(54) Title: APPARATUS FOR THE THERMAL TREATMENT OF SHOES OR PARTS THEREOF

(57) Abstract: An apparatus (1) for thermal treatment of shoes, or parts thereof (1 1 ) of the type comprising means (2, 3) for heating a gaseous fluid flow and means (4, 5, 6) for moisturizing this gaseous fluid flow, as well as at least one device (8, 10, 10') for forcibly delivering the fluid flow to said shoes, or parts thereof, the forced delivery device comprising at least one fan (8). The apparatus (1) according to the present invention further comprises at least one means for controlling the speed, or pressure and/or flow rate of said fluid flow.
"Apparatus for the thermal treatment of shoes or parts thereof"

FIELD OF THE INVENTION

The present invention relates to an apparatus for thermal treatment of shoes of the type comprising means for heating a gaseous fluid flow, typically air, means for moisturizing this gaseous fluid flow and at least one device for forcedly delivering this fluid flow, optionally moisturized, to the shoes to be subjected to this treatment.

It should be noted that here and hereunder with the term "shoe" is meant not only the finished product consisting of a shoe intended for the end user, but also more in general, any part of this finished product, during any manufacturing and assembly step of the same. With the term "shoe" is thus not only meant the finished shoe, but also the upper, insole, sole or other components – even not jointed one to the other – that are intended to provide a finished shoe.

Similarly, the thermal treatment referred to in the present patent application is not necessarily addressed only to the whole finished shoe, but can be addressed to any part of said shoe, during any manufacturing stage of this latter.

BACKGROUND ART

Apparatuses for thermal treatment of shoes of the type as described above are mainly used to stretch and/or loosen the leather in various areas of a shoe, for example on the upper, at the toe or heel of a finished shoe, or to reactivate adhesives or other reagents, during assembly of the various parts composing a finished shoe.

Particularly, apparatuses are known in which a heated air flow is caused to blow a whole shoe, or parts thereof, in order to dry or condition the shoe. A forced air flow is generated by a fan and heated by means of, for example, electrical resistances to be finally conveyed in a treatment
chamber where the shoe to be processed is dwelling.

The British Patent GB-A-275,681 in the name of MARKS describes an apparatus for treating a plurality of shoes with jets of heated air, of the above-mentioned type, in which the air is circulated in a substantially closed loop circuit.

Apparatuses are also known for thermal treatment of shoes, or parts thereof, by means of moisturized air at high temperature, and particularly a steam flow, in which a generator of this flow, such as of the type consisting of at least one electrical resistor on which water is atomized (i.e. atomized), is part of a circuit suitable to convey the steam or moisturized air to at least one delivery head (or diffuser) addressed to the shoe, or parts thereof, to be subjected to this treatment. Preferably, the flow of moisturized air, or steam, delivered to the shoe, or parts thereof, is a forced fluid flow generated by a fan located either upstream or downstream of the means provided for heating and moisturizing said fluid flow.

In greater detail, apparatuses are known in which a fan generates a flow of air drawn from the external environment, which is heated, such as by means of resistors, and moisturized by atomizing water in the air flow. The water atomized (or atomized) in the air flow can be preferably heated, such that a flow of steam and air can be delivered to the shoes to be processed.

The British Patent GB-A-978,154 in the name of TASSI illustrates an apparatus such as illustrated above, in which means are also provided for adjusting the amount of air atomized in the air flow, and the temperature of the latter.

According to a different operating diagram of an apparatus for thermal treatment of shoes by means of a stream of moisturized hot air, or steam, the means for atomizing the water are configured to introduce water at ambient temperature at, or in the proximity of said means for heating the
fluid flow, which preferably consist of an electrical resistor, such as to generate a steam flow in a rapid manner. A fan is arranged downstream of the moisturizing means and heating means for the fluid flow, and has the function of generating a forced flow directed on the shoe/s being processed.

In the apparatus known in the art, adjustments are mostly carried out on this steam, or moisturized air flow directed to the shoes, as regards to temperature and rate flow of the water in the flow, while no adjustment is provided on this flow as regards to pressure, speed or flow rate thereof.

Furthermore, no apparatus is known in which the shoes can be either independently or alternatively subjected to a flow of dry heated air or a flow of moisturized hot air, or steam.

It is therefore an object of the present invention to provide an apparatus for thermal treatment of shoes, both with dry hot air and humid hot air, or steam.

Another object of the present invention is to provide an apparatus for thermal treatment of shoes, which has an improved effectiveness of use, thereby allowing one to adjust functional parameters that had been neglected in the prior art apparatus.

**SUMMARY OF THE INVENTION**

These and other objects are achieved by the apparatus for thermal treatment of shoes according to the first independent claim and the subsequent dependent claims.

The apparatus for thermal treatment of shoes, or parts thereof, according to the present invention, comprises means for heating a gaseous fluid flow and means for moisturizing said gaseous fluid flow, as well as at least one device for forcibly delivering said flow on the shoes, or parts thereof, being processed, of the type comprising at least one fan. The apparatus of the present invention is also provided with at least one means for
controlling the speed, or pressure and/or flow rate of this fluid flow.
The possibility of adjusting the speed, or pressure and/or flow rate of the
forced fluid flow directed on the shoes being processed, which possibility is
not contemplated in any of the prior art apparatus, not only allows for a
very precise control of the conditions of the fluid flow impact on the shoe,
or parts thereof, such as to be capable of adjusting this impact as a
function of the greater or lower resistance of the leather subjected to
processing, but also allows one to decide whether the shoe, or parts
thereof, being processed has to be subjected to a flow of dry or
moisturized hot air.
In fact, when the operator decides that the shoe has to be treated by
means of an air flow without humidification, the speed of this air flow
normally has to be sensibly higher than the speed of a moisturized air flow,
in order to achieve the results expected from the thermal treatment.
Consequently, the fact that the operative conditions for machine
operation can be properly set both with the humid gaseous flow, and with
a dry gaseous flow is only due to the possibility of adjusting the fluid flow
speed allowed by the apparatus according to the present invention.
According to a preferred aspect of the present invention, furthermore, this
means for controlling the speed, pressure and/or flow rate of the gaseous
fluid flow consists of a controller for adjusting the speed of the rotor of said
fan.
According to another preferred aspect of the present invention, the
apparatus comprises suitable means for adjusting the operation of said
means for heating a gaseous fluid flow and/or said means for moisturizing
said gaseous fluid flow.
Thereby, a very accurate adjustment can be obtained for the
thermodynamic conditions to which the shoe, or parts thereof is subjected
upon processing.
**BRIEF DESCRIPTION OF THE DRAWINGS**

A preferred embodiment of the present invention will be described below only by way of example, with reference to the annexed figures, in which:

- Fig. 1 is a functional diagram of an apparatus for thermal treatment of shoes, according to a particular aspect of the present invention;
- Fig. 2a and 2b are front and side views, respectively, of the apparatus outlined in Fig. 1.

**DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION.**

With reference to the figures as a whole, the apparatus 1 for thermal treatment of shoes, or parts thereof, in the particular embodiment of the present invention as illustrated herein, comprises two delivery heads, or diffusers, 10, 10' of a gaseous fluid flow directed on parts 11 of a shoe, such as uppers. Means 2, 3 for heating a gaseous fluid flow, means 4, 5, 6 for moisturizing this fluid flow, as well as a fan 8, being located upstream of the heating means 2, 3, and of the moisturizing means 4, 5, 6.

In greater detail, the means for heating a gaseous fluid flow of the apparatus 1, according to a preferred aspect of the present invention, can comprise one or more electrical resistors 2 that are arranged in a heating chamber 13, which is permeable to the external environment due to an opening 3 that – in case – may be provided with a filter. The heat generated using the Joule effect by the resistors 2 is such as to heat the air being within the heating chamber 13.

Within this chamber 13 there are also housed nozzles 6 that are connected downstream of a pump 5, which is, in turn, fluidically connected to a water tank 4. The nozzles 6, along with the pump 5, have the function of atomizing water within the chamber 13 at, or in the proximity of the resistors 2. The tank 4, pump 5 and nozzles 6 are, at least partially, said means for moisturizing the gaseous fluid flow.

The apparatus 1, such as outlined in the figures, can also comprise a
controller 7, of a type known per se in the art, in order to adjust both the intensity of the electrical current directed to the resistors 2, and thus the heat produced therefrom, and the operation of the pump 5, and thus the head (or shutoff head) thereof.

The controller 7, mainly if it is of the type to be programmed with a microprocessor, can be further connected to sensors 14 for the water level within the tank 4. In this case, when the water level within the tank 4 as detected by the sensor 14 is not sufficient, the controller 7 can immediately and automatically interrupt both the atomizing of water by means of the nozzles 6, by stopping the pump 5, and preventing the electrical current from reaching the resistors 2.

The controller 7 can further be of the type to be freely operated by the operator of the apparatus 1, such that the conditions of temperature and relative humidity of the fluid flow being produced within the chamber 13 can be adjusted in an accurate manner.

Thereby, due to the controller 7, the operator can decide if and how much the inlet air flow from opening 3 has to be heated, by means of the resistors 2, and if this flow has to be moisturized, via the pump 5 and nozzles 6, such as by producing a steam flow exiting the chamber 13.

The apparatus 1 according to the present invention also comprises a fan 8, which is preferably driven by an electrical motor (not shown), which is intended to generate a forced fluid flow directed to the diffusers 10, 10'.

In the particular embodiment as illustrated herein, the fan 8 is of the centrifugal type and is located downstream of the chamber 13, relative to the feeding direction of the fluid. The fan 8, along with the diffusers 10, 10', is the so-called device for the forced delivery of the gaseous fluid flow.

It should be noted that, without departing from the scope of protection of this patent application, the fan 8 can be any suitable type and can be also placed upstream of said chamber 13.
Advantageously, the apparatus 1 also comprises means for controlling the outflow speed, or pressure, of the fluid flow generated by the fan 8, which in the embodiment described herein, can consist of a speed controller 9 for the rotor of the fan 8. In this case, the controller 9 can electrically adjust the speed of the electrical motor on which the drive shaft of the rotor, or impeller, of the centrifugal fan 8 is splined (or keyed).

Similarly to the controller 7, the controller 9, preferably of a programmable type, can be operated by the operator of the apparatus 1 such as to impose the most suitable operative conditions to the fan 8, which are selected by the operator.

It should be observed that, as those skilled in the art can easily appreciate, the apparatus 1 can be provided, either in replacement of or in addition to the controller 9, with alternative means to adjust the speed and/or flow rate of the flow directed to the diffusers 10, 10′, such as for example a gate valve to change the outflow or inflow section of the air and/or steam, etc.

The heating means 2, 3, moisturizing means 4, 5, 6, fan 8 and controllers 7, 9 are, in the apparatus 1 illustrated herein, enclosed in a cabinet 12 that also has the function of supporting said diffusers 10, 10′.

Due to the structure of the apparatus 1 as described above, the operator who desires to thermally treat a shoe 11, or a part thereof, can freely decide whether it has to be treated by means of a steam flow or a dry air flow, and thus set all the operative conditions required to perform this treatment.

Thereby, if the operator decides to treat a part 11 of a shoe, for example an upper, by means of a steam flow heated at more than 110° C, then he may set the controller 7 such that the latter duly adjusts the inflow of electrical current to the resistors 2 and to the pump 5, in order to allow the water atomized by the nozzles 6 to rapidly change its state when it comes in contact with the resistors 2 and thus turn into a steam flow. In this case,
the operator may also set the rotational speed of the rotor of the fan 8, such as to generate a forced steam flow being provided with such an outflow speed from the diffusers 10, 10' suitable to the part of shoe 11 being processed.

On the other hand, when the operator decides to treat the same part of shoe 11, or a different part thereof, or of another shoe, by means of a dry air flow, by duly setting the controllers 7 and 9, he may still allow the generation of heat by the resistors 2, stop the operation of the pump 5, thereby preventing the humidification of the air flow entering the chamber 13 via the opening 3, and finally change the rotational speed of the rotor of the fan 8, such as to generate a heated air flow with the proper thermo-dynamical characteristics desired for the processing.

It should be observed that, in a simplified embodiment of the apparatus 1 as illustrated herein, the controller 7 and 9, which may be also integrated in an individual control unit, may be programmed such that only two different operating conditions are allowed, which coincide with thermal treatments with and without steam, without allowing the operator to perform a fine adjustment of the thermo-dynamical parameters of these two operating conditions. While this simplification restrains the flexibility of use of the apparatus 1, it considerably facilitates the use of the same by the operator.
CLAIMS

1. An apparatus (1) for thermal treatment of shoes, or parts (11) thereof, of the type comprising means (2, 3) for heating a gaseous fluid flow and means (4, 5, 6) for moisturizing said gaseous fluid flow, as well as at least one device (8, 10, 10') for forcibly delivering said fluid flow to said shoes, or parts thereof, said forced delivery device comprising at least one fan (8), said apparatus being characterized in that it comprises at least one means for controlling the speed, or pressure, and/or flow rate of said fluid flow.

2. The apparatus according to claim 1, wherein said control means is a controller (9) for adjusting the speed of the rotor of said at least one fan.

3. The apparatus according to claim 1 or 2, characterized in that said at least one fan is driven by means of an electrical motor.

4. The apparatus according to claim 3, characterized in that said control means is configured to adjust the operative parameters of said electrical motor.

5. The apparatus according to any preceding claim, characterized in that said at least one fan is of a centrifugal type.

6. The apparatus according to any preceding claim, characterized in that said means for moisturizing said fluid flow comprise one or more nozzles (6) for atomizing water.

7. The apparatus according to claim 6, characterized in that said one or more nozzles are arranged at, or in the proximity of said means for heating the fluid flow.

8. The apparatus according to any preceding claim, characterized in that said means for heating a fluid flow comprise at least one electrical resistor (2).

9. The apparatus according to any preceding claim, characterized in that it comprises means (7) for adjusting the operation of said means for
heating a gaseous fluid flow and/or said means for moisturizing said
gaseous fluid flow.
10. The apparatus according to any preceding claim, characterized in
that said means for heating a gaseous fluid flow and said means for
moisturizing said gaseous fluid flow are configured such as to output a
steam flow.