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54 **Drying or baking apparatus.**

57 A drying or baking apparatus comprises a chamber divided into two compartments by a metal air-pervious conveyor for granular material to be dried or baked and with the compartments being connected by ducting incorporating, or having associated therewith, suction fan means and air heating means. The apparatus is characterised by a perforated electrode structure parallel with and spaced from the granular material-supporting surface of the conveyor, and radio frequency heating means connected to the perforated electrode structure and the pervious metal conveyor which serves as the other electrode of the radio frequency heating means, whereby a radio frequency heating means is provided so that the granular material is subjected both to internal radio frequency heating and surface air heating.

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DRYING OR BAKING APPARATUS

This invention relates to drying or baking apparatus especially but not exclusively for drying or baking granular or pelletised materials, for example, foodstuffs, or other materials in continuous or discrete form, for example, permeable textile fabric in web form, and loose stock such as wool.

A known form of suction drying apparatus comprises a drying chamber subdivided into two compartments by an air and/or other gaseous (usually air) permeable conveyor, the compartments being connected by ducting incorporating, or having associated therewith, a suction fan, an air heating means and a fresh air inlet usually incorporating, or being disposed adjacent to, the air heating means which may be electric, gas-fired, oil-fired, or steam.

In use material to be dried, and hereinafter and in the claims for convenience reference is made to granular material, is conveyed through the drying chamber on the permeable conveyor and heated air is continuously sucked through the granular material and conveyor to remove moisture from the granular material, the moisture-containing air being circulated back to the heating means to restore its temperature, part of the air usually being bled off and replenished with fresh dry air.

An example of such a suction drying apparatus is disclosed in our Patent GB 1191488.

It is also known in the drying art to provide a radio frequency field in the region through which material to be dried is passed. The heating provided by such a radio frequency field heats any moisture contained in the material and drives it to the surface of the material.

It is an object of the present invention to provide a drying apparatus which combines the advantageous features of both the above drying apparatus and which is also usable in the field of baking. Reference hereinafter and in the claims to "drying" is therefore to be construed as including "baking".

According to the present invention there is provided a drying apparatus comprising a drying chamber divided into two compartments by a metal air-pervious conveyor means for granular material to be dried and with the compartments being connected by ducting incorporating, or having associated therewith, suction fan means and air heating means, and the apparatus being characterised by a perforated electrode structure parallel with and spaced from the granular material-supporting surface of the air-pervious conveyor means, and radio frequency heating means connected to the perforated electrode structure and the air-pervious metal conveyor means which serves as the other electrode of the radio frequency heating means, where-

by a radio frequency heating means is provided so that the granular material is subjected both to internal and surface heating.

The perforated electrode structure may be a continuous perforated plate or it may be a plurality of discrete mutually spaced electrodes, the perforations or inter-electrode spaces being dimensioned to ensure that there is no jet impingement effect by the heated air passing therethrough on the granular material.

The air-pervious conveyor means may be a continuous slatted conveyor, the slats being suitably perforated or formed of openwork material, a perforated or open mesh flexible metallic belt or a non-metallic belt running over a fixed perforated metal plate.

The suction drying apparatus according to this invention has a substantially greater drying effectiveness than known suction drying apparatus.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying diagrammatic drawing of a longitudinal section through a suction drying apparatus.

The suction drying apparatus employs air as the main drying medium and comprises a drying chamber 10 divided into upper and lower compartments 11 and 12 by an endless conveyor 13 for supporting and conveying granular material (not shown) into and out of the drying chamber 10. The compartments 11 and 12 are connected by ducting 14 incorporating a suction or circulatory fan 15. An air-heating means 16, say gas-fired, is incorporated in an air inlet duct 17 for fresh air at the other end of the chamber 10. Part of the moisture-laden air passing through the duct 14 is vented to atmosphere through an exhaust duct 18.

The suction drying apparatus is illustrated diagrammatically and it is to be understood that a separate suction fan 18A is associated with the exhaust duct 18 to vent moisture-laden air only to atmosphere, i.e. fresh heated air which has not yet done work in passing through the granular material on the endless conveyor 13 is not vented to atmosphere. The disposition and arrangement of the inflow fan 15 and the venting fan 18A relative to the drying chamber 10 and endless conveyor 13 is well known to those skilled in the drying art and consequently needs no detailed description or illustration.

The drying chamber 10 has an inlet and an outlet for ingress and egress of the conveyor 13 and the granular material, and attenuation ducts 19 are provided at the inlet and outlet for a purpose referred to later.

The endless conveyor 13 is a driven metal slatted conveyor with the slats being of perforated or open mesh construction and being movably supported externally of the chamber 10 by sprocket wheels or pulleys 20, one of which (see 20A) at least is driven.

The conveyor 13 forms one electrode of a radio frequency heating means comprising a radio frequency generator 21 and whereof the second electrode is a perforated plate 22 above and parallel with the conveyor 13 and connected to the drying chamber walls via suitable insulation 23.

The attenuation ducts 19 serve the purpose of preventing the escape of radio frequency energy.

The radio frequency may be either a balanced feed or a coaxial feed arrangement as is well known to those skilled in the art.

The perforations in the perforated plate electrode 22 and in the conveyor 13 are dimensioned to ensure that there is a free flow of heated air through same and the granular material on the endless conveyor 13 without any impingement effect resulting from the perforated plate electrode 22 or the endless conveyor 13.

Fresh heated air is sucked into the compartment 12 of the chamber 10 via the duct 17 by the suction fan 15 while moisture-laden air is vented through the exhaust duct 18 as aforesaid.

In use, therefore, granular material conveyed through the drying chamber 10 is subjected to the combined action of heated air being sucked there-through and the internal heating effected by the radio frequency field which causes internal moisture to be heated and to move to the surface of the granular material where it is pulled off by the heated air flow.

Instead of a perforated slatted conveyor, there may be employed a perforated vibratory trough conveyor, or a drag link conveyor operating over a fixed perforated plate.

by a radio frequency heating means is provided so that the granular material is subjected both to internal and surface heating.

2. A drying apparatus according to claim 1, in which the perforated electrode structure is a continuous perforated plate or it may be a plurality of discrete mutually spaced electrodes, the perforations or inter-electrode spaces being dimensioned to ensure that there is no jet impingement effect by the heated air passing therethrough on the granular material.

3. A drying apparatus as claimed in claim 1 or 2, in which the air-pervious conveyor means is a continuous slatted conveyor, the slats being perforated or formed of openwork material, a perforated or open mesh flexible metallic belt or a non-metallic belt running over a fixed perforated metal plate, or a perforated vibratory trough conveyor or a drag link conveyor operating over a fixed perforated plate.

4. A drying apparatus as claimed in any one of claims 1 to 3, in which the air-pervious conveyor means passes in and out of the drying chamber through attenuation ducts which serve to prevent escape of radio frequency energy.

Claims

1. A drying apparatus comprising a drying chamber divided into two compartments by a metal air-pervious conveyor means for granular material to be dried and with the compartments being connected by ducting incorporating, or having associated therewith, suction fan means and air heating means, and the apparatus being characterised by a perforated electrode structure parallel with and spaced from the granular material-supporting surface of the air-pervious conveyor means, and radio frequency heating means connected to the perforated electrode structure and the air-pervious metal conveyor means which serves as the other electrode of the radio frequency heating means, where-

