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H. M. BARNETT ET AL

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PULP WASHER

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2 Sheets-Sheet 2

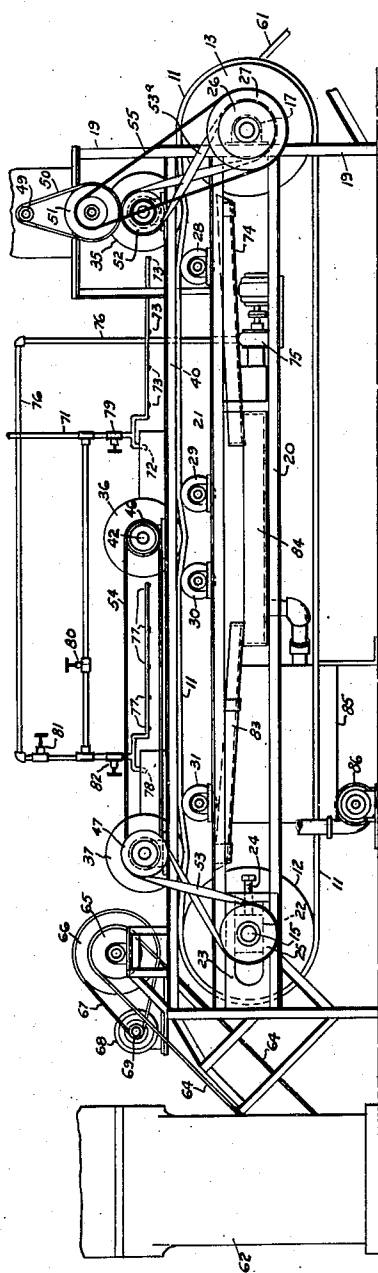


Fig. 3.

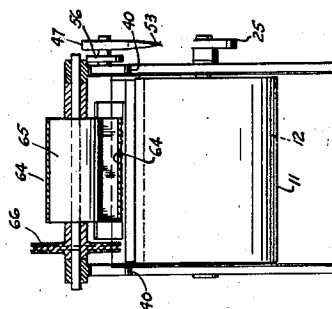


Fig. 5.

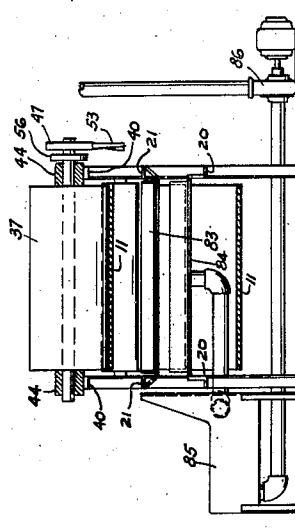


Fig. 4.

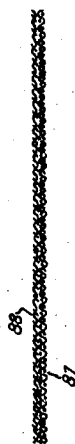


Fig. 6.

INVENTORS
HAROLD M. BARNETT
RUPERT C. MOSHER
BY
Minor L. Hartmann
ATTORNEY.

UNITED STATES PATENT OFFICE

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PULP WASHER

Harold M. Barnett, Long Beach, and Rupert C. Mosher, Downey, Calif.; said Mosher assignor to said Barnett

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6 Claims. (Cl. 100—37)

1

This invention relates to a machine for washing out enmeshed particles from vegetable pulp and the like.

Our machine is particularly adapted for washing out carotene-containing particles from pulped carrots and the like. The carotene of carrots and of other carotene-containing vegetables, is, for the most part, segregated in the vegetable in concentrated particles or crystals, enmeshed in the cellular plant structure. When the fibrous cellular structure of the carrot is disintegrated or pulped, the carotene-containing particles may be mechanically separated therefrom, and it is the object of this invention to provide a machine for continuously separating these carotene particles or carotene-containing particles from the pulp of the vegetable.

Our invention will be understood by reference to the accompanying drawings forming part of these specifications in which

Fig. 1 is a plan view of one form of our machine;

Fig. 2 is a side elevation of the same;

Fig. 3 is a side elevation from the opposite side from Fig. 2, with certain details omitted to better show the arrangement of driving means;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a cross-section of a portion of the foraminous belt showing details thereof.

In general our machine consists of a horizontal foraminous conveyor belt upon which a pulped vegetable material is delivered from a mill, with rollers for successively squeezing out the liquid naturally in the pulp and also that which is sprayed upon the pulp as it passes on the belt intermediate the rollers, with means for turning over and agitating the pulp, and for collecting liquid with suspended solids which pass through the belt. Referring to the drawings, the foraminous belt 11 is supported in horizontal position on end rollers 12 and 13 mounted on shafts 14 and 15. The shaft 14, at the discharge end of the machine, is supported by bearings 17 attached to end vertical members 18 and 19 of the main frame of the machine, and the shaft is extended for mounting drive pulleys 26 and 27 as detailed below. The shaft 15, at the feed end of the belt is supported in bearings 22 arranged to be adjustably attached to the main frame side members 20 and 21 by means of the belt tightener means 23 with tightening

2

screws 24. The shaft 15 is also extended for mounting the drive pulley 25.

The upper run or stretch of the foraminous belt 11 is supported by rollers 28, 29, 30, 31 mounted on bearings fastened to the main frame side members 21, and disposed so that support roller 28 is near a press roller 35 near the discharge end of the machine; support rollers 29 and 30 are on either side of intermediate press roller 36; and support roller 31 is near feed press roller 37. The press rollers 35, 36, and 37 bear down on top of the upper stretch of the belt 11 and are supported on the top frame members 40 by shafts 41, 42, and 43, respectively, mounted in bearings 44.

The main belt 11 is driven by a motor 48 having a drive pulley 49 with belt 50 to a speed reducing pulley 51 which in turn by belt 55 drives the pulley 27 attached to the shaft 14 of the roller 13, which carries the foraminous belt 11 at the discharge end. Press roller 35 is driven through its attached pulley 52 by crossed belt 53a from pulley 26 on the shaft 14 of roller 13. The feed end roller 12 is driven by the main belt 11, and the pulley 25 on its shaft 15 drives the press roller 37 through its attached pulley 47 by crossed belt 53. The intermediate press roller 36 is driven by the pulley 46 on its shaft 42 by belt 54 from another pulley 56 on the shaft 43 of the feed end press roller 37.

The press rollers 35, 36, 37 are preferably made of wood; and doctor or scraper blades 59, 57 and 58 are provided for each to remove material which sticks to their surfaces. A distributor 59 is provided behind press roller 37 to collect the caked pulp scraped off the roll and break it into lumps and redistribute it toward the center of the main belt 11; likewise a distributor 60 is provided behind press roller 36 for the same purpose. The relatively dry material scraped from press roller 35 drops onto the end of belt 11 and is removed by a scraper 61 placed adjacent the belt as it passes over the roller 13.

Pulped vegetable material, produced in the grinder shown conventionally as 62, driven by the motor 63, is carried to the foraminous belt 11 by the separate conveyor which is shown for illustration as an inclined belt 64 on an upper drum 65 rotated through the pulley 66 and the belt 67 and the drive pulley 69 of the motor 68 mounted on the main frame at the feed end. A scraper 70 is provided to remove the pulp from the conveyor belt 64 and drop it on to the main belt 11.

Nozzles are arranged to distribute water or

other liquids on the pulped material as it travels along with the main belt 11. As shown, fresh water from pipe 71 is sprayed on to the material following the intermediate roller 36 through nozzles 72 and 73, and is collected beneath the belt 11 (top run) by a collecting pan 74 which drains to a pump 75 which discharges into the pipe line 76, which carries the washings or fresh water or a mixture of them, to spray nozzles 77 and 78, valves 79, 80, 81, and 82 being provided for regulating the flow of liquid to the several sprays. Collecting pans 83 and 84 are provided beneath the belt 11 for collecting the liquid from press rollers 37 and 36, and from the portion of the belt 11 between them, and a reservoir 85 is provided for storage of the liquid from which it may be pumped, as required, by pump 86 to other vessels, not shown.

The main belt 11 may consist of any suitable foraminous material which has openings of proper size to let the desired fine particles go through, but fine enough to hold back the undesired larger particles of pulp. We have used various kinds of woven metallic screens but prefer a relatively coarse wire cloth belt 87 with a cotton filter cloth covering 88 as shown in Fig. 6. This provides a non-stretching belt base having sufficient strength to permit the rollers to be pressed against it to squeeze out the liquid from the pulp, and the cotton or other fibrous fabric may be selected for suitable fineness of openings. The fabric may be easily renewed.

The operation of the machine will be illustrated by its use in removing carotene-containing particles from carrot pulp, which is dropped onto the main foraminous belt 11 from the conveyor belt 64 leading from the grinder 62, and much of its liquid content is squeezed through the belt and collects in the pans 83 and 84 below. The pulp is caked by the squeezing action between the belt 11 and the press roller 37, and if the latter is of wood, or has a wood surface, as we prefer, the pulp adheres to the roll surface until scraped off by a doctor blade. It falls back in lumps onto the main belt, and water or dilute washings (from later stages) is forcibly sprayed through nozzle 78 on the lumps as these are forced toward the center portion of the belt by the distributor 59. The other nozzles, represented as 77, are directed toward the oncoming lumps of more or less saturated pulp, the direction of impingement and amount of liquid being adjusted to avoid driving the pulp down against the cloth cover 88 of the belt thereby forming a filtering bed. The colloidal or semi-colloidal particles containing the carotene must be mechanically disentangled from the pulp and separated therefrom by being forced through the belt; any compacting of the pulp on the cloth is to be avoided, because the colloidal particles will be held in the matted material.

The combined effects of forming a compressed pulp solid adhering to the wooden rollers which is broken up into lumps followed by further breaking down these lumps with water jets to effect a maximum mechanical washing out of the enmeshed colloidal particles bearing the carotene, without forming a filtering mat on the foraminous belt are important to the success of this process for separating carotene.

The wetted pulp is then passed through the intermediate press roll 36, squeezing out the water and the suspended colloidal carotene particles, which are collected in the pan 84; the pulp is again caught up by the wood roller and scraped

off, and the broken lumps sprayed by fresh water from nozzle 72. The lumps are steered toward the center of the belt 11 by the distributor 60, and further forcibly sprayed, as before, by water jets from nozzles 71. The water is finally squeezed out by passing the pulp under press roll 35, the semi-dry pulp cake being scraped off the wooden roll by scraper 89, and then dropped onto the belt 11, and finally removed by the scraper 61 as the belt passes over the discharge roller 13. The liquid which goes through the belt 11 between press rolls 35 and 36, and that which is squeezed out by the press roll 35, is collected in the pan 74, and since this is usually dilute in carotene suspension, it may be recirculated by the pump 75 to pipe line 76, where it again is used to wash out carotene from the fresher material. It is important in the subsequent concentration of carotene that it be associated with a minimum amount of water. In starting, or at other times, as may be desired, fresh water may be used in all or a selected portion of the spray nozzles.

While we have described a preferred form of our invention, we do not wish to be limited to the particular embodiment described, but restrict our invention only insofar as required by the prior art and the spirit of the appended claims.

We claim:

1. In a vegetable pulp washing machine of the class described, the combination of a foraminous conveyor belt, end pulleys for said belt, upper and lower pressing rollers extending across the top run of said belt adapted to press therebetween vegetable pulp carried on its surface, scraping distributors following each of said upper rollers except the last one adapted to break up the caked pulp and to redistribute it on said belt, and hydraulic sprayers disposed between said upper rollers adapted to hydraulically agitate and to wash the pulp on said belt.

2. In a vegetable pulp washing machine of the class described, the combination of a foraminous conveyor belt, end pulleys for said belt, upper wood-surfaced rollers extending across the top run of said belt adapted to press upon vegetable pulp carried on its surface and to pick the caked pulp off the belt, means to scrape the cake off said upper rollers, distributors following each of said rollers except the last one adapted to break up the caked pulp and to redistribute it on said belt, and hydraulic sprayers disposed between said upper rollers adapted to hydraulically agitate and to wash the pulp on said belt.

3. In a vegetable pulp washing machine of the class described, the combination of a foraminous conveyor belt, end pulleys for said belt, upper rollers extending across the top run of said belt adapted to press upon vegetable pulp carried on its surface, distributors following each of said rollers except the last one adapted to break up the caked pulp and to redistribute it to the center portion of said belt, hydraulic sprayers disposed between said rollers adapted to hydraulically agitate and to wash the pulp on said belt, and means to collect the liquid passing through the top run of said belt.

4. In a vegetable washing machine of the class described, the combination of a foraminous conveyor belt, end pulleys for said belt, upper wood-surfaced rollers extending across the top run of said belt adapted to press upon a vegetable pulp carried on its surface and to pick the caked pulp off the belt, means to scrape the cake off said rollers, distributors following each of said rollers

5

except the last one adapted to break up the caked pulp and to redistribute it to the center portion of said belt, hydraulic sprayers disposed between said rollers adapted to hydraulically agitate and to wash the pulp on said belt, and pan means to separately collect the liquid passing through selected portions of the top run of said belt.

5. In a vegetable pulp washing machine of the class described, the combination of a foraminous conveyor belt, end pulleys for said belt, upper wood-surfaced rollers extending across the top run of said belt adapted to press upon a vegetable pulp carried on its surface and to pick up the caked pulp off the belt, means to scrape the cake off said rollers, distributors following each of said rollers except the last one adapted to break up the caked pulp and to redistribute it to the center portion of said belt, hydraulic sprayers disposed between said rollers adapted to hydraulically agitate and to wash the pulp on said belt, pans to separately collect the liquid through selected portions of the top run of said belt, and pumping means adapted to recirculate the liquid

6

collecting in some of said pans through a portion of said sprayers.

6. In a vegetable pulp washing machine of the class described, the combination of a foraminous belt, end pulleys for said belt, upper wood-surfaced rollers extending across the top run of said belt adapted to press upon a vegetable pulp carried on its surface and to pick the caked pulp off the belt, means to scrape the cake off said rollers, distributors following each of said rollers except the last one adapted to break up the caked pulp and to redistribute it on said belt, liquid sprayers disposed between said rollers adapted to hydraulically agitate and to wash the pulp on said belt, pans to separately collect the liquid passing through the top run of said belt in the feed portion and in the remaining discharge portion of the belt, hydraulic means to deliver fresh water to said sprayers over the discharge end pan, and other hydraulic means to recirculate the liquid collected in said discharge end pan to said sprayers over said feed end pans.

HAROLD M. BARNETT.
RUPERT C. MOSHER.