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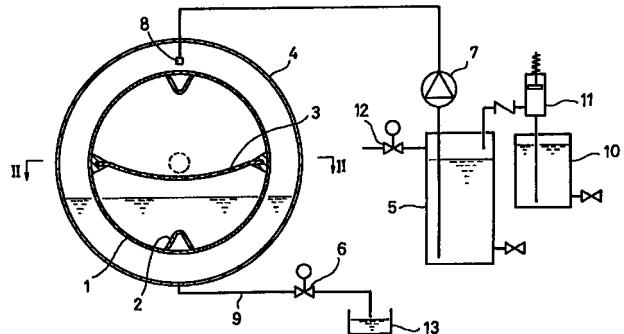
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### (54) WATER SYSTEM WASHING MACHINE FOR CLOTHES EQUIPPED WITH "DRY MARK"

(57) Dry-mark garments were believed to be unwashable in a water laundering device in which laundering is done with washing water to which are added detergents and processing agents. A device is provided in which such garments can be laundered.

The water laundering device is provided with a flexible partitioning plate 3 having many open holes in an inner drum 1 provided in an outer drum 4. It has a control unit for storing washing water in which detergents and processing agents are added, to less than half of the volume of the outer drum 4, and for rotating the garments put in the inner drum such that the rotational speed of the inner drum is at a low speed of one-overseveral of normal speed to wash them while giving shrinkage and swelling to the garments by repeating the step in which the partitioning plate 3 is in a horizontal state and the step in which it has been half-turned.

FIG. 1



**Description**

## Technical Field

**[0001]** This invention relates to an improvement in the inner drum structure of a water laundering device for cleaning dry-mark garments with washing water.

## Background Art

**[0002]** As a device for laundering garments with washing water to which are added a detergent and anti-shrinkage agents, there are known ones disclosed e.g. in unexamined Japanese patent publications 6-154462 and 8-164292. In either of the laundering devices disclosed in these publications, a rotatable inner drum (or trommel) is supported by a horizontal shaft in a laundering tank, and detergents and processing agents are added to water and the washing water is supplied through a water supply passage, and garments put in the inner drum are raised by a beater and are let to fall. Any dirt of garments is removed by mechanical action upon hitting when the garments fall.

## Disclosure of the Invention

**[0003]** A laundering device using such washing water is generally used for garments cleanable with washing water. But, trials are recently being made so that so-called dry-mark garments, which are not suitable for cleaning with washing water due to shrinking, but designated for dry cleaning, can be laundered in such a laundering device.

**[0004]** But if such dry-mark garments are laundered in a water laundering device, because the mechanical force that acts on garment fibers becomes a cause of fiber shrinkage, in order to prevent such shrinkage, the following measures are taken so that mechanical force will hardly act directly on the garments.

① the amount of garments put in the inner drum is reduced to a minimum and they are washed by water current with a high-water level and low-speed rotation, and

② before laundering, an anti-shrinkage agent is sprayed on garments so that they would not shrink even if mechanical force acts on the garments after water has been supplied, and the mechanical force is reduced by decreasing the speed of the inner drum, thereby preventing shrinkage of the garments.

**[0005]** But by simply taking such measures, the following problems are left.

① In the above method, while the inner drum is rotated at low speed so that mechanical force would

not act directly on the garments, since for the damping of mechanical force that acts when the garments move and fall during this rotary motion, water at a high water level is used as a medium, a large amount of water is consumed during laundering and together with that, consumption of detergents and processing agents is also large in amounts.

② The amount of garments which can be dumped is small in comparison with the capacity of the inner drum. The handling volume is low for large facility. Thus efficiency is poor.

③ It is difficult to control the mechanical force for laundering according to the garments. In order to prevent shrinkage, one has to depend solely on the effects of an anti-shrink agent and neutral detergents for dry-mark garments.

**[0006]** It is an object of this invention is to provide, in view of various problems when laundering dry-mark garments by use of a conventional water laundering device, a water laundering device in which a simple member is provided in the inner drum of a washing tank, the amount of washing water is limited to a predetermined amount, and the rotary speed is set at a low speed so that the garments in the inner drum is not subjected to strong mechanical shocks and thus dry-mark garments can be washed with washing water.

**[0007]** As a means to solve the above problem, there is provided a water laundering device for dry-mark garments wherein a washing tank, an inner drum rotatably supported in the washing tank, a water supply passage and a discharge passage for washing water connected to the washing tank, a partitioning member for partitioning the inner drum into a plurality of sections, the partitioning member having a plurality of holes, and a control unit for storing water while limiting the amount of water to a predetermined amount in response to a detection signal from a water amount detector for detecting the amount of water in the washing tank, and for rotating the inner drum at a speed that will not cause shrinkage of garments due to mechanical impact during rotation and stopping the inner drum in response to detection signals from a position detector for detecting the rotational position of the inner drum and a rotation detector for detecting the rotational speed of the inner drum.

**[0008]** According to the water laundering device of this invention having the above structure, it is possible to wash with washing water dry-mark garments, which could not heretofore be regarded as washable objects because shrinkage of the garment occurs.

**[0009]** Washing water is prepared by diluting detergents and processing agents with water. By the control unit, washing water is stored in the outer drum in an amount less than half the capacity of the outer drum, and dry-mark garments are put in the inner drum rotatably provided therein. The partitioning plate is provided

in the inner drum, equal amounts of garments are put in the respective washing chambers in the inner drum defined e.g. into two if the partitioning plate is one. Even if there are two or more partitioning plates, equal amounts of garments are put in each of the plurality of washing chambers.

**[0010]** To wash the garments, the rotational speed of the inner drum is set to a low speed of about one-over-several of a speed called high-speed rotation in a conventional water laundering device, and the inner drum is rotated in one direction or forward-backward reversed to repeat a state in which the garments put are immersed in the washing water with slow rotation and a state in which the garments are raised out of the washing water by the partitioning plate, rests on the partitioning plate so that washing water contained in the garments drips through the holes of the partitioning plate and the garments are dehydrated and shrink.

**[0011]** In this case, although in an intermediate stage, as the inner drum rotates at a low speed, the garments approach the partitioning plate by their weight, they are raised softly and when the partitioning plate stops in the horizontal position, due to the flow of water current, the garments move toward the central part of the partitioning plate. Thus, dry-mark garments can be washed with washing water without causing shrinkage of dry-mark garments due to mechanical impact.

**[0012]** If a flexible (resilient) material is used as the partitioning plate, the latter is deflected at its center due to resilience, so that garments will move toward the center when the partitioning plate is horizontal. Thus, mechanical impact further decreases.

#### Brief Description of the Drawings

##### **[0013]**

Fig. 1 is a schematic structural view of the entire water laundering device embodying this invention; Fig. 2 is a partial sectional plan view as viewed from the arrow II-II of Fig. 1; Fig. 3 is a block diagram of the entire control circuit of the water laundering device, and Fig. 4 is an explanatory view of the operation.

#### Best Mode for Embodying the Invention

**[0014]** Hereinbelow, description is made about the embodiment of this invention with reference to the drawings. Fig. 1 is a schematic structural view of the entire water laundering device for dry-mark garments of the embodiment. With the illustrated water laundering device, an inner drum 1 provided in an outer drum 4 for storing water is rotatably supported by a horizontal rotary shaft, and is driven by an electric motor (not shown) coupled to the rotary shaft. In the inner drum 1, a flexible partitioning plate 3 having many holes 3a is provided as a partition for uniformly dividing the interior

of the inner drum into two. On the inner circumferential surface of the inner drum 1, a plurality of (two in the illustrated example) beaters 2 are provided at suitable positions.

5 **[0015]** At an upper portion of the outer drum 4, a water supply nozzle 8 for supplying water, a detergent and processing agents is provided. Below, a water discharge pipe 9 for discharging water and a discharge valve 6 are provided. Incidentally, 13 is a discharge groove. A water supply passage is connected to the water supply nozzle 8. By a water supply pump 7 provided in the water supply passage, water containing necessary detergents and processing agents is fed under pressure and supplied from a water storage tank 5.

10 **[0016]** Into the water storage tank 5, water is fed through a water supply valve 12 provided in a water supply passage and stored. Detergents and processing agents are supplied from a detergent/processing agent tank 10 by a supply pump 11 in predetermined amounts to the tank 5 where they are diluted with water.

15 **[0017]** Fig. 2 is a partial plan view as viewed from the arrow II-II of Fig. 1. The rotary shaft 3x extends through the outer drum 4 and rotatably supported by bearings. An unillustrated electric motor is connected to the rotary shaft 3x. To the front side of the outer drum 4, a lid plate 4a is provided through which garments are fed. By opening the lid plate 4a, garments are put into the inner drum 1. The partitioning plate 3 has its both 20 ends fixed to the inner drum 1 by fixing members 3g and is formed with many holes 3a. The holes may be circular holes or slit-shaped.

25 **[0018]** In Fig. 3, a block diagram of the control circuit of the water laundering device is shown. The washing tank is provided with a float switch (or a pressure switch) 21 for detecting the water level, and position detecting sensors 22 for detecting the position of the inner drum 1 are provided. On a rotary shaft 1s coupled to a motor 1M for driving the inner drum 1, a rotation sensor 23 for detecting the rotation speed is provided. 22a is an actuator made of a magnetizable material (iron).

30 **[0019]** The float switch 21 serves to detect that an amount of water has reached a water level at which garments in the inner drum 1 are immersed entirely. Thus, for example, it may be a timer for setting a period of time during which the motor 7M operates, or a flow valve provided on the water supply passage and associated with the water supply pump to detect a predetermined water amount.

35 **[0020]** The position detecting sensors 22 are provided at two locations in the outer drum 4 and serve to detect whether the partitioning plate 3 is at a horizontal position or a vertical state. For example, proximity switches or Hall element sensors may be used. But they 40 may be of any other type. The rotation sensor 23 is a rotary encoder or a pulse generator for detecting the 45 rotational speed of the inner drum 1. The motor 1M may 50

be a DC motor or a variable-speed motor such as an inverter-controlled synchronous motor. For a motor 7M, a constant-speed motor is used.

**[0021]** Detection signals from the float switch 21, position detecting sensors 22 and rotation sensor 23 are inputted into a control unit 20, which performs operations based on these signals and outputs control signals to control motors 1M, 7M, electromagnetic valves 6v, 11v, 12v, etc. For the control unit 20, a microcomputer or a sequencer is used to perform necessary operations according to an internal memory program.

**[0022]** The water laundering device of the embodiment is structured as described above. Next, operation will be described with reference to Fig. 4. In Fig. 4(a) shows the step of feeding dry-mark garments and supplying washing water. Figs. 4b), 4c) and 4d) show the states during washing, and 4e) shows the state during water discharge. This water laundering device is characterized in that it can wash garments without applying impulsive mechanical force to the garments so that shrinkage and wear of the garments will be minimum. Hereinbelow, each control is carried out by control signals from the control unit 20.

**[0023]** As shown in Fig. 4a), garments are put in uniform amounts into the washing chambers A and B defined into the same volume by the partitioning plate 3, and washing water in which a detergent and an anti-shrinkage agent are diluted with water is fed by the water supply pump 7 and supplied through the water supply nozzle 8 to immerse the garments in the washing water. Washing water may be supplied first and garments may be put into the inner drum later. In this case, the partitioning plate 3 is held in the vertical position. The water is supplied to a relatively low water level at which, depending on the amount of garments put in, the entire garments can be immersed so that it will be less than half the volume of the outer drum 4. When the amount of water becomes a predetermined amount, the motor 7M of the water supply pump 7 is stopped in response to the detection signal from the float switch 21.

**[0024]** When the water supply ends, the inner drum 1 is rotated at a low speed, for example at 10-15 RPM, which is a speed which is less than one-over-several of 40-60 RPM, which is ordinarily said to be high-speed. Proceeding from the state of Fig. 4(b), it stops temporarily at a position where the partitioning plate 3 is horizontally positioned as shown in Fig. 4(c). When it makes a half turn thereafter (if the partitioning plate 3 is one), the state of Fig. 4(d) is reached. There, it makes a temporary stop again.

**[0025]** The rotational speed of the inner drum 1 is controlled through a control signal so as to become a preset low-speed rotation by inputting pulse signals from the rotation sensor 23 into the control unit 20. Stopping at the state of Fig. 4(c) is carried out based on a signal given when the actuator piece 22a approaches the horizontally positioned position detection sensor 22.

5 The control is carried out by setting a signal for maintaining a stop for a predetermined time with a timer (not shown), the motor 1M is then rotated so as to make a half turn. The pulse signal from the rotation sensor 23 is counted by a counter (not shown). When a predetermined count is reached, the counter output stops the motor. Thus the inner drum will stop at the state of (d).

**[0026]** When the step proceeds from Fig. 4(a) through 4(b) to 4(c), as the inner drum 1 rotates (in either forward or backward), for example as shown in 4c), if it is rotated forwardly so that the washing chamber B will be above (in the illustrated case, the direction of the arrow in Fig. 4b) is forward), the garments in the washing chamber B will be raised by the partitioning plate 3 and from the time slightly before the partitioning plate becomes horizontal, they will completely get off the washing water.

**[0027]** During rotation from a) to c), especially as shown in b), when the garments containing water are raised little by little by the partitioning plate 3, they move toward the center of the partitioning plate by their weight and water current and are received by the partitioning plate. At this time, since the weight of the garments is received with slow rotation, they are not subjected to a 20 strong impulsive mechanical force.

**[0028]** The garments in the washing chamber B raised above the water level by the partitioning plate 3 are dehydrated and shrink because water contained in the garments drips through the many holes 3a of the partitioning plate by coming out of the water surface. On the other hand, the garments in the opposite washing chamber A are kept immersed in washing water and swollen. They are also showered with water dripping through the holes of the partitioning plate 3.

**[0029]** Thereafter, when the inner drum 1 makes a half turn, the garments in the washing chamber A now rest on the partitioning plate 3 as shown in Fig. 4(d) and are dehydrated and shrink. Conversely, the garments in the washing chamber B are immersed again in the washing water and swell. In this operation, too, when the garments in the washing chamber A are raised out of the washing water, they are received softly on the partitioning plate 3, so that no strong impact will act thereon.

**[0030]** It is needless to say that in this operation, the effects are the same if the same forward rotation of the inner drum 1 is continued, or if forward and backward rotations are repeatedly carried out. Control of rotation and stopping of the inner drum 1 at this time may be carried out either by counting the signals from the position detection sensor 22 or the pulse signals from the rotation sensor 23. Thus, by repeating the above steps including temporary stop of the partitioning plate, garments are given shrinkage and swelling, so that it is possible to wash dry-mark garments without shrinkage by suppressing mechanical actions due to strong shocks during washing.

**[0031]** When the washing is carried out for a time

preset for dry-mark garments and finishes, the inner drum 1 is rotated so that the partitioning plate 3 is in a vertical position as shown in Fig. 4e) to discharge water. In this case too, rotation control may be carried out either by use of the detection signal from the upper position detection sensor 22 or the pulse signal from the rotation sensor 23.

**[0032]** In this method, it has been stated that the partitioning plate is temporarily stopped in the horizontal position. But if this temporary stop time is shortened, or in an extreme case, the inner drum is continuously rotated in one direction without such a temporary stop or forward and backward rotations are repeated without a temporary stop, cleaning power by laundering will strengthen. Thus, by setting a temporary stop time suitable for the particular garments, it is possible to give suitable cleaning power to the dry-mark garments. Also even if no temporary stop is carried out, since impulsive mechanical force is suppressed by the action of the flexible partitioning plate 3, no undue influence will be given to shrinkage and wear of the garments.

**[0033]** In the embodiment, a flexible material is used for the partitioning plate 3. But it does not have to be necessarily flexible but a material high in rigidity may be used. In this case, when the partitioning plate 3 stops in a horizontal position, the central portion would not deflect. Thus, since garments are moved toward the center by water current, cleaning power is sufficient while preventing impulsive force.

#### Industrial application

**[0034]** As described in detail so far, with the water laundering device of this invention, the partitioning plate having many holes is provided in the inner drum rotatably supported in the outer drum, washing water is stored in the outer drum to less than half thereof, and a control unit for rotating the inner drum at a low speed is provided to control it. Thus this invention provides epoch-making effects that even dry-mark garments can be laundered in washing water, and even if a predetermined amount of garments are put in the inner drum, they can be washed efficiently without increasing the size of the device.

#### Claims

1. A water laundering device for dry-mark garments wherein a washing tank, an inner drum rotatably supported in said washing tank, a water supply passage and a discharge passage for washing water connected to said washing tank, a partitioning member for partitioning said inner drum into a plurality of sections, said partitioning member having a plurality of holes, and a control unit for storing water while limiting the amount of water to a predetermined amount in response to a detection signal from a water amount detector for detecting the

amount of water in said washing tank, and for rotating said inner drum at a speed that will not cause shrinkage of garments due to mechanical impact during rotation and stopping said inner drum in response to detection signals from a position detector for detecting the rotational position of said inner drum and a rotation detector for detecting the rotational speed of said inner drum.

- 10 2. The water laundering device as claimed in claim 1 wherein said partitioning member is flexible.

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FIG. 1

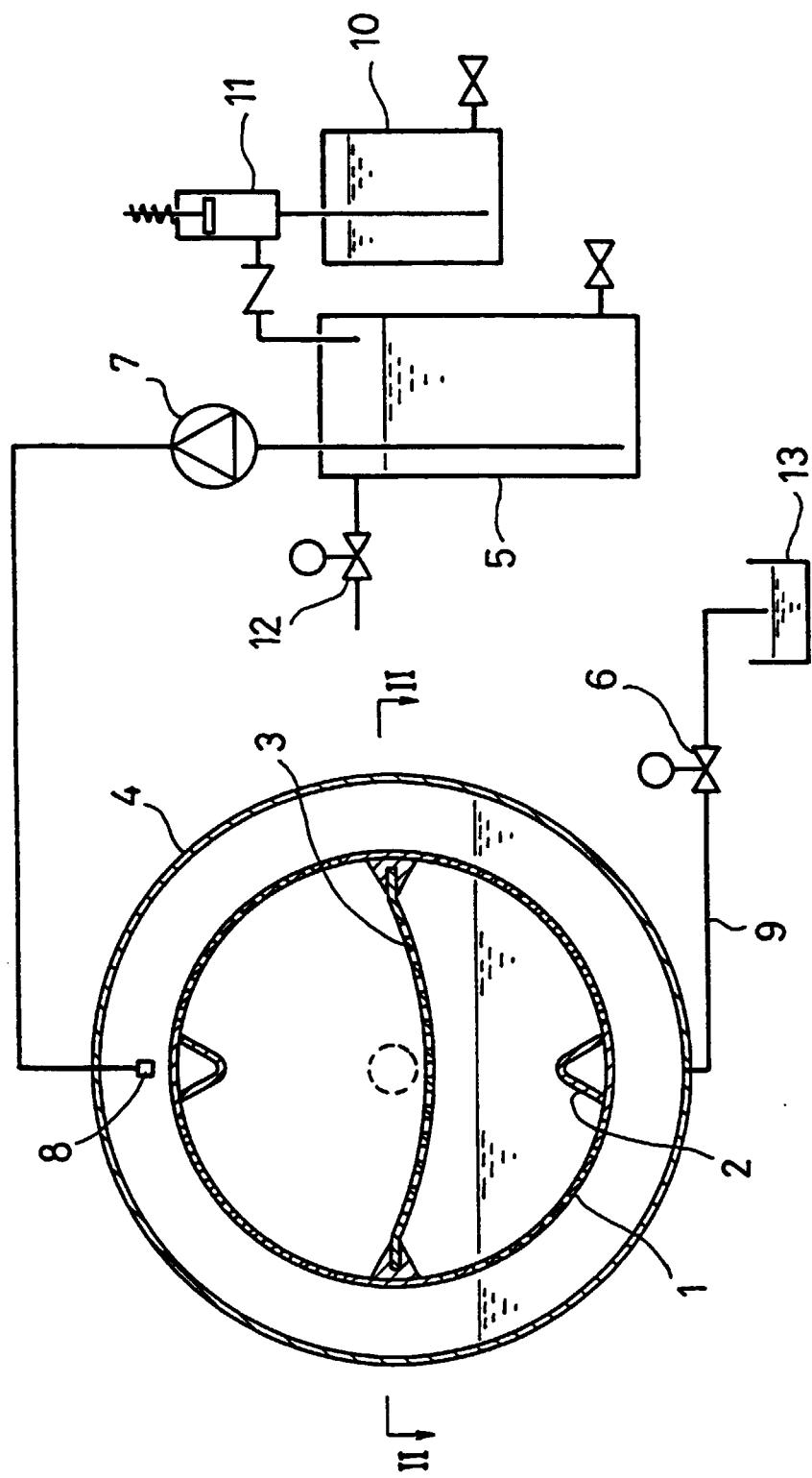


FIG. 2

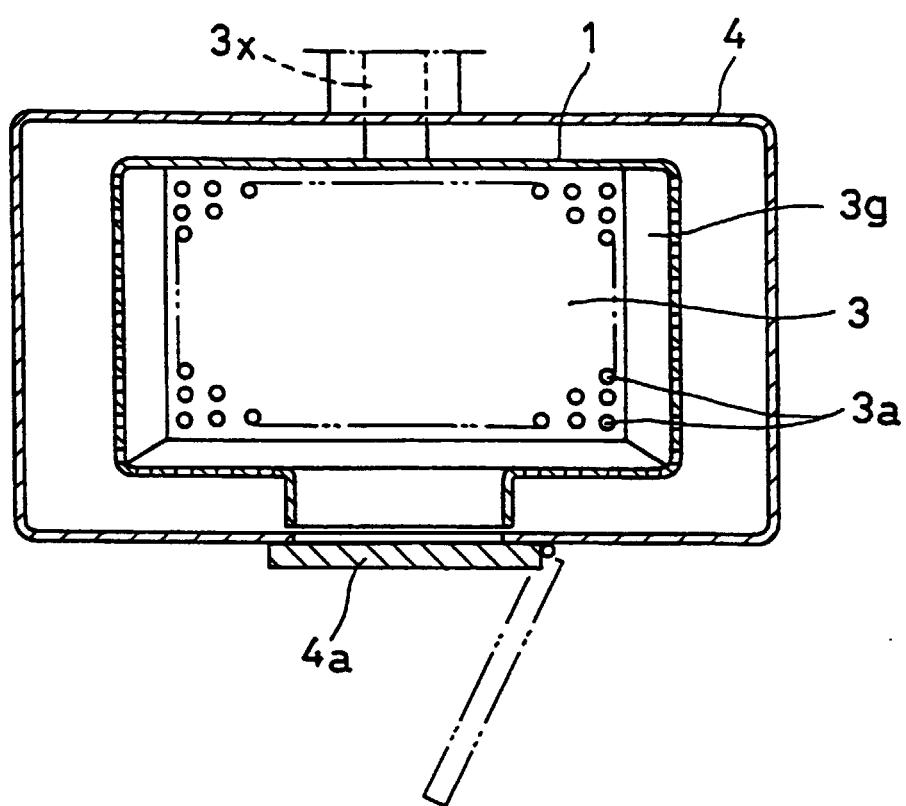


FIG. 3

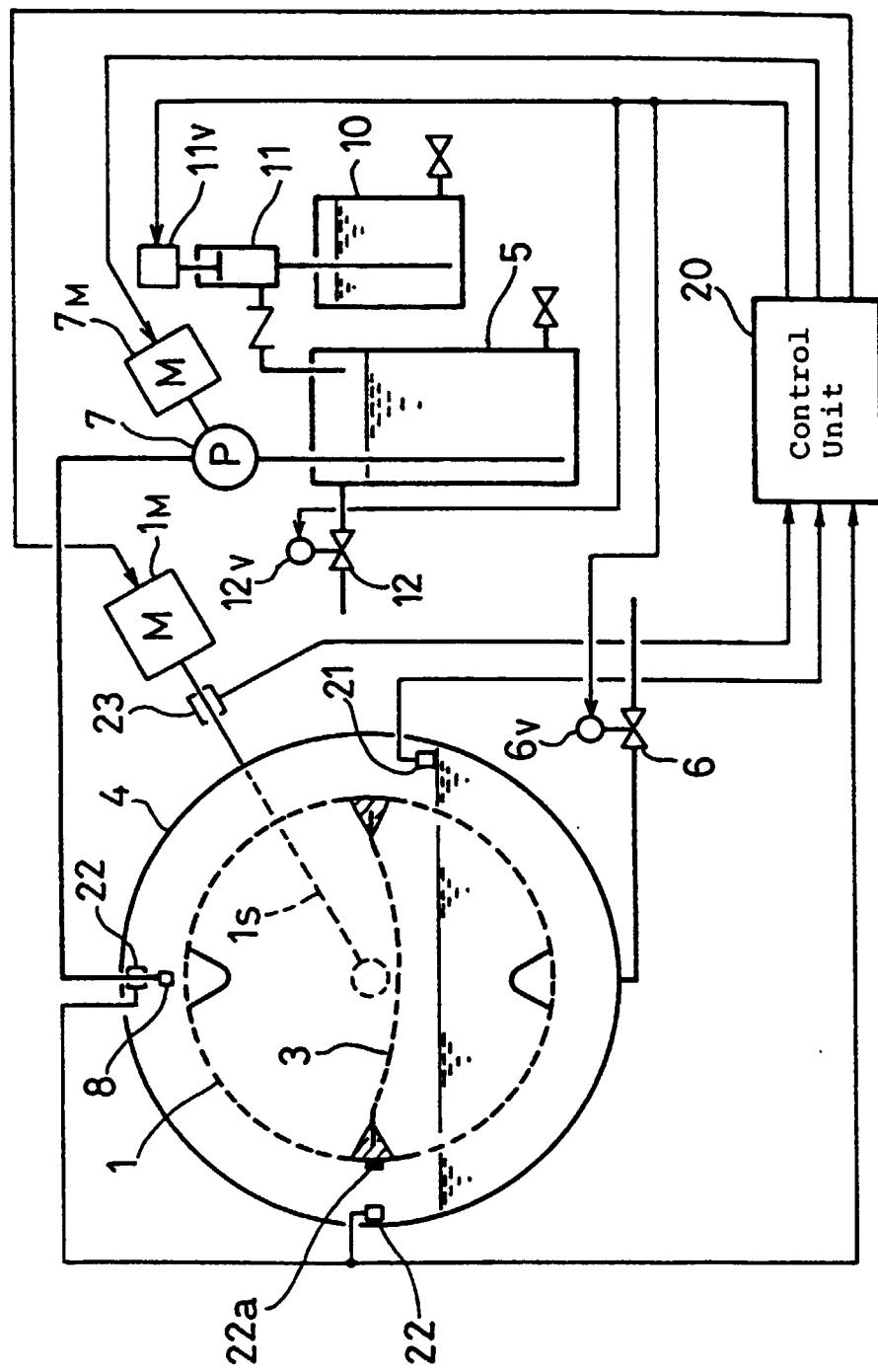


FIG. 4A FIG. 4B FIG. 4C

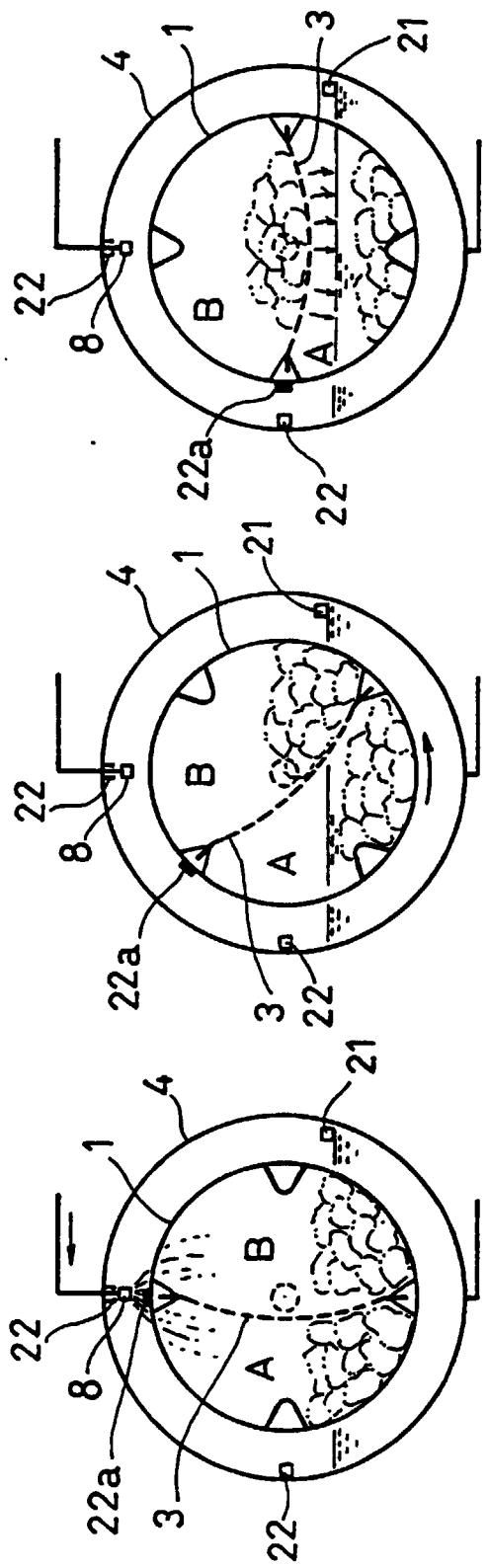
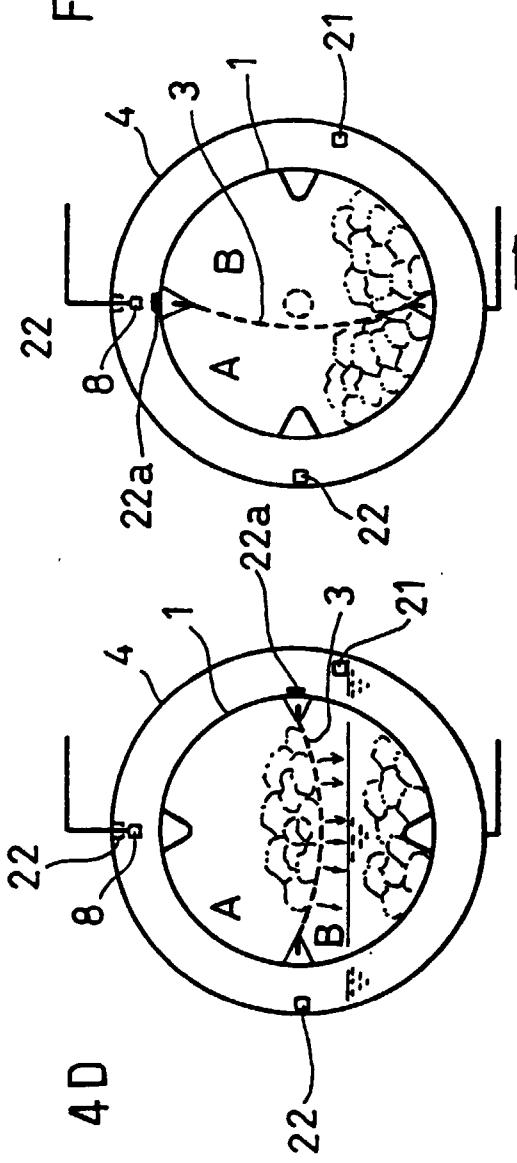


FIG. 4D FIG. 4E



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP98/05668

A. CLASSIFICATION OF SUBJECT MATTER  
Int.Cl<sup>e</sup> D06F33/02

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)  
Int.Cl<sup>e</sup> D06F33/02Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Jitsuyo Shinan Koho 1926-1997 Toroku Jitsuyo Shinan Koho 1994-1997  
Kokai Jitsuyo Shinan Koho 1971-1996 Jitsuyo Shinan Toroku Koho 1996-1998

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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category <sup>a</sup>	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, 9-248395, A (Sharp Corp.), 22 September, 1997 (22. 09. 97) (Family: none)	1-2
Y	JP, 5-317569, A (Mitsubishi Heavy Industries, Ltd.), 3 December, 1993 (03. 12. 93) (Family: none)	1-2

 Further documents are listed in the continuation of Box C.  See patent family annex.

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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