

Dec. 11, 1951

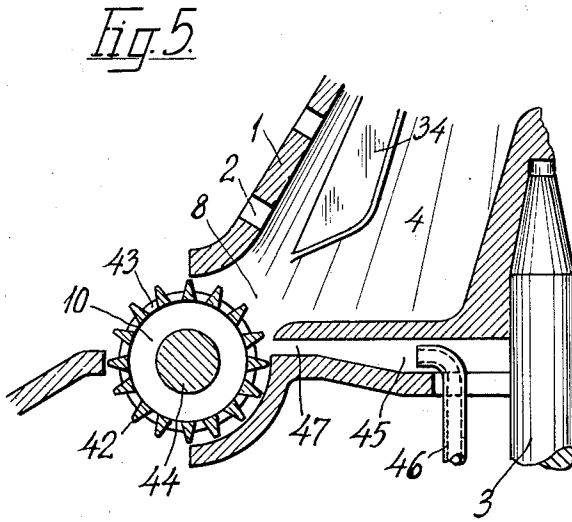
S. S. C. FLEISCHER

2,578,468

CONTINUOUS CENTRIFUGAL SEPARATOR

Filed Jan. 13, 1947

2 SHEETS—SHEET 2



Inventor

Svend S. C. Fleischer

by *H. B. Bevilson & Co.*
attys.

UNITED STATES PATENT OFFICE

2,578,468

CONTINUOUS CENTRIFUGAL SEPARATOR

Svend Sigurd Christie Fleischer,
Charlottenlund, DenmarkApplication January 13, 1947, Serial No. 721,698
In Great Britain January 14, 1946

2 Claims. (Cl. 210—74)

1

The present invention relates to a straining separator in which the solid matter strained from the material to be separated is removed continuously from the separator.

The common straining separators operate discontinuously, it being necessary to stop the separator whenever the strained material is to be removed from the separator and new material introduced therein. Accordingly, the out-put of such a discontinuously operating separator is comparatively small.

Straining separators that operate continually are, however, known, but these known separators are arranged for the ejection at a certain speed of the material from the separating chamber, and the separator has no means for altering this speed. There is thus no possibility of obtaining a satisfactory result if the consistency of the material to be separated is to be varied, which to some extent will be the case when the material consists for instance of textile raw material or other fibrous matter such as wool, and in the treatment of such materials it will not be possible to ensure a degree of dryness in the material corresponding to what is desired prior to the ejection from the separator chamber. Also granular materials may vary greatly in consistency and the apparatus may be used in the sugar industry.

The object of the present invention is to remedy these drawbacks in a straining separator, in which the solid matter strained from the material to be separated is removed continuously from the separator, and the drawbacks are mainly remedied by the separator, for removal of the solid matter (strained from the material to be separated) from the separating chamber by means that are so formed that the speed of the material to be separated from the separating chamber, may be regulated.

In a preferred manner of performing the invention the separator drum is provided with a wall in the shape of a truncated cone and has at its base along its outer periphery a number of ejection apertures, and according to the invention these apertures are provided with means that serve to vary the velocity of flow through the said apertures. In this manner it is possible to arrange the separator, or change it, to suit any different kind of material, and in each separate instance it is possible to obtain the most favourable separation of any material. According to the invention the said means may comprise conveyor members so formed that the material to be separated can be removed continuously,

2

and this means may be adjusted to remove the material at a suitable speed. Furthermore the feeding members may be formed in such a manner that they can be adjusted during operation.

5 In this manner it is possible not only to adjust the separator to such a speed of operation that the material remains within the separator chamber for a sufficiently long time to separate all the liquid from the solid matter so as to obtain 10 a suitable degree of dryness, but likewise that the conveyor members may be adjusted to varying consistencies of the material to be separated when the consistency varies during the separating period.

15 The said conveyor members may be of different kinds. For instance they may comprise rotatable rollers arranged within or adjacent the ejection apertures, and the surface of these rollers may be formed to engage the strained 20 material while rotating to move it away from the apertures. In the treatment of textile material or similar fibrous matter the surface of the drums may be provided with projecting means for engaging the fibrous matter.

25 The wall of the separator drum may be perforated to allow the liquid separated from the solid matter to be ejected through the drum wall, but according to the invention the rotating rollers may likewise have a perforated surface so that 30 the liquid is ejected through these rollers when they are simultaneously arranged in such a manner in relation to the ejection apertures that they are rotated so as to convey the remaining solid substance in a direction opposite the ejection 35 direction, or in a direction at an angle to the ejection direction.

If granular material is to be treated, or more or less plastic materials, it is preferable to provide the said rollers with a perforated surface 40 provided with outwardly open chambers or cells that engage and remove the strained solid material. These chambers or cells may according to the invention be obtained by providing the roller surface with a coating of wire gauze. Furthermore, there may be placed guide members 45 for the flowing liquid within the rollers. In some instances it may be desired to supply the separator with special liquids in order to be able either to rinse the perforated rollers, or to subject the material to a special treatment. The separator may then be provided with means for 50 supplying the special liquid to the conveyor members, or to shutter members for the ejection apertures from the separating chamber.

The rollers may according to the invention be

3

rotated by means of an independent operating mechanism for variable speed, for instance a variable speed electric motor, but likewise according to the invention the rollers may be operated by means of the driving mechanism of the separator through suitable transmission means for variable speed.

If the separator is intended for a material containing fibrous substances with long fibres, its separator chamber is, according to the invention, provided with guide members arranged on the inner wall of the separator chamber adjacent the ejection apertures, or there may be provided rotatable guide rollers, that guide the separator material towards the ejection apertures.

When the liquid is to be separated from the solid matter through the wall of the separator drum, the separator chamber is, according to the invention, evenly curved along its outer periphery and extends somewhat beyond the ejection apertures.

The invention is illustrated in the accompanying drawing in which

Fig. 1 shows one manner of constructing a separator according to the invention, seen partly in section of view on the axis of rotation,

Fig. 2 a cross section on line 2—2 in Fig. 1,

Fig. 3 a modified manner of construction of a separator according to the invention, likewise partly in section viewed on the axis of rotation,

Fig. 4 a top elevation of same,

Fig. 5 a detail section showing another modified form of the invention.

Referring to the manner of construction illustrated in Figs. 1 and 2, the separator is provided with a drum 1 formed as a truncated cone, the outer wall of which may be perforated with holes 2, or is formed as a strainer. The drum 2 is carried by a spindle 3 that is actuated to rotation by means of a driving mechanism not shown in the drawing. The material to be separated is conveyed into the separator chamber 4 of the separator through an inlet or hopper 5, and the incline of the drum wall is such that the material to be separated when conveyed into the chamber 4 slides down towards the outer periphery at a suitable speed.

The separated liquid ejected from the chamber 4 through the holes 2, or the strainer, is collected in a container 6 having a discharge pipe 7.

Close to the outer periphery of the separator chamber 4 the separator drum 1 is provided with ejection apertures 8 through which the separated solid matter of the material is discharged. In Fig. 2 the ejection apertures 8 are indicated by means of dot-and-dash lines. The ejection apertures 8 are provided with means so formed that they are able to vary the speed of flow through the apertures, so that there is imparted a suitable resistance against the ejection of the material. The incline of the separator drum wall and the resistance against the ejection of the material through the apertures 8 is adjusted in such a manner to allow the material to remain for so long a time within the separator chamber that it becomes suitably dry. The ejected solid matter of the material to be separated is collected in a container 9. The means mentioned for controlling the apertures 8 may comprise a conveyor device for removing the strained solid matter at a suitable speed.

In the manner of construction illustrated in Figs. 1 and 2 the means for reducing the ejection apertures 8, or for varying the speed of flow through these apertures, consist of rotatable

4

rollers 10 arranged adjacent the apertures and displaceable more or less in relation hereto, or they may be rotated at a suitable speed. The cylindrical surface of these rollers 10 may either be smooth, or they may be provided with spikes 42, see Fig. 5, or they may be covered with a frictional coating of, for instance rubber, dependent on the character of the material to be treated in the separator. The rollers may be hollow and provided with a perforated surface 43, see Fig. 5, through which the liquid is ejected from the rollers. In such latter construction the wall of the separator drum need not be perforated or provided with a strainer. In such case also the rollers 10 are so disposed in relation to the ejection apertures, and rotated in such a direction that the separated solid matter is conveyed opposite the ejection direction of the liquid, or in a direction that proceeds at an angle herewith, see Fig. 5. For leading the liquid into the rollers 10 these members may be provided with interior guide members, for instance a cylinder 44. On the interior of their perforated surface the rollers 10 may likewise be provided with outwardly open depressions or cells for collecting and conveying the separated solid matter. Corresponding compartments or cells may likewise be obtained by means of wire gauze encompassing the rollers.

For supplying a special rinsing liquid to the rollers 10, or for supplying a special liquid for subjecting the material to be separated to a special treatment, for instance a chemical treatment or a dyeing, the separator drum 1 is provided with an annular chamber 45, see Fig. 5, to which the liquid in question may be conveyed through a pipe 46, and from which chamber the liquid is conveyed through passages 47 to the rollers 10, or to the ejection apertures 8.

The rollers 10 are actuated in rotation at a suitable speed by means of the spindle 3 of the separator, for instance in the manner shown in Fig. 1, where the spindle 3 carries a screw gear wheel 11 that is rotated together with the spindle by means of a bushing 12 on the screw gear wheel, which bushing is provided with a frictional clutch 13 held in engaged position by means of a coil spring 14 encompassing the spindle 3. The screw gear wheel 11 is in engagement with complementary screw gear wheels 15 provided with axles 16 and worms 17 engaging worm wheels 18 on the rollers 10. The rotational speed of the screw gear wheel 11 is regulated by means of a speed governor or any other suitable means of known construction, for instance an adjustable brake device 20.

Instead of rotating the rollers 10 by means of the spindle 3 they may be actuated by means of a variable-speed driving mechanism which through a power transmission member, for instance a chain or belt 21, coacts with a sprocket or pulley 22 on the bushing 12. The sprocket or pulley 22 is indicated in Fig. 1 whereas the driving mechanism that may be operated by means of a variable-speed electromotor is not included in the drawing.

The number of screw gear wheels 15 with shafts 16 and worms 17 employed may vary, but preferably there is employed such a number that they may be arranged symmetrically around the spindle 3 in order to provide a good balancing of the separator drum 1. If there is a greater number of ejection apertures 8 with appertaining rollers 10 than of screw gear wheels 15 with axles 16 and worms 17, the rollers will have to be cou-

pled together by means of suitable coupling members or gear wheels 19.

If the material to be separated contains fibrous matter or long fibres the separator chamber 4 is provided with vertical, integrally formed, guide ribs or webs 34 disposed vertically along the interior surface of the separator chamber and arranged circumferentially between two next adjacent apertures 8 in the bottom as will be understood upon reference to Figs. 1 and 2. Each of these fibre guiding ribs or webs 34 projects inwardly from the perforated side wall and extends from the top of the latter adjacent the inlet opening 5 to a point which is spaced above the bottom of the chamber and which is midway between two next adjacent apertures 8. The inner edges of the annular series of webs 34 are inclined downwardly and outwardly, as seen in Fig. 1, and they tend to collect the fibrous matter between them and guide it downwardly and outwardly towards the apertures 8 while the liquid is centrifugally thrown out through the openings 2.

In the manner of construction illustrated in Figs. 3 and 4 the separator chamber has the form of a cross with compartments 48, 49, 50 and 51, and instead of guide ribs 34 the separator is provided with guide rollers 52. These guide rollers are at the inner ends of four upright ribs or webs which extend inwardly from the side wall of the separator body to form the cross-shaped chamber having the four compartments 48, 49, 50 and 51, as will be understood on reference to Fig. 4. This view shows in dotted lines the location of the four apertures 8 in the bottom of the body at the outer ends of the bottoms of the four compartments. The upright rollers 52 are rotated by axles 53 and bevel gears 54 engaging other bevel gears 55 on the shaft 16. Instead of the illustrated four compartments 48, 49, 50 and 51 the separator may be provided with two or three, or more than four compartments and have a corresponding number of guide rollers and ejection apertures. The function of the guide rollers 52 is to prevent fibrous matter from adhering to the inner vertical edges of the ribs or webs, on which edges the rollers are mounted in recesses as seen in Fig. 3. Since the rollers are driven the descending fibrous matter will be urged by them into one of the compartments 48, 49, 50 or 51 as it descends.

It will be noted that the webs or ribs 34 and the web portions on which the rollers 52 are mounted are arranged between perforated areas in the wall of the drum.

When the separator drum wall is provided with holes 2, or a strainer, the separator chamber 4 is curved along its outer periphery 35 and

extends somewhat beyond the apertures 8. The last of the separated liquid will by these means be ejected through the holes 2 because it cannot move inwardly towards the apertures 8. Thus the dry matter will become as dry as possible.

I claim:

1. In a continuously operating straining separator, the combination of a separator drum shaped as a hollow truncated cone with an open top to receive the material to be separated, said drum having a side wall perforated to serve as a sieve, said drum being provided with ejection apertures in its base along the periphery thereof for ejection of separated solid material, means including a spindle for operating the separator drum to rotation, guiding means within the drum and extending inwardly from the side wall of the drum for guiding the incoming material to the perforated areas and to said ejection apertures, rotary retarding and conveying rollers arranged outside of and adjacent to the ejection apertures in the base of the drum and adapted to simultaneously retard the discharge of the solid material and convey the flow of a certain quantity of separated solid material per time period through the ejection apertures and away from the separator drum, and means for actuating the said retarding and conveying rollers.

2. The structure of claim 1 in which said rotary rollers are provided with projections formed on their surfaces for engaging and retarding the discharged solid matter and conveying it away from said ejecting apertures.

SVEND SIGURD CHRISTIE FLEISCHER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
218,441	Hepworth	Aug. 12, 1879
242,110	Carstaedt	May 31, 1881
349,106	Koelkebeck	Sept. 14, 1886
802,473	De Raasloff	Oct. 24, 1905
911,469	Boyd	Feb. 2, 1909
934,221	Schmitz	Sept. 14, 1909
1,101,549	Hoffman	June 30, 1914
1,218,024	Wendell	Mar. 6, 1917
1,321,353	Bacon	Nov. 11, 1919
1,321,354	Bacon	Nov. 11, 1919
1,534,278	Lump	Apr. 21, 1925
2,104,162	Macklind	Jan. 4, 1938
2,107,909	Schaaf	Feb. 8, 1938
2,113,321	Harrington	Apr. 5, 1938
2,200,202	Harvey	May 7, 1940
2,331,700	Kirby	Oct. 12, 1943
2,370,353	Howe	Feb. 27, 1945