simultaneously the water enters, from the cavity 26 and trough the emission mouths 30, the lower arms 18 from which it issues as jets through the nozzles 31.

By means of the device shown in Figure 2 (and shown for greater clarity in perspective in Figure 3, where the lower and upper arms are for the same reason not shown) the purpose is achieved of having two sets of coaxial rotary spray-arms, emitting jets of water, which are totally independent and which can be fed separately. This is particularly advantageous with large dish-washing machines in which the hydraulic circuits followed during the stage of washing with soapy water and those followed during the stage of rinsing with clean water are separate. Hence it is possible for example to feed water to the filler mouth 25, and thus to the set of upper spray-arms, with the water of the rinsing circuit and to feed the filler mouth 32, and thus the lower spray-arms, with the soapy water of the washing circuit.

The two examples of application describes above, the first regarding a device with only one set of spray-arms and only one turbine and the second regarding a device with two separate sets of coaxial arms each with its own turbine, can of course be used simultaneously within one and the same dish-washing machine. A diagrammatic example of such an embodiment is given in Figure 4, where the two devices are disposed as follows within the same dish-washing machine: one device (similar to that shown in Figure 1) overhead and one device (similar to that shown in Figure 2) below. Together with the upper set of arms of the device situated in the lower position, the overhead device is fed through a line 33 with clean water during the rinsing cycle, while the lower set of arms of the device in the lower position is fed, during the washing cycle, through a second line 34, with water mixed with detergent. In this way the washing and rinsing cycles of the dish-washing machine can be kept completely separate and there can at the same time be obtained two different dish spraying characteristics depending on the operation (washing with detergent or rinsing) being carried out by the machine.

In addition, by appropriately sizing the blades of the various turbines, a different spray-arm rotation speed can be obtained in the various devices so as to achieve maximum washing efficiency.

It will appear from all the foregoing that the use in a dish-washing machine of a rotary spray-arm device constructed in accordance with the innovative principles of the invention will bring enormous advantages over any system thus far known in the art. The possibility of orientating, by appropriately angling the nozzles on the spray-arms, the jets of water emitted by the said arms so as to obtain the maximum washing and rinsing effect and, at the same time, the possibility of having the said spray-arms always rotate at a uniform velocity suited to the operations to be carried out, more than compensate for the small additional cost called for by the application of a small turbine.

The form of the rotary spray-arms herein described is an exemplifying form only, and the form may be any held to be helpful in obtaining the best washing action with the dish-washing machine. The same applies to the turbines herein exemplified.

It would also be possible not to have the flow of water feeding the turbine pass into the spray-arms as heretofore described in the examples of embodiment, but rather to send it to some other device in the dish-washing machine and to use an independent hydraulic circuit for feeding the spray-arms.

Claims

1) Device for dish-washing machines, of the type comprising at least one spray-arm supported rotatably on a first shaft, wherein the said first shaft is connected to a second rotary shaft of a hydraulic motor.

2) Device as described in claim 1, wherein the said hydraulic motor is fed by the same flow of water that is subsequently sent to the said at least one spray-arm.

3) Device as described in claim 1 or 2, wherein the said hydraulic motor is a hydraulic turbine.

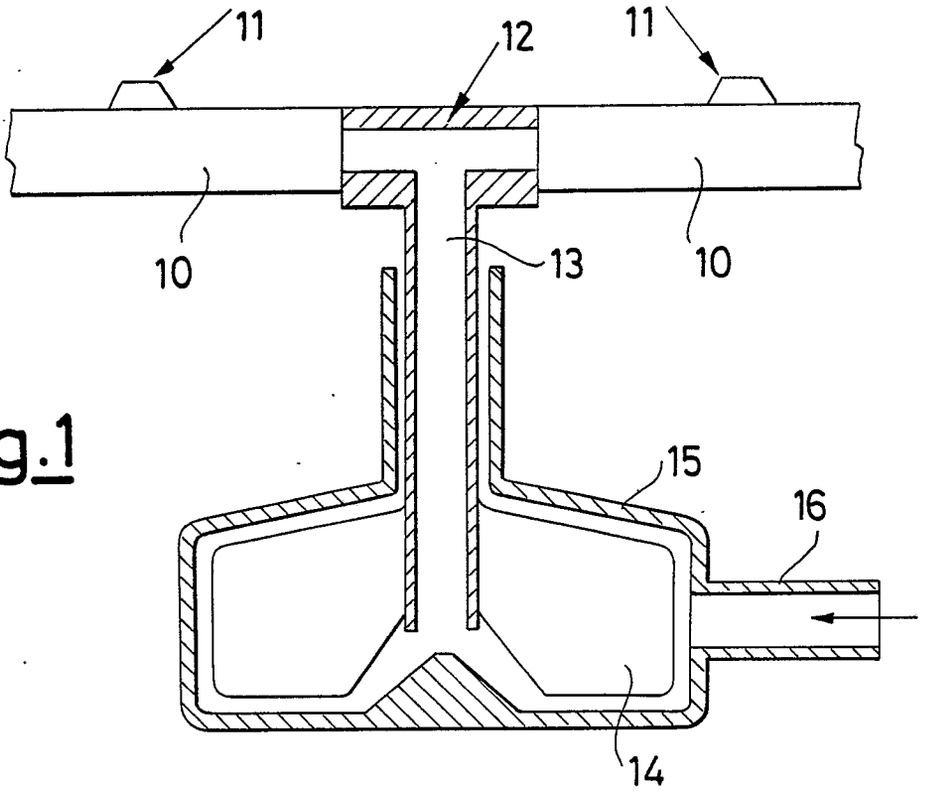
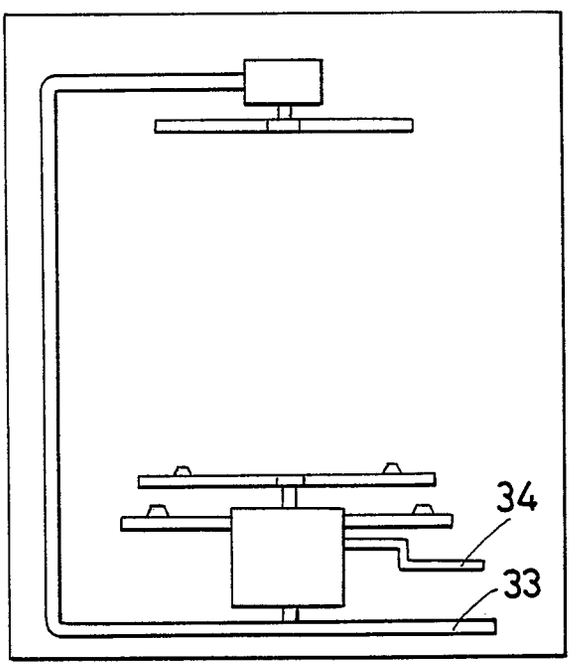


Fig.1

Fig.4



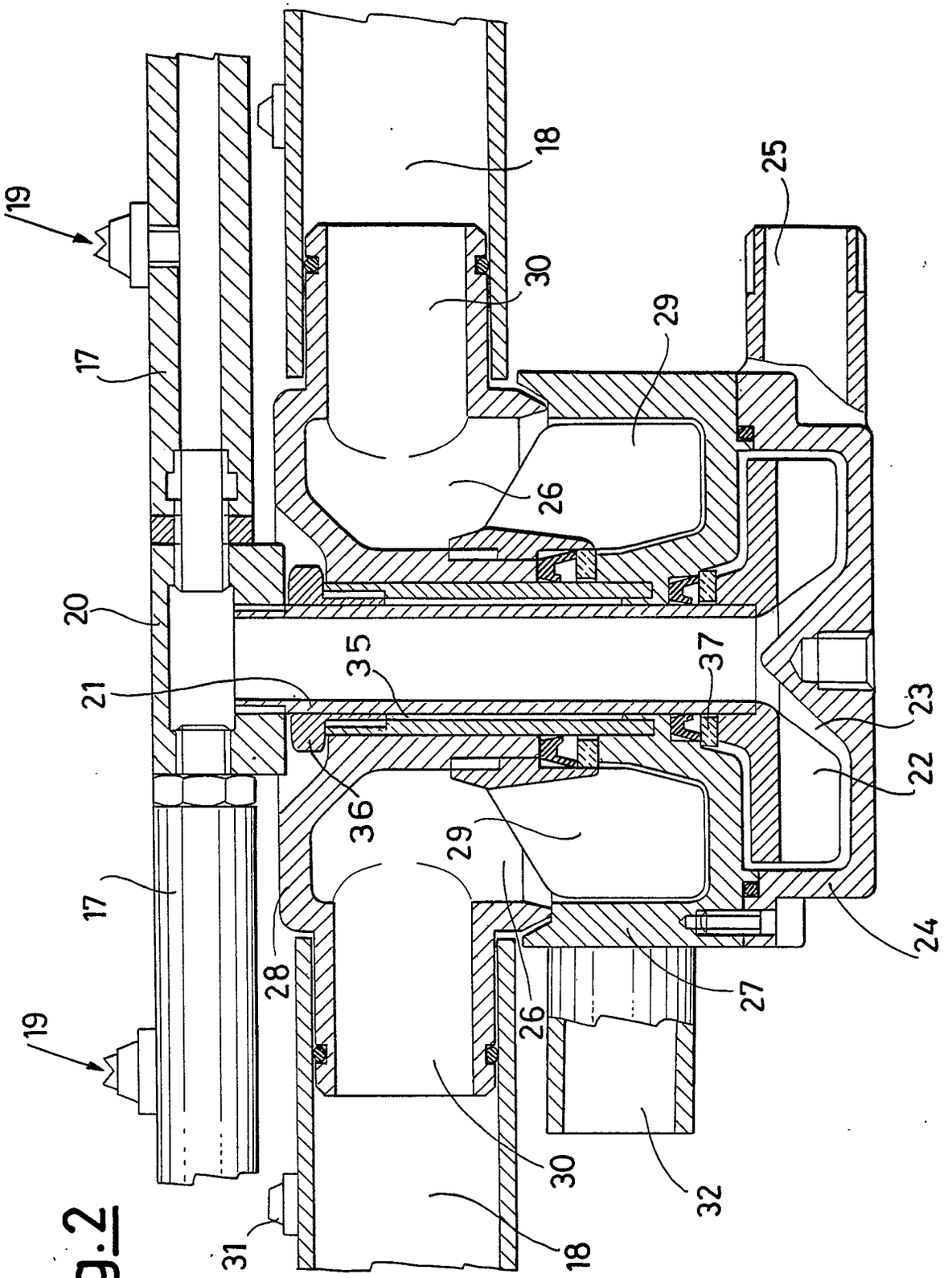

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Fig.2

Fig.3