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F. MUTH
CIGARETTE

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Fig. 3

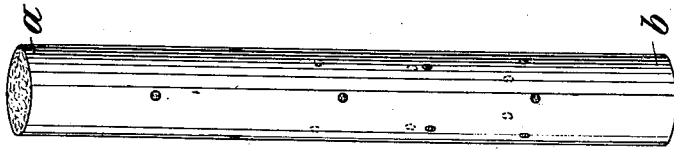


Fig. 4

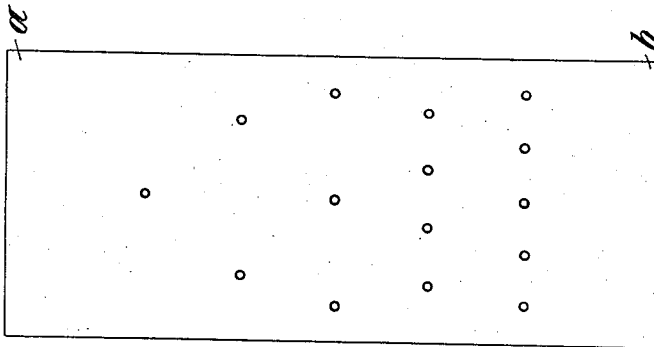


Fig. 1

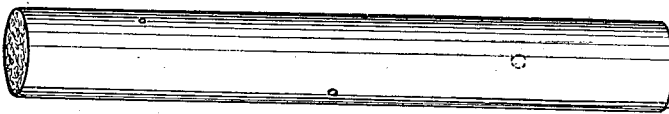
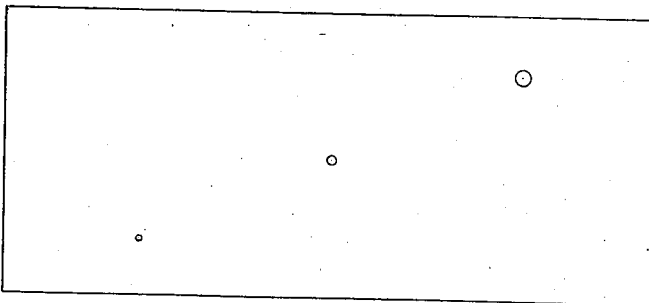


Fig. 2



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UNITED STATES PATENT OFFICE

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CIGARETTE

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vested in the Alien Property Custodian

Application November 5, 1938, Serial No. 239,110
In Germany December 20, 1937

2 Claims. (Cl. 131-15)

The invention relates to cigarettes and has for an object to reduce the effects of smoking which are detrimental to health, and to enhance the pleasure of smoking.

In the case of a normal cigarette, the wrapper filled with tobacco acts almost as a retort, that is incomplete combustion takes place in view of the lack of oxygen, which, on the one hand, causes the valuable aromatic resins to smoulder and to be converted into unpleasant combustion products, and, on the other hand, produces such high temperatures immediately behind the burning zone that, for example, nicotine salts and ammonium compounds are evaporated as colloids, depositing in a most finely divided state in the cooler part of the cigarette.

At the beginning of the next draw, these condensates are particularly easily evaporated if too high a temperature acts on them again, and they thus reach the breathing organs of the smoker undecomposed. This phenomenon, known as "nicotine rush" is not only detrimental to health, but also imparts a pungent, biting taste to the smoke. The effects of this phenomenon become particularly undesirable as the smoking of the cigarette progresses.

It has already been proposed to avoid part of these unfavorable phenomena by providing the wrapper of the cigarette with a large number of perforations which were intended to cause cold pure air to be drawn through these apertures when smoking the cigarette, thereby diluting and cooling the smoke.

The desired effect is, in this way, very incompletely achieved if at all, because too great an admission of air takes place at the beginning through the numerous apertures of a cigarette of uniform size. As soon as the draught resistance determined by the tobacco contents decreases as the cigarette is progressively consumed, the ratio of the admission of fresh air increases. A continuous change in the mixing ratio is caused thereby, with the result that the aromatical components of the smoke, which determine its taste, are condensed at once and do not distil, together with water vapours, into the mouth of the smoker as desired. With this known arrangement, a far greater proportion of fresh air is aspirated at the mouth end, because the air follows the easy path which is offered by the small draught resistance between the mouth of the smoker and the adjacent holes. Thus the mixing ratio of air and smoke gas by no means remains constant closely adjacent the burning zone during the whole smoking period, because the fresh air will, up to

the last moment, follow the easy path which is offered by the short column of tobacco up to the next nearest aperture.

According to the present invention all these difficulties are overcome by choosing the size of the holes provided in the wrapper at each of the different distances from the mouth end in accordance with the draught resistance of the cigarette, which changes with the distance from the mouth end, the size decreasing towards the mouth end.

Thus according to the invention the size or number of the holes decreases towards the mouth end in accordance with the draught resistance of the cigarette which varies according to the distance from the mouth end.

The effect thus obtained is that, while the draught resistance is still very high, i. e., while only a small piece of the cigarette has been smoked, the fresh air, which has to overcome the same resistance, enters the comparatively large opening of the perforation adjoining the glowing zone, whereby the air is conducted to the point where it should exert its effect, viz., in the close proximity of the burning zone. It is at this point that the supply of fresh air is important, because in the burning zone of each cigarette an additional increase in the draught resistance is caused by the mineral salt cone in the glowing skeleton, with the result that too little oxygen is available for oxidizing the detrimental CO into CO₂.

By the dimensions of the apertures the admission of too great quantities of fresh air is prevented at an undesirable point, viz., in the proximity of the mouth end, the apertures there being small.

As combustion progresses, the air admission apertures are burnt away successively the admission of the main quantities of fresh air occurring through the apertures which are situated nearest to the burning end. Their sizes are so chosen in view of the draught resistance of the cigarette known to decrease, from the beginning to the end of the cigarette, from about 40 mms. to about 2 mms. mercury column. This arrangement results in a constant mixing ratio of smoking gases and fresh air being maintained closely behind the burning zone during the smoking of the whole cigarette.

The fresh air which, on principle, enters at the burning zone and which can be accurately dosed by the size of the holes, prevents, on the one hand, the formation of detrimental carbon oxide in view of its oxygen contents, which is now imme-

diately oxidized into innocuous carbon dioxide in the zone which is still hot, and, on the other hand, the formation of the unpleasant products of incomplete combustion, i. e., smouldering.

The exact dosage of the fresh air is also necessary in order to retain in their vaporous state the volatile and valuable aromatical components distilling with the water vapour of the reaction products, so that they reach the mouth of the smoker without decomposition.

Even during the time when the cigarette is not drawn on, i. e., when a particularly intense smouldering tendency exists just behind the burning zone, the existing apertures offer a possibility of discharging products of evaporation into the outer atmosphere and to draw in, by the suction produced on the other side, fresh air which assists a priori in checking the formation of unfavourable products of incomplete combustion.

The organic ammonium salts which dissociate in this phase with particular ease, discharge through this aperture the easily evaporating and detrimental ammonia gas.

The size of the holes to be stamped into the wrapper conveniently increases from 0.2 mm. diameter at the mouth end to 1.3 mms. diameter at the burning end. On principle, three such holes, distributed over the length of the cigarette and having different diameters according to the resistance to draught, suffice for obtaining the effect of the invention, but in certain circumstances it is desirable to subdivide the total size of the aperture in one zone into a plurality of holes in such a manner that the quantity of air drawn through these holes is the same as that, which in other cases corresponds to the one hole calculated in view of the draught resistance.

This is particularly convenient if the purely mathematical calculation results, especially in the case of large size cigarettes, in comparatively large holes which might lead to tobacco crumbling out. With these last mentioned arrangements it will also have a beneficial effect if the air enters radially through various small holes in the same zone, thereby effecting a uniform cooling of the rear of the burning zone.

As far as the principle is concerned, the invention is, naturally, not limited to an arrangement of holes or groups of holes in a definite number of different distances from the mouth end. The number and size of the apertures be-

ing dependent upon various conditions, such as the length and the cross section of the cigarette, the degree of filling, the cutting width of the tobacco, and upon the uniformly small porosity of the cigarette paper which is already present in view of the additions of inorganic carbonates.

In the accompanying drawing, examples of the invention are shown in double their normal size.

Figure 1 shows a cigarette with a total of three individual holes arranged in different distances from the mouth end.

Figure 2 shows a wrapper of the cigarette according to Figure 1.

Figure 3 shows a second embodiment where the total size of the apertures in the different distances from the mouth end as determined by the calculated amount of air, is subdivided into a number of smaller holes in the same zone.

Figure 4 shows the wrapper of the embodiment according to Figure 3.

In view of the foregoing explanations, the drawing will be readily understood. In the embodiment according to Figures 1 and 2 the three holes are conveniently arranged in the diagonal of the paper leaflet forming the wrapper, the outer holes having a distance from the ends of the cigarette of about 1.5 cms. This distance is also approximately maintained in the somewhat different embodiment according to Figures 3 and 4. Further in connection with Figs. 3 and 4 the reference letter *a* is used to designate the mouth end of the cigarette while the burning end of the cigarette is designated *b*.

I claim:

1. A cigarette provided with a wrapper having a number of holes arranged at equal distances from each other in the longitudinal direction of the cigarette, the size of said holes decreasing towards the mouth end substantially in proportion to the draught resistance of the cigarette which substantially varies according to the distance from the mouth end.

2. A cigarette according to claim 1, wherein a hole is arranged at each of a number of different spaced intervals from the mouth end and said holes decrease in diameter from 1.3 mms. near the burning end to 0.2 mm. near the mouth end, and that said holes are arranged in staggered relationship on the circumference of the wrapper.

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