

SPECIFICATION

Improvements in cigarette holders

- 5 This invention relates to cigarette holders and, more particularly, to improvements in cigarette holders containing a filtering means for removing or trapping harmful substances contained in the smoke of cigarettes. 5

Generally, it is known that many substances harmful to human bodies are contained in the smoke of cigarettes, and that the main substances are (1) nicotine, (2) tar, (3) carbon-monoxide gas, (4) smoke particles, (5) imperfect-combustion products containing cancer generating substances, and so on. It is said that 20 to 25 mg of nicotine which is the most important substance are usually contained in one cigarette and about 3 mg. of nicotine will be absorbed in the lungs of a smoker during the course of smoking each cigarette. In order to remove these harmful substances as much as possible, measures have already been taken in which a filter made of cotton, acetate fibres, glass fibres or like porous material is attached to a cigarette or contained in a cigarette holder, alone or combined either with activated carbon or water, so that smoke will pass through the filter and the harmful substances will be physically trapped as deposited on the filter or dissolved in water. However, it is preferable that the filter should be of such density or permeability as will not remarkably prevent the passage of smoke and that the amount of water to be contained in the filter should be such as will remain between the fibres due to capilarity. Thus, the harmful substances cannot be perfectly trapped and will be carried as they are into the smoker's body after passing through the filter without contacting the material forming the filter or water. In particular, these known filters can do nothing about carbon-monoxide gas, and the total amount of generated carbon-monoxide gas is considered to be carried into the smoker's body. The present invention has been suggested to eliminate the defects of such conventional filters. 15 20 25

According to the present invention, there is provided a cigarette holder comprising a substantially cylindrical holder body having a hollow chamber, a small diameter conduit leading from the chamber to a mouthpiece at one end and a port at the other end adapted to receive therein an end of a cigarette, and a substantially columnar shape filtering means contained in said chamber, said filtering means being impregnated with a hydrogen peroxide solution. 30

By means of a cigarette holder according to the invention, the main harmful substances are chemically denatured and made harmless by a hydrogen peroxide solution contained in the filtering means which is quite different from the conventional measures in which attempts have been made to trap the harmful substances mechanically or absorbed or dissolved by the filtering means of fibres or fibres and water. 35

Preferably, the hydrogen peroxide solution has a concentration in the range of between 0.5 and 3% by weight and an amount in the range of between 0.1 and 0.3 cc.

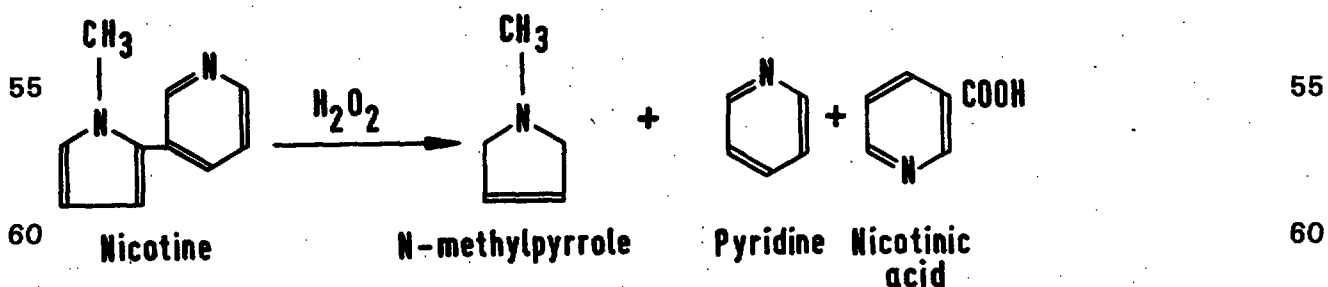
The invention will now be further described, by way of example, with reference to the drawings, in which:— 40

Figure 1 is a vertically sectioned view of one embodiment of a cigarette holder according to the present invention fitted with a cigarette;

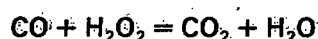
Figure 2 is a schematic view showing an example of testing apparatus for investigating the effect of the filtering means used in the cigarette holder of the present invention; and

Figure 3 is a vertically sectioned view of a Cambridge filter supporter and a supporter for filtering means under test which are used in the apparatus shown in Fig. 2. 45

The actions of hydrogen peroxide H_2O_2 used in the present invention will first be described with reference to the respective main harmful substances. When nicotine $C_{10}H_{14}N_2$ reacts with hydrogen peroxide H_2O_2 , the structure of nicotine will be split as shown by the following formula and N-methylpyrrole C_5H_7N , pyridine C_5H_5N , nicotinic acid $C_6H_5NO_2$ and others will be produced: 50



Further, as carbon monoxide which is particularly harmful is an inorganic compound, it will easily react with H_2O_2 to become carbon dioxide and water as represented by the formula



and will be made harmless.

- 5 The main ingredient of tar is a hydrocarbon, and it is clear that, when it reacts with H_2O_2 , a substance easily dissolvable in water will be produced. Therefore, the deposition and dissolution of tar on the fibres of the filter and in water contained in them will be evidently accelerated with the presence of H_2O_2 . 5

- 10 The imperfect combustion products will vary in composition and amount depending on the quality and burning condition of the cigarette but will mostly remain in the filter as deposited or dissolved on the filter material or in water together with the respective substances referred to above. Therefore, the amount of the imperfect combustion products to be removed will also increase in response to the amounts of the above referred substances trapped or denatured by the filter. 10

- 15 Tests have been made to investigate the effects of removing the harmful substances in cigarette smoke by means of the cigarette holder shown in Fig. 1 and having a filter containing a hydrogen peroxide solution and the filter has been found to be effective to render the harmful substances harmless owing to the chemical reactions described above according to the present invention, in addition to the physical trapping by means of the filter and water of the solution. 15
- 20 For solid phase substances of nicotine and tar, the testing apparatus shown in Figs. 2 and 3 has been used and, for gaseous phase substances such as carbon-monoxide gas, a gas chromatograph of a type generally used has been utilized. 20

- 25 Turning now to Fig. 1, 1 is a plain cigarette used for the tests and 2 is a cigarette holder similar to a substantially cylindrical conventional one having at one end a mouthpiece 3 which has a small conduit 4 communicating with a hollow chamber of the holder and provided at the other end with a cigarette inserting port 5 communicating with the hollow chamber. This hollow chamber is charged with a filter member 6 made, for example, of cotton, acetate or the like fibrous or porous material and impregnated with a hydrogen peroxide solution of respective concentrations and amounts later described. 25

- 30 In the solid phase substance investigating and testing apparatus shown in Fig. 2, 11 is an aspirator used to suck in combustion smoke of a cigarette, fed with a water current 12 at the upper end and discharging water from the lower end 13 of said aspirator 11. A discharge end of a discharge pipe 15 of a filter supporter 14 used generally to collect fine substances contained in smoke current is inserted substantially in the centre of the aspirator 11 and is open towards the lower end 13 thereof. An inlet pipe 16 of the supporter 14 is connected to an end of a supporter 17 for a filter member 6 which is impregnated with a hydrogen peroxide solution as used for the cigarette holder shown in Fig. 1. A cigarette 1 for the test is inserted into the other end of the supporter 17. 30

- 35 In the filter supporter 14, as shown in Fig. 3, a pair of metal screens 18 and 19 are provided at right angles with respect to the axis of the supporter with a spacing between them substantially in the middle of a cylindrical container and a disc-shaped membrane filter 20, used extensively internationally in this kind of test and known as a Cambridge filter is held between the metal screens 18 and 19. 35

- 40 In this arrangement, when the cigarette is lit and the water current 12 is passed through the aspirator 11, a negative pressure is generated at the discharge end of the pipe 15 so that the combustion smoke of the cigarette 1 will be caused to flow to the collecting filter 20 through the filter member 6, as if smoked by a person, and will be discharged out of the discharge pipe 15 after passing through the filter 20. 40

- 45 The membrane filter used in this apparatus has a capacity of collecting fine grains of 0.1 micron. Therefore, substantially 100% of fine granular substances contained in the smoke passing through the filter will be collected by the filter. In detecting the thus collected substances, the metal screens 18 and 19 holding the filter 20 are removed, the filter is taken out, the minute amount of the substances trapped on the filter is dissolved in a chloroform solution of a concentration of more than 99% and the composition of the substances extracted from such solution is analyzed and detected by means of a chromatograph. 45

The gas chromatograph used for investigating the carbon-monoxide gas may take the form of any suitable conventional arrangement widely employed therefor as will be apparent to those skilled in the art.

- 50 In the respective tests, a columnar filtering member of a diameter of 8 mm, length of 25 mm and weight of about 0.1 g made of acetate fibres was used for the filter member 6, and a plain cigarette "PEACE" containing no filter and produced by Japan Monopoly Corporation was used for the test cigarette 1. The results of the tests made by Japan Foodstuff Sanitation Society (a Japanese testing authority appointed by the Health and Welfare Minister) are set forth in Table 1, in which Sample 1 is a PEACE cigarette test-smoked without using the filter member 6, 50
- 55 Sample 2 is a PEACE cigarette test-smoked with the use of the filter member 6 containing 0.2 55

c.c. of an H_2O_2 solution of a concentration of 3% by weight, and Sample 3 is a PEACE cigarette test-smoked with the filter member 6 containing the same amount of plain water. Samples 1 and 2 were subjected to the investigations of nicotine, tar and carbon-monoxide gas, but Sample 3 was subjected only to that of tar.

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Table 1

Sample	Nicotine (mg)	Tar (mg)	CO (p.p.m.)
1	2.180	16.5	350
2	0.204	9.0	0
3	—	13.8	—

As will be clear from the table, it is found that more than 90% of the amount of nicotine detected on Sample 1 was removed in Sample 2, that nearly half of the tar in Sample 1 was removed in Sample 2 and about $\frac{1}{3}$ of the tar in Sample 3 was removed in Sample 2, and that carbon-monoxide gas was completely removed in Sample 2.

It is clear, therefore, that by the impregnation of a hydrogen peroxide solution in the filtering means, practically all nicotine and, to a large extent, tar are remarkably removed as compared with conventional filtering means and, in addition, carbon-monoxide gas about which nothing could be done conventionally is also removed substantially completely, though the respective values of the harmful substances removed might be varied depending on the amount and concentration of the hydrogen peroxide solution or on other testing conditions.

According to the present invention, nicotine as an important harmful substance and also as a substance important to the taste and flavour of cigarettes is remarkably removed as shown in Table 1 mostly by its chemical reaction with hydrogen peroxide H_2O_2 as described above. This removing rate will be different depending on the quality and density of tobacco contained in the cigarette, the burning speed of the cigarette, the air feeding condition, the composition and amount of other impurities, and so on. However, according to experiments made by the inventor, it has been found that about 100% of nicotine will be removed by 0.2 cc of hydrogen peroxide solution in a concentration of 10% by weight. On the other hand, it is considered that the smoke from which nicotine has been substantially perfectly removed is not always favourable in respect of the taste and flavour. Therefore, the results of experiments made by using a hydrogen peroxide solution of respective different concentrations selected to leave some nicotine after passing through the filtering means in consideration of the test results in Table 1 are shown in Table 2:

Table 2

H_2O_2 Concentration (%)	10	3	1	0.5
Impregnation (c.c.)	0.2	0.2	0.2	0.2
Approximate amount of remaining nicotine (%)	0	10	20	30

As will be clear from this table, the amount of removed nicotine can be controlled to be of any desired value in response to the concentration of the hydrogen peroxide solution contained in the filtering means so that some taste and flavour of the cigarette can be left by suitable selection of the concentration of the hydrogen peroxide solution.

The amount of the hydrogen peroxide solution with which the filtering means is to be impregnated should be determined in relation to the water absorbing force determined by the material, dimension and density of the filtering means to be used but is preferably selected to be in a range of 0.1 to 0.3 c.c. in the case of a concentration of 0.5 to 3% by weight for the filtering means of an ordinarily used fibre material.

According to the present invention, as has been described above, the harmful substances contained in the smoke of cigarettes when smoked can be remarkably removed and made harmless by very simple and economical measures of impregnating a filter made, for example, of a fibre body used conventionally with a small amount of a hydrogen peroxide solution of a proper concentration and using it in a cigarette holder and the taste and flavour of the cigarette can be left by simply controlling the amount of the removed substance by the selection of the solution concentration. Further, in the light of the economy of the present invention, the present invention can be applied to low cost cigarette holders made, for example, of plastics and

designed to be disposable.

In the case of normal holders of non-disposable type, the filtering means with the impregnated hydrogen peroxide solution may be made exchangeable. In preserving the holders or exchanging filtering means with the impregnation, it will be preferable to provide means for preventing the impregnated solution from evaporating.

CLAIMS

1. A cigarette holder comprising a substantially cylindrical holder body having a hollow chamber, a small diameter conduit leading from the chamber to the mouthpiece at one end and a port at the other end adapted to receive therein an end of a cigarette, and a substantially columnar shape filtering means contained in said chamber, said filtering means being impregnated with a hydrogen peroxide solution.

2. A cigarette holder according to claim 1, wherein said hydrogen peroxide solution is of a concentration in the range of between 0.5 and 3% by weight and an amount in the range between 0.1 and 0.3 c.c.

3. A cigarette holder substantially as described herein with reference to Fig. 1 of the drawings.

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