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(54) Automatic hair-washing machine

Automatische Haarwaschmaschine

Machine automatique pour laver les cheveux

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(56) References cited:
US-A- 1 868 598
US-A- 3 521 647
US-A- 3 692 066

- **PATENT ABSTRACTS OF JAPAN vol. 015, no. 328 (C-0860)21 August 1991 & JP-A-03 126 403 (MATSUSHITA)**

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Description

The present invention relates to an automatic hair-washing machine mainly used in a barbershop, a beauty shop or the like.

The United States Patent US-A-3,521,647 discloses a hair treating apparatus comprising a first nozzle manifold for washing the head portion of a person and a second nozzle manifold for washing the nape portion. Various valve means are provided for selectively supplying wash water under pressure to the nozzle manifolds. The first nozzle assembly is disposed within a housing in one or more arcs spaced at sufficient distance from the head so as to avoid entanglement with the hair. The arc upon which the nozzles are arranged is of sufficient length that the nozzles are directed to the scalp from one side of the head to the opposite side. Pressure generating means are provided for supplying pressurized water to the manifolds of the head portion and the nape portion.

Other automatic hair-washing machines for spraying wash water to the hair of a person are conventionally known. Such an automatic hair-washing machine is disclosed in, for example, Japanese Patent Publication JP-A-11248/1977. The automatic hair-washing machine disclosed is provided with a moving manifold or link having a plurality of nozzles arranged therein. At the time of washing the hair, wash water is sprayed from the plurality of nozzles and at the same time, the moving link is moved along a head portion of the person to be hair-washed.

Although in the above described prior art, the moving link is moved along the head portion it is not moved to the nape portion. Consequently, the nape portion is not washed, so that the hair is not sufficiently washed.

The applicants of the present application have proposed that a manifold or link for washing the nape portion of a person be independently provided (for example, Japanese Utility Model JP-U-4-9314 published after the filing date of the present patent). The device comprises a nozzle link for a head portion for washing a head portion of the person to be hair-washed and a nozzle link for a nape portion for washing the nape portion, which respectively have a plurality of nozzles arranged therein.

In the automatic hair-washing machine according to the utility model, the above described nozzle manifolds or links for a head portion and a nape portion are connected to the discharge side of a pump through one control valve. Therefore, at the time of hair-washing, a plurality of nozzles respectively provided on the nozzle link for the head portion and the nape portion respectively spray wash water at the same spray pressure and at the same flow rate.

However, it becomes clear that in the above described automatic hair-washing machine, the person to be hair-washed may, in some cases, feel that the nape portion is not being washed clean.

The reason for this is considered to be that the nape portion of the person has generally duller senses than the head portion thereof. Consequently, the person can feel that the head portion is washed at comfortable spray pressure, but may not, in some cases, feel that the nape portion is being washed. This even if it is washed at the same spray pressure and at the same flow rate as the head portion because the nape portion has duller senses.

Furthermore, the reason why many persons have an unsatisfied feeling when washed by this automatic hair-washing machine is considered to be that there is no stimulus to the scalp or no effect of a scalp massage. Generally, when the hair is washed by human hands, the scalp is suitably massaged by the tips of the fingers. As compared with hair-washing by human hands, therefore, the hair-washing by the automatic hair-washing machine has no satisfactory effect of massage.

Meanwhile, the applicants of the present application have proposed an automatic hair-washing machine capable of satisfactorily washing the hair irrespective of the length of the hair (see Japanese Patent Application JP-A-6-22812 also published after the filing date of the present patent.

In the described automatic hair-washing machine, a water tank into which the head portion can be inserted in its rear surface state is formed to such a depth that the hair naturally hangs from the head portion but the end of the hair does not stay at the bottom even if the hair is long. A nozzle manifold or link having a plurality of nozzles for mainly washing the head portion and a root portion of the hair is arranged therein to be movable in an upper position of this deep water tank. Fixed nozzles for mainly washing the end of the long hair are provided on an inner peripheral wall, that is, the front and rear and the right and left inner walls in at lower position of the deep water tank.

In the above described automatic hair-washing machine, however, the fixed nozzles are provided on both the front and rear and the right and left inner walls of the water tank and the wash water is simultaneously sprayed from the fixed nozzles. Accordingly, the end of the long hair may, in some cases, be rotated to become tangled and to hurt the hair. In addition, the wash water sprayed from the nozzles of the moving link is concentrated to a certain area of the head portion, so that the hair at the head portion is partially collected there. Accordingly, the hair on the head portion may, in some cases, also become tangled.

Therefore, an object of the present invention is to provide an automatic hair-washing machine capable of supplying a satisfying feeling of washing to a person to be hair-washed at the time of hair-washing.

Another object of the present invention is to provide an automatic hair-washing machine allowing scalp massage by giving a suitable stimulus to the head portion at the time of hair-washing.

Still another object of the present invention is to provide an automatic hair-washing machine capable of preventing

the hair from being tangled at the time of hair-washing.

According to the present invention, an automatic hair-washing machine for washing the hair of a person is provided as defined in claim 1.

The wash water can be sprayed at relatively high pressure to the nape portion of the person to be hair-washed. Even when the nape portion having relatively dull senses is washed, therefore, the person can clearly feel that the nape portion is being washed.

Furthermore, in another embodiment of the present invention, the nozzle manifold or link for a head portion is reciprocated for a predetermined time period in a hair-washing operation. Therefore, the person can be made to feel as if the hair is washed while being massaged by human hands.

Additionally, it is preferable that plurality of nozzles for the nozzle links are so arranged that the spray range of the wash water sprayed from each nozzle is overlapped with the spray ranges of the adjacent nozzles. Thereby to make it possible to prevent the washing hair from being twisted.

In still another embodiment of the present invention, a water tank is formed in such a depth that the long hair of a person naturally hangs from the head portion when the head portion is arranged in a washing state, and a plurality of fixed nozzles are fixed to inner walls in a lower position of the water tank and the above described fixed nozzles are disposed on two inner walls opposed to each other. Therefore, it is possible to wash the long hair of the person as if the end thereof is combed. Accordingly, the end of the long hair is prevented from being rotated to be tangled and the hair is not hurt.

The foregoing and other objects and advantages of the present invention will become more apparent from the following detailed description of embodiments when taken in conjunction with the accompanying drawings.

Fig. 1 is an external perspective view showing an automatic hair-washing machine according to one embodiment of the present invention;
Fig. 2 is a diagram for explaining the front shape of an entrance of an automatic hair-washing machine according to one embodiment of the present invention;
Fig. 3 is a plan view showing the structure of an operation panel;
Fig. 4 is a partially longitudinal sectional view showing the automatic hair-washing machine according to one embodiment of the present invention;
Fig. 5 is a transverse sectional plan view taken along a line V - V shown in Fig. 4;
Fig. 6 is a front view showing the detailed structure of an upper nozzle link;
Fig. 7 is a diagram showing a state where the upper nozzle link sprays wash water to a head portion;
Fig. 8 is an enlarged view showing a state where a nozzle of the upper nozzle link is mounted;
Figs. 9(a) and 9(b) are enlarged views showing the nozzle of the upper nozzle link, respectively;
Fig. 10 is a perspective view showing the specific structure of a lower nozzle link;
Fig. 11 is an illustration of a driving mechanism for driving the upper nozzle link and the lower nozzle link;
Fig. 12 is a diagram showing a water supply system of the automatic hair-washing machine according to one embodiment of the present invention;
Fig. 13 is a block diagram-showing the structure of a control circuit of the automatic hair-washing machine according to one embodiment of the present invention;
Fig. 14 is a timing chart indicating whether or not related elements are operated at the time of a washing operation in the automatic hair-washing machine according to one embodiment of the present invention;
Fig. 15 is a flow chart showing the contents of control in a hair-washing mode;
Fig. 16 is a flow chart showing the contents of control in a hair-washing mode;
Fig. 17 is a flow chart showing the contents of control in a hair-washing mode;
Fig. 18 is a flow chart showing the contents of control in a hair-washing mode;
Fig. 19 is a flow chart showing the contents of control in a massage stage of work; and
Fig. 20 is a diagram showing the movement of an upper nozzle link in the massage stage of work.

Fig. 1 is an external perspective view showing an automatic hair-washing machine according to one embodiment of the present invention. The external shape of this automatic hair-washing machine is formed by a cabinet 1, and an entrance 2 into which the head portion of the person is to be inserted is formed in the center of an upper surface of the cabinet 1. A water tank as described later containing the head portion and the hair is disposed inside the entrance 2.

A hood 3 covering the periphery of the face of the person is mounted on the entrance 2. The hood 3 can be switched to an opened state where the entrance 2 is widened and a closed state as shown where the entrance 2 is narrowed, and a cut-away portion 4 for exposing the face at the time of the use is formed therein. A face seal 5 which is brought into elastic contact with the face for preventing droplets splashed from the water tank from reaching the face of the person is disposed in the periphery of the cut-away portion 4. The amount of projection of the face seal 5 from the periphery of the cut-away portion 4 is made adjustable by three adjusting knobs 6.

An operation panel 7 is disposed in, for example, the right center of the upper surface of the cabinet 1, and various operation keys and indicators are arranged, as described later, on the operation panel 7.

Furthermore, a hand shower 8 which a beautician operating the automatic hair-washing machine uses, for example, when finishing the hair-washing is so provided that it can be pulled out on the upper surface of the cabinet 1. Knobs 9 and 10 for operating the outflow/stop of cold water and warm water from the hand shower 8 as well as adjusting the respective flow rates are provided at the back of the above described operation panel 7.

Additionally, a shampoo container box 11 and a treatment container box 12 are provided at the left back of the cabinet 1. A shampoo liquid and/or a treatment liquid in the container boxes 11 and 12 are automatically mixed with warm water, as described later.

Furthermore, a chamfered side surface 13 is formed in the right front corner of the cabinet 1. This chamfered side surface 13 allows the beautician to stand nearer to the person so that the beautician easily operates the hand shower 8.

Fig. 2 is a diagram for explaining the front shape of the entrance 2. A neck portion 2a for holding the nape portion of the person is recessed short of the above described entrance 2 so that the head portion can be inserted in its rear surface state, as shown in Fig. 2. Since the neck portion 2a is recessed, it is considered that wash water reaches the hood 3 and leads to the neck portion 2a along the peripheral wall of the entrance 2 at the time of hair-washing, so that the nape portion is wet to give an unpleasant feeling to the person. In the present embodiment, therefore, a pair of convex portions 2b is projected upward in the above described neck portion 2a so as to prevent the nape portion from being dripped with water at the time of hair-washing.

Fig. 3 is a plan view showing the structure of an operation panel. The operation panel 7 is divided into a hot water supply-related block portion 20, an operation course-related block portion 30, and an auxiliary key block portion 40.

The hot water supply-related block portion 20 comprises a hot water supply key 21, a hot water supply key lamp 21L indicating the on/off state of the hot water supply key 21, a standby indicator 23 constituted by a plurality of lamps, and a tank temperature indicator 24 constituted by seven segment indicators. The hot water supply key 21 is a key for instructing the start/stop of the supply of hot water to a tank as described later. When the hot water supply key 21 is turned on, a nozzle manifold or link in the water tank as described later is moved to its level position and is stopped, so that the supply of hot water to the water tank is started. During the supply of hot water, the plurality of lamps constituting the standby indicator 23 sequentially light up and go out repeatedly, to indicate that hot water is being supplied. If the tank is filled with a predetermined amount of warm water, all the lamps constituting the standby indicator 23 go on and off, to indicate that the supply of hot water to the tank is completed. In addition, the temperature of the warm water with which the tank is filled is indicated by the tank temperature indicator 24. The tank temperature indicator 24 is also used as a trouble monitor indicator, to make it possible to display an error (E). For example, "E1" is displayed when the temperature of the warm water in the tank is not less than a predetermined temperature, and "EP" is displayed when the tank is empty.

The operation program block portion 30 is provided with a short or medium hair-washing program selecting and start key 31, a key lamp 31L, a long hair-washing program selecting and start key 32, and a key lamp 32L. Specifically, one key is used both as a selecting key for selecting a hair-washing program and a start key. Therefore, a beautician operating the automatic hair-washing machine may only depress, when a hair-washing operation in a short or medium hair-washing program (hereinafter referred to as "short course"), for example, is performed, the short or medium hair-washing course selecting and start key 31. As a result, the short course is selected, so that the hair-washing operation in the selected short course is started. Similarly, when the long hair-washing program selecting and start key 32 is depressed, a long hair-washing course (hereinafter referred to as "long course") is selected, so that the hair-washing operation in the long course is started. If one key is thus used both as a course selecting key and a start key, superior operability is obtained because the hair-washing operation in a desired hair-washing course can be started by one key operation.

Furthermore, a remaining time indicator 33 for indicating time required until the end in "minutes", an elapsed state indicator 34, a hair-washing course selecting key 35 for selecting the type of washing program, that is, a shampoo course, a plain rinse course, a treatment course or a full course including all the courses, and a course type indicator 36 for indicating the type of hair-washing course selected by the hair-washing course selecting key 35 are arranged in the operation course-related block 30.

The auxiliary key block portion 40 comprises a musical program selecting key 41 for selecting a musical program constituted by an electronic melody sound or a buzzer sound for reporting that the hair-washing operation course is terminated, a sound volume adjusting key 42 for adjusting the sound volume of the electronic melody sound or the buzzer sound, a water pressure selecting key 43, an indicator lamp 43L for indicating water pressure selected by the water pressure selecting key 43, a link moving key 44 for moving a nozzle link as described later, a key lamp 44L for indicating the on/off state of the link moving key 44, a drain key 45 for draining water in the tank, and a key lamp 45L for indicating the on/off state of the drain key 45.

Fig. 4 is a sectional view showing an automatic hair-washing machine, and Fig. 5 is a transverse sectional plan view taken along a line V - V shown in Fig. 4. Referring to Figs. 4 and 5, description is made of the inner construction of this

embodiment of the automatic hair-washing machine.

In Fig. 4, an entrance 2 into which a head portion H of a person to be hair-washed can be inserted in its rear surface state at the time of hair-washing is formed in an upper part of a water tank 51, and a drain port 51a is formed on the bottom surface thereof. This water tank 51 is formed to such a depth that even if hair HA hanging from the head portion H is long, that is, so-called long hair, the end of the long hair HA does not stay at the bottom of the water tank 51 but can naturally hang when the head portion H is inserted. For example, the depth of the water tank 51 is set to approximately 50 cm.

A nozzle manifold or link for a head portion (hereinafter referred to as "upper nozzle link") 55 is provided in an upper position of the water tank 51, and the upper nozzle link 55 is movable in an angle range indicated by an arrow A1 around a supporting point 56. The upper nozzle link 55 is formed in a substantially semicircular shape along the head portion H, and its end is rotatably mounted on the side wall of the water tank 51, as described in detail later. This upper nozzle link 55 has a plurality of nozzles 57 arranged toward the head portion H. At the time of the use, the head portion H and a root portion of the hair HA can be washed by wash water sprayed from the nozzles 57, and the scalp can be massaged by spraying the wash water.

Furthermore, the water tank 51 is provided with a nozzle manifold or link for a nape portion (hereinafter referred to as "lower nozzle link") 58 rotatably in an angle range indicated by an arrow A2. A plurality of nozzles 59 are fixed to the lower nozzle link 58. The lower nozzle link 58 is so constructed that the nape portion and the root portion of the hair HA can be washed in the angle range indicated by the arrow A2 by the wash water sprayed from the nozzles 59.

Furthermore, three fixed nozzles 60a, 60b and 60c for mainly washing, when the hair HA is long, its end portion (hereinafter referred to as "long hair portion") are arranged on the front and rear inner walls in a relatively lower position of the water tank 51. A state where the respective fixed nozzles 60a, 60b and 60c are arranged will be described in detail. As shown in Fig. 5, one fixed nozzle 60a is mounted on the rear inner wall of the water tank 51, and a pair of fixed nozzles 60b and 60c is mounted on the front inner wall of the water tank 51. The fixed nozzles 60b and 60c are arranged in the horizontal direction. The fixed nozzles 60a, 60b and 60c are thus disposed on the front and rear inner walls, thereby to make it possible to wash the long hair portion as if it is combed.

Furthermore, the reason why the fixed nozzles 60b and 60c are provided side by side is that the spray range is extended by combining the nozzles 60b and 60c because spacing between the long hair portion and the front wall of the water tank 51 is small and thus, the spray range is narrow.

The same effect is obtained even if the fixed nozzles are provided on not the front and rear inner walls but the right and left inner walls. In addition, although two fixed nozzles are provided on the front side and one fixed nozzle is provided on the rear side, the number of nozzles may be the other number. Furthermore, a plurality of fixed nozzles may be disposed in the vertical direction on the two inner walls opposed to each other.

Referring to Fig. 4, a hood 3 is provided in an upper part of the water tank 51. The hood 3 is so constructed that it can be opened and closed in the direction indicated by an arrow A3 around a supporting point 13. Before starting the use, the hood 3 is opened to insert the head portion H into the entrance 2 of the water tank 51 in its rear surface state and then, the hood 3 is closed. A face seal 5 made of an elastic material having flexibility is mounted, as described above, on the periphery of a cut-away portion 4 of the hood 3 (see Fig. 1). If the hood 3 is closed, the face seal 5 abuts on the face of the person to be hair-washed. Accordingly, droplets splashed from the water tank 51 are prevented from reaching the face of the person to be hair-washed.

Fig. 6 is a front view showing the detailed structure of the upper nozzle link. The upper nozzle link 55 comprises a water pipe 551 in a substantially semicircular shape formed along the head portion inserted at the time of hair-washing and supporting means 552 for supporting one end of the water pipe 551 on a side wall 511 of the water tank.

The supporting means 552 has a shaft pipe 554 connected to one end of the water pipe 551 by a connecting member 553. This shaft pipe 554 is passed through the side wall 551 of the water tank, and is projected outward from the side wall 511. In addition, the shaft pipe 554 is surrounded by a housing 555 fixed to the side wall 511 of the water tank, and a bearing 556 is fitted between the housing 555 and the shaft pipe 554 so that the shaft pipe 554 is held rotatably in the housing 555.

A rotary joint 557 is connected to an outer end of the shaft pipe 554. A wash water supply pipe (not shown) is connected to the rotary joint 557, so that wash water is supplied to the water pipe 551 through the rotary joint 557, the shaft pipe 554 and the connecting member 553. The wash water is sprayed toward the head portion from a plurality of nozzles 57 arranged with predetermined spacing in the water pipe 551.

Furthermore, a pulley 558 is fixed to the outer end of the shaft pipe 554. A driving force as described later is transmitted to the pulley 558. The pulley 558 is rotated in the forward and reverse directions in a predetermined angle range A1, so that the shaft pipe 554 is rotated, and the water pipe 551 connected thereto is moved within the predetermined angle range A1. The other end of the water pipe 551 is formed into a free end and is not held.

If the upper nozzle link 55 is produced in a so-called cantilevered supporting structure in which only one end of the water pipe 551 in the upper nozzle link 55 is held on the side wall 511 of the water tank and the other end of the water pipe 551 is brought into a free state, therefore, assembling work at the time of the production is improved. The reason

for this is that central axes of holding portions on both sides must coincide with each other when both ends of the water pipe 551 are respectively mounted rotatably on both sides of the side wall of the water tank, and a mounting hole must be formed on the side wall with high precision. In addition, the holding members on both sides are respectively required, so that the number of parts is large and a long time is required for assembling. On the other hand, in the above described cantilevered supporting structure, the holding member on one side is sufficient, and the central axes need not coincide with each other, thereby to improve the workability at the time of assembling.

However, the upper nozzle link 55 need not be necessarily produced in a cantilevered supporting structure. For example, an upper nozzle link in a so-called center impeller supporting structure in which both ends of a water pipe 551 are respectively supported rotatably on the side walls of a water tank.

Fig. 7 is a diagram showing a state where the upper nozzle link sprays water to the head portion, Fig. 8 is a diagram showing a state where a nozzle of the upper nozzle link is mounted, and Figs. 9(a) and 9(b) are enlarged views showing a nozzle of the upper nozzle link, respectively.

As shown in Fig. 7, a plurality of (five in the drawing) nozzles 57 arranged toward the head portion H in the upper nozzle link 55 are arranged with predetermined spacing so that wash water is sprayed to the head portion in such a shape that parts of their respective spray ranges are overlapped with each other. Each of the nozzles 57 is fixed and fitted in a fitting hole 551a provided for the water pipe 551 and is stoppered by a packing P, as shown in Fig. 8. A fan-shaped nozzle whose spray angle θ (see Fig. 7) is set to approximately 70° is used as this nozzle 57. The fan-shaped nozzles are thus used as the nozzles 57 of the upper nozzle link 55, and the nozzles 57 are so disposed with predetermined spacing that the wash water is sprayed to the head portion in such a shape that parts of their respective spray ranges are overlapped with each other, thereby to make it possible to prevent the hair in the head portion from being twisted.

Fig. 10 is a perspective view showing the specific construction of the lower nozzle link. The lower nozzle link 58 has a water pipe 581 having its end closed and extending in a substantially linear shape, and a root portion of the water pipe 581 is projected outward after passing through a side wall 511 of the water tank. A housing 582 fixed to the side wall 511 and a bearing 583 interposed between the housing 582 and the root portion of the water pipe 581 are provided between the root portion of the water pipe 581 and the side wall 511 of the water tank. As a result, the water pipe 581 is rotatably mounted on the side wall 511 of the water tank. A rotary joint 584 is connected to the root portion of the water pipe 581 projected outward from the side wall 511 of the water tank, and a wash water supply pipe (not shown) is connected to the rotary joint 584. As a result, the wash water can be supplied to the water pipe 581 through the rotary joint 584. The wash water supplied is sprayed from a plurality of nozzles 59 arranged in the water pipe 581. In addition, a pulley 585 is fixed to the root portion of the water pipe 581 projected outward from the side wall 511 of the water tank. A projected shaft 586 is formed in a position which is not co-axial from the rotational center. As described later, if a driving force is applied to the projected shaft 586, the pulley 585 is rotated, and the water pipe 581 is rotated with the rotation. Consequently, the direction of spray water from which the plurality of nozzles 59 disposed in the water pipe 581 can be changed.

It is preferable that fan-shaped nozzles are used as the nozzles 59 of the lower nozzle link 58 and the nozzles 59 are so disposed with predetermined spacing that the wash water is sprayed to the nape portion in such a shape that parts of their respective spray ranges are overlapped with each other, similarly to the nozzles 57 of the upper nozzle link 55, so as to prevent the hair in the nape portion from being tangled.

Fig. 11 is an illustration of a driving mechanism for driving the upper nozzle link and the lower nozzle link. In the present embodiment, as apparent from Fig. 11, the two nozzle links, that is, the upper nozzle link 55 and the lower nozzle link 58 are driven by one link motor 71 which can be rotated in the forward and reverse directions.

Specifically, the above described driving mechanism comprises a link motor 71, a relatively short arm 73 mounted on a motor shaft 72 of the link motor 71, an endless-shaped pulley belt 75 wound between a pulley 558 of the upper nozzle link 55 and a pulley 585 of the lower nozzle link 58, and a link bar 74 having its one end connected to an end of the arm 73 and having the other end connected to a projected shaft 586 provided in a position which is not co-axial from the rotational center of the pulley 585 of the lower nozzle link 58.

Since the driving mechanism is so constructed, if the link motor 71 is rotated, the arm 73 is rotated, and the torque is converted into the up and down movement of the link bar 74. The up and down movement of the link bar 74 causes the pulley 585 of the lower nozzle link 58 to be moved back and forth within a predetermined angle range A2. Consequently, the water pipe 581 of the lower nozzle link 58 is rotated back and forth within the predetermined angle range A2. In addition, the back and forth movement of the pulley of the lower nozzle link 58 is transmitted to the pulley 558 of the upper nozzle link 55 through the pulley belt 75. Consequently, the pulley 558 of the upper nozzle link 55 is also rotated within a predetermined angle range A1. As a result, the water pipe 551 of the upper nozzle link 55 is moved within the predetermined angle range A1.

Furthermore, a proximity sensor is provided in relation to the pulley 585. Specifically, a magnetic piece MG is embedded in a predetermined position in the vicinity of the periphery of the pulley 585. In addition, a first read switch MS1 for detecting a level position of the upper nozzle link 55 and a second read switch MS2 for detecting a lower posi-

tion of the upper nozzle link 55 are respectively provided in two predetermined places opposed to the vicinity of the periphery of the pulley 585.

Such adjustment is made that the upper nozzle link 55 is in the level position when the pulley 585 is rotated so that the magnetic piece MG embedded is in a position opposed to the first read switch MS1. On the other hand, such adjustment is made that the upper nozzle link 55 is in the lower position when the pulley 585 is rotated so that the magnetic piece MG embedded is in a position opposed to the second read switch MS2.

By such construction, if the first read switch MS1 detects the level position of the upper nozzle link 55 when the link motor 71 is driven to move the upper nozzle link 55, it is possible to stop the upper nozzle link 55 in the level position by stopping the driving of the link motor 71. On the other hand, if the second read switch MS2 detects the lower position of the upper nozzle link 55, it is possible to stop the upper nozzle link 55 in the lower position by stopping the driving of the link motor 71.

Fig. 12 is a diagram showing a water channel of the automatic hair-washing machine. Cold water supplied from an outer water supply pipe is applied to a mixing valve 84 through a stop valve 81C, a strainer 82C, and a check valve 83C. In addition, hot water supplied from an outer hot water supply pipe is applied to the mixing valve 84 through a stop valve 81H, a strainer 82H, and a check valve 83H. In the mixing valve 84, the water and the hot water are mixed with each other, to obtain suitable warm water. This warm water is supplied to a hot water storage tank 87 through a hot water storage pipe 86 connected to the mixing valve 84 if a hot water storage valve 85 is opened. In addition, the warm water in the mixing valve 84 is sprayed from a hand shower 8 if a shower valve 88 is opened.

The hot water storage tank 87 is, for example, a tank having a capacity of 40 liters in the present embodiment. The hot water storage tank 87 comprises a lower limit water level sensor 89, a middle water level sensor 89a, and an upper water level sensor 90. It is possible to determine whether there is left little water in the tank 87, there is a middle amount of water in the tank 87, or the tank 87 is full of water on the basis of output signals of the three water level sensors 89, 89a and 90. In addition, a first water temperature detecting thermistor Th1 for detecting the temperature of the warm water in the tank 87 is provided in, for example, a lower position of the hot water storage tank 87, thereby to make it possible to detect the temperature of the warm water stored in the tank 87.

An overflow pipe 92 connected to a drain pipe 91 connected to a drain port 51a of the water tank 51 is provided in an upper position of the hot water storage tank 87. If warm water whose amount is not less than the storage limit is supplied to the tank 87, the warm water oversupplied is introduced into the drain pipe 91 by the overflow pipe 92, to be drained to the exterior.

A second water temperature detecting thermistor Th2 for detecting the temperature of the warm water obtained by the mixing using the mixing valve 84 is provided in a connecting portion between the hot water storage pipe 86 and the mixing valve 84, thereby to make it possible to determine whether or not the temperature of the warm water obtained by the mixing using the mixing valve 84 is within the range of temperature suitable for hair-washing. A water discharge pipe 93 connected to the overflow pipe 92 is connected to the hot water storage pipe 86 in such a shape as to be branched from the hot water storage pipe 86, and a water discharge valve 94 is provided in a halfway portion of the water discharge pipe 93. When it is determined by the water temperature detecting thermistor Th2 that the temperature of the warm water in the mixing valve 84 is outside the range of temperature suitable for hair-washing, the water discharge valve 94 is opened. Consequently, the warm water at a temperature which is not suitable for hair-washing is introduced into the overflow pipe 92 by the water discharge pipe 93, to be discharged to the exterior through the drain pipe 91 from the overflow pipe 92.

Furthermore, a lower position of the hot water storage tank 87 is connected to the suction side of a pump 95 whose work volume is variable by an inverter 106 through an outflow pipe 96. If the pump 95 is driven, the warm water stored in the tank 87 is sucked by the pump 95 through the outflow pipe 96. An upper nozzle link 55, a lower nozzle link 58, and fixed nozzles for long hair 60a, 60b and 60c are independently connected, respectively, through a valve for an upper nozzle 96A, a valve for a lower nozzle 96B, a valve for long hair 97 to the discharge side of the pump 95. In addition, the discharge side of the pump 95 is also connected to the drain pipe 91 through a drain valve 98.

When the valve for long hair 97 and the drain valve 98 are closed and the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are opened, therefore, the hot water sucked by the pump 95 is applied to the upper nozzle link 55 and the lower nozzle link 58, respectively, through the valves 96A and 96B, to be sprayed from the plurality of nozzles 57 and 59 arranged in the upper and lower nozzle links 55 and 58. On the other hand, when the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the drain valve 98 are closed and the valve for long hair 97 is opened, the warm water sucked by the pump 95 is vigorously sprayed from the fixed nozzles for long hair 60a, 60b and 60c.

Furthermore, when the valve for an upper nozzle 96A, the valve for long hair 97 and the drain valve 98 are closed and the valve for a lower nozzle 96B is opened, the warm water sucked by the pump 95 is sprayed from the nozzles 59 of the lower nozzle link 58, thereby to make it possible to wash the nape portion at the time of hair-washing.

Additionally, when the drain valve 98 is closed and the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the valve for long hair 97 are opened, the warm water is sprayed from three types of nozzles, that is, nozzles

57 of the upper nozzle link 55, nozzles 59 of the lower nozzle link 58, and the fixed nozzles for long hair 60a, 60b and 60c.

On the other hand, when the drain valve 98 is opened, the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the valve for long hair 97 are closed, so that the warm water sucked by the pump 95 is drained from the drain pipe 91.

The warm water sprayed from the above described three types of nozzles 57, 59 and 60a, 60b and 60c is caught in the water tank 51, and is drained to the drain pipe 91 through a drain trap 99 disposed in the drain port 51a of the water tank 51. The drain trap 99 has a conventionally known structure, and is for preventing a bad smell from being given in the water tank 51 as well as preventing the hair falling down to the water tank 51 from flowing out to the drain pipe 91.

A branch pipe 100 connected to a shampoo container box 11 and a branch pipe 101 connected to a treatment container box 12 are respectively connected to the outflow pipe 96. A shampoo valve 102 and an amount adjusting valve 103 are provided in a halfway portion of the branch pipe 100, and a treatment valve 104 and an amount adjusting valve 105 are provided in a halfway portion of the branch pipe 101. If the shampoo valve 102 is opened during the operation of the pump 95, therefore, the pressure of the branch pipe 100 becomes negative, so that a shampoo liquid contained in the shampoo container box 11 flows into the outflow pipe 96 from the branch pipe 100, and the shampoo liquid is mixed with the warm water taken out from the hot water storage tank 87. Similarly, when the treatment valve 104 is opened during the operation of the pump 95, the pressure of the branch pipe 101 becomes negative, so that a treatment liquid contained in the treatment container box 12 is mixed with the warm water flowing in the outflow pipe 96.

Consequently, the shampoo valve 102 or the treatment valve 104 is operated, and the amount adjusting valve 103 or 105 is adjusted, thereby to make it possible to mix the shampoo liquid or the treatment liquid in the wash water sprayed from the three types of nozzles 57, 59 and 60a, 60b and 60c.

Meanwhile, electromagnetic valves are used as the valves 85, 94, 96a, 96b, 97, 98, 102 and 104.

Fig. 13 is a block diagram showing the structure of a control circuit of the automatic hair-washing machine. The control circuit comprises a microcomputer 110 serving as a control center. Signals of various switches and sensors are applied to this microcomputer 110, and a control signal is outputted to various elements and devices from the microcomputer 110 on the basis of the signals.

More specifically, in response to the depression of the various keys provided on the operation panel 7 shown in Fig. 3, signals are inputted to the microcomputer 110 from, for example, a corresponding group of key switches 111. In addition, temperatures detected by the thermistors Th1 and Th2 shown in Fig. 12, outputs of the water level sensors 89, 89a and 90, an output of the hood switch 112 for detecting the closed state of the hood 3, a detection output of the moved position of the upper nozzle link 55 from the read switches MS1 and MS2 shown in Fig. 11 are provided to the microcomputer 110.

The microcomputer 110 outputs a segment signal to the tank temperature indicator 24 and the remaining time indicator 33 provided for the operation panel 7 on the basis of the above described respective input signals. At the same time, the microcomputer 110 outputs a control signal to the tank temperature indicator 24, the remaining time indicator 33, and a stage-of-work and state indicating light emitting diode (this light emitting diode 117 is, for example, 21L, 23, 31L, 32L, 34, 36, 43L, 44L and 45L on the operation panel 7 shown in Fig. 3). In addition, the microcomputer 110 provides a light emitting diode output to the stage-of-work and state indicating light emitting diode 117.

Furthermore, the microcomputer 110 outputs a control signal to the hot water storage valve 85, the water discharge valve 94, the valve for an upper nozzle 96A, the valve for a lower nozzle 96B, the valve for long hair 97, the drain valve 98, the shampoo valve 102, the treatment valve 104, and the link motor 71, to control the valves and a motor.

Additionally, the microcomputer 110 controls the inverter 106, to drive the pump 95 at a predetermined work rate. In addition, the microcomputer 110 controls a melody IC 118, to output a desired melody sound as required.

Fig. 14 is a timing chart indicating whether or not related elements are operated at the time of a hair-washing operation in the automatic hair-washing machine, and Figs. 15, 16, 17 and 18 are flow charts showing the contents of control in a hair-washing mode. In addition, Fig. 19 is a flow chart showing the contents of control in a massage stage of work.

Referring to Fig. 14, description is first made of the flow of a hair-washing stage of work at the time of a hair-washing operation in a short course. When the power supply is turned on, the automatic hair-washing machine enters a stand-by mode. Thereafter, when the hot water key 21 is turned on, the hot water storage valve 85 is opened, so that the automatic hair-washing machine enters a hot water supply mode and then, enters a stand-by mode. When the hair-washing operation in the short course is started, the automatic hair-washing machine enters a hair-washing mode conforming to the short course, so that the hair-washing operation is terminated sequentially through stages of work, that is, initial drainage (continuous) t1, weak washing (continuous) t2, previous washing (massage) t3, main washing (only lower part t4, massage t5, continuous t6, spot t7, and massage t8), rinsing 1 (only lower part t9, continuous ta, spot tb, and massage tc), treatment (continuous) td, and rinsing 2 (continuous) te.

Table 1

	HAIR-WASHING MODE																		
	INITIAL DRAINAGE	WEAK WASHING	PREVENTIVE WASHING	MAIN WASHING						RINSING 1						TREATMENT	RINSING 2	
	CONTINUOUS	CONTINUOUS	MASSAGE	ONLY LOWER PART	STOP	MASSAGE	CONTINUOUS	STOT	MASSAGE	ONLY LOWER PART	STOP	CONTINUOUS	STOT	MASSAGE		CONTINUOUS	CONTINUOUS	
FULL COURSE	15″	30″	18″	30″	0.3	18″	6″	18″	18″	30″	0.3	6″	18″	18″		24″	15″	4′ 09″
SHAMPOO COURSE	15″	15″	18″	30″	0.3	18″	6″	18″	18″	30″	0.3	6″	18″	18″		0	0	3′ 30″
PLAIN RINSE COURSE	15″	15″	0	0	0	0	0	0	0	30″	0.3	30″	30″	30″		0	0	2′ 30″
TREATMENT COURSE	15″	15″	0	0	0	0	0	0	0	30″	0.3	30″	30″	30″		24″	15″	3′ 09″
SET TIME FOR EACH STAGE OF WORK	t1	t2	t3	t4		t5	t6	t7	t8	t9		ta	tb	tc		td	te	TOTAL TIME

Meanwhile, respective times required for the above described stages of work t1, t2, t3, t4, t5, t6, ta, tb, tc, td and te are set depending on the respective washing courses, that is, a full course, a shampoo course, a plain rinse course, and

a treatment course, as shown in Table 1.

While hot water is being supplied, the automatic hair-washing machine is temporarily stopped when the hot water supply key 21 is depressed, while being restarted when the hot water supply key 21 is depressed again. In addition, when the hot water supply key 21 continuous to be depressed for not less than two seconds while the automatic hair-washing machine is being temporarily stopped, the automatic hair-washing machine is returned to the stand-by mode.

When the short or medium hair-washing course selecting and start key 31 or the long hair-washing course selecting and start key 32 is depressed during the hair-washing operation, the automatic hair-washing machine is temperately stopped, so that the key lamp 31L or 32L corresponding to the short course or the long course which is selected lights up. In addition, the automatic hair-washing machine is restarted by depressing again the hair-washing course selecting and start key 31 or 32 corresponding to the key lamp which is lighting up. If the start key 31 or 32 continuous to be depressed for not less than two seconds while the automatic hair-washing machine is being temporarily stopped, the automatic hair-washing machine is returned to the stand-by mode. However, if the start key 31 or 32 is depressed during the "initial drainage and weak washing" stages of work after the hair-washing operation is started, the automatic hair-washing machine is temporarily stopped, so that both the key lamps 31L and 32L light up. That is, the short course or the long course can be altered only during the "initial drainage and weak washing" stages of work.

When the short course is started, the valve for long hair 97 is turned off in the "weak washing" stage of work and the subsequent stages of work, as indicated by hatching in Fig. 14.

Furthermore, referring to Fig. 14, consider a case where the supply of hot water is started in a hot water supply mode. In this case, if the hair of a person to be hair-washed is long, the link motor 71 is first rotated in the forward direction (hereinafter referred to as "rotated rightward") to move the upper nozzle link 55 downward so that the upper nozzle link 55 does not prevent the hair from falling down to the lower part of the water tank 51 at the time of putting a head portion of the person to be hair-washed on the automatic hair-washing machine. When the first read switch MS1 detects the level position of the upper nozzle link 55, the link motor 71 is stopped to stop the upper nozzle link 55 in the level position (see *9 in Fig. 14).

When the result of detecting the temperature of water by the water temperature detecting thermistor Th2 (see Fig. 12) is such that the temperature of the warm water obtained by the mixing using the mixing valve 84 is in the range of temperature suitable for hair-washing, the hot water storage valve 85 is turned on, to store the warm water in the hot water storage tank 87. On the other hand, when the result of detecting the temperature of water by the water temperature detecting thermistor Th2 is such that the temperature of the warm water obtained by the mixing using the mixing valve 84 is outside the range of temperature suitable for hair-washing, the hot water storage valve 85 is turned off and the water discharge valve 94 is turned on, to discharge the warm water to the exterior through the water discharge pipe 93.

As described in the foregoing, in the hot water supply mode, if the warm water passed through the mixing valve 84 is in the range of temperature which cannot be used for hair-washing, the warm water is not supplied to the hot water storage tank 87 and is drained to the exterior, thereby to stabilize the temperature of the warm water in the tank 87.

Referring to Figs. 15, 16, 17 and 18, the flow of the hair-washing mode will be described in detail. Description is made assuming that the full course of the short course is selected. When the hair-washing mode is started, the water level and the temperature of the warm water in the hot water storage tank 87 are detected in the steps S1 and S2, and the automatic hair-washing machine waits for keying to perform keying processing in the steps S3 and S4.

In the step S5, the contents of stages of work are read, so that the number of stages of work is counted.

In the step S6, it is judged whether or not the counted number in the step S5 is 13. As a result, if the counted number is 13, the program proceeds to the step S7.

In the step S7, an initial drainage operation is performed until it is judged in the step S8 that t1 of time T has elapsed. The initial drainage is to drain water first stored in the outflow pipe 96, the pump 95, the upper nozzle link 55, the lower nozzle link 58 and the like (this water is water which is different from the warm water in the hot water storage tank 87 and is ordinarily cool).

When the initial drainage stage of work is started, the link motor 71 is first rotated rightward to move the upper nozzle link 55 so that cold water sprayed from the upper nozzle link 55 at the time of the initial drainage reaches the head portion of the person to be hair-washed as little as possible, and the link motor 71 is stopped to stop the upper nozzle link 55 in the lower position at the time point where the lower position of the upper nozzle link 55 is detected by the second read switch MS2, as shown in Fig. 14 (see * 10). The valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on while the pump 95 is being driven at a frequency of f (for example, 7 Hz), to perform the initial drainage operation.

When it is judged in the step S8 that t1 of time T required for initial drainage has elapsed, that is, the initial drainage stage of work is terminated, the program proceeds to the step S11 through the steps S9, 20 and 21 shown in Fig. 18. In the step S11, the counted number is decremented to 12. If the counted number is decremented, the program proceeds to the step S63 through the steps S12, 17, 18 and 62. In the step 63, it is judged whether or not the inverter 106 is abnormal. As a result, when it is judged that the inverter 106 is abnormal, the automatic hair-washing machine pro-

ceeds to a trouble monitor mode, so that an error (E) is displayed by the indicator 24.

On the other hand, if it is judged that the inverter 106 is normal, the hair-washing operation is continued and the measurement of time is continued in the step S65 and then, the program is returned to the step S1.

If the above described initial drainage operation is terminated, the program proceeds to the step S24. In the step S24, it is judged whether or not the counted number is 12. As a result, it is judged that the counted number is 12, the program proceeds to the step S25. In the step S25, the weak washing operation is performed until it is judged in the step S26 that t3 of time T has elapsed.

When the weak washing stage of work is started, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on while the pump 95 is being driven at a frequency of f (for example, 24 Hz), and the link motor 71 is rotated rightward until the level position of the upper nozzle link 55 is detected by the first read switch MS1, and the link motor 71 is stopped to stop the upper nozzle link 55 in the level position for a predetermined time period at the time point where the level position of the upper nozzle link 55 is detected by the read switch MS1, to perform the weak washing operation, as shown in Fig. 14 (see *11).

The upper nozzle link 55 is thus stopped in the level position for a predetermined time period to perform the washing operation, thereby to make it possible to spray the wash water to the head portion of the person to be hair-washed so as to first accustom the person to be hair-washed to the spray pressure and the temperature of the wash water as in the case of washing hair by human hands as well as to make it possible to reduce fears due to the sudden movement of the upper nozzle link 55 in a predetermined angle range that the person to be hair-washed tickles or the wash water is sprayed to the face. It is preferable that the pump pressure is gradually increased so as to further enhance the above described effect.

It is judged in the step S26 that t2 of operation time T required for weak washing has elapsed, that is, the weak washing stage of work is terminated, the counted number is decremented to 11 in the step S11 through predetermined steps shown in Fig. 18. The program is retuned to the step S1 through predetermined steps.

After the above described weak washing stage of work is terminated, the program proceeds to the step S27. In the step S27, it is judged whether or not the counted number is 11. As a result, if it is judged that the counted number is 11, the program proceeds to the step S28. In the step S28, the previous washing (massage) operation is performed until it is judged in the step S29 that t3 of time T has elapsed.

When the previous washing (massage) stage of work is started, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on while the pump 95 is being driven at a frequency of f (for example, 30 Hz), and the link motor 71 is rotated in the forward and reverse directions for each predetermined time so that the upper nozzle link 55 and the lower nozzle link 58 are repeatedly shaken little by little, to perform the previous washing (massage) operation.

The link motor 71 is thus rotated in the forward and reverse directions for each predetermined time, so that particularly the upper nozzle link 55 is repeatedly shaken little by little, as shown in Fig. 20. Accordingly, the person to be hair-washed is made to feel as if the hair is washed while being massaged by human hands by giving a suitable stimulus to the head portion of the person to be hair-washed. Consequently, the effects of massaging and washing the head portion are improved.

If it is judged in the step S29 that t3 of time T required for previous washing (massage) has elapsed, that is, the previous watching (massage) stage of work is terminated, the counted number is decremented to 10 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described previous washing (massage) stage of work is terminated, the program proceeds to the step S30. In the step S30, it is judged whether or not the counted number is 10. As a result, it is judged that the counted number is 10, the program proceeds to the step S31. In the step S31, the main washing (only lower part) operation is performed until it is judged in the step S32 that t4 of time T has elapsed. This "only lower part" is to spray the wash water from the lower nozzle link 58 to wash only the nape portion.

When the main washing (only lower part) stage of work is started, the valve for an upper nozzle 96A is turned off and the valve for a lower nozzle 96B and the shampoo valve 102 are turned on while the pump 95 is being driven at a frequency of f (for example, 42 Hz), to perform the main washing (only lower part) operation, as shown in Fig. 14.

It is to make the person to be hair-washed feel that the nape portion is washed that the valve for an upper nozzle 96A is turned off and the valve for a lower nozzle 96B is turned on to wash the nape portion. For example, when both the head portion and the nape portion are simultaneously washed, the person to be hair-washed relatively feels that the head portion is washed, while the person to be hair-washed may not, in some cases, feel so much that the nape portion is washed because the nape portion has duller senses than the head portion. Specifically, if only the nape portion is washed as described above, the person to be hair-washed can clearly feel that the nape portion is washed. In addition, the pressure of the pump 95 at this time is set to relatively high pressure. This is for making the person to be hair-washed clearly feel that the nape portion is washed.

Furthermore, although in the present embodiment, the valve for long hair 97 is turned off because the short course is selected, the valve for long hair 97 may be turned on in this main washing (only lower part) stage of work when the

long course is selected. The reason for this is that the pressure of the pump 95 is set to slightly higher pressure as described above in the main washing (only lower part) stage of work, so that the spray pressure of nozzles for a nape portion is not lowered to such a degree that the person to be hair-washed cannot feel that the nape portion is washed even if the valve for long hair 97 is turned on to spray the wash water from the nozzles for a nape portion.

The main washing (only upper part) stage of work and the rinsing 1 (only upper part) stage of work may be added in such a manner that the wash water is sprayed from only the upper nozzle link 55 subsequently to the main washing (only lower part) stage of work and the rinsing 1 (only lower part) stage of work as described later.

When it is judged in the step S32 that t4 of operation time T required for main washing (only lower part) has elapsed, that is, the main washing (only lower part) stage of work is terminated, the counted number is decremented to 9 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described main washing (only lower part) stage of work is terminated, the program proceeds to the step S33. In the step S33, it is judged whether or not the counted number is 9. As a result, if it is judged that the counted number is 9, the program proceeds to the step S34. In the step S34, the main washing (massage) operation is performed until it is judged in the step S35 that t5 of time T has elapsed.

When the main washing (massage) stage of work is started, the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the shampoo valve 102 are turned on, and the link motor 71 is rotated in the forward and reverse directions for each predetermined time as in the previous washing (massage) stage of work, so that the upper nozzle link 55 and the lower nozzle link 58 are respectively shaken little by little, to perform the main washing (massage) operation, as shown in Fig. 14.

It is judged in the step S35 that t5 of operation time T required for main washing (massage) has elapsed, that is, the main washing (massage) stage of work is terminated, the counted number is decremented to 8 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described (massage) stage of work is terminated, the program proceeds to the step S36. In the step S36, it is judged whether or not the counted number is 8. As a result, if it is judged that the counted number is 8, the program proceeds to the step S37. In the step S37, the main washing (continuous) operation is performed until t6 of time T has elapsed in the step S38. When the main washing (continuous) stage of work is started, the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the shampoo valve 102 are turned on, and the upper nozzle link 55 and the lower nozzle link 58 are moved, to perform the main washing (continuous) operation, as shown in Fig. 14.

When it is judged in the step S38 that t6 of operation time T required for main washing (continuous) has elapsed, that is, the main washing (continuous) stage of work is terminated, the counted number is decremented to 7 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described main washing (continuous) stage of work is terminated, the program proceeds to the step S39. In the step S39, it is judged whether or not the counted number is 7. As a result, if it is judged that the counted number is 7, the program proceeds to the step S40. In the step S40, the main washing (spot) operation is performed until it is judged in the step S41 that t7 of time T has elapsed.

When the main washing (spot) stage of work is started, the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the shampoo valve 102 are turned on, and the upper nozzle link 55 and the lower nozzle link 58 are moved, to perform the main washing (spot) operation, as shown in Fig. 14.

When it is judged in the step S41 that t7 of operation time T required for main washing (spot) has elapsed, that is, the main washing (spot) stage of work is terminated, the counted number is decremented to 6 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described main washing (stop) stage of work is terminated, the program proceeds to the step S42. In the step S42, it is judged whether or not the counted number is 6. As a result, if it is judged that the counted number is 6, the program proceeds to the step S43. In the step S43, the main washing (massage) operation is performed again until it is judged in the step S44 that t8 of time T has elapsed.

The flow of control carried out while it is judged in the step S44 that t6 of operation time T required for second main washing (massage) has not elapsed, that is, the second main washing (massage) stage of work is being carried out is the same as that in the initial drainage stage of work and hence, the description thereof is omitted. On the other hand, it is judged that t8 of time T required for second main washing (massage) has elapsed, that is, the second main washing (massage) stage of work is terminated, the counted number is decremented to 5 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described second main washing (massage) stage of work is terminated, the program proceeds to the step S45. In the step S45, it is judged whether or not the counted number is 5. As a result, if it is judged that the counted number is 5, the program proceeds to the step S46. In the step S46, the rinsing 1 (only lower part) operation is performed until it is judged in the step S47 that t9 of time T has elapsed.

When the rinsing 1 (only lower part) stage of work is started, the valve for an upper nozzle 96A is turned off and

the valve for a lower nozzle 96B is turned on while the pump 95 is being driven at a frequency of f (for example, 42 Hz), and only the lower nozzle link 58 is moved, to perform the rinsing 1 (only lower part) operation, as shown in Fig. 14.

If it is judged in the step S47 that t9 of operation time T required for rinsing 1 (only lower part) has elapsed, that is, the rinsing 1 (only lower part) stage of work is terminated, the counted number is decremented to 4 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

When the above described rinsing 1 (only lower part) stage of work is terminated, the program proceeds to the step S48. In the step S48, it is judged whether or not the counted number is 4. As a result, if it is judged that the counted number is 4, the program proceeds to the step S49. In the step S49, the rinsing 1 (continuous) operation is performed until it is judged in the step S50 that ta of time T has elapsed.

When the rinsing 1 (continuous) stage of work is started, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on, and the upper nozzle link 55 and the lower nozzle link 58 are moved, to perform the rinsing 1 (continuous) operation, as shown in Fig. 14.

When it is judged in the step S50 that ta of operation time T required for rinsing 1 (continuous) has elapsed, that is, the rinsing 1 (continuous) stage of work is terminated, the counted number is decremented to 3 in the step S11 through predetermined steps shown in Fig. 18. The program proceeds to the step S1 through predetermined steps.

After the above described rinsing 1 (continuous) stage of work is terminated, the program proceeds to the step S51. In the step S51, it is judged whether or not the counted number is 3. As a result, if it is judged that the counted number is 3, the program proceeds to the step S52. In the step S52, the rinsing 1 (spot) operation is performed until it is judged in the step S53 that tb of time T has elapsed.

When the rinsing 1 (spot) stage of work is started, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on and the upper nozzle link 55 and the lower nozzle link 58 are moved, to perform the rinsing 1 (spot) operation, as shown in Fig. 14.

It is judged in the step S53 that tb of operation time T required for rinsing 1 (spot) has elapsed, that is, the rinsing 1 (spot) stage of work is terminated, the counted number is decremented to 2 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described rinsing 1 (spot) stage of work is terminated, the program proceeds to the step S54. In the step S54, it is judged whether not the counted number is 2. As a result, when it is judged that the counted number is 2, the program proceeds to the step S55. In the step S55, the rinsing 1 (massage) operation is performed until it is judged in the step S56 that tc of time T has elapsed.

When the rinsing 1 (massage) stage of work is started, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on, and the link motor 71 is rotated in the forward and reverse directions for each predetermined time, so that the upper nozzle link 55 and the lower nozzle link 58 are shaken repeatedly little by little, to perform the rinsing 1 (massage) operation, as in the previous washing (massage) stage of work, as shown in Fig. 14.

If it is judged in the step S56 that tc of operation time T required for rinsing 1 (massage) has elapsed, that is, the rinsing 1 (massage) stage of work is terminated, the counted number is decremented to 1 in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described rinsing 1 (massage) stage of work is terminated, the program proceeds to the step S57. In the step S57, it is judged whether or not the counted number is 1. As a result, if it is judged that the counted number is 1, the program proceeds to the step S58. In the step S58, the treatment operation is performed until it is judged in the step S59 that td of time T has elapsed.

When the treatment stage of work is started, the valve for an upper nozzle 96A, the valve for a lower nozzle 96B and the treatment valve 104 are turned on, and the upper nozzle link 55 and the lower nozzle link 58 are moved, to perform the treatment operation, as shown in Fig. 14.

The flow of control carried out while it is judged in the step S59 that td of operation time T required for treatment has not elapsed, that is, the treatment operation is being performed is the same as that at the time of the initial drainage stage of work. When it is judged that td of time T required for treatment has elapsed, that is, the treatment stage of work is terminated, the counted number is decremented in the step S11 through predetermined steps shown in Fig. 18. The program is returned to the step S1 through predetermined steps.

After the above described treatment stage of work is terminated, the program proceeds to the step S60. In the step S60, the rinsing 2 operation is performed until te of time T has elapsed in the step S61.

When the rinsing 2 stage of work is started, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are turned on, and the upper nozzle link 55 and the lower nozzle link 58 are moved, to perform the rinsing 2 operation, as shown in Fig. 14.

If it is judged in the step S61 that te of operation time T required for rinsing 2 has elapsed, that is, the rinsing 2 stage of work is terminated, the program proceeds to the step 62 through predetermined steps shown in Fig 18. In the step S62, it is judged whether or not the rinsing 2 stage of work is terminated. In this case, the rinsing 2 stage of work is terminated, so that the program proceeds to the step S64. In the step S64, the output of the inverter 106 is stopped. If it is judged in the steps S66 and 67 that the second read switch MS2 is turned on, so that the upper nozzle link 55 is in

the lower position before six seconds have elapsed since the output of the inverter 106 was stopped, all the outputs are turned off in the step S68, and an end buzzer or a predetermined melody rings in the step S69, to terminate the washing mode.

Meanwhile, a frequency output of the inverter 106 (*4 in Fig. 14) in the stages of work, that is, the main washing (massage) stage of work, the main washing (continuous) stage of work, the rinsing 1 (continuous) stage of work, and the rinsing 1 (massage) stage of work is provided in response to the setting of pressure in the long course and the short course, as shown in the following table 2. The table 2 shows the relationship between the setting of pressure and the frequency.

Table 2

SETTING OF PRESSURE	SHORT (HZ)	LONG (HZ)	PUMP PRESSURE
STRONG + 2	50.2	52.2	← CONFORM TO 6.8(kg/cm²)
STRONGER THAN MEDIUM + 2	46.4	52.1	← CONFORM TO 6.0(kg/cm²)
STRONG	43.6	49.3	← CONFORM TO 5.4(kg/cm²)
STRONGER THAN MEDIUM	40.8	45.7	← CONFORM TO 4.8(kg/cm²)
MIDDLE	37.9	42.2	← CONFORM TO 4.1(kg/cm²)
WEAKER THAN MIDDLE	34.7	38.8	← CONFORM TO 3.5(kg/cm²)
WEAK	31.2	35.1	← CONFORM TO 2.8(kg/cm²)

A frequency output of the inverter 106 in the main washing (spot) stage of work and the rinsing 1 (spot) stage of work is provided by the repetition of 24 Hz (one second) and [pressure frequency higher than the set frequency by two stages] Hz (one second) at the time of selecting the short course (*1 in Fig. 14), while being provided by the repetition of 30 Hz (one second) and [pressure frequency higher than the set frequency by two stages] Hz (one second) at the time of selecting the long course (*2 in Fig. 14).

Furthermore, the pump 95 is stopped for 0,3 seconds in the case of the transition from the main washing (only lower part) to the main washing (massage) and the transition from the rinsing 1 (only lower part) to the rinsing 1 (massage) (*13 in Fig. 14) so as to prevent, because the variation in pressure at the time of switching the valve in the case of the transition from the main washing (only lower part) to the main washing (massage) and the transition from the rinsing 1 (only lower part) to the rinsing 1 (massage) is large, a water hammer phenomenon due to the variation in pressure.

As described in the foregoing, according to the present embodiment, the valve for an upper nozzle 96A and the valve for a lower nozzle 96B are independently connected to the discharge side of the pump 95. Accordingly, the wash water can be separately sprayed from the nozzles, so that only the nape portion having dull senses is washed, and the head portion having keener senses than the nape portion is not washed. In addition, when only the nape portion is washed, a force applied to the wash water by the pump 95 is set to a relatively strong force.

Since only the nape portion is washed at relatively strong water pressure, therefore, the person to be hair-washed can clearly feel that the nape portion is washed, thereby to make it possible to obtain a satisfactory feeling of washing.

Furthermore, it is judged in the step S9 whether or not the remaining time is not more than two minutes so that no warm water is left in the tank 87 at the time point where hair-washing is terminated before the counted number of stages of work is decremented in the step S11 shown in Fig. 18 after the above described respective stages of work, that is, the initial drainage (continuous) stage of work, the weak washing (continuous) stage of work, the previous washing (massage) stage of work, the main washing (only lower part, massage, continuous, spot, and massage) stage of work, the rinsing 1 (only lower part, continuous, spot, and massage) stage of work, the treatment (continuous) stage of work

and the rinsing 2 (continuous) stage of work are terminated. If the remaining time is not more than two minutes, the hot water storage valve 85 is turned off, to stop the supply of hot water. For example, when the washing course is the full course, the remaining time is not less than two minutes (see Table 1) at the time point where the main washing (spot) stage of work is terminated. Accordingly, the hot water storage valve 85 is turned on/off to continuously supply hot water on the basis of output signals of the water level sensors 89, 89a and 90 while the water level in the tank 87 is being maintained at a predetermined water level (steps S20, 21, 22 and 23). On the other hand, the remaining time is not more than two minutes at the time point where the main washing (massage) stage of work and the subsequent stages of work are terminated. Accordingly, the hot water storage valve 85 is turned off to stop the supply of hot water (step S10).

On the other hand, in the respective stages of work from the initial drainage stage of work to the treatment stage of work, it is judged in the step S12 shown in Fig. 18 whether or not a temporary stop flag "1" is set. If the temporary stop flag "1" is not set, it is judged in the step S17 whether or not the hood switch 112 is turned off in a state where the hood 3 is opened. In addition, it is judged in the step S18 that the hood 3 is closed and the hair-washing course selecting and start key 31 or 32 is turned on during the operation. If it is judged in the step S17 that the food switch 112 is turned off or if it is judged in the step S18 that the hair-washing course selecting and start key 31 or 32 is turned on, the temporary stop flag "1" is set in the step S19, so that the program is returned to the step S1 shown in Fig. 15. If the hood switch 112 is turned on in the step S17, and the hair-washing course selecting and start key 31 or 32 is turned off in the step S18, the program proceeds to the step S62.

Furthermore, if the temporary stop flag "1" is set in the step S12, the washing operation is stopped and the measurement of time is stopped in the step S13. If the hood switch 112 is turned on in a state where the hood 3 is closed again in the step S14, and the hair-washing course selecting and start key 31 or 32 is turned on again in the step S15, the temporary stop flag is brought into "0", that is, is cleared in the step S16. If the hood switch 112 is turned off in a state where the hood 3 is not closed again in the step S14, or if the hair-washing course and start key 31 or 32 is not turned on again in the step S15, the program is returned to the step S1 shown in Fig. 15.

Referring now to Fig. 19, the flow of control of rotation of the link motor in the above described massage stage of work will be described in detail. As shown in Fig. 19, when the massage stage of work is started, the link motor 71 is rotated rightward for 1,5 seconds in the steps S100 and S101. When 1,5 seconds have elapsed, the link motor 71 is stopped for 0,1 second in the steps S102 and S103. Thereafter, the link motor 71 is rotated leftward for 1,0 second in the steps S104 and S105. If 1,0 second has elapsed, the link motor 71 is stopped in the step S106, and it is judged in the step S108 whether or not the set time $\underline{T}$ in each of the massage stages of work shown in Table 1 has elapsed. If the set time $\underline{T}$ has not been elapsed, the program is returned to the step S100. On the other hand, if the set time $\underline{T}$ has elapsed, the massage stage of work is terminated, so that the subsequent stage of work is started.

The link motor 71 is thus rotated in the forward and reverse directions for each predetermined time, so that particularly the upper nozzle link 55 is repeatedly shaken little by little, as shown in Fig. 20, thereby to make it possible to make the person to be hair-washed feel as if the hair is washed while it is massaged by human hands by giving a suitable stimulus to the head portion of the person to be hair-washed at the time of hair-washing. Accordingly, it is possible to improve the effects of massaging and washing the head portion.

It is possible to make various changes in design to the above described embodiments.

For example, although the upper and lower nozzle links are moved by one link motor, the automatic hair-washing machine may be so constructed that the upper and lower nozzle links are separately moved and only the upper nozzle link is repeatedly shaken little by little.

Additionally, since the upper nozzle link and the lower nozzle link are independently connected to the pump, respectively, the main washing (only upper part) stage of work and rinsing 1 (only upper part) stage of work may be added in such a manner that a wash liquid is sprayed from only the upper nozzle link subsequently to, for example, the main washing (only lower part) stage of work and the rinsing 1 (only lower part) stage of work in the hair-washing mode.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation.

Claims

1. An automatic hair-washing machine comprising:

   a first nozzle manifold (55) having a plurality of nozzles (57) for spraying wash water to the head portion of a person to be hair-washed, a second nozzle manifold (58) having a plurality of nozzles (59) for spraying the wash water to the nape portion of the person to be hair-washed, pressure generating means (95, 106) for pressurizing the wash water supplied to said first and second manifolds (55, 58) for spraying the wash water from the nozzles (57, 59) to wash the hair,

first valve means (96A) for selectively supplying the wash water pressurized by said pressure generating means (95, 106) to said first nozzle manifold (55) for the person's head portion;

second valve means (96B) provided independently of said first valve means (96A) for selectively supplying the wash water pressurized by said pressure generating means (95, 106) to said second nozzle manifold (58) for the person's nape portion;

control means (110) for controlling said first and second valve means (96A, 96B);
characterized in that

said control means (110) are adapted to inhibit the water supply from said first valve means (96A) and to maintain the water supply to said second nozzle manifold (58) from said second valve means (96B) for a predetermined time period of a washing operation,
wherein the pressure applied by said pressure generating means (96, 106) is increased by a predetermined amount when said control means (110) inhibits the water supply by the first valve means (96A) and allows the water supply to be maintained from the second valve means (96B).

2. The automatic hair-washing machine according to Claim 1, wherein the plurality of nozzles (57) for said first nozzle manifold (55) are so arranged that the spray range of the wash water sprayed from each of the nozzles (57) is overlapped with the spray ranges of the wash water sprayed from the adjacent nozzles (57).

3. The automatic hair-washing machine according to Claim 2, wherein the plurality of nozzles (57) for said first nozzle manifold (55) is adapted to spray the wash water in a fan shape.

4. The automatic hair-washing machine according to any one of Claims 1, 2 or 3, further comprising:

moving means (71 - 75) for moving said first nozzle manifold (55) along the head portion of the person to be hair-washed through a predetermined range (A1) within which said first manifold (55) is movable;

said moving means (71 - 75) repeatedly reciprocating said first nozzle manifold (55) back and forth within said predetermined range (A1).

5. The automatic hair-washing machine according to Claim 1 or 2, wherein said pressure generating means (95, 106) comprise a pump (95) driven by an inverter (106), to provide a variable volume outflow of the pump;

said first valve means (96A) is located in a first water line for connecting the discharge side of said pump (95) and the first nozzle manifold (55), and

said second valve means (96B) is located in a second water line for connecting the discharge side of said pump (95) and the second nozzle manifold (58).

6. The automatic hair-washing machine according to Claim 5, wherein said second water line is branched from a halfway portion of the first water line.

7. The automatic hair-washing machine according to any one of Claims 1 to 6, further comprising:

a water basin (51) formed in such a depth that the long hair naturally hangs from the head portion of the person to be hair-washed when the head portion of the person is disposed in a washing state,

said first and second nozzle manifolds (55, 58) being mounted on the inner wall in a relatively upper position of the water basin (51),

a plurality of fixed nozzles (60a, 60b, 60c) for mainly spraying the wash water to a front portion of the long hair of the person to be hair-washed,

said fixed nozzles (60a, 60b, 60c) are disposed on a pair of inner walls opposed to each other at a relatively lower position of the water basin (51).

8. The automatic hair-washing machine according to Claim 7, wherein said fixed nozzles (60a, 60b, 60c) are alternately disposed on the front inner wall and the rear inner wall of the water tank.

Patentansprüche

1. Automatische Haarwasch-Maschine, die folgendes aufweist:

einen ersten Düsenverteiler (55) mit einer Vielzahl von Düsen (57), um Waschwasser auf den Kopfbereich einer Person zu sprühen, deren Haar zu waschen ist, einen zweiten Düsenverteiler (58) mit einer Vielzahl von Düsen (59), um das Waschwasser auf den Nackenbereich der Person zu sprühen, deren Haar zu waschen ist, Druckerzeugungseinrichtungen (95, 106) zur Druckbeaufschlagung des dem ersten und dem zweiten Verteiler (55, 58) zugeführten Waschwassers zum Sprühen des Waschwassers aus den Düsen (57, 59), um das Haar zu waschen,
eine erste Ventileinrichtung (96A) zum selektiven Zuführen des von den Druckerzeugungseinrichtungen (95, 106) druckbeaufschlagten Waschwassers zu dem ersten Düsenverteiler (55) für den Kopfbereich der Person;
eine zweite Ventileinrichtung (96B), die unabhängig von der ersten Ventileinrichtung (96A) vorgesehen ist, zum selektiven Zuführen des von den Druckerzeugungseinrichtungen (95, 106) druckbeaufschlagten Waschwassers zu dem zweiten Düsenverteiler (58) für den Nackenbereich der Person;
Steuerungseinrichtungen (110) zum Steuern der ersten und der zweiten Ventileinrichtung (96A, 96B);
dadurch gekennzeichnet,
daß die Steuerungseinrichtungen (110) dazu ausgebildet sind, die Wasserzufuhr von der ersten Ventileinrichtung (96A) zu sperren und die Wasserzufuhr zu dem zweiten Düsenverteiler (58) von der zweiten Ventileinrichtung (96B) für einen vorbestimmten Zeitraum eines Waschvorgangs aufrechtzuerhalten,
wobei der von den Druckerzeugungseinrichtungen (95, 106) aufgebrachte Druck um einen vorbestimmten Wert erhöht wird, wenn die Steuerungseinrichtung (110) die Wasserzufuhr durch die erste Ventileinrichtung (96A) sperrt und es ermöglicht, daß die Wasserzufuhr von der zweiten Ventileinrichtung (96B) aufrechterhalten wird.

2. Automatische Haarwasch-Maschine nach Anspruch 1, wobei die Vielzahl von Düsen (57) für den ersten Düsenverteiler (55) so angeordnet ist, daS der Sprühbereich des aus jeder der Düsen (57) versprühten Waschwassers mit den Sprühbereichen des aus den angrenzenden (57) Düsen versprühten Waschwassers überlappt.

3. Automatische Haarwasch-Maschine nach Anspruch 2, wobei die Vielzahl von Düsen (57) für den ersten Düsenverteiler (55) dazu ausgebildet ist, das Waschwasser fächerförmig zu versprühen.

4. Automatische Haarwasch-Maschine nach einem der Ansprüche 1, 2 oder 3, die ferner folgendes aufweist:

eine Bewegungseinrichtung (71-75) zum Bewegen des ersten Düsenverteilers (55) entlang dem Kopfbereich der Person, deren Haar zu waschen ist, durch einen vorbestimmten Bereich (A1), innerhalb dessen der erste Verteiler (55) bewegbar ist;
wobei die Bewegungseinrichtung (71-75) den ersten Düsenverteiler (55) innerhalb des vorbestimmten Bereichs (A1) wiederholt vorwärts und rückwärts hin- und herbewegt.

5. Automatische Haarwasch-Maschine nach Anspruch 1 oder 2, wobei die Druckerzeugungseinrichtungen (95, 106) eine von einem Wechselrichter (106) angetriebene Pumpe (95) aufweisen, um einen volumenveränderlichen Ausfluß von der Pumpe zu erzeugen;

die erste Ventileinrichtung (96A) in einer ersten Wasserleitung zum Verbinden der Abgabeseite der Pumpe (95) und des ersten Düsenverteilers (55) angeordnet ist und
die zweite Ventileinrichtung (96B) in einer zweiten Wasserleitung zum Verbinden der Abgabeseite der Pumpe (95) und des zweiten Düsenverteilers (58) angeordnet ist.

6. Automatische Haarwasch-Maschine nach Anspruch 5, wobei die zweite Wasserleitung von einem mittleren Bereich der ersten Wasserleitung abzweigt.

7. Automatische Haarwasch-Maschine nach einem der Ansprüche 1 bis 6, die ferner folgendes aufweist:

ein Wasserbecken (51), das mit einer solchen Tiefe ausgebildet ist, daß das lange Haar in natürlicher Weise

von dem Kopfbereich der Person herabhängt, deren Haar zu waschen ist, wenn der Kopfbereich der Person in einem Waschzustand positioniert ist,
wobei der erste und der zweite Düsenverteiler (55, 58) an der Innenwand in einer relativ oberen Position des Wasserbeckens (51) angebracht sind,
eine Vielzahl von fest angeordneten Düsen (60a, 60b, 60c), um das Waschwasser hauptsächlich auf einen vorderen Bereich des langen Haars der Person sprühen, deren Haar zu waschen ist,
wobei die fest angeordneten Düsen (60a, 60b, 60c) an einem Paar von Innenwänden angeordnet sind, die in einer relativ unteren Position des Wasserbeckens (51) einander gegenüberstehen.

8. Automatische Haarwasch-Maschine nach Anspruch 7, wobei die fest angeordneten Düsen (60a, 60b, 60c) alternierend an der vorderen Innenwand und der hinteren Innenwand des Wasserbeckens angeordnet sind.

Revendications

1. Appareil automatique lave-cheveux, comprenant :

- un premier collecteur à buses (55) ayant une pluralité de buses (57) pour pulvériser de l'eau de lavage sur la partie de tête d'une personne dont on doit laver les cheveux, un second collecteur à buses (58) ayant une pluralité de buses (59) pour pulvériser l'eau de lavage sur la partie de nuque de la personne dont on doit laver les cheveux, des moyens de production de pression (95, 106) pour mettre sous pression l'eau de lavage fournie audit premier et audit second collecteur (55, 58) pour pulvériser l'eau de lavage depuis les buses (57, 59) pour laver les cheveux;
- des premiers moyens formant valve (96A) pour fournir de façon sélective l'eau de lavage mise sous pression par lesdits moyens de production de pression (95, 106) audit premier collecteur à buses (55) pour la partie de tête de la personne;
- des seconds moyens formant valve (96B) prévus indépendamment desdits premiers moyens formant valve (96A) pour fournir sélectivement l'eau de lavage mise sous pression par lesdits moyens de production de pression (95, 106) audit second collecteur à buses (58) pour la partie de nuque de la personne;
- des moyens de commande (110) pour commander lesdits premiers et lesdits seconds moyens formant valve (95A, 95B);
caractérisé en ce que:
- lesdits moyens de commande (110) sont adaptés pour inhiber la fourniture d'eau depuis lesdits premiers moyens formant valve (96A) et pour maintenir la fourniture d'eau vers ledit second collecteur à buses (58) depuis lesdits seconds moyens formant valve (96B) pendant une période prédéterminée pour une opération de lavage,
- et la pression appliquée par lesdits moyens de production de pression (96, 106) est augmentée d'une valeur prédéterminée lorsque lesdits moyens de commande (110) inhibent la fourniture d'eau par les premiers moyens formant valve (96A) et permettent que la fourniture d'eau soit maintenue depuis les seconds moyens formant valve (96B).

2. Appareil automatique lave-cheveux selon la revendication 1, dans lequel la pluralité de buses (57) pour ledit premier collecteur à buses (55) sont agencées de manière que la plage de pulvérisation de l'eau de lavage pulvérisée depuis chacune des buses (57) est en chevauchement avec les plages de pulvérisation de l'eau de lavage pulvérisée depuis les buses adjacentes (57).

3. Appareil automatique lave-cheveux selon la revendication 2, dans lequel la pluralité de buses (57) pour ledit premier collecteur à buses (55) est adaptée à pulvériser l'eau de lavage sous forme d'éventail.

4. Appareil automatique lave-cheveux selon l'une quelconque des revendications 1, 2 et 3, comprenant en outre:

- des moyens de mouvement (71 - 75) pour déplacer ledit premier collecteur à buses (55) le long de la partie de tête de la personne dont on doit laver les cheveux sur une plage prédéterminée (A1) dans laquelle ledit premier collecteur (55) est mobile;
- lesdits moyens de mouvement (71 - 75) déplaçant de façon répétée en va-et-vient ledit premier collecteur à buses (55) à l'intérieur de ladite plage prédéterminée (A1).

5. Appareil automatique lave-cheveux selon l'une ou l'autre des revendications 1 et 2, dans lequel lesdits moyens de production de pression (95, 106) comprennent une pompe (95) entrainée par un inverseur (106) pour fournir un

refoulement à volume variable de la pompe;

- lesdits premiers moyens formant valve (96A) étant situés dans une première conduite d'eau pour connecter le côté refoulement de ladite pompe (95) et le premier collecteur à buses (55); et
- lesdits seconds moyens formant valve (96B) étant situés dans une seconde conduite d'eau pour connecter le côté refoulement de ladite pompe (95) et le second collecteur à buses (58).

6. Appareil automatique lave-cheveux selon la revendication 5, dans lequel ladite seconde conduite d'eau est branchée depuis une partie à mi-chemin de la première conduite d'eau.

7. Appareil automatique lave-cheveux selon l'une quelconque des revendications 1 à 6, comprenant en outre:

- un bassin d'eau (51) formé avec une telle profondeur que les cheveux longs pendent naturellement depuis la partie de tête de la personne de façon à être lavés par l'eau lorsque la partie de tête de la personne est disposée dans une situation de lavage;
- ledit premier et ledit second collecteur à buses (55, 58) étant montés sur la paroi intérieure dans une position relativement haute du bassin d'eau (51);
- une pluralité de buses fixes (60a, 60b, 60c) pour pulvériser principalement l'eau de lavage vers une partie avant des cheveux longs de la personne dont on doit laver les cheveux; et
- lesdites buses fixes (60a, 60b, 60c) étant disposées sur une paire de parois intérieures opposées l'une à l'autre à une position relativement basse du bassin d'eau (51).

8. Appareil automatique lave-cheveux selon la revendication 7, dans lequel lesdites buses fixes (60a, 60b, 60c) sont disposées alternativement sur la paroi intérieure avant et sur la paroi intérieure arrière du réservoir d'eau.

FIG. 1

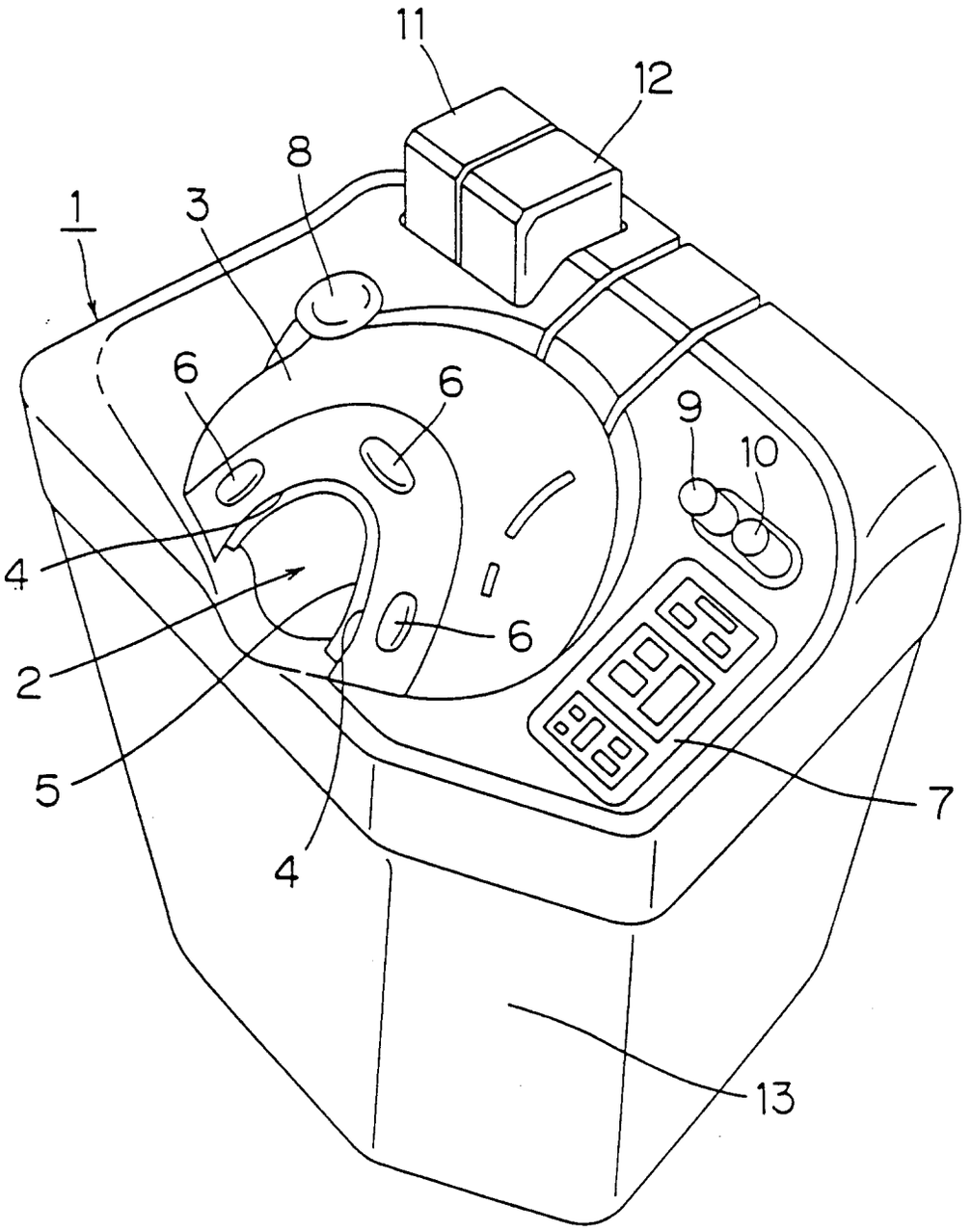


FIG. 2

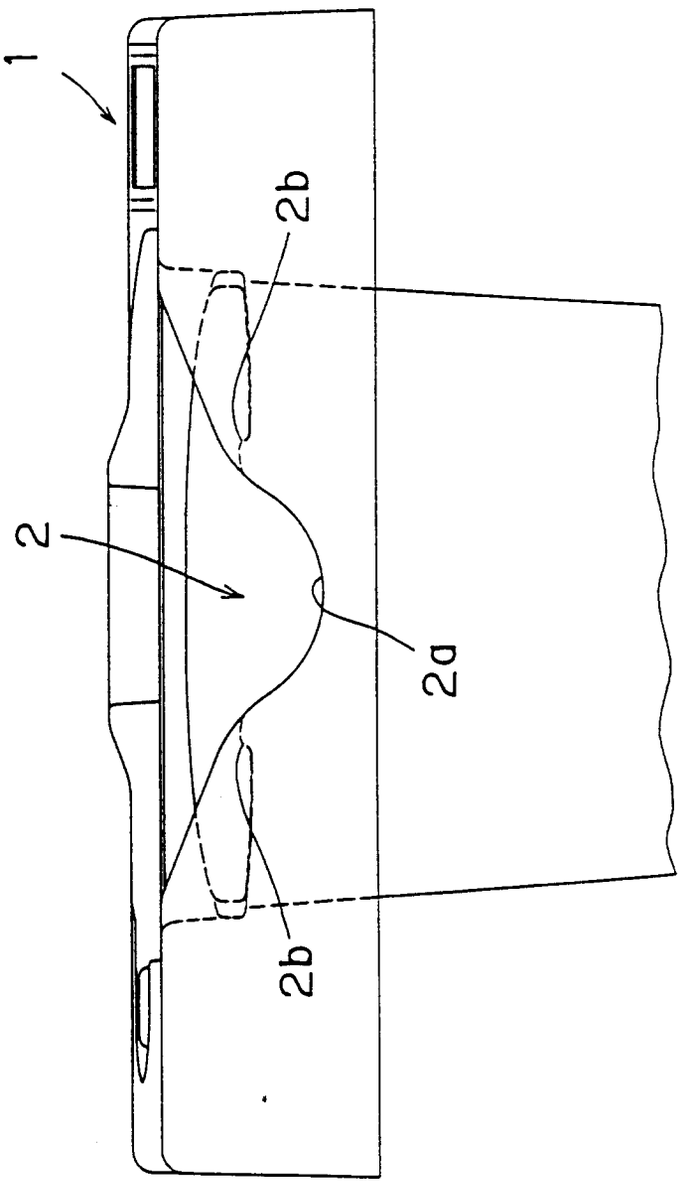


FIG. 3

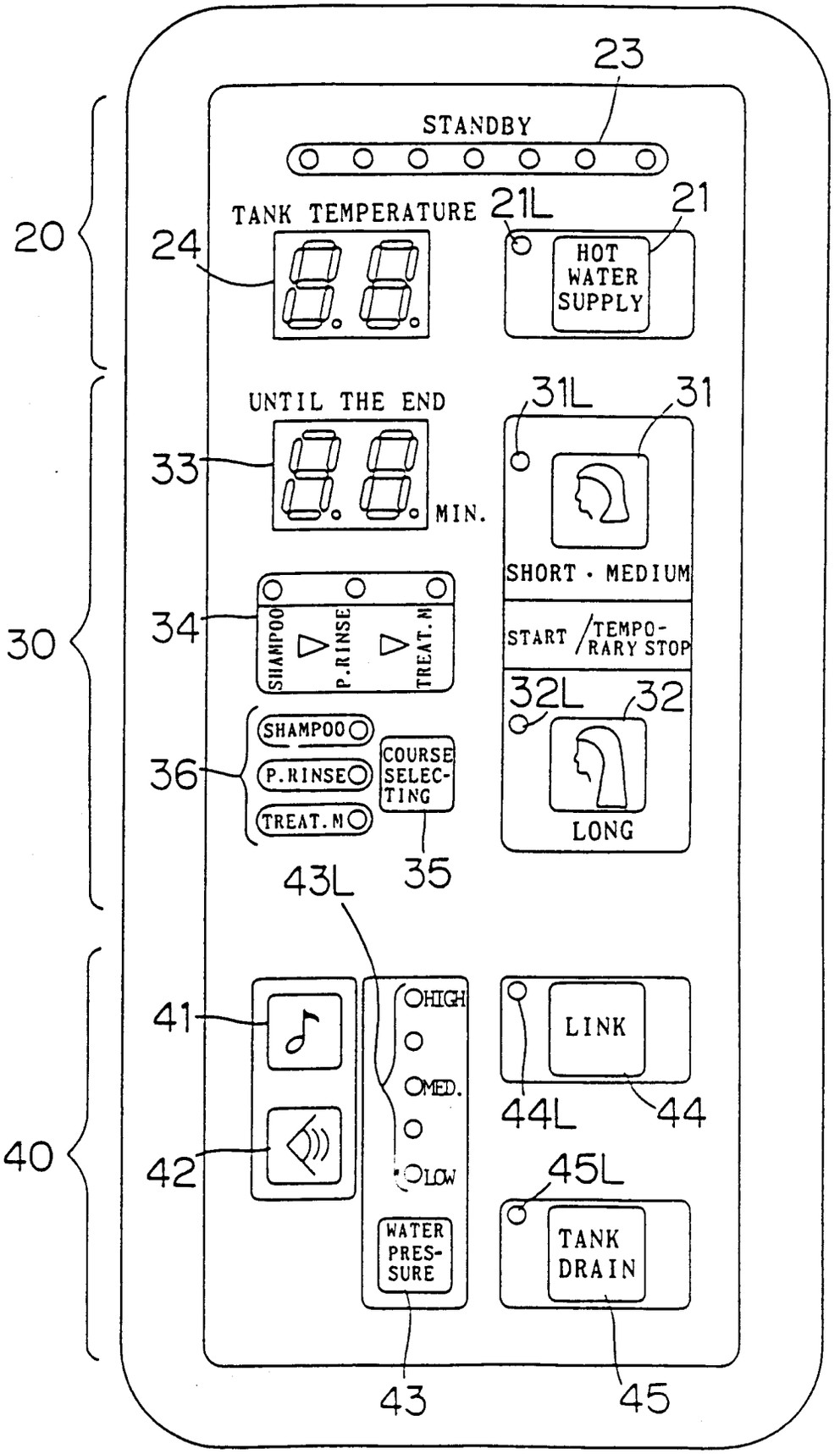

23
STANDBY
TANK TEMPERATURE
21L
21
24
HOT WATER SUPPLY
20
UNTIL THE END
31L
31
33
MIN.
SHORT · MEDIUM
START / TEMPO-RARY STOP
30
34
SHAMPOO
P.RINSE
TREAT.M
32L
32
36
SHAMPOO
P.RINSE
TREAT.M
COURSE SELEC-TING
LONG
35
43L
41
HIGH
MED.
LOW
LINK
42
44L
44
40
45L
WATER PRES-SURE
TANK DRAIN
43
45

FIG. 4

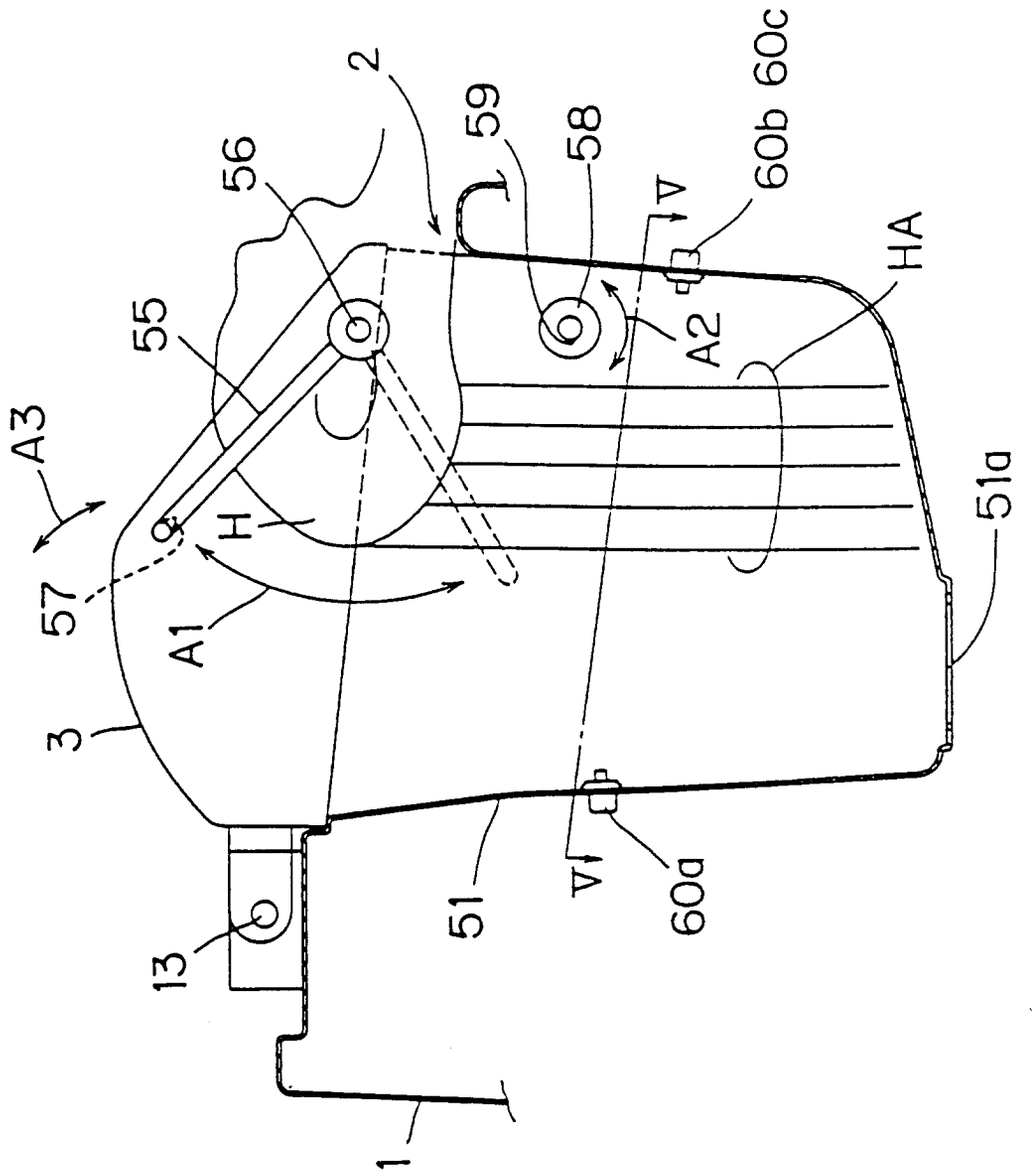


FIG. 5

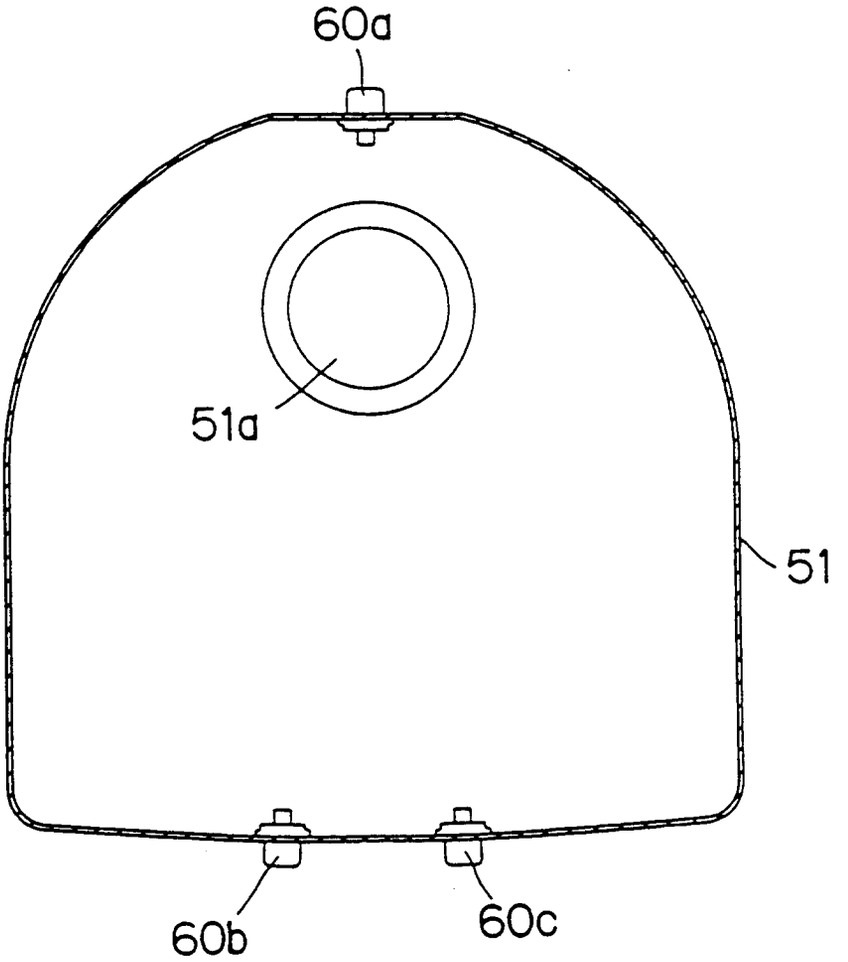


FIG. 6

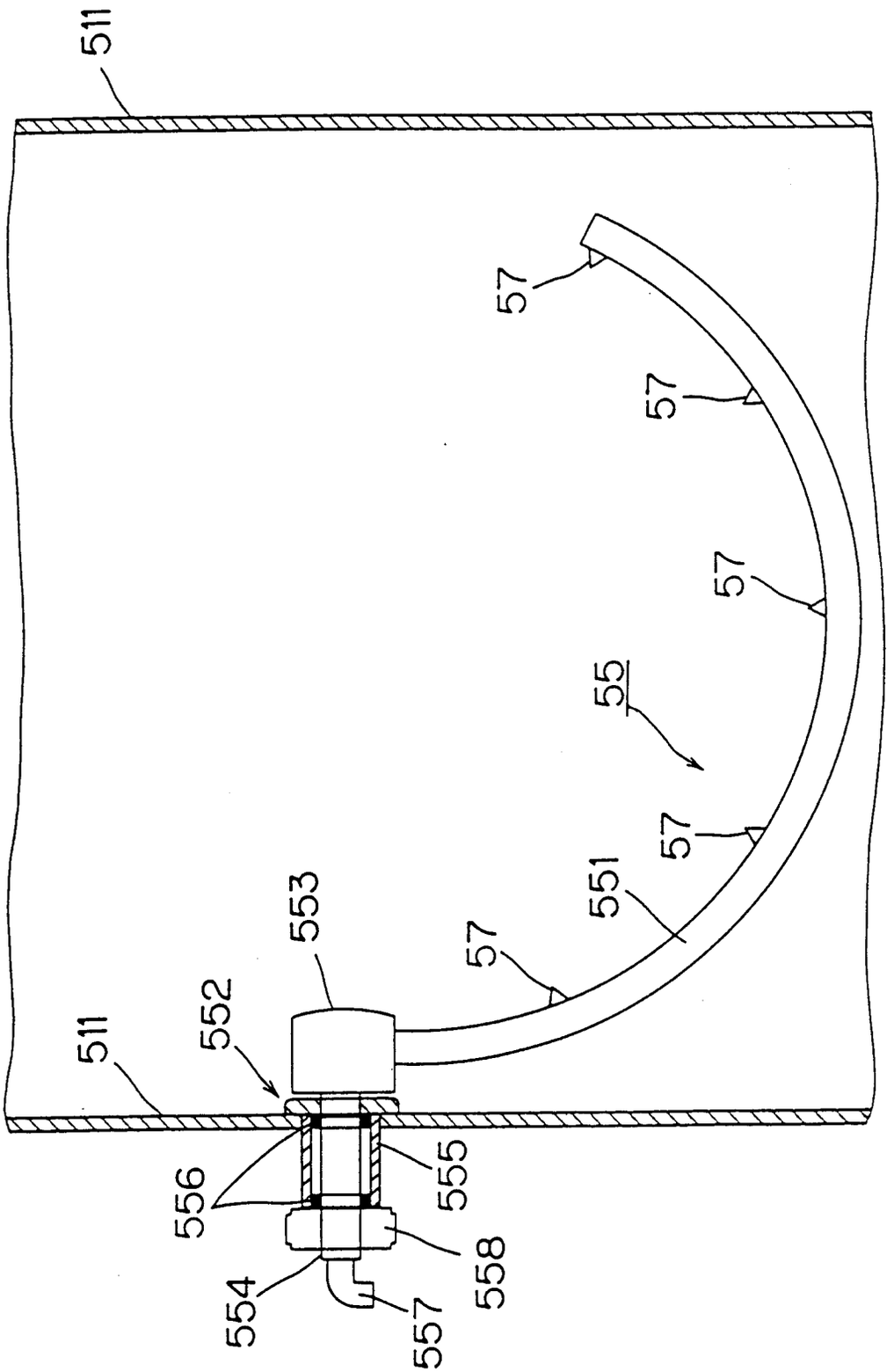


FIG. 7

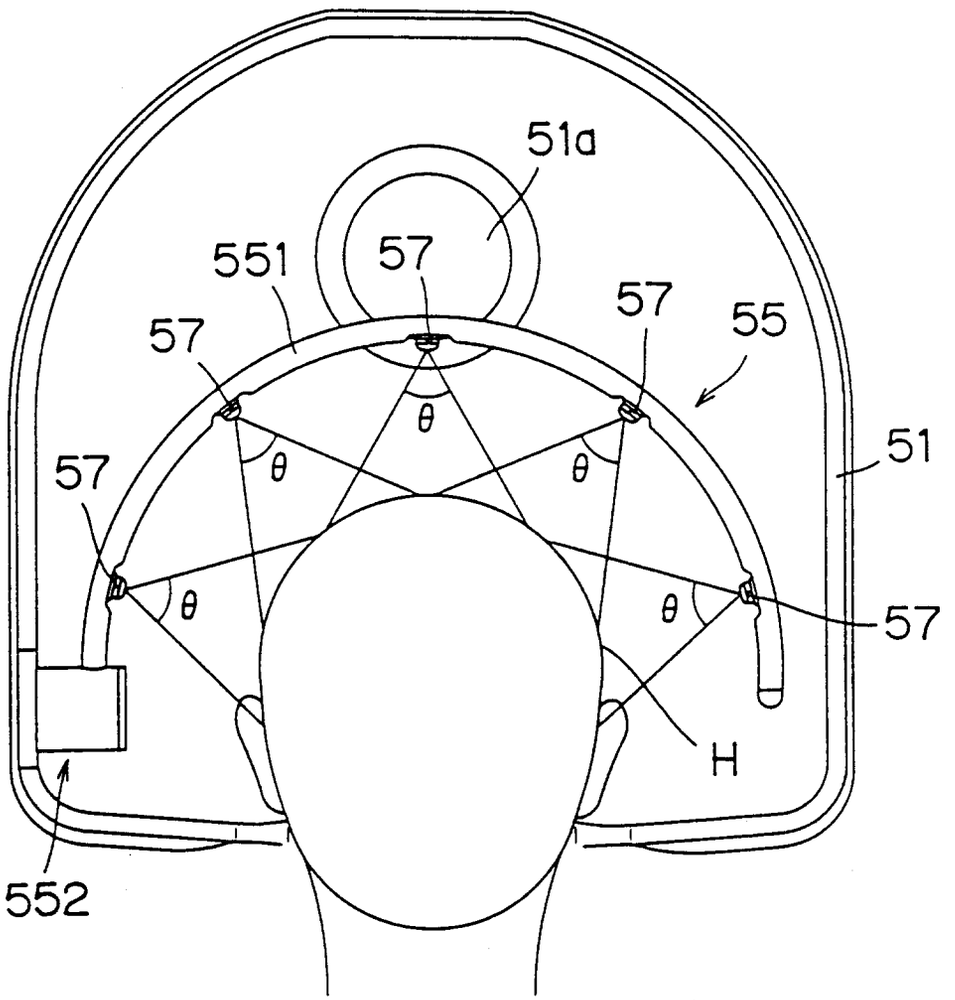


FIG. 8

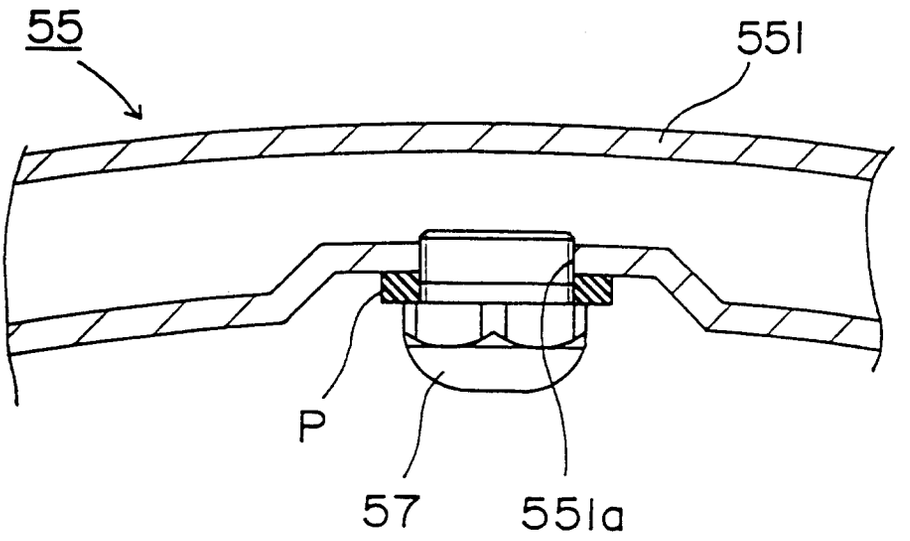


FIG. 9 (a)

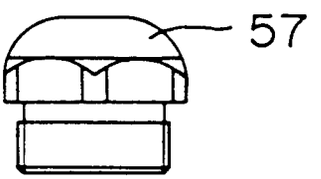


FIG. 9 (b)

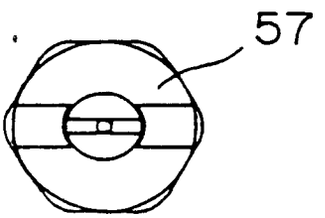


FIG. 10

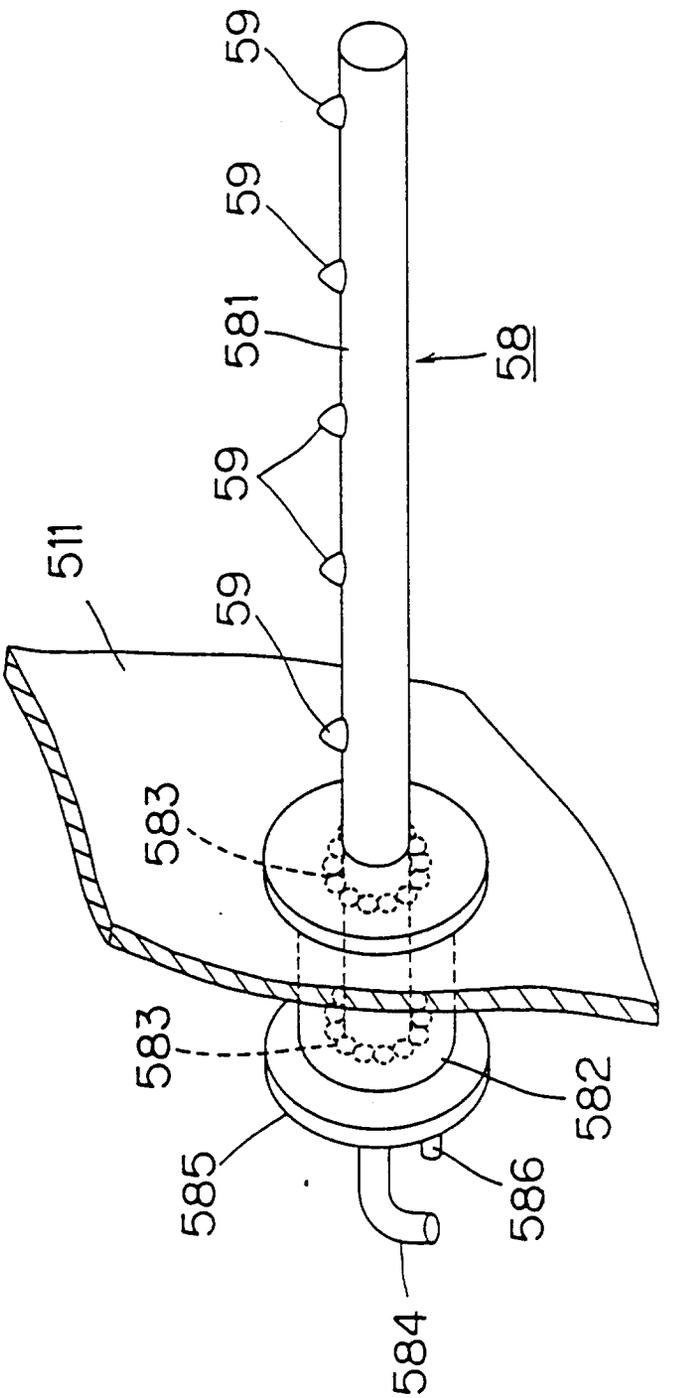
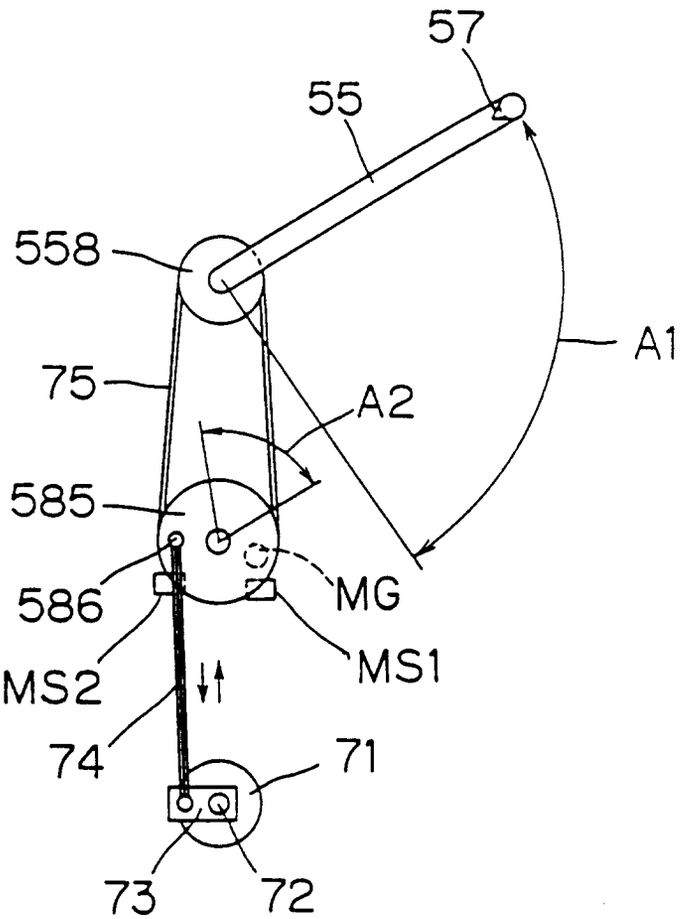


FIG. 11



F I G. 1 2

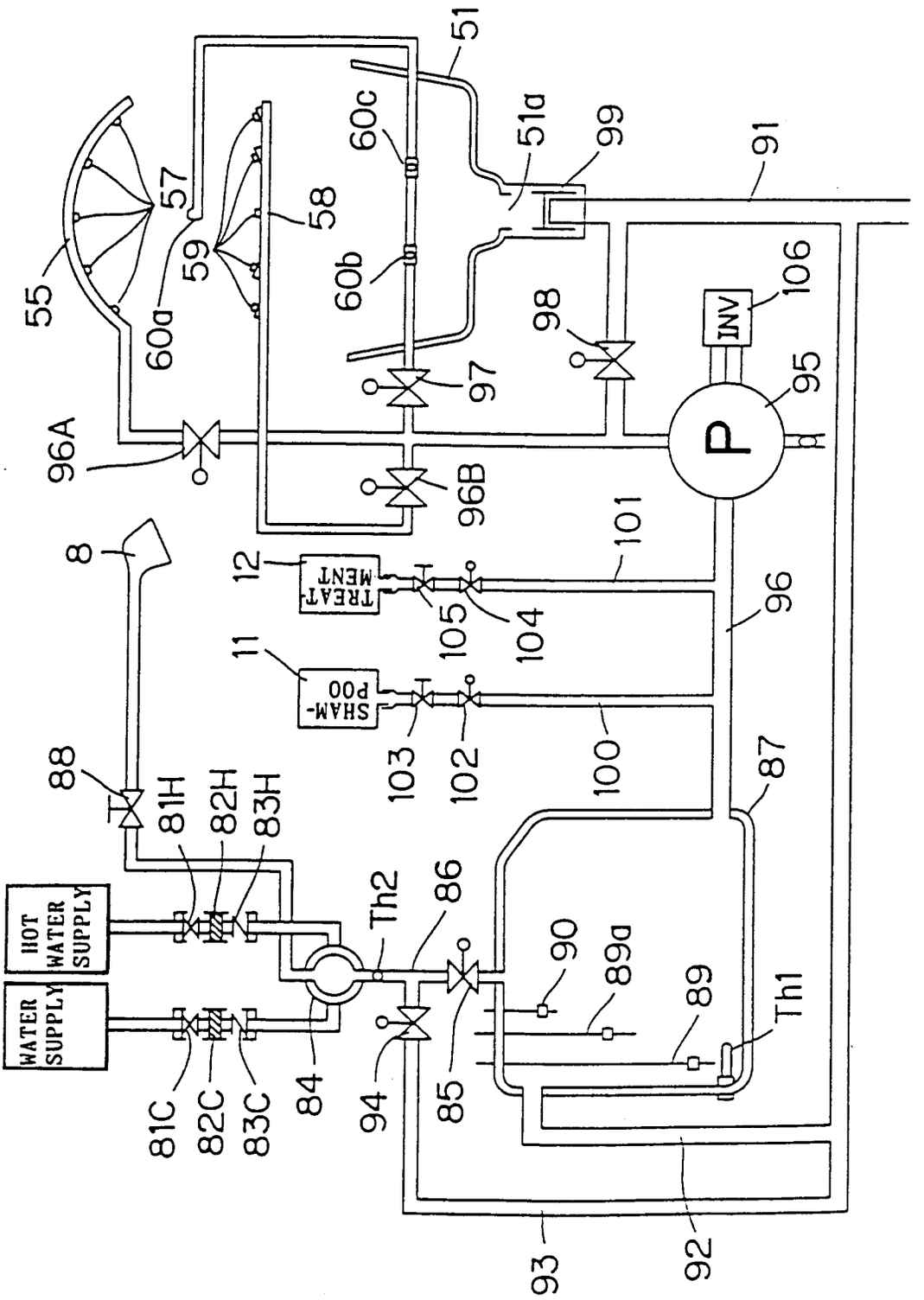

51
60c
51a
99
91
57
58
59
60a
60b
55
98
INV
106
97
95
P
96A
96B
101
8
12
TREAT-MENT
105
104
96
11
SHAM-POO
103
102
100
87
88
81H
82H
83H
HOT WATER SUPPLY
WATER SUPPLY
Th2
86
90
89a
89
Th1
81C
82C
83C
84
94
85
93
92

FIG. 13

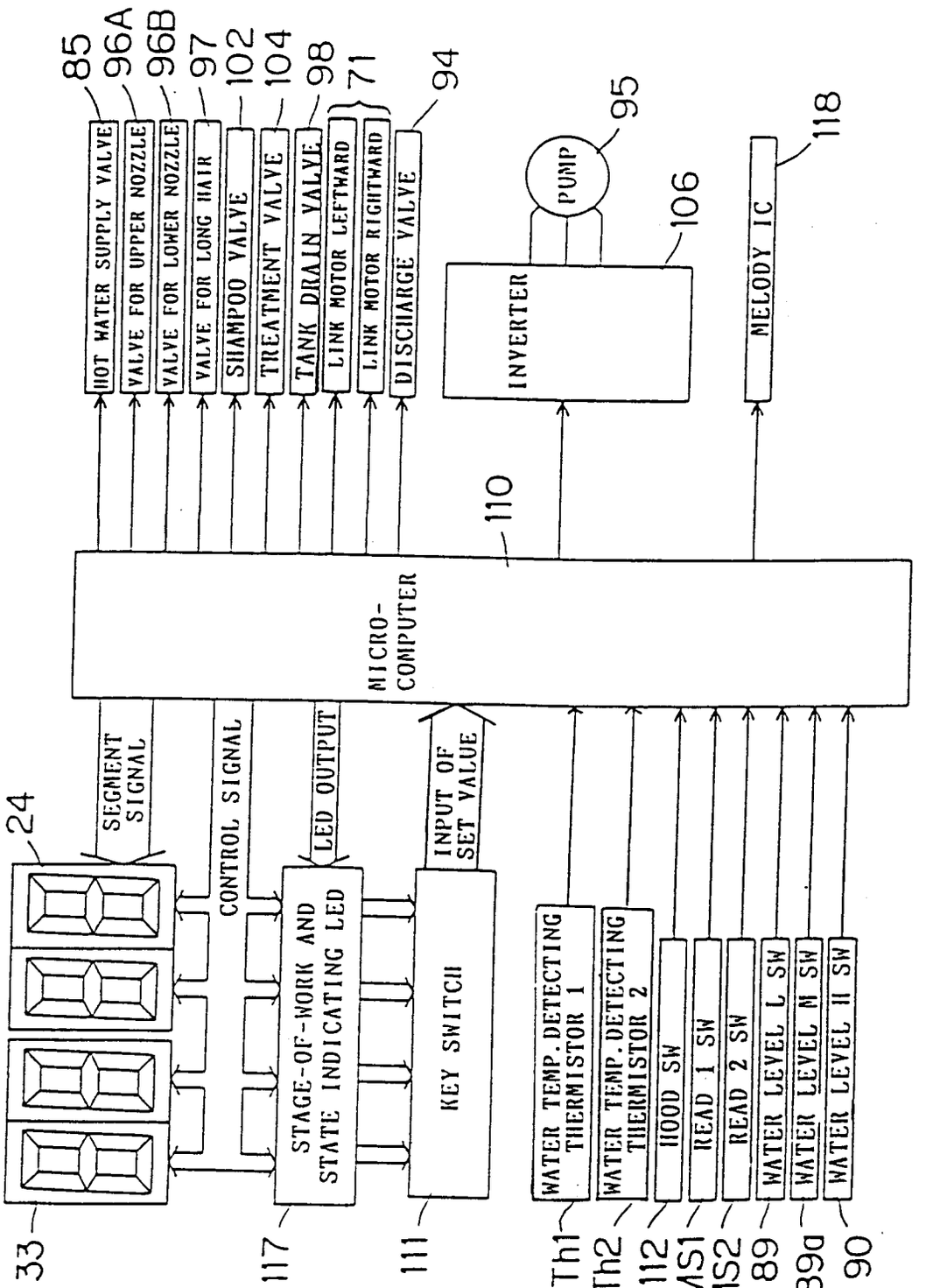

85
96A
96B
97
102
104
98
71
94
HOT WATER SUPPLY VALVE
VALVE FOR UPPER NOZZLE
VALVE FOR LOWER NOZZLE
VALVE FOR LONG HAIR
SHAMPOO VALVE
TREATMENT VALVE
TANK DRAIN VALVE
LINK MOTOR LEFTWARD
LINK MOTOR RIGHTWARD
DISCHARGE VALVE
110
MICRO-COMPUTER
INVERTER
PUMP
95
106
MELODY IC
118
SEGMENT SIGNAL
CONTROL SIGNAL
LED OUTPUT
INPUT OF SET VALUE
24
33
117
111
STAGE-OF-WORK AND STATE INDICATING LED
KEY SWITCH
WATER TEMP. DETECTING THERMISTOR 1
WATER TEMP. DETECTING THERMISTOR 2
HOOD SW
READ 1 SW
READ 2 SW
WATER LEVEL L SW
WATER LEVEL M SW
WATER LEVEL H SW
Th1
Th2
112
MS1
MS2
89
89a
90

FIG. 14

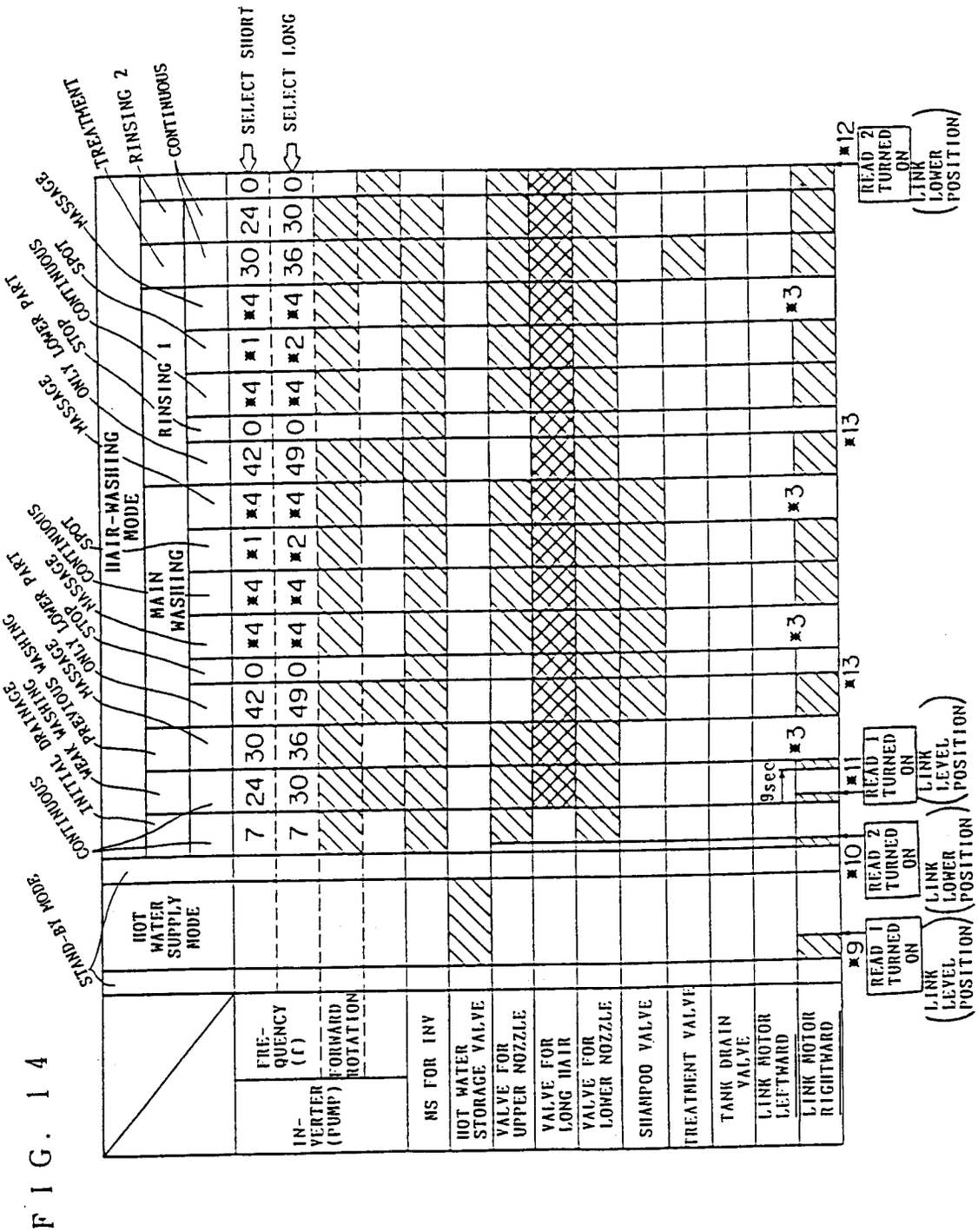

STAND-BY MODE
HOT WATER SUPPLY MODE
HAIR-WASHING MODE
MAIN WASHING
RINSING 1
RINSING 2
TREATMENT
CONTINUOUS
SELECT SHORT
SELECT LONG
CONTINUOUS
INITIAL DRAINAGE
WEAK WASHING
PREVIOUS WASHING
MASSAGE
ONLY LOWER PART
STOP
MASSAGE
CONTINUOUS
SPOT
MASSAGE
ONLY LOWER PART
STOP
CONTINUOUS
SPOT
MASSAGE
INVERTER (PUMP)
FREQUENCY (r)
FORWARD ROTATION
MS FOR INV
HOT WATER STORAGE VALVE
VALVE FOR UPPER NOZZLE
VALVE FOR LONG HAIR
VALVE FOR LOWER NOZZLE
SHAMPOO VALVE
TREATMENT VALVE
TANK DRAIN VALVE
LINK MOTOR LEFTWARD
LINK MOTOR RIGHTWARD
7 24 30 42 0 ✱4 ✱4 ✱1 ✱4 42 0 ✱4 ✱1 ✱4 30 24 0
7 30 36 49 0 ✱4 ✱4 ✱2 ✱4 49 0 ✱4 ✱2 ✱4 36 30 0
9sec
✱3
✱9
✱10
✱11
✱12
✱13
READ 1 TURNED ON
READ 2 TURNED ON
LINK LEVEL POSITION
LINK LOWER POSITION

FIG. 15

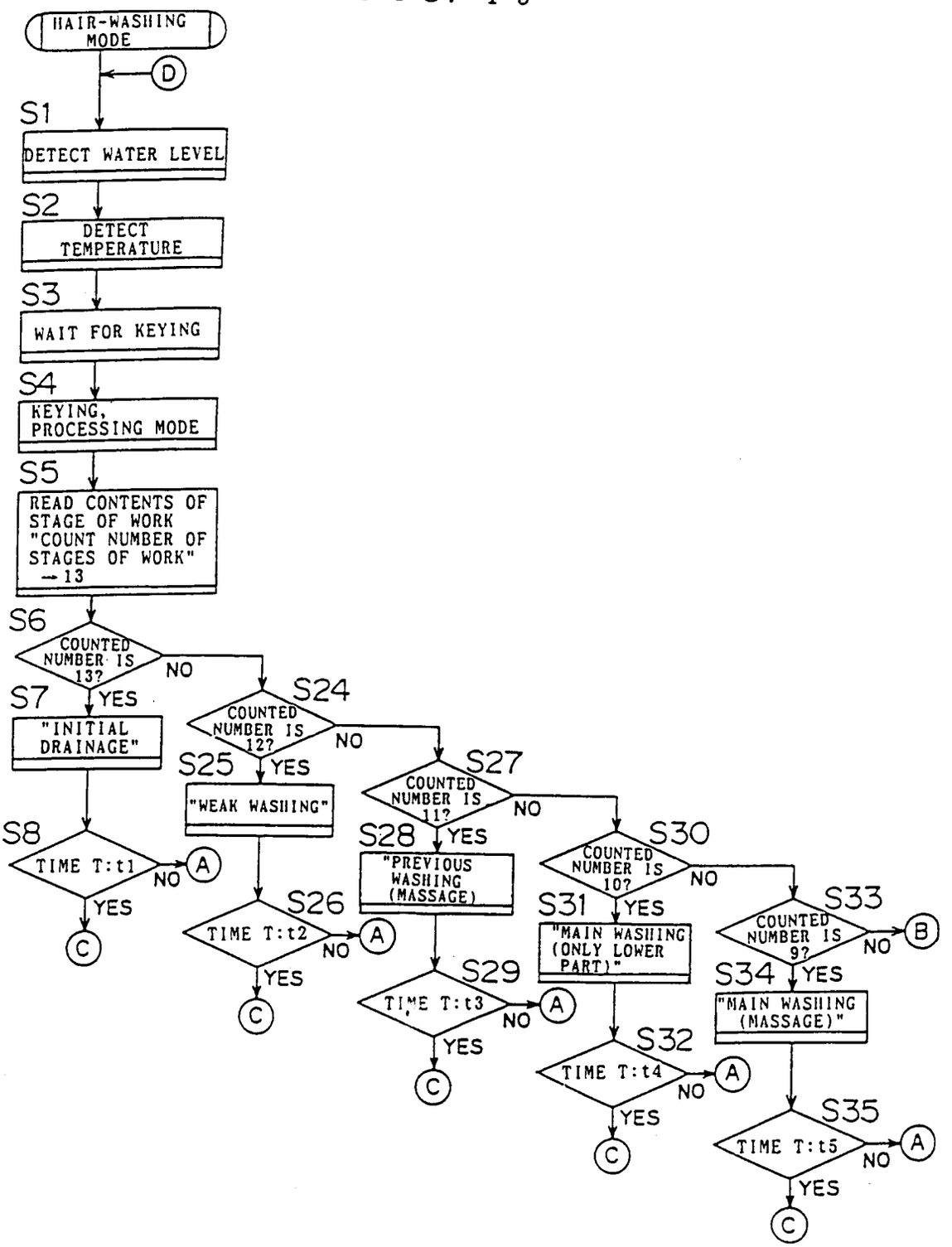

HAIR-WASHING MODE
D
S1
DETECT WATER LEVEL
S2
DETECT TEMPERATURE
S3
WAIT FOR KEYING
S4
KEYING, PROCESSING MODE
S5
READ CONTENTS OF STAGE OF WORK "COUNT NUMBER OF STAGES OF WORK" ← 13
S6
COUNTED NUMBER IS 13?
NO
YES
S7
"INITIAL DRAINAGE"
S8
TIME T:t1
NO
A
YES
C
S24
COUNTED NUMBER IS 12?
NO
YES
S25
"WEAK WASHING"
S26
TIME T:t2
NO
A
YES
C
S27
COUNTED NUMBER IS 11?
NO
YES
S28
"PREVIOUS WASHING (MASSAGE)
S29
TIME T:t3
NO
A
YES
C
S30
COUNTED NUMBER IS 10?
NO
YES
S31
"MAIN WASHING (ONLY LOWER PART)"
S32
TIME T:t4
NO
A
YES
C
S33
COUNTED NUMBER IS 9?
NO
B
YES
S34
"MAIN WASHING (MASSAGE)"
S35
TIME T:t5
NO
A
YES
C

FIG. 16

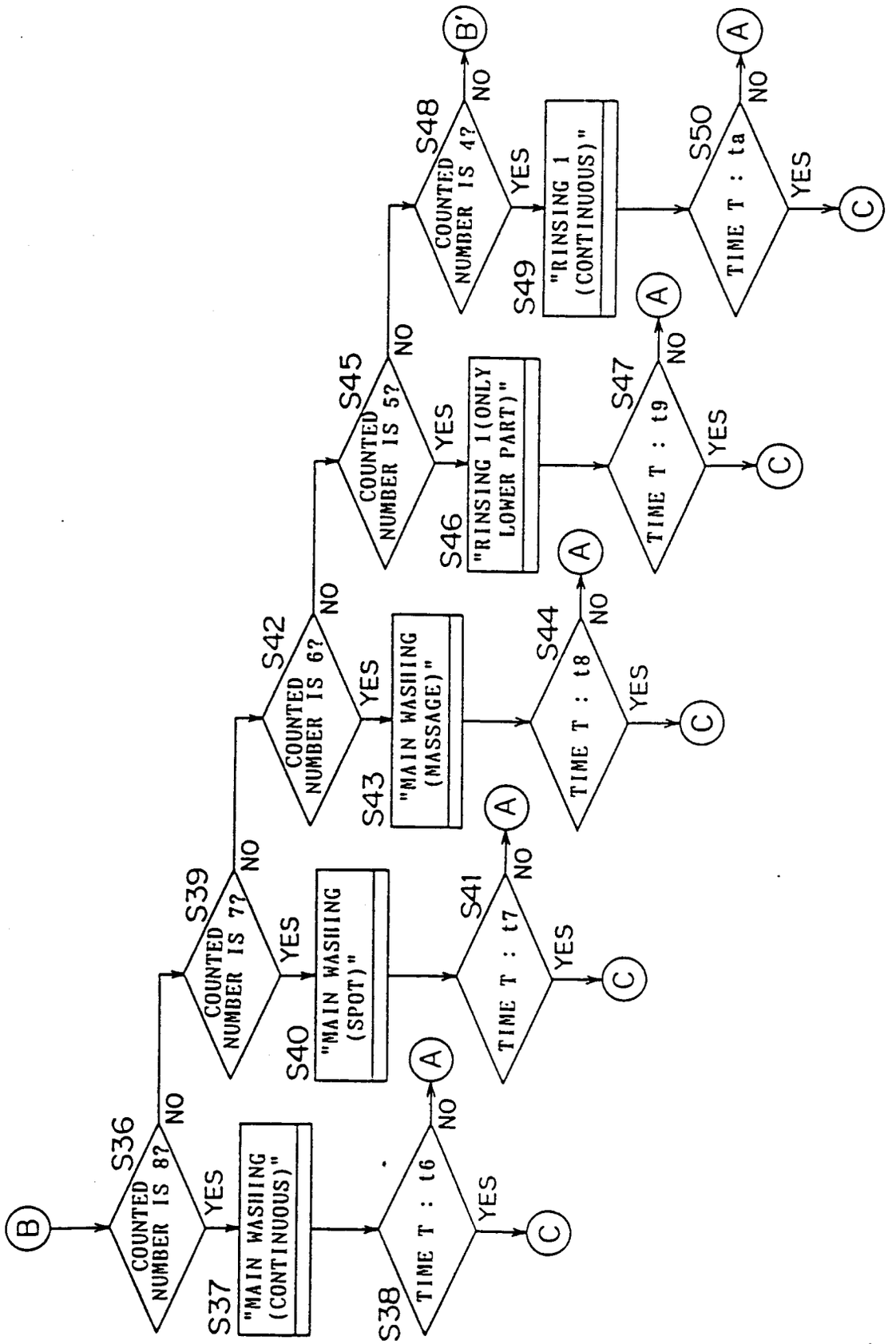

B
S36
COUNTED NUMBER IS 8?
YES
NO
S37
"MAIN WASHING (CONTINUOUS)"
S38
TIME T : t6
YES
NO
A
C
S39
COUNTED NUMBER IS 7?
YES
NO
S40
"MAIN WASHING (SPOT)"
S41
TIME T : t7
YES
NO
A
C
S42
COUNTED NUMBER IS 6?
YES
NO
S43
"MAIN WASHING (MASSAGE)"
S44
TIME T : t8
YES
NO
A
C
S45
COUNTED NUMBER IS 5?
YES
NO
S46
"RINSING 1(ONLY LOWER PART)"
S47
TIME T : t9
YES
NO
A
C
S48
COUNTED NUMBER IS 4?
YES
NO
B'
S49
"RINSING 1 (CONTINUOUS)"
S50
TIME T : ta
YES
NO
A
C

FIG. 17

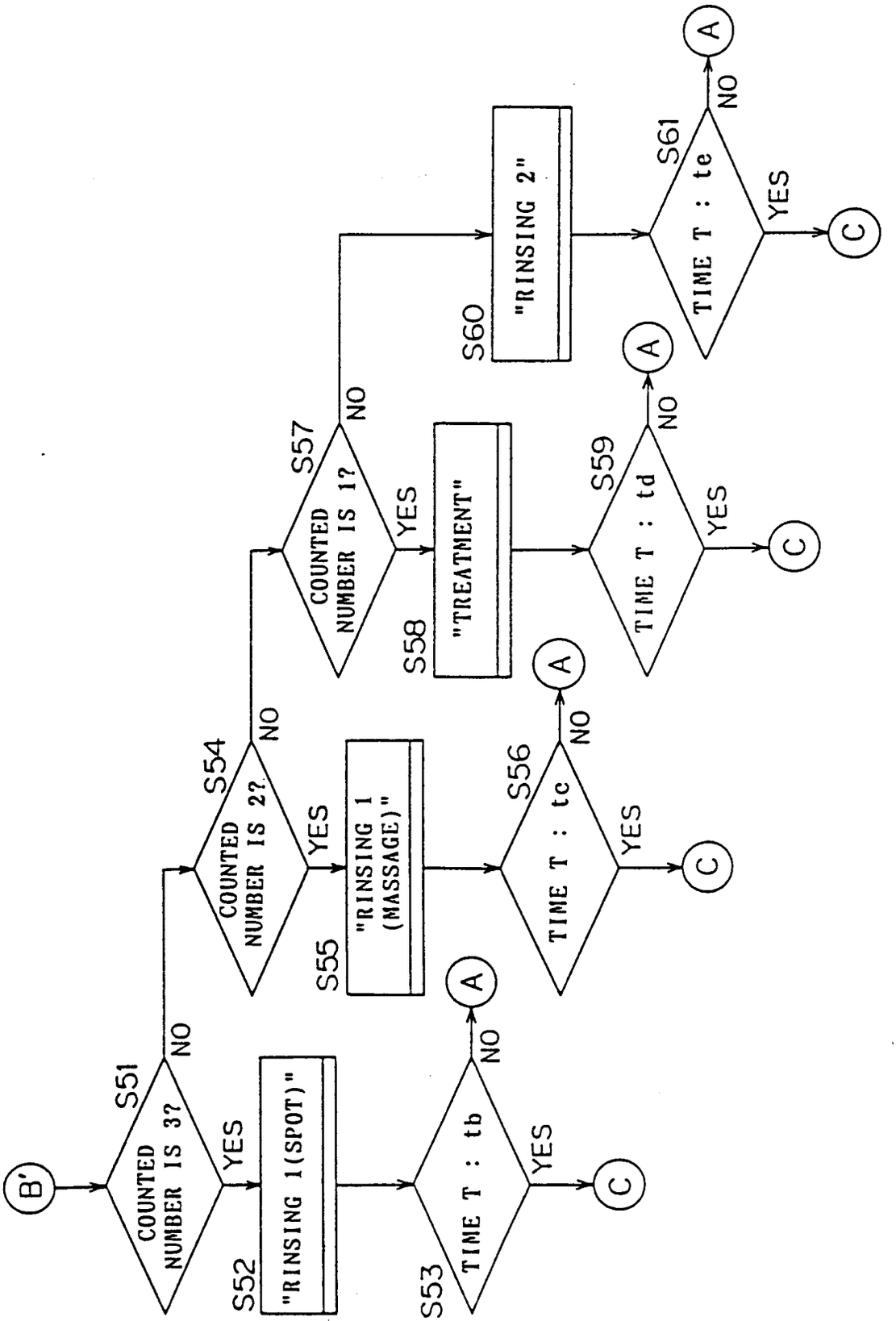

B'
S51
COUNTED NUMBER IS 3?
YES
NO
S52
"RINSING 1(SPOT)"
S53
TIME T : tb
YES
NO
A
C
S54
COUNTED NUMBER IS 2?
YES
NO
S55
"RINSING 1 (MASSAGE)"
S56
TIME T : tc
YES
NO
A
C
S57
COUNTED NUMBER IS 1?
YES
NO
S58
"TREATMENT"
S59
TIME T : td
YES
NO
A
C
S60
"RINSING 2"
S61
TIME T : te
YES
NO
A
C

FIG. 18

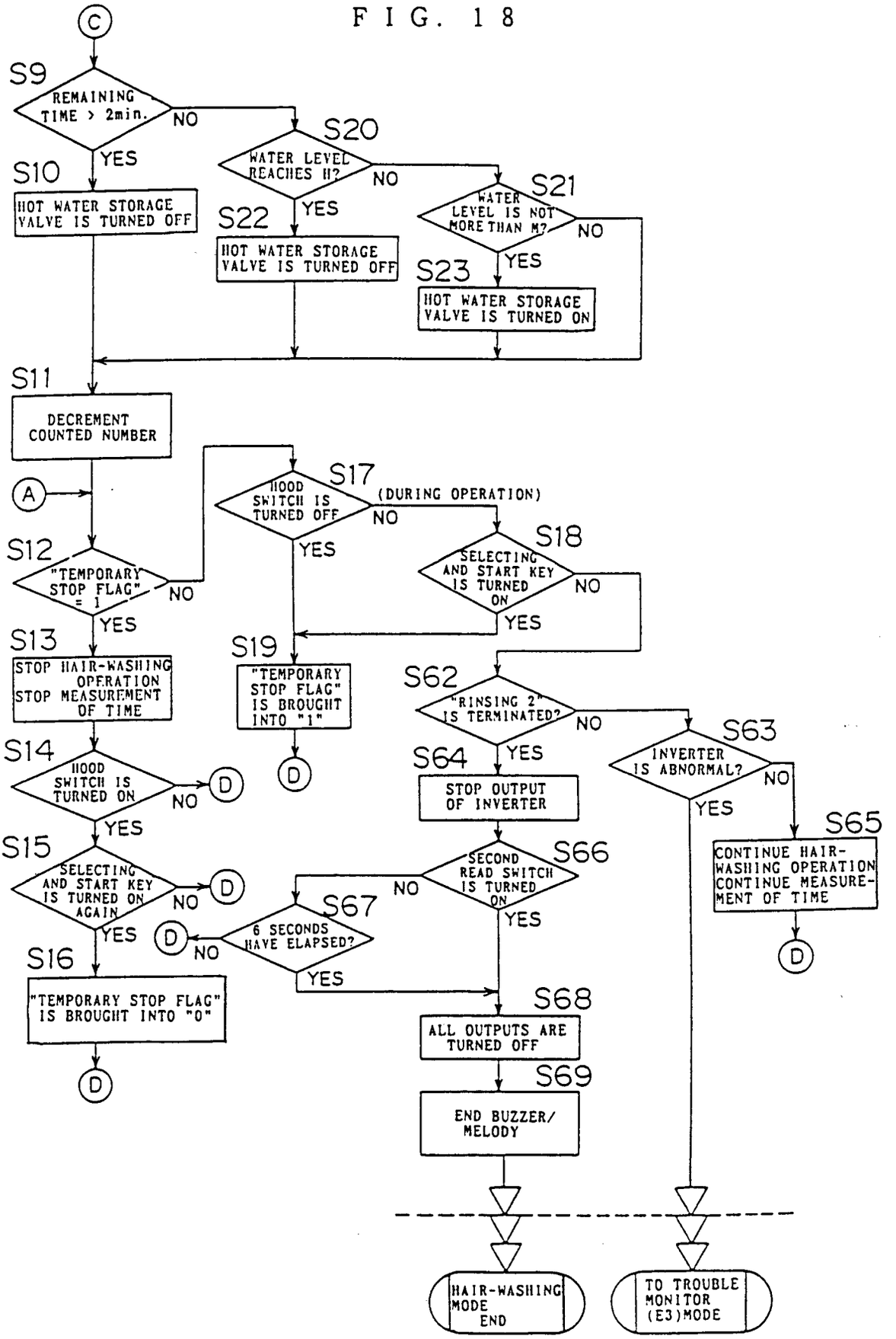

C
S9
REMAINING TIME > 2min.
NO
YES
S10
HOT WATER STORAGE VALVE IS TURNED OFF
S20
WATER LEVEL REACHES H?
NO
YES
S22
HOT WATER STORAGE VALVE IS TURNED OFF
S21
WATER LEVEL IS NOT MORE THAN M?
NO
YES
S23
HOT WATER STORAGE VALVE IS TURNED ON
S11
DECREMENT COUNTED NUMBER
A
S12
"TEMPORARY STOP FLAG" = 1
NO
YES
S13
STOP HAIR-WASHING OPERATION STOP MEASUREMENT OF TIME
S14
HOOD SWITCH IS TURNED ON
NO
D
YES
S15
SELECTING AND START KEY IS TURNED ON AGAIN
NO
D
YES
S16
"TEMPORARY STOP FLAG" IS BROUGHT INTO "0"
D
S17
HOOD SWITCH IS TURNED OFF
(DURING OPERATION)
NO
YES
S18
SELECTING AND START KEY IS TURNED ON
NO
YES
S19
"TEMPORARY STOP FLAG" IS BROUGHT INTO "1"
D
S62
"RINSING 2" IS TERMINATED?
NO
YES
S63
INVERTER IS ABNORMAL?
NO
YES
S64
STOP OUTPUT OF INVERTER
S65
CONTINUE HAIR-WASHING OPERATION CONTINUE MEASUREMENT OF TIME
D
S66
SECOND READ SWITCH IS TURNED ON
NO
YES
S67
6 SECONDS HAVE ELAPSED?
D
NO
YES
S68
ALL OUTPUTS ARE TURNED OFF
S69
END BUZZER/ MELODY
HAIR-WASHING MODE END
TO TROUBLE MONITOR (E3)MODE

FIG. 19

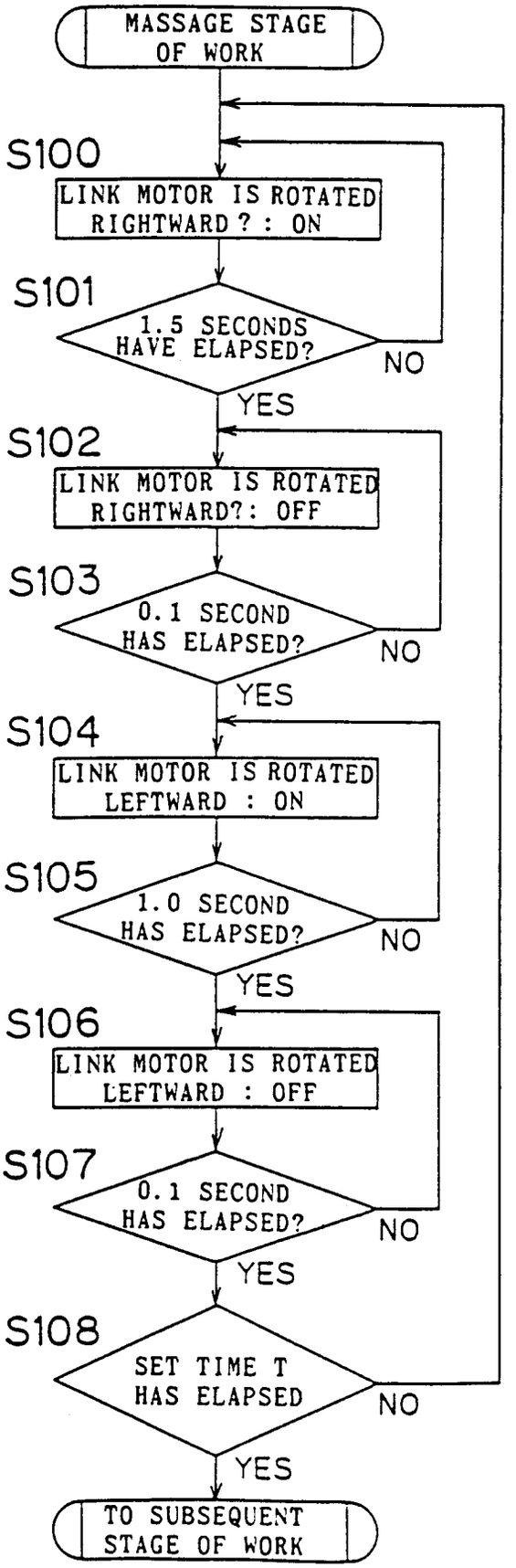

MASSAGE STAGE OF WORK
S100
LINK MOTOR IS ROTATED RIGHTWARD ? : ON
S101
1.5 SECONDS HAVE ELAPSED?
NO
YES
S102
LINK MOTOR IS ROTATED RIGHTWARD?: OFF
S103
0.1 SECOND HAS ELAPSED?
NO
YES
S104
LINK MOTOR IS ROTATED LEFTWARD : ON
S105
1.0 SECOND HAS ELAPSED?
NO
YES
S106
LINK MOTOR IS ROTATED LEFTWARD : OFF
S107
0.1 SECOND HAS ELAPSED?
NO
YES
S108
SET TIME T HAS ELAPSED
NO
YES
TO SUBSEQUENT STAGE OF WORK

FIG. 20

