Jan. 11, 1966 H. A. LEBERT 3,228,402

EMBOSSED WRAPPER CIGARETTE FOR PREVENTING FORMATION OF HIGH TEMPERATURE SMOKE FRACTIONS IN BURNING TOBACCO

Filed Aug. 7, 1963

FIG. 1

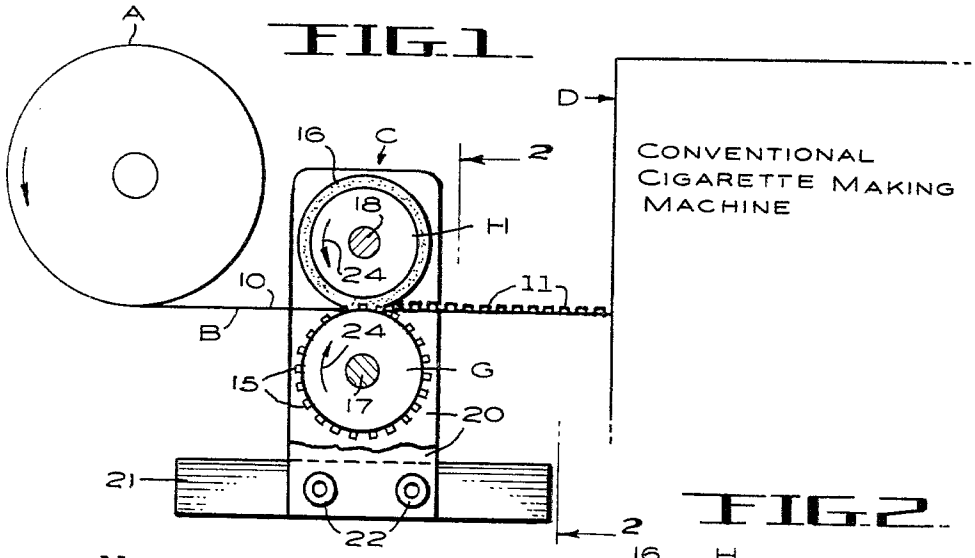


FIG. 2

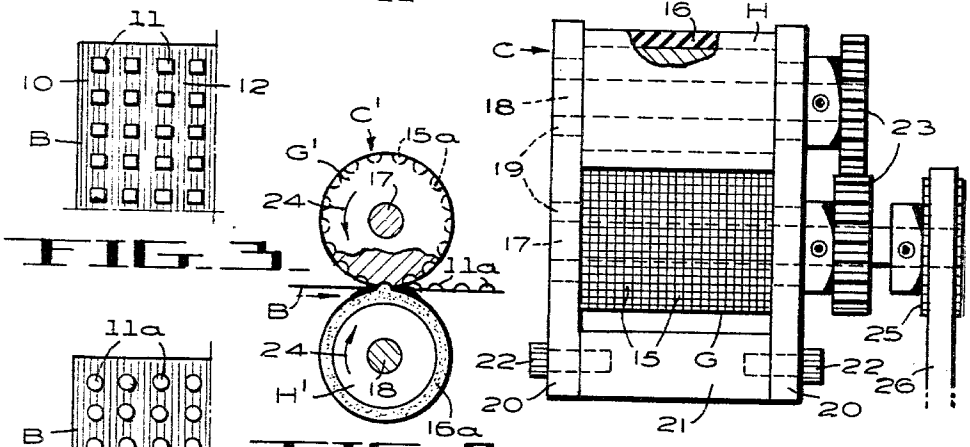
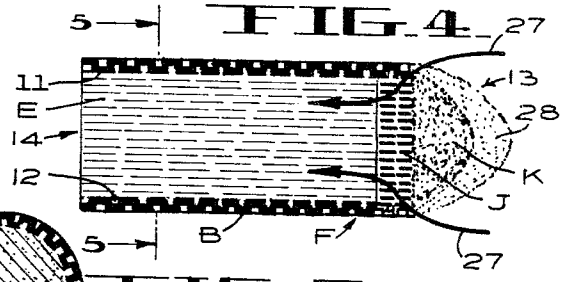


FIG. 3

FIG. 8

FIG. 6

FIG. 4



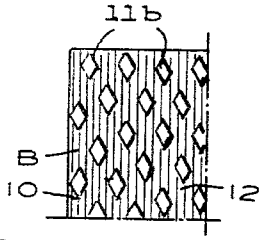


FIG. 7

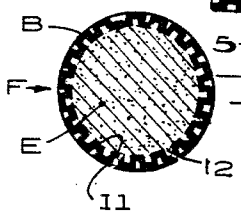


FIG. 5

INVENTOR.
HERBERT A. LEBERT
BY Joseph F. Cole
ATTORNEY

United States Patent Office 3,228,402 Patented Jan. 11, 1966

3,228,402

EMBOSSED WRAPPER CIGARETTE FOR PREVENTING FORMATION OF HIGH TEMPERATURE SMOKE FRACTIONS IN BURNING TOBACCO

Herbert A. Lebert, 8 Corte Dorado, Millbrae, Calif.

Filed Aug. 7, 1963, Ser. No. 300,580
1 Claim. (Cl. 131—15)

It is common knowledge that conventional cigarette smoke has a harmful effect on the human body and it is also well known that smokers obtain much satisfaction from cigarette smoke.

It is further known that the smoke fractions in cigarette smoke which are formed or distilled at the higher burning temperatures are the harmful fractions. Moreover, these high temperature formed fractions are not required to obtain a satisfactory smoke.

Many devices and means have been proposed to remove tar fractions from cigarette smoke after said tar fractions are already in the smoke stream and on their way to the smoker.

I propose a way to keep said high temperature formed tars from getting into the smoke stream in the first place.

A conventional cigarette is composed of finely shredded tobacco particles compressed or rolled into a cylinder and held in that form by means of the paper wrapper used to make the cigarette. Said cigarette burns as it is smoked with the formation of a glowing ember which turns to grey ash as the ember advances. The flowing ember is in contact with the tobacco directly in back of the ember and directly under the end of the paper wrapper, i.e., the ember ends at the paper, while the tobacco directly in back of the ember, but under the paper is the tobacco being converted into various smoke fractions. Said various smoke fractions range all the way from about 400° Fahrenheit to the burning ember or 1600° Fahrenheit. Those fractions coming off above 900° Fahrenheit are considered high temperature formed fractions.

In the conventional cigarette air (oxygen for combustion) is drawn through the glowing ember into the smoke producing zone, since the paper wrapper is in close contact with the tobacco particles in the smoke production zone, and thus the air is raised to high temperatures and thus, of course, drives off or distills high temperature smoke fractions from the tobacco in the smoke production zone.

Since the light aromatic, low temperature fractions can be driven off or out of the tobacco in the smoke producing zone by air that has been heated to the 400° to 900° Fahrenheit range, I propose to keep the smoke producing air from being heated above that range. I do this by providing a controlled air entrance space between the paper wrapper and the tobacco particles in the smoke production zone directly in back of the flowing ember.

As air is drawn over the glowing ember and into the smoke producing zone it is much lower in temperature than if the air were drawn through the glowing ember. With the controlled air entrance providing a path of least resistance we find the air is heated, as it passes over the ember, to the temperature required to drive off or distill the low temperature smoke fractions, but said air is not heated to a high enough temperature to drive off or distill the high temperature smoke fractions. These stay in the tobacco particles and are burned as the ember advances between drags or puffs on the cigarette.

I provide the required controlled air entrance space through the use of embossed or raised spots on the inner (tobacco side) surface of the paper wrapper. The raised points of the paper hold the rest of the paper away from the tobacco particles. The space between the raised points provides the air entrance space.

It is obvious that if too much air entrance space is provided the air passing over the ember will not be heated to the proper range to drive off or distill the low temperature smoke fractions and will, in fact, dilute the smoke with the excess air. Conversely, if the air entrance space is too small we have the same action or approach the same action that takes place in the conventional cigarette, i.e., the air has to pass through the ember and is thus heated into the high temperature range.

Other objects and advantages will appear as the specification proceeds. The novel features of the invention will be set forth in the appended claims.

For a better understanding of the invention, reference should be had to the accompanying drawing, forming part of this specification, in which:

FIGURE 1 is a diagrammatic elevational view disclosing a cigarette wrapper paper supply being fed from a roll to a conventional cigarette making machine, with an apparatus arranged to emboss the wrapper paper prior to being delivered to the cigarette making machine;

FIGURE 2 is a transverse sectional view taken along the plane 2—2 of FIGURE 1;

FIGURE 3 is a top plan view on a greatly enlarged scale, showing the cigarette wrapper paper after being embossed by the apparatus disclosed in FIGURE 1;

FIGURE 4 is a longitudinal sectional view on a greatly enlarged scale, resulting from the operation of the embossing apparatus and conventional cigarette making machine shown in FIGURE 1;

FIGURE 5 is a transverse sectional view taken along the plane 5—5 of FIGURE 4;

FIGURES 6 and 7 are top plan views of modified forms of the embossed cigarette wrapper paper, both views being shown on a greatly enlarged scale; and

FIGURE 8 is a fragmentary elevational view, partly in section, of a modified embodiment of an apparatus for embossing cigarette wrapper paper, it being understood that this apparatus may be used in lieu of the apparatus shown in FIGURE 1, and will be arranged between the supply roll and the conventional cigarette making machine.

While I show only the preferred forms of my invention, it should be made clear that various changes, or modifications, may be made within the scope of the annexed claims without departing from the spirit thereof.

Detailed description

Referring now to the drawings in detail, I have shown a supply roll A of cigarette wrapper paper B in FIGURE 1, which may be moved through an embossing apparatus C, with the embossed paper being delivered to a conventional cigarette making machine designated generally at D. It is common practice to utilize paper on standard 6000 meter rolls, the paper having a width of 28 mm., with the cigarette making machine D making 1500 cigarettes per minute. Of course, I do not desire to be limited to any particular type of machine or size of paper used.

In such cigarette making machines, a tobacco filler E is placed on the upper surface 10 of the wrapper paper B after the latter enters the machine D and is placed on woven fabric belts (not shown) of the machine. Then the wrapper paper is rolled around the tobacco particles or shreds to form a long cylinder to be cut into cigarettes. The paper thus provides a sleeve that surrounds the filler (see FIGURES 4 and 5). It is well known that the wrapper paper B is rolled about its length and then the opposite marginal edges of the paper are glued together, thus providing the surrounding sleeve.

As the wrapper paper B passes through the embossing apparatus C, a myriad of embossed raised spots 11 are

fashioned on the upper surface **10** of the paper (see FIGURE 1), and these embossed raised spots are disposed on the inner tobacco surface of the wrapper in the final cigarette (see FIGURES 4 and 5). These raised spots **11** project inwardly of the sleeve to bear against the tobacco filler E to hold the rest of the wrapper away from the tobacco particles.

Moreover, the adjacent embossed raised spots **11** are spaced from one another to define air passages **12** extending from the burning end **13** of each individual cigarette F toward the butt end **14** thereof (see FIGURE 4). The raised spots **11** may be arranged in alignment with one another, as shown in the greatly enlarged view in FIGURE 3, or these raised spots may be staggered with respect to one another.

Referring particularly to FIGURES 1 and 2 of the drawing, the embossing apparatus C has been shown as comprising two coacting members G and H between which a strip of the cigarette wrapper paper B may be advanced. These members G and H take the forms of a lower embossing roll and an upper resilient roll (see FIGURE 1). The embossing members or rolls G and H are operable and have coacting surfaces arranged to emboss the myriad of raised spots **11** on the cigarette wrapper paper B, as the latter is advanced therebetween.

For this purpose, the lower roll G is formed with a myriad of projections **15** on its peripheral surface which are arranged around the circumference and along the length of the roll G (see FIGURES 1 and 2), and thus the embossed raised spots **11** are formed along the entire length and width of the paper B, adjacent projections **15** being spaced apart both longitudinally and transversely of the roll G so as to correspond with the desired positions of the raised spots **11**.

The upper resilient member or roll H has a resilient rubber covering **16** on its peripheral surface and against which the cigarette wrapper paper B is pressed by the projections **15** on the embossing roll G. As shown in FIGURE 1, each projection **15** forces the paper B a short distance into the rubber covering **16** as the interposed paper B is advanced. It has been found from practice that the rubber covering should have a 40–60 durometer for best results.

Moreover, the rolls G and H are secured to shafts **17** and **18**, respectively, so that these rolls will be arranged in parallel relation with one another, these shafts being mounted for rotation in bearings **19** carried by a pair of upright plates **20**. The latter may be secured to a base **21** by screws **22**, or other suitable fastening means. These shafts are provided with intermeshing gears **23** so as to rotate the rolls G and H in opposite directions. The adjacent peripheral sections of these rolls are disposed to grip and advance the strip of paper B, when the rolls are rotated in opposite directions, as indicated by the arrows **24** in FIGURE 1.

It is important, of course, that the rolls G and H be operated synchronously with the speed of the cigarette making machine D to which the embossed cigarette wrapper paper B is delivered. For this purpose, I have shown a peripherally-notched pulley **25** in FIGURE 2 that is secured to one of the shafts (**17**), with a toothed rubber belt **26** being trained over this pulley. The belt may be operated by any suitable drive mechanism so as to impart the proper speed thereto.

It will be apparent that a large number of patterns and shapes of the raised spots on the cigarette wrapper paper may be utilized. FIGURE 6 shows the cigarette wrapper paper B as having a myriad of round raised spots **11*a*** as being embossed thereon, with adjacent spots being spaced from one another both longitudinally and transversely of the paper strip. In FIGURE 7, I show the paper B as being embossed with a myriad of raised diamond-shaped spots **11*b***. FIGURES 6 and 7 illustrate air passages **12** as being arranged between adjacent raised spots **11*a*** and **11*b***, respectively. As previously stated, both FIGURES 6 and 7 are drawn on a greatly enlarged scale.

Referring now to the modified embossing apparatus C' as shown in FIGURE 8, it will be obvious that the embossing roll G' and the resilient roll H' are reversed from that illustrated in FIGURE 1. In FIGURE 8, a myriad of depressions **15*a*** are fashioned in the peripheral surface of the embossing roll G', while the resilient roll H' has a rubber covering **16*a*** on its peripheral surface, this covering preferably being 40–60 durometer. As the interposed cigarette wrapper paper B is advanced between the rolls G' and H' from a supply roll to a conventional cigarette making machine (as in FIGURE 1), the spaced raised spots **11*a*** or other shaped spots will be embossed on the paper. Of course, the rolls G' and H' in FIGURE 8 may be actuated by the same mechanism as shown in FIGURE 2.

Returning now to the construction of the cigarette F, as disclosed in FIGURES 4 and 5, it should be noted that the air passages **12** between adjacent raised spots **11** (**11*a*** or **11*b***) provide controlled air entrance spaces between the wrapper B and the tobacco particles in the filler E in the smoke producing zone J directly in back of the glowing ember K. The passages are large enough so that air may be drawn over the ember K and into the smoke producing zone J with the indrawn air being much lower in temperature (range about 400° to 900° Fahrenheit) than if the air were drawn through the glowing ember (temperature about 1600° Fahrenheit), thus avoiding the distillation of the high temperature fractions (which are distilled or driven off at a temperature range of about 900° to 1600° Fahrenheit).

It will be noted that the embossed raised spots **11** (**11*a*** or **11*b***) are arranged along the entire circumference of the wrapper sleeve B (see FIGURE 5), whereby air may be drawn in around the periphery of the glowing ember K, as indicated by the arrows **27** in FIGURE 4. Also, the embossed raised spots are disposed along the entire length of the cigarette F (see FIGURE 4), whereby the air entrance spaces will continue to be provided as the cigarette burns toward its butt end **14**.

From actual tests, it has been determined that the free entrance spaces between the wrapper B and the tobacco particles of the filler E should be about .001 square inch of total area when the cigarette F is about one inch in circumference, and this proportion should be substantially followed in cigarettes of larger and smaller diameters.

As the cigarette burns, the glowing ember K turns to grey ash **28** as the ember advances toward the butt end **14** of the cigarette. It has been pointed out that those smoke fractions coming off above 900° Fahrenheit are high temperature formed fractions, and with my arrangement these fractions stay in the tobacco particles and are burned as the ember K advances between drags or puffs on the cigarette. Thus these harmful high temperature smoke fractions do not reach the smoker.

Since a conventional cigarette is about one inch in circumference it follows that a gap between the paper B and the tobacco particles of the filler E of about .001" is required. However, the embossed points or spots **11** (**11*a*** or **11*b***) take up space and thus must be compensated for. In other words, the embossed points must be higher than .001" in order that the effective open spaces will total or aggregate the equivalent of a continuous .001" space around the circumference of the cigarette F.

By actuatl reduction to practice I have used many various embossed designs, i.e., diamond shaped, square shaped, ball or spherical shaped, and have even provided the space required by using two layers of cigarette paper with the inner layer perforated with staggered rows of elongated openings which formed the required openings into the smoke producing zone J. It will also be obvious that if the embossed points are too far apart the small tobacco particles can wedge between the points and thus defeat the desired purpose.

As a satisfactory arrangement I have embossed the cigarette paper with 1/32" diameter steel balls (placed in direct side to side contact) to a depth of .003'. With this depth the embossed area is less than the ball diameter so that sections of the paper are not depressed or embossed and thus provide the required air entrance spaces. The raised paper points are, of course, depressed or flattened a slight amount as the cigarette is formed so with 1/32" diameter balls on 1/32" centers and coined or embossed into the cigarette paper a depth of .003" we end up with our required .001" square area in total.

Obviously, it is possible to go slightly over or under the above figures and still have the ideal work, but I cite the above workable range to show that just any kind of corrugations, embossing and the like will not work. The range is critical and must be held if the smoker is not to receive "diluted" smoke on the one hand or high temperature smoke fractions on the other, as now takes place in the cigarette construction.

I have done previous work on this idea as covered by my United States Patent No. 2,667,170, issued Jan. 26, 1954, on Crimped Wrapper for Cigarette, wherein I use triangular shaped pleats in the paper wrapper to provide the required air spaces. I do this with a crimper that does the work on a finished cigarette. However, this is the age of "throwaway," i.e., everything has to be "ready to use" and then thrown away when used.

Moreover, I find that smokers barely have the patience to reach for matches let alone taking time to crimp the cigarette. If the paper is pleated per Patent No. 2,667,170 before the cigarette is formed the pleats will pull out of shape as they come under tension during the cigarette forming operation in a modern machine, and conversely, if the pleats are made in the completed cigarette the cigarette's diameter is smaller and a packaging problem exists.

By contrast, the present idea of embossing the paper before it is made into a cigarette the tension encountered can make no change as the webs of original paper between the raised points take the tension in either direction and the only change in the embossed or raised points of paper is a slight compression due to contact with the tobacco particles and that can be compensated for by making the points or embossed area a little higher to start with.

The embossing apparatus (C or C') may be added to a conventional cigarette making machine with a minimum of expense and no cost for added materials, such as filters, and still produce a cigarette that gives a satisfactory smoke without the smoke fractions derived from high temperatures which medical science considers to be the harmful elements.

This invention makes it possible to provide the benefits of the hand crimped cigarette of Patent No. 2,667,170 on the factory made cigarette with no change to the machine D through the addition of small embossing rolls.

The results of having .001 square inch of free entrance space between the paper wrapper B and the tobacco particles in the filler E are remarkable. The "bite" of the usual high temperature tars is gone. Draw effort is normal. However, the amount of smoke obtained from the burning of a given amount of the cigarette F is about 30% less than is obtained from the burning of the same amount of a conventional cigarette. Said 30% reduction represents the high temperature smoke fractions that are not released by virtue of reduced air temperature as contrasted to the higher air temperature of the air that has to pass through the glowing ember of the conventional cigarette.

The "burning rate" of a cigarette with the embossed wrapper is not changed by the extra entrance area. This can be demonstrated by smoking two cirgarettes simultaneously in a double holder, i.e., both cigarettes are subjected to the same draw effort at the same time. By using one cigarette that has had the embossed wrapper placed thereon and one that is standard or conventional, we will see that both cigarettes burn and are consumed at the same rate.

Obviously, if the embossed wrapper cigarettes were allowing extra air to enter then that cigarette would burn slower as happens if a cigarette wrapper is broken or even punctured with pin holes. In short, the only change made by the embossed formed air entrance is to lower the temperature of the oxygen (air) to a point where the tobacco elements that require high temperatures for their distillation do not release such smoke fractions. The same amount of tobacco is "burned" but since the temperature is lower less smoke is released and the "less smoke" represents the unwanted high temperature fractions—fractions that are completely burned by the 1600° Fahrenheit ember K as it advances between puffs or drags by the smoker. Complete distillation cannot be avoided but the high temperature distillation smoke fractions can be made to burn off into the air instead of going into the smoke stream that goes into the smoker's mouth and lungs.

The smoker thus gets the taste and satisfaction of the aromatic, low temperature smoke fractions, while avoiding the high temperature, harmful fractions. These benefits can be incorporated in the cigarette at the time of its original manufacture without the addition of filters and the like—without a change to the now used materials, i.e., paper and tobacco or the existing high production machines as the simple addition of embossing rolls, between the conventional 6000 meter roll A of cigarette paper B and the woven fabric belt that holds the paper in flat position to receive the tobacco particles E or shreds, will do the trick. The embossing rolls of the apparatus C or C' would be machine driven, i.e., actuated by the machine D that makes the cigarettes and thus synchronized to all desired speeds and feeds of the main machine.

The cost of thus producing such improved cigarettes F would be very small. The smoker would be able to obtain a satisfactory smoke without having to contend with the harmful smoke fractions. The present trend toward the elimination of all cigarette smoking could be changed to the end that a great industrial complex (tobacco growing-marketing-manufacturing-sales and advertising to say nothing of tax revenue) can go on giving smoking satisfactory to millions.

I claim:

In a cigarette of the character described:

(a) a wrapper providing a sleeve surrounding a tobacco filler;

(b) the wrapper being fashioned with a very large number of embossed raised spots on the inner tobacco surface thereof, which project inwardly of the sleeve to bear against the tobacco filler to hold the rest of the wrapper away from the tobacco particles, each raised spot defining a solid wall to preclude passage of ambient air therethrough;

(c) adjacent embossed raised spots being spaced from one another both longitudinally and transversely of the cigarette to define air passages extending from the burning end of the cigarette toward the butt end thereof, and the web of the original wrapper between adjacent raised spots being disposed to take the tension in longitudinal and transverse directions during the cigarette forming operation and precluding the raised spots from being pulled out of shape;

(d) the passages providing controlled air entrance spaces between the wrapper and the tobacco particles in the smoke producing zone directly in back of the glowing ember at the burning end, the passages being large enough so that air may be drawn over the ember and into the smoke producing zone with the indrawn air being much lower in temperature than if the air were drawn through the glowing ember, thus avoiding the distillation of the high temperature

smoke fractions (temperature range of about 900° to 1600° Fahrenheit);

(e) the passages being small enough so that air passing over the ember will be heated to the proper range to drive off or distill the low temperature smoke fractions (temperature range of about 400° to 900° Fahrenheit) and preclude the smoke from being diluted with excess air;

(f) the embossed raised spots being arranged along substantially the entire circumference of the wrapper sleeve, whereby air may be drawn in around the periphery of the glowing ember;

(g) the embossed raised spots being further disposed along at least a substantial length of the cigarette, whereby the air entrance spaces between the wrapper and the tobacco particles at the burning end will continue to be provided as the cigarette burns towards its butt end;

(h) the free air entrance spaces between the wrapper and the tobacco particles being about .001 square inch of total cross-sectional area when the cigarette is about one inch in circumference, and this proportion being substantially followed in cigarettes of larger and small diameters.

References Cited by the Examiner

UNITED STATES PATENTS

673,041	4/1901	Ault	156—595
1,784,906	12/1930	Oxhandler	264—285
2,667,170	1/1954	Lebert	131—15
2,981,261	5/1961	Rupert	131—15
2,998,012	8/1961	Lamm	131—15

SAMUEL KOREN, *Primary Examiner.*

MELVIN D. REIN, *Examiner.*