

[54] METHOD OF TREATING TOBACCO WITH FLAVORANTS IN A PNEUMATIC SYSTEM

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 778,383, Nov. 25, 1968, Pat. No. 3,548,838.

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[58] Field of Search. 131/2, 15, 17, 140-144, 131/138, 136

References Cited

UNITED STATES PATENTS

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Primary Examiner—Melvin D. Rein

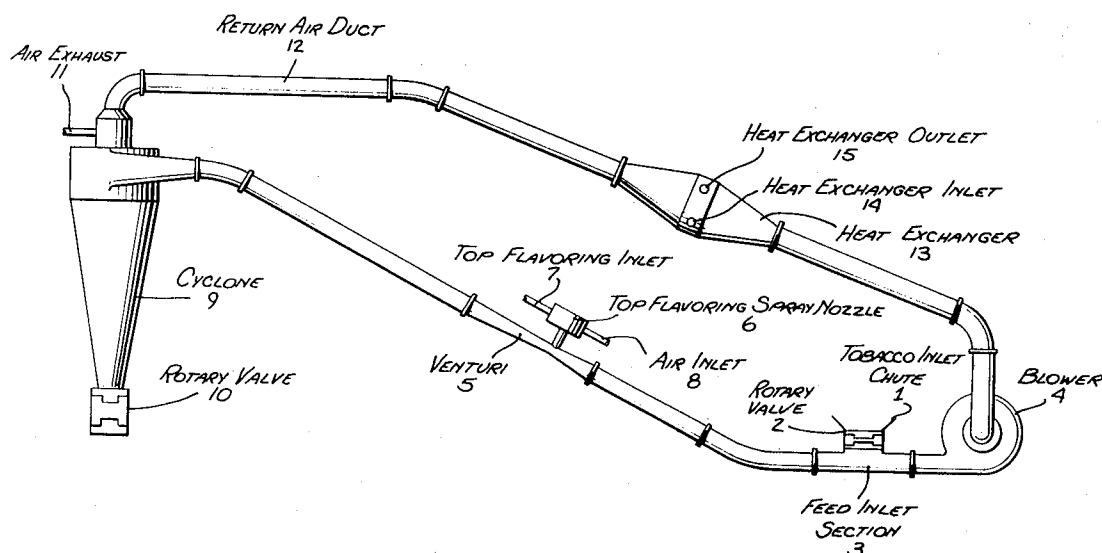
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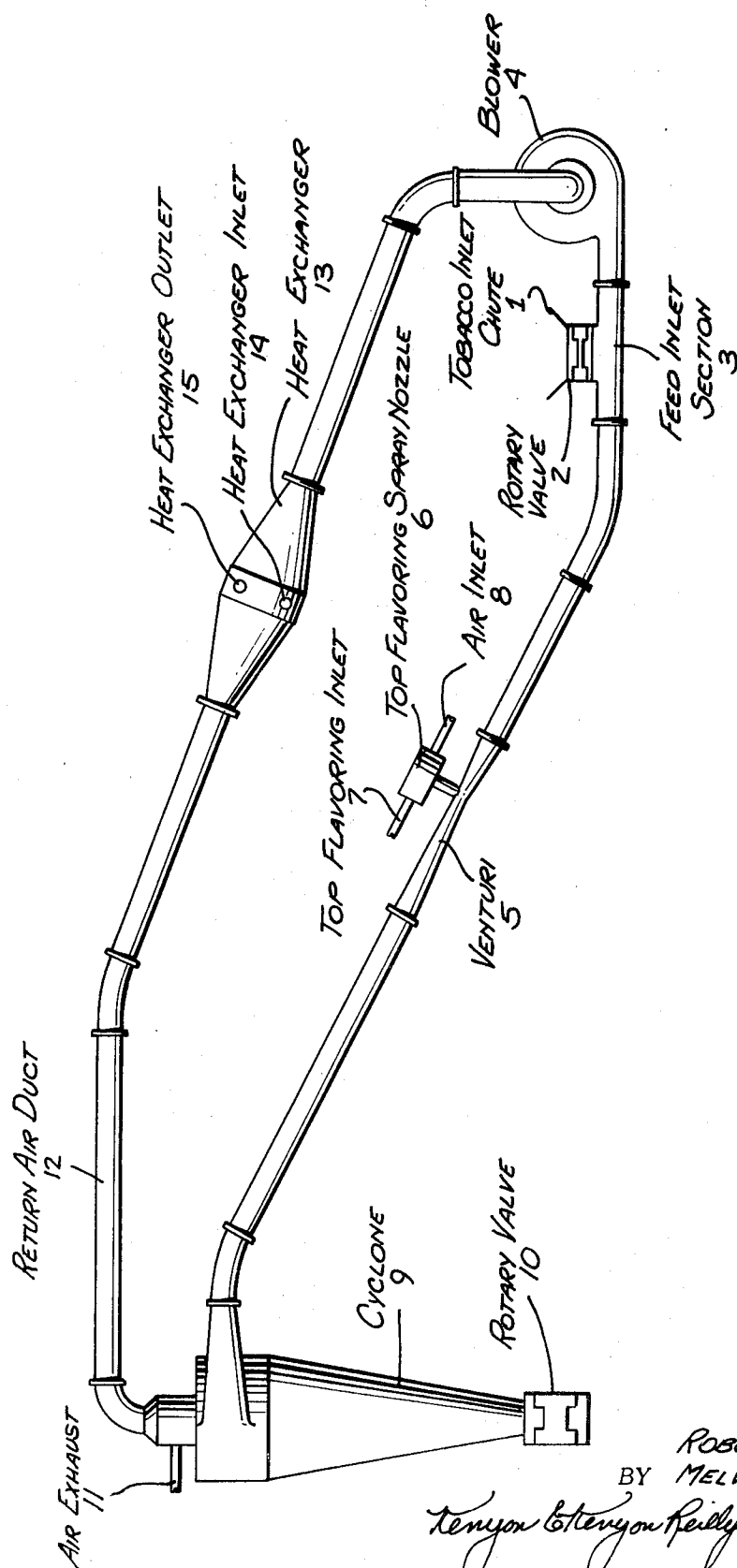
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ABSTRACT

This disclosure is directed to a continuous method of applying additives to tobacco in a closed system. The product obtained does not require the customary bulking operation. In carrying out the method the tobacco, which is at a temperature of between 130°–180° C, is fed into a pneumatic system and carried by air blown within the conduit of the system to a point downstream from the feedin at which point flavoring solution is dispersed within the tobacco mass. The tobacco is then separated from the air mass and the air, which is reduced in temperature to about 50° to 70° C., is then recirculated in the conduit to come into contact with a fresh supply of hot tobacco.

3 Claims, 1 Drawing Figure





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METHOD OF TREATING TOBACCO WITH FLAVORANTS IN A PNEUMATIC SYSTEM

CROSS-REFERENCES

This application is a continuation-in-part of patent application Ser. No. 778,383, filed Nov. 25, 1968 by Robert L. Key, III, and Melvin G. Christy, now U.S. Pat. No. 3,548,838.

BACKGROUND

The addition of flavorants or aromatic compounds to tobacco presents several problems. Conventional means for the application of additives to tobacco include mixers, sprayer, tumbler and variations thereof. It is impractical to mix flavoring additives 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 additive solution onto tobacco must be carefully controlled to obtain a sufficient and accurate amount of addition. The spraying of additives onto a tobacco conveying belt often does not result in adequate or uniform retention of the additive, 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 the additive 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 homogenous 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 system 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 systems for applying additives to tobacco have not been entirely satisfactory. There is a need for an additive system which is both accurate as to the amount of additive 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 system for the blending of tobacco and tobacco additives.

A further object of this invention is to provide a system which cools the hot cut tobacco prior to its treatment with additives, so that the tobacco is discharged from the system at about ambient conditions and can be made into cigarettes without the need for a conventional bulking treatment.

These and other objects of the invention are set forth in greater detail in the accompanying specification.

THE INVENTION

This invention is directed to a means for method tobacco with a flavorant or aromatic compound in liquid form or in solution and for controlling the temperature of the tobacco. The tobacco is blown through a closed-loop conduit system which is in communication with a source of an additive, such as menthol in an alcohol solution. The additive is preferably supplied to the conduit at a reduced portion thereof, or throat, where the venturi effect draws the additive solution into the conduit and disperses it onto the tobacco. The hot tobacco which enters the system is cooled by recirculating air prior to contact with the additive solution and the tobacco exists in a condition ready for further use without requiring the usual lengthy bulking period.

The apparatus utilized to treat the tobacco is designed for continuous and uniform treatment of tobacco in a pneumatic system to which a metered amount of tobacco top flavoring is added. The unit consists of a hopper to continuously feed hot cut tobacco into the feed inlet of the conduit where it is mixed with a cool airstream. This tobacco-air mixture passes through a venturi and is combined with the additive which is in-

troduced at the throat of the venturi. The tobacco is separated from the airstream by a cyclone collector. The air stream is recirculated and passed through a heat exchanger to control its temperature.

This invention will be illustrated in greater detail by the following examples in conjunction with the attached drawing which shows a preferred embodiment of the invention.

Referring to the attached drawing of the pneumatic cooling and top flavoring system, hot tobacco (170°-180° F), previously cut and passed through a dryer of conventional design, is collected and uniformly fed into the tobacco inlet chute 1. This tobacco drops into the vanes of a rotary valve 2 and is distributed into the feed inlet section 3. An air stream provided by a blower 4 conveys said tobacco through a duct and into a venturi 5. In the throat of this venturi is located a spray nozzle 6, which is constantly supplied with a metered amount of tobacco top flavoring from one inlet 7 and air from a second inlet 8. The flavoring mentioned can be a combination of commonly employed flavoring compounds, including menthol, and is normally in an alcohol-water mixture.

The flavored tobacco is further conveyed by the air-stream into a cyclone collector 9, passed out through a rotary valve 10, and collected. The tobacco exits at about 76°-78° F and is ready to be made immediately into cigarettes with no bulking period required.

The air conveying the tobacco exits through the top of the cyclone and into the return air duct 12 which may be about eight inches in diameter, with a portion exhausted at an air exhaust port 11. The return air passes through a heat exchanger 13 cooled by circulating a cooling medium, such as ice water or brine, into the bottom 14 and out the top 15 of the exchanger. This cooled air is returned to the intake side of the blower and constantly recirculated to cool the incoming hot tobacco.

To control the relative humidity within the system, water and alcohol in the airstream from the cyclone are condensed by the heat exchanger 13 and collected outside of the system. The main control, with respect to humidity within the system, is the temperature of the air leaving the heat exchanger which is controlled by the cooling medium. This saturation temperature of the air leaving the exchanger determines the per cent water vapor remaining in the recirculating air. Further cooling, heating, or moisture addition to the air may be made downstream of the heat exchanger prior to the tobacco entry. A baffle (not shown) may be positioned in the tobacco feed inlet section 3, slightly upstream from the feed inlet, to assist in dispersing the tobacco through the duct system.

EXAMPLE I

Using the apparatus previously described, cased and cut tobacco leaving the dryer at 170° to 180° F was added to the feed inlet at a rate of 500 lbs./hr. and a temperature of 130° to 140° F. The tobacco was immediately cooled as it contacted the 62° to 64° F dry bulb air maintained at about 60 percent relative humidity. A menthol-alcohol-water-plus other flavorings solution was sprayed on the tobacco as it passed through the venturi throat.

The tobacco collected at the outlet of the cyclone was about 76° F. A portion of this tobacco was allowed to bulk overnight prior to being made into cigarettes, however, a second part was made immediately (within one hour) into cigarettes. Another portion of the same lot of tobacco was processed through the standard rotary cooler and top flavored using the same solution as above. This sample was designated as the control.

Trained flavor panelists could detect no significant differences between the two pneumatically processed samples and the rotary cylinder control cigarettes. These examples were then repeated with the same results.

EXAMPLE II

The above example was repeated four times using a water-alcohol solution containing top flavoring as used on standard nonmenthol cigarettes with no menthol therein. The only differences were the use of a wider range of air temperatures (50° to 70° F) and relative humidities (55 to 75 percent). Again trained flavor panelists were unable to distinguish between cigarettes made from tobacco processed in the pneumatic cooling and top flavoring system when compared to those made from tobacco as normally processed in a rotary cylinder.

EXAMPLES III-V

Cooled tobacco was treated with a menthol solution in an apparatus similar to that of FIG. 1. Instead of recirculating the air through conduit 12, the air was drawn off through conduit 11 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 forth 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	III	IV	V
Inlet Air Pressure (psig)	15.0	14.0	15.0
Inlet Air Volume (CFM)	20.0	19.5	19.6
Wt. Tob. Treated (gm)	293	540	1561
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. (% by wt.)	0.68	0.44	0.35
Actual Menthol Appln. (% by wt.)	0.37	0.26	0.24
Application Efficiency (%)	54.1	59.7	63.4

EXAMPLES VI-VIII

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.

The menthol solution was introduced into the throat of a venturi located upstream of the cut tobacco inlet point in a duct system. Tobacco entered the system through a rotary valve and was drawn into the system by negative pressure below the valve. The negative pressure is created by air passing beneath a baffle plate between the tobacco and menthol inlet. 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 airstream, ethanol evaporation caused cooling and thereby brought about the crystallization of menthol prior to contacting the tobacco downstream. Only 0.03 to 0.08 percent menthol was deposited upon the tobacco.

In a variation of the above system a heating tape was wrapped about the apparatus from the throat of the upstream venturi to the tobacco feed inlet. 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 VI of Table II.

In another variation of this system the menthol feed mixture was introduced into a copper tube positioned directly behind a baffle upstream of, and adjacent to, the tobacco inlet in a duct

system. The results of this system are set forth in Examples VII and VIII, Table II; only 19.2 to 28.5 percent of the available menthol was adsorbed on the tobacco.

TABLE II

Example	VI	VII	VIII
Inlet Air Pressure (psig)	14.0	15.0	16.5
Inlet Air Volume (CFM)	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. (% by wt.)	0.78	1.20	0.72
Actual Menthol Appln. (% by wt.)	0.09	0.23	0.205
Application Efficiency (%)	15.7	19.2	28.5

EXAMPLE IX

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 the drawing, however, without the heat exchanger shown. Air for the unit was supplied by an 800 cfm all aluminum, spark-proof blower. The air from this blower was passed through a 2 1/4 inch throat diameter venturi, creating a negative pressure at the throat where cooled 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 three inch diameter throat about six feet downstream. To insure sufficient contact time, the tobacco was conveyed through 25 feet of straight six-inch duct before entering a cyclone separator. This distance between the venturi and the separator should be several times the distance between the venturi and the tobacco inlet, for example, the former distance should preferably be at least four times the latter distance. 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 eight-inch return duct.

In the interest of safety a portable combustible gas indicator (not shown) was used to monitor ethanol content and indicate magnitudes in terms of per cent 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 feed 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 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 lbs. of tobacco. At a tobacco throughput rate of 700 lbs./hr. an efficiency of 93.3 percent was recorded; for 900 LBS./HR. the efficiency was 92.8 percent. An advantage of higher throughput rates is that the tobacco filling power is slightly improved.

EXAMPLES X-XVIII

The advantages of the above systems 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 1 1/2 inches in diameter and 6 inches high. The cylinder was placed inside the chamber for retention times from two 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

Ex.	Dry bulb temp. ° F.	Wet bulb temp. ° F.	Relative humidity %	Menthol concentration in air (mg/ml)	Menthol % by wt. in air	Menthol deposited on tob. % by wet wt. basis	Contact time of tobacco in secs.
x	130	83	16	8.9×10 ⁻⁵	.008	0.14	15
xi	132	90	22	13.8×10 ⁻⁵	.012	.008	45
xii	133	94	25	15.4×10 ⁻⁵	.013	.006	30
xiii	134	93	24	11.6×10 ⁻⁵	.010	.012	60
xiv	154	118	34	46.0×10 ⁻⁵	.039	.010	10
xv	155	123	40	53.2×10 ⁻⁵	.045	.014	5
xvi	159	148	75	71.8×10 ⁻⁵	.061	.015	15
xvii	164	146	62	98.4×10 ⁻⁵	.084	.022	30
xviii	165	148	66	96.8×10 ⁻⁵	.082	.013	2

The highest percentage menthol deposited on a tobacco sample was 0.022 percent by weight of wet tobacco. This occurred at a higher temperature (164° F), high relative humidity

ty (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 system of this invention is based on the principle of dispersing an additive, such as menthol in an ethanol solution, into an airstream through which cut tobacco is being pneumatically conveyed. By regulating the amount of additive solution, the tobacco feed rate as tobacco enters the system, and the contact time, the desired level of flavoring 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. The temperature of the air may be controlled by recirculating it through a heat exchanger. The use of a cooled airstream eliminates the need to cool the tobacco to ambient conditions prior to entering feed inlet and eliminates the need for a bulking period after discharge of the tobacco from 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.

We claim:

1. The method of treating hot cut tobacco which comprises,
 - a. driving air through a conduit,
 - b. feeding said tobacco into said conduit in contact with said air,
 - c. injecting a flavoring solution into and dispersing it in said conduit in contact with said tobacco, wherein said step of injecting the flavoring solution is carried out downstream from the feeding of said tobacco,
 - d. separating said tobacco from said air and discharging said tobacco from said conduit,
 - e. cooling said air subsequent to separating said tobacco therefrom, and
 - f. recirculating said air through said conduit and into said contact with said hot cut tobacco.

2. The process of claim 1 wherein said hot cut tobacco is at a temperature of from about 130°-180° C, said air is at a temperature of about 50° to 70° C when brought into contact with said tobacco.

3. The process of claim 1 wherein after discharging said tobacco from said conduit it is made directly into a final tobacco product without a bulking step.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,678,939

Dated July 25, 1972

Inventor(s) Robert L. Key, III; Milvin G. Christy, both of
Durham, N.C.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Correct the name of the Assignee, Liggett & Myers Incorporated.

Abstract

Line 5, change "130°-180°C" to --130-180°F--

Line 10, change "50° to 70°C" to --50-70°F--

Column 4, line 64, change "feed" to --fed--

Claims

Claim 2, line 2, change "130°-180°C" to --130-180°F--

Claim 2, line 3, change "50° to 70°C" to --50-70°F--

Signed and sealed this 2nd day of January 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents