TAR REMOVING CIGARETTE HOLDER AND DISPOSABLE FILTER CARTRIDGE THEREFOR
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ABSTRACT OF THE DISCLOSURE

A holder for cigarettes, cigars and the like, wherein tars are removed by dividing a high-velocity smoke stream into two circumferentially moving streams which lose most of their velocity upon entering enlarged condensation pockets in which most of the tars carried by the initial high-velocity steam are deposited. The deposit takes place within a disposable cylindrical cartridge having in its side wall a restricted aperture through which the high-velocity smoke stream is injected into the cartridge. A fouled cartridge can be quickly replaced by a fresh cartridge.

BACKGROUND OF THE INVENTION

Tar-collecting cigarette holders wherein tar is removed from a smoke stream by impingement of a small jet of the smoke against a radial surface in axial opposition thereto, are known in the art. Such a holder is disclosed in Lebert Patent No. 2,954,772.

SUMMARY OF INVENTION

The present invention is characterized by a construction wherein smoke is drawn from a cigarette butt-holding socket through a restricted radial aperture in one end of the lateral wall of a cylindrical tar-trapping cartridge, at high velocity because of the small size of the aperture, and is divided into two streams spreading circumferentially in opposite directions, by a circumferential channel in a core in said one end of the cartridge, the two streams passing from the dividing channel into respective expansion pockets at the respective ends of the channel, into which they expand with a major loss of velocity and pressure and a corresponding condensation of tar within the cartridge. When the user decides that a fresh cartridge is required, he removes the fouled cartridge, disposes of it, and replaces it by a fresh cartridge.

An object of the invention is to provide a cigarette holder of relatively simple and inexpensive construction having a disposable cartridge in which tar is collected, whereby the necessity for cleaning is substantially eliminated.

Another object is to provide a cigarette holder embodying a smoke-filtering device of highly efficient tar-removal operation.

A further object is to provide a smoke-filtering cartridge of highly efficient tar-removal operation and which is easily inserted into and removable from a cigarette holder for disposal and replacement by a fresh cartridge.

These and other objects will become apparent in the ensuing specifications and appended drawings, wherein:

FIG. 1 is a plan view of a holder embodying the invention, the holder body being shown partially in section;

FIG. 2 is an axial sectional view of the same, taken as indicated by line 2—2 of FIG. 1;

FIG. 3 is a fragmentary axial plan sectional view of the filter cartridge thereof, the deflector core being shown in an axial section;

FIG. 4 is a cross-sectional view of the cartridge and holder, taken on line 4—4 of FIG. 1;

FIG. 5 is a cross-sectional view of the cartridge, taken on line 5—5 of FIG. 3; and

FIG. 6 is an axial section view of the cartridge taken on line 6—6 in FIG. 5.

DESCRIPTION

Referring now to the drawings in detail, and in particular to FIGS. 1 and 2, we have shown therein, as an example of one form in which the invention may be embodied, a cigarette holder comprising, in general, a holder sleeve A, a mouthpiece or stem B, and a tar trap in the form of a disposable cartridge C mounted on the mouthpiece B and extending into the sleeve A. Sleeve A provides at one end a socket 10 to receive the butt end of a cigarette D. A small annular internal ridge 11 provides a cigarette-abutment shoulder as the bottom of socket 10.

Stem B comprises a mouthpiece 20 which may be conventional, and a tubular cylindrical shoulder 21 which is snugly fitted in the cylindrical bore of sleeve A so as to connect the members A and B within a frictional coupling which can be overcome by a smoker in rotationally pulling the two members apart for periodic cartridge replacement. A reduced cylindrical nipple 22 projects the end of shoulder 21, cartridge C is snugly fitted and thereby mounted on nipple 22 in coaxial relation to sleeve A. The rear end of the bore of nipple 22 is extended into a conventional draft conduit 23 of stem B. A tar-retaining tubular tip 24 on the end of nipple 22, projects into cartridge C. The radial depth of passage 27 is not critical.

Between the cartridge C and the holder sleeve A there is defined an annular passage 27 having a radial depth which may be as little as 3/8 inch or as much as 3/4 inch or more, through which smoke travels a short distance from socket 10 to an orifice through which it enters cartridge C. The radial depth of passage 27 is not critical.

Cartridge C comprises a thin-walled cylindrical tube 30 of soft, tough, elastic, stretchable, inexpensive material such as polyethylene tubing of wall thickness which can be as low as .007 inch, having an internal diameter substantially the same (or preferably slightly smaller than) the external diameter of shoulder 21, wherein the cartridge is firmly supported in coaxial relation to holder sleeve A by forcing its one end over the shoulder 21 and leaving it attached thereto by frictional gripping engagement therewith. In the preferred form of the cartridge, the shoulder 21 has a diameter of .030 inch and the internal diameter of tube 30 is as much as .004 inch, and the enclosing end of tube 30 is stretched around shoulder 21 so as to grip it by hoop tension.

In the free end of tube 30 is a core plug which has a body 31 snugly fitted and frictionally retained within this end of the tube and a head 32 abutting the end of tube 30.

In the lateral wall of core body 31 is a channel 33 which extends circumferentially through an arc of roughly 1/4 inch (where body 31 has a diameter of 1/4 inch) or between 1/4 and 1/3 of a circumference. The bottom of channel 33 is in the form of a circular arc concentric with tube 30 and roughly 5/8 inch in radial depth below tube 30. Adjacent head 32, core body 31 has a solid cylindrical upstream portion (best shown in FIG. 3 at 31) the periphery of which has a friction fit within the upstream end of sleeve 30. It has a downstream portion in the form of a solid semi-cylinder having a frusto-conic surface extending radially from its center, the periphery of the ling (except where interrupted by channel 33) and of the semicylinder, having a friction fit within sleeve 30. The center of annular channel 33 is adapted to be positioned radially opposite the internal end of a radial smoke orifice 34 in the wall of tube 30, as shown especially in FIG. 4. A pair of smoke divider passages are defined between the channel 33 and...
tube 30, extending equal length in opposite directions from the radial orifice 34 on opposite sides of the radial lug of core body 31 are defined expansion pockets 35 which provide parallel passages for the smoke to be drawn into a collecting chamber 36. Column 3, line 15

The upstream portion of core body 31, between pockets 35 and head 32, is of limited width, though its width can be in a fairly broad range, e.g., between ½ inch and ¾ inch or somewhat wider. The ends of the divider passages discharge into the expansion pockets 35 in which tar is condensed out of the divided smoke streams, and deposited within the cartridge in the collecting chamber 36 which includes the annular trap 25. The upstream portion of core body 31, between pockets 35 and head 32, is of full circular cross-section and fitted tightly in tube 30 so as to function as a stopper, closing the free end of the tube. The pockets 35 are open at the inner end of core body 31, so that smoke and tar may flow freely from the pockets into collecting chamber 36.

OPERATION

When used in smoking, the holder provides for the application of suction from stem 20 through collection cartridge C and annular passage 27 to the orifice 34 in the front end of cartridge C, causing a stream of smoke to flow from the rear end of cigarette D through orifice 34. In passing through orifice 34, which is constricted as compared to the area at the rear end of socket 10, the smoke is compressed and accelerated to high velocity. As it leaves the orifice 34, it is divided by divider channel 33 and flows through the two ends thereof, still at high velocity (because of the shallow depth and narrow width of channel 33) and upon entering the pockets 35, which have an area many times larger than the cross-sectional flow area of orifice 34 and channel 33, the smoke stream loses most of their velocity and compression, expanding into pockets 35 with a cooling effect and a corresponding condensation of tar from the smoke. From the pockets 35 the smoke streams are deflected axially into the collecting chamber 36, with a further drop in velocity (at least partially due to the change in the direction of flow) and the condensed tar is collected in chamber 36.

The travel of the smoke from socket 10 to collecting chamber 36 is energized by the suction applied to stem passage 23 by the smoker in drawing on the cigarette. This creates a partial vacuum inside cartridge C while substantially ambient pressure is maintained in socket 10 and annular passage 27 around the exterior of the cartridge, due to the restriction in orifice 34. Thus the hot smoke surrounding the cartridge will remain hot (and the tar therein will remain in substantially vaporized suspension) unless the smoke has passed through orifice 34, which will be condensed out of the smoke only after the velocity and pressure of the divided streams have been reduced as the streams approach and enter the pockets 35. Since subatmospheric pressure exists in pockets 35 when the smoke is being drawn into stem B, there will be a substantial pressure drop which will cool the smoke and condense the tar into pockets 35. Any tar which is condensed in channel 33 will be swept into pockets 35 by the rapidly flowing streams in channel 33. We find that a very highly efficient removal of tar in pockets 35 and collection inside cartridge C is thereby attained.

When a smoker is through using the holder, he may separate the stem B from holder sleeve A. The cartridge C will remain attached to stem B as the latter is detached from unit A, and the smoker then may detach the cartridge C from stem B by withdrawing tube 30 from nipple 22. A new cartridge may then be inserted on nipple 22, and the parts may then be reassembled for future use of the holder.

An important aspect of operation is the bending of the smoke stream substantially at right angles, several times during its travel from socket 10 to collecting chamber 36. In the rear end of the cigarette D the stream is bent at right angles along the flat face of head 32. It is again bent at right angles in entering annular passage 27.

More important, the high-speed jet passing through orifice 34 is divided and bent substantially at right angles into spreading circumferential paths in divider channel 33, and as the divided streams meet the shouldered bottoms of pockets 35, they are again bent at right angles as they are deflected into collecting chamber 36. It has been found through experiments that if the smoke is not bent at right angles at least twice in its high-speed approach to a collecting chamber, 60% or more of the tar-removal efficiency of the device is lost.

We claim:

1. A cigarette holder comprising:

   a. stem having a coupling nipple at its upstream end, and having an axial draft passage extending through said nipple and through said stem; a holder sleeve detachably coupled to said upstream end and projecting therefrom beyond said nipple; a disposable filter cartridge comprising a tube having an open downstream end receiving and coupled to said tube and closed by said nipple in communication with said draft passage so as to define an expansion and tar trap chamber within said cartridge in which suction can be applied from said draft passage, said cartridge projecting downstream into said sleeve; a core plug having an upstream portion closing the upstream end of said tube and a downstream portion in the form of a semicylinder having a lug projecting radially from its center to the inner wall of said tube, said core plug being secured within said tube, the downstream end of said core plug being axially opposed to and spaced from the upstream end of said stem within said tar trap chamber; said cartridge tube having a radial orifice through which smoke can be drawn into said cartridge from said sleeve, and said lug having an aruncate channel extending thereacross, the central portion of which is adapted to be positioned radially inwardly of the internal end of said radial smoke orifice; the sides of said lug being spaced from the said inner wall of the tube so as to define pockets in said downstream portion of the core plug, said pockets communicating with the outer ends of said aruncate channel and providing parallel passages extending downstream therefrom to said expansion chamber, for smoke to be drawn into said expansion chamber while expanding and losing velocity with a resultant condensation of tar which is collected in said expansion chamber.

2. A holder as defined in claim 1, wherein said coupling means comprises a cylindrical peripheral wall of said nipple, having a snug frictional holding fit in the bore of said tube, said shank being mounted in said nipple.

3. A holder as defined in claim 2, including a tubular tip of smaller diameter than said nipple, projecting from the forward end thereof into said trap chamber and defining therein an annular well in which collected tar will be trapped when said holder is placed in a vertical position with said stem below said holder body.

4. A disposable trap filter cartridge for use in a cigarette holder having a tubular stem with an upstream end provided with a coupling nipple, and a holder sleeve detachably coupled to said upstream end and projecting therefrom beyond said nipple, said stem having a longitudinal draft passage extending through said nipple; said filter cartridge comprising a tube having a downstream end provided with means for detachably coupling it to said nipple in communication with said draft passage so as to define an expansion and tar trap chamber within said cartridge in which suction can be applied from said draft passage, said cartridge projecting downstream into said sleeve when so installed; a core plug having an upstream portion closing the upstream end of said tube and a downstream portion in the form of a solid semicylinder having a lug pro-
jecting radially from its center to the inner wall of said tube, said core plug having a friction fit within said tube;
the downstream end of said tube projecting axially beyond the downstream end of said core plug for coupling to said nipple;
said cartridge tube having a radial orifice through which smoke can be drawn into said cartridge from said sleeve, and said lug having an arcuate channel extending thereacross, the central portion of which is adapted to be positioned radially inwardly of the internal end of said radial smoke orifice;
the sides of said lug being spaced from the said inner wall of the tube so as to define pockets in said downstream portion of the core plug, said pockets communicating with the outer ends of said arcuate channel and providing parallel passages extending downstream therefrom to said expansion chamber, for smoke to be drawn into said expansion chamber while expanding and losing velocity with a resultant condensation of tar which is collected in said expansion chamber.

5. A disposable cartridge as defined in claim 4, wherein said pockets are of greater cross-sectional area than said arcuate channel, whereby said smoke streams will lose velocity in said pockets and tar will be condensed out of said streams and deposited in said pockets.

6. A disposable cartridge as defined in claim 4, wherein said plug has at its upstream end a head in the form of a radial flange abutting the end of said tube to position the plug in the tube.

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