Sept. 14, 1954 J. H. GINTHER 2,688,807

CONVEYER DRIER

Filed June 13, 1952 2 Sheets-Sheet 1

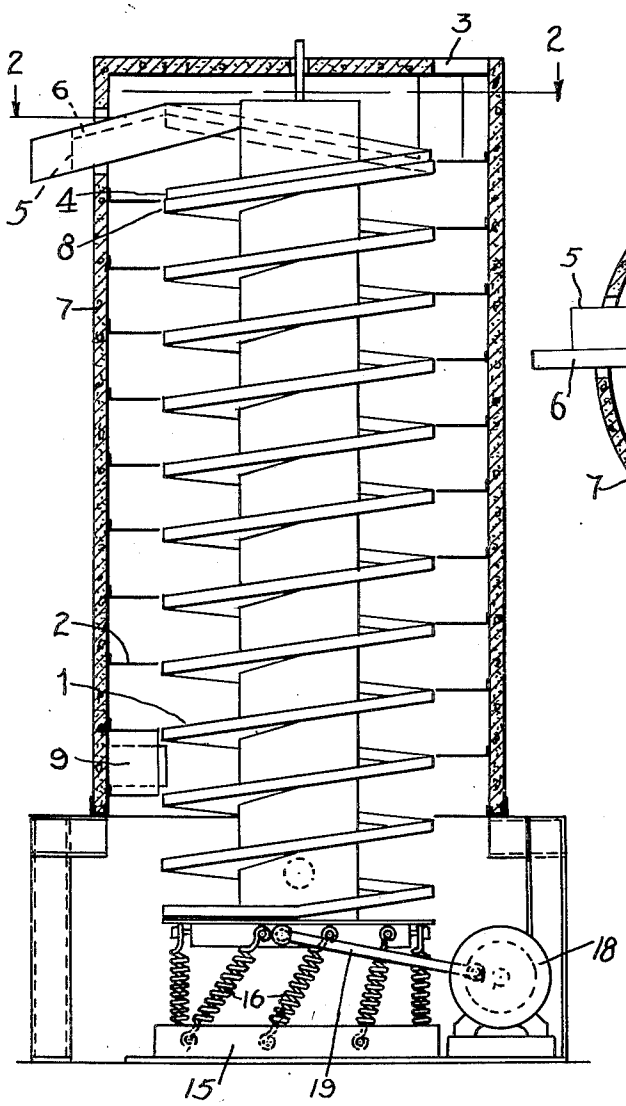

Fig. 1

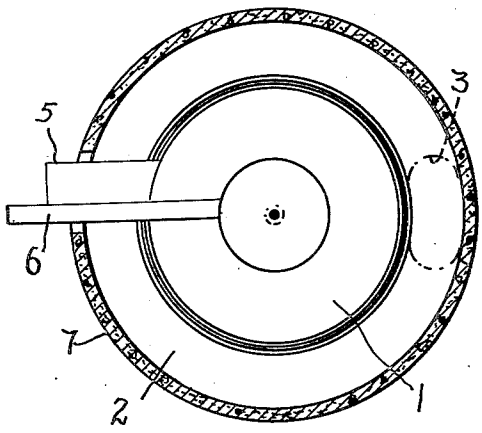

Fig. 2

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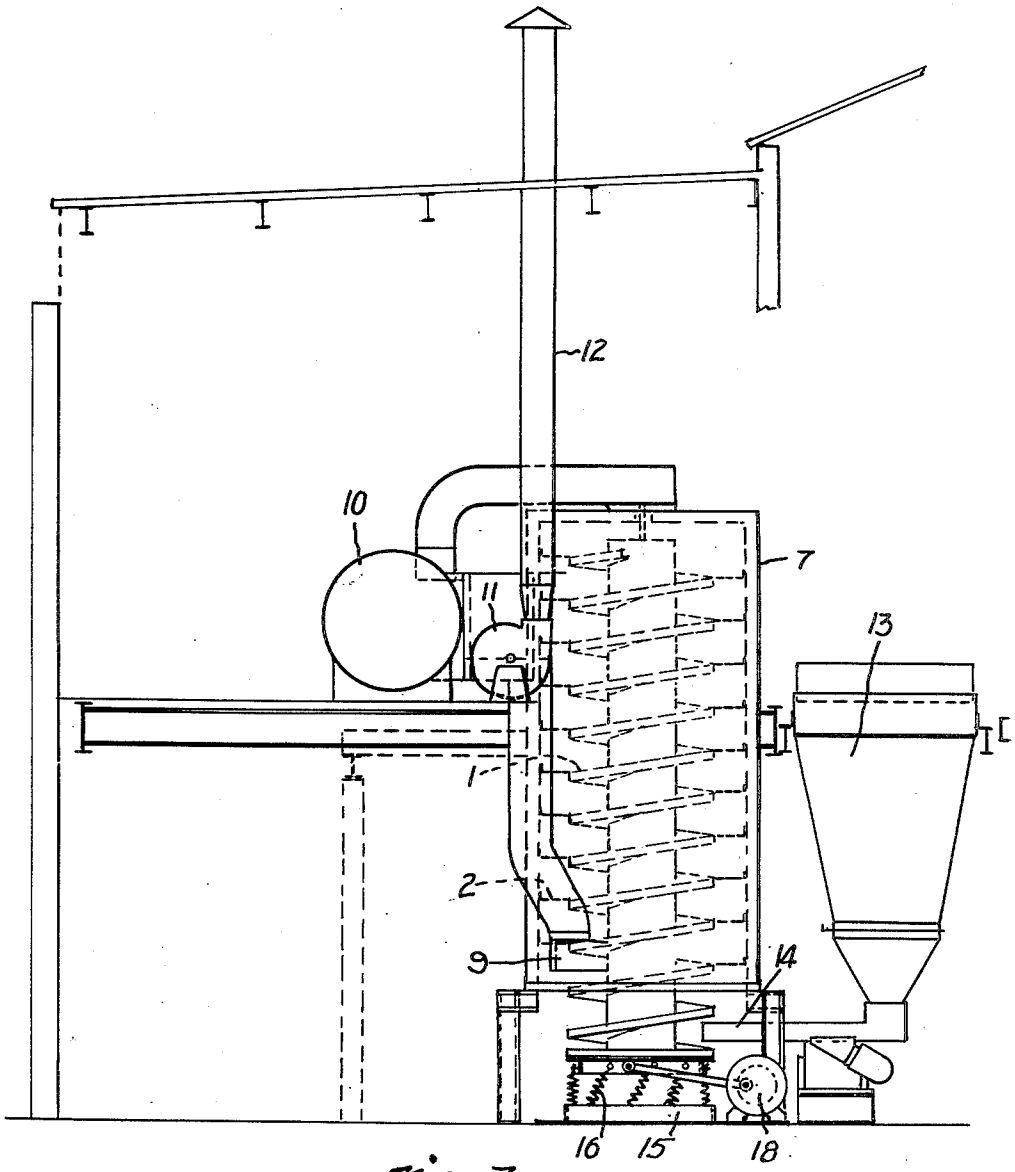

Fig. 3

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UNITED STATES PATENT OFFICE

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CONVEYER-DRIER

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4 Claims. (Cl. 34—147)

1

This invention relates as indicated to a conveyor-dryer and has more particular reference to a vibrating conveyor in combination with drying means.

Vibrating conveyors are generally divided into two principal classes. First, there is the "throwing" type in which the material is thrown upward and forward and second, the "closed path" movement type in which the material is moved forward with a minimum of disturbance. This latter type depends upon friction between the material and the bed. The present invention is applicable to both types of vibrating conveyors, however, it is interested in the "throw" type primarily.

It is the principal object of the present invention to provide a vertical helical vibrating conveyor which shall include drying means whereby, various materials may be dried as they travel up the conveyor.

Other objects will appear as the description proceeds.

To the accomplishments of the foregoing and related ends, the invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Fig. 1 is a transverse sectional view of an embodiment of the present invention;

Fig. 2 is a top plan view of Fig. 1; and

Fig. 3 is a part sectional, side elevational view of the conveyor drier with the feeder hopper and hot air supply in position.

Referring more specifically to the drawings 1 indicates a vertical vibrating conveyor of the "throw" type. Vibrating conveyor 1 is moveably mounted upon base 15 as by upwardly extending coil spring 16. 18 is a motor which may be mounted on or adjacent to base 15 and connected to vibrating conveyor 1 by shaft 19. It will be understood that any suitable eccentric or vibrating means may be associated with conveyor 1, the details of which form no part of the present invention. It will readily be seen from the annexed drawings that vibrating conveyor 1 has upstanding sides forming a trough thus preventing the material which is being dried from drifting off the conveyor.

I have found the conveyor-dryer of the present invention especially suited for such substances as porcelain enamel. In the manufacture of porcelain enamel the raw ingredients are smelted in a high temperature smelter and the molten material is run into water and fritted. The frit then has to be thoroughly dried before packaging. In using the present invention the wet frit is placed into hopper 13 and fed into the conveyor-drier as by feeder 14. The wet frit enters at the bottom of the vertical vibrating conveyor 1 and is conveyed upwardly. Hot air enters the conveyor-drier through inlet 3 and flows downwardly countercurrent to the flow of the material being dried. The air is exhausted at the bottom of the conveyor-drier at outlet 9. The outlet 9 is connected to exhaust fan 11 and the air is partially returned to heater unit 10 and partially exhausted through stack 12. I have found that if the frit to be dried is conveyed at a rate of about 25 feet per minute the air should enter the conveyor-drier at about 500° F. and moved at the rate of about 2900 C. F. M. Under these conditions about 75% of the air is recirculated through heater 10 and the remainder exhausted through stack 12. It is to be understood that the foregoing conditions are only one typical example of temperature and air velocity. It will readily be seen by those skilled in the art of drying that the air temperature and velocity may be varied according to the material to be dried and the amount of production desired.

2

It is important to note here the significance of the vertical helical baffle 2. The heater air entering inlet 3 comes into contact with baffle 2. Thus the air instead of flowing straight down the conveyor-drier is forced to flow countercurrent over the top of the moving material. As the material moves up the vibrating-conveyor it is thrown up off the bed of the conveyor. The heated air which is forced by baffle 2 to follow the helical path of the conveyor comes into intimate contact with substantially all of the surfaces of the material and thus more efficiently effects drying. The outer wall of the conveyor-drier is covered with insulation 7 and thus prevents loss of heat through the wall.

The top portion of the helical conveyor as best shown at 8 in Fig. 1 comprises a scalping screen 4. The material of the proper particle size drops through screen 4 and is discharged through discharge spout 5. The oversize material is carried on screen 4 to discharge spout 6.

It will now be readily seen that my present invention has several particular advantages over prior art practices of conveying and drying. First my invention permits the simultaneous

movement of the material to packaging equipment or storage while it is being dried; secondly, the particle size of the material can be readily controlled; and thirdly the apparatus is relatively simple in construction and operation and consumes considerably less floor space than prior conveyors and dryers. One other outstanding feature of my device consists in the vertical helical baffle surrounding the vibrating-conveyor. This latter point is particularly advantageous for two reasons: first, since the heated air is forced to follow the path of the conveyor bed the drying is performed more efficiently and secondly, the heated air entering at the top of the device allows drainage of excess water and thus eliminates the waste of heat trying to dry off the excess water.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the feature stated in any of the following claims or the equivalent of such be employed.

I, therefore, particularly point out and distinctly claim as my invention:

1. In a device for simultaneously drying and conveying including a vertical helical vibrating conveyor, a vertical helical baffle coaxial and of equal pitch with said conveyor, the outer edge of said conveyor abutting the inner edge of said baffle, and means for supplying heated air to said drying and conveying apparatus.

2. In a device for simultaneously drying and conveying including a vertical helical vibrating conveyor, a vertical helical baffle coaxial and of equal pitch with said conveyor, the outer edge of said conveyor abutting the inner edge of said baffle and means for supplying heated air through the top of said device whereby the heated air flows countercurrent to the flow of material through said device.

3. In a device for simultaneously drying and conveying including a vertical helical vibrating conveyor, a vertical helical baffle coaxial and of equal pitch with said conveyor, the outer edge of said conveyor abutting the inner edge of said baffle, means for enclosing said conveyor and baffle, means for supplying heated air through the top of said device and means for exhausting the heated air adjacent the bottom of said device whereby said heated air flows counter-current to the flow of material being dried in said device.

4. In a device for simultaneously drying and conveying including a vertical helical vibrating conveyor, a vertical helical baffle coaxial and of equal pitch with said conveyor, the outer edge of said conveyor abutting the inner edge of said baffle, means for enclosing said conveyor and baffle, an inlet substantially adjacent the bottom of said conveyor for delivering material to be dried and an outlet substantially adjacent the top of said conveyor for discharging the dried material, means for supplying heated air through the top of said device and means for exhausting the heated air adjacent the bottom of said device whereby said heated air flows counter-current to the flow of said material being dried.

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