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ACCESSORY FOR DRUM DRIER

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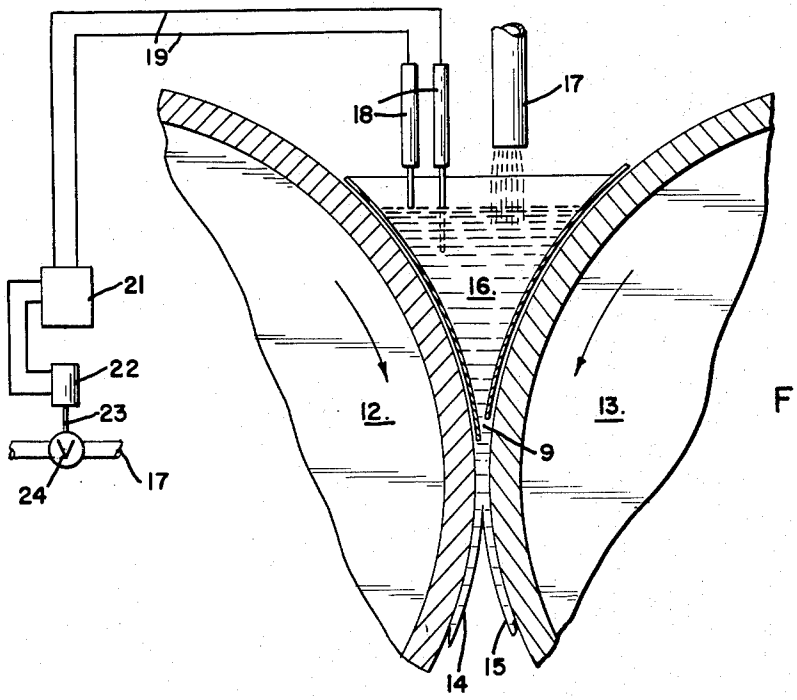


Fig. 1.

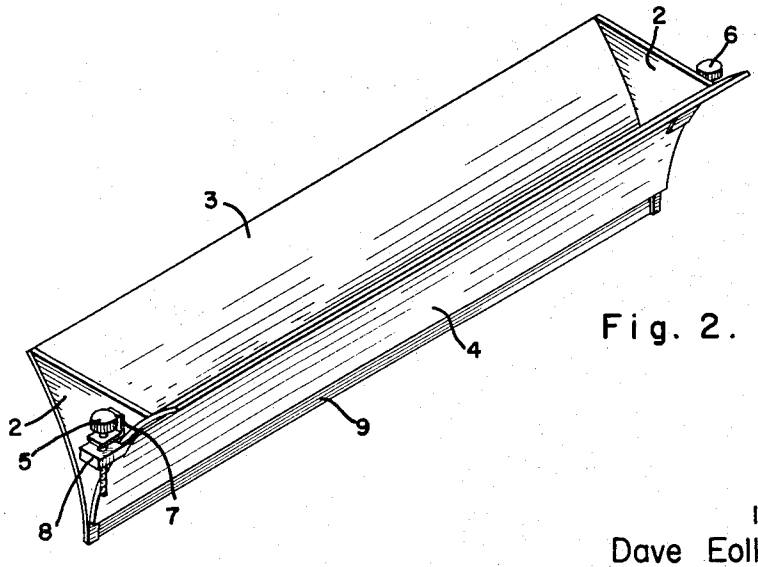


Fig. 2.

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ACCESSORY FOR DRUM DRIER

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This invention relates to an improvement in film drying apparatus of the internally-heated drum dried type.

Conventional driers of this type comprise a pair of closely spaced drums heated internally as by steam. The drums may have the same radius and be in parallel alignment with their axes of rotation at the same level. The material to be dried is supplied in a liquid form to a puddle contained in the space between the upper, adjacent surfaces of the two drums. The puddle is contained in direct contact with the upper adjacent surfaces of the two drums. The drums at their adjoining surfaces rotate downwardly, and each removes a thin film of the puddle contents on its outer surface. Drying of the thin film continues throughout the interval that the sheet is in contact with the heated drum surface. The film sheet is scraped from each drum by a doctor blade placed near the top of the drum.

It has been the practice to maintain a puddle of considerable volume in direct contact with and between the upper surfaces of the two drums. This puddle assures an adequate and immediate replenishing of the liquid forming the films carried by the downwardly rotating drums. Conventionally, the puddle is maintained at a height which results in a comparatively large amount of liquid being in contact with the hot drum surfaces for a considerable period of time before being removed as a film on the rotating drums. This situation is productive of several serious problems, particularly if the material to be dried is a very heat sensitive item such as high sugar content foods, such as fruits.

Undue contact with the heated drums necessarily occurring during residence time of the product in the conventional puddle causes the material to be damaged. Material closest to the drum surfaces may at times be heated up to temperatures approaching the temperatures of the drums themselves. While the degree of adverse effect that this will have depends upon the nature of the product to be dried, it will in general be quite serious in the case of high sugar content food since excessive heating tends to impair qualitative characteristics such as flavor.

Another disadvantage of the conventional drum drying apparatus employing a puddle in direct contact with the drums is that the drums, upon entering the region of the puddle, are cooled by the liquid in contact with them. Upon leaving the puddle and having picked up a layer of material to be dried, the steam within the drums must reheat the cooled surface of the drums thereby reducing the efficiency of the drum driers and resulting in lowered production rates.

It is therefore a principal object of this invention to provide an improved drum drying product feed apparatus, here termed a "false puddle." It is an object of this invention to provide an improved drum drying apparatus in which the material to be dried comes in contact with the drying surface of the drum drier for the minimum possible time and at minimal temperatures required to effect the desired degree of drying of the material. It is a further object of this invention to provide a means for supplying a controllable uniform rate of feed of material to be dried to the drum drier thus enabling greater uniformity of dried end product and better quality control.

Other objects and advantages of this invention will appear from the following detailed description wherein

similar characters of reference represent corresponding parts in several views.

In the accompanying drawings:

FIG. 1 is a fragmented partially cut away side view showing portions of two drum driers closely spaced in combination with a preferred embodiment of this invention.

FIG. 2 is a perspective view of the apparatus provided by this invention.

The invention in its broader aspects is an improvement for a film drying apparatus of the type having two closely spaced rotatable internally steam heated drums normally adapted to hold a puddle of viscous liquid to be dried in the area between the upper adjacent surfaces of the drums and immediately above the converging peripheral faces of the drums, which location may be termed the nip. The device or false puddle comprises means for holding the material in flowable condition to be dried out of physical contact with the drum surfaces and adapted for supplying an adjustable controllable quantity of the liquid to the drums.

The apparatus which constitutes the preferred embodiment of the invention generally comprises (see FIG. 2) an elongated puddle trough of downwardly decreasing cross section having two end members 2 attached to one fixed side member 3 and one slidably attached side member 4. Slidably attached side member 4 can be raised and lowered by turning adjuster screws 5, 6. The adjuster screw 5 is in threaded engagement with a bracket 7 attached to end wall 2 and keyed to bracket 8 attached to wall 4. Similar adjustable controls are affixed at both ends and it is noted that any conventional adjustment means may be employed to move the gate 4.

As side member 4 is raised, the valve opening or slot 9 which is formed between the converging edges of side members 3 and 4 becomes larger. Conversely, as side member 4 is lowered the width of slot 9 becomes smaller. The trough illustrated has side members that are curvilinear in shape. The radius of curvature selected will normally be that having a radius substantially equal to that of the drums of the drum drier as shown in FIG. 1. Suitable troughs within the scope of this invention also include, among others, those having side members which form a trough having a triangular cross section, the side members approaching an apex of the triangle at the nip of the driers.

It should be understood that the present invention is not limited to the particular type of drum drier illustrated but is broadly applicable to any drum drying apparatus having closely spaced rotatable drums.

Referring to FIG. 1, the apparatus illustrated comprises two adjacent internally heated rotatable drums 12 and 13 closely spaced in parallel disposition to each other with their axes of rotation at the same level. The trough illustrated in FIG. 2 is shown disposed in the space between the upper adjacent surfaces of the drum 12 and 13.

In conventional design the puddle is in direct contact with the upper adjacent surfaces of the two drums. By means of the device illustrated it will be seen that the liquid may be held within the trough and will not contact the drums until discharged through the slot 9 immediately preceding the time when the liquid is to be applied to the surface of the drums for drying. The size of the slot 9 may be adjusted to a width which allows liquid material to flow to the nip at approximately the speed that the drums are removing liquid to form a film 14 and 15 on their surfaces with their downward rotation. In this way an extremely small puddle will exist. The existence of an extremely small puddle eliminates the problem of drum cooling in the area of the puddle and the necessity for reheating them. This permits an increase in production rates. Most important, of course, is the reduction

to a minimum of residence time in contact with the drums which results in the elimination of deleterious effects on the material being dried. As a consequence, the techniques of drum drying will be made available for use with heat sensitive materials that were previously either not capable of being dried in this manner or only with great difficulty and sacrifice.

The false puddle, indicated at 16, held by the trough has yet another important advantage. Since the feed to the drum surface is entirely from a slit, the rate of feed into the nip of the drums is uniform. This means that the material being dried on the drums will be uniformly dispersed resulting in a uniformly dried sheet. On the other hand, a conventional puddle is composed of a liquid normally having differences in total solids in its various parts. The rate of feed from this type of puddle to the nip will not be uniform. The film picked up by the rotating drums will consequently not be entirely uniform leading to a final product having significant differences in moisture content through its entire mass.

Referring again to FIG. 1, the material to be dried enters the trough from a feed line 17 and forms the false puddle 16. The level of the false puddle is preset and maintained at that value by a conventional level controller comprising two conventional sensing probes 18 which are spaced apart with the terminal end of one somewhat lower than the end of the other. The probes are connected through leads 19 to a conventional controller 21. With the fall of the level of the puddle below preset value, the circuit completed through the two sensing probes and liquid is broken and this occurrence causes the controller 21 to energize an electric motor 22, which through suitable mechanical linkage 23 positions valve 24 of feed line 17. Flow of liquid material to be dried through the valve 23 and line 17 restores the puddle level of the trough.

Reference to the control circuit, valving 23, and associated parts may be varied in many ways by those skilled in the art and forms no part of the inventive concept but is merely illustrative.

The adjustment of gate member 4 relative to gate 3 to change the flow of product to the drums may be accomplished through any convenient form of control.

The essence of the invention is in the provision of a false puddle capable of controlling the output of product to drier and with minimal thermal damage to product.

Various changes may be practiced in the arrangement of parts illustrated and described herein for purposes of clarity of description and understanding.

What is claimed is:

1. In a film drying apparatus of the type having two closely spaced rotatable drums normally adapted to hold a puddle of viscous liquid in the nip area between the upper adjacent surfaces of said drums, the improvement which comprises a container for holding said liquid, the container being disposed in said nip area and having an adjustable opening on its underside permitting discharge of said liquid into said space substantially uniformly over the length of the drums' drying area, said container comprising an elongated trough of downwardly decreasing cross section having two end members and two elongated side members, the side members of said trough being curvilinear with curves having axes of curvature approximately coinciding with the respective axes of said drums, and a level controller associated with said trough for maintaining the height of liquid to be dried within the trough at a preselected level.

2. In a film drying apparatus of the type having two closely spaced rotatable drums normally adapted for holding a puddle of viscous liquid in the nip area between the upper adjacent surfaces of said drums, the improvement which comprises a container for holding said liquid, the container being disposed in said nip area and having an adjustable opening on its underside permitting discharge of said liquid into said space substantially uniformly over the length of the drums' drying area, said container comprising an elongated trough of downwardly decreasing cross section having two end members and two elongated side members, the side member of said trough being curvilinear from their top edges to their bottom edges and defining curves approximately concentric with corresponding surfaces of the two drums to permit relatively close conformity between substantially the entire exterior of said trough side members and the adjacent drum surfaces.

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