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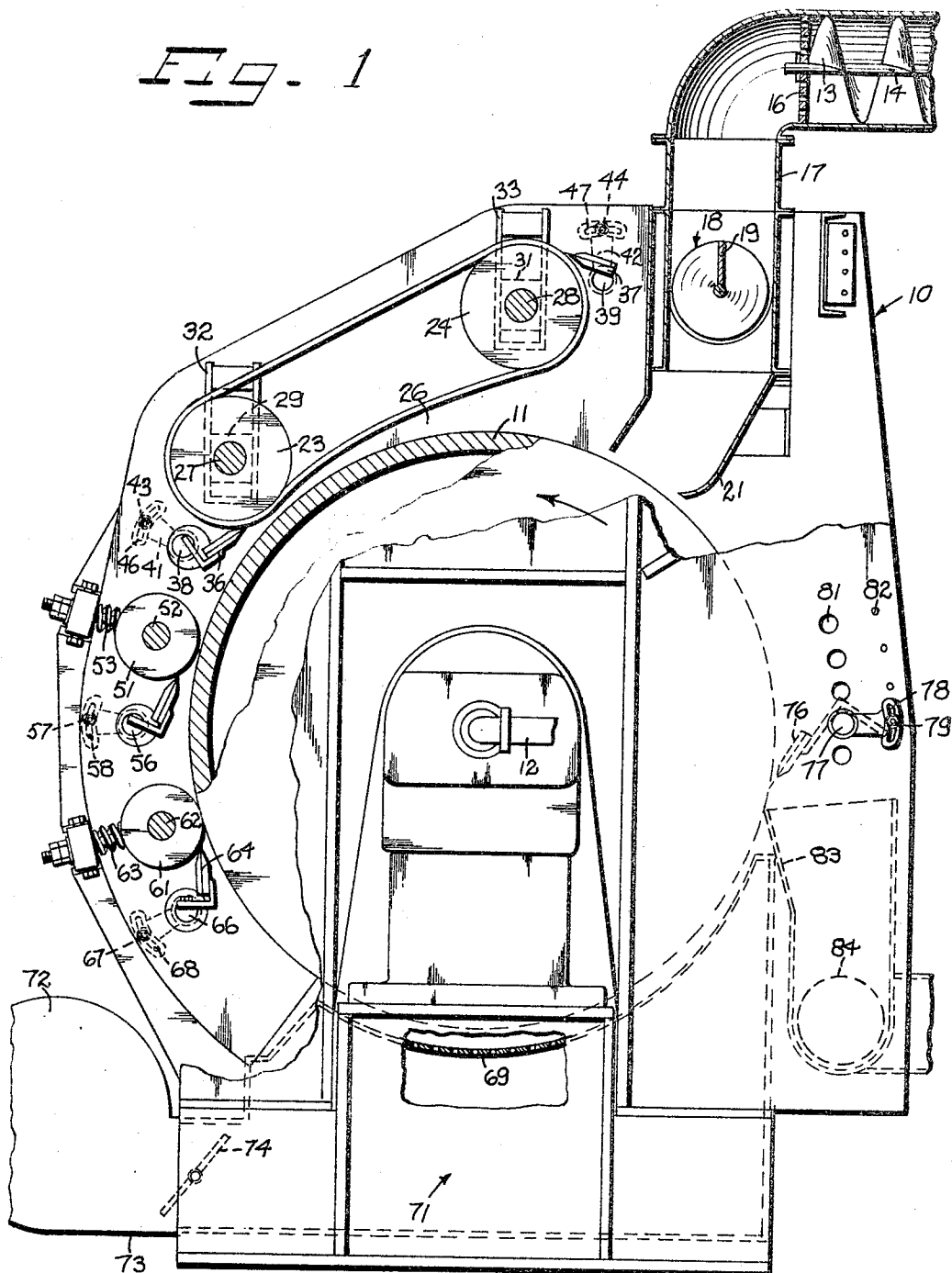
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FOOD DEHYDRATOR

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2 Sheets-Sheet 1

Fig. 1



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FOOD DEHYDRATOR

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The present invention deals with an improved type of dehydrating assembly particularly applicable for the dehydration of food products, notatably cooked potatoes.

In typical installations for drying mashed potatoes in the preparation of the so-called "instant" type of packaged product, a substantial amount of manpower is involved in the normal operation, cleaning, and the like. In a typical installation, a single drum is employed for drying, with a number of individual applicator rolls cooperating with the drum to build up a layer of mashed potatoes on the periphery of the drum. Frequently, the potato slurry has to be passed from roll to roll by a manual operation. The potato mash is continuously worked from one roll to another until a suitable film is built up on the drum for removal by a doctor blade. Much of the difficulty involved in this type of structure is centered about the means employed for spreading the potato mash over the drying drum in a uniform film.

The present invention provides an improved type of food dehydrator which significantly reduces the amount of manpower required to provide an acceptable final product. Novel means are provided for spreading the potato mash over a drying drum to produce a relatively uniform film over the periphery of the drum. Subsequently, the film on the rotating, heated drum is compacted even further by suitably positioned pressure rolls. Substantial drying capacity is provided in the structure of the present invention by the inclusion of an improved air type drier which cooperates with the drum to remove sufficient moisture from the film on the drum so that a doctor blade acting against the surface of the drum removes the film cleanly in the form of flakes.

More specifically, the present invention involves a drier assembly including a rotating, imperforate drum together with feed means which are adapted to apply the material to be dried to the periphery of the drum. Initial compaction of the material applied to the drum is achieved by providing a travelling endless belt which defines with the periphery of the drum a convergingly shaped gap through which the film of material advances during rotation of the drum. Then, one or more pressure rolls further compact the film against the surface of the drum, the spacing between the succeeding pressure rolls and the drum in the direction of rotation of the drum being successively smaller. Next, the thus formed film on the periphery of the drum passes through a heating zone in which heated air is applied to the film during its travel through the zone, resulting in the completion of the drying operation on the periphery of the drum. Finally, a suitable doctor blade is employed to scrape off the dried film from the periphery of the drum and deliver it to a suitable conveying means.

The apparatus of the present invention also includes a novel separator for removing lumps from a slurry so that the material fed to the periphery of the drying drum is as homogeneous as possible. The improved separator includes a rotating perforated drum in association with pressure means which urge the incoming slurry against the perforations of the drum, the pressure means being slightly spaced from the periphery of the drum to define a passage for oversized lumps which cannot be conveniently accommodated through the perforations of the drum. These lumps are then directed to a conveyor means which remove them from the assembly, while smaller aggregates appearing in the slurry are forced through the perforations of the drum where an imperforate drum mounted within

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the perforate drum in abutment with the inner cylindrical surface thereof presses the slurry entering the drum out through the perforations and into a conveyor for delivery to the drier assembly.

5 The pressure means in the separator preferably takes the form of a second perforated drum which rotates in a direction opposite to the first named drum so that the slurry entering the space between the two drums is received through both and is ultimately discharged from the interiors of the two perforated drums into a common delivery means.

10 An object of the present invention is to provide an improved drier assembly particularly applicable to the dehydration of food products and, more specifically, to the drying of mashed potatoes so that they may be recovered in flaked form.

15 Still another object of the invention is to provide an improved drying assembly which substantially reduces the amount of manpower required in operation particularly in the area of spreading the potato mash over the drier drum.

20 Another object of the invention is to provide a drier for mashed potatoes and the like which is capable of higher operating speeds than are presently conventionally employed.

25 A further object of the invention is to provide a combined potato cooker, masher, and drier assembly which produces a more uniform product of higher quality in less time than apparatus previously employed for this purpose.

30 Another object of the invention is to provide an improved separator for removing lumps and the like from a potato mash in a continuous manner prior to drying.

35 Other objects and features of the present invention will be apparent to those skilled in the art from the following specific description of the attached sheets of drawings, which illustrate a preferred embodiment of the invention.

In the drawings:

40 FIGURE 1 is a view partly in elevation and partly in cross-section illustrating the drier section of the apparatus of the present invention; and

45 FIGURE 2 is a view in cross-section of the cooker, masher, and lump remover sections of the assembly which deliver the potato mash to the drier assembly of FIGURE 1, the view being taken at right angles to the plane of FIGURE 1.

As shown in the drawings:

50 In FIGURE 1, reference numeral 10 indicates generally a frame support for the elements of the apparatus. Rotatably mounted on the frame 10 is an imperforate drying drum 11 composed of cast iron or the like. A steam input line 12 located centrally of the drum 11 injects steam into the interior of the drum 11 to bring the surface of the drum to a predetermined drying temperature.

55 The potato mash is introduced onto the periphery of the drum 11 from a conveyor having flights 13 disposed about a rotating central shaft 14. A substantially lump free mash results from the mash being forced through a perforated plate 16 which constitutes the final masher-ricer of the assembly. The mashed and riced potato mass is then delivered through a conduit 17 onto a spreader conveyor 18 which is longitudinally coextensive with the drying drum 11. Flights 19 on the conveyor 18 distribute the mass along the periphery of the drum 11 through an outlet conduit 21.

60 As the potato mash is deposited on the periphery of the drum 11 it appears as a deposit of varying thickness. The initial compaction of the mass takes place by means of an endless belt 22 supported between support rollers 23 and 24. The lower run of the belt 22 defines a convergingly tapered gap 26 extending the full longitudinal di-

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mension of the drum 11 and serves to distribute the mass more uniformly along the entire longitudinal length and to compact it against the surface of the drum 11. Support rollers 23 and 24 are mounted on shafts 27 and 28 respectively which shafts are received in bearings 29 and 31 respectively. The dimensions of the gap 26 are adjustable by supporting the bearings 29 and 31 in adjustable vertical relation through the agency of spaced guides 32 and 33 in which the bearings 29 and 31 are locked in adjustable relationship with respect to the periphery of the drum 11. Any material adhering to the surface of the belt 22 is removed by means of a pair of doctor blades 36 and 37 disposed in spaced relation along the run of the belt 22. The blades 36 and 37 are secured to pivot pins 38 and 39 respectively, the pins being secured to arms 41 and 42 formed with slots 46 and 47. Nut and bolt assemblies 43 and 44 extending through the slots and the frame 10 provide for angular adjustment of the blades 36 and 37 with respect to the belt 22.

After the initially compacted mass passes through the gap 26, it is subjected to further compaction by means of a driven pressure roller 51 mounted on a shaft 52. The roller 51 is resiliently urged toward the periphery of the drum 11 by springs 53 which act against the bearings (not shown) in which the shaft 52 is rotatably mounted. The gap defined between the periphery of the roller 51 and the periphery of the drum 11 is somewhat less than the smallest dimension of the gap 26 existing between the endless belt 22 and the drum 11 so that further compaction occurs by the pressure of the roller 51 against the mass. Any material adhering to the roller 51 is removed therefrom by means of a doctor blade 54 mounted on a pivot pin 56 and having a stud 57 which adjustably locks the doctor blade assembly to the frame 10 through a slot 58.

Further pressure on the mass being dried at the periphery of the drum 11 is applied by means of a second pressure roller 61 mounted on a shaft 62. The roller 51 is resiliently urged toward the periphery of the drum 11 by means of springs 63. The gap defined between the periphery of the roller 61 and the outer periphery of the drum 11 is smaller than the gap defined between the roller 51 and the drum so that further compaction occurs as the drum carries the incompletely dried mass past the roller assembly. A doctor blade 64 mounted on a pivot pin 66 and adjustably secured to the frame 10 by means of a slot 68 and a stud 67 removes any material that may adhere to the periphery of the roller 61.

The partly dried material after smoothing compaction by roller 66 then enters the final drying stage in which most of the remaining moisture is removed. The drum 11, as indicated in FIGURE 1, carries the film of partly dried material past a perforated wall 69 of a drying chamber generally indicated at reference numeral 71, the wall 69 having a shape complementary to the periphery of the drum 11. Heated air is introduced into the drying chamber 71 by means of a blower 72 and an inlet duct 73. A damper 74 disposed within the duct 73 controls the amount of air introduced into the drying chamber 71.

After passing beyond the end of the perforated wall 69, the film carried on the drum 11 is substantially dry, and the material is removed in the form of flakes by means of a flake doctor 76 mounted on a pivot pin 77 which in turn is carried by an arm having an arcuate slot 78. A nut and bolt 79 secures the doctor 76 in adjustable relation with respect to the periphery of the drum 11. It is also possible to advance the doctor assembly in the direction of motion of the drum by providing a series of apertures 81 for the pivot pin 77, and a series of apertures 82 for the nut and bolt 79 so that the doctor blade assembly may be selectively positioned at a variety of positions with respect to the movement of the drum 11.

The doctor blade scrapes off flakes of the dried mate-

rial and deposits them in a chute 83 at the bottom of which there is disposed a flake conveyor 84 which delivers the finished material to suitable packaging apparatus.

FIGURE 2 illustrates a cooking, mashing, and lump separating assembly which can be employed in connection with the drier shown in FIGURE 1. The assembly shown in FIGURE 2 includes a frame 86 having a top closure 87 through which the raw, sliced potatoes are introduced continuously. A cooking zone 88 having a conveyor 89 rotatably supported therein is fed with a suitable source of steam (not shown). The residence time of the potato pieces in the cooking chamber 88 is sufficient to provide the consistency desired for mashing. The conveyor 89 drops the cooked potatoes into a mashing zone where a pair of interengaging toothed wheels 91 and 92, rotating in opposite directions, mash the cooked potatoes, whereupon the mash is delivered into a space 93 existing between a pair of oppositely rotating perforated drums 94 and 96. The space 93 is sufficient to define a passage for lumps occurring in the slurry which are too large to be received through the perforations in the drums 94 and 96. These large lumps and any peelings which may remain in the slurry are dropped onto a peeling and lump removal conveyor 97 which directs these materials to a suitable point of disposal.

Located within the perforate drum 94 is an imperforate rotating cylinder 98, and a similar cylinder 99 is disposed within the confines of the perforate drum 96. The interior cylinders 98 and 99 rotate in the same direction as the respective drums 94 and 96. Material forced through the perforations in the drums is then forced by the rotating cylinders 98 and 99 which about the inner diameters of their respective drums through the perforations and into a collecting space identified at reference numeral 101 where the conveyor flight 13 deliver the material to the drying assembly shown in FIGURE 1.

From the foregoing, it will be understood that the dehydrator of the present invention substantially reduces the manpower required in comparable installations, and produces an improved quality product at a faster rate. It should also be evident that various modifications can be made to the described embodiments without departing from the scope of the present invention.

I claim as my invention:

1. A drier comprising a rotating imperforate drum, feed means arranged to apply a material to be dried to the periphery of said drum, means for heating said drum to thereby form a film of dried material on said periphery, a travelling endless belt mounted in spaced relation with respect to the periphery of said drum and forming with said periphery a convergently shaped gap in the direction of movement of said drum, said gap coextending longitudinally with said drum, and removal means disposed beyond said belt in the direction of rotation of said drum for scraping the resulting film from said drum.

2. The drier of claim 1 which includes at least one press roll intermediate said belt and said removal means, said roll being arranged to compact the layer on said drum during drying thereof, said roll being spaced from said drum by an amount which is less than the minimum spacing of said belt from said drum.

3. The drier assembly of claim 2 including supplementary heating means disposed externally of said drum and positioned intermediate said press roll and said removal means, said supplementary heating means including a perforated wall in parallel spaced relationship to said drum, and means for supplying heated air through said wall at the film of material adhering to said drum.

4. The drier of claim 1 which includes adjustable means for varying the spacing between said belt and the periphery of said drum.

5. The drier of claim 4 which includes at least one press roll intermediate said belt and said removal means in the direction of rotation of said drum, said press roll being

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disposed adjacent said drum and spaced therefrom an amount less than the minimum spacing between said belt and said drum.

6. The drier of claim 5 which includes supplementary heating means disposed externally of said drum and positioned intermediate said roll and said removal means, said supplementary heating means including a perforate wall portion in spaced relation to a portion of the periphery of said drum, and means for supplying heated air through the perforations in said wall.

7. A separator for removing lumps from a slurry comprising a perforated rotating drum, feed means directing said slurry to the outer periphery of said drum, pressure means urging said slurry against the perforations of said drum, said pressure means being slightly spaced from said drum to define a passage for lumps having a size greater than the perforations of said drum, said pressure means urging aggregates of a size not greater than said perforations into the interior of said perforated drum, collector means adjacent said passage for receiving lumps therefrom, and a rotatable imperforate roll disposed within the interior of said drum in abutting relationship with the inner periphery thereof, said roll being arranged to rotate in the same direction as said perforated drum and thereby force portions of said slurry within said drum out through the perforations of said drum.

8. The separator of claim 7 wherein said pressure means comprises a second perforated drum having its axis in parallel spaced relationship to the first mentioned drum, said second drum being arranged to rotate in a direction opposite to the first drum, and a second rotatable imperforate roll mounted within said second drum in abutting relation with the inner periphery thereof, said second roll being arranged to rotate in the same direction as said second perforated drum to thereby force the material received through the perforations of said second drum out of said second perforated drum.

9. An apparatus for removing lumps from slurries and for drying such slurries comprising a rotating perforated drum, feed means directing said slurry to the periphery of said drum, pressure means urging said slurry against the perforations of said drum, said pressure means being slightly spaced from said drum to define a passage for lumps having a size greater than can be accommodated by the perforations of said perforated drum whereby portions of said slurry containing aggregates not greater in size than said perforations are forced into the interior of said perforated drum, collector means adjacent said passage adapted to receive said lumps for disposal thereof, a rotatable imperforate roll mouter interiorly of said perforated drum in abutment with the inner periphery

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thereof to press slurry accumulating within the interior of said drum outwardly through the perforations thereof, a heated, rotating imperforate drying drum, conveyor means arranged to deliver material expressed from said perforate drum onto the periphery of said drying drum, a travelling endless belt, a pair of spaced support rolls receiving said belt therearound, said belt being positioned with respect to said drying drum to provide a convergently shaped gap in the direction of rotation of said drum, and removal means disposed beyond said belt in the direction of rotation of said drum for scraping the resulting dried film from said drying drum.

10. The assembly of claim 9 which includes at least one press roll intermediate said belt and said removal means, said press roll being arranged to compact the layer of material on said drying drum, said press roll being spaced from said drying drum an amount less than a minimum spacing existing between said belt and said drum.

11. The assembly of claim 10 including supplementary heating means disposed externally of said drying drum and positioned intermediate said press roll and said removal means, said supplementary heating means including a perforate wall in parallel spaced relationship to a portion of the periphery of said drum and means for supplying heated air through said perforated wall.

12. The assembly of claim 11 which includes adjustable means for positioning said support rolls with respect to said drier drum and thereby adjusting the spacing between said belt and said drier drum.

13. The assembly of claim 9 wherein said pressure means includes a second perforated drum disposed in parallel spaced relation to the first named perforated drum and arranged to rotate in the direction opposite to the first named perforated drum, a second rotating imperforate drum disposed within the second perforated drum and abutting the inner periphery thereof, said second imperforate roll being arranged to rotate in the same direction as said second perforated drum to thereby force slurry contained within the interior of said second perforated drum outwardly through the perforations thereof.

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