Nov. 23, 1965 R. G. RITZE 3,219,187

APPARATUS FOR THE CLASSIFICATION OF FINELY DIVIDED MATERIALS

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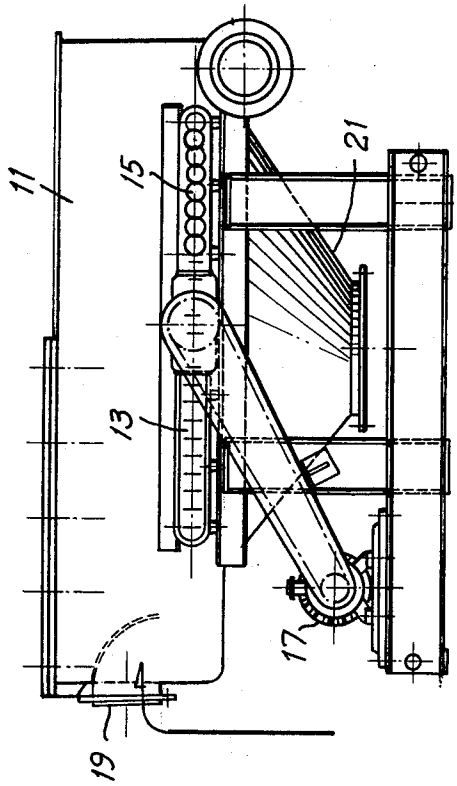


Fig. 1

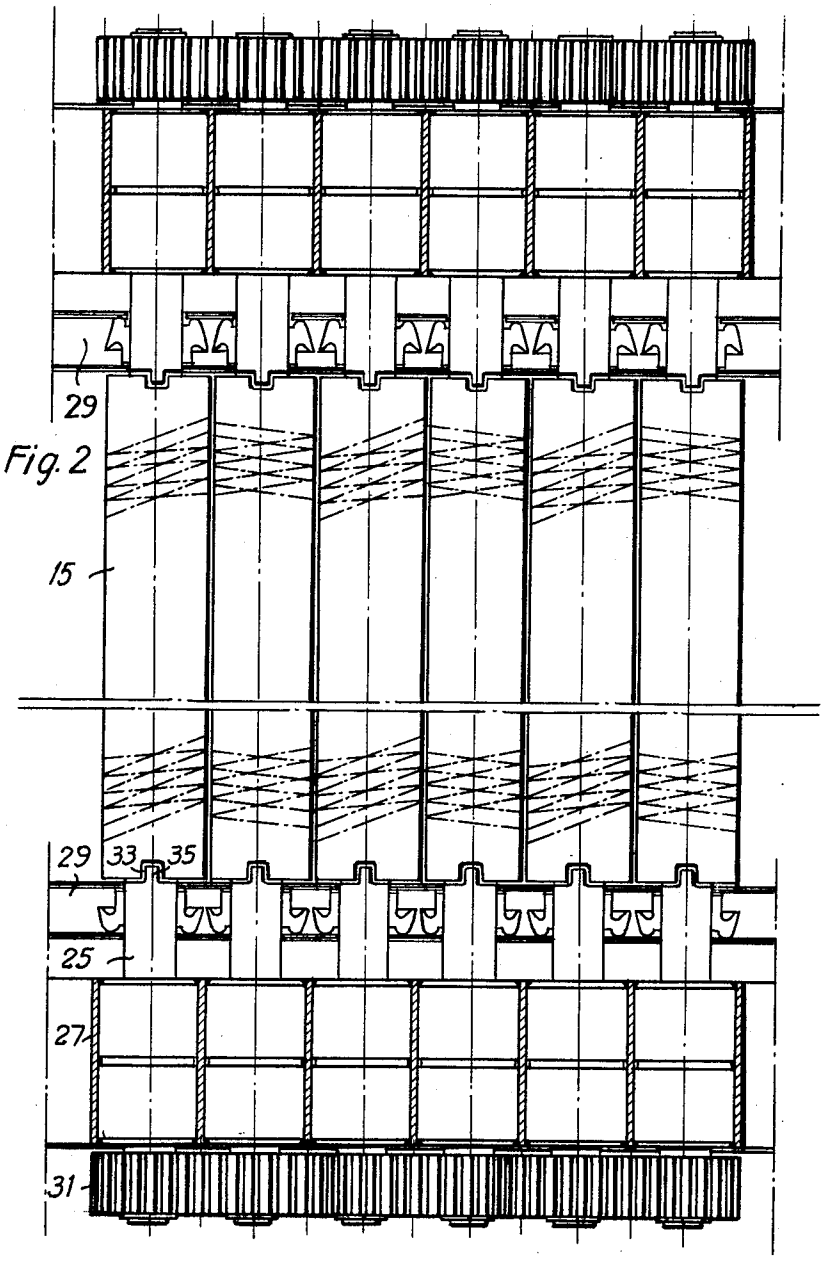
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APPARATUS FOR THE CLASSIFICATION OF FINELY DIVIDED MATERIALS

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Fig. 2



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FIG. 3

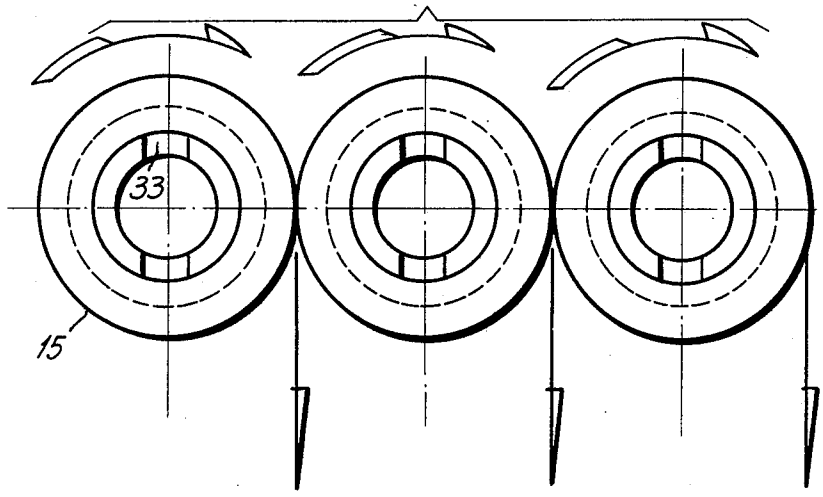
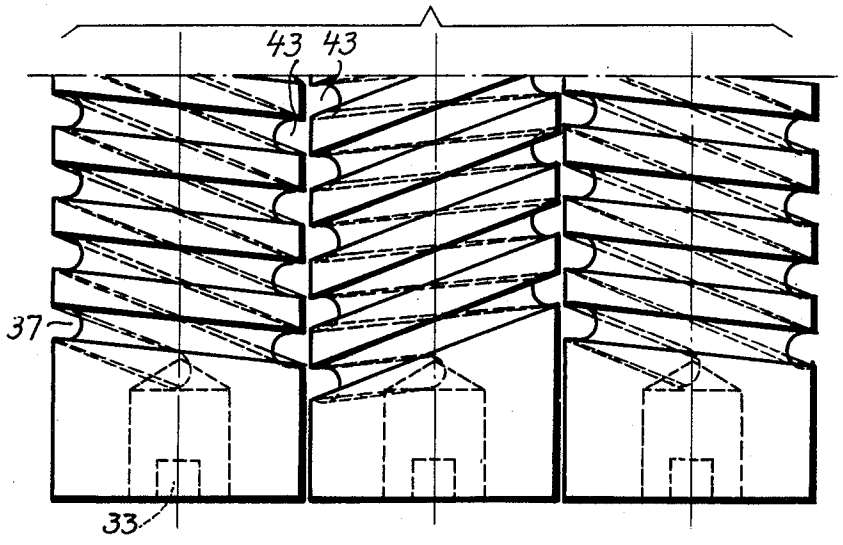


FIG. 4



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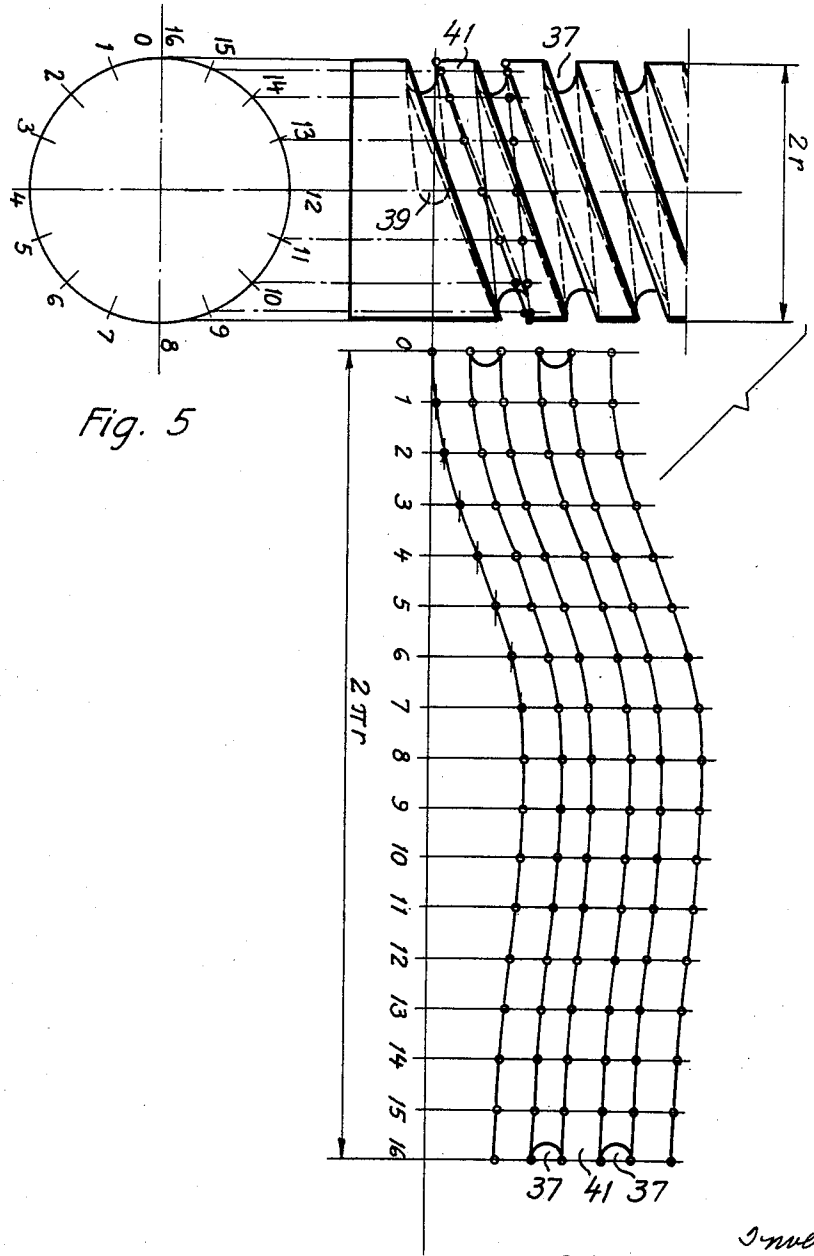


Fig. 5

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FIG. 6

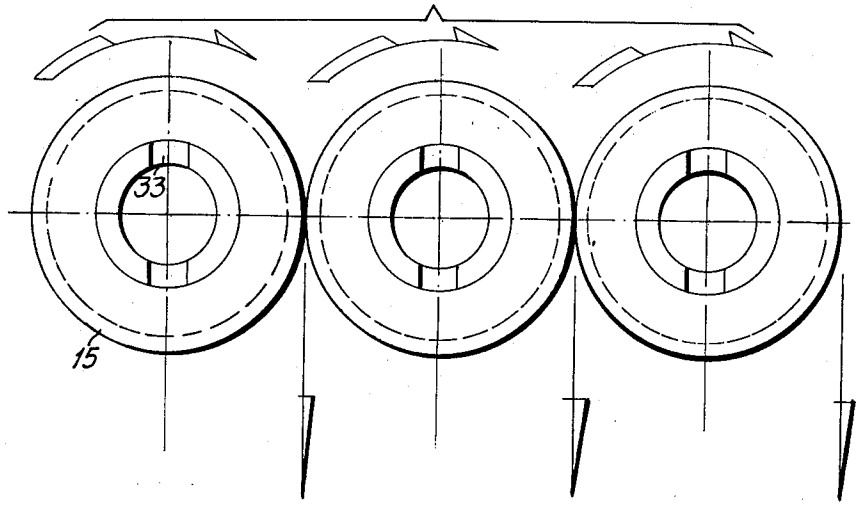
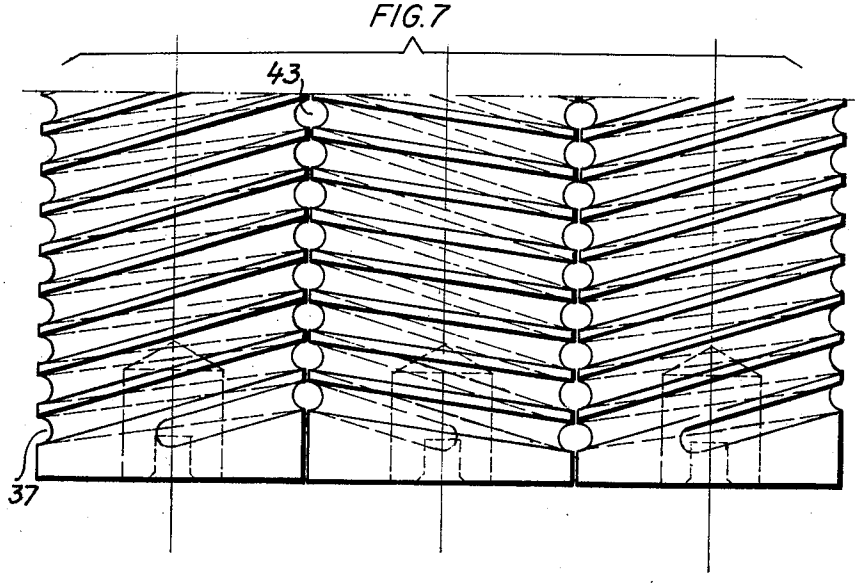


FIG. 7



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APPARATUS FOR THE CLASSIFICATION OF FINELY DIVIDED MATERIALS

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Claims priority, application Sweden, June 16, 1961, 6,294
5 Claims. (Cl. 209—233)

The invention relates to an apparatus for the classification of finely divided materials, particularly wood chips or cellulosic pulp, in which a pervious bottom is constituted by a number of parallel rolls arranged along each other and adapted to be driven with the same speed and in the same rotational direction and which are provided in their peripheries with inclined grooves. Above all the invention relates to an apparatus of said kind adapted for separating uncooked chips of knots or similar coarse particles from digester cellulose pulp, i.e. a so-called knot screen. In an apparatus of said kind known from the U.S. Patent No. 2,966,267, the rolls are provided with a number of inclined grooves, each of which extends around the roll one single turn and forms a closed loop which is separated by a continuous ridge from the loop formed by the adjacent groove. A drawback of said apparatus consists therein that particles only a little too large to pass through the apertures formed by the grooves at the nip of the rolls, are not moved on by the rolls but tend to remain in the angle between the pairs of adjacent rolls, where they are incessantly pushed back and forth in the axial direction of the rolls, thereby reducing the screening capacity of the apparatus. According to the invention said drawback is eliminated thereby that each of the rolls is formed with at least one groove which extends in several continuous turns around the roll and advances in the axial direction alternatingly towards one end and the other of the roll. The ends of the groove or grooves do not meet to form a closed loop but the groove or grooves have open ends located distant from each other. Therefore when the rolls rotate, a particle which is stuck in a certain groove will ultimately be moved to one end of the groove where it is forced to leave it. Preferably the rolls of the apparatus are so shaped that each turn of the groove or grooves has a part with a steep pitch in one direction and a part with a less steep pitch in the other direction. As a rule, the lengths of continuous advance of the groove or grooves in one direction correspond to greater axial measures than the intermediate lengths where the groove continuously advances in the other direction. In a preferred embodiment, for each turn of said screwthreaded grooves, the difference between the total progression and the total regression in the axial direction is approximately twice the width of the groove, leaving an intermediate ridge of about the same width as the groove.

The apparatus according to the invention will be more closely described herein below with reference to the accompanying drawings, in which FIG. 1 is an elevational view and partly sectional view of the apparatus,

FIG. 2 is a plan view on an enlarged scale, of a part of the screening bottom of the apparatus,

FIG. 3 is an end view of the rolls,

FIG. 4 is a plan view of end parts of said rolls,

FIG. 5 is a detailed graphic representation of the groove of one of said rolls,

FIGS. 6 and 7 are views similar to FIGS. 3 and 4 and showing a modification of the arrangement of the rolls.

The apparatus shown in the drawings consists essentially of a box **11** having a screening bottom **13** consisting of a number of parallel rolls **15** located close to each

other and driven by a motor **17** in the same direction of rotation, i.e. clock-wise in FIG. 1. The material that should be classified is introduced through the opening **19** and is fed by the rolls **15**, particles smaller than the apertures formed by the rolls dropping down in a hopper **21**, whereas coarser particles are moved on by the upper sides of the rolls and finally discharged by the last roll at the right end of the apparatus.

The rolls **15** are driven by journals **25** which are held by bearings **27** and project through opposite end walls **29** of the box **11** and the outer ends of which carry gear wheels **31**. In a manner not described said gear wheels mesh in a predetermined relation to each other and are connected to the motor **17** so that all journals **25** are driven in the same direction of rotation and in complete synchronism. Provided in the ends of the rolls **15** are diametrical grooves **33** into which project diametrical flanges **35** formed upon the ends of the journals **25**, whereby the rolls are maintained in the correct mutual relation.

In the manner shown clearly in FIG. 5 each roll **15** is formed with a groove **37** having the approximate shape of a deformed helix and running several turns around the roll. Starting from an end **39** close to the left end of the roll as shown in FIG. 5, the groove extends first over a quarter of a turn with negative pitch, i.e. towards said end of the roll (points **12** to **16**) and then over the next half turn in the other direction with a great positive pitch (points **0** to **8**), whereafter the groove again reverses its direction of axial advance and continues with a smaller and negative pitch over the next half turn of the circumference of the roll (points **8** to **16**) and so on. Everywhere the groove follows the foregoing turn at a fixed distance, so that of the cylindric surface there remains a ridge **41**, the width of which, i.e. its measure in the axial direction, is constant and equal to or preferably somewhat greater than the width or the axial measure of the groove **37**. Thus, for each turn the groove progresses a distance about twice the width of the groove towards the other end of the roll **15**. The groove is of a profile approximately square, preferably with rounded inner corners, but the groove may also be of some other cross-sectional shape, i.e. triangular or half-circular shape.

As is apparent from FIGS 2 and 4, the grooved parts of all rolls are identical and are so adjusted relatively to each other that in a certain position of turning every second of them shows on the upper side a small pitch of the groove in one direction and the intermediate roll shows a great pitch in the opposite direction. The rolls are also so positioned in relation to each other that everywhere at the nip a groove on one of two adjacent rolls is located opposite to a remaining (full diameter) part (ridge) of the cylindric face of the other roll, and vice versa. This holds true along the entire length of each pair of rolls and during the rotation thereof. The pattern (shown in FIG. 4) of apertures located alternatingly on opposite sides of the nip of the rolls, through which apertures smaller particles pass, will therefore move back and forth when the rolls are driven, so that a kind of agitation is obtained which assist in the feed of the particles through said apertures. Particles too great to pass the screen face so formed, are fetched by the upper side of the rolls which all move in the same direction, and conveyed towards the outlet. Particles, however, which are neither passed through said apertures nor carried with the rolls but remain in a groove, where they slide or roll against the ridge of the adjacent roll, will gradually be displaced relatively to the roll in which the groove in question is provided, and will finally reach one end of the groove. There the particles are forced up on the fully cylindrical (not grooved) end part of the roll, where

they will easily be transferred from one roll to the next and thus conveyed towards the outlet of the apparatus for oversized particles.

The rolls **15** may either be coaxial to their journals **25** or they may be somewhat eccentrical. In the latter case the axes of the rolls should be offset equal distances and in the same direction from the axes of the pertaining journals. Then the rolls will always take the same mutual positions and will describe a circularly oscillating movement as a unitary screen bottom.

In the above embodiment which merely is an example of the application of the invention, each roll has a single groove. However, it is also possible to provide the rolls with two or more grooves in the shape of deformed helices, which grooves run along each other and are separated by continuous ridges. It is also possible to interrupt the groove or grooves, for instance at the center part of the length of the roll and to provide a fully cylindrical part there. Then it is possible to arrange that particles moved axially in the grooves are carried either outwardly to opposite sides of the box **11** or inwardly to the center parts of the rolls. Furthermore instead of having a part of a groove of one roll oppose a part of a ridge upon the other roll, and vice versa, at the nip of the rolls of each pair of rolls, it is also possible as shown in FIGS. 6 and 7 to have a groove of one roll oppose a groove on the other roll of each pair so that the apertures **43** through which small particles pass, are located on a straight line extending along the nip of the rolls. Said modification of the embodiment first described could be obtained merely by displacing the groove of every second roll axially a certain distance and turning the same a certain angle relatively to the other rolls before all of the rolls are connected to the common drive means.

I claim:

1. Apparatus for the classification of materials having a pervious bottom constituted by a plurality of rolls parallel to and arranged alongside each other and rotatable at the same speed and in the same direction of rotation, each of the rolls having at least one helical groove in its periphery making several continuous turns around the roll, consecutive turns making a resultant axial advancement in one and the same direction wherein each turn of said groove has a portion with respect to the longitudinal axis of the roll with a greater inclination in one direction and a portion with a smaller inclination in the opposite direction whereby each said groove alternately progresses and regresses along the axis of its roll.

2. Apparatus according to claim **1** wherein the portion of said groove which advances continuously in one direction extends over a greater axial length than the portion which advances continuously in the opposite direction.

3. Apparatus according to claim **1** wherein the difference between the total axial progression and the total axial retrogression of each turn of said groove is greater than the width of the groove.

4. Apparatus according to claim **1** wherein the groove of one roll is identical to the groove of an adjacent roll.

5. A roller for use in a classification apparatus of the type including a plurality of parallel, externally grooved rollers which define a plurality of distinct classification openings between adjacent rollers through which small particles pass when said rollers are rotated about their longitudinal axes, said roller having at least one continuous external helical groove extending over at least a substantial part of the length of the roller and making a plurality of uninterrupted turns around the roller with the distance between corresponding parts of each turn being the same, consecutive turns making a resultant axial advancement in one and the same direction, wherein each turn of said groove has a portion with respect to the longitudinal axis of the roller with a greater inclination in one direction and a portion with a smaller inclination in the opposite direction.

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