

March 9, 1943.

E. J. JACOB

2,313,344

SMOKING DEVICE

Filed May 23, 1941

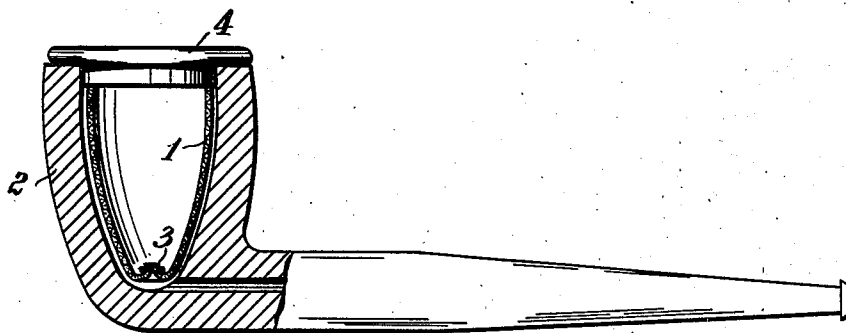


Fig. 1

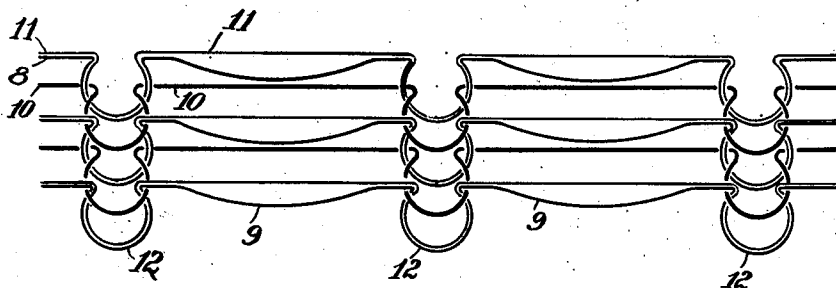


Fig. 3

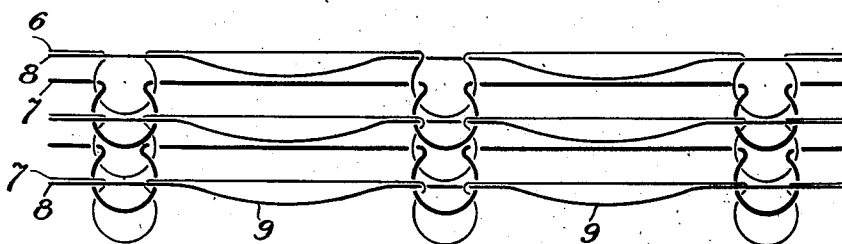


Fig. 2

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2,313,344

SMOKING DEVICE

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Application May 23, 1941, Serial No. 394,895

4 Claims. (Cl. 131-208)

The present application is a continuation in part of my prior application Serial No. 330,504 filed April 19, 1940.

My present invention relates to smokers' pipes, and more particularly to devices for eliminating tarry substances and condensates from the smoke stream of a pipe.

There have been made a great number of proposals to eliminate the condensate from the smoke stream by the use of filtering devices in the stem of the pipe or elsewhere not in contact with the burning tobacco. However, the condensates in the smoke stream rapidly accumulate in these filtering devices; in addition to that, there is an accumulation of the moisture from the smoker's breath and saliva. Thus, these known filtering devices act as a meeting place for these liquids and after a relatively short period of smoking become befouled and give rise to objectionable odor and taste; they serve a useful purpose only for a very limited smoking period and thereafter defeat the purpose for which they were invented.

Therefore, it is the principal object of my present invention to provide an absorbing device which not merely catches the tarry substances or condensates, but to a high degree disposes of them by exposing them to the temperature of the burning tobacco; this causes destructive distillation or otherwise burns off the said condensate, leaving behind a slowly accumulated carbon residue which does not interfere with the functioning of the device but, on the contrary, aids it.

Another object of my invention is to provide an absorbing device adapted to lie in the bowl of a pipe in contact with the tobacco therein, to absorb the condensate formed during smoking, and to expose it to the temperature of the burning tobacco.

Still another object of my present invention is to make such an absorbing device durable by reducing its tendency to burn out when exposed to localized excessive temperature due, for instance, to the flame of a match.

A further object of my invention is to distribute localized excessive temperature over a greater surface of the absorbing device, thereby preventing burning-out of the absorbing device at these localized high temperature points.

Still a further object of my present invention consists in conveying the heat from the combustion zone to the zones where no combustion takes place thereby causing additional evaporation of tarry liquids in these zones.

Another object of my invention is to afford some protection to the pipe bowl from the heat of the burning tobacco. This object is of particular significance at the time of this application when the importation of the hard briar woods usually employed in smokers' pipes is substantially cut off and when more extensive use of domestic woods may be necessitated. By interposing a protective layer between the burning tobacco and the pipe bowl, destructive distillation of the wood of the pipe bowl is reduced, thereby making a wider choice of woods possible for this purpose.

In order to attain these objects and others to be described, this invention provides a device for trapping condensable vapors in the bowl of a smoker's pipe and exposing at least a substantial part of the condensate to the temperature of burning tobacco in the combustion region. The device comprises an absorbent pervious aggregate, e. g., a layer consisting of fine heat resistant filaments of relatively low heat conductivity and of heat resistant filaments of relatively high heat conductivity, which aggregate is adapted to lie in contact with the burning tobacco in the bowl of a pipe. In a preferred embodiment, the said aggregate is made in the form of a sack, adapted to lie in the bowl of a pipe and to hold the tobacco while it is smoked.

The expression "heat resistant" as used throughout this specification and the claims, means having the ability to withstand the temperature encountered in the bowl of the pipe due to the burning tobacco therein, without undergoing any substantial physical or chemical change.

I have found that by incorporating heat resistant filaments of relatively high heat conductivity into an absorbent aggregate of fine heat resistant filaments of relatively low heat conductivity, I am able to reduce the tendency of these heat resistant filaments of relatively low heat conductivity to burn out when exposed to localized excessive temperature due, for instance, to the flame of a match.

The reason therefore is that the heat resistant filaments of relatively high heat conductivity incorporated in the absorbent aggregate distribute the heat over a greater surface, thereby reducing the temperature. Thus, the heat resistant filaments of a relatively low heat conductivity are protected from being melted or otherwise damaged by the heat of the flame.

The heat resistant filaments may be chosen of a group of materials which all are heat re-

sistant and of a relatively low heat conductivity. Glass filaments, for instance, are especially well adapted for the purpose of this invention: glass is heat resistant in the sense herein defined and can be readily drawn into extremely fine filaments. It is of particular advantage for the specific embodiments herein shown that yarns made of such filaments can be woven or knitted into fabrics which are pervious and absorbent. As an example of a specific embodiment, yarns which are very satisfactory for the present purposes may be made by twisting together approximately 100 glass filaments, each of which has a diameter of the order of magnitude of a few ten-thousandths of an inch; a number, e. g. six, of the resulting yarns may be plied or twisted together to form the final yarn of which the desired fabric may be made. In the making of these yarns a low twist is preferred because it is conducive to a higher degree of absorptivity.

These glass, or other heat resistance filaments of relatively low heat conductivity, or the yarns made thereof, form the main part of the absorbent aggregates, layers or fabrics. Incorporated therein are the heat resistant filaments of relatively high heat conductivity. I propose to use mainly fine metallic wires as such filaments. The metal these wires are made of should preferably have a melting point well above the temperature obtained in the pipe bowl due to the burning tobacco therein. Suitable materials are, e. g., chromium nickel, iron nickel alloys, or other metals having a substantially high melting point and high resistance to oxidation at elevated temperatures. It is not necessary for the melting point to be unusually high, however, as the temperature of the flame of a match seldom exceeds 1000° F.

These metallic wires of relatively high heat conductivity should preferably have a diameter of about .002 to .005 inch and be properly distributed through the absorbent filaments of relatively low heat conductivity.

It should be noted that I call the aggregate, layer, or fabric made of filaments of relatively low heat conductivity, e. g. glass filaments, "absorbent," although the glass filaments per se are hardly classifiable as such. Materials which are ordinarily classed as absorbent owe this property mainly to their physical structure and not to the nature of the material per se. For example, consider a sheet of cellulose acetate. Such a sheet would not be classed as absorbent and its actual absorptivity is very low. Nevertheless, when this material is drawn into exceedingly fine filaments, and when these filaments are spun into yarns, and these yarns subsequently woven or knitted into a fabric, the resulting fabric is definitely classifiable as "absorbent." Precisely the same remarks apply, for example, to glass. In either case the material in the form of a fabric has a vastly greater capacity for absorbing liquids than in the form of a sheet. The reason for this is a well-known one, associated with the words "capillary action." In general, any aggregate of material in highly divided form, that is, having a large surface per unit of mass, would be classed as absorbent toward any liquid which wets it.

The aggregates, layers and fabrics, especially the glass fabric, herein proposed, have the above defined characteristic property of capillarity. By virtue of this property the tarry liquids which otherwise would tend to accumulate more at the bottom of the bowl and through the stem are to a

considerable extent distributed over the surface of the sack and thus are exposed to the combustion temperatures of the tobacco on subsequent smoking, and destroyed by the heat of the burning tobacco.

This way of eliminating the undesirable tarry liquids is efficiently supplemented by the heat transfer due to the metallic wires incorporated in the absorbent aggregate: these metallic wires convey heat from the combustion zone to the zones where little or no combustion takes place, e. g., in the direction of the lower part and the bottom of the bowl, and thereby raise the temperature in this part of the bowl; this increase of temperature lowers the viscosity of the tarry substances in said part of the bowl and thereby promotes their transference by capillary action to the hotter region where they may be destroyed.

Thus, by the present invention accumulation of undesirable liquids is substantially avoided by virtue of the facts that these liquids, firstly, are trapped to a large extent in the combustion zone, secondly, the heat of the combustion zone is spread over the lower part and bottom of the bowl, thereby causing additional transfer of the liquids to the hotter zones, and, thirdly, because in these high temperature zones the liquids are destroyed by the heat they are exposed to, and leave behind a slowly accumulating carbon residue, which helps rather than hinders the operation of the device. Excessive carbon deposits can be removed in the same way as they are removed from ordinary pipes.

The incorporated wires, furthermore, mechanically strengthen the structure of the aggregate, e. g. fabric of which the absorbent device is made. By increasing the mechanical strength of the absorbent device, it retains its shape more easily; furthermore, the wires, when incorporated in an appropriate manner in a knitted fabric, hinder the fabric bowl from unravelling. This function of the wire is particularly useful in the course of production of the fabric bowls.

In the accompanying diagrammatic drawing I show a preferred embodiment of my invention from which the same will be more clearly understood. In this drawing:

Fig. 1 is a cross-section of a pipe equipped with a specific embodiment of the new absorbing device; and

Figs. 2 and 3 are enlarged fragmentary views of two modifications of the knitted fabric of which the new absorbing device, shown in Fig. 1, is made.

Referring to the drawing: 2 is the bowl of a pipe which may be of any convenient or usual structure; 1 is the bowl, basket or sack-like element adapted to lie within the pipe bowl 2 and to receive and hold the tobacco. This bowl or sack-like element 1 may be woven or knitted, preferably knitted, of glass yarn described above; in the knitted fabric of this sack-like element 1 metallic wires are incorporated in the way described below in detail.

For convenience in manufacturing the knitting is tubular; that is, the fabric itself is knitted in the form of a continuous tube; when using sizes of glass yarn mentioned above, the knitting is preferably double ply and rib stitch. This tube is closed at intervals by pinching it together by means of a wire or staple or other convenient means, the length of the intervals being selected so as to produce sack-like elements of appropriate length. After the pinching together of the tubes at these intervals, they are cut apart and the sack-like elements are finally completed by

finishing off the open end. A tuft is left as indicated at 3. This tuft may be turned inside the sack, as shown in Fig. 1, or outside the sack.

It is preferable, but not absolutely essential, for the purpose of this invention that the bottom of the sack-like element be completely closed. A small opening may be left at the bottom. While this is not as effective as complete closure in trapping condensate and in preventing solid particles from entering the stem of the pipe, I have found experimentally that it still gives very good results.

In order to finish off the open end of the sack-like element, a rim 4 may be attached; in some cases it is preferable to design the rim in such a manner that it will frictionally engage the bowl of the pipe, internally or externally.

Two different modifications of the way of incorporating the metallic wires into the knitted fabric are shown in Figs. 2 and 3. The fabric itself is knitted of yarns 6 of glass filaments. The knitting is double-ply, i. e., the fabric consists of two knitted plies 7. As shown in Fig. 2, the metallic wires 8 lie between the two plies 7 and form small loops 9.

In the embodiment shown in Fig. 3, the knitting of the glass yarn is identical with the one shown in Fig. 2. The only difference is that the metallic wires lie not only between the two plies 10 and 11 of the knitting, but the wire loops 12 form part of the outer ply 11.

As shown in Figs. 2 and 3, the metallic wires are substantially evenly distributed in the fabric; the distance and arrangement of the metallic wires is preferably chosen in such a manner that they are spaced from the inner surface, and that from each point of this inner surface at least one of these metallic wires is not farther than one-sixteenth of an inch.

In order to increase the capillary action of the absorbent material, e. g., sack-like elements described, it is advantageous to have a light deposit of carbon particles thereon. This end may be achieved, and simultaneously another end achieved by baking the completed sacks at a temperature of approximately 400 to 650 degrees Fahrenheit for, say, approximately 30 minutes. It will be understood that all yarns, including the glass yarns herein described, are generally treated with sizing material comprising oils, waxes, starch, etc., to secure better properties for the various manufacturing operation. These sizing materials in the finished absorbent sack-like elements are objectionable because they give a noticeable taste during the first smokes. By the above baking operation, however, the oils, etc. are broken down, and in being broken down they leave the desired carbon residue. In this way the objectionable initial taste is eliminated, and an improved capillary action is obtained.

A smokers' pipe equipped with one of these baked absorbent bowls smokes satisfactorily, without appreciable extraneous odors or tastes, from the very beginning.

It is, furthermore, possible to provide the glass yarn and the incorporated metallic wires with an additional heat resistant absorbent coating, e. g., by applying to these yarns and wires a carbonizable substance and exposing them, with the carbonizable substance applied thereto, to a temperature sufficient to carbonize this substance, thereby forming an absorbent carbon residue adhering to said yarns and wires. As carbonizable substance I may use the most different organic substances, e. g., mineral and vegetable oils, waxes, sugar, or the like.

The specific embodiments shown are merely illustrative.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A sack-like device adapted to lie in the bowl of a smoker's pipe and to contain the tobacco while it is smoked, said sack-like device comprising a heat resistant absorbent layer lying during use of said device at least partly in the combustion zone of said pipe, said layer consisting of fine glass filaments and fine metallic wires.

2. A device for smokers' pipes comprising a pervious absorbent sack-like element adapted to contain the tobacco while it is smoked, thus lying during use at least partly in contact with the burning tobacco in the bowl of the pipe, the fabric of said sack-like element consisting of fine glass filaments and fine metallic wires, the latter being arranged in said fabric in such a manner that from each point of the inner surface of said sack-like element at least one of said fine metallic wires is at a distance of not more than one-eighth of an inch.

3. A device for smokers' pipes comprising a pervious absorbent fabric sack-like element adapted to lie in contact with the burning tobacco in the bowl of a pipe and to contain the tobacco while it is smoked, the fabric of said sack-like element being knitted of fine metallic wires and yarns of fine glass filaments.

4. A device for smokers' pipes comprising a knitted double-ply fabric sack-like element adapted to lie in contact with the burning tobacco in the bowl of a pipe and to contain the tobacco while it is smoked, the fabric of said sack-like element consisting of yarns of fine glass filaments and fine metallic wires arranged substantially between the two plies of said fabric in such a manner that from each point of the inner surface of said sack-like element at least one of said metallic wires is at a distance of not more than one-eighth of an inch.

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