July 24, 1956 H. FLEISSNER 2,755,513

APPARATUS FOR DRYING LOOSE FIBROUS MATERIALS

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Fig. 1

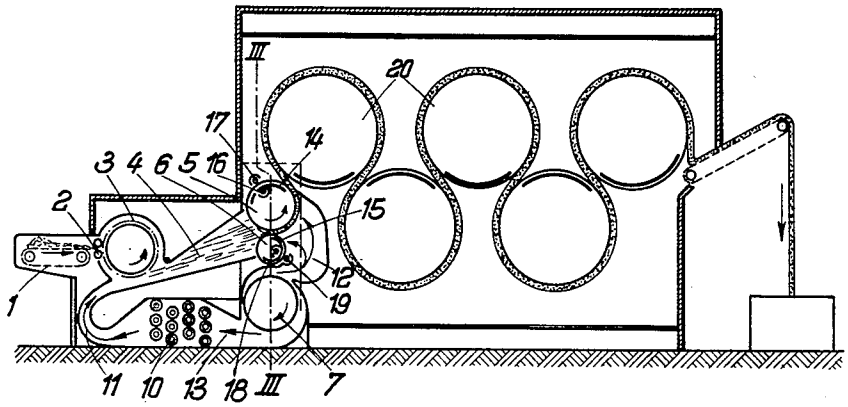


Fig. 2

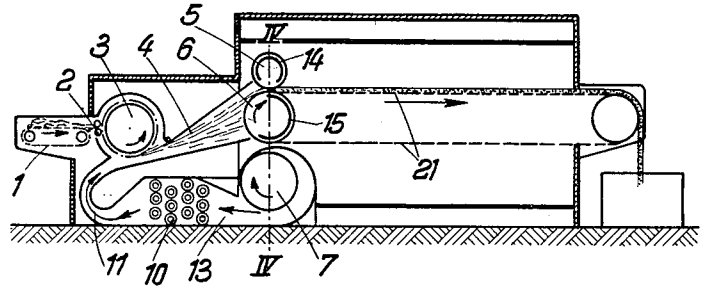


Fig. 3

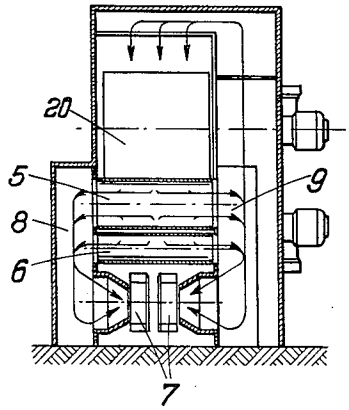
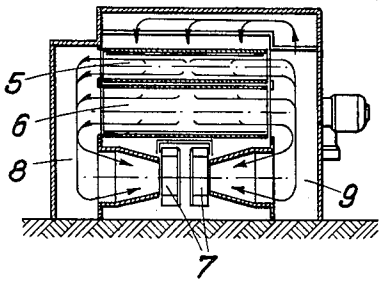


Fig. 4



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APPARATUS FOR DRYING LOOSE FIBROUS MATERIALS

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6 Claims. (Cl. 19—89)

The present invention relates to an apparatus for drying loose fibrous materials.

The apparatus is of the type comprising a disintegrating unit and a pair of superposed perforated cylinders to which the disintegrated flakes are conveyed by means of a circulating current of air. The air current is generated by a fan and is made to pass a radiator on its way to the cylinders; part of the air current is branched off and made to travel to the rear side of the upper perforated cylinder.

In machines of this known type, the disintegrated fibers or flakes are made to adhere to the circumference of the perforated cylinders, where an even thick fleece is formed depending on the feeding of the air current and the adjustment of guide plates covering part of the cylinders.

The known machines, however, have the inconvenience that the air circulation has to be under constant surveyance by operating a number of flaps. When the control and adjustment of these flaps are not carried out at the proper time, disturbances are likely to come up in the fleece formation and the machine can no longer be operated continuously. A very marked disadvantage is, furthermore, the occurrence of a strong eddy formation at the rear of the upper perforated cylinder. This is likely to interfere with the entire air circulation system. The eddies disturb fleece formation at the rear of the cylinder to such an extent that some places of the cylinder become completely uncovered. This, in turn, interferes with the vacuum in the upper cylinder so that the whole air circulation is disturbed.

In addition to this drawback, there is a further inconvenience interfering with the air circulation. This is the fact that in the known machines the beaters, too, have a certain fan action while disintegrating the starting material into flakes. Cold air is thereby admitted into the system which lowers the temperature of the hot air reaching the perforated cylinder. This in turn reduces the temperature of the cylinder itself to an extent that water is condensed on the cylinder from the moist air. Such condensation is, of course, another inconveniece which counteracts the drying action of the machine.

The eddy formation at the upper cylinder is caused primarily by an unsatisfactory air circulation in the known machines. In these machines, the fan is enclosed completely in a spiral casing from which air is withdrawn through an adjustable flap. This air removal causes a strong turbulence which, as stated above, is a serious drawback in the operation of the machines of this type.

It is the object of the present invention to overcome the shortcomings of the known machines and to provide an apparatus permitting a continuous flawless formation.

It is a further object of the invention to provide means for continuous operation without adjustment of the machinery during said operation at the time when new material is fed thereto.

Finally, it is an object of the invention to provide machinery in which materials of varying moisture content can be dried under even working conditions.

Other objects and advantages of this invention will become apparent from the following description and the acompanying drawings.

The machine according to the invention comprises a scroll housing which completely encloses a fan for the generation of an air circulating system. The casing contains two separated air ducts, one of which serves for feeding air over a heater to the disintegrating unit, whereas the other duct conveys air to the rear side of the upper of two perforated cylinders. By this air circulation through separate ducts, which is brought about by the subdivision of the spiral casing into two parts, the air current at the rear of the perforated cylinder is calmed down to such an extent that no more disturbances in fleece formation will occur; the air circulation in the entire machine is very uniform and operation can be made to function continuously, without interruption.

A further characteristic feature of the invention is the arrangement of a completely closed system of the circulating air passing by the disintegrating unit. In the known drying apparatus of the present type, a flap has to be provided as an outlet for the air drawn into the system at another place. This is necessary because of the irregularity of the admission of fresh air by the fan action of the beater. The before-mentioned arrangement causes considerable heat losses in the whole system since the air is at high temperature at the withdrawal spot of the circulating system.

According to the invention, the disintegrating unit, which preferably contains a spiked drum, is included in the drying chamber and the air circulating system is completely closed. It is thereby accomplishd that the heat in the air is retained in its entirety, since no fresh air is admitted which could cool down the circulating air and could lead to moisture precipitation in the perforated cylinders.

The use of a spiked drum conjointly employed with the air circulating system according to the invention has the advantage that spikes have a far lower fan action and will therefore not suck in fresh air from their environment into the circulating system.

It is a further advantage of the present invention that additional heaters are provided inside and/or outside of the perforated cylinders, so that the cylinders will be heated up to a degree that will insure their remaining dry at all times.

A machine built according to the invention operates continuously without condensation of moisture occurring on the cylinder walls and without other disturbances. Furthermore, the drying efficiency of the machine is increased due to the fact that a drying action is already performed in the take-in-cylinders which is equal to about half the drying action of one of the perforated driers.

An apparatus according to the present invention is shown more fully in the accompanying drawing, in which corresponding parts are designated by the same numerals in the various figures of the drawing.

Fig. 1 is a vertical longitudinal section through the center of my device provided with a drier of the straining drum type.

Fig. 2 is a vertical longitudinal section through the center of another embodiment of my invention in which a belt drier is used.

Fig. 3 is partly a sectional view along line III—III of Fig. 1 and shows one of the large driers in elevation; and

Fig. 4 is a section along line IV—IV of Fig. 2.

Referring more particularly to Fig. 1, which shows a disintegrating unit with the perforated take-in cylinders, an associated fan and the heaters for the cylinders, as well as the large driers in cross-section, numeral **1** designates a conveyor band onto which the fibrous goods to be dried are placed by hand or by any mechanical device. Before this happens, water is eliminated from the goods by a centrifuging or sqeeuzing process.

Arranged ahead of the conveyor **1** is a pair of take-in rollers **2**, which are arranged in the neighborhood of the spikes of the disintegrator **3**. The spikes are so close to rollers **2** that there is hardly any gap left. The spikes are driven past at high speed and tear the fiber material emerging from the rollers into fine flakes, which are thrust by centrifugal force through a channel **4** to take-in cylinders **5** and **6**.

The cylinders **5** and **6** are open at both ends and are connected to a fan **7** which sucks out air from the interior of cylinders **5** and **6** through ducts **8** and **9**. Fan **7** is so constructed that it returns part of the air by the shortest route **12** to the upper cylinder, whereas the remaining part is conducted by way of heaters **10** and a channel **11** to pass disintegrator **3** and is carried through channel **4** to the front side of cylinders **5** and **6**. Where the air passes the disintegrator **3**, the channel **11** is very narrow and air velocity is great, whereby the flakes are withdrawn and carried along from the spikes of the disintegrator.

For that purpose, the fan casing is so constructed that two separate air ducts **12** and **13** are provided therein. Duct **12** carries air at reduced pressure to the rear side of the upper cylinder, whereas duct **13** presses air through heaters **10** and by way of channels **11** and **4** returns it to the front side of the cylinders. The air movement is enhanced by the rapid rotation of the disintegrator **3**.

In the interior of the cylinders **5** and **6**, guide plates **14** and **15** are arranged, which prevent the aspiration of air through the covered part of the cylinder wall. These plates serve the purpose of preventing fiber flakes to adhere to those parts of the cylinder walls where their adherence is not desired. In the free portions of the cylinders, flakes will adhere at the front and fleece will form at the rear, whereafter the fleece is caused to travel from one larger drier **20** to another one, while being under the suction of dry air.

The fleece formed in the take-in cylinders may also be placed onto one or more conveyor bands **21** and carried through the drying chamber thereon (see Figs. 2 and 4).

In Fig. 1, heaters for the upper cylinder **5** are shown at **16** and **17**; heaters for the lower cylinder **6** are designated by **18**, **19**. These heaters may be of any known design.

What I claim is:

1. A device for drying loose fibrous material, comprising a fiber-disintegrating unit, a pair of perforated cylinders one arranged above the other, means for generating an air current capable of transporting the particles disintegrated in said unit to said cylinders, means for heating said air current, and means for drying a fleece of said fibers formed on said cylinders, said device being provided with a scroll housing; a fan arranged therein for generating said air current; two separated air ducts one of them discharging air over said heating means to said disintegrating unit, the other one supplying air to the rear of the upper one of said two cylinders.

2. A device for drying loose fibrous material according to claim 1, wherein the disintegrating unit consists of a spiked drum built into said drying chamber and completely enclosed therein.

3. A device for drying loose fibrous material according to claim 2, wherein the air system is a circulating, completely closed system.

4. A device for drying loose fibrous material according to claim 1 including additional heating means inside the perforated cylinders.

5. A device for drying loose fibrous material according to claim 1 including additional heating means outside the perforated cylinders.

6. A device for drying loose fibrous material according to claim 1 including additional heating means both inside and outside the perforated cylinders.

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