

PATENT SPECIFICATION

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(54) IMPROVED APPARATUS FOR THE AIR DRYING OF TOBACCO

(71) We, BRITISH-AMERICAN TOBACCO COMPANY LIMITED, of Westminster House, 7, Millbank, London, S.W.1, a Company incorporated under the laws of Great Britain, 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:—

This invention concerns improvements relating to apparatus for the air-drying of tobacco by heated air circulating in a substantially closed system.

According to the invention, apparatus for the purpose set forth comprises an air-circulating substantially closed system having means for heating the air in the system, means for introducing tobacco at one point of the system and in the path of the heated air, a series of chambers which are located in the system downstream of the tobacco-introduction means and in each of which the tobacco is conveyed upwardly in use by the hot air flowing through the chamber, means for separating the tobacco from the conveying air after it has passed through the last of the series of chambers, and, associated with at least one of said chambers, provision for increasing the drying effect and enabling the tobacco through-put thereof to be increased, which provision comprises means for bleeding an amount of air from the apparatus at a location between chambers, means for adding supplemental heated air adjacent the air inlet of the chamber following the air-bleeding means as a replacement for at least part of the air bled from the apparatus and for increasing the temperature of the air flowing through the said one chamber. The system may provide for the recirculation and reconditioning of the air in order that it may be at the desired temperature and moisture content at the point of introduction of the tobacco.

The invention is especially directed to improvements in apparatus for drying tobacco of the kind disclosed in the Specification of our

Patent No. 957,532. Apparatus disclosed in that patent embodies a system for improving the filling power and quality of tobacco by drying with hot air containing a high proportion of water vapour. Air is conditioned by lowering the moisture content and increasing its temperature. This is accomplished by bleeding off part of the recirculating air and replenishing it with an equal amount of fresh air at a lower moisture content. The quantity of air that is removed and introduced is automatically controlled. Similarly automatic means are employed for attaining the desired air temperature at the location at which the tobacco is introduced into the system. Practice has proven that the system of the said patent performed satisfactorily with acceptable efficiency in obtaining tobacco of uniform moisture content.

The invention seeks to enhance the drying and tobacco through-put efficiency of other suitable tobacco air-drying systems as well as of the system disclosed in the said patent.

One manner in which the invention can be carried into effect will now be more fully described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic view of a tobacco-drying system,

Fig. 2 is an enlarged fragmentary elevational view showing the connections of a supplemental heated-air unit to the system, and

Fig. 3 is a plan view thereof.

In the closed system shown in the drawings, air conditioned as to temperature and moisture content, as in the above patent, is delivered through a duct 12. Tobacco is introduced into the air stream in the system by an automatic feeder 14 through an airlock 15 and is conveyed by the air flow through one or more drying chambers 16 (as shown, three such chambers 16a, 16b, 16c).

In each chamber, the tobacco is conveyed upwardly, the velocity of the air being substantially lower than in the ducts of the system. The chambers are so proportioned in relation to the velocity of air flow that the air flow

in each of the chambers is insufficient to overcome the force of gravity on denser portions of the tobacco. In this manner, these denser portions will lose their initial upward velocity before reaching the top of the chamber and will sink back in the outer portion of the chamber and execute a circulatory motion in the chamber until their density has become less. These denser portions of tobacco may be the result of wetness of the tobacco or physical matting.

The tobacco-laden air flows from the last chamber 16 into a separator 17 of known type in which the tobacco is separated from the air and is discharged through an airlock 18. The tobacco may then be carried off by a conveyor belt 19 to a rotary cooling apparatus 20 of known type.

The air passes from the separator 17 through a duct 21 to the remainder of the closed system, shown generally at 22, which may include the units and operate in accordance with the related part of the system disclosed in the above patent. Thus, as the patent mentions, the air may pass through means for separating any dust therefrom and may also have a portion thereof discharged or bled from the system. The remaining air is recirculated and the removed air replenished by fresh air. The temperature of the air that is recirculated is sensed in order to assure the optimum temperature of the air eventually introduced into duct 12. Similarly, the water vapor content of the air at this juncture may be controlled and adjusted when necessary.

The above patent clearly points out that the amount of moisture removed from a particular tobacco, types of tobacco, blends of tobacco and particular forms thereof will vary, whereby the operating parameters of the air drying system will vary accordingly in producing a uniform and constant moisture content of tobacco discharged from the system. Nevertheless, two important factors are taken into consideration in controlling the operation of the system, notably,

(a) the hold time of the tobacco within the system, and

(b) the ratio of volume of air flow to weight of tobacco being discharged.

In addition, the quantity of heat required for drying the tobacco will depend upon the rate at which the tobacco is fed through the system and upon its initial moisture content. An increase in either the rate of feed or the moisture content will affect the air temperature of the air in duct 21 which normally has the effect of requiring the heat input to be increased.

With this in mind, it naturally follows that when it is desirable to increase the operational efficiency of the system and, particularly, increase the tobacco through-put of the system, an increase in the heat input is required. This is accomplished according to the present invention by a supplemental heated-air unit

designated generally by numeral 24 (Fig. 1).

The unit 24 functions to introduce supplemental heated air between drying chambers 16 at a rate and in proportion to an amount removed at these locations.

Thus, the unit 24 includes a fan 25, the output of which is passed through a heater 26, which may include steam coils designed to heat the air, to which they are exposed, to a predetermined temperature. The heated air passes through an air check valve 27 to prevent any undesirable reverse flow of tobacco into the heater 26 and consequent malfunction of the unit 24. Air dampers or valves 29 and 30 control the amount of heated air passing through branch lines 31 and 32 both of which are in communication with duct 28. The air dampers or valves 29 and 30 cooperate in regulating the quantity of supplementary heated air introduced into heating chambers 16b and 16c, respectively, in order to assure tobacco-conveying velocity and optimum drying of the tobacco conveyed in such chambers.

Simultaneously with the introduction of supplementary heated air into heating chambers 16b and 16c, a comparable amount of air is exhausted from ducts 35 and 36 containing tobacco-laden air the temperature of which has been reduced as a result of the drying action taking place in heating chambers 16a and 16b. In order to accomplish this air-exhaust operation, air exhaust ducts 37 and 38 are coupled with ducts 35 and 36, respectively. The ducts 37 and 38 may eventually be coupled to a common exhaust duct for ultimate removal of the desired exhausted air from the system. The quantity of air removed from the system through ducts 37 and 38 is controlled by dampers or valves 40 and 41, respectively. The valves 40 and 41 and their associated ducts 37 and 38 are connected to the inner face of the bends 42 and 43 forming part of ducts 35 and 36, respectively, to assure the exhausting from the system of air alone and not tobacco, which, due to centrifugal action, is carried through the bends adjacent to the outer face thereof.

In most instances, the inclusion of the unit 24 has increased by 50% the output of air-drying systems, particularly those covered by the above patent. In one instance, for example, where such increased through-put was realised, the total air flow was 12960 cubic feet/minute (CFM) and the air temperature in duct 12 was approximately 365°F. The exhaust from ducts 37 and 38 was at 3150 CFM and 3750 CFM, the indicated temperature of the air being 205°F. and 190°F., respectively. Auxiliary air was supplied through ducts 31 and 33 at 2750 CFM in both instances, the air in both ducts being at 335°F. The tobacco introduced into the system at 15 had a moisture content of 21% and the median moisture content of the tobacco after drying and cooling was between 12%—15%.

Obviously, lesser percentage increases in through-put may be similarly accomplished. As a practical matter, the unit 24 permits any increase, from 0% to 50%, in capacity of the drying system, particularly of a system of the type disclosed by the aforesaid patent and of other systems, not employing an auxiliary heating unit, in actual production today. Increased drying efficiency is also realised, the limits thereof being dependent upon the percentage increase in through-put desired. Naturally, as the percent increases in through-put is lowered below 50%, closer tolerances of drying efficiency are proportionately obtained.

15 WHAT WE CLAIM IS:—

1. Apparatus for drying tobacco comprising an air-circulating substantially closed system having means for heating the air in the system, means for introducing tobacco at one point of the system and in the path of the heated air, a series of chambers which are located in the system downstream of the tobacco-introduction means and in each of which the tobacco is conveyed upwardly in use by the hot air flowing through the chamber, means for separating the tobacco from the conveying air after it has passed through the last of the series of chambers, and, associated with at least one of said chambers, provision for increasing the drying effect and enabling the tobacco through-put thereof to be increased, which provision comprises means for bleeding an amount of air from the apparatus at a location between chambers, means for adding supplemental heated air adjacent the air inlet of the chamber following the air-bleeding means as a replacement for at least part of the air bled from the apparatus and for increasing the temperature of the air flowing through the said one chamber.

2. Apparatus in accordance with claim 1, wherein a duct between chambers immediately before and after the bleeding means includes a bend having an inner curved face and an outer curved face against which the tobacco is thrown and directed by centrifugal forces as

it passes through the bend, and the bleeding means includes a connection to the inner face of the bend, so that air-conveyed tobacco in the bend passes by the said connection.

3. Apparatus in accordance with claim 1 or 2, wherein a valve is provided in the bleeding means for regulating the amount of air bled from the apparatus.

4. Apparatus in accordance with claim 1, 2 or 3, wherein the said provision includes a fan and a heater receiving the air from the fan and heating it to a predetermined temperature.

5. Apparatus in accordance with any one of claims 1 to 4, wherein the said provision includes damper means for regulating the amount of air passed into the chamber or chambers.

6. Apparatus in accordance with any one of claims 1 to 5, wherein the said provision includes a check valve for preventing tobacco from being transferred from the air-circulating system into the said provision.

7. Apparatus in accordance with claim 1, wherein the bleeding means includes a duct between the chambers immediately before and after the said bleeding means and a valve in the duct for regulating the amount of air passing into the duct from the apparatus.

8. Apparatus in accordance with claim 7, wherein the said provision includes a fan and a heater for air passed therethrough by the fan.

9. Apparatus in accordance with claim 7 or 8, wherein the said provision includes a damper for regulating the amount of air passing into the chamber or chambers.

10. Apparatus in accordance with claim 7, 8 or 9, wherein the said provision includes a check valve for preventing tobacco entering the said unit from the air-circulating system.

11. Apparatus for drying tobacco in an air-circulating system substantially as described with reference to the accompanying drawings.

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