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**US-A- 2 639 365**  
**US-A- 2 849 736**  
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## Description

This invention relates to a steam cleaning apparatus of the kind defined in the preamble of claim 1.

As is known, apparatuses for steam cleaning generic surfaces, such as floors, walls, and so forth, and normally employed for domestic use, are already present on the market, and comprise substantially a boiler which contains water to be heated by an electric resistance heater until steam is produced which, through a flexible hose, is brought to an outlet fitting or device for delivery of the steam over the surfaces to be cleaned.

US-A-2 849 736 discloses an apparatus of the above mentioned kind, i.e., a fabric steaming brush adapted to generate steam in a flash manner, while US-A-2 639 365 discloses a portable steam cleaner having a small portable boiler, wherein steam is generated, and a valve controlled nozzle for discharging steam when desired.

Prior types have, in some embodiments, a solenoid valve which cuts off the steam flow, as controlled from a pushbutton or the like, or may simply have restricted nozzles or other like elements which do not afford control of the steam delivery, which takes place as a continuous flow.

The steam production is effected by means of a pressurized boiler into which a certain amount of liquid is introduced which must be fully heated to effect the production of steam, resulting in consequence in a long time for operating the apparatus, with the need for providing heating of the liquid mass throughout, even in those cases where reduced amounts of steam are required.

Another problem encountered with such solutions is that the boiler contains a pressurized liquid which, despite the presence of thermostats or maximum pressure relief valves, can create a source of serious danger owing to faulty operations.

Another drawback of the above solutions is then that the apparatus is practically composed of two entities (i.e. the boiler and the delivery outlet) which are separate from each other and connected by a flexible hose.

Another drawback of the above solutions is due to the large thermal losses in the steam flow through the flexible hose connecting the boiler to the delivery outlet.

Also a drawback of known solutions is that they are in general scarcely handy, do not permit to be differently located, and have large weights because of the particular construction of the boiler which must be capable of withstanding the pressures which are generated on its interior.

A further drawback of the known types is then that it is necessary to adopt precautions both in

opening the boiler and in introducing the water into the boiler, because it is necessary, in order to open the boiler, that the temperature and consequently the inside pressure have dropped to adequate levels to prevent steam jets at opening and hazardous thermal surges at the time of introducing the water with the likelihood of steam or hot water jets being ejected outwards.

The aim set forth for this invention is indeed that of eliminating the above drawbacks, by providing a steam cleaning apparatus generator which is extremely versatile and handy, and, in particular, which can be used on every possible position, also upside down, and moreover, has no pressurized boiler, with consequent elimination of all the potential hazards.

Within the above-specified aim it is a particular object of the invention to provide a cleaning apparatus wherein the starting time, i.e. the time required to bring the apparatus in the work condition, is extremely short and wherein it is not necessary to heat simultaneously the entire mass of water present in the tank.

Also an object of this invention is to provide a cleaning apparatus wherein thermal losses and waste are minimised, thereby increasing the efficiency of the apparatus.

A further object of this invention is to provide a cleaning apparatus which has an extremely compact and handy conformation as the only constraint is the electric cable and is fully reliable and safe to use.

The above-mentioned aim, and the outlined and other objects to become apparent hereinafter, are achieved by a steam cleaning apparatus, according to the appended claim 1.

The features and advantages of the invention will be clearly apparent from the description of a preferred, though not exclusive, embodiment of a steam cleaning apparatus, as shown by way of illustration and not of limitation in the accompanying drawings where:

Figure 1 shows schematically the cleaning apparatus, according to the invention, in a possible utilization conformation thereof;

Figure 2 shows the apparatus in a partly sectioned and exploded view;

Figure 3 shows the apparatus, partly in section, in a possible position of utilization thereof;

Figure 4 shows the apparatus in a different utilization position partly in section to point out the position taken by the dipper in the water tank;

Figures 5, 6, 7 and 8 show different conformations of delivery outlets;

Figure 9 shows the wiring diagram of the apparatus;

Figure 10 shows the apparatus with another

exterior conformation substantially in the shape of a gun.

With reference to the cited figures, the steam cleaning apparatus, according to the invention, comprises a body, generally designated at 1, which has handgrip means consisting of a gripping member 2 and a handle element 3, the latter being defined in a middle portion of the body itself.

To the gripping member 2 there is connected an electric cable 4, having a plug 5 and possibly provided with a switch 6. The cited electric cable is further connected to a pushbutton 7 for controlling the electric pump, preferably arranged in the gripping member 2 and advantageously flanked by a light indicator 8.

The gripping member 2 is advantageously provided with a ring 9 for suspending the apparatus while the body 1 defines two cable take-up hooks 10 and 11 projecting outwards.

The body 1 defines a tank 15, at which the gripping handle 3 is formed, said tank having a filler fitting 16 over which a cap 17 provided with a small vent valve 18 can be fitted.

The tank 15 accommodates a dip tube 20 which is connected to pumping means consisting of an electric pump 21 driven by the pushbutton 7.

The dip tube 20 is of the flexible type, and at its free end is provided with a weighing body 22 thereby the free end of the dip tube 20 is at all times submerged in the water irrespective of the position taken by the body 1 during the apparatus utilization.

The electric pump 21 is supported on a flange 25 through a threaded ring nut 26 engaging with a joint 27 for connection to the dip tube 20.

The electric pump 21 delivery is connected, through a thermally insulating fitting 30, to a flash steam generator 31, consisting of a cylindrical or prismatic body which defines a cylindrical chamber in the walls whereof there is inserted an embedded resistance 32 controlled by a thermostat 33 (exemplified in Figure 9 by a switch) which maintains the desired thermal level for the generator 31, such that the water jet admitted through the electric pump 21 is flash steamed.

The steam generator 31 is externally insulated by an insulating sleeve 34 and is provided, at the end remote from the water inlet end, with a delivery nozzle 35 attached to the generator 31 through a mounting flange 36 which defines a coupling tang 37 for interchangeable application of outlets delivering the steam generated in the flash boiler chamber.

The outlets may have varied conformations, according to their specific utilization; in the accompanying drawings some of the possible conformations for such outlets are shown.

Figure 5 shows an outlet 40 provided with

bristles 41 encircling the steam delivery area, which is particularly suitable for floor cleaning.

Figure 6 shows a paddle-like outlet 42 of an extendible type which is advisable for wet cleaning and scraping; and Figure 7 shows a nozzle-like outlet 43 preferably applicable for cleaning hard-to-reach places.

Figure 8 furthermore shows a nozzle-like outlet 44 which enables delivery of concentrated steam jets.

Figure 10 then shows a gun-shaped apparatus 50 which, with a reduced bulk, includes the elements described above.

The operation of the apparatus is quite simple, as is brought out by the wiring diagram of Figure 9, showing the pushbutton 7 as interconnected between the leads defining the electric cable 4 provided with the switch 6; the pushbutton 7 controls the operation of the electric pump 21, whereas the electric resistance 32, in parallel with the light indicator 8, is controlled by the thermostat 33.

In the practical utilization, it occurs that, after filling the tank 15 with cold water and applying the filler fitting provided for the particular utilization of the apparatus, it will be sufficient to wait for the flash boiler chamber of the steam generator to reach the sought temperature; reaching the desired thermal level is displayed through the light indicator 8, which goes off on the thermostat 33 opening the contact.

Once the desired thermal level is reached the user, in order to obtain delivery of the steam, is to merely depress, for a more or less long time period, the pushbutton 7 controlling the electric pump 21, thus causing injection, through the fitting 30, of a predetermined amount of water which is flash steamed by the flash steam generator 31.

The generated steam comes out of the calibrated hole of the nozzle 35 which ensures an appropriate outlet pressure and which is so conformed as not to let out any uncompletely steamed water.

The steam so produced is dispensed through the selected outlet over the surface to be cleaned, so as to dissolve the dirt swept by the steam.

The apparatus according to the invention has the great advantage of having in a single body both the tank and the steam generator which is connected directly to the delivery outlet, is usable at any positions, that is to clean horizontal or vertical surfaces, while being always sure that the pump can dip the liquid contained in the tank, since the free end of the dip tube as weighed follows in practice the displacement of the water inside the tank, affording at all times proper operation of the apparatus, thanks also to the particular structure of the steam generator.

Another important aspect of the invention con-

sists in the construction as a single compact body including all the component elements, that is the tank and steam generator, avoiding pressurized boilers which, as previously mentioned, are the source of potential hazards.

Furthermore thermal losses and waste are minimized, because the steam is generated in the close vicinity of the delivery outlet.

The invention herein is susceptible to many modifications and changes within the scope of the inventive concept.

Furthermore, all the details may be replaced with other technically equivalent elements.

In practicing the invention the materials used, so long as compatible with the specific use, as well as the dimensions and contingent shapes may be any ones according to necessity.

### Claims

1. A steam cleaning apparatus, comprising a body (1) having handgrip means (2, 3) and defining on its interior a storage tank (15) for cold water in communication, through pumping means (21), with a flash boiler chamber (31) having a delivery nozzle (35), characterized in that said apparatus further comprises interchangeable outlets (40 - 44) removably associable with said delivery nozzle (35) to dispense to the outside the steam generated in said flash boiler chamber (31), said pumping means comprises an electric pump (21) and said electric pump (21) is operatively connected to said storage tank (15) by a dip tube (20) of a flexible material provided, at its free end, with a weighing body (22) adapted to ensure dipping into the water irrespective of the utilization position of said apparatus. 25
2. A cleaning apparatus, according to the preceding claim, characterized in that said storage tank (15) and said flash boiler chamber (31) are laid side-by-side in axial alignment relationship to define said body (1). 40
3. A cleaning apparatus, according to the preceding claims, characterized in that said handgrip means comprise a gripping member (2), whence a power supply cable (4) protrudes, and a gripping handle (3) defined by said cold water storage tank (15). 45
4. A cleaning apparatus, according to one or more of the preceding claims, characterized in that said electric pump (21) is controlled by a pushbutton (7) interposed on the power supply of said electric pump and arranged on said gripping member (2). 55

5. A cleaning apparatus, according to one or more of the preceding claims, characterized in that it comprises a thermostat (33) for controlling an electric resistance heater (32) embedded in a cylindrical or prismatic body defining said flash boiler chamber (31). 5
6. A cleaning apparatus, according to one or more of the preceding claims, characterized in that it comprises a sleeve (34) of a thermally insulating material provided externally of said cylindrical or prismatic body defining said flash boiler chamber (31). 10
7. A cleaning apparatus, according to one or more of the preceding claims, characterized in that said delivery nozzle (35) is provided in said flash boiler chamber (31) on the side remote from said electric pump (21). 15
8. A cleaning apparatus, according to one or more of the preceding claims, characterized in that it comprises, at said delivery nozzle (35), a flange joint (36) defining a coupling tang (37) for said interchangeable outlets (40 - 44). 20

### Revendications

1. Appareil de nettoyage par la vapeur, comportant un corps (1) pourvu d'organes de préhension (2, 3) et définissant dans son espace intérieur un réservoir (15) de stockage d'eau froide communicant, par l'intermédiaire de moyens de pompage (21) avec une chambre de vaporisation instantanée (31) elle-même pourvue d'une buse de projection (35), caractérisé en ce que cet appareil comprend en outre des sorties interchangeables (40, 44) associées de façon amovible à ladite buse de projection (35) pour délivrer vers l'extérieur la vapeur dégagée dans ladite chambre (31) de vaporisation instantanée, lesdits moyens de pompage comportant une pompe électrique (21) et cette pompe étant fonctionnellement reliée audit réservoir de stockage (15) par un tube plongeur (20) réalisé en matériau flexible et comportant à son extrémité libre un corps pondéreux (22) permettant de s'assurer que le tube plonge dans l'eau indépendamment de la position d'utilisation de l'appareil. 30
2. Appareil de nettoyage selon la revendication précédente, caractérisé en ce que ledit réservoir de stockage (15) et ladite chambre de vaporisation instantanée (31) sont disposés côte à côte et selon un alignement co-axial pour définir ledit corps (1). 45

3. Appareil de nettoyage selon les revendications précédentes, caractérisé en ce que lesdits organes de préhension comportent un élément de tenue (2) d'où part un câble d'alimentation (4) et une poignée (3) définie par ledit réservoir de stockage d'eau froide (15). 5
4. Appareil de nettoyage selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite pompe électrique (21) est contrôlée par un bouton poussoir (7) interposé sur l'alimentation de ladite pompe électrique et disposé sur ledit élément de tenue (2). 10
5. Appareil de nettoyage selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'il comporte un thermostat (33) pour le contrôle d'une résistance électrique de chauffage (32) noyé dans un corps prismatique ou cylindrique définissant ladite chambre de vaporisation instantanée (31). 15 20
6. Appareil de nettoyage selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'il comporte un manchon (34) en matériau thermiquement isolant disposé à l'extérieur dudit corps prismatique ou cylindrique définissant ladite chambre de vaporisation instantanée. 25 30
7. Appareil de nettoyage selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite buse de projection (35) est disposée dans la ladite chambre de vaporisation instantanée (31) sur son extrémité éloignée de la pompe électrique (21). 35
8. Appareil de nettoyage selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'il comporte au niveau de la buse de projection (35) un joint à collerette (36) définissant un embout d'accouplement (37) pour recevoir les sorties interchangeables (40, 44). 40

#### Patentansprüche 45

1. Dampfreinigungsgerät mit einem Gehäuse (1) mit Handgriffmitteln (2, 3), welches auf seiner Innenseite einen Vorratstank (16) für Kaltwasser in Verbindung - über Pumpmittel (21) - mit einer Schnellverdampfungskammer (31) mit einer Lieferröhre (35) bildet, dadurch gekennzeichnet, daß dieses Gerät weiterhin auswechselbare Auslässe (40 - 44) umfaßt, die lösbar dieser Lieferröhre (35) zuordnungsbar sind, um nach außen den in dieser Schnellverdampfungskammer (31) erzeugten Dampf zu geben, daß dieses Pumpmittel eine elektrische Pumpe (21) umfaßt und diese Elektropumpe (31) wirksam mit dem Vorratstank (15) über ein Tauchrohr (20) aus einem flexiblen Material verbunden ist, das an seinem freien Ende mit einem Ballastkörper (22) verbunden ist, derartiger Ausbildung, daß ein Eintauchen in das Wasser unabhängig von der Benutzerstellung dieses Gerätes sichergestellt ist. 50
2. Reinigungsgerät nach dem vorhergehenden Anspruch, dadurch gekennzeichnet, daß dieser Vorratsbehälter (15) und diese Schnellverdampfungskammer (31) seitlich nebeneinander in Axialausrichtungsbeziehung zur Bildung dieses Gehäuses (1) ausgelegt sind. 55
3. Reinigungsgerät nach den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß diese Handgriffmittel ein Griffelement (2) umfassen, aus dem ein Stromversorgungskabel (4) vorsteht und ein Handgriff (3) durch diesen Kaltwasservorratstank (15) bestimmt ist.
4. Reinigungsgerät nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese elektrische Pumpe (21) von einem Druckknopf (7) geregelt ist, der in die Stromzuführung der elektrischen Pumpe zwischengeschaltet und auf diesem Griffelement (2) angeordnet ist.
5. Reinigungsgerät nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es einen Thermostat (33) zum Regeln eines elektrischen Widerstandsheizers (32) aufweist, der in ein zylindrisches oder prismatisches diese Schnellverdampfungskammer (31) bildendes Gehäuse eingebettet ist.
6. Reinigungsgerät nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es einen Mantel (34) aus einem wärmeisolierenden Material umfaßt, der außerhalb dieses zylindrischen oder prismatischen diese Schnellverdampfungskammer (31) bildenden Gehäuses vorgesehen ist.
7. Reinigungsgerät nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Lieferröhre (35) in dieser Schnellverdampfungskammer (31) auf der der elektrischen Pumpe (21) abgelegenen Seite vorgesehen ist.
8. Reinigungsgerät nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es an dieser Lieferröhre (35)

eine Flanschverbindung (36) aufweist, die ein Kupplungsstück (37) für diese auswechselbaren Auslässe (40 - 44) bestimmt.

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