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CIGARETTE PAPER

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12 Claims. (Cl. 131—15)

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One of the important characteristics of cigarette paper is its ashing property, that is, the type of ash formed when the cigarette is smoked. The general tendency of cigarette paper, when burned on a cigarette, is to produce an ash in the form of black curly particles, which do not adhere to the tobacco ash, and in fact have a tendency to curl outwardly from the tobacco ash as the cigarette burns, and to fall upon the smoker's clothing.

It is desirable to have the cigarette paper ash adhere to the tobacco ash and blend with it to give a pleasing appearance. The paper ash should consist of fine flakes of a highly discontinuous character, and should adhere to the tobacco ash, so as to avoid accidental falling, but adapted to be flicked off easily at the will of the smoker.

Our present invention constitutes an improved cigarette paper wrapper, which upon burning on a cigarette will produce the desired paper ash. It comprises incorporating in the paper web, a quaternary ammonium phosphate or phosphite salt. We have found that the judicious use of these salts in the cigarette wrapper produces the above-described fine grain, adhering type of cigarette paper ash.

The quaternary ammonium phosphate and phosphite salts useful in this invention have a quaternary ammonium cation with the general formula:



wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aralkyl, aliphatic and alicyclic radicals preferably containing not more than 20 carbon atoms.

These salts may be prepared by the reaction of a quaternary ammonium base and a phosphoric or phosphorous acid. Specific illustrative examples of the substituent groups attached to nitrogen in the quaternary ammonium base radical, and of the phosphoric and phosphorous acids that come within the above general definition, are:

(a) Alkyl and hydroxyalkyl radicals—methyl, ethyl, propyl, isopropyl, butyl, tertbutyl, amyl, isoamyl, hydroxyethyl, dihydroxypropyl, and the like radicals.

(b) Aralkyl radicals—benzyl, phenethyl, paraxylyl, naphthyl methyl, methyl xylyl, and the like.

(c) Aliphatic and alicyclic radicals—nonyl, dodecyl, tridecyl, heptadecyl, cyclopropane, cyclohexane, cyclooctane, and the like radicals.

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(d) Phosphoric and phosphorous acids, such as orthophosphoric, pyrophosphoric, orthophosphorous, pyrophosphorous, metaphosphoric, tripolyphosphoric, tetraphosphoric, and the like.

(e) Substituted phosphoric and phosphorous acids, such as amido phosphoric, diamido phosphoric, diamido phosphorous, and alkyl and hydroxyl alkyl substituted phosphoric and phosphorous acids where the organic radical contains less than 10 carbon atoms such as methyl, dimethyl, ethyl, diethyl, butanyl ethyl, methyl propanyl, di-isoamyl, isoamyl octyl, dimethyol, glycerol, and the like.

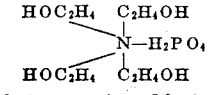
In view of the fact that many of the phosphoric and phosphorous acids are polybasic, the reaction products of these and the above bases may be the mono, di, or tri-basic salts such as for example:

Tetra methyl ammonium dihydrogen phosphate, di-tetra methylammonium hydrogen phosphate, and tri-tetra methylammonium phosphate.

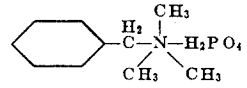
For present commercial use we prefer the mono-basic salts.

Illustrative but non-limiting examples of the quaternary ammonium salts coming within the above definition, and which we have tested with good results, are as follows:

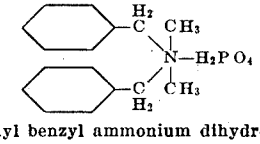
tetra ethanol ammonium dihydrogen phosphate



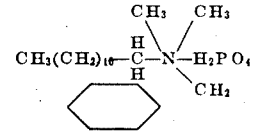
benzyl trimethyl ammonium dihydrogen phosphate



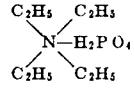
dibenzyl dimethyl ammonium dihydrogen phosphate



lauryl dimethyl benzyl ammonium dihydrogen phosphate



tetraethyl ammonium dihydrogen phosphate



In the use of the above-defined salts, it is important to the success of our invention to utilize judicious and controlled amounts of them in the

paper. The amount of any one specific salt originally added to the paper web will vary appreciably with the type of salt, and the degree of its retention in the final paper. Different paper furnishes and different operating conditions will also require a variation in the amount of salt added. In view of this situation, we have found it advantageous to compute and to specify the amount of salt used on the basis of the amount actually retained in the finished dry paper, ready for use in the manufacture of cigarettes. The approximate percentage range of amounts of the salt used, expressed as (PO_4), and based on the dry weight of the finished paper, is approximately 0.05% to 0.6%. A range that we have found commercially advantageous is approximately 0.2% to 0.4%.

Non-limiting examples of the process characteristic of our invention are illustrated by the following:

Example I

A sheet of cigarette paper was formed in the conventional manner from a furnish comprised of beaten flax pulp and calcium carbonate filler. At a point in the drier where the water content of the paper was about equal in weight to the dry weight of the fiber and the filler, the paper was run through a size-press and impregnated with a 1% solution of tetra ethanol ammonium dihydrogen phosphate. A weight of solution about equal to the weight of the dry contents of the paper was picked up, and the paper was then completely dried by passage over drying cylinders in the conventional manner. The paper was found to contain 0.35% (PO_4), which corresponds to 1.05% tetra ethanol ammonium dihydrogen phosphate. Cigarettes rolled in the dry paper burned so as to leave fine, discontinuous flakes of paper ash, which closely adhered to the tobacco ash.

When the size-press was skipped, i. e., when no quaternary ammonium phosphate was added to the paper, cigarettes rolled in such paper burned with a black, curling paper ash, which adhered very loosely or not at all.

Example II

A sheet of cigarette paper was formed in the conventional manner from a furnish comprised of beaten wood fiber pulp and calcium carbonate filler. The dry paper was impregnated with a solution containing 0.40% tetra ethanol ammonium hydroxide and 0.19% phosphoric acid (H_3PO_4). The paper was then passed through a pair of press rolls adjusted to leave about 1 pound of solution per pound of paper, based on the dry weight of the paper. The paper was then completely dried in the conventional manner. The paper was found to contain 0.19% (PO_4), which corresponds to 0.57% tetra ethanol dihydrogen phosphate. Cigarettes rolled in the dry paper burned so as to leave fine, discontinuous flakes of paper ash, which closely adhered to the tobacco ash.

When no quaternary ammonium phosphate was added to the paper, cigarettes rolled in such paper burned with a black, curling paper ash, which adhered very loosely or not at all.

Example III

A sheet of cigarette paper was formed in the conventional manner from a furnish comprised of beaten purified flax pulp and calcium carbonate filler. The dry paper was impregnated with a 0.3% solution of benzyl trimethyl dihydrogen phosphate (expressed as PO_4). The paper was then passed through a pair of press rolls adjusted to leave about 1 pound of solution per pound of paper, based on the dry weight of the paper. The paper was then dried in the conventional manner. The paper was found to contain 0.3% benzyl trimethyl dihydrogen phosphate (expressed as PO_4). Cigarettes rolled in the dry paper burned so as to leave fine, discontinuous flakes of paper ash, which closely adhered to the tobacco ash.

When no quaternary ammonium phosphate was added to the paper, cigarettes rolled in such paper burned with a black, curling paper ash, which adhered very loosely or not at all.

Example IV

A sheet of cigarette paper was formed in the conventional manner from a furnish comprised of beaten purified flax pulp and calcium carbonate filler. The dry paper was impregnated with a 0.3% solution of lauryl dimethyl benzyl ammonium dihydrogen phosphate (expressed as PO_4). The paper was then passed through a pair of press rolls adjusted to leave about 1 pound of solution per pound of paper, based on the dry weight of the paper. The paper was then dried in the conventional manner. The paper was found to contain 0.3% lauryl dimethyl benzyl ammonium dihydrogen phosphate (expressed as PO_4). Cigarettes rolled in the dry paper burned so as to leave fine, discontinuous flakes of paper ash, which closely adhered to the tobacco ash.

When no quaternary ammonium phosphate was added to the paper, cigarettes rolled in such paper burned with a black, curling paper ash, which adhered very loosely or not at all.

The filler commonly used in cigarette paper to regulate the porosity, and hence the rate at which it burns on the cigarette, is calcium carbonate. It is ordinarily added to the pulp furnish in an amount sufficient to give a filler content of about 20–30% in the finished paper. In this connection it is important to note that the quaternary ammonium phosphates and phosphites of this invention are stable compounds and do not react with the calcium carbonate filler to any marked extent when the paper is exposed to high relative humidity or when the paper is wrapped on the cigarette and thereby brought into contact with the tobacco.

This application is a continuation-in-part of our application Serial No. 719,945, filed January 2, 1947, now abandoned.

Various modifications and changes may be made in the foregoing process, materials and products without departing from the spirit and scope of our invention as defined in the appended claims.

We claim:

1. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of a quaternary ammonium salt selected from the group consisting of quaternary ammonium phosphate and phosphite salts (expressed as PO_4), having a quaternary ammonium cation of the general formula:



wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aralkyl, ali-

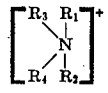
phatic and alicyclic radicals containing not more than 20 carbon atoms, said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

2. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of a quaternary ammonium phosphate salt (expressed as PO_4), having a quaternary ammonium cation of the general formula:



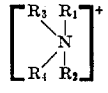
wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aralkyl, aliphatic and alicyclic radicals containing not more than 20 carbon atoms, said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

3. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of a quaternary ammonium phosphite salt (expressed as PO_4) having a quaternary ammonium cation of the general formula:



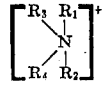
wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aralkyl, aliphatic, and alicyclic radicals containing not more than 20 carbon atoms, said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

4. A combustible, flax fiber, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of a quaternary ammonium salt selected from the group consisting of quaternary ammonium phosphate and phosphite salts (expressed as PO_4) having a quaternary ammonium cation of the general formula:



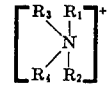
wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aralkyl, aliphatic, and alicyclic radicals containing not more than 20 carbon atoms, said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

5. A combustible, wood fiber, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of a quaternary ammonium phosphate or phosphite salt (expressed as PO_4) having a quaternary ammonium cation of the general formula:



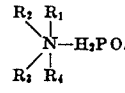
wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aralkyl, aliphatic and alicyclic radicals containing not more than 20 carbon atoms.

6. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05 to 0.6% of a quaternary ammonium salt selected from the group consisting of quaternary ammonium phosphate and phosphite salts (expressed as PO_4) having a quaternary ammonium cation of the general formula:



wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of alkyl, hydroxyalkyl, aliphatic, aralkyl and alicyclic radicals, and an anion derived from phosphoric, phosphorous and substituted phosphoric and phosphorous acids.

7. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of a quaternary ammonium phosphate (expressed as PO_4) having the general formula:



wherein R_1, R_2, R_3, and R_4 stand for radicals selected from the group consisting of the lower alkyl and hydroxyalkyl radicals, aliphatic aralkyl and alicyclic radicals, containing not more than 20 carbon atoms.

8. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of tetra ethanol ammonium phosphate (expressed as PO_4), said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

9. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of benzyl trimethyl ammonium phosphate (expressed as PO_4), said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

10. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of dibenzyl dimethyl ammonium phosphate (expressed as PO_4), said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

11. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of lauryl dimethyl benzyl ammonium phosphate (expressed as PO_4), said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

12. A combustible, cellulose, cigarette paper containing a carbonate filler and approximately 0.05% to 0.6% of tetraethyl ammonium phosphate (expressed as PO_4), said paper when burned as the wrapper on a cigarette producing an ash of fine discontinuous flakes that closely adhere to the tobacco ash.

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REFERENCES CITED

The following references are of record in the file of this patent:

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