

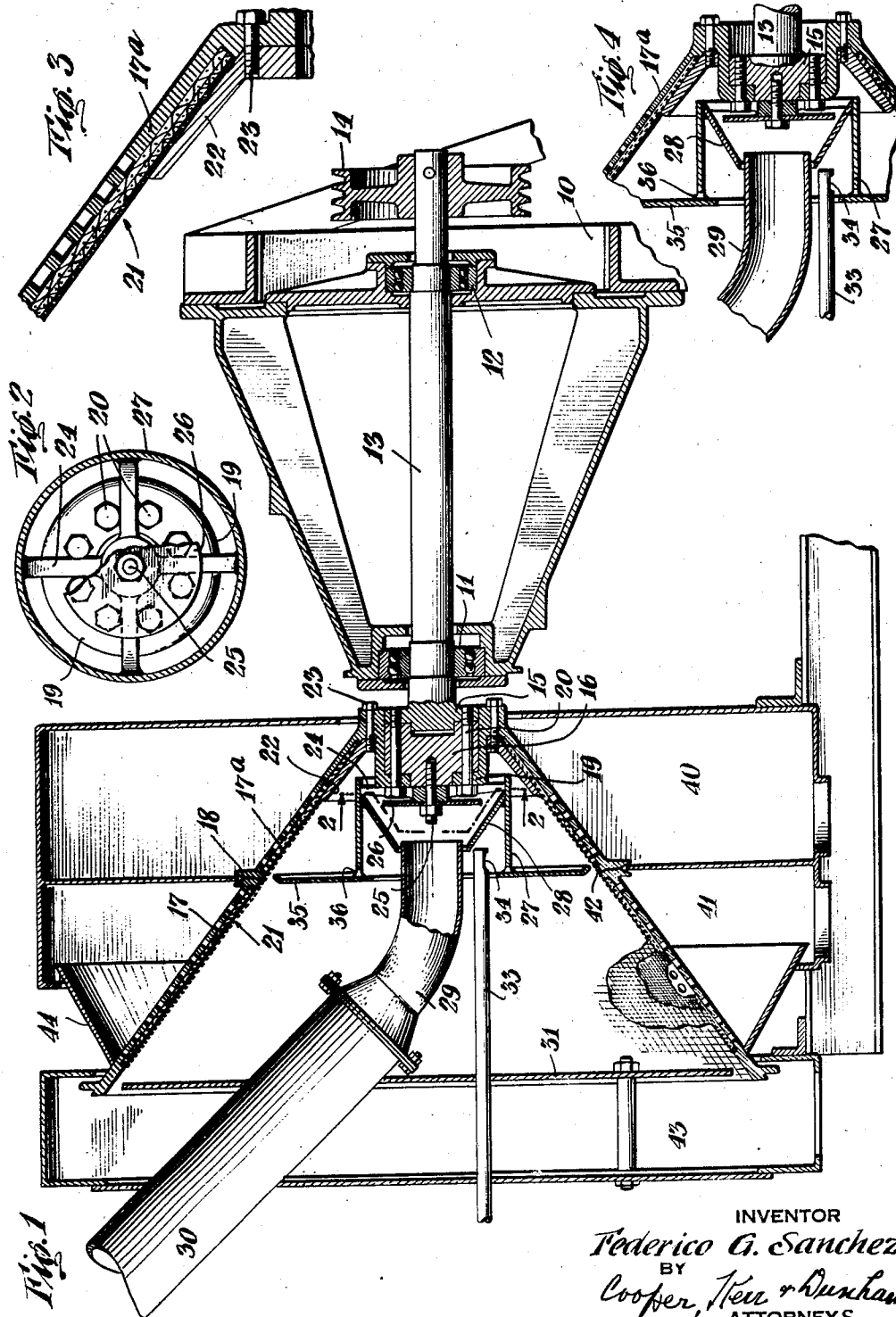
Nov. 30, 1943.

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2,335,794

CONTINUOUS ACTION CENTRIFUGAL SEPARATOR

Filed Oct. 26, 1938



UNITED STATES PATENT OFFICE

2,335,794

CONTINUOUS ACTION CENTRIFUGAL
SEPARATOR

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Application October 26, 1938, Serial No. 236,997

6 Claims. (Cl. 210—68)

This invention relates to improvements in continuous action centrifugal separators and more particularly to improvements in a separator shown in my Patent No. 2,096,594.

One of the chief difficulties encountered in the use of centrifugal separators, particularly in those of the continuous type used for the purging of massecuite and the drying of sugar crystals was that a considerable quantity of crushed sugar crystals was left in the molasses. Other difficulties were experienced in obtaining the proper washing of the sugar crystals. Experience has shown that extreme care must be taken to avoid grinding and crushing of sugar crystals in the massecuite. If such grinding and crushing occurs to any substantial extent, the purged molasses will be found to contain an appreciable amount of sugar which is a positive loss. Furthermore, in the washing of the sugar crystals, after most of the molasses has been purged therefrom, difficulties have been encountered in obtaining thorough washing of the crystals. Such difficulties were apparently due to the splashing and atomizing of the water upon impinging the crystal layer on the basket.

The present invention has for one of its objects the provision of a construction which will minimize, if not wholly eliminate the undesired grinding and crushing of the sugar crystals.

A further object of the present invention resides in the provision of a construction which will provide for a more uniform and thorough washing of the sugar crystals.

A further object of the present invention resides in the provision of novel massecuite supplying means for a continuous conical centrifugal separator wherein provision is made for accelerating the incoming stream of massecuite gradually up to substantially the speed of the basket and affording delivery of the massecuite on the basket without splashing and without grinding and crushing of the sugar crystals.

A further object of the present invention resides in the provision of means for supplying wash water to the sugar crystals at the precise zone where washing is required.

A further object of the present invention resides in the provision of novel wash water supplying means which will accelerate the incoming water to a rotational speed approximating that of the basket speed whereby splashing and atomizing of the water is minimized.

A further object of the present invention resides in improved baffling means to prevent the flow of air out of the sides of the molasses en-

trapping housing and thereby prevent waste and loss of molasses.

A further object of the present invention resides in improved means for securing the screens in position in the basket which means will afford easy removal and replacement of the screen.

A further object of the present invention resides in the provision of means to enable liquid, substantially free from wash water, to be entrapped in one chamber and to enable liquid containing wash water to be entrapped in a separate chamber.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawing which shows by way of illustration a preferred embodiment and the principle thereof and what I now consider to be the best mode in which I have contemplated of applying that principle. Other embodiments of the invention employing the same or equivalent principle may be used and structural changes made as desired by those skilled in the art without departing from the present invention and within the spirit of the appended claims.

In the drawing:

Figure 1 shows a transverse vertical sectional view of my improved centrifugal separator;

Fig. 2 is a detail view taken on line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is an enlarged detailed view of certain parts shown in reduced scale in Fig. 1; and

Fig. 4 shows a slightly modified arrangement of massecuite and water supply devices.

In general my improved continuous action separator comprises a cantilever supported rotatable basket which, at the larger end, is spokeless and open. A feed conduit for the massecuite extends into the basket through this large open end. The wash water supply pipe also extends through the open end and devices are provided for accelerating the incoming massecuite and wash water and delivering the same to the rotating basket in the form of films which move in a rotational direction at about basket speed.

In more detail, in the drawing, 10 designates the supporting frame of the apparatus. This frame supports two bearings designated 11 and 12. The bearings in turn support the drive shaft 13. The drive shaft 13 is provided with a pulley 14 adapted to be driven by a belt from a suitable motor not shown. The opposite end of shaft 13 is provided with a driving flange 15. Abutting this driving flange is a filler block 16. The conical basket is preferably made in two parts design-

nated 17 and 17a. Part 17 is a welded steel plate which is in turn welded to part 17a, the welding being designated at 18. Part 17a is preferably a machined steel casting which has a turned back flange portion 19 which receives fastening bolts 20, which bolts pass through holes in the filler block 16 and thread into the driving flange 15. Parts 15, 16, 19 and 20 afford what might be termed a "cantilever form of support" for driving the basket from the shaft 13. Such a construction provides for the complete support and drive for the basket at the smaller end. Accordingly, free space is provided within the basket at its axis at a point slightly spaced from the supporting parts. The conical basket 17 is perforated in the usual way and the upper part of the 17a section is likewise perforated. Within the perforated basket 17a, there are placed the customary multiple screens designated 21. These screens are clamped near the apex of the conical basket by a conical member 22. Member 22 is held in position by bolts 23 which are accessible for removal from the exterior of the apparatus. By merely removing the member 22 the screens may be removed and replaced. Abutting the end of the filler block 16 is a spider member 24. This spider is clamped to the filler block 16 by a bolt 25 and this bolt 25 secures in position a disk 26 which covers the heads of bolts 20. The arms of the spider 24 clear the heads of bolts 20 (see Fig. 2) and at their periphery such arms are fastened in any suitable way as by welding to a cylindrical member 27. Secured to member 27 is a conical member 28. Conical member 28 is centrally apertured to provide for the entrance of a massecuite feed pipe or conduit 29. The massecuite feed-pipe extends out through the open end of the conical basket and through the sugar collecting chamber 43. Preferably the massecuite supply pipe 29 is made detachable from a larger pipe 30 and around the pipe 30 is a removable two part disk 31 which closes up the central open part of the conical basket, leaving an annular opening near the basket.

When in use the members 28 and 27 rotate in unison with the conical basket. The massecuite descends by gravity in pipe 30 and is delivered within the conical member 28 at the smaller end thereof by the pipe 29. In view of the cantilever support and drive for the basket it is possible to utilize a pipe 29 of comparatively large diameter. Such large diameter pipe is required for handling the quality of massecuite that the machine is adapted to handle. Such supply pipe in fact may approximate in its outer diameter a size slightly smaller than the smallest diameter of the delivery cone 28. The supply pipe may accordingly deliver massecuite in proper amounts coaxially into the completely unobstructed open end of the cone. Upon falling upon the rotating cone the massecuite stream is gradually accelerated in speed. Centrifugal action advances the massecuite in a thin film along the conical member 28 and the stream accelerates speed gradually, being finally delivered as a film over the inner part of the cylinder 27 and to the smooth surface of member 22. The surfaces of 28 and 27 and 22 are all made smooth to minimize any grinding action on the sugar crystals in the massecuite stream or film.

The above arrangement of parts provides for delivering the massecuite on to part 22 at a speed which approximates the speed of the member 22 at the receiving point. The massecuite then flows along the smooth member 22 and is again

accelerated in speed as it moves outward or to the left. When it finally reaches the screened portion of member 17a the massecuite is moving substantially with the same rotational speed as the rotational speed of the screens. By this arrangement of massecuite supplying means there is substantially no peripheral slip of the massecuite upon reaching the screens. In this way grinding and crushing effects upon the sugar crystals in the massecuite are minimized. Furthermore, the massecuite supplying arrangement described obviates any splashing of the massecuite either upon the screens or upon the smooth conical member 22. While member 27 provides a short annular flange at the end of conical member 28, this annular flange portion together with 28 will hereinafter in the claims be termed "a conical member." It will be obvious that by shortening the length of the filler block 16 the conical member 28 could be disposed to extend to the end of the annular member 27. Such an arrangement is shown in Fig. 4 wherein the filler block 16 is wholly omitted and member 17a is directly bolted to flange 15. The conical member 28 is here shown as extending to the end of the cylindrical member 27.

Water supply

Experience has shown that to secure uniformity of washing of the sugar crystals, provision should be made for supplying the wash water at a definite zone and the water should be supplied in close proximity to the layer of sugar crystals on the screen. Poor washing will be attained if the water is indiscriminately splashed on the crystal layer. Atomizing of the water enroute to the crystal layer should also be prevented. 33 designates a water supply pipe. This pipe passes through plate 31 and extends to a point within member 27. There is preferably provided a port 34 in pipe 33 facing in the direction of rotation of 27. Attached to the end of member 27 is an annular disk 35. Water outlet ports in the form of narrow slits are provided at 36 between the ends of member 27 and the right hand side of the annular disk 35. Members 35, 27 and 28 form a rotating water container and water entering at 34 falls upon the rotating annular cylinder 27. The water is then accelerated in speed and is distributed in a thin layer around the interior of the cylinder 27. The water in a thin film flows out the slits 36 and on to the right hand side of the disk 35. The rotation of this disk therefore accelerates the water and the water is ultimately delivered off the periphery of the disk and on to the sugar crystal layer on the screen in such a way that the rotational speed of the water approximates that of the sugar crystals. By delivering the water in this manner, thorough washing of the sugar crystals is secured and all atomizing and splashing effects are obviated.

In the operation of the apparatus molasses substantially free from wash water is entrapped in housing 40. Molasses containing the wash water is entrapped in housing 41. 42 is a seal or dam to prevent the rich molasses from flowing along the inner face of the basket into 41. This seal 42 serves the same purpose as the seal 53 in Fig. 5 of my Patent No. 2,096,594. The dry sugar crystals will be delivered over the outer edge of the conical basket and will be caught in a sugar entrapping housing 43. It will be noted that the disk 35 delivers the wash water to the crystal

layer on the basket at approximately the partition or dividing point between the green molasses entrapping chamber 40 and the other molasses chamber 41. By delivering the water at this point or zone, the water will pass out into the second chamber 41 and will not dilute to any great extent the green molasses entrapped in chamber 40.

With the high rotational speed of devices in this class, air currents of considerable intensity are set up by skin friction of the rotating basket. These air currents tend to pick up molasses drops as these drops are purged and to prevent the molasses drops from being carried out with the air currents I preferably provide baffling means 44 disposed in the relation shown. Conical member 44, which is at an angle of about 60 degrees with the basket, diverts the air currents and also diverts drops of molasses, causing them to impinge upon the inside rearwardly of the housing 41.

Disk 26 provides a smooth face for the inner end of the shaft and mounting and prevents grinding action by the heads of the bolts upon the incoming massecuite.

While in the foregoing description reference has been made to massecuite, sugar crystals and molasses, it will be appreciated that the apparatus is equally adaptable for use with other materials. "Massecuite" as herein used should accordingly, be construed to mean any mixture of solids and liquids which are to be separated. The term "crystals" is to be construed to mean any solids in the mixture or the solids after separation. The term "molasses" is to be construed to mean the liquid in the mixture before or after separation.

What I claim is:

1. A continuous action centrifugal separator comprising a screened frusto-conical basket continuously rotatable about a substantially horizontal axis, driving means connected to the smaller end of said basket for supporting and rotating the same, said driving means being located substantially entirely outside said basket, a frustro-conical distributing element rotatable with and received coaxially within said basket, the space between said distributing element and said basket being entirely unobstructed, the larger end of said distributing element being directed towards the smaller end of said basket, the larger end of said distributing element being open around substantially its entire inner edge which constitutes its discharge end, a massecuite supply pipe projecting into the larger end of said basket and delivering into the inside of and through the smaller end of said distributing element, a chamber located around said basket for receiving molasses discharged through the screened portion thereof, a receptacle for receiving sugar delivered beyond the larger end of said basket, and inclined baffle means arranged intermediate said chamber and receptacle and adjacent the larger end of said basket to prevent undesired intermixture of sugar and molasses.

2. A continuous action centrifugal separator comprising a screened frusto-conical basket continuously rotatable about a substantially horizontal axis, driving means connected to the smaller end of said basket for supporting and rotating the same, said driving means being located substantially entirely outside said basket, a frustro-conical distributing element rotatable with and received coaxially within said basket, the space

between said distributing element and said basket being substantially unobstructed, the larger end of said distributing element being directed towards the smaller end of said basket, the larger end of said distributing element being open around substantially its entire inner edge which constitutes its discharge end, a massecuite supply pipe projecting into the larger end of said basket and delivering into the inside of and through the smaller end of said distributing element, a chamber located around said basket for receiving molasses discharged through the screened portion thereof, a receptacle for receiving sugar delivered beyond the larger end of said basket, means adjacent the larger end of said basket to direct air currents into said chamber and receptacle to prevent undesired intermixture of sugar and molasses.

3. A continuous action centrifugal separator comprising a screened frusto-conical basket continuously rotatable about a substantially horizontal axis, driving means connected to the smaller end of said basket for supporting and rotating the same, said driving means being located substantially entirely outside said basket, a frustro-conical distributing element rotatable with and received coaxially within said basket, the space between said distributing element and said basket being substantially unobstructed, the larger end of said distributing element being directed towards the smaller end of said basket, the larger end of said distributing element being open around substantially its entire inner edge which constitutes its discharge end, a massecuite supply pipe projecting into the larger end of said basket and delivering centrally into the inside of and through the smaller end of said distributing element, a chamber located around said basket for receiving molasses discharged through the screened portion thereof, a receptacle for receiving sugar delivered beyond the larger end of said basket, and means arranged intermediate said chamber and receptacle and adjacent the larger end of said basket to direct air flow into said chamber to prevent undesired intermixture of sugar and molasses.

4. A continuous action centrifugal separator comprising a screened frusto-conical basket continuously rotatable about a substantially horizontal axis, driving means providing a cantilever support for and connected to the smaller end of said basket for rotating the same, said driving means being located substantially entirely outside said basket, a frustro-conical distributing element rotatable with and received coaxially within said basket, the space between said distributing element and said basket being substantially unobstructed, the larger end of said distributing element being directed towards the smaller end of said basket, the larger end of said distributing element being open around substantially its entire inner edge which constitutes its discharge end, a massecuite supply pipe projecting into the larger end of said basket and delivering into the inside of and through the smaller end of said distributing element, a chamber located around said basket for receiving molasses discharged through the screened portion thereof, a receptacle for receiving sugar delivered beyond the larger end of said basket, and inclined baffle means arranged intermediate said chamber and receptacle and adjacent the larger end of said basket to prevent undesired intermixture of sugar and molasses.

5. A continuous action centrifugal separator comprising a screened frusto-conical basket hav-

ing an internally unobstructed larger end continuously rotatable about a substantially horizontal axis, driving means connected to the smaller end of said basket for supporting and rotating the same, said driving means being located substantially entirely outside said basket, a frustro-conical distributing element rotatable with and received coaxially within said basket, the space between said distributing element and said basket being substantially unobstructed, the larger end of said distributing element being directed towards the smaller end of said basket, a massecuite supply pipe projecting into the larger end of said basket and delivering into the inside of and through the smaller end of said distributing element, a chamber located around said basket for receiving molasses discharged through the screened portion thereof, a receptacle for receiving sugar delivered beyond the larger end of said basket, means arranged intermediate said chamber and receptacle and adjacent the larger end of said basket to direct a flow of air into said chamber to prevent undesired intermixture of sugar and molasses.

6. A continuous action centrifugal separator

comprising a screened frusto-conical basket having an imperforate portion adjacent its smaller end continuously rotatable about a substantially horizontal axis, driving means connected to the smaller end of said basket for supporting and rotating the same, a frustro-conical distributing element rotatable with and received coaxially within said basket, the space between said distributing element and said basket being substantially unobstructed, the larger end of said distributing element being directed towards the smaller end of said basket and coplanar with said imperforate portion thereof, a massecuite supply pipe projecting into the larger end of said basket and delivering into the inside of and through the smaller end of said distributing element, a chamber located around said basket for receiving molasses discharged through the screened portion thereof, a receptacle for receiving sugar delivered beyond the larger end of said basket, and inclined baffle means arranged intermediate said chamber and receptacle and adjacent the larger end of said basket to prevent undesired intermixture of sugar and molasses.

FEDERICO G. SANCHEZ.

CERTIFICATE OF CORRECTION.

Patent No. 2,335,794.

November 30, 1943.

FEDERICO G. SANCHEZ.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 71, claim 2, for "bsaket" read --basket--; page 4, first column, line 12, claim 5, after "basket," insert --the larger end of said distributing element being open around substantially its entire inner edge which constitutes its discharge end,--; and second column, line 6, claim 6, after "same," insert --said driving means being located substantially entirely outside said basket,--; line 13, same claim, after "thereof," insert --the larger end of said distributing element being open around substantially its entire inner edge which constitutes its discharge end,--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of May, A. D. 1944.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.