

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Vertical Tea Processing Machine

We, TEA RESEARCH ASSOCIATION, a registered body under the West Bengal Societies Registration Act, 1961, of Royal Exchange, 6, Netaji Subhas Road, Calcutta 1, West Bengal, India, do hereby declare the Invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statements:—

10 This invention relates to a machine for processing tea leaf after withering and before drying, by subjecting the leaf to a rolling, twisting, bruising and rupturing action as it is passed through the machine.

15 In patent specification No. 856,568 a machine for this purpose is described, which comprises a stationary horizontally disposed cylinder closed at one end and provided thereat with a gravity feed hopper opposite a helical feed worm mounted within the cylinder on a rotatable axial drive shaft which also carries a plurality of sets of vanes arranged along the shaft on a cylindrical extension thereof and protruding into an annular space formed between that cylindrical extension and the cylinder wall. The latter is provided with a plurality of sets of stationary pins protruding into that annular space, the sets of vanes and the sets of pins being staggered with respect to one another.

25 The feed worm feeds incoming tea leaf into the annular space mentioned, wherein the vanes are arranged to propel the leaf to the other end of the cylinder, where the leaf is discharged. During its passage through the cylinder the leaf is subjected to compression, twisting, rolling, bruising and rupturing.

30 An object of the present invention is to provide an improved machine of the general character above described and which affords greater flexibility for operation to cope with varying processing requirements that are encountered for different types and conditions of leaf.

40 According to this invention there is provided a machine for processing tea leaf after withering [Price 4s. 6d.]

and before drying, comprising a vertical barrel- or cylinder-like stator containing a vertical rotor the shaft of which is axially rotatable in the stator, the rotor carrying a plurality of sets of vanes which protrude into an annular space 50 formed between the stator and the rotor and are inclined at an angle to said shaft for propelling tea leaf upwards through said space towards the upper end of the stator, the stator carrying a plurality of sets of pins protruding into said annular space, said sets of vanes alternating with said sets of pins, a horizontal feed cylinder at the side of the stator near its lower end and provided with a feed hopper and containing a horizontal rotatable feed worm for feeding tea 60 leaf into the stator, the stator having a discharge opening at the side of the stator near its top end for discharge of processed tea leaf.

Sets of vanes on the rotor shaft may be four-segmented or some may be four-segmented and some two-segmented. In the latter case top ones, say two top ones, are two-segmented. When two-segmented vane sets are at the top, only the vanes in the four-segmented vane sets need be inclined for upward propulsion of tea 70 leaf. The vanes in one set of two-segmented vanes lie in a plane which crosses the plane in which lie the vanes in the adjacent set of two-segmented vanes.

In a preferred embodiment, on the lower part 75 of the rotor shaft inside the stator and in the vicinity of the horizontal feed cylinder, there is provided a helical segment onto which tea leaf is discharged from the feed cylinder.

The upward movement and processing 80 action is brought about by the relationship of the rotor shaft and attached vanes, which are inclined for upward progression, to the pins fixed to the stator cylinder wall. These pins are referred to as resistor pins. The rotor shaft 85 vanes cause the tea leaf shoots fed into the stator cylinder to rotate and resistor pins fixed to the stator wall enable relative motion within the mass of tea leaf shoots to be set up. This relative motion is the means whereby retarda- 90

tion of the rotating leaf mass induces a rubbing action of leaf shoot against leaf shoot. This feature is the basic requirement for the breakdown of the leaf cells. Thus the upward progression of the leaf mass is brought about by the inclined vanes of the rotor which progress is partially opposed by said resistor pins, thereby permitting processed leaf to be discharged continuously from the discharge end near the top of the stator.

The number of segments in vane sets and resistor pins associated therewith, may be varied to suit processing requirements e.g. two or four vanes opposed by two, four or six resistors per stage are employed.

The horizontal feed worm and vertical rotor shaft may be run from the same motor or rotating shaft by suitable gear arrangement.

The speed of the rotor shaft can be made variable. However, it is not quite necessary that the feed worm should have variable speed but it should, preferably, be possible to fix the worm to one speed on which it is desired to work throughout for a particular throughput from the machine.

The invention is described below further with reference to the drawing accompanying the provisional specification.

A vertical stator cylinder, marked 1, has fitted to it as horizontal extension, near its base, a horizontal worm feeder cylinder F whose feed hopper is marked H and the worm or screw is marked 2.

The stator 1 has a rotor shaft 3, having a helical segment 7 near the base of the stator and three four-segmented vanes 4 located on an intermediate portion of the rotor shaft 3 and two two-segmented vanes 8 on the upper portion of said shaft 3.

A plurality of pins 5 are fixed to the wall W of the stator cylinder 1 protruding towards the centre of the said cylinder leaving enough clearance for the vanes 4 and 8 to rotate in between them in a horizontal plane. The number of such resistor pins 5 can vary from one to four or even more at any stage. The speed at which the rotor shaft 3 rotates can be made variable while the speed of the horizontal feed screw or worm is fixed for any particular output through the machine.

In the attached diagram, one particular application of the invention is shown, wherein the drive to both the rotating parts i.e. worm 2 and rotor shaft 3, is taken off a single horizontal shaft SH. The feed screw 2 is chain-driven through sprockets S1, S2 and chain CH, while the vertical shaft 3 derives its rotation off the right-angled drive D at the end of the horizontal shaft SH. The power requirement is reduced by known means in that the rotating parts are all mounted on ball bearings while the vertical rotor shaft 3 has two ball bearings (BB) on top of thrust bearing (TB) to counteract the thrust loading imposed on it by the action of the rotor-vanes and its own weight.

In action, withered leaf shoots are fed into the feed hopper H, wherefrom the leaf is propelled by the action of the feed worm 2 operating within and closely fitting the wall W1 of feeder cylinder F. Leaf fed into the feeder F emerges direct into the vertically disposed stator 1 wherein the rotor shaft 3 and associated inclined vanes 4, 8 and static resistors 5 cause simultaneous processing action as well as upward propulsion of the leaf mass.

The lowest part of the rotor, the helix 7, imparts to the material fed into the stator an upward lift, while the resistor pins 5 partially resist rotation of the leaf along with the rotor. As the vertically disposed stator cylinder 1 gradually fills with tea leaf shoots the pressure resulting from increasing density, as the tea shoots are reduced in size, is sufficient to meet the needs of cell distortion without mechanical aids.

Gradually thus the fully processed leaf is propelled out of the cylinder 1 at the discharge end E, thereby a continuous flow of processed leaf is maintained as long as enough withered leaf is fed into the machine through the feed hopper H.

The worm 2 in this particular instance is run at twice the speed of the rotor shaft 3. However, this is made adjustable, as already stated above, to suit the requirements of different types of leaf under different moisture status to enable adequate work to be done on the leaf under all conditions.

WHAT WE CLAIM IS:—

1. A machine for processing tea leaf after withering and before drying, comprising a vertical barrel- or cylinder-like stator containing a vertical rotor the shaft of which is axially rotatable in the stator, the rotor carrying a plurality of sets of vanes which protrude into an annular space formed between the stator and the rotor and are inclined at an angle to said shaft for propelling tea leaf upwards through said space towards the upper end of the stator, the stator carrying a plurality of sets of pins protruding into said annular space, said sets of vanes alternating with said sets of pins, a horizontal feed cylinder at the side of the stator near its lower end and provided with a feed hopper and containing a horizontal rotatable feed worm for feeding tea leaf into the stator, the stator having a discharge opening at the side of the stator near its top end for discharge of processed tea leaf.
2. A machine as claimed in claim 1 wherein four-segmented vane sets are employed.
3. A machine as claimed in claim 1 or 2 wherein some of the vane sets are two-segmented and some are four-segmented.
4. A machine as claimed in claim 3 wherein the top sets of vanes are two-segmented and the others are four-segmented.
5. A machine as claimed in claim 4 wherein the top two sets of vanes are two-segmented.
6. A machine as claimed in claim 4 or 5



tion of the rotating leaf mass induces a rubbing action of leaf shoot against leaf shoot. This feature is the basic requirement for the breakdown of the leaf cells. Thus the upward progression of the leaf mass is brought about by the inclined vanes of the rotor which progress is partially opposed by said resistor pins, thereby permitting processed leaf to be discharged continuously from the discharge end near the top of the stator.

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2. A machine as claimed in claim 1 wherein four-segmented vane sets are employed.
3. A machine as claimed in claim 1 or 2 wherein some of the vane sets are two-segmented and some are four-segmented.
4. A machine as claimed in claim 3 wherein the top sets of vanes are two-segmented and the others are four-segmented.
5. A machine as claimed in claim 4 wherein the top two sets of vanes are two-segmented.
6. A machine as claimed in claim 4 or 5





wherein only the vanes in the four-segmented sets of vanes are included.

7. A machine as claimed in claim 6 wherein the vanes in one set of two-segmented vanes lie in a plane which crosses the plane in which the vanes in the adjacent two-segmented set lie.

8. A machine as claimed in any one of the foregoing claims wherein the lower part of the rotor shaft inside the stator and in the vicinity of the horizontal feed cylinder is provided with a helical segment for receiving tea leaf discharged

into the stator from the feed cylinder.

9. A tea processing machine substantially as herein described with reference to and as illustrated in the drawing accompanying the Provisional Specification.

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