June 19, 1962 A. ESENWEIN ET AL 3,039,201

APPARATUS FOR TREATING TOBACCO PRODUCTS

Filed Sept. 26, 1957 2 Sheets-Sheet 1

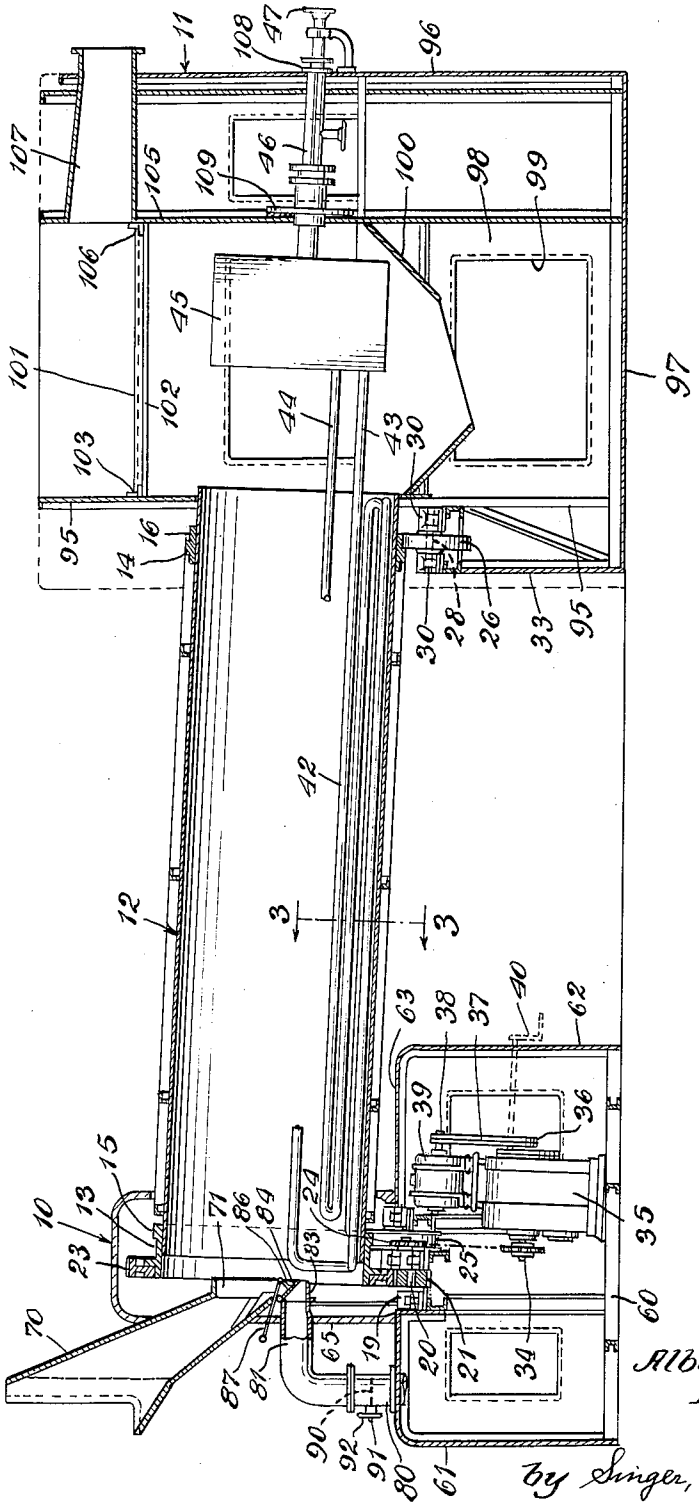

Fig. 1

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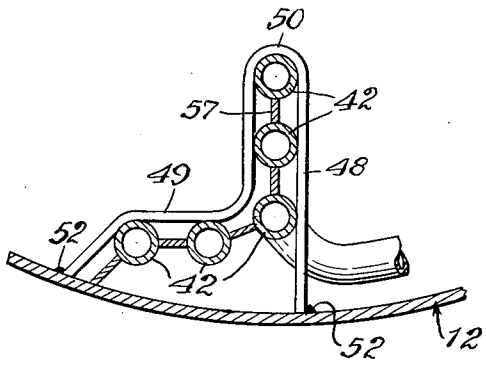


Fig. 3

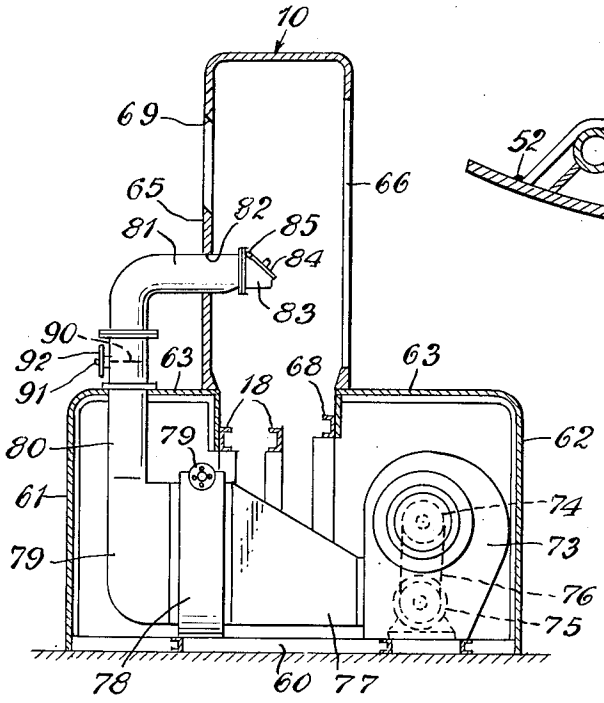


Fig. 2

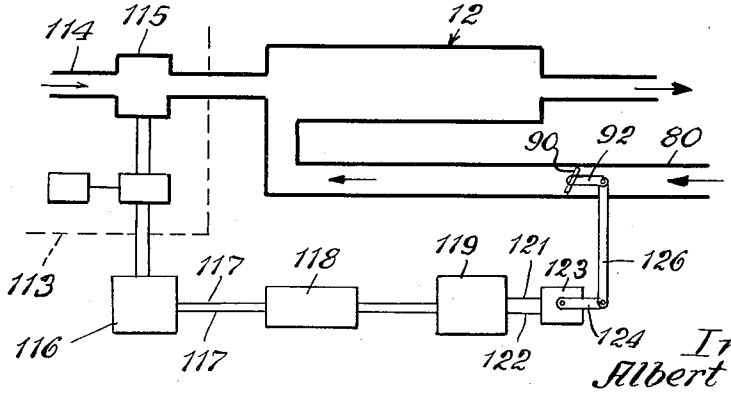


Fig. 4

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3,039,201

# APPARATUS FOR TREATING TOBACCO PRODUCTS

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4 Claims. (Cl. 34—48)

The present invention relates to an apparatus for treating tobacco products, and more particularly to heat treatment such as roasting of the tobacco in a cylindrical oven where the tobacco is continuously fed to the oven and the heating temperature thereof is automatically controlled.

One object of the invention, is to provide an apparatus for heat treating and roasting tobacco by providing additional heating means in addition to the heating means in the oven which can be conveniently controlled to effect rapid changes in temperature in the heating oven, and thereby maintain the temperature thereof at a predetermined level depending upon the moisture content of the tobacco being supplied to the oven.

Another object, is to provide an apparatus for heat treating tobacco such as roasting and the like in which the tobacco is continuously fed to a roasting oven which includes a rotating cylinder having steam heating pipes therein and a feed hopper at one end projecting into the cylinder for feeding the tobacco. Directly beneath the outlet of the feed hopper is positioned the discharge nozzle of an auxiliary heating device to direct a stream of hot air through the tobacco as it falls by gravity into the heat treating cylinder.

Another object, is to provide a heat treating apparatus for roasting tobacco in which the discharge end of the rotating cylinder is provided with a discharge hopper above which is arranged a perforated sieve plate for the purpose of drawing off excess moisture in the roasting oven by suction means having the conventional vent for the normal escape of moist air from the roasting cylinder.

Another object, is to provide an apparatus which includes a hygrometer control system in which a humidity control switch is actuated to close a circuit through a solenoid control valve governing the flow of additional heat to the heat treating cylinder.

Another object, is to provide a heat treating apparatus in which the steam heating pipes passing into the heat treating cylinder are mounted in blade members adapted to agitate the tobacco as it passes through said cylinder and permit the blast of warm air from the auxiliary heater to pass through the particles of tobacco more readily.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings, wherein:

FIGURE 1 is a longitudinal cross-sectional view of the heat treating apparatus showing the manner in which the inclined roasting cylinder is supported at its opposite end and illustrating the auxiliary heating device arranged at one end with its discharge pipe presented to one end of the cylinder beneath the supply hopper.

FIGURE 2 is a vertical cross-sectional view of one of the end housings showing the arrangement of the heater blower assembly housed therein.

FIGURE 3 is a vertical cross-sectional view taken on line 3—3 and looking in the direction of the arrows to illustrate one of the agitator blades, and the manner in which the steam heating pipes are encased therein; and

FIGURE 4 is a diagrammatic view illustrating the control system for the auxiliary heater.



In the drawings, and more for the purpose of illustration, attention is first directed to FIGURE 1 wherein there is shown a heat treating apparatus for tobacco including a supply housing generally designated 10 and a discharge housing generally designated 11. An inclined rotary cylinder likewise generally indicated 12 has its ends supported by the spaced casings 10 and 11, and said heat treating cylinder is formed of an elongated tube 12 having annular castings 13 and 14 on the opposite ends thereof. The casting 13 is suitably secured in place and is shaped to provide a ring 15, while the casting 14 is similarly shaped to provide a ring 16.

The housing 10 is provided with a pair of spaced angle bars or structural channel members 18 arranged in spaced relation, and said channel members are adapted to support a pair of bearings 19 for supporting a rotary shaft 20 on which is keyed a gear wheel 21. The gear wheel 21 drivingly engages a ring gear 23 on the casting 13, and said shaft is fitted on one end with a sprocket wheel 24. The ends of the cylinder 12 rest upon wheels 25 and 26 supported by the respective housings 10 and 11 in the conventional manner. The gear wheels 26 are mounted on shafts 28 arranged in circumferentially spaced relation, and each of said shafts is supported in bearing caps 30 mounted on an upright frame 33 built into the housing 11. Since the arrangement of the wheels 25 is identical to that described in connection with the wheels 26, a description of one will suffice for both. The structure is such that the ends of the cylinder 12 are rotatably supported on the wheels 25 and 26 in the respective housings 10 and 11.

The sprocket wheel 24 is adapted to be driven from the output shaft 34 of a speed reducer 35 which may be of the variable type to permit rotation of the cylinder 12 at different speeds. The input shaft of the speed reducer 35 is provided with a pulley 36 over which is trained a drive belt 37 for drivingly connecting the pulley 38 on the armature shaft of an electric motor 39 to said speed reducer. The speed reducer is provided with a manual control 40 to change speed in the conventional manner.

Extending into the cylinder 12 from one end thereof is a series of heating coils arranged in groups disposed in circumferentially spaced relation within the cylinder 12. The heating pipes 42 are arranged in a zig-zag fashion and have their inlet and outlet pipes 43 and 44 respectively connected to a rotatable header 45 arranged in spaced relation from one end of the cylinder 12. The header 45 rotates on an inclined steam supply pipe 46 having a coupling 47 adapted to be attached to a suitable source of steam supply. The shaft 46 may be provided with a discharge passageway (not shown) to permit flow of steam from the steam header 45 through the pipes 42 and thence back to the source or atmosphere through the return duct. The heating pipes 42 are shielded by blade members secured to the inner periphery of the shell 12, and as shown in FIGURE 3 the steam heating pipes 42 are arranged in groups with one wall 48 extending along one group of pipes and the other side wall 49 being shaped to extend along the sides of another set of steam pipes of the same group. The blade member 50 formed by the side walls 48 and 49 is secured to the inner periphery of the cylinder 12 by welding or the like, as at 52, and if desired the heating pipes 42 can be connected together by anchoring straps 57.

The housing 10 includes a base 60 upon which the speed reducer 35 is mounted, and said base supports a a lower housing having front and rear walls 61 and 62, and a top wall 63. Supported on the top wall 63 is a shroud casing 65 having an opening 66 (FIG. 2) for receiving the left hand end of the cylinder 12. The housing formed by the walls 61—62 and 63 is re-inforced

with vertical channel bars connected by horizontal channel bars 18 and 68. An opening 69 is formed in the front wall of the shroud housing 65 for receiving a feed hopper 70 which has its lower end projecting downwardly into a discharge opening 71 directed in such a manner as to feed tobacco to the interior of the cylinder 12.

Mounted in the casing 10 on the base 60 is a blower 73 having a pulley 74 connected to its impeller shaft which is driven by an electric motor 75 through a drive belt 76. The discharge housing 77 of the blower 73 is flared outwardly and is connected to a heating element 78 having heating coils supplied with steam through an inlet 79. An outlet (not shown) is provided for conducting the steam to a return circuit. Mounted on the outlet side of the steam heater 78 is a collection chamber 79 having a vertically extending pipe 80 which is bent at its upper end and terminates in a horizontal portion 81 projecting into the shroud housing 65 through a suitable opening 82 therein. The end of the horizontal portion 81 is provided with a discharge nozzle 83 having a flap valve 84 pivoted thereto as at 85. A control lever 86 is secured to the flap valve 84 and is provided with a manually operable notched pull rod 87 which projects through an opening for the passage of the control rod 87 so that the notches in said rod may engage the edge of said opening and retain said flap valve 86 in position. It is to be noted that the discharge nozzle 83 projects into the shroud with its discharge end disposed beneath the discharge opening 71 of the hopper 70. Thus tobacco falling by gravity into the cylinder 12 will be subjected to a blast of warm air at predetermined intervals depending upon the moisture content of the tobacco being supplied to the cylinder in a manner which will be hereinafter more fully described.

A butterfly valve 90 is pivotally mounted in the vertical portion 80 of the warm air duct, and the stem of said valve 91 has attached thereto a control link 92 for a purpose which will be later defined.

The supporting housing 11 is constructed of vertical walls 95 and 96 arranged in spaced relation and extending upwardly from a base 97. Side walls 98 are provided and one of the side walls is provided with an opening 99 into which may be inserted a collection receptacle for receiving the tobacco after it has been heat treated. A hopper 100 is provided for directing the tobacco into a receptacle (not shown) placed therebeneath. Extending between the upper walls 95 and 98 is a sieve plate 101 which includes a metal sheet perforated throughout its area and having one or more side frame members 102 which are supported at one end by the wall 95 as at 103, and the opposite end on the upper end of a wall 105 as at 106.

The upper portion of the housing 11 between the walls 95, 98 and 105 are connected to the intake of a blower to create suction in the discharge end of the cylinder 12 and withdraw vapors therefrom. A suction vent duct 107 is connected to the wall 105, and may be provided with suitable controls to vent the area bove the perforated sieve plate 101 at certain intervals, and thus permit tobacco to fall from the sieve plate after it has collected thereon.

The feed shaft 46 is supported between the walls 96 and 105 by suitable means such as flanged collars or the like as at 108 and 109, and as previously set forth the shaft 46 is angled slightly so that its axis coincides with the axis of the cylinder 12.

In order to control the butterfly valve 90 there is provided a control circuit shown schematically in FIGURE 4, and in order to accomplish the control of the valve 90 a humidity regulator having a control switch is indicated at 113. This control unit may be of the Minneapolis-Honeywell Company type in which a fine coil subject to moisture causes a shaft to rotate in either direction and operate a switch at preselected humidity points. The tobacco is supplied to the humidity control



regulator 113 through a pipe 114 which passes through the humidity control regulator switch and passes through a measuring condenser 115 of the humidity control switch device 113. A suitable source of electrical energy is interposed between the low voltage circuit of the humidity regulator switch 113 (not shown) and the output is connected to an amplifier 116 of the magnetic type well known in the art. The output of the amplifier 116 is connected by lines 117 to an error detector 118 which detects the moisture of the tobacco according to the momentary humidity as well as the duration of time that the humidity is at a high or low amplitude. The output of the detector 118 is connected to an amplifier 119 and the output of the amplifier 119 is electrically connected by lines 121 to an electric motor drive device 123. The armature of the electric drive device 123 is connected to the lever 124 which has its free end connected to a link 126 pivotally attached to the arm 92 of the butterfly valve 90.

It will thus be seen that in operation the cylinder 12 is rotated continuously at a reduced speed by the motor 39, and that the steam is supplied to the heating coils 42 which rotate with the cylinder 12 so that said heating coils will reach a proper predetermined temperature for roasting or otherwise heat treating the tobacco in the cylinder. The blower 73 is likewise operated continuously, and steam is supplied to the heating coils of the heater 78 through the inlet 79. As tobacco is fed to the hopper 70 it passes through the automatic moisture measuring device 113 and in so doing actuates the various amplifiers which control the motor 120 and permit the butterfly valve 90 to be opened and closed in accordance with the humidity condition of the tobacco passing through the duct 114. If the humidity content or moisture condition of the tobacco being fed through the duct 114 is within predetermined standards, the butterfly valve 90 will remain closed. A spring may be employed for this purpose (not shown) to bias the valve to its closed position. Thus, an additional heat will flow through the discharge 83 of the pipe 81, and the tobacco will be heated and toasted by the conventional heating coils in the cylinder 12. However, should the moisture content of the tobacco be high while passing through the pipe or duct 114, the butterfly valve 90 will be operated and upon energization of the electric motor device 123 said valve will be opened to permit additional heat to pass into the cylinder 12 and be directed in a stream through the tobacco being fed thereto as it falls by gravity from the discharge 71 of the hopper 70. Thus, a warm stream of air will be blown through the tobacco during suspension in the air which will remove moisture in excess of the prescribed amount so that when the tobacco is subjected to agitation and heat from the steam coils 42 and blades 50 the tobacco will be discharged through the hopper 100 to a suitable collection chamber in the proper heat treated condition with a controlled moisture content.

It has been found that temperature changes in the cylinder 12 can be made rapidly within fine adjustment limits and that better results can be obtained than by trying to regulate the temperature of the steam passing to the coils 42 due to the fact that a great time delay ensues when changing the temperature of the steam in the heating coils 42. This time lag is too great to control the temperature within fine adjustment limits, and by using an auxiliary heater wherein warm air is directed through the tobacco as it falls by gravity from the supply hopper when needed a fine temperature adjustment can be more readily had and the resultant product will be more uniform after treatment.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment thereof, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim is:

1. In an apparatus for heat treating tobacco, comprising an inclined rotary cylinder having an inlet and an outlet at the opposite ends thereof, means projecting into the outlet end of said cylinder for supplying internal heat thereto to heat said cylinder to a predetermined basic temperature level, means at the inlet end of said cylinder for rotating the same, agitating means carried by said cylinder for supporting said first named means, a hopper having a discharge end presented to the inlet of said cylinder for feeding tobacco thereto by gravity, a blower mounted adjacent the inlet end of said cylinder adapted to be driven by the means for rotating said cylinder, a duct having its discharge end presented to the inlet end of the cylinder and disposed beneath the discharge of said hopper, the other end of said duct being connected to the discharge of said blower, a second heater mounted in the flow path of said blower and interposed in said duct, the discharge end of said duct being disposed to introduce warm air to the stream of tobacco falling in front of said discharge end by gravity as it is fed from said hopper to the inlet of the cylinder, valve means in said duct for regulating the flow of hot air to the discharge end of said duct and increase and decrease the additional heat in the form of hot air to intercept the tobacco during its gravity fall, and a perforated plate mounted near the discharge end of said cylinder to permit the escape of excess heated air and to filter the tobacco particles therefrom.

2. In an apparatus for heat treating tobacco comprising an inclined rotary cylinder having inlet and outlet ends, heating coil means projecting into the outlet end of the cylinder for supplying internal heat thereto at a predetermined basic temperature level, means at the inlet end of said cylinder for rotating the same, agitating means carried by said cylinder for supporting said heating coil means, a hopper adjacent the inlet end of said cylinder having a discharge arranged to feed tobacco into the cylinder by gravity, a second heater means for directing additional hot air into said cylinder, said second heater means including a duct having a discharge end presented to the inlet of the cylinder and disposed beneath the discharge of said hopper to feed hot air in a direction to intercept the tobacco during its gravity fall from the hopper discharge, a source of hot air for supplying said duct valve means in said duct to regulate air flow therethrough, and means responsive to the humidity of the tobacco to control said valve means, said valve being opened to permit additional heat in the form of hot air to intercept the tobacco when its initial moisture content exceeds a predetermined maximum and being closed when the moisture content of the tobacco is below the maximum value.

3. In an apparatus for heat treating and roasting tobacco, comprising an inclined rotary cylinder forming a heating chamber having inlet and outlet ends, heating coils projecting into said cylinder from the outlet end thereof and secured to the cylinder to rotate therewith, means for rotating said cylinder at a reduced speed, agitating members in said cylinder for supporting said heating coil means, a hopper having its discharge end presented to the inlet of said cylinder for feeding tobacco thereto by gravity, a blower adjacent the inlet end of said



cylinder, a duct connected to the discharge of said blower, a heater interposed in the duct in the flow path thereof, the discharge end of said duct being disposed beneath the hopper discharge for directing a restricted stream of warm air to the cylinder after intercepting the tobacco from the hopper discharge falling by gravity, a casing located at the outlet end of the cylinder to receive treated tobacco therefrom and form a collection chamber, a hopper in the lower portion of said casing for receiving and collecting the tobacco after it has been treated, a sieve plate mounted in the upper portion of said casing and above the outlet of said cylinder, valve means in said duct adapted to be opened to permit additional heat in the form of hot air to intercept the tobacco when its initial moisture content exceeds a predetermined maximum value and to be closed when the moisture content is below said value, and control means responsive to the moisture content of the tobacco fed to said hopper for regulating said valve means.

4. In an apparatus for heat treating and roasting tobacco, an inclined rotary cylinder forming a heating chamber having inlet and outlet ends, heating pipes extending into the outlet end of the cylinder for supplying heat thereto at a predetermined basic temperature level, motor means for rotating said cylinders at a predetermined speed, agitator blades arranged in said cylinder on the inner peripheral wall thereof in circumferentially spaced relation to provide a support and cover for said heating pipes, a hopper having its discharge presented to the inlet end of said cylinder for feeding tobacco to one end of the cylinder by gravity, a heater blower unit arranged externally of the cylinder, a duct extending from said assembly having its outlet end projecting into the inlet of the cylinder and beneath the discharge of the feed hopper to direct a stream of warm air into the cylinder and intercept the tobacco falling from the hopper discharge by gravity, a casing located at the outlet end of the cylinder, a collection chamber in the bottom of said casing to receive tobacco after the same has been treated, a vent passage in the upper portion of said casing to permit the escape of vapor, and a filter screen mounted in the upper portion of said casing between the outlet end of the cylinder and the vent of said casing, said duct being provided with valve means to regulate the passage of warm air from said heater blower unit, and said heater blower unit forming a source of additional heat separate and distinct from the heat supplied by said heating pipes.

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