ABSTRACT: A hair washing machine is disclosed comprising a casing provided with a lining which defines a zone in which a person's head is intended to be received. The lining is rigid and supports a plurality of hair treatment units each including a hair treatment element reciprocable by means of a piston and cylinder assembly into and out of the head-receiving zone. The treatment elements take the form of groups of resiliently flexible fingers which spread outwardly on engagement with a person's head and thus perform a massaging action. The treatment units are operated by an air pump driven by a motor which also drives a camshaft havingcams designed and arranged to cause water, shampoo and the like to be supplied to sprays contained within the lining. The camshaft also carries cams operable to cause the operations performed by the machine to be performed in a predetermined sequence.
FIG. 4.

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HAIR WASHING MACHINE

SUMMARY OF THE INVENTION

It is an object of the invention to provide a hair treatment machine capable of rubbing and/or massaging a person's head. Another object is to provide a hair treatment machine in which the rubbing and/or massaging of a person's head is combined with the supply of water and other suitable hair treatment liquids such as shampoo, either separately or in admixture with each other, to the head. A further object is to provide a hair treatment machine in which the treatment of the hair is carried out automatically in a predetermined sequence of operations.

The expression “hair treatment” is used in this specification to include washing, bleaching, dying, oiling and other similar treatments of the hair and also treatments, such as massaging, cleansing or medicating of the skin from which the hair is growing.

According to one aspect of the present invention, a hair treatment machine comprises a plurality of treatment units arranged to define a head-receiving zone and a lining extending between the units to contain the hair, each treatment unit including a treatment element reciprocable by means of a piston and cylinder assembly into and out of the head-receiving zone. The treatment elements of alternate treatment units are arranged to move into the head-receiving zone while the treatment elements of the remaining units move out of the head-receiving zone, and spray means is provided to inject a liquid into the head-receiving zone.

According to another aspect of the present invention a hair treatment unit for use in a hair treatment machine comprises a piston and cylinder assembly, a tubular extension on the cylinder of the assembly into which the piston can partially extend and a treatment element releasably secured to the piston, the treatment element being reciprocable by the piston to project from the tubular extension.

DRAWINGS

Embodiments of a hair treatment machine in accordance with the invention are now described by way of example, reference being made to the accompanying drawings in which:

FIG. 1 is a diagrammatic, sectional view of one embodiment of a hair treatment machine.

FIG. 2 is a sectional view of a detail of the machine of FIG. 1.

FIG. 3 is a view similar to that of FIG. 1 of another embodiment of a hair treatment machine.

FIG. 4 shows schematically a liquid supply system and an electrical circuit of the machine of FIG. 3, and

FIG. 5 is a sectional view of a detail of FIG. 3.

The hair treatment machine shown in FIG. 1 comprises a generally dome-shaped housing 10 in which a plurality of treatment units 11 are arranged to define a head-receiving zone 12 in which a head 13 of a person in a backward inclined position can be received. The treatment units 11 include inwardly opening cylinders 14 in each of which a piston 15 is slidably held. The peripheries of the cylinders 14 are secured in openings in a lining 16 which acts to retain the hair within the head-receiving zone 12. Each piston 15 carries a group of resiliently flexible fingers 17, for example of rubber, which project towards the head-receiving zone 12. The fingers 17 of each group are arranged in a ring on the associated piston 15 and the free ends of the fingers 17 are deformed to extend outwardly so that as the piston is moved towards the head-receiving zone 12 bringing the fingers 17 into engagement with the head 13, the fingers move outwardly to move over the head 13 and massage it. The groups of fingers 18 around the periphery of the head-receiving zone 13 have their free ends deformed to extend towards the rear of the zone 12 so that on being brought into engagement with the front of the head 13 they then move towards the back of the head 13. The housing 10 and the lining 16 are joined at the entry 19 to the head-receiving zone 12 and the junction is provided with a covering 20 of resiliently flexible material which acts as a seal about the head 13 to prevent water escaping from the hair-treatment zone 12.

A main two-way pump 21 comprises a cylinder 22 having outlets 23 and 24 at its opposite ends and a piston 25 reciprocated by a motor 26. Lines 27 and 28 are respectively connected to the outlets 23 and 24 to supply compressed air to the cylinders 14. In the arrangement shown alternate ones of the cylinders 14 around the head are connected to the line 27 and to the line 28 but any selection of cylinders 14 may be connected to the line 27 with the others connected to the line 28. It will be appreciated that as compressed air is supplied to line 27, driving the associated pistons 15 inwardly, the other pistons connected to line 28 will be withdrawn away from the head and vice versa.

A pair of sprays 29 are mounted on the inner surface of the hood and arranged to be supplied with water and shampoo through a line 30. A line 31 is connected to the water mains at 32 and is connected to line 30 through a venturi system. A shampoo supply 33 containing a number of different shampoos, the desired one of which may be selected by means of a selector knob 34, is connected through line 35 to the venturi so that the flow of water will suck shampoo into line 30. The water and shampoo are thus thoroughly mixed before they reach the sprays 29 and are then applied to the head in a fine spray. A timing control 36 is arranged to control the supply of water and shampoo so that the hair is first wetted, then shampooed and then rinsed. Water can leave the hood through a drain 37 provided with a stray hair catch 38. A heater and temperature controller 39 can be provided in the water supply line.

As seen in FIG. 2, a piston 15 is sealed in a cylinder 14 by means of an "O"-ring 40 slidable with the piston; a further "O"-ring 41 being fixed at the top of the cylinder to provide an abutment.

The hair treatment machine shown in FIG. 3 includes a lining 40 formed of a rigid material such as aluminium. The lining 40 defines a head-receiving zone and is fixed in a suitable casing (not shown) in such a position that the head 41 of a backwardly inclined person can readily be inserted. The lining 40 is formed with a plurality of apertures 42, arranged in concentric circles, in which treatment units 43, shown in more detail in FIG. 5, are mounted. Each treatment unit 43 has a cylinder 44 in which a piston 45 is slidably held. Sealing between the piston 45 and the walls of the cylinder 44 is effected by means of rolling "O"-ring 46, that is an "O"-ring which rolls along the piston 45 as it moves relative to the cylinder 44 thereby forming a good seal while causing little resistance to the movement of the piston. A nipple 47 is provided at one end of the cylinder 44 to permit the interior of the cylinder to be placed in communication with a source of fluid under pressure. The other end of the cylinder 44 carries a tubular extension 48 into which the piston 45 is movable. The extension 48 has externally an annular recess 50 in which a rubber grommet 51 is received. The grommet 51 is secured in an aperture 42 of the lining 40 and acts as a resilient mounting for the treatment unit 43. Apertures 52 are formed in the extension 48 adjacent the cylinder 45. A treatment element 54, formed of a resiliently flexible material such as rubber, is located in the extension 48. The element 54 comprises a base formed with a recess into which a projection 57 on the piston 45 tightly fits. Four fingers 58 extend from the base 55, they are uniformly spaced round the base 55 and their free ends 59 are outwardly inclined.

Fluid pressure for the actuation of the pistons 45 of the treatment units 43 is derived from a dual, two-way air pump 60. The pump 60 comprises a pair of aligned cylinders 61 having their pistons 62 connected by a common connecting rod 63 reciprocable by an electric motor 64. The cylinders 61 have an outlet 65, 70 at each end, the two outlets 65 communicating with a common pipeline 72. It will be appreciated that as the pistons 62 are reciprocated in their respective cylinders 61, the pipelines 71, 72 will alternately be at positive and
negative pressures. Pipeline 71 communicates through branch pipelines 73 with the cylinders 44 of alternate ones of the treatment units 43 and similarly the pipeline 72 communicates through branch pipelines 74 with the cylinders 44 of the remaining treatment units 43.

Each of the pipelines 71, 72 is openable to the atmosphere by means of valves 75, 76, 77. Valves 75 are pressure release valves and are normally held closed by a common, freely tiltable beam 78 under the action of a cam 79. Valves 76 act to relieve pressure within the lines 71, 72 and are spring loaded.

The compression of the springs, and therefore the pressure at which the valves lift from their seatings, can be set to any desired value by means of a beam 80 pivotally secured to a screw adjuster 81 and engaging both springs. Valves 77 act to relieve vacuum within the lines 71, 72 and are spring loaded to a predetermined value.

Hair treatment liquid is injected into the hair treatment zone by means of perforated tubes 90 secured to the linings 40. Liquid is supplied to the tubes 90 through a supply system shown in FIG. 4. Sources of hot and cold water are connected through pipes 91, 92 respectively to an adjustable mixing valve 93, the outlet of which is connected through a pipe 94 to an off/on valve 95 switchable to the "on" position by a plunger 96 and to the "off" position by a plunger 97 engaged by the "on" side of the valve 95 to a water temperature sensing valve 100. The valve 100 contains a bellows over which the incoming water flows and which expands in response to increase in water temperatures. The bellows are designed to expand to a predetermined extent at a suitable, selected temperature. A rod carrying piston valves is attached to the bellows, an end 101 of the rod extending from the valve 100 for engagement with an actuator 102 of a microswitch 103. When the water entering the valve 100 is cold, the bellows are contracted and the piston valves are positioned so that the water leaves the valve 100 through a pipe 105, to flow to the water injection tubes 90. When the bellows are expanded sufficient to permit the flow of water to the pipe 105, the end 101 of the rod engages the actuator 102 and operates the microswitch 103. In a partially expanded condition of the bellows, the pipe 105 is in communication with a further pipe 106 leading to a drain. A pump 107 operable by a cam 108 is provided to admit disinfectant from a container (not shown) with the water in the pipe 105. A pump 109 operable by a cam 110 is provided to admit shampoo with the water in the pipe 105. The shampoo is supplied to the pump 109 through a pipe 111 to a selection valve 112 by which the required shampoo can be selected from various shampoos in containers 113.

The motor 26 is supplied with electric current from a source 114, one side 115 of which is connected direct to the motor 26. The other side 116 is connected to a microswitch 117 operable by a starter device 118 which when moved into the "start" position as shown in FIG. 4 closes the microswitch 117. The device 118 is returned to its initial position by the engagement of a cam 119 with an arm 120 on the device 118. The device 118 also has a projection 121 engageable with the "on" plunger 96 of the valve 95 when the device 118 is in the "start" position. When closed the microswitch 117 connects the current source side 116 to the motor 26, through the microswitch 103 and also through a normally closed microswitch 122 openable by a cam 123. In addition to driving the pump 60, the motor 26 drives a camshaft 125 on which each of the cams 79, 98, 108, 119 and 123 are secured.

To use the hair treatment machine, a person whose hair is to be treated, for example, a person whose hair is to be treated, for example, is arranged in a backwardly inclined position with her head extending into the treatment zone. The starter device 118 is moved to the "start" position shown in FIG. 4 closing the microswitch 117 and engaging the plunger 96 of the valve 95 thereby opening the valve 95 so that water flows to the temperature sensing valve 100. Initially the water entering the valve 100 may well be cold and the cold water runs to waste through the drain pipe 104. As the temperature of the water increases due to appropriate adjustment of the mixing valve, the bellows of the valve 100 expand, until at the selected temperature the piston valves controlled by the bellows are in a position so as to permit the water flowing through the pipe 105 to open permitting water at the selected temperature to flow to the spray tubes 90. The rod 101 from the bellows is now in engagement with the actuator 102 of the microswitch 103 and holds the switch 103 closed so that the motor 16 is energized. The motor 26 drives the pump and positive and negative pressures are alternately produced in the pipelines 71, 72. When the pressure in the pipe 71 is at a positive level the pistons 45 of the treatment unit cylinders 44 in communication with the line 71 are driven down the cylinders causing the treatment elements 54 to extend into the treatment zone. When the pressure in the line 71 is negative the pistons 45 are drawn back into their cylinders 44 withdrawing the treatment elements 54 from the treatment zone. Similarly, when the pipeline 72 is at a positive pressure the line 72 is at a negative pressure, and vice versa it will be seen that half the number of treatment elements 54 will be extended into the treatment zone and the other half will be withdrawn. As the treatment elements 54 enter the treatment zone their fingers 58 engage the head and spread outwardly and as the elements 54 are withdrawn fingers 58 inwardly. Thus, the pump 58 performs a washing/massage action on the head, the forcefulness of the action being controllable by adjustment of the loading of the valves 76 by means of the adjuster 81.

When the motor 26 is started the camshaft 125 commences to rotate. The speed of rotation of the cam shaft 125 and the profiles of the cams it carries are designed to cause the following sequence of operations to occur at selected intervals. The cams 108 and 110 actuate the pumps 107 and 109 respectively. The pump 107 causes a quantity of disinfectant to be admixed with the water in the pipe 105 and the pump 110 causes a quantity of shampoo of the kind selected by means of the selector valve 112, to be admixed with the water. It will be appreciated that the disinfectant and the shampoo may be admixed with the water either simultaneously or one before the other depending upon the design of the cams 108 and 110. Since the flow of water through the pipe 105 is continuous while the machine is in operation, wetting of the hair, shampooing and rinsing occurs as a substantially continuous process, the water running through the apertures 52 in the tubular extensions 48 of the treatment units 43.

During the shampooing and rinsing processes, the cam 119 engages the arm 120 of the starter device 118 returning it to its "off" position. The supply of electric current to the motor 26 is now controlled by the microswitches 103 and 122. After a time sufficient to complete the shampooing and rinsing processes, the cam 98 engages the plunger 97 of the on/off valve 95 thus stopping the flow of water to the spray pipes 90. Immediately following this, the cam 79 disengages from the beam 78 and the cam 123 causes the microswitch 122 to open thereby deenergizing the motor 26. The effect of disengaging the cam 79 from the beam 78 is that the valves 75 are free to lift from their seatings under the pressures existing within the pipelines 71, 72 as the pump 60 comes to a standstill. However, the valves 75 seat when the pressures in the pipelines 71, 72 are negative and thus the treatment elements 54 are caused to return and remain in their tubular extensions 48. If the machine is allowed to stand idle for a short period, the water and consequently the bellows in the valve 100 cools. The bellows therefore contract moving the valve to a position at which water in the valve 100 and the pipe 105 can drain through the pipe 106 thus ensuring that the next person to use the machine does not receive a spray of cold water.

If desired the on/off valve 95 and its associated cam 98 may be modified so that at selected intervals in the operation of the machine the supply of water to the spray tubes 90 is stopped, as for example, during the shampooing process. It will be appreciated that, depending on the treatment the machine is to perform, the treatment elements 54 described may be replaced by other treatment elements such as sponges.
or brushes. The machine may also incorporate further pumps operable by additional cams on the camshaft 125 to supply other hair treatment agents such as oils, bleaches or dyes to the spray pipes 90. These other hair treatment agents may be introduced into the water being delivered to the pipes 90 or supplied direct to the pipes 90.

In a modification (not shown) of the machine, the treatment units are supported by a framework and the treatment elements are sealed to a sheet of resiliently flexible material which forms a hair-retaining lining.

1. A hair treatment machine comprising a plurality of treatment units and a lining extending between the units, the units and lining defining a head receiving zone to contain the hair, each treatment unit including a treatment element reciprocable by means of a piston and cylinder assembly into and out of the head-receiving zone and drive means for causing such reciprocation substantially continuously to massage a head within said zone.

2. A hair treatment machine, according to claim 1, in which the drive means is arranged to move the treatment elements of alternate treatment units into the head-receiving zone while the treatment elements of the remaining units move out of the head-receiving zone.

3. A hair treatment machine, according to claim 2, in which the drive means is arranged to alternatively connect the cylinders of the piston and cylinder assembly with the cylinders of the piston and cylinder assemblies to a negative pressure source and a positive pressure source.

4. A hair treatment machine, according to claim 1, in which the treatment units are mounted in apertures in a rigid hood which constitutes the lining to retain the hair.

5. A hair treatment machine, according to claim 1, in which a sheet of resiliently flexible material extends between the treatment elements to constitute the lining to retain the hair.

6. A hair treatment machine, according to claim 1, in which the spray means is provided to inject a liquid into the head-receiving zone.

7. A hair treatment machine, according to claim 6, in which means is provided to supply hair treatment agents to the spray means.

8. A hair treatment machine, according to claim 7, in which the hair treatment agents are admitted with the water before they are supplied to the spray means.

9. A hair treatment machine, according to claim 1, in which each treatment unit includes an open ended tubular extension at least partly to receive the treatment element when it is moved out of the head-receiving zone.

10. A hair treatment machine, according to claim 9, in which the tubular extension defines apertures for the escape of liquids from the head-receiving zone.

11. A hair treatment machine, according to claim 1, in which the treatment elements comprise groups of resiliently deformable fingers attached to the movable members of the associated piston and cylinder assemblies.

12. A hair treatment machine, according to claim 11, in which the fingers of each group are arranged in an annular formation.

13. A hair treatment machine, according to claim 12, in which the ends of the fingers are turned outwardly so that as they are moved into engagement with the head, the fingers are displaced outwardly moving over the head and serve to massage the head.

14. A hair treatment machine, according to claim 13, in which the groups of fingers around the periphery of the head-receiving zone have their ends turned towards the back of the zone.

15. A hair treatment machine according to claim 3, in which the drive means includes a dual action pump.

16. A hair treatment machine according to claim 15, in which the pump is actuated by a motor which also drives a camshaft carrying a cam arranged to operate a switch to stop the motor after a predetermined time interval.

17. A hair treatment machine according to claim 16, in which the camshaft carries further cams arranged to cause shampoo and rinse operations to be performed in a predetermined sequence.

18. A hair treatment unit for use in a hair treatment machine, comprising a piston and cylinder assembly, an open ended tubular extension on the cylinder of the assembly into which the piston can partially extend and a treatment element releasably secured to the piston, the treatment element being reciprocable by the piston between a position in which it is at least partially accommodated within the extension and a position in which it projects from the tubular extension.

19. A hair treatment unit according to claim 18, in which the treatment element comprises a group of resiliently flexible fingers extending from a base releasably secureable to the piston, the fingers being outwardly turned towards their free ends.

20. A hair treatment unit according to claim 18, in which the tubular extension has apertures at its end adjacent the cylinder.

21. A hair treatment machine according to claim 9 in which the lining is substantially rigid and defines apertures therein, and the tubular extensions of the treatment units are resiliently mounted in the apertures.

22. A hair treatment machine according to claim 1 arranged to receive the head of a person in a backward inclined position.

23. A hair treatment machine comprising a generally dome shaped housing, within the housing a set of hair treatment units and a substantially rigid lining member extending between the units and defining a head-receiving zone, said zone being arranged to receive the head of a person in backward inclined position, each treatment unit including a group of resiliently deformable fingers and means for reciprocating the fingers into and out of the head receiving zone to massage a head therein.

24. A hair treatment machine according to claim 23 including liquid supply means for supplying liquids into the head receiving zone and drain means for draining liquid from the head receiving zone and treatment units into the housing and from the housing to waste.