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APPARATUS FOR CURING TOBACCO

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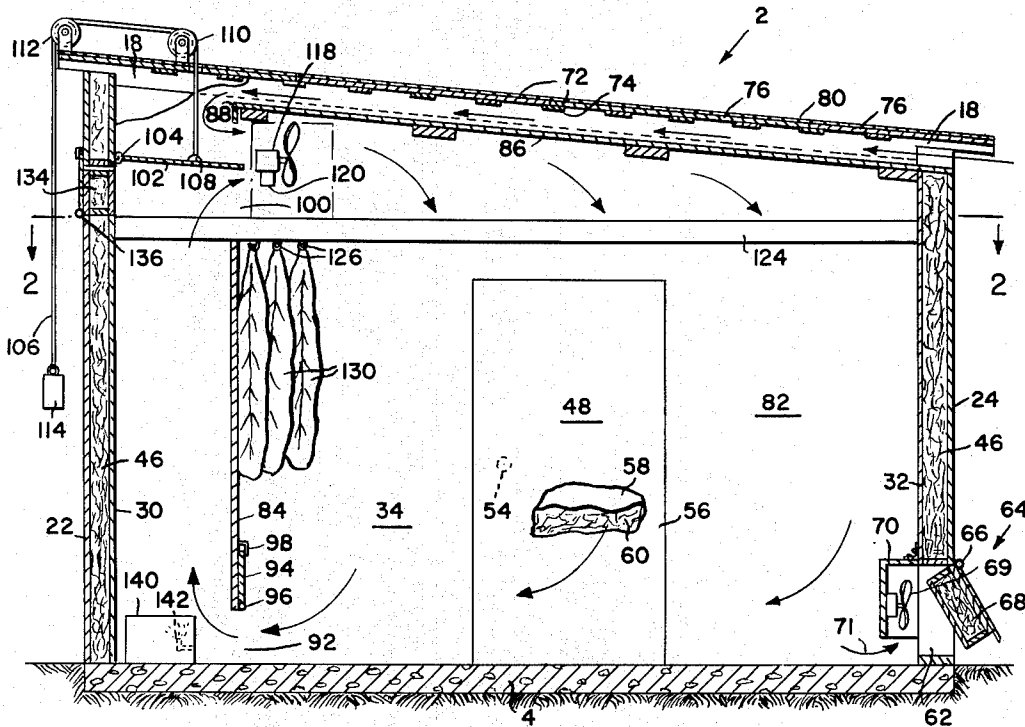


FIG. 1.

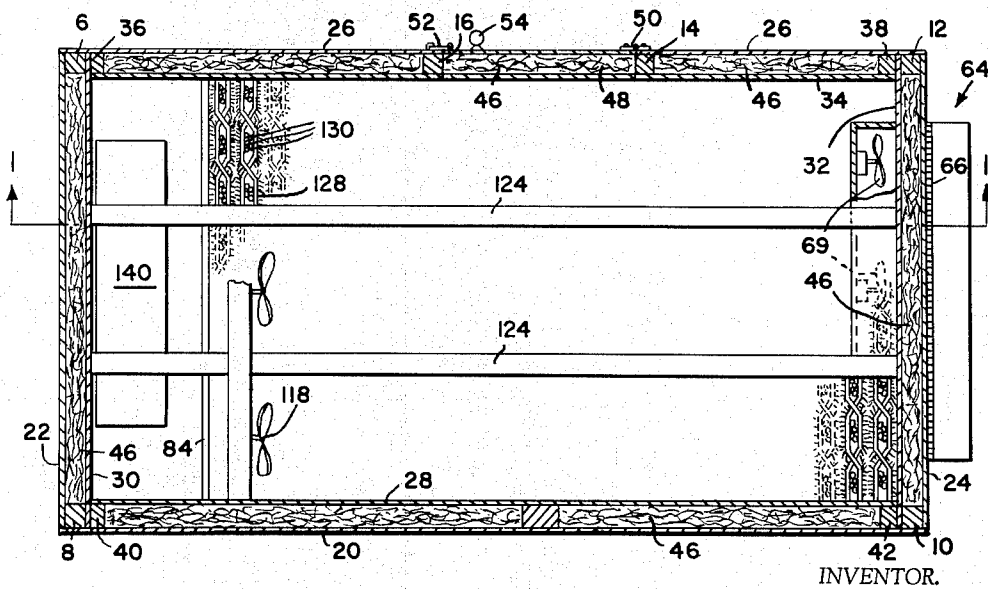


FIG. 2.

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APPARATUS FOR CURING TOBACCO

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4 Claims. (Cl. 34-219)

This invention relates to apparatus for curing tobacco and more particularly relates to apparatus which advantageously takes advantage of solar heat and/or nocturnal radiation.

It is known to be highly advantageous to cure tobacco in compact beds formed by hanging the tobacco closely spaced to form such beds. Heretofore, in carrying out such curing it has been necessary to employ full-time, costly air-conditioning equipment in order to provide conditioning air at the desired temperature. Further, conventional air conditioning apparatus has heretofore been required in order to prevent condensation on the tobacco during so-called rest periods when the temperature of the conditioned air is lowered, it being recognized recently that intermittent rest periods are advantageous in curing tobacco to a high quality.

Unexpectedly in accordance with this invention, it has been found that highly efficient and very economic apparatus can be provided largely eliminating conventional air conditioning devices and relying for the necessary heat and air movement mainly on solar heat energy and nocturnal radiation.

The invention will be understood from a reading of the following description in conjunction with the drawings in which:

FIGURE 1 is a vertical section of apparatus in accordance with this invention taken on the plane indicated by the line 1-1 in FIGURE 2; and

FIGURE 2 is a horizontal section of the apparatus of FIGURE 1 taken on the plane indicated by the line 2-2 in FIGURE 1.

As shown in the figures, a housing 2 has a concrete slab foundation 4 on which upright posts 6, 8, 10, 12, 14 and 16 are supported. It is desirable to have the foundation 4 slope towards the front or rear, for example, a 2° slope downwardly from left to right as viewed in FIGURE 1. A joist 18 is supported by posts 6 and 12, the latter post being shorter than the former to provide for the sloping of the joists from left to right as viewed in FIGURE 1 at an angle of about 10° to the horizontal. Advantageously the slope of the joists will be in the range of from 5° to 20° below the horizontal. A second joist, not shown, is similarly supported by posts 8 and 10. The housing 2 is provided with an outer front wall 20, outer side walls 22 and 24 and an outer rear wall 26. Housing 2 is located with wall 24 facing in a southerly direction, preferably a little west of south, such as 190°. An inner front wall 28, inner side walls 30 and 32 and an inner rear wall 34 are also provided, upright members 36, 38, 40 and 42 being provided for the purpose of securing the inner front panel 28 and the inner rear panel 34. Insulating material 46 fills the spaces between the inner and outer walls. Any suitable insulating material such as, for example, rock wool or spun glass or reflective sheets such as aluminum sheets, may be employed. A door 48 hinged as indicated at 50 and having a securing latch 52 and a handle 54 is installed in the rear of the housing 2. As shown in FIGURE 1, the door is formed of a front panel 56, a rear panel 58 between which is placed insulation 60. The right-hand end of housing 2, as viewed in FIGURE 1, is provided with a vent opening 62 controlled by a door 64 hinged at 66, the interior of door 64 is also filled with insulating material indicated at 68. An exhaust blower 69 at opening 62 is desirable.

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Blowers 69 are mounted in housing 70 which is open at its lower end 71.

A plurality of transverse beams 72 are supported in cut-out portions 74 of the joists. Flat sheets 76 of, for example, plywood are secured to the beams 72 and to the joists. In turn the sheets 76 are overlaid with a black surfacing material 80, which may be, for example, black roofing paper, pitch or black paint. The pitch of the plane in which sheets 76 lie is approximately 10° below the horizontal and advantageously will be in the range of from 5° to 20° below the horizontal. Black corrugated iron, where snow and ice loads permit, may be substituted for sheets 76 and black surfacing material 80.

A curing chamber 82 is formed within housing 2 by partition 84 and ceiling 86, which is substantially parallel to sheets 76. Ceiling 86 has a depending flange indicated at 88 and rests on the upper ends of outer wall 24, inner wall 32. As will be seen from FIGURE 1, sheet 76 and ceiling 86 form, in effect, a duct open to the atmosphere at its right-hand end and discharging into the interior of housing 2 at its left-hand end.

Partition 84 has an opening 92 at its lower end controlled by door 94 pivoted at 96, a latch 98 being provided to hold the door in open position when so desired. Partition 84, together with walls 28, 30 and 34, forms in effect an air duct adjacent curing chamber 82 which leads from the lower portion of curing chamber 82 to the upper portion of chamber 82, partition 84 having an opening 100 at its upper end. A flapper valve 102 hinged at 104 is provided to control the flow of air into the upper portion of curing chamber 82. The position of flapper valve 102 is controlled by a line 106 secured to valve 102 at 108 extending upwardly through the roof and over pulleys 110 and 112. Line 106 has a counter-balancing weight 114 secured to it to provide for ready adjustment of valve 102 and to maintain valve 102 in a desired position.

Blowers 118 mounted on transverse beam 120 are provided to pull air through opening 100 into curing chamber 82.

To provide for the hanging of strung tobacco, curing chamber 82 is provided with beams 124 which are substantially parallel to foundation 4 to which are secured closely spaced hooks 126 which are adapted to support strings 128 carrying the tobacco 130. As is known in the art, a tightly packed bed of tobacco can be formed also by supporting the butt ends of the tobacco leaves on a screen.

A door 134 hinged at 136 is provided between beams 124 to provide a supplemental inlet or outlet as to utilize fog without rain and a vent opening at night to achieve a chimney effect.

A burner 140 is supported on foundation 4. Burner 140 has a pilot light 142 which burns continuously.

Operation

In operating the above described apparatus of this invention, the strung tobacco of, for example typical cigar leaf, will be placed in chamber 82 with advantageously from about 60 to 300 leaves per square foot. When the temperature of the outside air is higher than the bed temperature which generally occurs at about ten o'clock in the morning, flapper valve 102 will be approximately horizontal to permit the flow of air exterior housing 2 into curing chamber 82. The air exterior the housing will have been somewhat heated by the sun and will be substantially further heated during its passage between roofing sheet 76 and ceiling 86, beams 72 providing some turbulence in the air flow which further facilitates the heating. While not essential, it is desirable to have a black surface on sheets 76 in order to increase the heating effect by the sun. The heated air tending to move upwardly will move from right to left as viewed in FIG-

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FIGURE 1 to the area adjacent opening 100 where it will be drawn into chamber 82 by blowers 118, and forced downwardly through the bed of tobacco. Depending upon the air conditions desired in the tobacco bed, the air can be partially recirculated passing first through opening 92, then back into chamber 82 through opening 100 and partially exhausted through vent opening 62, or all of the air can be exhausted through vent opening 62 by closing door 94. It is desirable to prevent the temperature of the air passing through the tobacco bed from exceeding a desired maximum usually in the range of 100° F. to 120° F. at the time it is introduced to the bed. Flapper valve 102 is moved upwardly as necessary to prevent excessive hot air from being introduced into the chamber 82. Further lowering of the temperature of the air supplied to the tobacco bed can be achieved by opening of door 134.

When the air temperature drops to about 5° F. above the temperature of the tobacco bed, which is generally about 6 p.m., blowers 118 are stopped, and door 94 closed with valve 102 in the horizontal position. As the outside air cools down to a temperature below the temperature of the tobacco bed, the flow of air reverses and air gradually moves upwardly through the tobacco bed. Due to radiation from the roof, there is a substantial cooling effect on the air in the duct above ceiling 36 causing air to flow downwardly in the duct to the outside of the housing 2 thus also acting as a reversed chimney and creating a negative pressure over the tobacco bed. In addition, if desired, door 134 may be left open during this period for the exhaustion to the atmosphere of the warm air moving up from the top of the bed.

This reverse flow of air at night prevents any damaging build up or localized centers of moisture which would harm the tobacco. The upward flow of air through the tobacco bed is aided by the heat stored by the tobacco. This air movement is increased by the employment of slab foundation 4 which acts as a heat bank gradually giving up heat during the night. A slab foundation, however, is not essential. Door 64 will be ajar during this period and will be regulated so as to prevent the tobacco bed temperature from being lowered to the temperature of the outside air to prevent moisture condensation on the tobacco.

When the heat supplied by the sun has been low for a prolonged period it may be desirable to expedite curing to supply heat from the burner in the daytime.

The next morning the cycle of procedures is repeated and is continued from day to day until the tobacco is in a satisfactory cured condition as is evidenced to an expert in the field by the color and moisture content of the tobacco.

The operation of blowers 69 while not essential, may be employed to provide close humidity control and/or a more uniform flow of hot air downwardly through the bed by increasing the negative pressure under the front end of the bed which is remote from the point where the hot air first is introduced above the bed. It is to be noted that reasonably good distribution of air through the bed is achieved by the gradually reducing transverse vertical cross-sectional area about the tobacco bed from left to right as viewed in FIGURE 1.

What is claimed is:

1. Apparatus for curing tobacco leaves comprising

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walls, a floor and a sloping ceiling forming a chamber, a heat conducting sloping roof spaced above said ceiling and together with the ceiling forming an air duct for conveying air from the surrounding atmosphere at a point adjacent the lower point of the ceiling to discharge it at a point adjacent the upper end of the ceiling when the roof is being heated by the sun and in turn the roof is heating the air in the duct during the daytime and for conveying air from a point adjacent the upper end of the ceiling downwardly to the exterior of the apparatus when the roof is cooling the air in the air duct during the nighttime, means for supporting a compact bed of tobacco intermediate the top and bottom of said chamber, means operable to draw air discharging at a point adjacent the upper end of the ceiling into said chamber and pass it downwardly through said tobacco bed and means for connecting the lower portion of said chamber to the atmosphere whereby heated air is passed downwardly through the tobacco bed to heat and cure the tobacco when the roof is heated and air passes upwardly through the heated tobacco bed when the roof is cooling the air in the air duct due to the heating of air by the tobacco bed and due to radiation causing air to flow downwardly in the duct to the exterior of the apparatus, the last mentioned flow of air causing a negative pressure over the tobacco bed.

2. Apparatus in accordance with claim 1 in which the floor is a concrete slab, the slab being heated by the air flowing downwardly through the tobacco bed and giving up heat when the air reverses its direction of flow to flow upwardly through the bed.

3. Apparatus in accordance with claim 1 in which the floor is a concrete slab which slopes downwardly towards the means for connecting the lower portion of the chamber to the atmosphere, the slab being heated by the air flowing downwardly through the tobacco bed and giving up heat when the air reverses its direction of flow to flow upwardly through the bed.

4. Apparatus in accordance with claim 1 in which the means for connecting the lower portion of the chamber to the atmosphere includes a blower adapted to withdraw air from the chamber and discharge it to the atmosphere.

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