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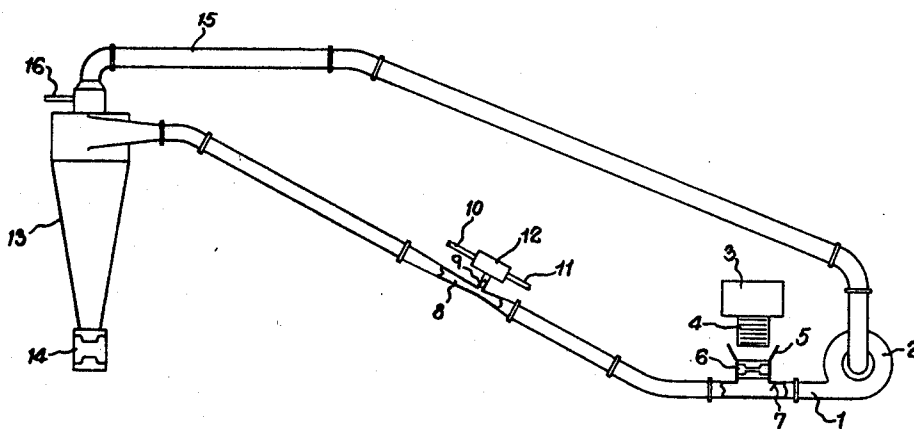
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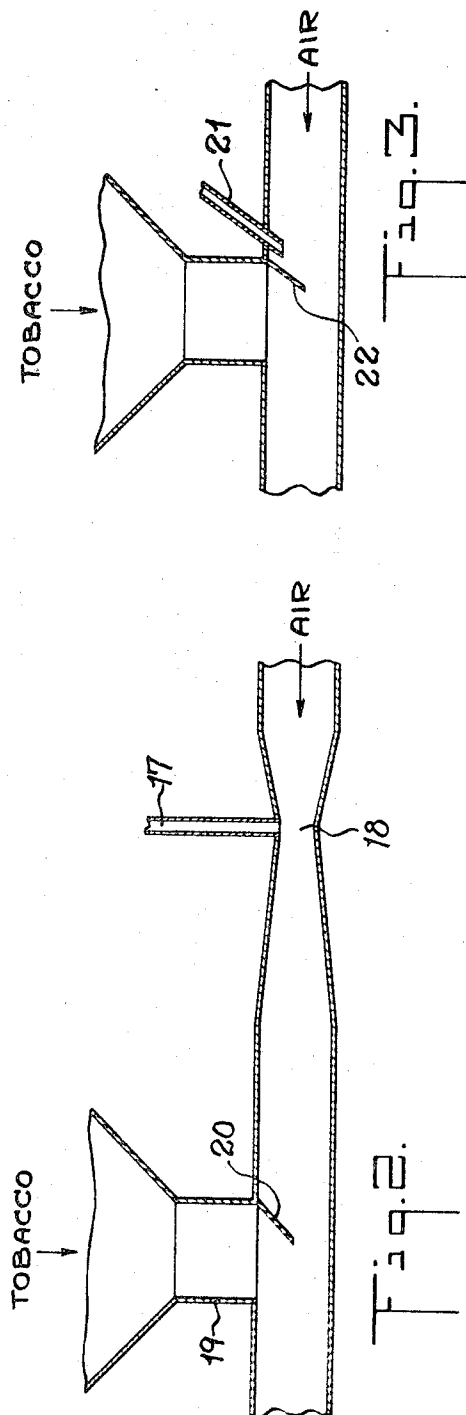
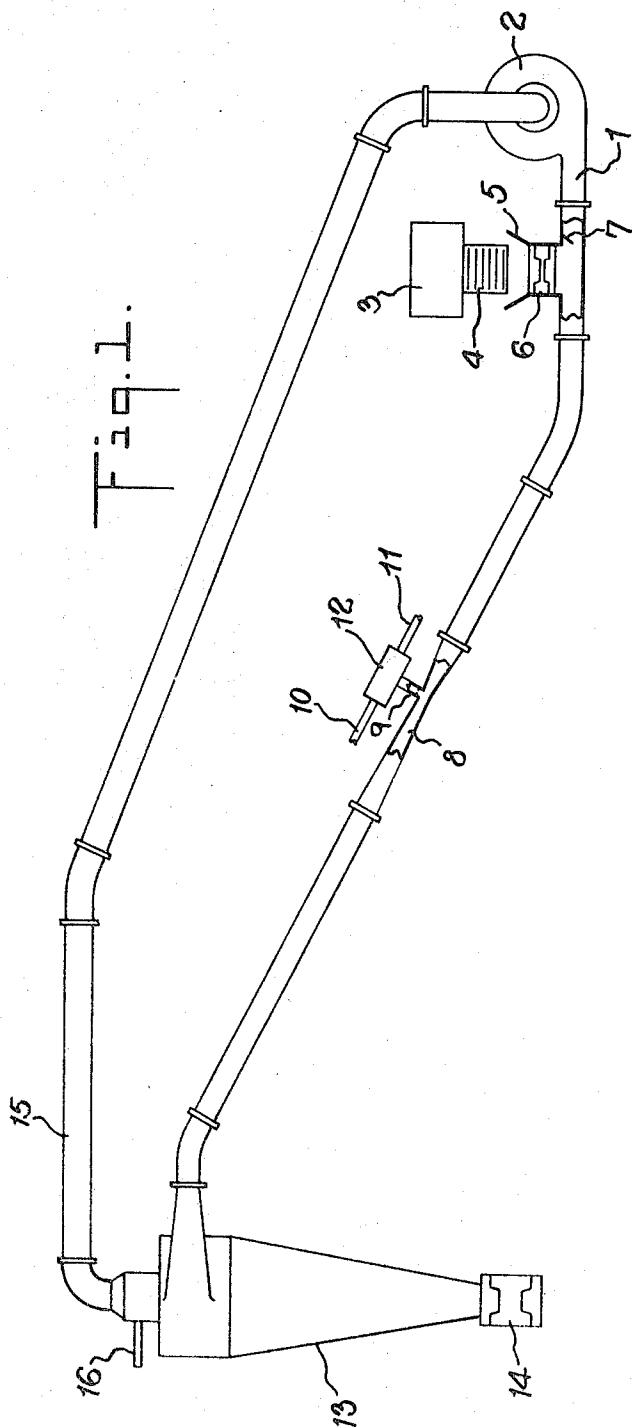
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[54] **APPLYING MENTHOL TO TOBACCO IN A
 PNEUMATIC SYSTEM**
4 Claims, 3 Drawing Figs.

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 144, 138; 99/238.4, 238.5, 238.7

ABSTRACT: A method for the continuous application of menthol additives to tobacco. Tobacco is injected into and pneumatically conveyed in a conduit. A menthol solution is then injected into the conduit at a point downstream from the injection of the tobacco into the conduit. For example, in a pneumatic system tobacco is blown through a conduit and blended with menthol upon passage through a venturi connected with a supply of menthol.





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APPLYING MENTHOL TO TOBACCO IN A PNEUMATIC SYSTEM

BACKGROUND

The addition of flavorants or aromatic compounds such as menthol to tobacco presents several problems. Conventional methods for the application of additives to tobacco include direct mixing, spraying, tumbling and variations thereof. It is impractical to mix menthol directly with tobacco since it is too difficult to control the very minor quantities which it is desired to use. The spraying of a dilute menthol solution onto tobacco must be carefully controlled to obtain a sufficient and accurate amount of menthol-addition. The spraying of menthol onto a tobacco conveying belt does not result in adequate or uniform retention of the menthol, particularly if ambient conditions are not carefully controlled. Therefore, attempts have been made to carry out the spraying in closed vessels which conserve and contain volatile components. The apparatus may comprise a cylinder into which menthol is sprayed as the tobacco is tumbled about by rotation of the cylinder or by movement of agitator blades within the cylinder. Considerable periods of time are often required to insure thorough and homogeneous blending in this fashion. Moreover, this type of spraying is basically a batch blending method which is not readily adaptable to the efficiencies of continuous blending. In another method a rotating cylinder which is open at both ends is used to tumble the tobacco while a series of sprays are directed at the tumbling mass. Shields may be employed at the ends and the entire system is usually vented to the atmosphere outside the building by exhaust fans. However, these commercial methods for accomplishing the addition of menthol to tobacco have not been entirely satisfactory. There is a need for a method of adding menthol which is both accurate as to the amount of menthol retained on the tobacco and capable of being integrated into a continuous operation.

It is therefore an object of the present invention to provide an improved method for the blending of tobacco and tobacco additives.

THE INVENTION

This invention is directed to a method and means for mixing tobacco with a flavorant or aromatic compound in liquid form or in solution. The tobacco is blown through a conduit which is in communication with a source of an additive, such as menthol in an alcohol solution. The menthol is preferably supplied to the conduit at a reduced portion thereof, or throat, where the venturi effect draws the menthol solution into the conduit and disperses it onto the tobacco.

The apparatus of this invention is designed for continuous and uniform mentholation of tobacco in a pneumatic system, preferably with the menthol in an ethanol solution. The unit consists of a hopper to continuously feed tobacco into the feed inlet of the conduit where it is mixed with an air stream. This tobacco-air mixture passes through a venturi and is combined with the ethanol-menthol mixture which is introduced at the throat of the venturi. The tobacco is separated from the air stream by a cyclone collector. The tobacco can then be further processed and the air stream recirculated.

This invention will be illustrated in greater detail by the following examples in conjunction with the attached FIGS.

FIG. 1 shows a preferred embodiment of this invention.

FIGS. 2 and 3 disclose alternative configurations for adding menthol to tobacco.

The system is designed to pneumatically feed cut blend tobacco into a conduit, where it is continuously contacted with the menthol-ethanol solution. A constant level of menthol can be applied to tobacco in this manner.

In FIG. 1 air is delivered to conduit 1 from blower motor 2. The cut blended tobacco is drawn from a storage bin 3 and delivered by a conveyor belt 4 into hopper or loading chute 5. The tobacco is picked up by rotary valve 6 and fed into a standard feed inlet section of conduit 1 having a baffle 7 slightly

upstream from the feed inlet. The continuous air stream flowing across the baffle creates a negative pressure at the feed point. The tobacco is carried along and dispersed by the air stream through the conduit. The menthol-ethanol solution is fed into the throat of venturi section 8 from spray nozzle 9. The menthol delivery system, which is not shown, may comprise conventional liquid pumping means and an air pressure supply of, for example, 10 p.s.i.g. The menthol solution, from conduit 10, and the air, from conduit 11, converge in head 12. The spray nozzle 9 provides an atomized menthol solution which is mixed with the air-tobacco stream. The stream then passes into cyclone collector 13 from which the tobacco exits through rotary valve 14. The air stream passes upward through conduit 15 and back to blower 2.

In a further embodiment, an additional venturi (not shown) may be positioned between baffle 7 and venturi 8; this additional venturi may further disperse the tobacco into the air current and breaks up any "wads."

EXAMPLES 1—3

Tobacco was treated with a menthol solution in an apparatus similar to that of FIG. 1. Instead of recirculating the air through conduit 15, the air was drawn off through conduit 16 and passed through a water-cooled condenser. The condensate was analyzed and the amount of menthol actually applied to the tobacco was determined. The results are set for in Table I, with the operating data for each of the examples. The menthol application efficiency ranged from 54.1 percent to 63.4 percent.

TABLE I

	Example		
	1	2	3
Inlet air pressure, p.s.i.g.	15.0	14.0	15.0
Inlet air volume, c.f.m.	20.0	19.5	19.6
Wt. tob. treated, gm.	293	540	1,561
Treatment time, min.	1.5	1.5	3.5
Menthol sol. feed rate, ml./min.	7.0	8.2	8.9
Tobacco throughput rate, gm./min.	195	360	446
Menthol available, gm.	2.0	2.4	6.0
Theoretical menthol appln., percent by wt.	0.68	0.44	0.38
Actual menthol appln., percent by wt.	0.37	0.26	0.24
Application efficiency, percent.	54.1	59.7	63.4

EXAMPLES 4—6

In order to determine the optimum feed point for introducing menthol solution into the pneumatic system, a series of runs was made with menthol fed into the system upstream of the tobacco inlet point.

In accordance with the apparatus of FIG. 2, the menthol solution was introduced at 17 into the throat of a venturi, 18, located upstream of the cut tobacco inlet point 19. Tobacco entered through a rotary valve (not shown) and was drawn into the system by negative pressure below the valve. The negative pressure is created by air passing beneath a baffle plate 20. The menthol solution injected upstream of the tobacco was not well dispersed in the air stream and did not give a uniform application. As the solution entered the air stream, ethanol evaporation caused cooling and thereby brought about the crystallization of menthol prior to contacting the tobacco downstream. Only 0.03 percent to 1.08 percent menthol was deposited upon the tobacco.

In a variation of the above method a heating tape (not shown) was wrapped about the apparatus from the throat of the upstream venturi, 18, to the tobacco feed inlet, 19. This eliminated the menthol crystallization; however, only 15.7 percent of the menthol was deposited upon the tobacco. The data for this run is set forth in Example 4 of Table II.

TABLE II

	Example		
	4	5	6
Inlet air pressure, p.s.i.g.	14.0	15.0	16.5
Inlet air volume, c.f.m.	19.0	19.6	21.0
Wt. tob. treated, gm.	738	564	816
Treatment time, min.	3.0	4.0	3.0
Menthol solution feed rate, ml./min.	10.0	8.8	10.3
Tobacco throughput rate, gm./min.	246	141	272
Menthol available, gm.	5.7	6.7	5.9
Theoretical menthol appln., percent by wt.	0.78	1.20	0.72
Actual menthol appln., percent by wt.	0.09	0.23	0.205
Application efficiency, percent.	15.7	19.2	28.5

FIG. 3 illustrates another variation of the method of introducing menthol. The method feed mixture was introduced into a copper tube 21 positioned directly behind the tobacco inlet baffle 22. The results of this method are set forth in Examples 5 and 6, Table II; only 19.2 percent to 28.5 percent of the available menthol was adsorbed on the tobacco.

EXAMPLE 7

In the operation of a plant unit for pneumatically conveying and mentholating cut tobacco, a closed-loop recirculation system was used in accordance with the apparatus of FIG. 1. Air for the unit was supplied by an 800 cfm all aluminum, spark-proof blower. The air from this blower was passed through a 2½ inch throat diameter venturi, creating a negative pressure at the throat where cut tobacco entered through a rotary valve. The cut tobacco was fed from a conveyor belt feeder regulated by a weigh belt, and capable of controlling from 300 to 900 pounds of tobacco per hour. Atomized menthol solution was next contacted with the tobacco and mixed via a second venturi downstream, with a 3 inch diameter throat about 6 feet downstream. To insure sufficient contact time, the tobacco was conveyed through 25 feet of straight 6 inch duct before entering a cyclone separator. After the tobacco was separated in the cyclone, it exited through a rotary valve at the bottom. The air leaving the top of cyclone was recycled to the blower intake through an 8 inch return duct.

In the interest of safety a portable combustible gas indicator (not shown) was used to monitor ethanol content and indicate

weight with the balance being mostly ethanol plus lesser amounts of water and flavoring. The menthol solution was applied at a rate of 987 ml/100 pounds of tobacco. At a tobacco throughput rate of 700 pounds/hr. an efficiency of 93.3 percent was recorded; for 900 pounds/hr. the efficiency was 92.8 percent. An advantage of higher throughput rates is that the tobacco filling power is slightly improved.

EXAMPLES 8-16

The advantages of the above methods and means were shown in the following examples by the adsorption of menthol on cut blend tobacco in a closed air recirculation system. The menthol and tobacco were introduced into a 1.28 cubic foot plexiglass box equipped with an electrically heated air recirculation system. The parameters checked were temperature (wet and dry bulb), relative humidity, and contact time of the tobacco in the menthol atmosphere. The menthol concentration in the enclosed chamber and the temperature at which the tobacco was contacted with the menthol-saturated atmosphere were varied within the stated limits shown in Table III.

A typical menthol concentration check was made as follows: a watch glass containing menthol was placed in the bottom of the chamber and the top was secured; air circulation was begun through the chamber; the air was driven by a blower through a heated copper tube into the chamber and back to the blower; when the desired air temperature inside the chamber was reached, a sample was taken of the atmosphere inside the chamber with a syringe for menthol determination.

In order to determine the amount of menthol condensed or adsorbed on cut blend tobacco, 8.5 grams of tobacco were weighed into an open-top, wire mesh cylinder 1½ inches in diameter and 6 inches high. The cylinder was placed inside the chamber for retention times from 2 to 60 seconds. The recirculating, menthol-saturated air was passed over the sample for the desired length of time while a sample of the atmosphere was collected and wet and dry bulb temperatures recorded. The tobacco sample was removed and analyzed for menthol determination. During a portion of the runs, steam was injected into the chamber to test the effect of relative humidity with respect to the amount of menthol deposited upon tobacco. The results of these runs are shown in Table III.

TABLE III

Example	Dry bulb temp.	Wet bulb temp.	Percent relative humidity	Menthol concentration in air, mgm./ml.	Menthol percent by wt. in air	Menthol deposited on tobacco percent by wt. basis	Contact time of tobacco in secs.
8.....	130	83	16	8.9×10 ⁻⁵	.008	.014	15
9.....	132	90	22	13.8×10 ⁻⁵	.012	.008	45
10.....	133	94	25	15.4×10 ⁻⁵	.013	.006	30
11.....	134	93	24	11.6×10 ⁻⁵	.010	.012	60
12.....	154	118	34	46.0×10 ⁻⁵	.039	.010	10
13.....	155	123	40	53.2×10 ⁻⁵	.045	.014	5
14.....	159	148	75	71.8×10 ⁻⁵	.061	.015	15
15.....	164	146	62	98.4×10 ⁻⁵	.084	.022	30
16.....	165	148	66	96.8×10 ⁻⁵	.082	.013	2

magnitudes in terms of percent of the lower explosive limit. The system was maintained at or below 80 percent of the lower explosive limit of ethanol at all times. To accomplish this the system was vented to the atmosphere through the outlet located just above the cyclone as necessary.

Blended tobacco was continuously fed into the system at 500 pounds per hour. The tobacco was conveyed by an air stream moving at about 325 cubic feet per minute. As the tobacco passed through a venturi downstream it was contacted by menthol solution sprayed into the throat of the venturi. The sprayed solution contained 19.8 percent menthol by

The highest percentage menthol deposited on a tobacco sample was 0.0217 percent by weight of wet tobacco. This occurred at higher temperature (164° F.), high relative humidity (62 percent), and 30 seconds contact time. The menthol collected on the tobacco was only 7 percent of the target, which was 0.35 percent by weight (wet basis). The high temperatures which would be necessary to increase the concentration make this method unfeasible for mentholation of cut blend tobacco. The results indicate that this method is not conducive to menthol application to tobacco because only a small amount of the menthol needed was adsorbed on the tobacco

and the temperature needed to increase menthol concentration to an acceptable level would be well in excess of 200° F. and, therefore could not be adapted to tobacco processing.

In summary, the method of this invention is based on the principle of dispersing menthol in an ethanol solution into an air stream through which cut tobacco is being pneumatically conveyed. By regulating the amount of menthol solution, the tobacco feed rate as tobacco enters the system, and the contact time, the desired level of menthol can be applied to the tobacco. After the tobacco has been treated, it is removed from the system via a cyclone collector. The air containing the remaining volatiles is preferably recycled back into the system.

This invention has been described in terms of specific embodiments set forth in detail. Alternative embodiments will be apparent to those skilled in the art in view of this disclosure, and accordingly such modifications are to be contemplated within the spirit of the invention as disclosed and claimed herein.

I claim:

1. The method of treating tobacco which comprises:
 - a. injecting tobacco into a conduit;

- b. pneumatically conveying said tobacco through said conduit; and
 - c. injecting a menthol solution into said conduit at a point downstream from said injection of said tobacco into said conduit.

2. The method of treating tobacco which comprises:

- a. driving air through a conduit;

- b. injecting tobacco into and dispersing it in said conduit;

- c. injecting a menthol solution into and dispersing it in said conduit in contact with said tobacco, wherein said step of injecting the menthol solution is carried out downstream from the injecting of said tobacco;

- d. separating said tobacco from said air; and

- e. recirculating said air through said conduit.

3. The method of claim 2 wherein said tobacco is injected into said conduit at a rate of from about 300 to 900 pounds per hour.

4. The method of claim 2 wherein said menthol and tobacco are conveyed together through said conduit downstream from the injecting of said menthol to provide sufficient contact between the menthol and tobacco.