Nov. 1, 1966 G. C. MASON ET AL 3,282,199

FLAKING OR CRUSHING ROLLS

Filed May 28, 1965 3 Sheets-Sheet 1

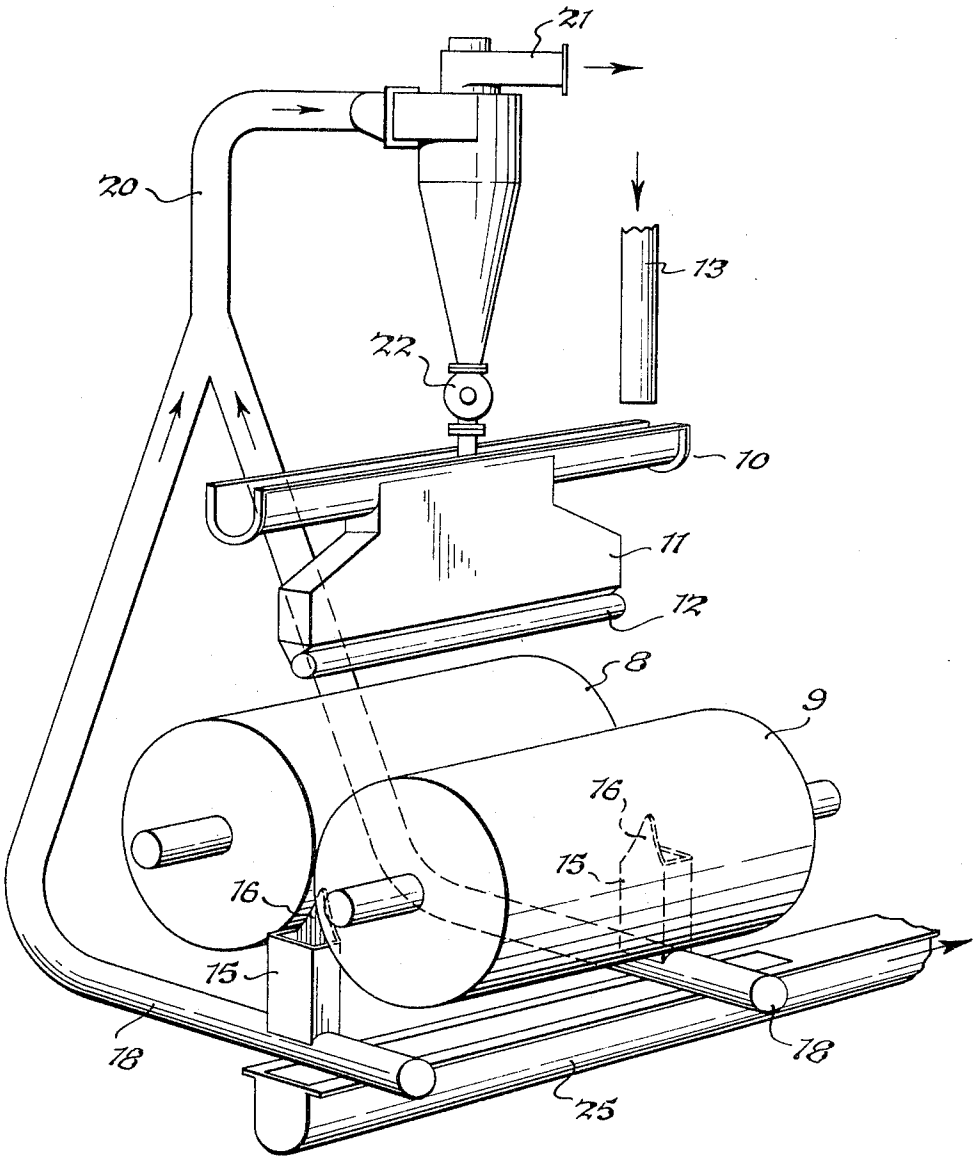


Fig. 1.

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Fig. 2.

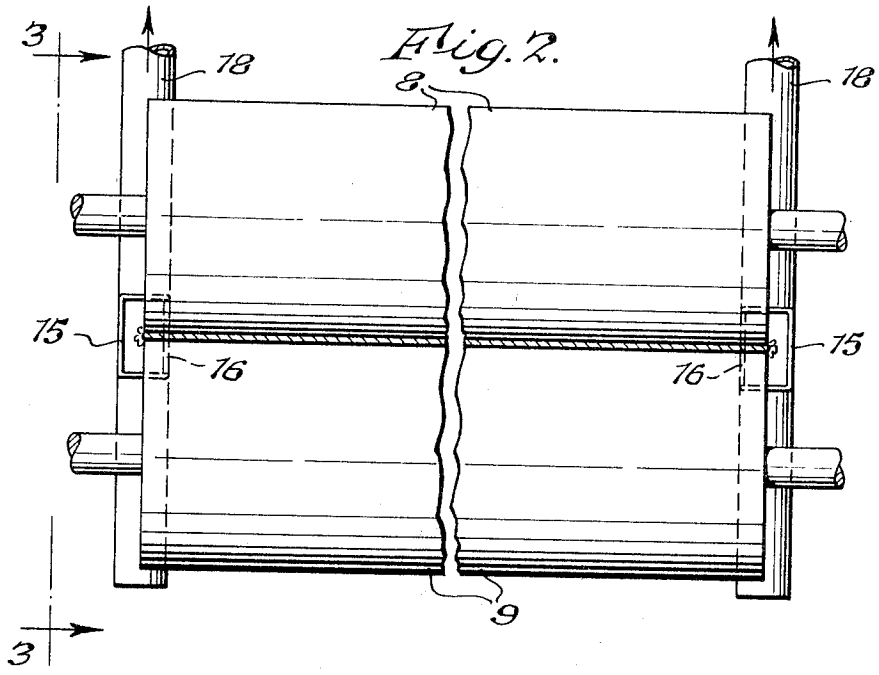
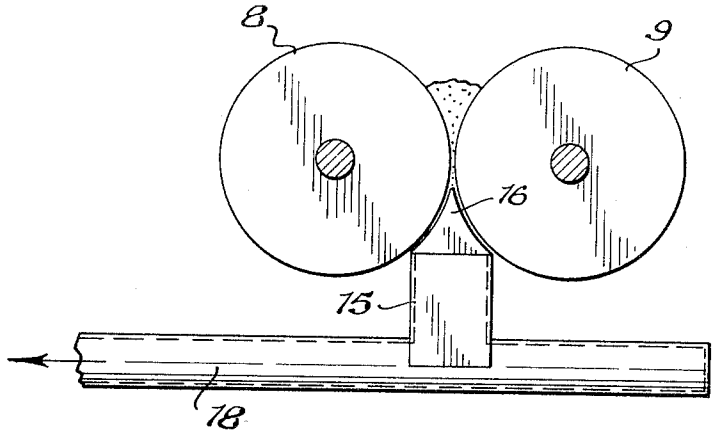


Fig. 3.



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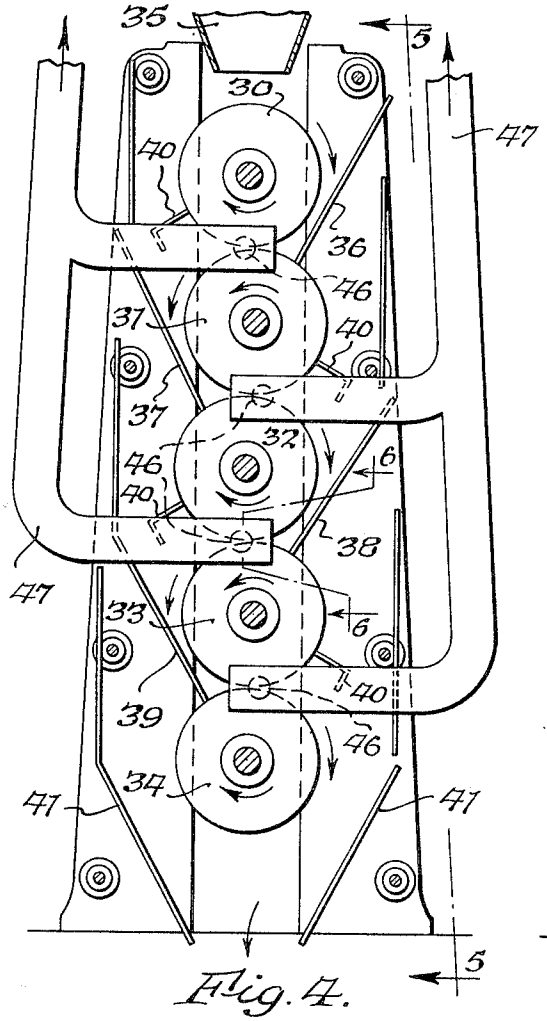


Fig. 4.

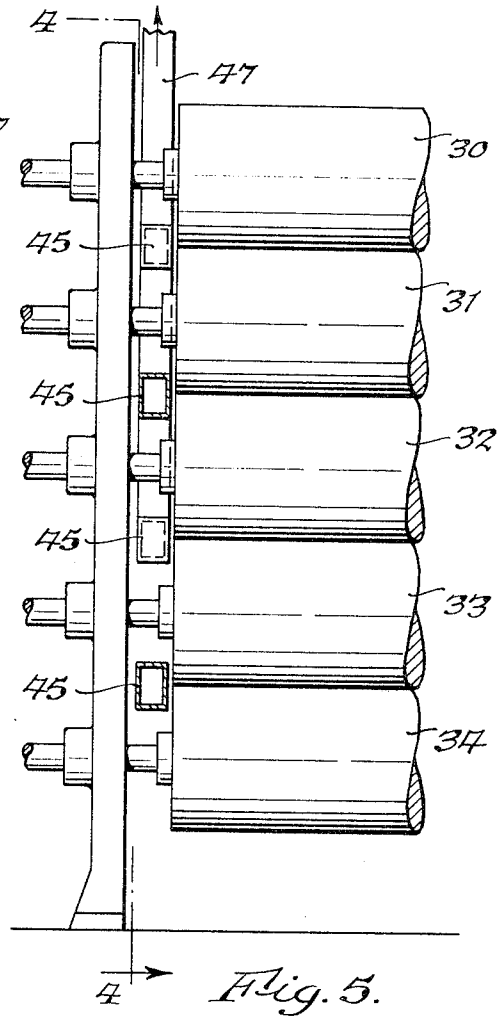


Fig. 5.

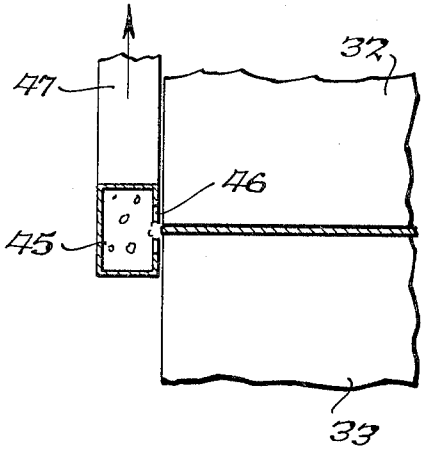


Fig. 6.

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FLAKING OR CRUSHING ROLLS

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Filed May 28, 1965, Ser. No. 459,624

7 Claims. (Cl. 100—90)

This invention relates to rolls of the type between which seeds or other meats are passed for the purpose of crushing or flaking them so that they can be readily acted on by solvents to extract oil therefrom.

In rolls of this type difficulty has been experienced for the reason that the meats would be squeezed out around the end guards at the ends of the rolls so that this by-passed material would not be crushed or flaked to the extent necessary for efficient removal of oil therefrom. The uneven passage of material over different portions of the rolls also effects the spacing of the roll surfaces particularly at the ends of the rolls where conditions exist which makes uniform feeding essentially impossible. Here improper feeding causes more or less wear depending upon whether the feed rate is higher or lower than average. This uneven wear produces areas of low pressure where beans are improperly flaked for efficient oil removal, and it necessitates frequent grinding of the ends of the rolls to the same diameter as the middle portions thereof. The non-uniform feed of the meats at the ends of the rolls, by causing uneven wear on the roll surfaces, also causes heating of the ends of the rolls due to metal-to-metal contact at the portions of less wear which generates heat, and thus causes greater expansion of the ends of the rolls than at the middle portions thereof. This increases the area of low pressure where material is improperly flaked and the intense pressure at the high areas often results in chipping or breaking off of pieces of the end of the rolls.

One of the objects of this invention is to provide means for eliminating tight fitting end guards which prevent material by-passing rolls and feed the roll uniformly over its entire length.

Another object is to provide means for preventing damage to the rolls due to the uneven feed caused by the deflection of material from the ends of the rolls.

Another object is to provide rolls of this type which crush or flake the material so as to produce a more uniform product and consequently make possible a greater yield of oil from the material.

It is also an object to provide rolls of this type with means whereby the material deflected from the ends of the rolls and material between the rolls adjacent to the ends thereof are fed back to the rolls for further operation thereon.

In the accompanying drawings:

FIG. 1 is a diagrammatic view showing our improvements applied to a pair of flaking rolls.

FIG. 2 is a top plan view thereof.

FIG. 3 is an end view thereof as seen on line 3—3, FIG. 2.

FIG. 4 is an end elevation, partly in section, along the line 4—4, FIG. 5, of a vertical tier of crushing rolls having the improvements embodying our invention applied thereto.

FIG. 5 is a fragmentary elevation thereof on line 5—5, FIG. 4.

FIG. 6 is a fragmentary sectional view thereof on line 6—6, FIG. 4.

Referring first to the flaking rolls shown in FIGS. 1, 2, 3, 8 and 9 represent a pair of rolls of the type commonly employed in apparatus of this type in which the material to be flaked prior to extraction of oil is passed downwardly between the upper faces of the rolls, rotating in opposite directions, to pass between the closely adjacent surfaces of the rolls. The construction for feeding material between the rolls may be of any usual type heretofore commonly used in connection with flaking rolls, for example, including a roll feed conveyor 10, a feeder 11 and a grooved roll 12 which distributes the material substantially uniformly lengthwise of the rolls 8 and 9, and a feed duct 13 which supplies material to be flaked to the apparatus.

In the ordinary use of these rolls the material is fed between the rolls as uniformly as possible but at the ends of the rolls the material will be squeezed or deflected outwardly around tight fitting, commonly used end guards without being properly flaked, and this material may consequently be mixed with the properly flaked material discharged from the intermediate portion of the rolls so that in the final extraction of oil from the material that portion of the material that has been deflected from the ends of the rolls will yield less oil than the material that has been properly flaked.

In accordance with our invention we eliminate end guards and provide means at the ends of the rolls for collecting the deflected materials and then transmitting this material back for another passage between the rolls with the fresh material entering the same.

In the construction shown for this purpose we have provided a pair of receptacles arranged at the ends of the rolls for the purpose of collecting the material deflected therefrom. These receptacles 15 are open at their upper ends and are provided at one side with an extension 16 which conforms closely to the contour of the rolls from which the deflected material is discharged. The deflected and improperly flaked material discharged from the rolls leaves the material adjacent to the ends of the rolls of less volume and loosely packed so that this material is also not sufficiently flaked. Consequently, the receptacles 15 are so formed as to receive any material discharged from the outer ends of the rolls as well as material discharged from the cylindrical portions of the rolls at short distances from the ends.

The receptacles 15 are arranged on and connected with the lower ends of tubular members 18 into which the deflected material enters from the receptacles 15. These tubular members are subjected to suction in any usual manner and connect into a single tube 20 leading to a cyclone separator 21 in which the air and deflected or solid particles of material are separated from each other. The air is discharged through opening 21 and the material is collected at the bottom of the separator and passes into rotary valve 22 to conveyor 10 from which it passes to feeder 11 for distribution with the material entering the apparatus. The suction in pipes 20 and 18 produces suction in receptacles 15, which not only collect material deflected from the ends of the rolls but also some of the material adhering loosely to the end portion of the rolls and which has not been sufficiently flaked because of some of the material from this portion of the rolls having been deflected outwardly, leaving smaller quantities of less compressed material at the ends of the rolls. This material consequently is again passed into the rolls for further flaking action. The suction from pipes 18 passes into the receptacles 15 and consequently the resulting air flow has a cooling effect on the ends of the rolls, which minimizes the distortion of the rolls. The material which has passed through the rolls and has been properly flaked then passes into collecting conveyor 25 from which the deflected material is excluded by means of the receptacles 15. This results in a more uniform product delivered to and from rolls 8 and 9 and produces also more uniform wear over the entire length

of rolls which in turn reduces the maintenance required on the apparatus.

The extensions **16** also serve to concentrate the suction to those end portions of the rolls which have improperly flaked material and which require cooling air currents.

Our invention is also applicable to crushing rolls for use in connection with oil bearing seeds and other materials. In apparatus of this kind rolls **30**, **31**, **32**, **33** and **34** are arranged in an upright series and the material may be supplied to the upper roll in any suitable manner, for example, by means of a chute or conveyor **35**. The rolls are rotated in the direction indicated by the arrows in FIG. 4, and the material delivered to the upper roll is held in position to pass beneath the upper and second rolls by means of a cant board **36**. As the material passes between these two rolls it is held in position to be passed to the rolls **31** and **32** by means of another cant board **37**. Similar cant boards **38** and **39** are provided for use in connection with the other rolls. Each roll is also provided with a scraper **40** by means of which material which has passed between a pair of rolls is removed therefrom and passed into the next pair of rolls. From the last roll the material is discharged from the apparatus between the deflectors **41**.

In connection with rolls of this kind, material is also deflected from the ends of the rolls, and the same difficulties consequently arise, as in the construction shown in FIGS. 1–3, due to the deflected material passing out of the apparatus with the properly crushed material, and damage to the rolls, due to reduced crushing action taking place at the ends of the rolls. For this purpose I have provided collecting receptacles **45** arranged at those portions of the ends of the rolls at which material is deflected, having openings **46** arranged on the sides of the receptacles nearest to the ends of the rolls. These receptacles are connected by means of suction ducts **47** which connect with a cyclone separator or other means to separate the deflected material from the air. The material is then returned to the apparatus, as described in connection with FIGS. 1–3.

The material which is deflected or squeezed out at the ends of the rolls leaves the material near the ends of the rolls in a loosened condition and not compacted like the material farther from the ends of the rolls. It is desirable of course to remove this loosely held material, which is also not thoroughly crushed, and feed it back to pass again between the rolls, and this is done in the construction shown in FIGS. 4–6 by means of the suction in the collecting receptacles **45**. This suction draws in air and loosely held material adjacent to the ends of the rolls for feeding back to again pass between the rolls, and also the suction produces air currents which cool the end portions of the roll.

It will be understood that various changes in the details, materials and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

We claim:

1. Apparatus comprising a series of crushing rolls arranged vertically one above the other and the adjacent rolls being in close proximity to crush material passed between them,

(a) said rolls deflecting some of the material from the opposite ends thereof,

(b) receptacles arranged at each of the ends of said pair of rolls and having openings in the sides thereof adjacent to the ends of the rolls for receiving material deflected therefrom,

(c) suction ducts connected with said receptacles for drawing into said receptacles the deflected material,

(e) and said receptacles also serving to produce cooling air currents at the ends of said rolls.

2. Apparatus comprising rolls with substantially parallel axes spaced with their peripheries in close proximity between which material being operated upon is passed and from the ends of which material not properly operated upon is deflected,

(a) receptacles at the ends of said rolls having openings adjacent to the ends of said rolls to receive deflected material,

(b) and air suction means connected with said receptacles and which convey material from said receptacles to the upper surfaces of said rolls for again passing deflected material between said rolls.

3. Apparatus according to claim **2** and including a separator to which air and deflected material is passed and in which the deflected material is separated and again fed to said rolls for passing between them.

4. Apparatus comprising rolls with substantially parallel axes spaced with their peripheries in close proximity,

(a) means for feeding material to be treated to said rolls,

(b) receptacles at the ends of said rolls and which collect material deflected from the ends of said rolls,

(c) suction means for drawing deflected material into said receptacles, and

(d) said suction means also returning said deflected material to said feed means.

5. Apparatus according to claim **4** and including a separator which separates air from said deflected material before said deflected material is passed to said feed means for mixture with the incoming material.

6. Apparatus comprising rolls with substantially parallel axes spaced with their peripheries in close proximity,

(a) means for feeding material to be treated to said rolls,

(b) suction means which act on the ends of said rolls to withdraw material deflected from the ends of said rolls, said suction means producing air currents which cool the ends of said rolls,

(c) a separator to which the air carrying deflected material is passed and which collects said deflected material,

(d) and means for returning said deflected material to the material initially entering said apparatus.

7. Apparatus comprising a pair of flaking rolls arranged side by side in close proximity and between which material to be flaked is passed, said rolls deflecting some of the material acted upon at opposite ends thereof,

(a) a pair of receptacles arranged one at each end of said rolls and receiving material deflected from the ends of said rolls,

(b) extensions on said receptacles which extend under the end portions of said rolls to receive material dropped from said rolls adjacent to said deflected material,

(c) suction means connected to said receptacles for withdrawing from said receptacles deflected material collected therein and for producing air currents which cool the ends of said rolls, and draw loose material from the ends of said rolls,

(d) said extensions restricting said suction to the end portions of said rolls.

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