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(54) **MEMBRANE WASHING MACHINE**

MEMBRANWASCHMACHINE

MACHINE A LAVER A MEMBRANE

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## Description

### Technical Field

**[0001]** This invention relates to a membrane washing machine which has a completely new washing process that replaces the existing one. According to the International Patent Classification it is classified as: A 47 L - Domestic washing or cleaning: F 26 B - Drying solid materials or objects by removing liquid therefrom.

### Background of the Invention

**[0002]** The most persistent problems encountered in the operation of modem washing machines are the large amount of water used and high levels of pollution caused by dirt and detergents from washed laundry, and also the length of time of the washing cycle. The population in the world increases every day, while water reserves remain the same. As the population increases, water gets more and more polluted. Manufacturers of washing machines have never specified the exact quantity of consumed water, detergents, power and time in their catalogues.

**[0003]** There is at least one washing machine in each household worldwide and only a few households have tested the exact quantity of consumed water, power, detergents and time required for each washing cycle. So far, the laundry washing system has been based on paddling and the application of several cycles of spinning to remove water from the laundry. This washing system requires a large quantity of water, from 120 to 250 litres of water per 4,5 kilograms of laundry, 150 minutes per washing cycle, and a substantial quantity of detergents and consumed power. These data are the results of measurements conducted on numerous modem washing machines. In addition, the technical problem with the existing system of laundry washing is the use of a two-speed asynchronous motor that is prone to frequent breakdowns. There is also a problem with frequent breakdowns of program selectors (controllers).

**[0004]** US-A-2 417 998 discloses a membrane washing machine having a membrane without a valve.

### Disclosure of the Invention

**[0005]** The primary objective of this invention is to reduce the quantity of consumed water, time, power and detergent and to eliminate parts that break down frequently and thus cause expense when they have to be repaired or replaced. Another objective is to reduce the environmental pollution and improve the global eco-system. Some additional advantages of the invention will be illustrated in the following description of the invention, while others will become apparent through the application of the invention.

**[0006]** The present invention provides a membrane washing machine as defined in claim 1.

**[0007]** The membrane washing machine of this invention uses an entirely different system of laundry washing based on pushing water through the laundry, thus making it wet, and immediately afterwards extracting water from the laundry. This washing process implemented by one circular, two-way water pump of low pressure but high capacity. The process is also implemented by means of one-way valves, filters, reduction valves, safety valves and a washing-machine program selector (controller). The membrane washing machine has got neither a drum which rotates nor a motor or spinning parts. Therefore there is no danger of noise and of sliding of the machine - and there are neither concrete weight blocks nor shock absorber.

**[0008]** The membrane washing machine comprises two containers, each with an opening, placed so that their openings face and touch each other, resembling two joined washing-up basins. A perforated pane is placed in the bottom part, under which a water reservoir and a heater are located, while the upper part is divided by a membrane (diaphragm) which can be fitted snugly along the axes, to the bottom part of the top container, so it can push in the opposite direction towards the bottom container. The laundry is placed between the membrane in the top container and the perforated pane in the bottom container, and two containers are then firmly closed and locked by two small, hydraulic cylinders, symmetrically inserted, whose pistons are driven by the pressure from the municipal water supply system via an electric valve which is activated by opening or closing the joined containers. After selecting the washing program, the membrane washing machine is put into operation by switching on the program selector (controller).

**[0009]** Figure 1 shows a detailed diagram of the complete membrane washing machine with all its corresponding parts. Referring to Figure 1, the container 9 represents the top container of the washing machine with embedded membrane 10, in whose centre a one-way valve 22 is inserted. In the lower part of the container 13, a perforated pane 12 is located, with a cone 11 with openings (cuttings) for water, so that the incoming flow of water is directed tangentially into the turbulent yoke which is created by means of a two-way radial water pump.

**[0010]** The membrane washing machine has an opening 1 for placing the laundry in the machine. The machine is controlled by a program selector (controller) 2 which automatically switches on electro-valves 3 and 6, depending on whether only water or water with detergent, placed in container 7, are to flow into the machine.

**[0011]** Since the membrane machine operates under the low pressure, the pressure of the incoming flow of water is regulated by a pressure regulating valve 8. The membrane washing machine begins washing laundry when containers are filled up with water, when an aeration control valve 14 closes, and the pressure within the machine activates a pressure control valve (presostat) 5, which is controlled by the machine selector 2, which

also closes electrical valves 3 and 6, while a circular two-way water pump 16 is activated. The water under the perforated pane is pumped upwards, through an embedded microfilter 21, above the membrane 10 within the container 9, and during this whole process a one-way valve 22 in the middle of the membrane is closed. The membrane 10 continuously presses the laundry, removing water from it.

**[0012]** In the case of increased pressure during this cycle, a safety valve 15 opens and decreases the unwanted pressure in the upper area. After removing water from the laundry, the pump changes its direction and starts pumping downwards the water located above the membrane, using an electric valve 23 and one-directional valve 20. The water then flows through a cone 11 which has tangentially directed cuttings (openings) by means of which the water rotates the laundry. The water is forced through the laundry and through an open one-way valve 22 in the middle of the membrane 10. This process takes slightly longer than the one described above.

**[0013]** The time required for this process is determined by the program controller 2, while the number of repetitions of the process depends on the actual dirtiness of the laundry. Water is heated by a heater 17 and the temperature is controlled by a thermostat 18, which is in turn controlled by a special switch on the machine. After completion of washing cycles, the controller closes the electric valve 23 and opens the electric valve 24, while the pump pumps out the remaining water extracted from the laundry.

**[0014]** This invention provides a practical, durable and useful device which may be economically manufactured, and which includes substantial improvements over prior known devices of this type.

**[0015]** It will be apparent to those skilled in the art that various modifications and variations could be made in the washing machine of the invention without departing from the scope of the invention as defined in the claims.

## Claims

1. A membrane washing machine comprising a top (9) and a bottom (13), cylindrical, large containers placed with their openings facing each other, in the horizontal position with the common vertical axes, and a compensation membrane (10) embedded in the top container, **characterized in that** a one-way valve (22) is inserted in the centre of the membrane (10), said one-way valve (22) enabling washing cycles comprising a first phase of soaking and pushing water with detergents through the laundry, and a second phase of extracting water from the laundry, which takes less time than the first phase, and during which said second phase the one-way valve (22) is closed.

2. The membrane washing machine according to Claim 1, **characterized by** an electronic program controller (2) which controls duration of soaking, flow of water through the laundry, and number of water extraction cycles.

3. The membrane washing machine according to Claim 2, **characterized by** a cone shaped handler of water gush (11) which is mounted on a reinforced perforated pane (12) and which has tangentially directed openings by means of which the water rotates the laundry, thus increasing laundry washing effects.

4. The membrane washing machine according to Claim 3, **characterized by** a two-way safety valve (15) which ensures that the hydraulic pressure, produced by a two-way radial water pump (16), is within prescribed range.

## Patentansprüche

1. Membranwaschmaschine, umfassend einen oberen (9) und einen unteren (13) zylindrischen großen Behälter, welche so angeordnet sind, dass deren Öffnungen in der horizontalen Position mit den gemeinsamen vertikalen Achsen sich gegenüberliegen, und eine in dem oberen Behälter eingesetzte Kompensationsmembran (10), **dadurch gekennzeichnet, dass** ein Einwegventil (22) im Zentrum der Membran (10) eingefügt ist, wobei das Einwegventil (22) Waschzyklen ermöglicht, umfassend eine erste Phase des Einweiches und Durchdrückens von Wasser mit Detergentien durch die Wäsche, und eine zweite Phase des Extrahierens von Wasser aus der Wäsche, welche weniger Zeit in Anspruch nimmt als die erste Phase, und wobei während der zweiten Phase das Einwegventil (22) geschlossen ist.

2. Membranwaschmaschine nach Anspruch 1, **gekennzeichnet durch** einen elektronischen Programmregler (2), welcher die Zeitdauer des Einweichens, des Strömens von Wasser **durch** die Wäsche und die Anzahl an Wasserextraktionszyklen reguliert.

3. Membranwaschmaschine nach Anspruch 2, **gekennzeichnet durch** eine konisch geformte Handhabungseinrichtung (11) für den Wasserstrom, die auf einer verstärkten perforierten Platte (12) montiert ist und die tangential gerichtete Öffnungen besitzt, mittels denen das Wasser die Wäsche rotiert, wodurch Wäschewaschwirkungen verstärkt werden.

4. Membranwaschmaschine nach Anspruch 3, **ge-**

**kennzeichnet durch** ein Zweiwege-Sicherheitsventil (15), das sicherstellt, dass der **durch** eine Zweiwege-Radialwasserpumpe (16) erzeugte, hydraulische Druck innerhalb eines vorgeschriebenen Bereichs liegt.

## Revendications

1. Machine à laver à membrane comprenant un grand caisson supérieur (9) et un grand caisson inférieur (13) cylindriques placés avec leurs ouvertures se faisant face, dans une position horizontale, d'axes verticaux communs et une membrane de compensation (10) encastrée dans le caisson supérieur, **caractérisé en ce qu'**une valve anti-retour (22) est disposée au centre de la membrane (10), ladite valve anti-retour (22) permettant des cycles de lavage comprenant une première étape de trempage et de poussage d'eau avec des détergents au travers du linge, et une deuxième étape d'extraction de l'eau contenue dans le linge, laquelle prend moins de temps que la première étape, deuxième étape durant laquelle la valve anti-retour (22) est fermée.

2. Machine à laver à membrane selon la revendication 1, **caractérisé en ce qu'**elle comprend un contrôleur de programme (2) qui contrôle la durée du trempage, d'écoulement de l'eau au travers du linge, et le nombre de cycles d'extraction de l'eau.

3. Machine à laver à membrane selon la revendication 2, **caractérisé en ce qu'**elle comprend une cavité d'arrivée d'eau (11) de forme conique qui est montée sur une plaque perforée (12) renforcée et qui comprend des ouvertures dirigées tangentiellement au moyen desquelles d'eau tourne dans le linge, augmentant ainsi l'effet lavant pour le linge.

4. Machine à laver à membrane selon la revendication 3, **caractérisé en ce qu'**elle comprend une valve de sécurité à double sens (15) qui garantit que la pression hydraulique, produite par une pompe à eau radiale à double sens (16), est dans une plage prescrite.

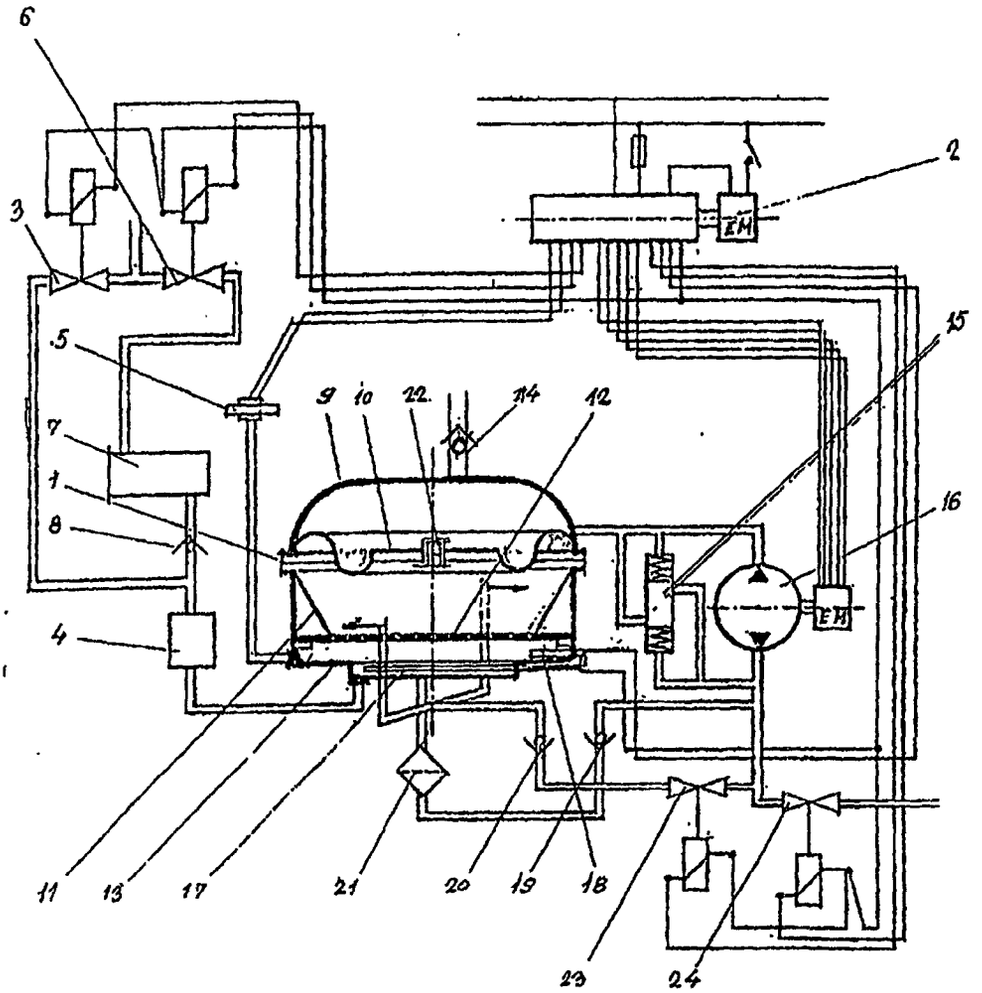



Figure 1