

Specification

WASHING MACHINE WITH OZONE SAFETY

5 Field of the Invention

The invention relates to a washing machine using ozone water, and particularly to such a machine which decreases the concentration of ozone at the last stage of washing process, so that the ozone concentration is safe to the user's health.

Background of the Invention

A washing machine is used to clean cloths from dirt and germs. Usually washing machine utilizes bleaching agent to clean, sterilize and deodorize cloths. Because bleaching agent contains dangerous substances when inhaled, ozone is used instead. An advantage of using ozone is its ability to wipe out germs sticking to the cloths.

Nowadays there are common washing machines, washing process of which uses ozone containing water. The washing machines should conform to the regulations set up by OSHA (Occupational Safety & Health Administration) regarding safe ozone content to the operator of the machine.

US Patent No. 20050251925 A1 in the name of JLA Limited and Daniels Equipment Company disclosed a washing machine having a water container and a mixing chamber. At a bottom side of the container a water pipe is fitted. An ozone conductor is fixed in the mixing chamber to conduct ozone to the water.

US Patent No. 5404732 A in the name of Samsung Electronics Co., Ltd. disclosed a washing machine comprising an outer housing, a tub mounted in the outer housing and a perforated basket mounted in the tub. An ozone generator

generates ozone which is conducted to water in the tub for sterilizing, bleaching and deodorizing clothes. The ozone generator comprises a flexible tube which is intermittently compressed by an electromagnetically controlled actuator for directing air toward an ozone-producing electrode.

Patent publication WO2007099113A1 in the name of Arcelik Anonim Sirketi disclosed a washer comprising a washing program which has a cycle of ozone wash and detergent wash, a tub, a drum and an ozone generator, which mixes ozone gas into the water and a heater which heats up the water in the tub.

US Patent No. 6418580 B1 in the name of Agrimond, L.L.C. disclosed an apparatus and a method of treatment to keep the efficiency of ozone consumption in a laundry process. The method allows machine user to set the ozone concentration according to the amount and type of soil of the laundry. The method also assures that there is enough ozone dissolved in water any time.

US Patent 5625915 A in the name of Cyclo3PSS Textile Systems, Inc. disclosed an ozone injection system, which includes an ozone generator coonected to an ozone distribution manifold. The manifold has a plurality of outlets connected through ozone valves to ozone injectors associated with washing machines of a laundry plant. Each machine has water cycled therefrom by a pump, through the ozone injector, and back to the washer chamber. This patent is also registered in Europe under number EP0841427 A1.

None of the above-mentioned patents talks about ozone safety, where ozone is probably still highly concentrated after cloth drying step. The high concentration of ozone can endanger the operator of the machine and damage the environment because high ozone concentration is corrosive.

According the above disclosure regarding the drawbacks of the common washing machine, the inventor has endeavoured to obtain a washing machine which can overcome the above drawback by modifying a common washing machine or by manufacturing a new washing machine.

An aspect to utilize is to lower the ozone concentration in the washing machine, prior to opening the door of the machine by the operator, by increasing the temperature in the washing machine up to a predetermined value so that the ozone can be quickly decomposed to oxygen.

Summary of the Invention

A main object of the present invention is to provide a washing machine equipped with a system and a device for ozone safety in the washing process with ozone, so that the safety of the machine operator against ozone exposure will be assured and in conformity to health requirement of OSHA.

To achieve the above object the scope of the invention is as follows :

Common washing machine utilizing ozone water can conduct washing steps in the program of washing scheme of the machine. Ozone water can either come from ozone water tank which lies outside the machine, or the machine can produce water ozone by taking ozone into the water therein. Therefore all the water used for washing is ozone water.

Schemes of normal washing are as follows :

Step 1 : prewash

Step 2 : main wash

Step 3 : rinse 1

Step 4 : rinse 2

Step 5 : final rinse

Step 6 : extract

The invention modifies an existing washing machine by adding up an electric heater as an ir heater, where the heater is located on a top side of the outer tube of the existing washing machine. The electric heater operates for
5 several minutes at stage 6, extract, to heat up the air in the revolving inner tube of the washing machine, so that the ozone is entirely decomposed to oxygen. When the inner tube of the machine stops revolving and door of the washing machine is open at the end of the washing process, safety
10 for environment and operator's health will be assured.

The inventor obtained the modification by experiment. Outer wall of a washing machine is cut to make a parallelogram hole at a top side thereof.

Thereafter a vertical wall is fixed at the
15 parallelogram hole at the top side of the outer wall, the vertical wall encircles the parallelogram hole so that the vertical wall look like a box, and this box is provided with a cover plate fixed with screw between the cover plate and the box, so that the box is tightly close and air cannot
20 flow in or out therefrom. To strengthen the heating box a rubber seal is located between the heating box and the cover of the heating box.

Inside the box an electric heater is fixed and controlled on time basis, which set out the time needed by
25 the electric heater in "on" state so the entire ozone within the machine tube is decomposed to oxygen, and the electric heater is "off" at the step 5, final rinse. Because the inner tube revolves, the air inside the outer and inner tubes will be heated up quickly and uniformly. Ozone inside
30 the machine will easily decompose if the temperature inside the machine is high.

An important aspect in the invention is that there should be no pore or hole on the outer tube of the machine, which permits ozone leakage. Neither may ozone leaks or penetrates through all holes in the common machine such as inlet hole for supplying powder detergent, hole for inserting hose for supplying liquid detergent, hole to supply water and all other holes.

To determine the time span for the electric heater to set on in order to decompose all ozone to oxygen needs a device to measure ozone level in the air. The device will measure how much ppm ozone content flows into the air when the door of the machine is open at the final step of washing process.

Supplementary materials in making the electric heater is of stainless steel plate of type 304 or 316, which is chemical and ozone resistant. Rubber seal is made of a substance which is heat and ozone resistant.

The invention also provides a washing machine specially manufactured with the same equipment as described above.

Brief Description of the Drawings

Figure 1 is a front view of an embodiment of a washing machine according to the invention with a supplementary ozone heater located at the top right side.

Figure 2 is a cross sectional view of an embodiment of a washing machine according to the invention which shows ozone heater in the heating box.

Figure 3 is a perspective view of an embodiment of a normal washing machine after cutting top right side of the outer tube to make a parallelogram hole to fix the supplementary ozone heater.

Figure 4 shows washing steps conducted with computer program in a normal washing machine.

Detailed Description of the Preferred Embodiments

Figure 1 is a front view of a washing according to the invention with an ozone heater (1) at the top right side of an outer tube (2), wherein an ozone heating box (3) lies to fix an electric heater (4), a heating box cover (5), a rubber seal (6), a locking bolt (7), a electric heater socket (8) and an electric cable (9).

The ozone heating box (3) comprises a threaded hole at a side thereof. The electric heater socket (8) has a thread corresponding to the thread of the ozone heating box (3). The electric cable lies outside of the ozone heating box (3).

Figure 2 is a cross sectional view of a washing machine with ozone heater (1) according to the invention, which shows an inner tube (10) and an outer tube (2) cut so that a heating box hole (11) is formed, wherein the ozone heater (3), the electric heater (4), the heating box cover (5), the rubber seal (6), the locking bolt (7), the electric heater socket (8) and the electric cable (9) are located.

Figure 3 is a perspective view of a normal washing machine after cutting the outer tube (2) so that the inner tube (10) is visible and the heating box hole (11) is formed in shape of parallelogram. The removed part of the wall of the outer tube (2) is not reused. In the heating box hole (11) an ozone heater box (3) is fixed by welding the ozone heater (3) onto the periphery of heating box hole (11). Thereafter an electric heater (4) is fixed within the ozone heater (3) with electric heater socket (8) having a thread at one side of the ozone heater box (3) and a screw can be fixed on the ozone heater box (3) as to set the electric

heater (4) rigid, unmovable and unshakeable during the operation of the washing machine.

Then a rubber seal (6) of heat and ozone resistant vitton material is set on the top surface of the heating box (11) with strong adhesive, and a heating box cover (5) and a locking bolt (7) are fixed with spring to cover tightly the ozone heating box (11) and compress the rubber seal (6) uniformly to prevent air or ozone leakage. Finally the electric cable (9) is connected to the electric heater socket (8) so that the electric heater (4) can operate. The electric cable (9) can be clamped in the electric heater socket (8), or be clamped with screw and bolt, or with solder.

See Figure 4, which shows washing steps running in a washing machine modified according to the invention. Each washing step uses ozone water, and at stage 5, final rinse, all ozone water has been discharged out of the machine tube but ozone concentration in the washing machine is still high.

At step 6, extract, the electric heater (4) operates to heat up the air in the outer tube (2) and inner tube (10). Heat from the electric heater (4) will heat up the entire inner tube (10) and outer tube (2) quickly and uniformly, because the inner tube (10) revolves. Because the ozone heater (3) is air-tight, no air or ozone will flow out. The inner tube (10) has a plurality of holes like the common washing machine in order that hot air can reach the outer tube (2). Because the inner tube (10) revolves, hot air will be distributed uniformly within the inner tube (10) and outer tube (2). Air temperature can be controlled to decompose ozone soon. For example, at temperature 50°C it takes about 5 minutes to decompose ozone to oxygen.

Therefore the user can open the washing machine to take out the washed articles safely without worry of being exposed to or inhaling ozone.

With the invention it is also possible to provide a washing machine with features, capability and equipment as described above. However the inventor emphasize for the moment at the modification of an existing washing machine.

According to the above disclosure, it can be concluded that a washing machine (1) with an ozone heater (3) according to the invention gives following advantages :

1. It keeps the operator safety against ozone exposure as to meet the requirements of OSHA.
2. It keeps the safety of the environment against corrosive ozone exposure.
3. All used ozone is decomposed to oxygen at the final step of washing process.
4. It shortens the time needed by the washing process.
5. Ozone will not leak out of the washing machine.

The invention has been disclosed with the above description. It can be understood that any modification, variation or adjustment can be made without departing from the scope and spirit of the invention. Therefore the invention is described by, but not limited to, the accompanying claims.

Explanation of reference number:

1. Washing machine with ozone heater
2. Outer tube
3. Ozone heating box
4. Electric heater
5. Heating box cover
6. Rubber seal
7. Locking bolt

- 8. Electric heater socket
- 9. Electric cable
- 10. Inner tube
- 11. Heating box hole

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I claim

1. A washing machine with ozone heater (1) made by modifying a normal washing machine, where the modification consists of a heating box (3), an electric heater (4), a heating box cover (5), a rubber seal (6), a locking bolt (7), an electric heater socket (8), an electric cable (9) and a heating box hole (11).
2. The washing machine with ozone heater (1) according to claim 1, where :
 - a. the heating box hole (11) lies at top side of the inner tube (2);
 - b. the heating box (3) is located right in the heating box hole (11);
 - c. the heating box (3) receives the electric heater (4) and the electric heater socket (8);
 - d. the heating box (3) has a threaded hole at one side thereof to receive the electric heater socket (8);
 - e. the electric heater socket (8) lies at both ends of the electric heater (4);
 - f. the rubber seal (6) is made of heat and ozone resistant material;
 - g. the rubber seal (6) is located between the heating box (3) and the cover of the heating box (5);
3. The washing machine with ozone heater (1) according to claim 1, where modification is made by :
 - a. cutting the outer tube (2) of an existing washing machine as to show the inner tube (10) and form a heating box hole (11);
 - b. fixing a heating box (3) by welding on the circumference of heating box hole (11) of the outer tube (2);

- c. locating an electric heater (4) within the heating box (3) by placing the electric heater socket (8) in a threaded hole at one side of the heating box (3);
- d. fixing the rubber seal (6) at a top side of the heating box (3) with a strong adhesive;
- e. fixing the the heating box cover (5) with a spring on the rubber seal (6);
- f. fixing the locking bolts (7) to join the heating box (3), rubber seal (6) and the the heating box cover (5); and
- g. connecting the electric cable (9) with the electric heater socket (8).

4. The washing machine with ozone heater (1) according to claim 1, where the modification changes the existing program, that is, to enter a command that the electric heater (4) operates at step 6, extract, to heat up the air within the inner tube (10) and outer tube (2), where the hot air will decompose ozone to oxygen.