

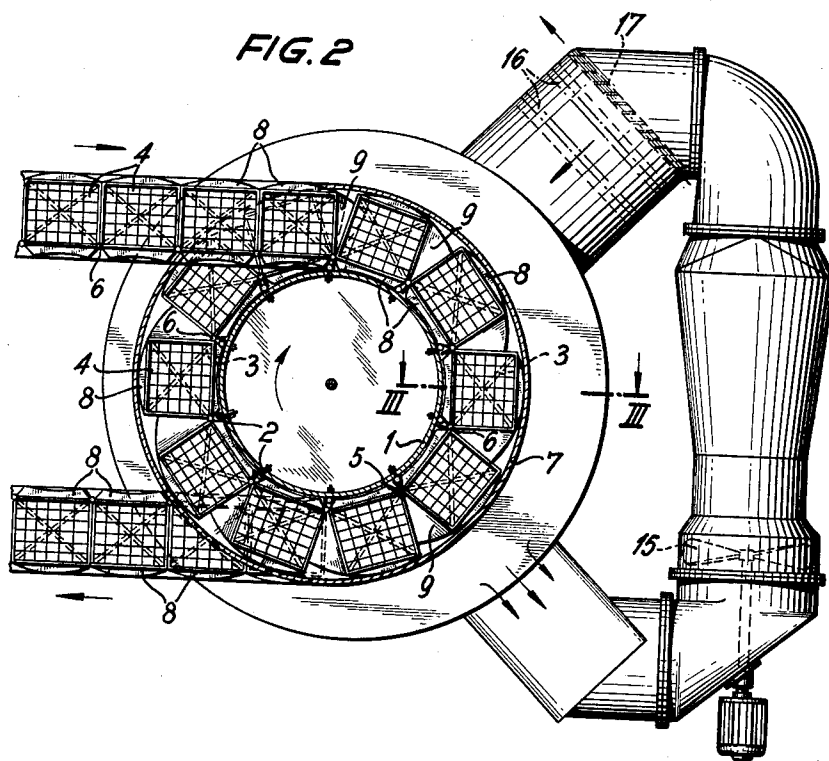
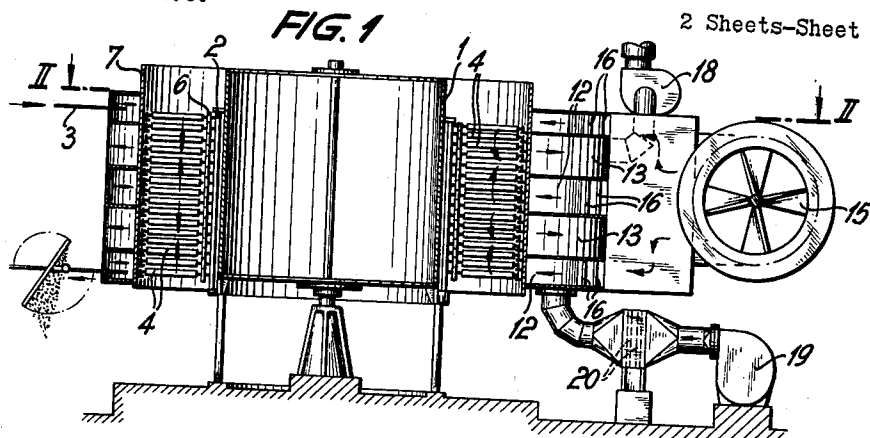
May 19, 1964

E. FELD ETAL
HELICAL BELT DRIER

3,133,798

Filed Dec. 22, 1960

2 Sheets-Sheet 1



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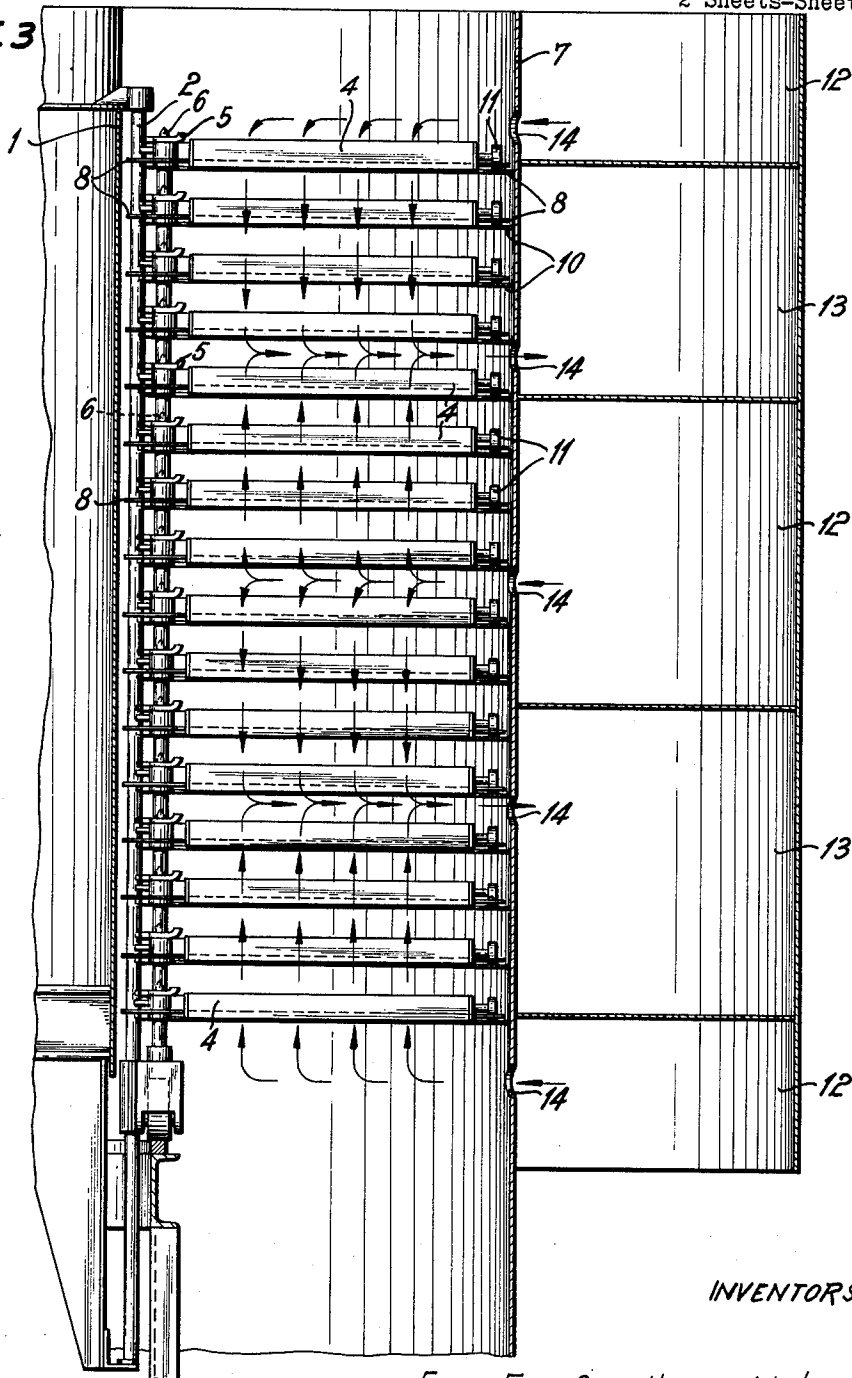
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FIG. 3



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HELICAL BELT DRIER

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Filed Dec. 22, 1960, Ser. No. 77,594

Claims priority, application Germany Dec. 24, 1959

5 Claims. (Cl. 34—187)

The present invention relates to a helical belt drier wherein the drying medium flows through the material to be dried.

Helical belt drivers are already known, for example from German patent specifications 684,922 and 698,360. In such driers an endless conveying chain on which rectangular or square carrier members for the material to be dried are fixed, is guided along a helical course about a rotary frame which comprises individual driver rods forming a polygon. Inside the rotary frame there are bladed-wheel fans producing a continuous circulation of hot air which flows over the layers of material to be dried.

According to the present invention the helical belt drier is so constructed that the hot air flows through the layers of material which makes it possible to increase considerably, e.g., to double or treble, the evaporative power of the drier.

The rotary frame consists of a closed cylinder so that between the cylinder and the drier housing an annular chamber is provided which receives the conveying chain with the latticed screens, i.e., the carriers for the material to be dried. The carriers are shaped in accordance with the curvature of the cylinder and of the drier housing and triangular gaps formed between each two latticed screens are covered.

It is also proposed to surround the drier housing with superposed annular ducts for the supply and discharge of the hot air and to provide communication between these ducts and the interior of the drier through apertures in the drier housing. The ducts, which are arranged annularly about the drier housing, preferably have eccentric bases. The pipes for the supply and discharge of the hot air are then connected to the ducts in the region of the wider side of the eccentric base.

The sub-division of the drier into individual through-flow zones situated one above another has the following advantage:

Owing to the thermal sensitivity of most materials, only a limited temperature gradient is available for drying purposes. This means that in order to transfer the necessary amount of heat to the material, a correspondingly considerable quantity of hot air is required. If this large quantity of hot air were passed straight through all the layers of material situated above one another, the high air speed would also cause the material to be carried along and the air would become saturated prematurely. Furthermore, owing to the great pressure difference, a considerable quantity of hot air would escape through the gaps at the lateral boundary walls of the drying material carriers.

The sub-division of the drier into individual through-flow zones makes it possible to operate the drier with a very large total quantity of air without exceeding the permissible values for the air speeds in the individual zones and without causing too great a pressure difference.

One constructional embodiment of the invention is illustrated, by way of example, in the accompanying drawings, wherein:

FIG. 1 is a vertical sectional view through a helical belt drier;

FIG. 2 is a horizontal sectional view on the line a—b in FIG. 1; and

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FIG. 3 is a sectional view on a larger scale on the line c—d in FIG. 2.

Referring to the drawings:

The drier comprises a closed cylinder 1, which rotates in the clockwise direction and has driver rods 2 fixed on it, and an endless conveying chain 3 on which latticed screens 4 are fixed. The conveying chain consists of individual links each of which corresponds to the length of a latticed screen. The driver rods 2 engage on projections 5 on the chain links, so that as the cylinder rotates, the chain is carried along with it. The hinge pins 6 of the links bear on one another and, for this reason, they are provided at the top with studs and below with recesses. Metal plates 8 are arranged on the latticed screen frames 4 in accordance with the curvature of the cylinder 1 and of the drier housing 7, in such a manner that only small gaps remain between the boundary surfaces. The latticed screen frames also comprise cover plates 9 which, as the latticed screens are guided through the drier, cover the free triangular gaps between the screens. When the latticed screens are moving along rectilinear paths of travel, i.e., when they are approaching the drier and leaving the drier, each plate 9 slides under the following latticed screen. The inner wall of the housing 7 is provided with a helical guide track 10 on which rollers 11 on the screens run.

After leaving the drier, the chain, with the latticed screens fixed thereon, is guided in a known manner, which is not shown in detail in the drawings, over a reversal station whence it once more approaches the upper portion of the drier. During this travel, the latticed screens are emptied and charged. In order to permit automatic emptying of the latticed screens the latter are tiltably arranged on the drier frame. The latticed screens are tipped by abutments (not shown) or alternatively by cam means.

Hot air supply ducts 12 and hot air discharge ducts 13 are arranged around the drier housing 7 and openings 14 connect the ducts to the interior of the drier. The openings are preferably constructed as control orifices, e.g., in the form of wire grids or perforated sheet metal plates, in order to guarantee the most uniform possible inward and outward flow over the entire periphery of the drier. This uniform inward and outward flow is also promoted by shaping the ducts eccentrically as shown in plan view. In the region of the wider side of the eccentric ducts, the hot air discharge ducts 13 are connected to the suction pipe of a fan 15 and the hot air supply ducts 12 are connected to a delivery pipe coming from air heaters 16. Throttling means 17 are arranged upstream of the air heaters. During its cyclic travel, the air is continually heated.

A partial quantity of air is passed out into the atmosphere from the upper hot air discharge duct 13 by means of a fan 18 in accordance with the air saturation. In order to compensate, fresh air enters the bottom-most air supply duct by means of a fan 19 and an air heater 20. As shown in FIGS. 1 and 3, the hot air divides up into two portions after passing into the drier. One portion flows through the layers of material in the downward direction and the other portion flows in the reverse direction.

The throttling means 17 upstream of the air heaters make it possible to use different flow speeds in the individual zones. Moreover, since each hot air supply duct 12 has its own air heater, the hot air entry temperature into the individual zones can be varied in accordance with the product to be dried in each case.

The apparatus described can be modified and adapted in many ways within the scope of the invention as defined in the following claims. This applies, for example, to the construction of the screen chain, the shape of the

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screens, and the way in which the free spaces between the individual screens are covered.

We claim:

1. A helical belt drier comprising a drier housing a rotary frame within said housing formed of a closed cylinder and defining an annular drying chamber with said housing, conveying means in said chamber wrapped around said frame, guide means guiding said conveyor means along a helical course through said chamber, and a plurality of hot air supply ducts and a plurality of discharge ducts communicating with said chamber through said housing and arranged alternately one above the other, said hot air supply ducts and said discharge ducts being eccentric as viewed in a plan view and adapted to be connected to hot air supply pipes and discharge pipes in the region of the widest side of the eccentric portion thereof.

2. A helical belt drier as set forth in claim 1 wherein fan means are provided communicating with the air discharge ducts and additionally including air heaters positioned to heat the air discharged from said fan means.

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3. A helical belt drier as set forth in claim 1 including a discharge fan communicating with the uppermost air discharge duct and discharging into the atmosphere.

4. A helical belt drier as set forth in claim 1 including a fresh air supply means communicating with the lowermost one of the hot air supply ducts.

5. A helical belt drier as set forth in claim 4 including an air heater in said fresh air supply means.

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