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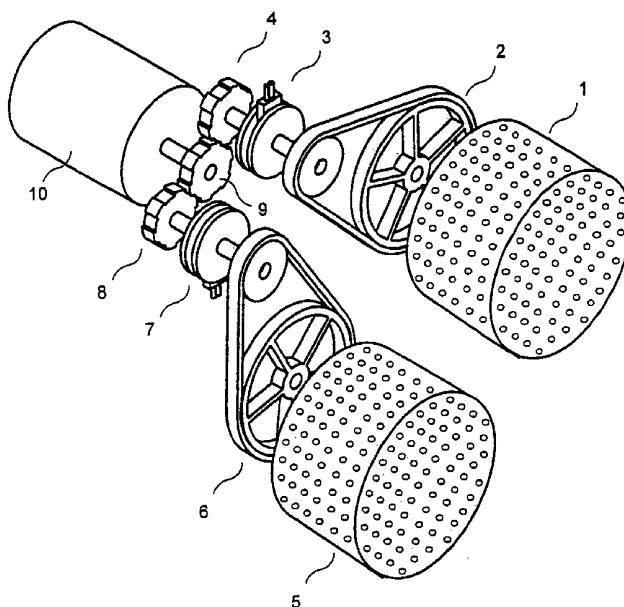
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[Continued on next page]

(54) Title: WASHING MACHINE WITH MORE THAN ONE DRUM



(57) Abstract: The washing machine according to the present invention comprises more than one separate drums and tubs in which said drums are located. In a preferred embodiment of the invention the washing machine comprises a first drum (1), a first tub (18) in which the first drum (1) rotates, a second drum (5) and a second tub (19) in which the second drum (5) rotates. In such washing machines, easily soiled and frequently washed laundry is washed in the second drum (5) without waiting for the loading capacity of the machine to be filled. By enabling the user to wash two different kinds of laundry in two drums simultaneously, total washing time will also be shortened.



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WASHING MACHINE WITH MORE THAN ONE DRUM

The present invention relates to washing machines having more than one
5 drum.

The washing machines used in the prior art operate with a single drum. The amount of the laundry that can be washed in the machine is determined according to the loading capacity of said machine. The user separates the laundry in groups
10 according to their types and collects them up to a quantity depending on the washing capacity of the machine, before starting washing. The most important feature that the user requires is to be able to wash the laundry in small quantities with different characteristics, by using less water, less energy and less detergent per unit laundry, in a short time. This feature is provided in the commercially
15 available machines by the short-cycle programs for the “less-dirty” laundries or by “economy” programs for the small quantities of laundry, but this need still is not fully satisfied.

The object of the present invention is to ensure that small quantities of
20 laundry with different properties to be washed by using less water, less energy and less detergent per unit laundry, in a short time.

The washing machine with more than one drum, realized to attain above mentioned object of the present invention has been illustrated in the attached
25 drawings, wherein:

Figure 1, is the view of an embodiment wherein the washing machine with more than one drum is driven by a single motor and a magnetic clutch.

Figure 2, is the view of an embodiment wherein the washing machine with
30 more than one drum is driven by a single motor and synchromesh.

Figure 3, is a diagram showing the washing programs in both drums in case when the washing machine with more than one drum is driven by a single motor and synchromesh.

Figure 4, is the view showing the tub and drum of a washing machine with
5 more than one drum, as extruded from a single mould.

Figure 5, is a schematical top view of an embodiment wherein two detergent dispensers are used in a washing machine with more than one drum.

Figure 6, is a schematical view of an embodiment wherein a single detergent dispenser is used in a washing machine with more than one drum.

10 Figure 7, is a schematical view of an embodiment showing the water intake and drainage systems of a washing machine with more than one drum.

Figure 8, is a schematical view of another embodiment showing the water intake and drainage systems of a washing machine with more than one drum.

Figure 9, is the view of a washing machine with more than one drum.

15 Figure 10, is the three-dimensional view of a washing machine, wherein the drums are placed consecutively on a horizontal plane.

Figure 11, is the three-dimensional schematical view of a washing machine, wherein the drums are placed consecutively on a horizontal plane.

20 Figure 12, is the front schematical view of a washing machine, wherein the drums are placed consecutively on a horizontal plane.

The components shown in the drawings are separately given reference numerals as follows :

- 25 1) First drum
 2) First pulley
 3) First magnetic clutch
 4) First gear
 5) Second drum
30 6) Second pulley
 7) Second magnetic clutch

- 8) Second gear
- 9) Transfer gear
- 10) Motor
- 11) Synchromesh
- 5 12) First detergent dispenser
- 13) Water-softener compartment
- 14) Bleacher compartment
- 15) Washing compartment
- 16) Pre-washing compartment
- 10 17) Second detergent dispenser
- 18) First tub
- 19) Second tub
- 20) Cold water inlet
- 21) Hot water inlet
- 15 22) Four-way valve
- 23) One-way valve
- 24) Common detergent dispenser
- 25) Directing element
- 26) Tank
- 20 27) Discharge pump
- 28) Three-way valve
- 29) First drum water inlet
- 30) Second drum water inlet
- 31) First drum water drainage path
- 25 32) Second drum water drainage path

In the washing machines, different programs are employed according to the type and degree of soiling of the laundry to be washed. However in such washing operations, the washing period is extended and an extra time is required for the classification of the laundry. Also, when a small quantity of laundry is to be washed, clothes of different natures with different sensitivities have to be washed

together or small quantites of laundry have to be washed separately, such problems as excessive water, electricity and detergent consumption, arise. The conventional washing machines comprise a drum into which laundry is loaded and a tub in which said drum rotates; whereas the washing machine according to

5 the present invention comprises more than one, separate drums and tubs in which these drums rotate. In a preferred embodiment of the present invention, the washing machine comprises a first drum (1), a first tub (18) in which the first drum rotates, a second drum (5), a second tub (19) in which the second drum rotates. In these machines, easily soiled and frequently washed clothes can be

10 washed in the second drum without waiting for reaching the washing capacity of the machine. Furthermore by washing two different kinds of laundry simultaneously in the first (1) and second drums (5), the total washing time can be shortened. In the state of art, in the case of washing laundry using two different programs, is approximately 4 hours; this time period in the washing machines

15 with two drums will be about $\frac{1}{2}$ or $\frac{3}{4}$ of the washing cycle of the single drum machines.

The volume of the first drum (1) may be equal to or smaller than that of the second drum(5). Said drums are so designed that they will have washing

20 capacities for different or same quantities of laundry. The tubs (18, 19) that receive the drums (1,5) may be produced separately or as a single piece, preferably as a plastic mono block piece provided with water tightness between the drums (1,5).

25 The washing machine with more than one drum may be driven by one or more than one motors.

In case the drums are driven by more than one motors, the number of the motors employed is the same as that of the drums and the system operates by

30 means of the belt and pulley mechanism and damping elements used in the single-drum type machine driven by a single motor.

The washing machine with more than one drum, is preferably driven by a single motor in order to reduce the cost of the machine and the number of components, as well as to facilitate its manufacturing. In an embodiment of a washing machine
5 driven by a single motor, the drums are driven by a magnetic clutch. The drive mechanism comprises a first pulley (2) transferring the rotational movement of the motor (10) to the first drum (1) and a first magnetic clutch (3) passing the motion to the first pulley (2); a first gear (4) driving the first magnetic clutch (3), a second pulley (6) passing the rotational motion of the motor to the second drum
10 (5), a second magnetic clutch (7) passing the motion to the second pulley (6), a second gear (8) driving the second magnetic clutch (7); a transfer gear (9) driven by the motor (10) and actuating the first (4) and second gears (8) and the motor (10) to which the transfer gear (9) is connected. The single motor (10) employed in this system, is able to rotate both drums (1 and 5) by simultaneously
15 transferring the motion from the transfer gear (9). The first (3) and the second magnetic clutches (7) are controlled by means of micro processors. The drum (1 or 5) that is intended to be rotated is activated by means of the first (3) and/or second magnetic clutch (7) via supplying current to the motor (10). Here, the speed of rotation being one of the most important criteria, can be adjusted
20 according to the amount of the current supplied and the related drum (1 and/or 5) can be stopped by cutting off the supply current. In this manner, both drums (1 and 5) can be used for washing simultaneously or at different times. The disadvantage of this method is observed when the washing cycle is completed and the spinning cycle starts; the laundry is washed simultaneously in both drums (1 and 5) but it is not possible to perform spinning in order to economize the
25 damping elements, as additional damping elements will be required for simultaneous spinning. During the spinning stage of one drum, the other drum is switched off in order to avoid excessive vibrations that may occur due to unnecessary loading of the motor (10).

30

In another embodiment wherein the washing machine is driven by a single motor, the system comprises a first pulley (2) transferring the rotational motion of the motor (10) to the first drum (1), a second pulley (6) passing the rotational motion of the motor (10) to the second drum (5), a first gear (4) activating the first pulley (2), a second gear (8) activating the second pulley (16), a synchromesh (11) to which the first (4) and second gears (8) are connected and which passes the rotational movement of the motor (10) to the first (1) or second (5) drums at different times, a transfer gear (9) providing the movement of said synchromesh (11), and a motor (10) driving said transfer gear (9). Both drums (1,5) can be rotated by using a single motor (10), by means of said synchromesh (11) and the rotational movement of the motor (10) is transmitted to the drums (1,5) by means of the first (4) and second gears (8). The difference between this alternative and the previous one is that, here, the steps of the washing cycles can be optimized by adjusting the ON/OFF time periods. The second drum (5) is switched on during the "off" period of the first drum (1); when the same operational principle is considered for both drums (1 and 5), the extension of the program cycles is equal to the difference of phases between two programs, which will be a shorter time period than the sum of the washing cycles of two programs but longer than the washing cycles of each individual washing program. This increase may change depending on various kinds of laundry to be washed.

In the washing machine comprising more than one drum, water intake and detergent intake may be attained by using an equal number of detergent dispensers to the number of the drums. In this embodiment, water or water-detergent mixture is directed to the first drum (1) via first detergent dispenser (12), a one-way valve (23) located at the hot water inlet (21) of the first detergent dispenser; and a four-way valve (22) placed at the cold water inlet (20) of the first detergent dispenser. Similarly, water or water-detergent mixture is directed to the second drum (5) via second detergent dispenser (17), a one-way valve (23) located at the hot water inlet (21) of the second detergent dispenser; and a four-way valve (22) placed at the cold water inlet (20) of the second detergent dispenser (17). As is the case in

the current state of art, the detergent dispensers (12 and 17), are divided into 4 compartments, namely; compartments of water softener (13), bleach (14), washing (15) and pre-washing (16) and optionally they may be divided into 3 compartments wherein one compartment is subdivided as water softener (13) and
5 bleach (14) compartments.

In another embodiment of the invention, a common detergent dispenser (24) is used to reduce the cost and to occupy a smaller area. In said embodiment, the common detergent dispenser (24) comprises a single drawer, a single cold water
10 inlet (20) and a single hot water inlet (21) and one or more than one directing element (25) used to direct water towards the intended compartment. It is possible to supply two or more drums or laundry tubs with detergent or other washing agents by means of said common detergent dispenser (24). This common detergent dispenser (24) has the same number of outlets as the number of the
15 drums. By using partition walls in this compartment, detergents and other means of washing are prevented from mixing with each other. The drawer is so designed that there will be at least three (in cases when the same compartment is used for the bleach/water softener) and maximum four compartments for each drum, with washing and water softener partitions provided in all of them, whereas pre-
20 washing and bleach sub divisions will be optional. Different detergents and other supplementary agents are disposed into the partitions of the drawer, depending on the amount, degree of dirtiness, and type of the laundry present in the drum to be used for washing. The directing elements (25) direct water from the cold water valve, towards one of the partitions of the detergent dispenser.
25 Water coming from the hot water valve is also directed by the same or different directing element towards one of the two washing partitions. Water directing system may utilize the conventional components used in the state of art, to direct water.

30 The washing machine comprising more than one drum comprises a first drum water inlet (29) and a second drum water inlet (30) provided for directing

water to the first drum (1) and the second drum (5) respectively after entering the detergent dispenser. After the entry of water into the detergent dispenser, it is sent to one or both of the drum(s) (1 and/or 5) through different connections. Water is discharged from the first drum (1) through water drainage channel (31) using a conventional one-way valve (23) located on said water drainage path (31), which
5 avoids any back flow of water while being discharged. In a similar manner, water is discharged from the second drum (5) via second drum drainage path (32) using a conventional one-way valve (23) located on said water drainage path (32) which avoids any back flow of water while being discharged. Discharged water is
10 directed to a tank (26) where its dirtiness and temperature are determined by using sensors and then water is directed to the water discharge pump (27) to be sent back to the first (1) or second drums (5), or discharged, by using a conventional three-way valve (28) provided at the outlet of the discharge pump(27).

15 In another embodiment of the washing machine with more than one drum, water is sent to one or both of the drums (1 and 5), through the first drum water inlet (29) or the second drum water inlet (30), after entering the detergent dispenser and then after the completion of the washing cycle, water is discharged from both of the drums (1 and 5), through the first drum water drainage path (31)
20 or the second drum water drainage path (32) and sent to the water discharge pump (27) for being discharged. In this system also, conventional one-way valves (23) are located on the first drum water drainage path (31) or on the second drum water drainage path (32) for preventing any back flow of water while being discharged.

25 In both applications anticipated for the distribution of water to the tubs, a single discharge pump (27) is used but one pump for each drum may also be used. In the latter case, valves are not required to be placed at the drum outlets.

The washing machine according to the present invention, enables the user to
30 wash different or same quantities, and types of laundry simultaneously, in a shorter time, consuming less energy, water and detergent per unit laundry. By

using one washing machine instead of two, savings of damping elements, cabinet components, water intake/discharge and control elements, and space will be possible. All these savings bring out an advantage with respect to cost and space. The drums which may have the same or different volumes, are preferably placed

5 horizontally but their lay out may be side-by-side, superimposed or at a certain angle. They may also be placed preferably in a diagonal position so that they can operate as weight balancers as well (Figure 9). In another embodiment, the drums are placed consecutively (Figures 10,11 and 12). In this case, the washing machine is of the top-loading type. Drums may also be used for collecting the

10 laundry to be washed. The tubs may be made preferably of plastic material, in a single mould with a mono block structure, which in turn brings a cost advantage and flexibility in production.

CLAIMS

1. A washing machine equipped with conventional damping, water intake and drainage systems, characterized with, more than one drums and the same
5 number of tubs into which said drums are placed..
2. A washing machine as defined in Claim 1, characterized with, more than one drum located on the horizontal axis.
- 10 3. A washing machine as defined in Claim 1, characterized with more than one drum of different volumes.
4. A washing machine as defined in Claim 1, characterized with more than one drum of identical volumes.
- 15 5. A washing machine as defined in Claim 1, characterized with more than one drum placed diagonally on the horizontal axis so that they can operate as weight compensators.
- 20 6. A washing machine as defined in Claim 1, characterized with more than one drum placed side by side on the horizontal axis.
7. A washing machine as defined in Claim 1, characterized with more than one drum placed consecutively on the horizontal axis.
- 25 8. A washing machine as defined in Claims 1 to 7, characterized with a first drum (1) and a second drum (5) placed separately on the horizontal axis, and with a first tub (18) wherein the first drum (1) is located and a second tub (19) wherein the second drum (5) is located.

30

9. A washing machine as defined in Claims 1 to 8, characterized with the first tub (18) and the second tub (19) are made preferably of plastic material in a single mould with a mono block structure, with water tightness provided between each other.
- 5
10. A washing machine as defined in Claims 1 to 8, characterized with a motor (10) driving the first drum (1) and the second drum (5), a first pulley (2) transferring the rotational movement of the motor (10) to the first drum (1) and a first magnetic clutch (3) passing the motion to the first pulley (2), a first gear (4) driving the first magnetic clutch (3); a second pulley (6) passing the rotational motion of the motor to the second drum (5), a second magnetic clutch (7) passing the motion to the second pulley (6), a second gear (8) driving the second magnetic clutch (7); and a transfer gear (9) driven by the motor (10) and actuating the first (4) and second gears (8).
- 10
- 15
11. A washing machine as defined in Claims 1 to 8, characterized with a motor (10) driving the first drum (1) and the second drum (5) simultaneously; a first pulley (2) passing the rotational motion of the motor (10) to the first drum (1), a second pulley (6) passing the rotational motion of the motor (10) to the second drum (5), a first gear (4) activating the first pulley (2), a second gear (8) activating the second pulley (6), a synchromesh (11) to which the first (4) and second gears (8) are connected and which passes the rotational movement of the motor (10) to the first (1) or second (5) drums at different times and a transfer gear (9) driven by the motor (10) and providing the movement of said synchromesh (11).
- 20
- 25
12. A washing machine as defined in Claims 1 to 8, characterized in that the number of the motors is the same as the number of the drums.
- 30
13. A washing machine as defined in Claims 1 to 12, characterized with a first detergent dispenser (12) comprising a hot water inlet (21) and a cold water

inlet (22), a water softener compartment (13) to receive the water softener to be used for the first drum (1), a bleacher compartment (14) to receive the bleacher, a washing compartment (15) to receive the detergent and a pre-washing compartment (16) to receive the detergent, and a second detergent dispenser (17) comprising a water softener compartment (13) to receive the water softener to be used for the second drum (5), a bleacher compartment (14) to receive the bleacher, a washing compartment (15) to receive the detergent and a pre-washing compartment (16) to receive the detergent.

14. A washing machine as defined in Claim 13, characterized with a one-way valve (23) placed at the hot water inlet (21) of the first detergent dispenser (12), a four-way valve (22) placed at the cold water inlet (20) of the first detergent dispenser (12), a one-way valve (23) placed at the hot water inlet (21) of the second detergent dispenser (17) and a four-way valve (22) placed at the cold water inlet (20) of the second detergent dispenser.

15. A washing machine as defined in Claims 1 to 12, characterized with a common detergent dispenser (24), comprising a single cold water inlet (20) and a single hot water inlet (21), two water softener compartments (13) to receive the water softener to be used for the first (1) and second drums (5) separately, two bleacher compartments (14) to receive the bleacher, two washing compartments (15) to receive the detergent, and two pre-washing compartment (16) to receive the detergent.

16. A washing machine as defined in Claim 15, characterized with at least one directing element (25) placed at the inlet of the common detergent dispenser (24) and which directs cold and/or hot water towards one of the compartments (13, 14, 15 and 16) of the common detergent dispenser (24).

17. A washing machine as defined in Claims 1 to 16, characterized with a first drum water inlet (29) and/or a second drum water inlet (30) directing water

after entering the detergent dispenser, to the first drum (1) and to the second drum (5) respectively, a first drum water drainage channel (31) through which the used water is discharged from the first drum (1), a conventional one-way valve (23) located on said water drainage path (31), which avoids any back
5 flow of water while being discharged, a second drum water drainage channel (32) through which the used water is discharged from the second drum, a conventional one-way valve (23) located on said water drainage path (32), which avoids any back flow of water while being discharged, a tank (26) to which drained water is directed and where its dirtiness and temperature are
10 determined by using sensors, a discharge pump (27) directing water in the tank (26), and a conventional three-way valve (28) provided at the outlet of the discharge pump which sends water back to the first (1) or second drum (5) as required, or discharges it.

15 18. A washing machine as defined in Claims 1 to 16, characterized with a first drum water inlet (29) and/or a second drum water inlet (30) directing water after entering the detergent dispenser, to the first drum (1) and the second drum (5) respectively, a first drum water drainage channel (31) through which the used water is discharged from the first drum (1), a conventional one-way
20 valve (23) located on said water drainage path (31), which avoids any back flow of water while being discharged, a second drum water drainage channel (32) through which the used water is discharged from the second drum, a conventional one-way valve (23) located on said water drainage path (32), which avoids any back flow of water while being discharged and a discharged
25 pump (27) discharging the drainage water.

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Figure 1

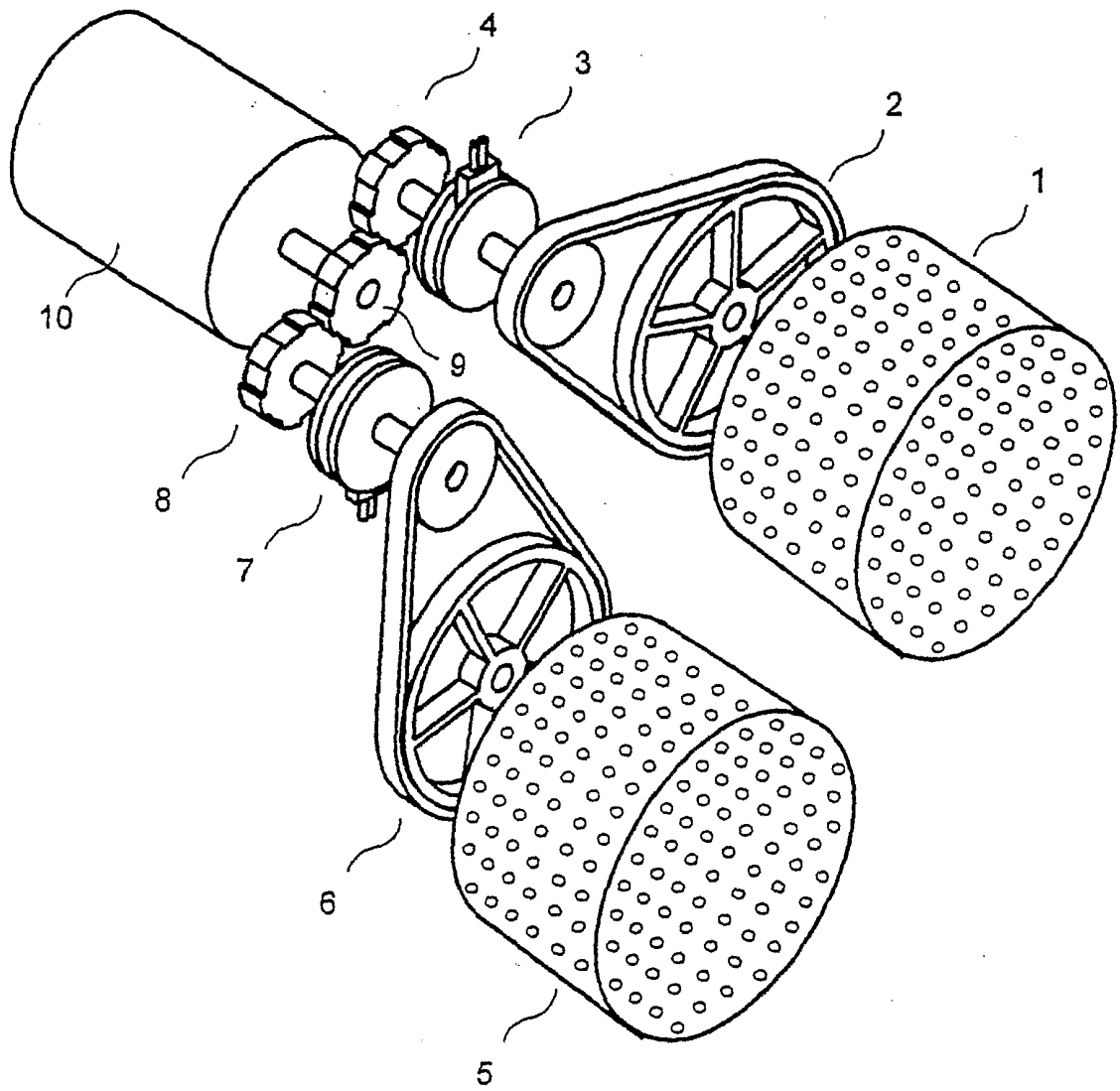


Figure 2

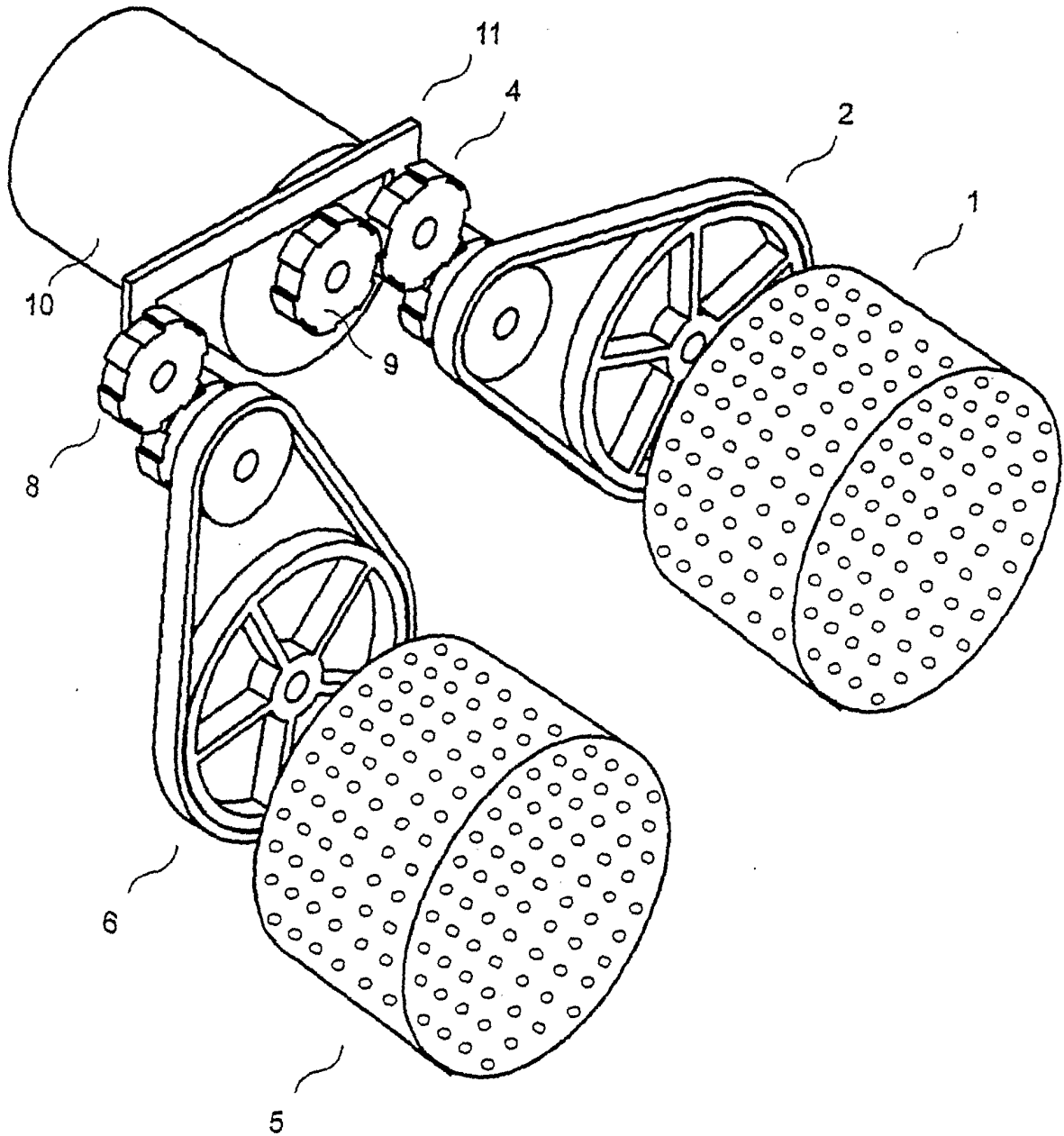


Figure 3

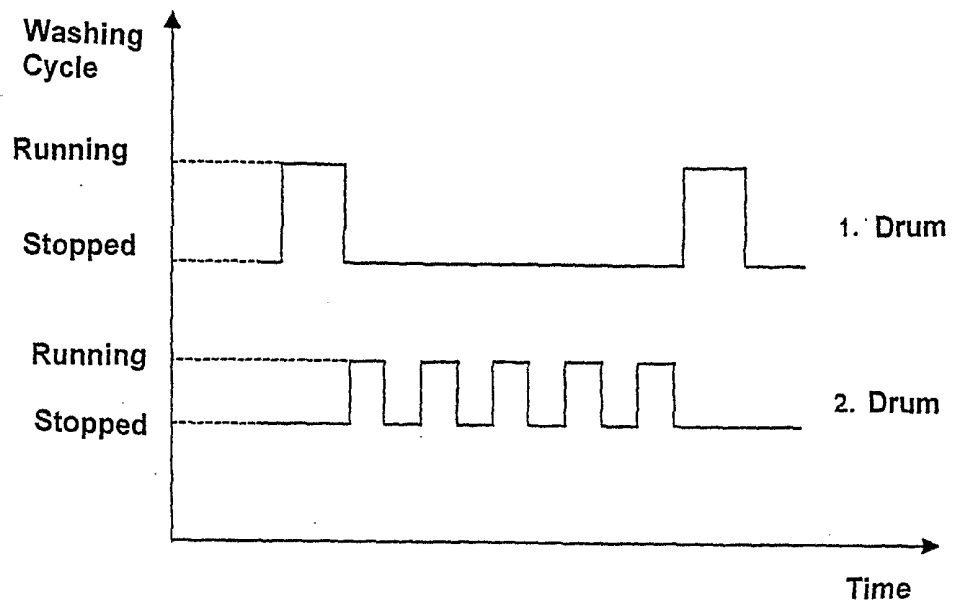
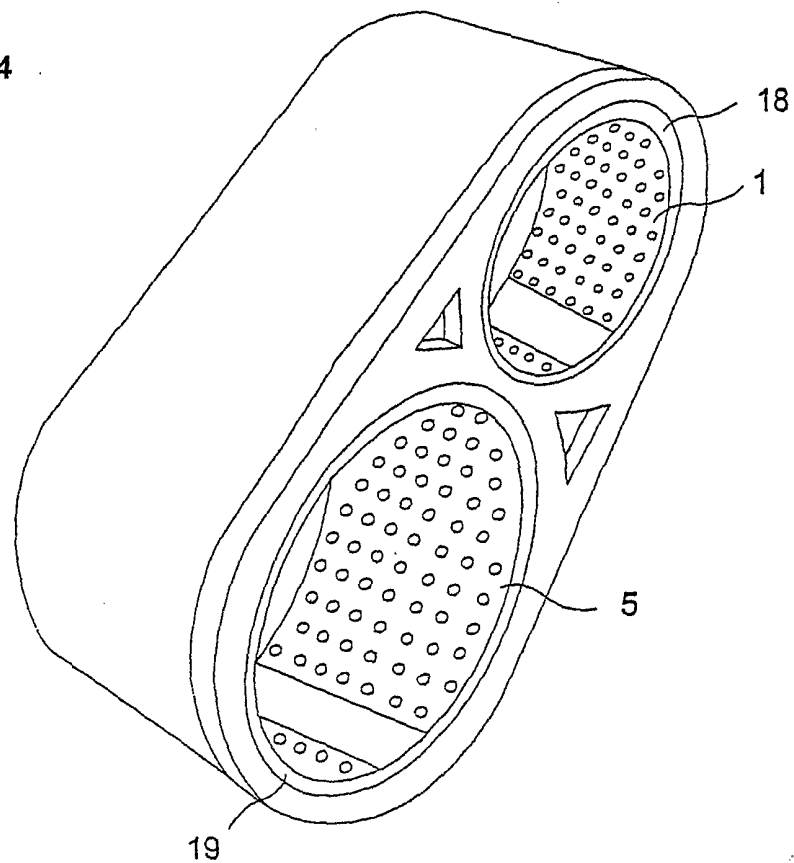


Figure 4



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Figure 5

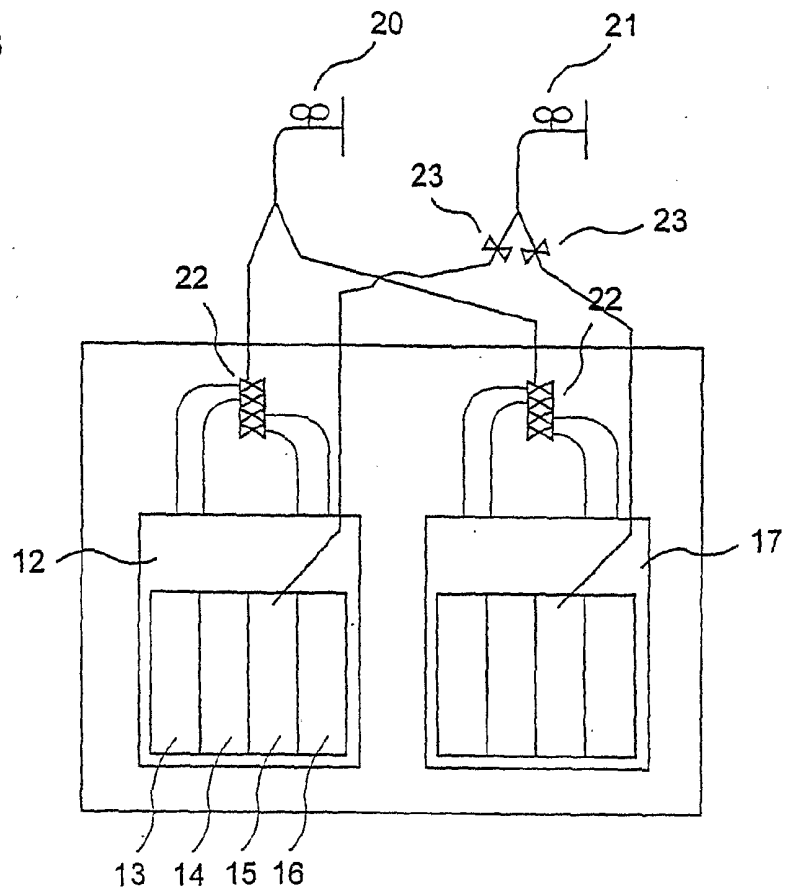
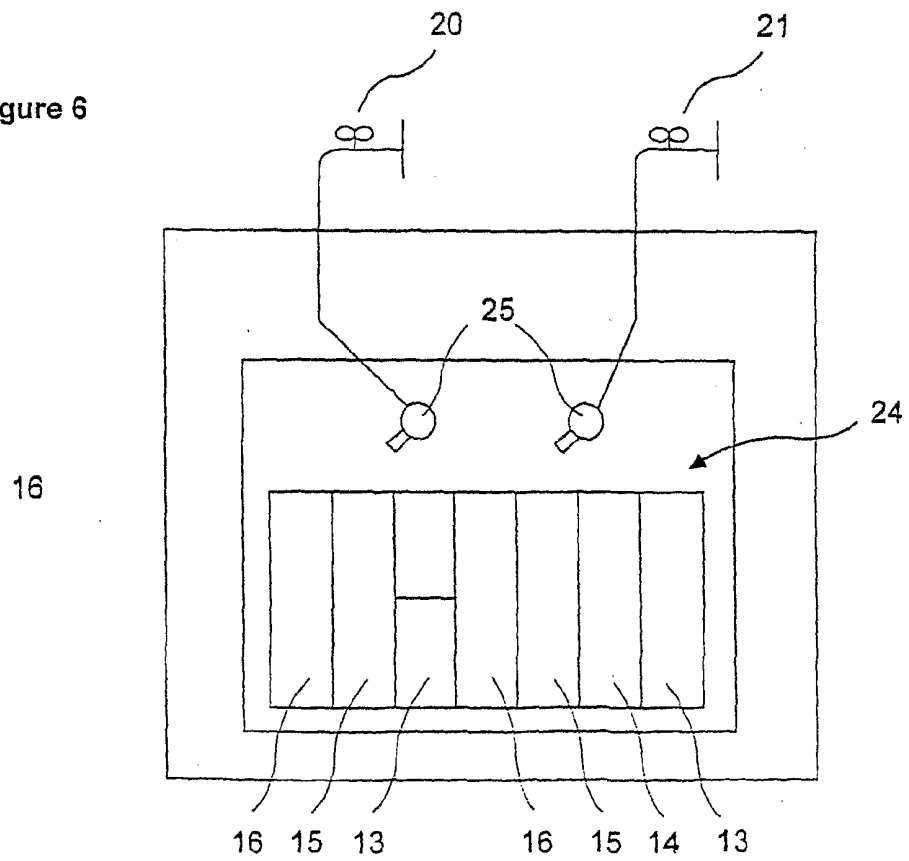


Figure 6



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Figure 7

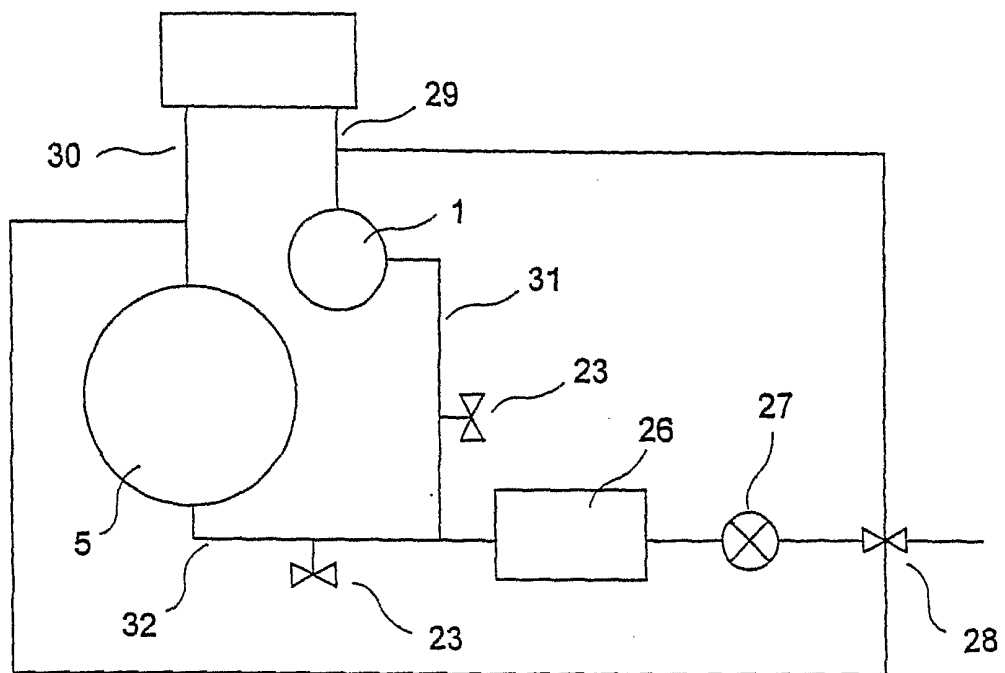
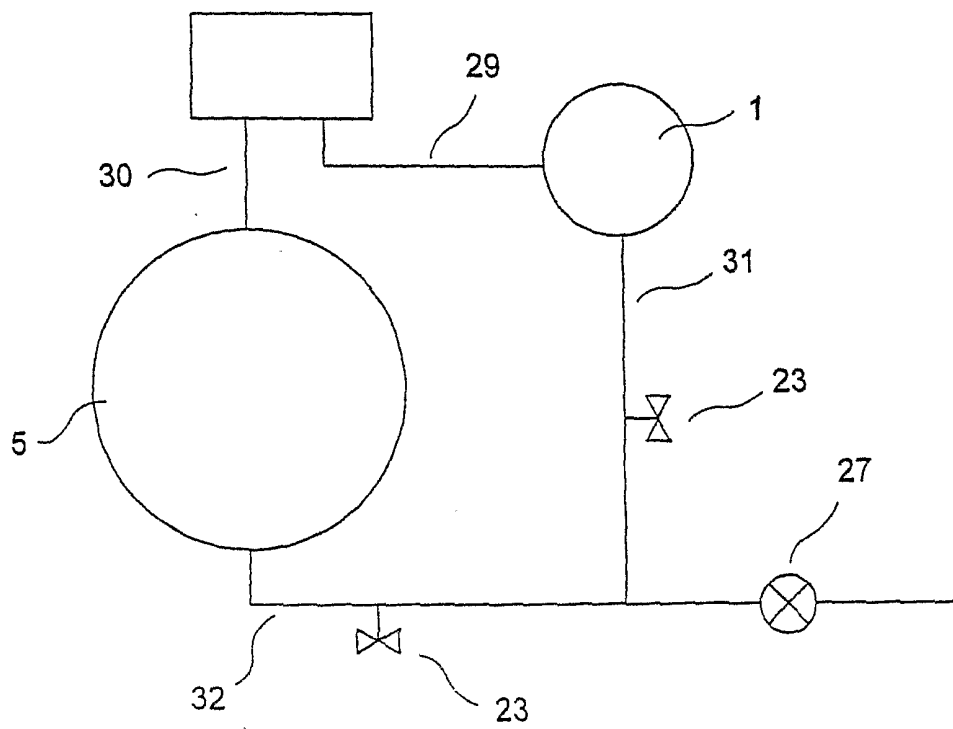


Figure 8



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Figure 9

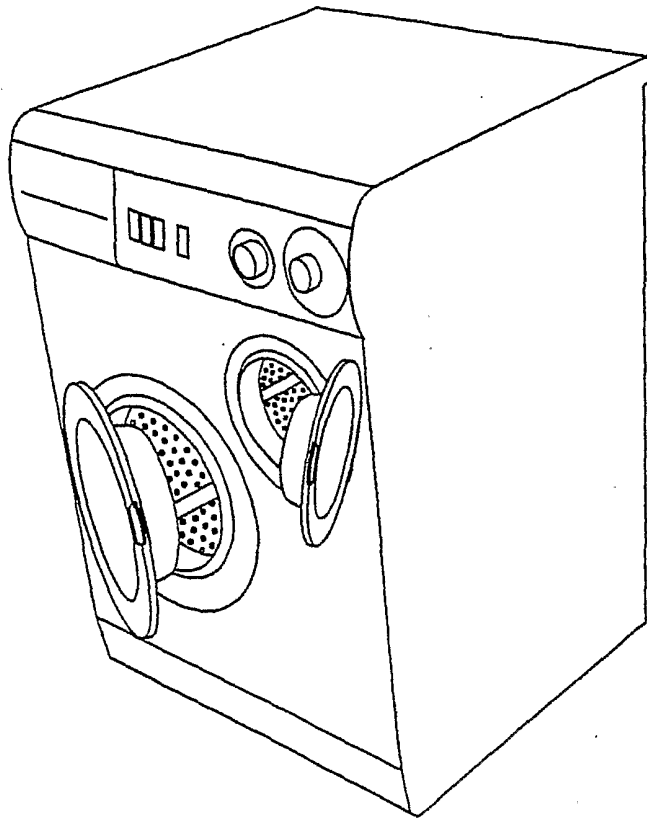


Figure 10

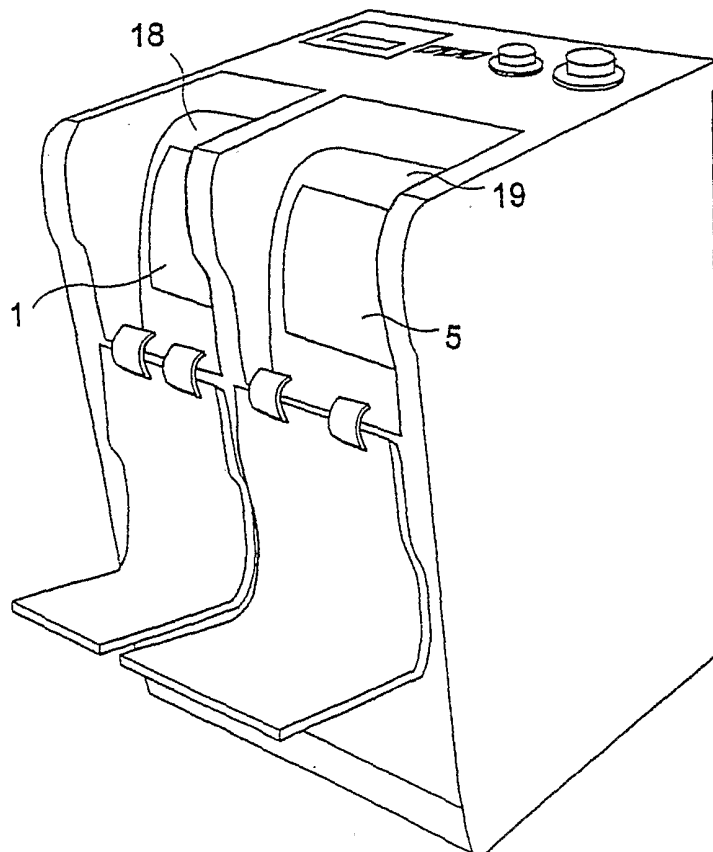


Figure 11

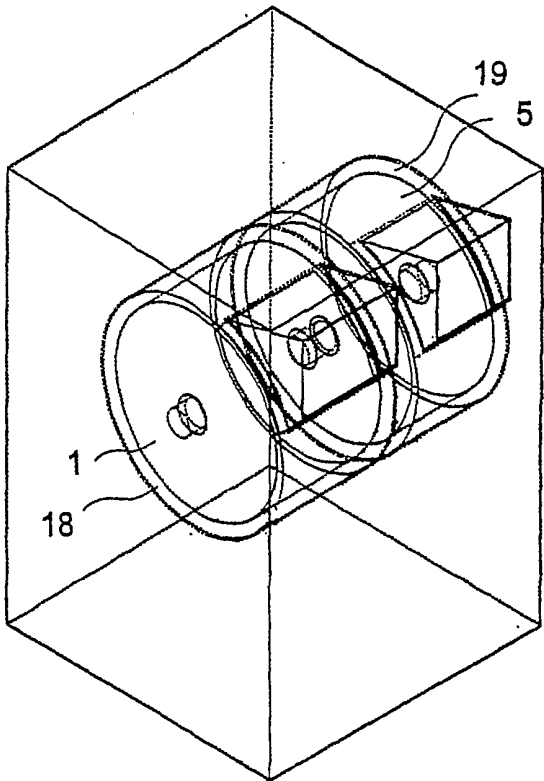
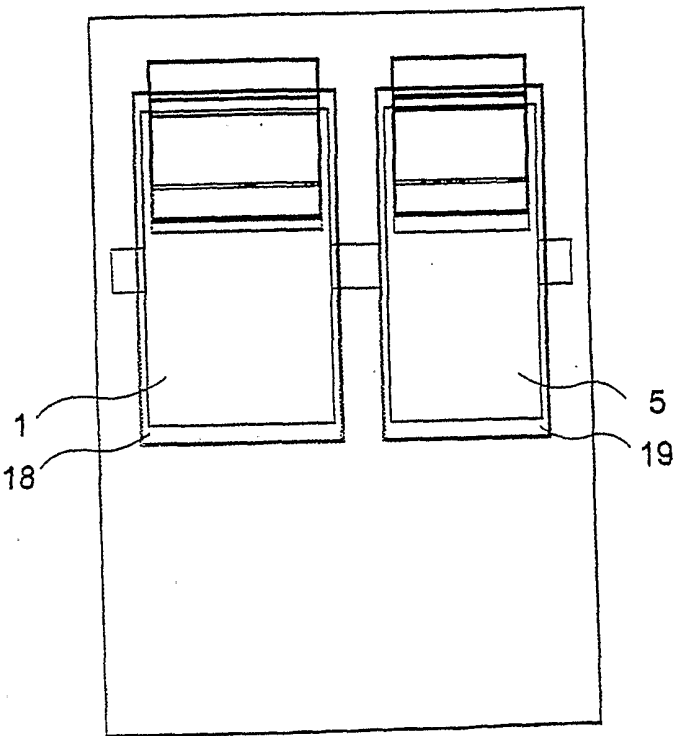


Figure 12



INTERNATIONAL SEARCH REPORT

International Application No

PCT/TR 01/00039

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 D06F31/00 D06F37/30 D06F39/02 D06F39/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 688 894 A (FORON WASCHGERÄTE GMBH) 27 December 1995 (1995-12-27) column 3, line 10 - line 28 -----	1,2,4,7, 8,12
X	DE 21 00 343 A (INDUSTRIE A. ZANUSSI S.P.A.) 15 July 1971 (1971-07-15) page 6, line 15 -page 7, line 25 page 9, line 14 - line 19 -----	1-3,7,8, 18
X	DE 195 22 438 A (FORON HAUSGERÄTE GMBH) 2 January 1997 (1997-01-02) column 2, line 6 - line 50 -----	1,2,4,6, 12



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