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⑧ Improved laundry dryer.

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Description

The present invention relates to a laundry dryer comprising a rotating drum provided with sensor electrodes for measuring the degree of moisture of the laundry contained in said drum.

For ensuring satisfactory drying of the laundry introduced into the drum of a conventional laundry dryer, and for avoiding the danger of such laundry being heated excessively so as to be damaged thereby, it is known to provide such laundry dryers with sensor electrodes for measuring the electric conductivity of the laundry and thus for determining the degree of moisture thereof. These electrodes are connected to the electric circuitry of the dryer, together with a motor for rotating said drum, a motor for a blower, and at least one heater element for heating the drying air.

The sensor electrodes, which may be designed to any shape and dimensions, are disposed in said drum in such a manner that they are in contact with the laundry during the entire drying operation for producing electric output signals indicative of the varying degree of moisture of the laundry during operation of the dryer.

Laundry dryers of this type such as described in US—A—3335501 are additionally provided with a moisture control device comprising for instance an electronic comparator circuit of conventional type connected to said sensor electrodes and to the electric circuitry of the dryer.

This control device is programmed for comparing the electric signals produced by said sensor electrodes to predetermined electric reference signals corresponding to the condition in which the laundry is dried to a satisfactory degree.

As this condition is attained, the control device causes said heater element and said motors to be deenergized so as to terminate the laundry drying operation.

In the same manner, said control device is able to interrupt the laundry drying operation at any instant of the operation cycle in the case for instance of failure of components of the dryer which might otherwise lead to the laundry becoming overheated and damaged thereby.

For ensuring accurate measurement of the degree of moisture and thus satisfactory drying of the laundry, the sensor electrodes of laundry dryers of the type described have to be dimensioned and to be located in the drum of such dryer in such a manner that the contact area of the sensor electrodes with the laundry is as large as possible and that contact between the electrodes and the laundry is ensured under all operational conditions.

To this effect, present laundry dryers are provided with two groups of sensor electrodes disposed at various locations on the interior

wall surface of the drum so as to come into contact with the laundry. The sensor electrodes may for instance be located adjacent the end walls of the drum or may take the form of circumferential rings affixed to the drum. The groups of electrodes are electrically insulated from one another and connected respectively to the electric supply source and to the mass of the dryer in a per se known manner.

In any case, a laundry dryer of this construction suffers from certain shortcomings.

In the first place, the assembly of the drum of such dryers is complicated by the presence of the described electrodes the attachment of which to the drum requires a number of delicate working steps and a considerable amount of material.

On the other hand, as the sensor electrodes cannot be designed to have dimensions exceeding certain limits in order not to further complicate and encumber the construction of the drum, the resulting contact areas between the sensor electrodes and the laundry are of a correspondingly limited size. As a result, it is rather difficult to obtain continuous and accurate measurements of the degree of moisture of the laundry during the drying operation, so that it is scarcely possible to dry the laundry to the optimum state.

It is therefore an object of the present invention to eliminate the above indicated drawbacks and shortcomings by providing a laundry dryer comprising a drum provided with sensor electrodes in a simple manner, with reduced consumption of material and a reduced number of working steps required for its manufacture.

To this effect, the invention is substantially based on the employ of the wall surface of the drum itself for forming the sensor electrodes, whereby to obtain maximum contact areas between said electrodes and the laundry during the drying operation.

These and other objects are attained according to the invention by a laundry dryer comprising a rotating drum adapted to contain the wet laundry to be dried and having a peripheral wall and two end walls, a stream of heated drying air being passed through said drum with the aid of at least one heater element, and further comprising at least two sensor electrodes connected respectively to an electric supply source and to the mass of the dryer through per se known means for measuring the degree of moisture of said laundry and controlling the energization and deenergization of said heater element with the aid of a per se known control device connected to said sensor electrodes.

In accordance with the invention, a laundry dryer of this type is characterized in that said sensor electrodes are formed respectively by a portion of the peripheral wall surface and one of said end walls, said peripheral wall surface

portions being located adjacent one another and connected to one another with interposition of at least one electrically insulating element.

The invention will be more fully understood from the following description of an exemplary embodiment with reference to the accompanying drawings, wherein:

Fig. 1 shows a diagrammatic and partially sectioned front view of a laundry dryer according to the invention, and

Fig. 2 shows a cross-sectional view of a detail of the laundry dryer of Fig. 1.

With reference to Fig. 1, a laundry dryer according to the invention comprises an outer housing 3 enclosing a rotatable drum 4 adapted to contain the wet laundry and driven to rotate by a per se known motor (not shown).

Drum 4 comprises a peripheral wall 5 and two end walls 6, 7, a forward and a rearward one, respectively, and is mounted, cantilever fashion, within housing 3 by means of an axle pin 8 attached to rear end wall 7. Rear end wall 7 of drum 4 is formed with a through-opening 9 communicating with an air inlet opening 31 formed in the rear wall of housing 3. A duct 10 communicates on the one hand with an access opening 11 formed in front end wall 6 of drum 4, and on the other hand, with an air outlet opening 32 formed at the rear of the dryer. Located in duct 10 are a lint filter 12, a blower 13 driven by a motor 14, and at least one heater element 15 of conventional type. Drying air aspirated from the exterior by blower 13 through inlet opening 31 is heated by heater element 15 before passing through the wet laundry contained in drum 4 for progressively drying the laundry. The air is subsequently exhausted to the exterior of the dryer through outlet opening 32.

For ensuring satisfactory drying of the laundry, the present laundry dryer is further provided with at least two individual sensor electrodes in contact with the laundry for measuring the conductivity of the laundry to thereby determine the degree of moisture thereof during all phases of the drying operation.

To this purpose the drum of the dryer is formed of two separate components 16 and 17 directly functioning as the said sensor electrodes, each of said components being formed by a peripheral wall surface portion 18 and 19, and one of said end walls 6 and 7, respectively, with at least one element 20 formed of an electrically insulating material being interposed between the two thus formed components.

As shown in Fig. 2, element 20 is preferably formed as a ring having the same diameter as the peripheral wall 5 of drum 4, although of limited width. Along its entire circumference ring 20 is formed with lateral slots or incisions 21 and 22 adapted to receive therein the respective edges 23 and 24 of the two peripheral wall portions 18 and 19 of drum 4.

Assembly of the drum is carried out by mutually approaching the two components 16 and 17, with interposition of annular element 20,

and by fully introducing the respective edges 23 and 24 into lateral incisions 21 and 22 of element 20. The assembly of the two components 16 and 17 with annular element 20 may of course also be carried out in a different manner within the scope of the present invention.

This thus obtained structure of the drum is further strengthened adjacent the laundry carrier ledges disposed transversely on the internal surface of the drum (only a single ledge 25 being shown in Fig. 2), by fixedly attaching each ledge to both components of the drum by means of screws 26 or similar per se known fasteners. Component 17 is electrically connected to ground due to the contact of axle pin 8 of rear end wall 7 with housing 3 of the laundry dryer (Fig. 1).

The component 16 on its part has applied a voltage thereto by the sliding contact of a brush 28 connected to an electric supply source of the dryer with a raised edge portion 29 of front end wall 6.

Brush 28 is in addition connected to a terminal of a conventional electronic control device 30 inserted into the electric circuitry of the dryer, the other terminal of said moisture control device 30 being connected to ground.

In this manner the values of the conductivity of the laundry indicative of the degree of moisture thereof during the drying operation as measured by the described sensor electrodes are transmitted to control device 30, the latter being effective to continuously monitor these values and to permit the drying operation to continue until the laundry has been dried to a suitable state.

As this condition is attained, control device 30 automatically and in a per se known manner causes heater element 15 and the motors driving drum 4 and blower 13 to be deenergized so as to terminate the drying operation.

As in prior art, the control device may likewise be designed for interrupting the drying operation during any phase of the operating cycle in the case of failure of any components of the dryer which might otherwise result in overheating of and the danger of damage to the laundry.

The advantages obtained by the described construction of the laundry dryer according to the invention are thus evident. In the first place, as the sensor electrodes are formed directly by the two component parts of the drum, it is no longer required, as in prior art, to employ separate electrodes, thereby avoiding the additional labour for installing such separate electrodes in the drum.

As a result, the drum is of particularly simple construction, with a noteworthy saving of the required material. On the other hand, the described construction provides the greatest possible contact area between the sensor electrodes and the laundry, whereby it is possible to achieve continuous and accurate measurements of the degree of moisture of the laundry during the drying operation, so that the laundry can be dried to an optimum state.

Claims

1. A laundry dryer comprising a rotating drum (4) adapted to contain the wet laundry to be dried and having a peripheral wall (5) and two end walls (6, 7), a stream of heated drying air being passed through said drum with the aid of at least one heater element (15), and further comprising at least two sensor electrodes connected respectively to an electric supply source and to the grounded mass of the dryer through per se known means for measuring the degree of moisture of said laundry and controlling the energization and deenergization of said heater element with the aid of a per se known control device connected to said sensor electrodes, characterized in that said sensor electrodes are formed respectively by a portion of the peripheral wall surface (18, 19) and one of said end walls (6, 7), said peripheral wall surface portions (18, 19) being located adjacent one another and connected to one another with interposition of at least one electrically insulating element (20).

2. A laundry dryer according to claim 1, characterized in that said insulating element is formed as a ring (20) having the same diameter as said peripheral wall surface portions (18, 19) and being of limited width, said ring being provided along its full circumference with lateral incisions (21, 22) adapted to receive the respective edges (23, 24) of said peripheral wall surface portions.

Patentansprüche

1. Wäschetrockner mit einer rotierenden Trommel (4), die zur Aufnahme von feuchter, zu trocknender Wäsche bestimmt ist und eine Umfangswand (5) und zwei Stirnwände (6, 7) aufweist, wobei ein Strom erwärmter Trocknungsluft durch die Trommel mit Unterstützung durch wenigstens ein Heizelement (15) geleitet wird, und weiterhin enthaltend wenigstens zwei Sensorelektroden, die jeweils mit einer elektrischen Stromquelle und mit dem geerdeten Masseanschluß des Trockners über an sich bekannte Einrichtungen zum Messen des Feuchtigkeitsgehaltes der Wäsche verbunden sind und die Stromversorgung und Abschaltung des Heizelementes mit Hilfe einer an sich bekannten Steuereinrichtung steuern, die mit den Sensorelektroden verbunden ist, dadurch gekennzeichnet, daß die Sensorelektroden jeweils

aus einem Abschnitt der Umfangswandfläche (18, 19) und einer der Stirnwände (6, 7) gebildet sind, wobei die Umfangswandflächenabschnitte (18, 19) einander benachbart angeordnet und miteinander über wenigstens ein elektrisch isolierendes Element (20) verbunden sind.

2. Wäschetrockner nach Anspruch 1, dadurch gekennzeichnet, daß das isolierende Element als ein Ring (20) ausgebildet ist, der den gleichen Durchmesser wie die Umfangswandflächenabschnitte (18, 19) aufweist und von begrenzter Breite ist, daß der Ring längs seines gesamten Umfangs mit Quereinschnitten (21, 22) versehen ist, die dazu eingerichtet sind, die jeweiligen Ränder (23, 24) der genannten Umfangswandabschnitte aufzunehmen.

Revendications

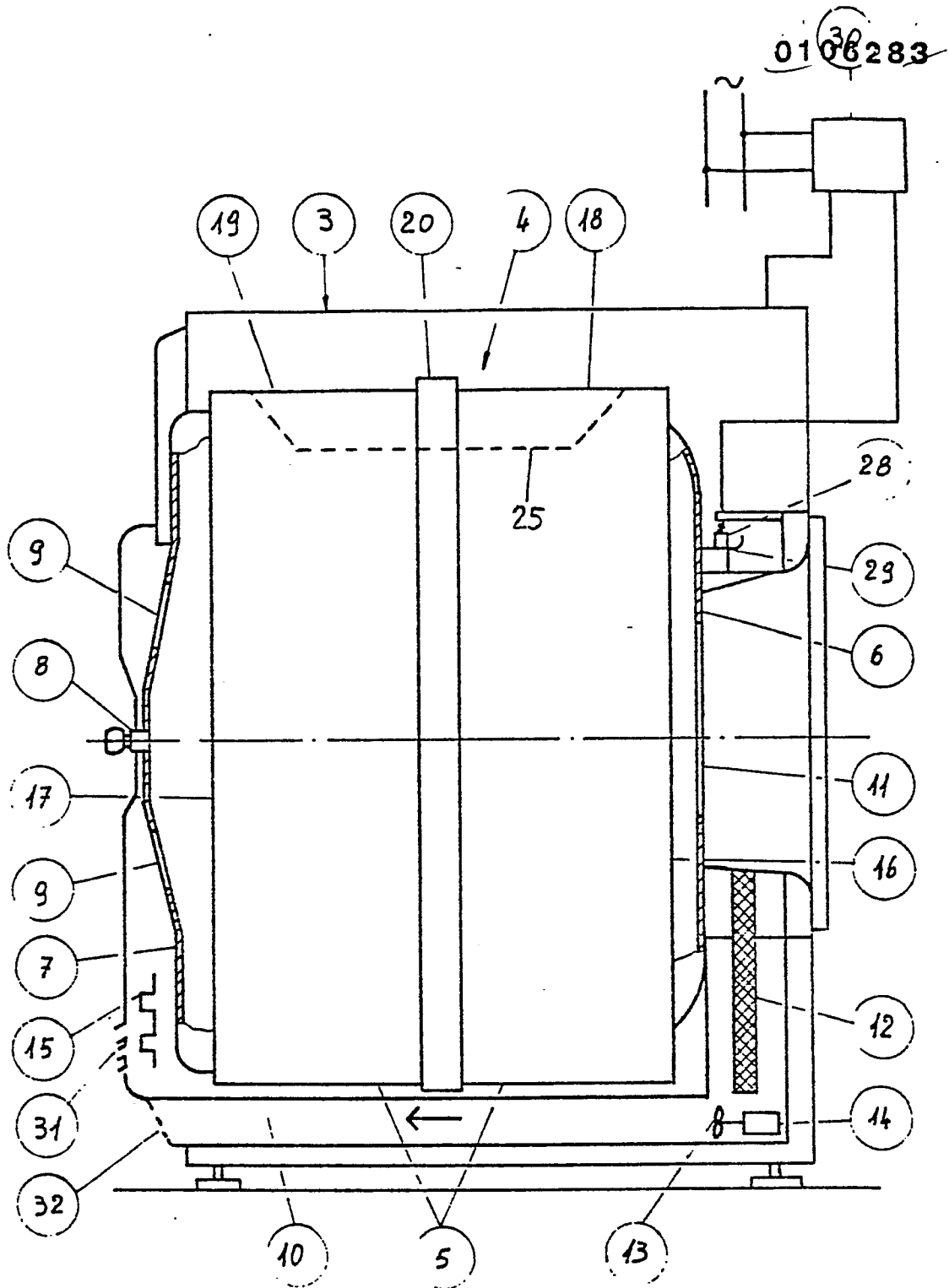
1. Machine à sécher le linge comprenant un tambour tournant (4) adapté pour contenir le linge humide à sécher et ayant une paroi périphérique (5) et deux parois terminales (6, 7), un courant d'air de séchage chaud traversant le tambour à l'aide d'au moins un élément chauffant (15), et comprenant en outre au moins deux électrodes de détection raccordées respectivement à une source de courant électrique et à la masse mise à la terre de la machine à sécher par des moyens connus en soi pour mesurer le degré d'humidité du linge et commander la mise sous tension et hors tension de l'élément chauffant à l'aide d'un dispositif de contrôle connu en soi, raccordé à ces électrodes de détection, caractérisée en ce que les électrodes de détection sont formées respectivement par une portion de la surface de la paroi périphérique (18, 19) et par une des parois terminales (6, 7), les portions de surface de la paroi périphérique (18, 19) étant disposées adjacentes l'une à l'autre et étant raccordées l'une à l'autre avec interposition d'au moins un élément électriquement isolant (20).

2. Machine à sécher le linge selon la revendication 1, caractérisée en ce que cet élément isolant a la forme d'une couronne (20) ayant le même diamètre que les portions de surface de la paroi périphérique (18, 19) et étant de largeur limitée, cette couronne présentant sur toute sa circonférence des incisions latérales (21, 22) adaptées pour recevoir les bords respectifs (23, 24) de ces portions de surface de la paroi périphérique.

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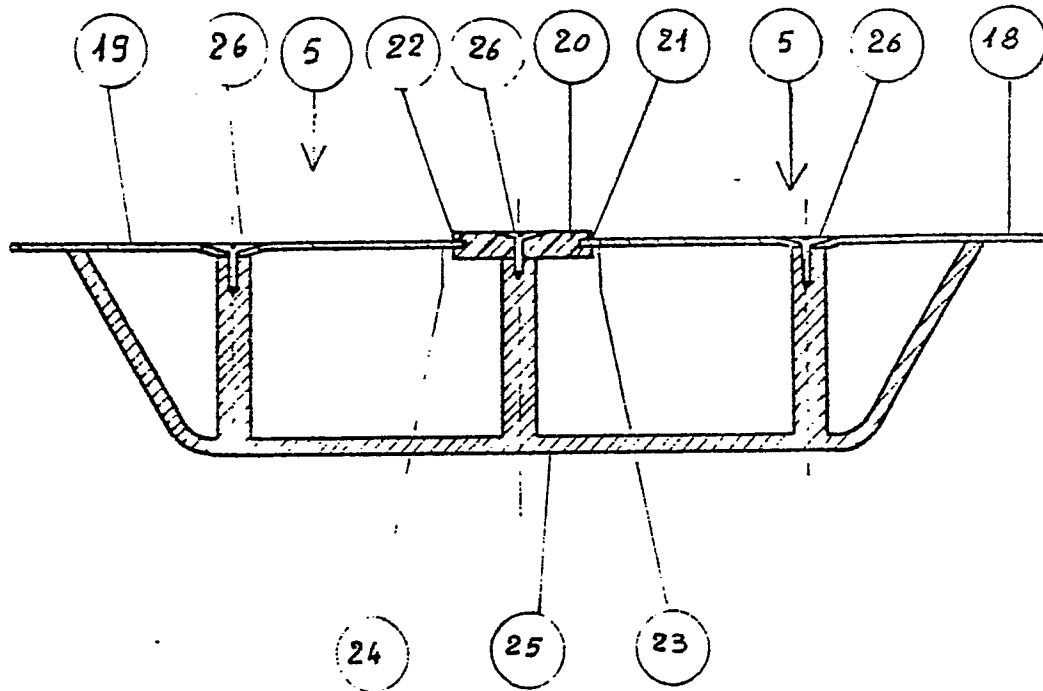


FIG. 2