CIGARETTE WITH MODIFIED PAPER WRAPPER

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Field of Search ..................................131/4, 9, 10, 15, 17

References Cited

UNITED STATES PATENTS
3,526,904 1/1970 Tamoll ..................................131/15 B
2,754,828 7/1956 Swain ..................................131/15 B X
2,836,183 5/1958 Fay et al. ............................131/4
2,923,647 2/1960 Aghnides ................................131/9
2,936,763 5/1960 Saffir ..................................131/15 B
2,992,647 7/1961 Figge .................................131/15 B X

FOREIGN PATENTS OR APPLICATIONS
942,181 11/1963 Great Britain ..........................131/15 B

OTHER PUBLICATIONS
N. I. Sax (Text) "Dangerous Properties of Industrial Materials" 3rd Edition 1968– Published by Reinhold Publishing Co. N.Y. Pages 485, 961, 1000 and 1101 cited

ABSTRACT

An improved cigarette is prepared through use of a modified cigarette paper as a wrapper. The wrapper is treated in preselected areas with a burn control additive, preferably a strong combustion supporting, oxidizing agent. When the burning coal reaches the area of treatment, the treated area is burned away, allowing for the passage of air through the opening created, during smoking of the cigarette. This air entering through the opening dilutes the smoke stream and results in a substantial reduction in smoke constituents delivered on smoking of the cigarette, with a corresponding improvement in the organoleptic properties of the smoke. The preselected areas on the wrapper are so arranged that larger areas are burned away as the burning coal proceeds from the tip of the cigarette toward the mouthpiece of the cigarette, so that increasing amounts of air are drawn into the tobacco column as smoking proceeds, and constituent delivery is correspondingly reduced in greater amounts as smoking proceeds, so as to provide for a more uniform constituent delivery. The strong, combustion supporting, oxidizing agent may be sodium chlorate, sodium bromate, potassium chlorate, an alkali or alkaline earth metal perchlorate, sodium nitrite, potassium nitrite, ammonium perchlorate or nitric acid. The burn accelerating agent is applied so as to cover 2 to 50 percent of the wrapper and in concentration constitutes ¼ to 8 milligrams per square centimeter of the treated portion.

8 Claims, 11 Drawing Figures
CIGARETTE WITH MODIFIED PAPER WRAPPER

BACKGROUND OF THE INVENTION

As a cigarette is smoked, progressively, from the tip end to the butt end, which may or may not be equipped with a filter, there is a gradual increase in delivery of smoke constituents. The constituents which are increased include total particulate matter, tar, nicotine, and others. Reduction of the constituent delivery in the later puffs of the cigarette, so as to conform to that constituent delivery more closely to the delivery of earlier puffs would result, not only, in an overall reduction of the delivery of these constituents over the entire length of the cigarette smoked, but would also provide a more pleasing smoke taste in smoking the latter portions of the cigarette.

In general, previous cigarette treatments have been directed toward overall reductions of this constituent delivery and have not recognized the problem of providing a uniform smoke taste and constituent delivery throughout the cigarette. Further, these prior treatments have not been overly successful in reducing the overall constituent delivery.

SUMMARY OF THE INVENTION

In accordance with the present invention an improved cigarette has been developed whereby the constituent delivery is reduced, in the overall, and the constituent delivery, on a puff-by-puff basis has been made more generally uniform. Of course, while this uniformity of constituent delivery on a puff-by-puff basis is desired, the invention is not so limited but can be applied, in general, to the reduction of constituent delivery.

The improved cigarette is formed by employing a modified paper as the cigarette wrapper. This wrapper is modified by treatment in preselected areas so that portions of the wrapper, in advance of the burning coal, are burned away so as to provide openings in the wrapper. As the cigarette is smoked, air is drawn through these openings or as to dilute the smoke which is delivered through the butt end of the cigarette. This dilution results in a decrease in the constituent delivery and, correspondingly, improves the taste of the smoke in these latter puffs.

As the constituent delivery from smoking of the tobacco near the tip end of the cigarette is relatively low, it is generally preferable to leave the tip end untreated. Thus, the cigarette paper wrapper is generally modified only in the one-third to two-third portion closest to the butt end of the cigarette.

The preferred method of providing the openings for passage of diluting air is through treatment of the paper wrapper, in preselected areas, with a strong combustion supporting, oxidizing agent.

It is thus an object of this invention to provide a cigarette employing a modified paper wrapper.

It is a further object of this invention to provide a reduced delivery of smoke constituents by employing a modified paper wrapper.

It is a still further object of the present invention to provide for a generally uniform delivery of smoke constituents throughout the length of the cigarette, by providing a paper wrapper which is preferably modified near the butt end of the cigarette in such a manner as to provide air passages for diluting the smoke delivered.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a side elevational view of a cigarette having a burn accelerating agent applied to the cigarette paper wrapper in an interrupted triangular pattern;

FIG. 2 is a vertical sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a side elevational view of a cigarette having a combustion additive applied to the paper wrapper in parallel, axially directed, interrupted strips of varying lengths;

FIG. 4 is a perspective view of a cigarette having a combustion modifying agent applied to the cigarette wrapper in the form of parallel spaced rings;

FIG. 5 is a side elevational view of a cigarette having a burn accelerating agent applied to the cigarette wrapper in a continuous spiral pattern, with the line interrupted at points, and with the amount of combustion additive increasing toward the butt end of the cigarette;

FIG. 6 is a perspective view of a cigarette having a combustion modifying additive applied to the cigarette paper wrapper in the form of semi-circular rings, the thickness of the rings increasing as the rings more closely approach the butt end of the cigarette;

FIG. 7 is a perspective view of a cigarette having a burn accelerating agent applied to the cigarette wrapper in the form of circular rings, the thickness of the rings increasing toward the mouthpiece end of the cigarette;

FIG. 8 is a side elevational view of a cigarette having a combustion modifying agent printed on the cigarette wrapper in such a manner that increasing amounts of the additive are placed on the paper as the pattern approaches the mouthpiece end;

FIG. 9 is a side elevational view of a cigarette wrapper treated with a combustion modifying agent, in a modified checkerboard pattern, with the density of treatment increasing toward the butt end of the cigarette;

FIG. 10 is a side elevational view of a cigarette wrapper treatment with a combustion modifying agent in a regular, modified checkerboard pattern;

FIG. 11 is a graph illustrating the reduction in total particulate matter delivered employing a modified wrapper of the present invention when compared with a cigarette employing an unmodified wrapper.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In each of the accompanying figures, the numeral 10 designates a cigarette having a wrapper modified in accordance with the present invention, and the numeral 11 designates the butt or mouthpiece end of that cigarette. While the cigarette is illustrated, in each case, as one having a tip or filter, it is equally apparent that the present invention is applicable to plain, untipped cigarettes. However, in those instances where a leveling of the smoke constituent delivery is desired, that end of the cigarette which will be closest to the butt or mouthpiece is the end which should be treated. When employing the modified wrapper of the present invention or untipped cigarettes, the wrapper at either end of the cigarette should be unmodified.

As previously mentioned, the preferred modification of the cigarette paper wrapper is a treatment of that wrapper with a strong, combustion supporting, oxidizing agent in preselected areas. While the preferred oxidizing agent is sodium chloride, other strong, combustion supporting, oxidizing agents can also be employed. These agents include potassium chloride, alkali and alkaline earth metal perchlorates, such as, sodium, potassium, and barium perchlorates, ammonium perchlorate, sodium bromate, sodium nitrate, and potassium nitrate, which are adsorbed on the wrapper, and nitric acid which may chemically be combined with the wrapper. The amount of agent which is employed will vary, to some degree, with the particular paper which is employed in the wrapper and with the oxidizing agent employed. In may instances, however, the average amount of oxidizing agent employed will be approximately ¼ to 8 milligrams per square centimeter of that portion of the wrapper to which the modifying agent is actually applied. In that portion of the wrapper which is actually modified, the strong combustion supporting, oxidizing agent, should actually occupy between about 2 and 50 percent of the wrapper area, and the points of application should be distributed throughout the modified portion. Preferably, the area so occupied should be from about 25 to 45 percent. With sodium chloride, the concentration is preferably at least 0.4 mg./cm.². As previously indicated, the amount of agent employed to modify the wrapper should be varied in different areas of the wrapper, e.g., greater amounts may be employed in the area closest to the butt or mouthpiece, than are employed in the areas more remote from the butt or mouthpiece.
As the burning coal of the cigarette approaches a treated area, the burn accelerating agent acts to cause the cigarette paper wrapper in that area to burn more rapidly than the surrounding wrapper, and in advance of the coal. With sodium chlorate, for example, the rapid burning of the paper is caused by the decomposition of the sodium chlorate into sodium chloride and oxygen. In this manner, an opening is created in the wrapper in the treated area. This, when further puff is drawn on the cigarette, air is drawn in through these openings created in the treated area and the smoke drawn through the cigarette is diluted by this air, resulting in a decrease in the smoke constituent delivery. It may be desirable, in some instances, to accentuate this creation of openings. Such an accentuation may be accomplished by modifying those areas of the paper not treated with the strong, combustion supporting, oxidizing agent, which acts as a burn accelerator, with a burn retardant. In this manner, the burn accelerating effect of the strong, combustion supporting, oxidizing agent is increased.

Referring to the accompanying drawings, and particularly FIG. 1, a cigarette is shown where the paper wrapper is modified by treatment of preselected areas 13, 14 and 15 of wrapper 12 with a burn accelerating agent. The overall pattern created by areas 13, 14 and 15 is of an elongated triangle, interrupted at points. Thus, the areas 13 and 14 are in a trapezoidal form, with the larger base in the direction of the butt or mouthpiece. As these areas 13, 14 nd 15 are the areas in which openings will be created because of a burning away of the paper caused by the burn accelerating agent and advancing coal, it will be noted that a larger opening is created as the portion of the cigarette being smoked more closely approaches the butt end. As indicated, the delivery of smoke constituents increases toward the butt end, and this increase in the treated area toward that end results in a general evening of smoke constituent delivery throughout the length of the cigarette. It will also be noted that the tip end of the cigarette is untreated.

FIG. 2 is a vertical sectional view taken along the line 2—2 of FIG. 1 and shows tobacco section 20 encased in wrapper 12, with a layer of oxidizing agent 15 adhered to wrapper 12. This, it should be noted, is merely a schematic representation of the treated area and, in actual application, the oxidizing agent may be absorbed or adsorbed by the paper such that a sectional view of the cigarette would not show an actual layer of the oxidizing agent layer.

FIG. 3 is an embodiment of the invention in which the oxidizing agent is applied to wrapper 12 in the form of parallel rectangular strips 22, 23 and 24, which are formed in the axial direction of the cigarette and are interrupted along the length. It is to be noted that the strip 24 is shorter than strips 22 and 23, so that the burn accelerating agent is present in increased concentration toward mouthpiece 26.

A further embodiment of the invention is illustrated in FIG. 4 where the oxidizing agent is applied to wrapper 12 in the form of spaced, circular rings, 26, 27, 28, 29 and 30. Rings 26, 27 and 28, closest to the mouthpiece end of the cigarette, are spaced closer together so as to compensate for the increase in delivery of smoke constituents delivered with puffs nearer the mouthpiece end of the cigarette.

FIG. 5 represents another embodiment of the present invention showing the burn accelerating agent applied to wrapper 12 in the form of a continuous spiral 21, interrupted along its length. The width of the spiral band increases as the band more closely approaches the mouthpiece end 11. With this manner of application, as the burning coal advancing from the lighted end reaches the beginning of spiral 21, a continuous and progressively accelerating burning of the wrapper develops, until a point just short of mouthpiece 11. The continuous and progressively accelerating burning can also be accomplished by proper spacing of the interruptions, and the spiral, in the present embodiment, may even be of constant width.

Semi-circular rings 31, 32, 33 and 34 formed by treatment with burn accelerating agent are employed in FIG. 6. These semi-circular rings increase, respectively, in thickness as the ring is closer to the mouthpiece end 11. A similar form of treatment is shown in FIG. 7, where the rings encircle the entire circumference of the wrapper.

Printed letters are employed in FIG. 8 as the form of application of the burn accelerating agent, these letters being represented by the numeral 38. Again, the size of the letters closest the mouthpiece end 11 is larger than the size of the letters which are closer to the tip or end of the cigarette which is to be lighted.

In FIG. 9 a preferred embodiment of the present invention is presented in which the burn accelerating agent is applied in a modified checkerboard pattern as illustrated. The pattern employs alternate rows of large rectangular areas 39 and smaller rectangular areas 40. As can be seen in the figure, the sizes of the rectangular areas 41 and 42, closest to the butt or mouthpiece end of the cigarette are larger and they are more closely spaced than are the rectangular areas 39 and 40. There is a progressive increase in size of the rectangles, both larger and smaller, and a progressive decrease in the spacing of these rectangles as the treated area more closely approaches the mouthpiece end.

In FIG. 10 a further preferred embodiment of the present invention is shown, employing a different type of modified checkerboard pattern. In this form alternate rows of large squares 46 and small squares 47 of oxidizing agent are placed on the wrapper so as to modify it. As can be seen, the form of the pattern is constant throughout the length of the application, and the rows of large squares 49 and small squares 50 nearest the butt or mouthpiece end of the cigarette are the same as the size of the similar rows 46 and 47 nearest the end of the cigarette to be lighted. Similarly, the spacing of these rows is the same throughout the length of the treated area of the cigarette wrapper. Increased concentration of the burn control additive is achieved, with this design, by increasing the amount of additive in each given area as the treated area more closely approaches the butt end of the cigarette.

A comparison of the total particulate matter delivery, on a puff-by-puff basis, is illustrated in FIG. 11. A plot of the total particulate matter delivered with a cigarette having a wrapper modified as illustrated in FIGS. 1 and 3 through 9 is shown by Line 51, while similar data are plotted as Line 52 for a standard cigarette, with an unmodified wrapper. The total particulate matter delivered in the first puff is relatively low. Essentially, with each succeeding puff, the delivery of total particulate matter increases, with a sharp rise in the delivery of such total particulate matter between the sixth and ninth puffs. On the other hand, while the total particulate matter delivered with each of the first two puffs of a cigarette having a wrapper modified in accordance with the present invention is the same as that using an unmodified cigarette wrapper (this portion of the cigarette is untreated in the embodiment illustrated in FIGS. 1 and 3 through 9), there is essentially no change in the amount of total particulate matter delivered with a cigarette having a wrapper modified in accordance with the present invention from the second through the ninth puffs. Thus, not only is the sum of the total particulate matter delivered employing a cigarette wrapper modified in accordance with the present invention reduced, but there is a general leveling of the amount of total particulate matter delivered with each of the puffs.

The illustration above do not necessarily indicate whether the treated areas are visible or invisible. Generally, an application of sodium chlorate produces a pattern which is substantially invisible after the application solvent has evaporated. In some instances, it may be desirable, in order to provide a more attractive appearance to the cigarette, to make the area of treatment visible to the smoker. Such a visible treatment might be particularly desirable in the case of those embodiments illustrated in FIGS. 9, 10 and 10. In that case, a dye, such as a vegetable dye, might be incorporated into the treating solution, so that after the solvent has evaporated, the areas which the strong, combustion supporting, oxidizing agent, such as sodium chlorate, remains, is colored so as to make it visible.
While the manner of application of the treatment forms no part of the present invention, it should be noted that the various treatment designs can be applied in a variety of ways. For example, a felt pad can be cut into the particular design desired, saturated with a solution of the treating agent, and applied to the cigarette paper. A fully formed cigarette can be rolled on the pad, in order to cover the entire circumference of the cigarette, or the flattened piece of paper wrapper can be impressed with the saturated felt pad and, after the solvent has evaporated, the wrapper can be applied to a tobacco rod in order to form the finished cigarette. A variety of application methods can be employed, as known in the art, either to the wrapper paper, prior to application to the tobacco rod, or to the finished cigarette. For example, gravure printing can be used.

Gravure printing is particularly useful when it is desired to vary the concentration of the strong, combustion supporting, oxidizing agent in different areas of the wrapper. For example, in addition to or instead of varying the pattern of modifying agent application, the concentration of this modifying agent can be varied. Thus, particularly when it is desired to reduce the smoke constituent delivery in the later puffs of a cigarette, the amount of modifying agent present on the wrapper will be greater closer to the butt or mouthpiece end of the cigarette. While the various figures show this being accomplished through increasing the percentage of wrapper actually occupied by the modifying agent, similar results can be achieved through employing a non-varying pattern, such as illustrated in FIG. 10, but increasing the concentration of the modifying agent toward the butt or mouthpiece end. While gravure printing is a preferred method for accomplishing this, other techniques known in the art can also be employed, and the use of gravure printing is not limited to applying varying concentrations of modifying agent.

In order to give those skilled in the art a better appreciation of the results achieved through use of the modified wrapper of the present invention, the examples below will illustrate treatments according to the present invention and the reduction in smoke constituent delivery achieved. In each example, the cigarettes employing the modified wrapper of the present invention and the control cigarettes were smoked on smoking machines commonly employed in the art as, for example, the Mason Smoking Machine which was employed for testing in certain of the examples. In each case the smoking machine tool a puff of 35 ml. volume over a period of 2 seconds, with one puff each minute.

**EXAMPLE 1**

Five hundred standard, king-size untipped cigarettes of equal weight (plus or minus 2 percent) were divided into two groups. In the first group, the 50 percent of the wrapper closest to the mouthpiece end was treated with a 50 percent water solution of sodium chlorate, in the pattern illustrated in FIG. 1, in order to provide approximately 3 milligrams of sodium chlorate per cigarette wrapper. The concentration of treatment was thus about 1–2 mg. per square centimeter on the approximately 15 percent of the wrapper which was modified. The treated area of the cigarettes of the first group was reached after the fourth puff on the smoking machine. Table I illustrates the delivery of total particulate matter by the treated and untreated cigarettes, on average.

**TABLE I**

<table>
<thead>
<tr>
<th>Puff number</th>
<th>TPM delivery of cigarettes with médidod wrapper (mg/puff)</th>
<th>TPM delivery of cigarettes with modified wrapper (mg/puff)</th>
<th>Decrease in TPM delivery of cigarettes with modified wrapper (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3.8</td>
<td>3.2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>3.7</td>
<td>2.9</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>3.5</td>
<td>2.8</td>
<td>39</td>
</tr>
<tr>
<td>10</td>
<td>5.7</td>
<td>3.4</td>
<td>40</td>
</tr>
</tbody>
</table>

1 In this table, and the remaining tables, TPM stands for total particulate matter.

Thus, employing the modified wrapper of the present invention on cigarettes, not only is there a per puff decrease in delivery of various smoke constituents, but there is a surprising reduction in the total delivery of various smoke constituents, on a selective basis. The average length of cigarette consumed for 10 puffs was approximately the same employing either the cigarette with the modified wrapper of the present invention, or the control cigarette with the unmodified wrapper.

**EXAMPLE 2**

The necessity for the strong, combustion supporting, oxidizing agents of the present invention is illustrated by comparison with a cigarette having a wrapper modified in the same manner as the present invention, but employing ammonium nitrate. This is the treatment agent described in U.S. Pat. No. 3,285,253 — Lebert for the purpose of reducing the temperature of air contacting the tobacco. While that patent describes the charring of the paper wrapper in advance of the burning coal, it does not suggest the provision of an opening through which diluting air passes during a puff on the cigarette.

In this example 50 standard, king-sized, filter cigarettes had wrappers modified for each modifying agent and concentration of modification, and the results reported in Table III are an average of the results from these 50 cigarettes in each case. The modifying agents in each case, were applied to the cigarette wrapper in the pattern illustrated in FIG. 9. Approxi-
mately two-thirds of the wrapper area was so modified and approximately 40 percent of that portion of the wrapper had the modifying agent applied. The concentration at the point of application was about 1.25 mg./cm² when 50 percent solutions were applied.

As can be seen from the data in Table III, not only is there a reduction in the total delivery of particulate matter, nicotine, and tar when employing the modifying agent of the present invention, compared both with the control and with an ammonium nitrate modification, but there is even a slight increase in the number of puffs with the cigarette of the present invention.

In the examples in Table III, two types of controls were employed. The first control was the same type of cigarette employed for both the ammonium nitrate and sodium chloride wrapper modifications, but to which no modifying agent of any kind was applied. The second type of control was, again, the same type of cigarette, but this cigarette was treated with the modified checkerboard pattern of Fig. 9, as used for the ammonium nitrate and sodium chloride wrapper modified cigarettes, but the applied material was water, with no added oxidizing agent.

<table>
<thead>
<tr>
<th>TABLE III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smoke constituent or number of puffs</strong></td>
</tr>
<tr>
<td><strong>TPM, milligrams</strong></td>
</tr>
<tr>
<td><strong>Nicotine, milligrams</strong></td>
</tr>
<tr>
<td><strong>Tar, milligrams</strong></td>
</tr>
<tr>
<td><strong>Number of puffs</strong></td>
</tr>
</tbody>
</table>

1 Tar is TPM except for water and nicotine.

As can be seen, those cigarettes employing an ammonium nitrate wrapper modification, regardless of the concentration, showed, at best, no improvement in TPM, nicotine, or tar and, in many cases, showed an increase in the delivery of these constituents. On the other hand, while the cigarettes having wrappers modified with the 10 percent or 30 percent solution of sodium chloride showed some improvement in delivery of these constituents, employing the 50 percent solution, in accordance with the present invention, there was a significant reduction in each of these constituents. These cigarettes were also found to have improved organoleptic properties.

**EXAMPLE 3**

A group of 100 standard, king-sized filter cigarettes were selected, the weight of the cigarettes varying by no more than ±2 percent. One-half of these cigarettes had no modification of the wrapper and were retained as a control. The other half of the cigarettes had wrappers modified with two applications of 50 percent sodium chloride solutions in the pattern illustrated in Fig. 9. These cigarettes were smoked on a smoking machine, as in the prior examples, and the sodium chloride wrapper modified cigarettes showed a reduction in tar of 39 percent, when compared with the control, and a 43 percent in carbon monoxide, when compared with the control. Both of these reductions, based upon the overall smoking of the cigarette, were unexpected and surprising. The manner of application and spacing, was as in Example 2. Thus, the concentration was approximately 2.5 mg./cm².

Thus, in accordance with the present invention, a cigarette employing a modified wrapper has been illustrated whereby a reduction in the total delivery of various smoke constituents can be achieved. Further, by proper application of the treatment, the amounts of these smoke constituents delivered on a puff-by-puff basis can approach uniformity.

We claim:

1. In a cigarette having a tobacco rod surrounded by a uniform, imperforate paper wrapper, the improvement which comprises modification of the wrapper by treatment of said wrapper in a plurality of specific, separated areas, with a strong, combustion supporting, oxidizing agent, the amount of said oxidizing agent being greater closest to the butt end of the cigarette, and lesser nearer the tip end of the cigarette, the burn accelerating agent covering from 2 to 50 percent of the portion treated, said oxidizing agent being selected from the group consisting of sodium chloride, sodium bromate, potassium chloride, alkal and alkaline earth metal perchlorates sodium nitrite, potassium nitride, ammonium perchlorate and nitric acid and being applied in amounts of from 1/4 to 8 milligrams per square centimeter in that treated portion, whereby, upon smoking of the cigarette, the pre-selected areas are burned in advance of the advancing cigarette coal, so as to allow air to enter during smoking in a manner essentially imperceptible to the smoker, the amount of air increasing as the burning coal more closely approaches the butt end of the cigarette to render, essentially constant, the amount of total particulate matter delivered with each puff.

2. The cigarette of claim 1 wherein the burn control agent is applied in a pattern so as to occupy from 25 to 45 percent of that portion of the wrapper to which the oxidizing agent is applied.

3. The cigarette of claim 1 wherein the oxidizing agent is sodium chloride.

4. The cigarette of claim 1 wherein the burn accelerating agent is applied in a modified checkerboard pattern.

5. The cigarette of claim 4 wherein the checkerboard pattern is applied to from one-third to two-thirds of the cigarette wrapper closest to the butt end of the cigarette.

6. The cigarette of claim 1 wherein the pattern of the burn accelerating agent is visible.

7. The cigarette of claim 1 wherein the burn accelerating agent is sodium chloride and the concentration is at least 0.4 milligrams per square centimeter.

8. The cigarette of claim 1 in which the modified portion encompasses the entire cigarette wrapper and the cigarette is a tipped or filter cigarette.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,667,479 Dated June 6, 1972

Inventor(s) Robert A. Sanford, Robert Reiner Johnson, Thomas Wade Summers

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

Col. 1, line 37, change "os" to--so--;
   line 61, change "ing" to--ion--;

Col. 2, line 25, change "treatment" to--treated--;
   line 44, change "or" to--on--;
   line 55, change "nitrate" to--nitrite--;

Col. 3, line 9, change "draw" to--drawn--;
   line 23, change "patter" to--pattern--;
   line 44, change "shown" to--show--;

Col. 4, line 62, change "illustration" to--illustrations--;

Col. 5, line 46, change "tool" to--took--;

Table III, under "30% sodium chlorate" change "21.6" to--21.8--;
   under "0%", change "1.0" to--1.2--; and

Col. 7, line 58, after "43% insert--reduction--.

Signed and sealed this 21st day of November 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR. ROBERT GOTTSCHALK
Attesting Officer Commissioner of Patents