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C. M. HAMILTON ET AL
METHOD FOR BULKING TOBACCO

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3 Sheets-Sheet 1

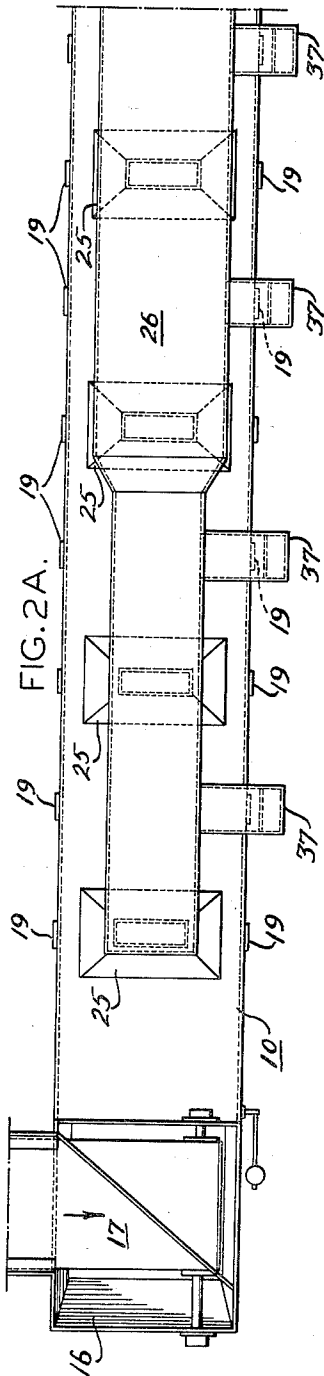
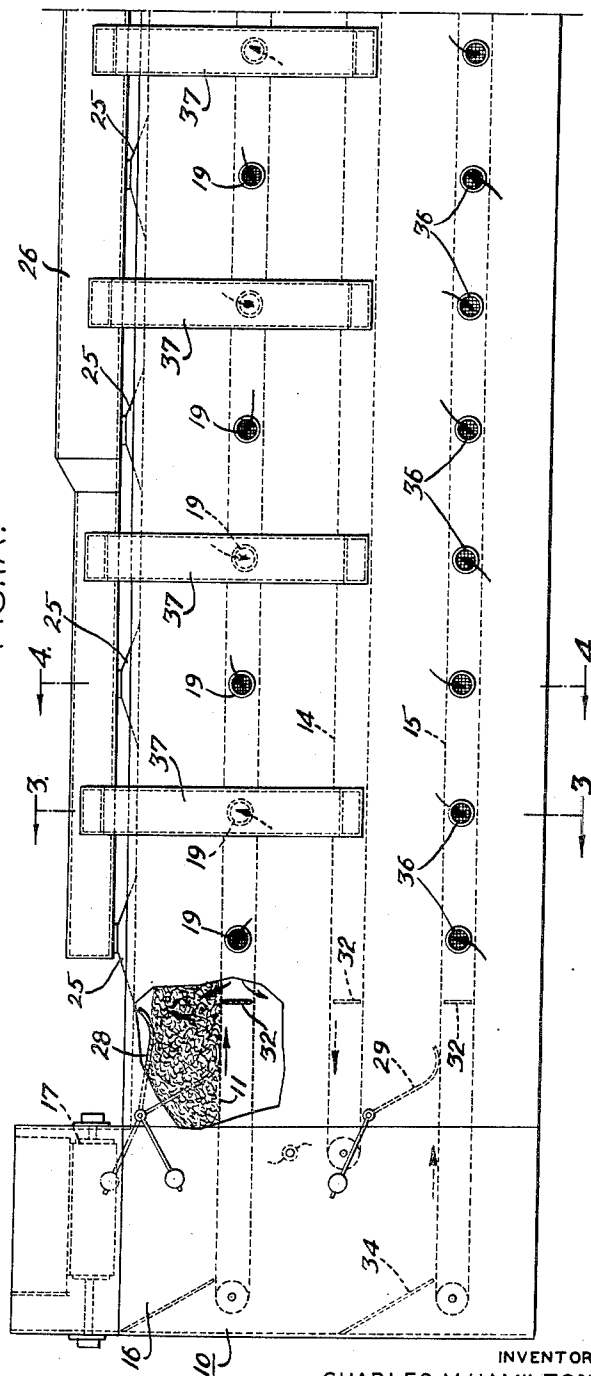


FIG. 1A.



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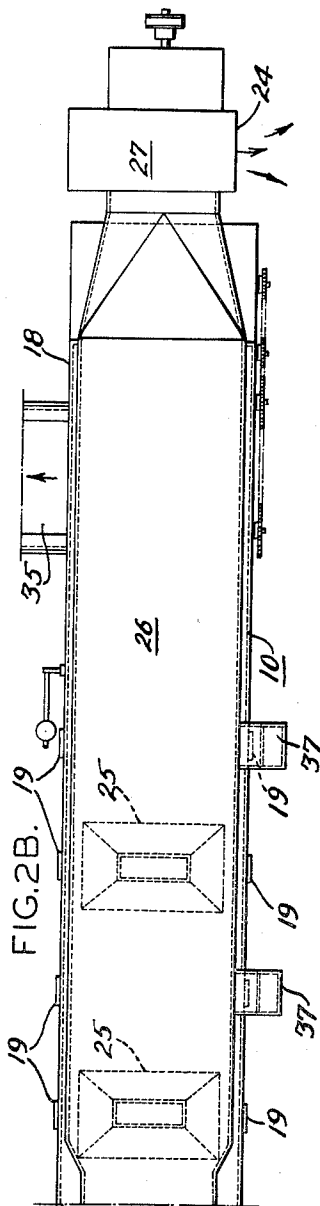
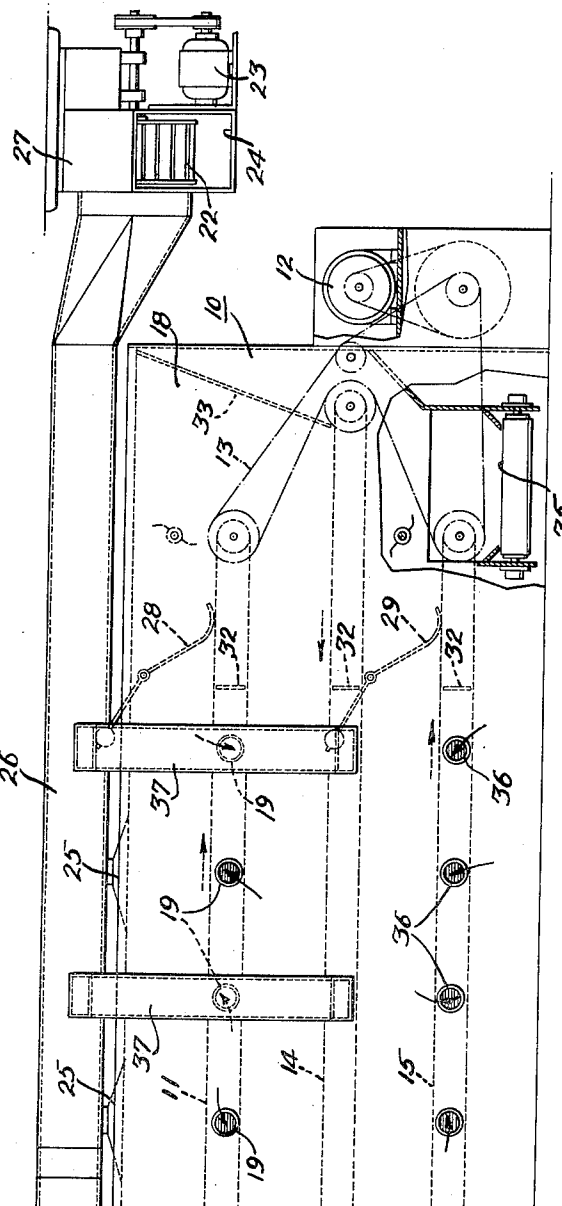


FIG. 1B.



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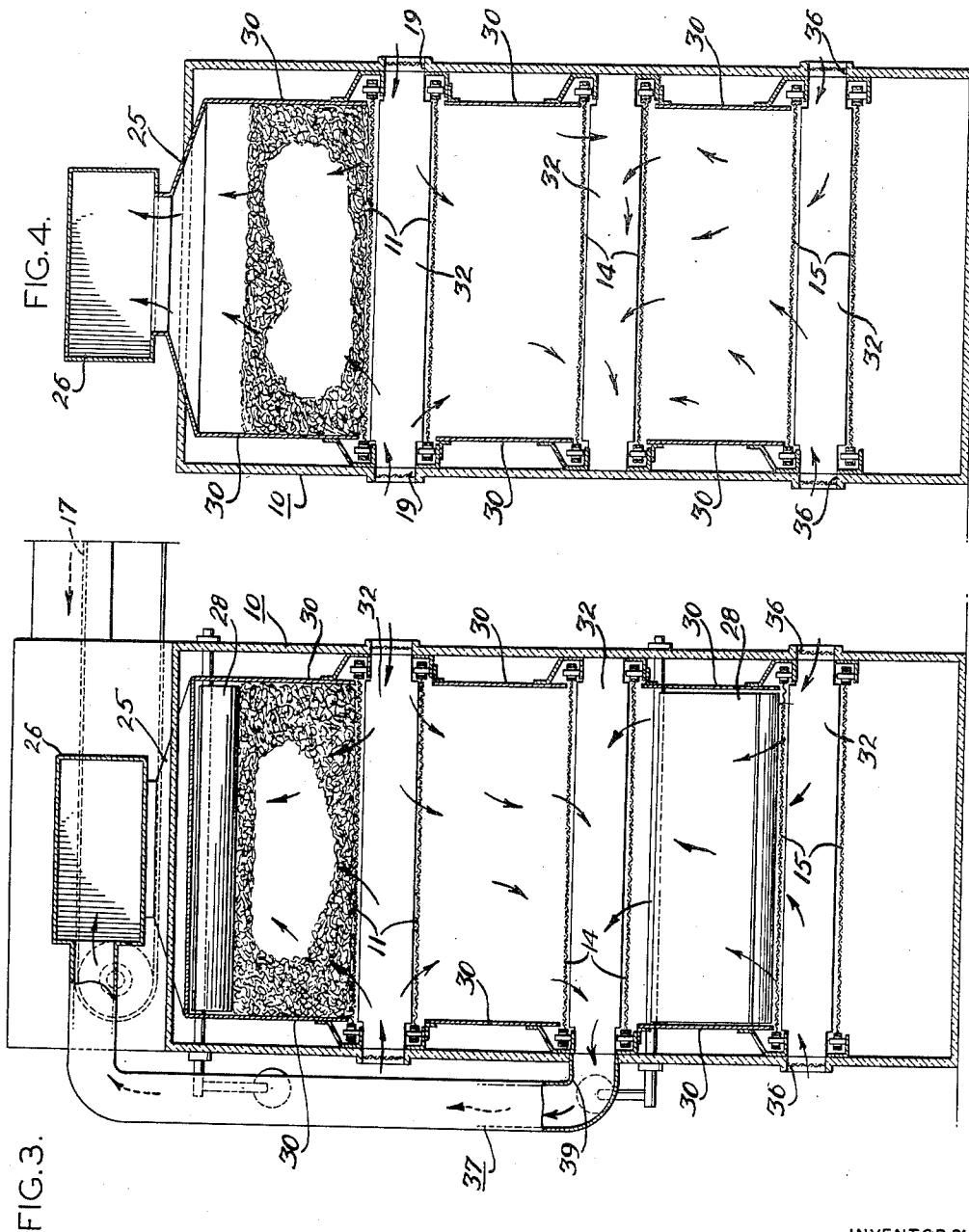
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METHOD FOR BULKING TOBACCO

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3 Claims. (Cl. 131-140)

This invention relates to the art of bulking tobacco, and is concerned with the provision of improvements in that art by which economies in processing steps are effected, while at the same time providing a more effective and uniform bulking operation.

In the conventional processing of hot cut tobacco, it has been customary to cool the tobacco after its discharge from the drying apparatus at a temperature which may be between 130 and 190° F., by tumbling it through an inclined screened drum while subjecting it to the cooling effect of a stream of air by which it was cooled to about 75-80° F. From this cooling drum, the tobacco has been deposited on a conveyor apron by which it has been carried to bulking boxes, or to a bulking bin through a redresser, which served to fluff the tobacco, and to render it substantially uniform throughout its mass, both in moisture content and in general consistency.

An object of the present invention has been to provide a process in which the cooling, as a separate step, may be eliminated, and performed in conjunction with the bulking operation in a manner which not only eliminates the separate cooling, but actually improves the effectiveness of the bulking.

A further object has been to combine the cooling and bulking functions in a manner which not only eliminates the separate cooling as discussed above, but also reduces the time required for effective bulking, thereby providing greater throughput and corresponding economy in use of the bulking apparatus.

A further object has been to combine with the bulking operation a cooling feature by which the effectiveness of the bulking operation is improved to provide a superior and more uniform product.

In the attainment of these objects, the hot tobacco is passed directly from the drying step into a bulking chamber in which it is advanced on a foraminous conveyor, while being subjected to the gentle agitating and moisture redistributing effect of streams of conditioned air passed vertically through the conveyor and tobacco at a rate sufficient to provide the desired cooling and prevent undesirable rise of chamber temperature due to continued introduction of tobacco, but insufficient to remove any substantial amount of moisture from the body of tobacco beyond that normally lost during cooling, or to disturb the deposit of tobacco beyond the mild agitating effect. While there is some evaporation of moisture from parts of the bed of tobacco, this is for the most part redeposited in other parts of the bed. The net effect is therefore to obtain more rapidly the desired redistribution of moisture content and the rendering of the bed of tobacco more uniformly consistent.

Still further objects and advantages of the invention, and the manner in which they have been attained, will be evident from reading of the following detailed description in the light of the attached drawing, in which:

Figure 1A is a side elevation, partly broken away, illustrating the left end of the apparatus in practice of the process of the invention,

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Figure 1B is a side elevation of the right end of the apparatus,

Figures 2A and 2B are plan views corresponding respectively to Figures 1A and 1B,

Figures 3 and 4 are cross-sections taken on the lines 3-3 and 4-4, respectively, of Figure 1A.

The preferred apparatus for use in practice of the invention includes a housing 10 which encloses a chamber through which the cut tobacco passes to provide the bulking operation. As illustrated, the hot tobacco is deposited immediately after its discharge from the drier, from an overhead conveyor which distributes it laterally across foraminous conveyor 11, upon the upper or conveying run of conveyor 11. Conveyor 11 is continuously driven to advance the tobacco longitudinally of the housing during continuous deposit of tobacco from the dryer, and the rate of advance of conveyor 11 is relatively slow, being correlated with the rate of continuous receipt of the tobacco from the dryer so as to maintain a constantly advancing bed of tobacco of substantial thickness, say 3-6", upon conveyor 11.

Conveyor 11 may be driven by motor 12 through a system of pulleys by belt 13, and this belt may also be interconnected with underlying conveyors 14 and 15, so that they are driven simultaneously with conveyor 11, conveyor 15 being driven in the same direction and conveyor 14 in the opposite direction. As the tobacco advances continuously from the receiving end 16 (Figure 1A) at which it is supplied to conveyor 11 by overhead conveyor 17 to the discharge end 18 (Figure 1B) from which it is discharged upon conveyor 14, a body of cooling and conditioning air is constantly passed through the tobacco. This cooling air may, for example, be drawn into housing 10 from the air conditioned room or space surrounding it, through inlet ports or openings 19 in the side wall of the housing.

The circulating system provided to create the gentle flow of cooling air for mildly agitating the tobacco to assist in the bulking while at the same time providing the desired cooling and moisture redistribution may include a blower 22 driven by a motor 23 to suck air into the housing through inlet ports 19 and discharge it through outlet 24. In passing from inlets 19 to outlet 24, the air is drawn upwardly throughout the length and width of the advancing bed of tobacco from inlets 19 into spaced overlying hoods 25 and thence into a common exhaust duct 26 which is interconnected at its discharge end with the housing 27 of blower 22. It will thus be seen that air is sucked continuously upwardly and vertically through the bed of tobacco as it advances on conveyor 11. This air may be continuously recirculated instead of being discharged into the surrounding room by interconnecting the exhaust of fan or blower 22 directly to ports 19 and including suitable cooling and other air conditioning units within the duct-work system by which the air is continuously recirculated.

Sealing members in the form of hinged, counter-weighted baffle plates 28 are provided at the receiving and discharge ends of the housing in positions overlying the conveying run of conveyor 11, as illustrated in Figures 1A and 1B. As illustrated in broken and full lines respectively in Figure 1A, the seals 28 are pressed upwardly by the advancing bed of tobacco and maintained in sealing contact therewith by the force of gravity, and the longitudinally extending bed of tobacco on conveyor 11, as confined between the conveyor and the seals 28, serves to prevent, or at least minimize, undesired flow of air longitudinally of the bed of tobacco beyond the location of the seals. By reference to Figure 3, it will be seen that the tobacco is confined between seals 28 and vertically extending side wall members 30 within the housing

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10. In Figure 1B, the sealing member 28 is shown in its lower position, as the advancing bed of tobacco has not yet reached that location. However, as the bed does reach that location, the seal of Figure 1B will be raised to a position corresponding to that illustrated in Figure 1A, and the same thing will be true of the corresponding seals 29 illustrated in connection with the upper run of conveyor 15 in these figures. In addition to the sealing plates 28 and 29, there are preferably provided sealing strips 32 between the upper and lower runs of the respective conveyors 11, 14 and 15 adjacent the ends thereof, as illustrated in Figures 1A and 1B.

The bed of tobacco, which has been cooled at least partially down to the ultimately desired temperature during the process of conveying it from the receiving to the discharging ends of conveyor 11, is directed by guide plate or baffle 33 from the discharge end of conveyor 11 to the underlying receiving end of conveyor 14, and is next passed as illustrated by the arrow in Figures 1B and 1A, to the end of conveyor 14 adjacent the receiving end of conveyor 11. This tobacco may then be discharged from conveyor 14 and directed by guide plate or baffle 34 onto the upper side of conveyor 15, whence it is passed to the discharge end of that conveyor as illustrated in Figure 1B, and discharged onto an underlying transversely extending conveyor 35 by which it is discharged from the housing 10.

In addition to the inlet ports or openings 19 by which air is sucked through the bed of tobacco upon conveyor 11, there may also be provided corresponding inlet ports or openings 36 through which cooling and conditioning air is similarly sucked into the housing and upwardly through the bed of tobacco advancing upon conveyor 15. A plurality of spaced, vertically extending ducts or conduits 37 are also provided with their inlets communicating with the space between the conveyor run of conveyor 14 and its underlying return run, and these ducts 37 are interconnected with the main exhaust duct 26 as indicated at 38 (Figure 3), so that the blower 22 serves not only to draw air upwardly through hoods 25, but also through these ducts 37 into the exhaust duct 26.

The results of the provision of this combination of inlet ports and ducts are illustrated in Figures 3 and 4. As noted above in discussion of the cooling and bulking function as performed on conveyor 11, and as illustrated in Figure 4, a part of the stream of air sucked into the housing through inlet port 19 passes upwardly through hoods 25 into the exhaust duct 26. At the same time, a part of this air passes downwardly and longitudinally, as illustrated by the arrows in Figures 3 and 4, from the inlet ports 19 through the bed of tobacco upon conveyor 14, and into the laterally inwardly bent extensions 39 of ducts 37. Air entering the housing through inlet ports 36 is also sucked through the bed of tobacco in a vertical direction, being drawn from these inlets into extension 39 of ducts 37, as illustrated by the upwardly directed arrows toward the bottom of Figures 3 and 4. Air for cooling and mildly agitating the tobacco is thus directed downwardly through the bed of tobacco upon conveyor 14, and upwardly through the bed of tobacco on conveyor 15, at the same time that air is being directed upwardly through conveyor 11 and its overlying bed of tobacco, so that the cooling and conditioning and agitating action is continuous, substantially from end to end, of the advancing beds of tobacco on the three upper conveying runs of conveyors 11, 14 and 15, as this tobacco moves tortuously through the apparatus.

When the invention is practiced by passage of cooling and conditioning and agitating air through the bed of tobacco as it advances continuously on each of conveyors 11, 14 and 15, as illustrated, the conveyors 14 and 15 will be driven at approximately the same speed as conveyor 11, so that tobacco will be maintained in substantially uniform depth on all three of these conveyors during its passage through the apparatus and treatment by

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the process of the invention. The apparatus may thus be continuously used, hour after hour, in the continuing treatment of tobacco supplied continuously into the receiving end 16 and discharged from the housing 10 upon conveyor 35.

While the invention has been described above primarily in relation to a process in which the cooling and conditioning and agitating functions are performed during the entire course of progression of the tobacco upon the successive conveyors of the bulking chamber, it is of course possible to adopt various modifications. As one example of such modification, the cooling and agitating may be performed only upon the tobacco as it progresses along the uppermost conveyor 11, and the lower conveyors 14 and 15 may be employed merely to provide the additional time factor required for most effective bulking. In such a process or arrangement, the bed of tobacco upon the underlying conveyors 14 and 15 may be allowed to accumulate in substantially greater depth than that upon conveyor 11. For example, the tobacco upon uppermost conveyor 11, through which the air is sucked continuously upwardly, may be approximately 6 inches in thickness, and the tobacco on the lower conveyors 14 and 15 may be allowed to accumulate to a depth of 24 inches, by running these conveyors at a much slower speed than the conveyor 11. Of course, if conveyors 14 and 15 are not to be used to assist in the agitating function, the lowermost inlet ports 36 will be closed off or eliminated, as will also the vertical ducts 37.

Example 1

A bulking unit is provided for cut tobacco substantially as illustrated in the drawing. This unit is 3 conveyors high, and supplies 10 cigarette-making machines. It is 78 feet long overall and 6 feet 6 inches wide between the side panels. In order to maintain a static pressure difference equal to $\frac{3}{8}$ inch of water head through each conveyor, a 30 horsepower fan is used. Tobacco having a density of approximately 9.1 pounds per cubic foot is fed at the rate of 3.3 cubic feet per lineal foot of conveyor and loads the conveyor at an approximate rate of 30 pounds per lineal foot or 1800 pounds per hour. The depth of loading under this condition is 6 inches on each conveyor.

The conveyors are operated at a surface speed of approximately 12 inches per minute. The cut tobacco is, therefore, exposed to gentle agitation and air passage through the bed of tobacco for approximately 3 hours. At the end of this time, the moisture content and temperature of the tobacco is substantially uniform throughout the bulk and the tobacco is ready for use. In addition, a complete redistribution of tobacco on the conveyors occurs at the end of the run of the top and the middle conveyors which further enhances the opening and uniformity of the final product.

Example 2

A bulking unit of the same size as in Example 1, that is 78 feet overall with a width of 6 feet 6 inches between side panels, supplies 10 makers as before. A static pressure difference equal to approximately $\frac{3}{8}$ inch of water head is maintained through the top foraminous conveyor only. This pressure may be maintained by means of a 10 horsepower fan. The intermediate conveyor and the bottom conveyor are not of a foraminous apron construction, hence there is no pressure difference through these conveyors. The cut tobacco is fed to the apparatus at the approximate rate of 1800 pounds per hour. The top conveyor has a surface speed of approximately 24 inches per minute. The depth of the tobacco on the top conveyor under these conditions is approximately 3 inches.

The gentle agitation caused by the passage of the air through the top bed of tobacco continues for approximately 30 minutes while the tobacco remains on the top

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apron. The tobacco is then transferred onto the intermediate conveyor and then upon the lower conveyor. The intermediate conveyor and the bottom conveyor operate at a surface speed in the order of 3 inches per minute. The depth of tobacco on the intermediate and bottom aprons is approximately 24 inches. No air is passed through the tobacco while it is upon the intermediate or bottom conveyors.

Feed of tobacco to the top conveyor is discontinued after 4 hours and after about $4\frac{1}{4}$ hours all three conveyors are stopped, with the intermediate and bottom conveyor aprons loaded with tobacco and with the top apron depleted of tobacco. At this juncture the fan supplying cooling air through the top conveyor is turned off. The tobacco is then maintained in a state of rest for about $3\frac{3}{4}$ hours so that the moisture content and the temperature will become uniform throughout the bulk before the tobacco is used in the next stage of the process. During the period of feed interruption, tobacco from the dryer is passed to similar bulking apparatus arranged in parallel to the first and operated in step-wise timed relation thereto.

During the period immediately prior to completion of loading of the intermediate and bottom conveyors, when the top conveyor is being depleted of stock, the resistance to passage of air through the top conveyor decreases, due to the fact that an increasing portion of the top conveyor apron does not contain stock, hence the velocity of air through the depleted portion of the conveyor tends to increase thereby causing the tobacco to be too violently agitated. Means in the form of a pervious fabric strip, having the same resistance to the flow of air as the tobacco, can be fed into the bulker behind the depleting tobacco, thereby maintaining a uniform resistance to the flow of air. Another means for achieving the same air control would be to have a series of adjustable dampers positioned beneath the forward run of the conveyor aprons. The dampers may be actuated sequentially, closing in response to a change in velocity head, or electrically operated and closed in timed intervals.

While the invention has been disclosed primarily in relation to a preferred form of the invention, we wish it to be understood that this invention may be modified or refined in a number of ways without departing from its basic spirit. We therefore wish it to be understood that this invention is not to be limited in interpretation except by the scope of the following claims.

We claim:

1. In the cooling and bulking of tobacco, the process comprising continuously depositing hot tobacco from a

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dryer upon a foraminous conveyor, advancing said conveyor during discharge through an enclosed cooling and bulking chamber at a rate sufficiently slow to provide a continuously advancing bed of tobacco of substantial depth upon said conveyor, passing cooling, conditioning and agitating air gently upwardly through said conveyor and said bed of tobacco in a vertical direction as it advances slowly through said chamber, the passage of air being continuous and substantially throughout the length and width of the advancing bed, discharging said tobacco from said first conveyor upon a second conveyor advancing at a slower rate than said first conveyor in the opposite direction and thereby providing a continuously advancing bed of tobacco of greater depth upon said second conveyor and maintaining tobacco on said second conveyor quiescent by avoiding passage of air therethrough to complete said bulking thereof.

2. A process as claimed in claim 1 and further including discontinuing deposit of tobacco on said first conveyor and thereafter, after discharging the tobacco from the first conveyor onto said second conveyor stopping both conveyors with the second conveyor loaded with tobacco and the first conveyor depleted of tobacco, and maintaining the tobacco on said second conveyor in a state of rest for a substantial period of time to bring moisture content and temperature uniform throughout the bulk of tobacco.

3. A process as claimed in claim 2, and maintaining resistance to flow of air through said first conveyor uniform through the depleted portion of said first conveyor as tobacco is discharged therefrom to prevent too violent agitation of the tobacco.

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