

PATENT SPECIFICATION

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 A2B A3B
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(54) A MACHINE FOR PROCESSING TEA LEAF

(71) We, TEA RESEARCH ASSOCIATION, of Royal Exchange, 6, Netaji Subhas Road, Calcutta 1, West Bengal, India, a registered body under the West Bengal Societies Registration Act, 1961, 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 statement:—

The present invention constitutes an improvement in or modification of that described and claimed in our United Kingdom Patent No. 1274783 (referred to hereinafter as the "main patent"), and relates to an improved tea processing machine.

Processing of tea leaf is a step in the manufacture of tea after withering and before drying the leaf. In this step tea leaves are squeezed and twisted in its passage through a stationary cylinder or barrel of the type of tea processing machines, as described hereinafter, said cylinder or barrel being closed at one end and open or partially open at the other end. Tea leaf is fed in the cylinder through an opening at the closed end and is fed by a worm provided on a rotatable shaft within the cylinder. The rotating shaft and the stationary cylinder are provided with means to propel the leaf to the open discharge end, and during its passage to squeeze and twist the leaf.

One such machine according to United Kingdom Patent No. 856568 comprises a stationary cylinder wholly or partially open, or adapted to be wholly or partially opened, at one end and closed at the other end and provided at said closed end with means for feeding leaf into a helical feed worm provided on a rotatable axial shaft, said helical feed worm being adapted to feed the leaf into an annular space formed by the cylinder bore and a substantially cylindrical extension of said rotatable axial

drive shaft, said cylindrical extension being provided with a plurality of sets of vanes or the like protruding into said annular space and adapted to propel the leaf towards, and to discharge it through, said open end of the cylinder, and said cylinder bore being provided with a plurality of sets of pins or the like also protruding into said annular space, said sets of vanes or the like and said sets of pins or the like being staggered with respect to one another.

Specification of U.K. Patent No. 1099758 claims for a tea processing machine as described above an attachment comprising a conical or frusto-conical member having its curved surface fluted with the flutes helically disposed, the conical or frusto-conical end thereof being adapted to be mounted at the end of the rotor shaft at the discharge end of the stationary cylinder, for axial drive, said attachment being adapted to be enclosed by the end portion of, or by an extension of, stationary cylinder i.e. stator of said machine, leaving a clearance for processed tea to discharge from around the base of the attachment. The rotor shaft described herein corresponds to the axial drive shaft described with reference to U.K. Patent No. 856568. The curved surface of the attachment is fluted by fixing battens to the surface.

In the specification of United Kingdom Patent No. 1175559 there is disclosed an improvement in or modification of a tea processing machine and attachment thereof as described and claimed in said patent specification No. 1099758 and comprises a sleeve slidably mounted within the stationary barrel of the machine from its discharge end in the space between the inner wall of the barrel and the conical or frusto-conical attachment to the rotor shaft. The said sleeve is cylindrical for a portion of its length at the anterior end of the rotor and has its intermediate portion

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sloping downwards, the remaining portion extending divergently. The sleeve is provided at least at its intermediate portion with pins projecting within itself; and also the conical or frusto-conical attachment is provided with pins projecting from its inclined surface. The said pins in the sleeve and in the attachment are staggered and do not come in contact.

10 According to the main patent no. 1274783 a machine is provided for processing tea leaf, which comprises a stationary cylinder or barrel closed at one end and open at the other, said cylinder enclosing a
15 feed worm or feed screw mounted on a rotatable shaft, and a stationary sleeve adjustably fitted at the open end of the cylinder to enclose a conical or frusto-conical attachment on an extension of the
20 rotatable shaft, the open end of the sleeve being supported at two sides by two support lugs mounted on cylinder support bars and locked in position by locking nuts. The support lugs are provided with eyed
25 ends through which pass the cylinder support bars. A hopper is provided in the cylinder at the location of the feed screw.

According to other features of the invention of the main patent the sleeve is
30 screw threaded externally at the end fitting in the cylinder to which it is screwed and adjustably secured by a ring nut. A groove is provided at this end of the sleeve to accommodate a packing ring. At the free end
35 of the sleeve it is externally cylindrical and carries two support lugs for mounting on the support bars. Internally at the cylinder end the sleeve slopes downwardly for a certain length and then slopes upwardly for
40 the rest of the length, and pins or battens are provided projecting from the sloping surface. Due to the sloping surfaces of the sleeve and its adjustable mounting on the cylinder it is possible to adjust the intensity of processing the leaf, because by
45 moving the sleeve axially in relation to the conical or the frusto-conical attachment the effective pressure to which the tea leaves are subjected at the discharge end of the
50 machine, can be varied.

The object of the present invention is to provide an improvement in the machine according to the main patent, the improvement lying in that instead of mounting
55 the sleeve adjustably in relation to the conical or the frusto-conical attachment at the discharge end of the machine, the sleeve is specifically fixed at the open end of the cylinder, and to achieve the desired
60 degree of intensity of tea processing, pressuriser plates are fitted to the conical or the frusto-conical attachment at said discharge end. With such pressuriser plates provided at the discharge end of the
65 machine, adjustment of pressure during

processing of tea leaves in the machine can be made instantaneous, and, thus, these do away with the adjustment of the sleeve in relation to the position of the conical or the frusto-conical attachment, which is to
70 be made in the machine according to the main patent. There is no need to alter the position of the sleeve relative to the conical or the frusto-conical attachment so as to achieve the desired degree of processing action, and, therefore, in the improved
75 machine according to the present invention the sleeve is specifically fixed at the open end of the cylinder with the conical or the frusto-conical attachment being enclosed
80 therein.

Accordingly, the present invention provides a tea processing machine according to U.K. Patent No. 1274783 wherein
85 the sleeve is specifically fixed at the open end of the cylinder, that is, it is not adjustably fitted, with the conical or the frusto-conical attachment being enclosed therein, and in order to adjust the intensity of processing tea leaves with such arrangement
90 pressuriser plates are additionally fitted to the conical or the frusto-conical attachment at the discharge end of the machine.

As a particular embodiment, the internal
95 surface of the sleeve is of convergent-divergent configuration, having longer convergent tapered entrance compared to the divergent discharge end. The pins or battens are provided projecting from said convergent-divergent surface of the sleeve.
100

As a preferred embodiment, the long helical battens provided on the conical or the frusto-conical attachment of the
105 machine according to the main patent may be replaced by short staggered battens of different depths along the tapered face of the attachment.

The pressuriser plates provided in the machine according to the present invention,
110 preferably consist of two superimposed discs, each having three or more radial projections projecting into the annulus defined between the base of the conical or the frusto-conical attachment and the inner
115 face of the sleeve, one of said discs being fixed to the end of said conical or frusto-conical attachment and the other disc being rotatable about its axis in relation to said fixed disc, whereby the position of the
120 radial projections of said rotatable disc can be altered, as desired, in relation to those of the fixed disc to control the area of opening available for the processed leaf to emerge from the cylinder and the sleeve of
125 the machine.

As a preferred embodiment, in the improved machine according to the present invention there are provided multiple
130 thrust faces at the discharge end of the

rotary feed means of the machine. Such multiple thrust faces may be constituted by a single start feed screw exposing a single thrust face at its discharge end, and another thrust face in diametrically opposite relationship with said thrust face at the discharge end of the feed screw, is formed by cutting away a notch at a distance of half the pitch from said thrust face at the discharge end. Preferably, pins are fitted on the stationary cylinder of the tea processing machine, to prevent accumulation of the fed material at said notch as also at said discharge end of the feed screw, and to ensure that the thrust faces as exposed by the cut away notch and at said discharge end are kept clear during the rotation of the feed screw.

The invention will now be described with reference to the accompanying drawings, by way of illustration, wherein:

Figure 1 is an elevation of the improved machine according to the present invention;

Figure 2 is the plan, partly in section, of the improved machine according to the present invention; and

Figure 3 shows the pressuriser plates fitted to the improved machine.

Referring to Figures 1 and 2 of the drawings, only those features of the machine will be described hereinafter, which are necessary and relevant to understand the invention. The other features which are not described herein, are known, and have been described in detail in the specification of the main patent.

As shown, the machine has, like that according to the main patent, a stationary cylinder 1 enclosing a feed worm 2, said cylinder 1 being closed at one end, and open at the other end, which is the discharge end of the machine. At said discharge end a sleeve 3 of convergent-divergent configuration is fitted inside the cylinder 1. Said sleeve 3, according to the present invention, is specifically fixed to the cylinder 1, that is, it is not adjustably fitted in relation to the cylinder and the frusto-conical attachment 5, which is enclosed within the sleeve 3. The inner surface of the sleeve is provided with pins 4. Along the tapered face of the frusto-conical attachment 5 are provided short staggered battens 6 of different depths. The staggered arrangement of the battens 6 lead to better processing action due to elimination of the path of least resistance for those particles of tea shoots which cling to the sides of long helical battens (as provided in the machine of the main patent), and escape processing action induced by the rotation of the conical attachment in conjunction with the internal wall of the sleeve and the pins provided in the latter. The staggered bottoms 6 are in-

verted 'U'-shaped like the long battens provided in the conical attachment of the machine according to the main patent, the only difference is that they are short and staggered as shown. At the discharge end of the machine pressuriser plates 7 are fitted to the frusto-conical attachment 5, the construction and function of which will be described hereinafter.

In order to provide multiple thrust faces at the discharge end of the feed worm 2, which is, as shown, a single start feed screw, a notch 8 is cut-away in the screw (e.g. by turning in lathe) at a distance of half the pitch from the thrust face defined by the discharge end 9 of the feed worm 2, such thrust face, formed by the notch 8, being at a diametrically opposite point to that where the other thrust face defined by the end 9 of the feed worm 2 is located. Pins 10 are fitted on the cylinder 1 to prevent accumulation of the fed material at said notch 8 as also at the end 9 of the feed worm, and also to ensure that the thrust faces defined in said notch 8 and the end 9 of the feed worm are kept clear during the rotation of the feed worm through the material which is fed. The usual hopper for feeding tea leaves to the machine is indicated by 11 in Figure 1.

Referring now to Figure 3 the pressuriser plates 7 consist of two superimposed discs 7A and 7B, each of which, as shown, has radial projections 12 and 13 respectively. When such pressuriser plates 7 are fitted to the frusto-conical attachment 5 at the discharge end of the machine, said projections 12 and 13 project into the annulus defined between the base of the conical attachment 5 and the inner face of the sleeve 3. One of the discs 7A and 7B is fixed to the conical attachment 5, while the other is rotatable about its axis in relation to the fixed one, so that the position of the projections of the rotatable disc can be altered in relation to those of the fixed disc. The idea is to restrict the area of opening available for the processed leaves to emerge from the cylinder and the sleeve. By controlling the area of such opening the pressure generated within the machine can be increased or decreased quickly, and thus the desired degree of processing action of the tea leaves can be achieved. The projections 12 and 13 cover an area of 30-50% of the annulus, referred to hereinbefore. The pressuriser plates 7 thus eliminate the necessity of adjusting the position of the sleeve in relation to the conical attachment, in order to achieve the desired degree of processing action, as is done in the machine according to the main patent.

As shown, the sleeve 3 has a longer convergent tapered entrance compared to the

divergent exit end.

WHAT WE CLAIM IS:—

1. A tea processing machine according to United Kingdom Patent No. 1 274 783 wherein the sleeve is specifically fixed at the open end of the cylinder, that is, it is not adjustably fitted, with the conical or the frusto-conical attachment being enclosed therein, and in order to adjust the intensity of processing tea leaves with such arrangement pressuriser plates are additionally fitted to the conical or the frusto-conical attachment at the discharge end of the machine.
2. A tea processing machine according to claim 1, wherein the internal surface of said sleeve is of convergent-divergent configuration, having longer convergent tapered entrance compared to the divergent discharge end.
3. A tea processing machine according to claim 2, wherein pins or battens are provided projecting from said convergent-divergent surface of the sleeve.
4. A tea processing machine according to any of the preceding claims, wherein said conical or frusto-conical attachment is provided with short staggered battens of different depths along the tapered face of said attachment.
5. A tea processing machine according to any of the preceding claims, wherein said pressuriser plates consist of two superimposed discs, each having three or more radial projections projecting into the annulus defined between the base of the conical or the frusto-conical attachment and the inner face of the sleeve, one of said discs being fixed to the end of said conical or frusto-conical attachment and the other disc being rotatable about its axis in relation to said fixed disc, whereby

the position of the radial projections of said rotatable disc can be altered, as desired, in relation to those of the fixed disc to control the area of opening available for the processed leaf to emerge from the cylinder and the sleeve of the machine.

6. A tea processing machine according to any of the preceding claims, wherein there are provided multiple thrust faces at the discharge end of the rotary feed means of the machine.

7. A tea processing machine according to claim 6, wherein a single start feed screw exposing a single thrust face at its discharge end, is provided as the rotary feed means, and another thrust face in diametrically opposite relationship with said thrust face at the discharge end of the feed screw, is formed by cutting away a notch at a distance of half the pitch from said thrust face at the discharge end.

8. A tea processing machine according to claim 7, wherein pins are fitted on the stationary cylinder of the tea processing machine to prevent accumulation of the fed material at said notch as also to said discharge end of the feed screw, and to ensure that the thrust faces as exposed by the cut away notch and said discharge end are kept clear during the rotation of the feed screw.

9. A tea processing machine substantially as hereinbefore described with particular reference to and as illustrated in the accompanying drawings.

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1. A tea processing machine according to United Kingdom Patent No. 1 274 783 wherein the sleeve is specifically fixed at the open end of the cylinder, that is, it is not adjustably fitted, with the conical or the frusto-conical attachment being enclosed therein, and in order to adjust the intensity of processing tea leaves with such arrangement pressuriser plates are additionally fitted to the conical or the frusto-conical attachment at the discharge end of the machine.
2. A tea processing machine according to claim 1, wherein the internal surface of said sleeve is of convergent-divergent configuration, having longer convergent tapered entrance compared to the divergent discharge end.
3. A tea processing machine according to claim 2, wherein pins or battens are provided projecting from said convergent-divergent surface of the sleeve.
4. A tea processing machine according to any of the preceding claims, wherein said conical or frusto-conical attachment is provided with short staggered battens of different depths along the tapered face of said attachment.
5. A tea processing machine according to any of the preceding claims, wherein said pressuriser plates consist of two superimposed discs, each having three or more radial projections projecting into the annulus defined between the base of the conical or the frusto-conical attachment and the inner face of the sleeve, one of said discs being fixed to the end of said conical or frusto-conical attachment and the other disc being rotatable about its axis in relation to said fixed disc, whereby

the position of the radial projections of said rotatable disc can be altered, as desired, in relation to those of the fixed disc to control the area of opening available for the processed leaf to emerge from the cylinder and the sleeve of the machine.

6. A tea processing machine according to any of the preceding claims, wherein there are provided multiple thrust faces at the discharge end of the rotary feed means of the machine.

7. A tea processing machine according to claim 6, wherein a single start feed screw exposing a single thrust face at its discharge end, is provided as the rotary feed means, and another thrust face in diametrically opposite relationship with said thrust face at the discharge end of the feed screw, is formed by cutting away a notch at a distance of half the pitch from said thrust face at the discharge end.

8. A tea processing machine according to claim 7, wherein pins are fitted on the stationary cylinder of the tea processing machine to prevent accumulation of the fed material at said notch as also to said discharge end of the feed screw, and to ensure that the thrust faces as exposed by the cut away notch and said discharge end are kept clear during the rotation of the feed screw.

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