

MODULAR SMOKING ARTICLE AND METHOD OF USE

FIELD OF THE INVENTION

The present invention relates to smoking of cigarettes and
5 flavoring, filtering, and taste articles for use with cigarettes as
well as to methods of testing new cigarettes and articles for
facilitating the testing of new cigarettes.

BACKGROUND OF THE INVENTION

10 In the description that follows, reference is made to certain
structures and methods. However, such references should not
necessarily be construed as an admission that these structures and
methods qualify as prior art under the applicable statutory
provisions. Applicants reserve the right to demonstrate that any of
15 the referenced subject matter does not constitute prior art.

Various smoking articles, cigarette holders and cigarette holders
with filtering arrangements are disclosed in US 4 250 901;
US 4 201 232; US 4 171 000; US 4 157 721; US 4 071 036; and,
US 3 771 534. In addition, US 2003/0154993 discloses a cigarette
20 filter with beaded carbon. The beaded carbon may be combined with
inactivated (or less activated) beaded material, or with beaded
material flavor carriers, or with other suitable filler material such
as glass beads.

25 SUMMARY OF THE INVENTION

In the preferred embodiments disclosed herein, a modular article
for smoking a cigarette with a predetermined volume of a particular
medium such as flavoring, filtering, or taste materials, comprises an
outer sleeve member having a first end and a second end. The first
30 end of the outer sleeve member is arranged to receive an end of a
cigarette and the outer sleeve member defines a passageway through the
outer sleeve member. A plurality of inner sleeve members are each
receivable within the passageway of the outer sleeve. Each of the
inner sleeve members defines a passageway through the inner sleeve
35 member with a compartment provided within the passageway of the inner
sleeve member having a predetermined volume. The predetermined volume
of the compartment is different for different inner sleeve members of

the plurality of inner sleeve members. In this way, a different volume of a particular medium may be used when smoking a different cigarette.

In other preferred embodiments, the modular article further comprises a mouthpiece with the second end of the outer sleeve being arranged to receive the mouthpiece. The second end of the outer sleeve may also provide the mouthpiece for the article. In another preferred embodiment, the modular article comprises an end member arranged to be received by the second end of the outer sleeve member with the end member being arranged to receive a cigarette filter.

In a preferred embodiment, each of the plurality of inner sleeve members defines a first end and a second end with the compartment provided between the first end and the second end of the inner sleeve member. The inner sleeve members each are snugly received within the passageway of the outer sleeve so that substantially all fluid passing from the first end of the outer sleeve to the second end of the outer sleeve passes through the compartment of the inner sleeve. The modular article further comprises a first sieve member arranged to be received adjacent the first end of the inner sleeve member with an arrangement for retaining the first sieve adjacent the first end of the inner sleeve member. A second sieve member is arranged to be received adjacent the second end of the inner sleeve member with an arrangement provided for retaining the second sieve member adjacent the second end of the inner sleeve member.

In a preferred embodiment, each of the plurality of inner sleeve members has a different predetermined length and a common predetermined inner diameter. Also, each of the plurality of inner sleeve members may provide a resistance to draw for a smoker which is generally imperceptible to the smoker when smoking a cigarette. Preferably, the volume of the compartments of the plurality of inner sleeve members ranges from about 0.025cm³ to about 0.3cm³ and the plurality of inner sleeve members are filled with a predetermined particular medium.

In another preferred embodiment, a modular article for smoking a cigarette with a predetermined volume of a particular medium such as flavoring, filtering, or taste materials, comprises an outer sleeve member having a first end and a second end. The first end of said

outer sleeve member is arranged to receive an end of a cigarette and the outer sleeve member defines a passageway through the outer sleeve member. An inner sleeve member is receivable within the passageway of the outer sleeve. The inner sleeve member defines a passageway
5 through the inner sleeve member with a compartment provided within the passageway of the inner sleeve member having a predetermined volume. The predetermined volume of the compartment is determined by the length of a portion of the inner sleeve member. In this way, a predetermined volume of a particular medium may be used when smoking a
10 cigarette.

In other preferred embodiments, the modular article comprises a mouthpiece with the second end of the outer sleeve being arranged to receive the mouthpiece. The second end of the outer sleeve may also provide a mouthpiece for the article. The inner sleeve member defines
15 a first end and a second end with the compartment provided between the first end and the second end of the inner sleeve member. The inner sleeve member is snugly received within the passageway of the outer sleeve so that substantially all fluid passing from the first end of the outer sleeve to the second end of the outer sleeve passes through
20 the compartment of the inner sleeve. The modular article further comprises a first sieve member arranged to be received adjacent the first end of the inner sleeve member with an arrangement provided for retaining the first sieve adjacent the first end of the inner sleeve member. A second sieve member is arranged to be received adjacent the
25 second end of the inner sleeve member and an arrangement is provided for retaining the second sieve member adjacent the second end of the inner sleeve member.

The modular article further comprises a mouthpiece with the second end of the outer sleeve being arranged to receive the
30 mouthpiece. An end member may be arranged to be received by the second end of the outer sleeve member with the end member being arranged to receive a cigarette filter. The second end of the outer sleeve may provide a mouthpiece for the article and the second end of the outer sleeve may be arranged to receive a cigarette filter. The
35 inner sleeve member provides a resistance to draw for a smoker which is generally imperceptible to the smoker when smoking a cigarette. The predetermined volume of the compartment of the inner sleeve member

is preferably between about 0.025cm^3 to about 0.3cm^3 and filled with a predetermined particular medium.

In a preferred method disclosed herein, a cigarette may be tested with different predetermined volumes of a particular medium such as
5 flavoring, filtering, or taste materials. In the preferred method, a first inner sleeve member is selected from a plurality of inner sleeve members and the selected inner sleeve member has a passageway with a compartment having a first predetermined volume. The compartment of the first inner sleeve member is filled with a predetermined medium
10 and the compartment is closed with a sieve member to retain the medium within the compartment. The first inner sleeve member is inserted within an outer sleeve member and one end of a cigarette is inserted in a first end of the outer sleeve member. The cigarette is then smoked. The first inner sleeve member is then removed from the outer
15 sleeve member and a second inner sleeve member is selected from the plurality of inner sleeve members. The second inner sleeve member has a passageway with a compartment having a second predetermined volume, different than the first predetermined volume. The compartment of the second inner sleeve member is filled with the predetermined medium and
20 the compartment is closed with a sieve member to retain the medium within the compartment. The second inner sleeve member is inserted within the outer sleeve member and one end of a cigarette is inserted in a first end of the outer sleeve member. The cigarette is then smoked, whereby different volumes of a predetermined flavor, filter or
25 taste material for cigarettes may be tested. The steps of smoking the cigarette may be performed by an individual or by a machine.

Another preferred method for smoking a cigarette with a predetermined volume of a particular medium such as flavoring, filtering, or taste materials, comprises the steps of selecting a
30 first inner sleeve member from a plurality of inner sleeve members. The selected first inner sleeve member has a passageway with a compartment having a first predetermined volume. The compartments of the plurality of inner sleeve members provide a variety of predetermined volumes with the compartment of each of the plurality of
35 inner sleeve members being filled with a predetermined medium. The first inner sleeve member is inserted within an outer sleeve member and one end of a cigarette is inserted in a first end of the outer

sleeve member. The cigarette is then smoked and the first inner sleeve member is removed from the outer sleeve member. A second inner sleeve member is selected from the plurality of inner sleeve members with the selected second inner sleeve member having a passageway with a compartment having a second predetermined volume filled with a predetermined medium. The second inner sleeve member is inserted within the outer sleeve member and one end of a cigarette is inserted in the first end of the outer sleeve member and the cigarette is smoked.

The predetermined volume of the second selected inner sleeve member may be substantially the same as the predetermined volume of the first selected inner sleeve member and the medium provided in the compartment of the second selected inner sleeve member may be substantially the same as the medium provided in the compartment of the first selected inner sleeve member. The predetermined volume of the second selected inner sleeve member may be different than the predetermined volume of the first selected inner sleeve member and the medium provided in the compartment of the second selected inner sleeve member may be different than the medium provided in the compartment of the first selected inner sleeve member. The cigarette may be smoked by an individual.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Fig. 1 is a perspective view of a preferred embodiment of a modular smoking article.

Fig. 2 is an exploded view of the modular smoking article of Fig. 1.

Fig. 3 is a perspective view of another preferred embodiment of a modular smoking article.

Fig. 4 is an exploded view of the modular smoking article of Fig. 3.

Figs. 5a to 5e are cross-sectional side views of differently sized inner sleeve members of the modular smoking article.

Fig. 6 is a graph of analytical RTD versus amount of carbon beads in a modular smoking article.

Fig. 7 is a graph of sensory RTD versus amount of carbon beads in a modular smoking article.

Fig. 8 is a schematic illustration of a machine for smoking a cigarette using the modular smoking article.

DETAILED DESCRIPTION

5 With reference now to Fig. 1, a preferred embodiment of a modular smoking article 20 includes an outer sleeve 22. One end of a cigarette 24 is inserted into a first end 34 of the modular smoking article 20 with a second end 36 of the modular smoking article 20 providing a mouthpiece 28 for the article. An end piece 26 which
10 forms the mouthpiece 28 in the embodiment of Fig. 1 is received within a second end 32 of the outer sleeve 22 of the modular smoking article 20.

With reference now to Fig. 2, an exploded view of the modular smoking article 20 and cigarette 24 of Fig. 1 is provided. The outer
15 sleeve 22 is generally cylindrical in shape with a passageway 31 extending through the outer sleeve 22 from the first end 34 of the outer sleeve 22 to the second end 32 of the outer sleeve. A first portion 35 of the passageway at the first end 34 of the outer sleeve has a diameter corresponding to the diameter of the cigarette 24 to be
20 smoked so that an end of the cigarette may be snugly received by the first end of the outer sleeve 22.

A central portion 33 of the passageway 31 has a larger diameter than the first portion 35 with the diameter of the central portion 33 corresponding generally to the outside diameter of an assembly
25 including an inner sleeve 40 and annular retainers 52, 62 for the inner sleeve. The inside end of the first portion 35 of the passageway 31 provides a shoulder 38 which prevents the assembly including the inner sleeve 40 from passing through the first end of the outer sleeve 22.

30 The central portion 33 of the passageway 31 has a length that is sufficient to receive a variety of inner sleeve assemblies having different lengths as will be explained below. The passageway 31 may be tapered at the second end 32 of the outer sleeve so as to snugly receive the end piece 26 and to facilitate insertion of the inner
35 sleeve assembly into the passageway 31.

The inner sleeve member 40 is generally cylindrical in shape with a passageway extending axially through the inner sleeve member 40.

Both ends of the inner sleeve member are generally identical and include a shoulder 46 provided a short distance inside the end of the inner sleeve member. The end of the inner sleeve member 40 is slightly tapered outwardly to snugly and releasably receive a
5 corresponding portion of one of the retainers 52, 62.

A sieve member 50, 60 is provided adjacent the shoulder 46 at each end of the inner sleeve member 40. The sieve member 50, 60 is held by the associated retainer 52, 62 adjacent the shoulder 46 of the inner sleeve member with the sieve members 50, 60 defining a
10 compartment within the inner sleeve member between the two sieve members 50, 60. A material such as a flavoring, filtering, or taste medium 58 may be provided inside the compartment of the inner sleeve as desired.

The retainers 52, 62 for the inner sleeve member 40 may have
15 knurled ends 56 which facilitate insertion and removal of the retainers 52, 62 from the ends of the inner sleeve member 40. The retainers 52, 62 have a generally cylindrical surface which is received by a respective tapered end of the inner sleeve member 40. If desired, the retainers and the ends of the inner sleeve member may
20 be threaded so that the retainers are screwed into the ends of the inner sleeve member or provided with another engagement arrangement as readily apparent to one skilled in the art. If desired, the ends of the retainers may be tapered and the taper omitted from the ends of the inner sleeve or neither the retainers nor the ends of the inner
25 sleeve may be tapered.

The sieves 50, 60 are selected so as to have openings which are generally smaller than the minimum particle size of the medium 58 to retain the medium 58 between the sieves 50, 60 while permitting a fluid such as air or tobacco smoke to pass readily through the sieves
30 and the medium 58.

The end piece 26 has a reduced diameter portion 70 which corresponds to the second end 32 of the outer sleeve 22 and which is arranged to be snugly and releasably received by the second end 32 of the outer sleeve. The end piece 26 has a conical portion which ends
35 in a tubular portion 71 that forms the mouthpiece for the modular smoking article 20. The end piece has a passageway extending through the end piece with a diameter generally the same as the diameter of

the passageway through the inner sleeve 40. The end piece 26 and the second end of the outer sleeve member may be threaded to facilitate assembly and disassembly of the article.

The various components of the modular smoking article 20 (other than the sieves 50, 60 and the medium 58) are all preferably formed of a plastic material which is suitable for use with smoking articles and which does not absorb flavoring and taste characteristics so that the plastic material remains substantially inert throughout use. One suitable material is a polyetheretherketone (*PEEK*) polymer. The sieves 50, 60 may also be formed of plastic although the sieves 50, 60 are generally comprised of metal such as stainless steel or may be formed of wire mesh. For example, a #250 sieve having openings of 0.0635mm (0.00250 inch) is appropriate for use with a 0.35mm diameter beaded carbon medium (*i.e.*, a typical bead diameter of about 0.36mm (0.014 inches)). The various components of the modular smoking article 20 are arranged to be readily assembled and disassembled so that the various components (other than the medium 58) may be washed or otherwise cleaned between uses.

While beaded carbon is described above, other flavored or unflavored organic and inorganic materials can be used such as silica gel, molecular sieve materials, zeolites, resins, cellulosic materials, metal oxides such as alumina, titania, spinels, or the like may be used. Likewise, while beaded materials have been described, other forms of material such as fibrous material (*e.g.*, filter tow), particle bearing fibrous material (*e.g.*, carbon-on-tow) can be used. Depending upon the medium being used with the inner sleeve, it may be desirable to coat a substance, such as a flavoring material, onto the carbon beads. However, the beaded carbon may be used alone, *i.e.*, unflavored beaded carbon. Generally, the flavoring, filtering, or taste materials will be granular, beaded, or particulate materials (collectively referred to as "granular materials").

In use, typically one end of the inner sleeve 40 is provided with the first sieve 50 and the first retainer 52. The compartment of the inner sleeve member 40 is then provided with a predetermined medium 58. If desired, the amount of the predetermined medium 58 to be provided in the compartment may be determined by measuring the weight of the medium 58 or by measuring the volume of the medium 58. The

desired amount of the medium 58 may also be determined by simply filling the compartment with the medium 58 until the level of the medium reaches the shoulder 46 for the second sieve 60. When the compartment has been provided with the appropriate amount of the medium 58, the second sieve 60 is inserted into the inner member and the second retainer is provided at the second end of the inner sleeve member 40. In this way, the inner sleeve member is prepared with the predetermined amount of the medium 58 and the inner sleeve member 40 is then inserted into the second end of the outer sleeve member 22.

After the inner sleeve member 40 has been positioned in the passageway of the outer sleeve member 22, the end piece 26 is provided at the second end of the outer sleeve 22 to retain the inner sleeve member in place and to provide a mouthpiece 28 for the article. If a cigarette has not been already provided for the article, one end of a cigarette 24 is inserted into the first end of the outer sleeve member 22 and the cigarette may then be smoked either by a person or by a machine. If desired, measurements or observations regarding the characteristics of tobacco smoke passing through the particular medium 58 may be recorded.

With reference to Fig. 8, a suitable, conventional smoking machine 120 is provided with one or more modular smoking articles 20 with the mouthpiece 26 of the article 20 being received within a port 122 of the machine 120. A cigarette 24 is received by the modular smoking article 20 and then the cigarette may be smoked and the desired parameters measured and recorded by the machine 120 as conventionally known in the art. Especially when the modular smoking article is being used with a conventional smoking machine 120, the end piece 26 may be omitted and the second end of the outer sleeve may provide the mouthpiece for the modular smoking article 20.

Typically, the cigarette 24 used with the modular smoking article will not have a filter provided as part of the cigarette 24. However, if the cigarette 24 does have a filter (not shown) the end of the cigarette 24 with the filter would be inserted into the first end of the outer sleeve 22 and the other end of the cigarette would be lit to smoke the cigarette.

With reference now to Fig. 3, another preferred embodiment of the modular smoking article 20' has an end piece 76 which is arranged to

receive a conventional cigarette filter 72 to provide the mouthpiece for the article. The modular smoking article 20' is otherwise generally identical to the modular smoking article of the embodiment of Figs. 1 and 2 with a cigarette 24 received within a first end of an outer sleeve 22.

With reference to Fig. 4, the outer sleeve 22 and the inner sleeve assembly of the modular smoking article 20' corresponds to the outer sleeve 22 and the inner sleeve assembly of the modular smoking article 20 of Fig. 1. Likewise, the end piece 76 has a reduced diameter portion 78 which corresponds to the second end of the outer sleeve 22 and which is arranged to be snugly received by the second end 32 of the outer sleeve. The end piece 76 has a conical portion with an inner tapered surface 80. The end piece 76 has a passageway through the end piece with a diameter corresponding generally to the diameter of the passageway of the inner sleeve 40 and which is configured to receive one end of a conventional cigarette filter 72. In this way, the cigarette filter 72 provides the mouthpiece for the modular smoking article 20' and enables the cigarette 24 to be smoked with the filter 72 in addition to any filtering provided by the medium 58.

With reference now to Figs. 5a through 5e, five inner sleeve members are provided which are substantially identical to one another except that the length of the inner sleeve member varies from one embodiment to the next. Specifically, the length of the compartment 88 of the inner sleeve member varies from embodiment to embodiment whereby different volumes of the medium 58 may be used with the modular smoking article 20, 20'. The outer sleeve 22 is preferably configured to have a length sufficient to receive the longest inner sleeve member 40 intended to be used with the outer sleeve member 22.

For example, if the inside diameter of the compartment 88 of the inner sleeve 40 is 3 millimeters, the cross sectional area of the compartment is 0.07065cm^2 . If the medium 58 to be used in the inner sleeve comprises carbon beads having a density of 0.6g/cm^3 , and, if it is desired to use 15mg of the medium, then the volume of the medium would be 0.025cm^3 which corresponds to a compartment having a length of 3.54mm. Similarly, if it were desired to use 30mg of the medium, the

volume of the medium would be 0.05cm^3 and the length of the compartment would be 7.08mm.

Table 1 below provides the length in millimeters for the compartment for various amounts of carbon beads ranging from 15 milligrams to 180mg when the inside diameter of the compartment is 3mm.

TABLE 1

Weight mg	Density g/cm^3	I.D. mm	Area cm^2	Volume cm^3	Length mm
15	0.6	3	0.07065	0.025	3.54
30	0.6	3	0.07065	0.05	7.08
45	0.6	3	0.07065	0.075	10.62
60	0.6	3	0.07065	0.1	14.15
75	0.6	3	0.07065	0.125	17.69
90	0.6	3	0.07065	0.15	21.23
105	0.6	3	0.07065	0.175	24.77
120	0.6	3	0.07065	0.2	28.31
150	0.6	3	0.07065	0.25	35.39
180	0.6	3	0.07065	0.3	42.46

If the inside diameter of the inner sleeve is 4mm rather than 3mm, the cross sectional area of the compartment changes and therefore the length of the compartment corresponding to various amounts of the medium changes as well. In Table 2, the length of the compartment corresponding to weights of the medium ranging from 15mg to 180mg with a compartment having an inside diameter of 4mm is provided.

TABLE 2

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	4	0.1256	0.025	1.99
30	0.6	4	0.1256	0.05	3.98
45	0.6	4	0.1256	0.075	5.97
60	0.6	4	0.1256	0.1	7.96
75	0.6	4	0.1256	0.125	9.95
90	0.6	4	0.1256	0.15	11.94
105	0.6	4	0.1256	0.175	13.93
120	0.6	4	0.1256	0.2	15.92
150	0.6	4	0.1256	0.25	19.90
180	0.6	4	0.1256	0.3	23.89

Similarly, in Table 3, the corresponding information for an inner sleeve having an inside diameter of 5 millimeters is provided.

5

TABLE 3

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	5	0.19625	0.025	1.27
30	0.6	5	0.19625	0.05	2.55
45	0.6	5	0.19625	0.075	3.82
60	0.6	5	0.19625	0.1	5.10
75	0.6	5	0.19625	0.125	6.37
90	0.6	5	0.19625	0.15	7.64
105	0.6	5	0.19625	0.175	8.92
120	0.6	5	0.19625	0.2	10.19
150	0.6	5	0.19625	0.25	12.74
180	0.6	5	0.19625	0.3	15.29

Table 4 provides the corresponding information for an inner sleeve member having an inside diameter of 5.5mm and Table 5 provides
 10 the corresponding information for an inner sleeve having an inside diameter of 6.5 millimeters.

TABLE 4

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	5.5	0.237463	0.025	1.05
30	0.6	5.5	0.237463	0.05	2.11
45	0.6	5.5	0.237463	0.075	3.16
60	0.6	5.5	0.237463	0.1	4.21
75	0.6	5.5	0.237463	0.125	5.26
90	0.6	5.5	0.237463	0.15	6.32
105	0.6	5.5	0.237463	0.175	7.37
120	0.6	5.5	0.237463	0.2	8.42
150	0.6	5.5	0.237463	0.25	10.53
180	0.6	5.5	0.237463	0.3	12.63

TABLE 5

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	6.5	0.331663	0.025	0.75
30	0.6	6.5	0.331663	0.05	1.51
45	0.6	6.5	0.331663	0.075	2.26
60	0.6	6.5	0.331663	0.1	3.02
75	0.6	6.5	0.331663	0.125	3.77
90	0.6	6.5	0.331663	0.15	4.52
105	0.6	6.5	0.331663	0.175	5.28
120	0.6	6.5	0.331663	0.2	6.03
150	0.6	6.5	0.331663	0.25	7.54
180	0.6	6.5	0.331663	0.3	9.05

5 Table 6 provides the corresponding information for an inner sleeve member having an inside diameter of 3.2mm. Table 7 provides the corresponding information for an inner sleeve having an inside diameter of 3.8mm, and Table 8 provides the corresponding information for an inner sleeve member having an inside diameter of 4.8mm.

TABLE 6

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	3.2	0.080384	0.025	3.11
30	0.6	3.2	0.080384	0.05	6.22
45	0.6	3.2	0.080384	0.075	9.33
60	0.6	3.2	0.080384	0.1	12.44
75	0.6	3.2	0.080384	0.125	15.55
90	0.6	3.2	0.080384	0.15	18.66
105	0.6	3.2	0.080384	0.175	21.77
120	0.6	3.2	0.080384	0.2	24.88
150	0.6	3.2	0.080384	0.25	31.10
180	0.6	3.2	0.080384	0.3	37.32

TABLE 7

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	3.8	0.113354	0.025	2.21
30	0.6	3.8	0.113354	0.05	4.41
45	0.6	3.8	0.113354	0.075	6.62
60	0.6	3.8	0.113354	0.1	8.82
75	0.6	3.8	0.113354	0.125	11.03
90	0.6	3.8	0.113354	0.15	13.23
105	0.6	3.8	0.113354	0.175	15.44
120	0.6	3.8	0.113354	0.2	17.64
150	0.6	3.8	0.113354	0.25	22.05
180	0.6	3.8	0.113354	0.3	26.47

TABLE 8

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	4.8	0.180864	0.025	1.38
30	0.6	4.8	0.180864	0.05	2.76
45	0.6	4.8	0.180864	0.075	4.15
60	0.6	4.8	0.180864	0.1	5.53
75	0.6	4.8	0.180864	0.125	6.91
90	0.6	4.8	0.180864	0.15	8.29
105	0.6	4.8	0.180864	0.175	9.68
120	0.6	4.8	0.180864	0.2	11.06
150	0.6	4.8	0.180864	0.25	13.82
180	0.6	4.8	0.180864	0.3	16.59

Table 9 provides the corresponding information for an inner sleeve member having an inside diameter of 6mm and Table 10 provides
 5 the corresponding information for an inner sleeve member having an inside diameter of 5.8mm.

TABLE 9

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	6	0.2826	0.025	0.88
30	0.6	6	0.2826	0.05	1.77
45	0.6	6	0.2826	0.075	2.65
60	0.6	6	0.2826	0.1	3.54
75	0.6	6	0.2826	0.125	4.42
90	0.6	6	0.2826	0.15	5.31
105	0.6	6	0.2826	0.175	6.19
120	0.6	6	0.2826	0.2	7.08
150	0.6	6	0.2826	0.25	8.85
180	0.6	6	0.2826	0.3	10.62

TABLE 10

Weight mg	Density g/cm ³	I.D. mm	Area cm ²	Volume cm ³	Length mm
15	0.6	5.8	0.264074	0.025	0.95
30	0.6	5.8	0.264074	0.05	1.89
45	0.6	5.8	0.264074	0.075	2.84
60	0.6	5.8	0.264074	0.1	3.79
75	0.6	5.8	0.264074	0.125	4.73
90	0.6	5.8	0.264074	0.15	5.68
105	0.6	5.8	0.264074	0.175	6.63
120	0.6	5.8	0.264074	0.2	7.57
150	0.6	5.8	0.264074	0.25	9.47
180	0.6	5.8	0.264074	0.3	11.36

When testing cigarettes with new or different flavoring, filtering or taste mediums, it is desirable to be able to easily change the amount of such medium without significantly changing the "resistance to draw" (*i.e.*, "RTD") for the cigarette. RTD can be measured analytically and is conventionally expressed in mm of water. RTD can also be observed or sensed by the smoker which is denoted as a "Sensory RTD" in which the smoker assigns a numerical value such as the numbers 1-5 to indicate whether the RTD is low (*i.e.*, a value of 1), medium (*i.e.*, a value of 3) or high (*i.e.*, a value of 5). Experimental results with a modular smoking article have shown that an analytical difference of RTD of about 25mm of water is generally not perceptible by a smoker when going from a compartment with at least about 15g of beaded carbon medium to about 180g of beaded carbon medium. However, a change in RTD of even about 25mm of water is perceptible or decipherable by a smoker if the compartment goes from 0 beaded carbon medium to about 180g of beaded carbon medium. Accordingly, the amount of medium used in a compartment of a modular smoking article may be varied from about 15mg of medium to about 180mg of medium while maintaining the RTD within a general range which is not generally apparent to the smoker.

In Table 11, the Total RTD Carbon Loadings for 10 tests using 30mg, 60mg, 75mg, and an empty inner sleeve are provided along with the calculated average and standard deviation.

TABLE 11

	30mg total RTD	60mg Total RTD	75mg Total RTD	0 Total RTD
	121	123	130	117
	118	121	121	118
	116	115	120	113
	115	123	129	112
	111	117	116	118
	119	121	131	115
	116	123	121	114
	124	130	122	116
	111	127	121	115
	112	122	126	117
avg.	116.3	122.2	123.7	115.5
std. dev.	4.3218	4.1253	4.9900	2.0683

In Table 12, the Total RTD Carbon Loadings for 10 tests using 90mg, 120mg and 180mg are provided along with the calculated average and standard deviation.

TABLE 12

	30mg Total RTD	120mg Total RTD	180mg Total RTD
	133	124	138
	126	130	145
	134	133	137
	123	134	138
	124	133	138
	132	131	133
	123	134	133
	129	129	138
	132	134	135
	127	126	130
average	128.3	130.8	136.5
std. dev.	4.270050741	3.552776692	4.089281382

In Table 13, the Analytical RTD measured for various volumes of beaded carbon ranging from 0 to 180mg is provided.

TABLE 13

Analytical	RTD
0	115.5
30mg	116.3
60mg	122.2
75mg	123.7
90mg	128.3
120mg	130.8
180mg	136.5

In Table 14, the Sensory RTD for various volumes of beaded carbon ranging from 0 to 180mg is provided.

5

TABLE 14

Sensory	RTD
0	3.79
30mg	4.07
60mg	4.32
75mg	4.27
90mg	4.64
120mg	4.23
180mg	4.57

With reference to Fig. 6, the data from Table 13 has been plotted showing a generally straight-line increase in analytically measured
10 RTD when going from 0 to 180mg of beaded carbon medium. In Fig. 7, the sensory RTD data of Table 14 is plotted, showing that over a relatively wide range of amounts of beaded carbon (*i.e.*, from 30mg to 180mg) the sensory RTD ranges from about 4 to about 4.5. A sensory RTD which varies by only about 0.5 on a scale of 1-5 is not considered
15 to be readily discernible or perceptible to the typical smoker.

With reference again to Figs. 5a to 5e, a set of inner sleeves 40 may be provided each having a compartment 80 corresponding to a desired or predetermined volume. Then during testing of a particular flavoring, filtering, or testing medium 58, the various inner sleeves
20 may be filled with the corresponding different volumes of the medium to be tested. In this way, the testing of different volumes of a

particular medium is facilitated. Although in the preferred embodiments, the length of the compartments of the inner sleeve members is changed to provide the different predetermined volumes for the compartments, the diameter of the compartments may be changed while maintaining the same length for the compartment and inner sleeve member. However, changing the diameter of the compartment is expected to result in a larger change in RTD than changing the length of the compartment for a variety of predetermined compartment volumes.

Accordingly, if it were desired to test a particular flavoring medium 58, using different amounts of the medium varying from 15mg to 180mg, preferably a particular inside diameter for the inner sleeve would be determined, perhaps based upon the diameter of the cigarettes to be used with the flavoring medium. Assuming that an inside diameter of 6.5mm were selected, then 10 different inner sleeves having compartments with the lengths provided in Table 5 would be prepared by filling the compartments of each of the inner sleeves with the medium. Generally, the inner sleeves would be prepared by inserting an appropriate sieve in one end of each of the inner sleeves and then a retainer would be inserted into the end of the inner sleeve to maintain the sieve in place at one end of the respective compartment. The compartment of each inner sleeve could then be filled by hand or filled in a jig adapted to hold the inner sleeve vertically while the medium is inserted into the compartment. As discussed above, it may be preferable to either weigh or premeasure the volume of the medium to be inserted into a particular inner sleeve compartment. The medium could be tamped to compress the medium as desired or appropriate to correspond to any predetermined configuration or density. After filling, the other sieve is provided at the end of the compartment and the other retainer is inserted to keep the medium within the compartment. Each of the various inner sleeves would be prepared in this manner.

Subsequently, each of the inner sleeves would be inserted into the outer sleeve one at a time and then a cigarette would be smoked either by a person or by a machine and the pertinent measurements or observations would be recorded. When one cigarette had been smoked, the inner sleeve would be removed from the outer sleeve and another inner sleeve with the next volume of the medium inserted into the

outer sleeve. If necessary, a rod could be inserted into the first end of the outer sleeve member to push the inner sleeve member through the second end of the outer sleeve member. After the second inner sleeve member had been inserted into the outer sleeve member and
5 another cigarette inserted into the first end of the outer sleeve member, the cigarette would then be smoked and the appropriate measurements or observations would be recorded. This process would then be repeated until all of the various predetermined volumes of medium had been used in connection with a cigarette.

10 Of course, it may be preferable to provided multiple outer sleeves so that multiple cigarettes could be smoked either with the same volume of medium or with different volumes of the medium either simultaneously or relatively close in time to one another.

The modular smoking article has been described above primarily in
15 connection with the testing of different volumes of flavoring, filtering or testing mediums. However, the modular smoking article is also expected to be useful by smokers generally (*i.e.*, not in a laboratory setting or in a testing environment). For example, the modular smoking article could be sold to consumers who would be able
20 to select from among an assortment of different filtering, flavoring and taste mediums provided in pre-filled inner sleeves with various volumes of the mediums. It is expected that the pre-filled inner sleeves would be disposable either after one or several cigarettes have been smoked but that the consumer would reuse the outer sleeve
25 and mouthpiece. The inner sleeves could also be sold to the consumer either in a set with compartments of identical volumes or in a set with different predetermined volumes. In addition, the inner sleeves could be reused by the consumer by removing one or both retainers and sieves, cleaning the components as desired and then refilling the
30 inner sleeve either with the same medium or with a medium selected by the consumer.

Thus, different mediums can be selected by the smoker prior to inserting a cigarette in the smoking article. Once assembled together, the smoking article and cigarette has dimensions and
35 physical feel of a traditional lit-end cigarette. This allows the smoker to experience the same sort of handling mannerisms normally associated with smoking a traditional lit-end cigarette.

In this way, the modular smoking article facilitates the insertion of different amounts of flavors, tastes and filtering medium in the path of the cigarette smoke stream for delivery to a smoker or to a testing machine. The modular smoking article provides the
5 ability to easily and rapidly change the quantities of the particular mediums being tested or used with the cigarettes without significantly changing the RTD (resistance to draw) of the cigarette. The modular smoking article can be used with both filtered or non-filtered cigarettes and various filters can be provided as the mouthpiece, as
10 desired.

In this way, new cigarette designs can be easily tested by using standard cigarettes and then varying the filtering medium, the flavoring medium or the taste medium as well as the volume or amount of such mediums without actually manufacturing each new design of
15 cigarette. As a consumer product, the modular smoking article facilitates the selection of different flavoring, filtering and taste mediums by the smoker as well as the selection of different amount of such mediums to be used when smoking.

While the present invention has been particularly shown and
20 described with reference to exemplary embodiments thereof, the modular smoking article according to the present invention may be varied by a person skilled in the art without departing from the spirit and scope of the present invention as defined by the following claims.

CLAIMS:

1. A modular article for smoking a cigarette with a predetermined
5 volume of a particular medium such as flavoring, filtering, or taste materials, comprising:

an outer sleeve member having a first end and a second end, the first end of said outer sleeve member being arranged to receive an end of a cigarette, said outer sleeve member defining a passageway through
10 the outer sleeve member; and

a plurality of inner sleeve members, each of said inner sleeve members being receivable within said passageway of said outer sleeve, each of said inner sleeve members defining a passageway through the inner sleeve member with a compartment provided within the passageway
15 of the inner sleeve member having a predetermined volume, the predetermined volume of the compartment being different for different inner sleeve members of said plurality of inner sleeve members, wherein a different volume of a particular medium may be used when smoking a different cigarette.

2. A modular article for smoking a cigarette with a predetermined volume of a particular medium such as flavoring, filtering, or taste materials, comprising:

an outer sleeve member having a first end and a second end, the
25 first end of said outer sleeve member being arranged to receive an end of a cigarette, said outer sleeve member defining a passageway through the outer sleeve member; and

an inner sleeve member, said inner sleeve member being receivable within said passageway of said outer sleeve, said inner sleeve member
30 defining a passageway through the inner sleeve member with a compartment provided within the passageway of the inner sleeve member having a predetermined volume, the predetermined volume of the compartment being determined by the length of a portion of the inner sleeve member, wherein a predetermined volume of a particular medium
35 may be used when smoking a cigarette.

3. The modular article of claim 2 further comprising a mouthpiece, said second end of said outer sleeve being arranged to receive said mouthpiece and the smoking article having the physical feel of a traditional lit-end cigarette upon insertion of a cigarette in the
5 outer sleeve.

4. The modular article of claim 2 wherein said second end of said outer sleeve provides a mouthpiece for the article.

10 5. The modular article of claim 2 wherein said inner sleeve member defines a first end and a second end with said compartment provided between said first end and said second end of said inner sleeve member, said inner sleeve member being snugly received within the passageway of said outer sleeve so that substantially all fluid
15 passing from the first end of the outer sleeve to the second end of the outer sleeve passes through the compartment of the inner sleeve, said modular article further comprising:

a first sieve member arranged to be received adjacent the first end of said inner sleeve member;

20 means for retaining said first sieve adjacent said first end of said inner sleeve member;

a second sieve member arranged to be received adjacent the second end of said inner sleeve member; and,

means for retaining said second sieve member adjacent the second
25 end of said inner sleeve member.

6. The modular article of claim 5 further comprising a mouthpiece, said second end of said outer sleeve being arranged to receive said mouthpiece and the smoking article having the physical feel of a
30 traditional lit-end cigarette upon insertion of a cigarette in the outer sleeve.

7. The modular article of claim 5 further comprising an end member arranged to be received by said second end of said outer sleeve
35 member, said end member being arranged to receive a cigarette filter.

8. The modular article of claim 5 wherein said second end of said outer sleeve provides a mouthpiece for the article.

9. The modular article of claim 5 wherein said second end of said
5 outer sleeve is arranged to receive a cigarette filter.

10. The modular article of claim 2 wherein said inner sleeve member provides a resistance to draw for a smoker which is generally imperceptible to the smoker when smoking a cigarette.

10

11. The modular article of claim 2 wherein the predetermined volume of the compartment of said inner sleeve member is between about 0.025cm^3 to about 0.3cm^3 .

12. The modular article of claim 2 wherein said inner sleeve member
15 is filled with a predetermined particular medium.

13. A method for adjusting treatment of mainstream tobacco smoke by passing the smoke through a predetermined volume of a particular
20 medium such as flavoring, filtering, or taste materials, comprising the steps of:

selecting a first inner sleeve member from a plurality of inner sleeve members, said selected first inner sleeve member having a passageway with a compartment having a first predetermined volume, the
25 compartment of said plurality of inner sleeve members providing a variety of predetermined volumes, the compartment of each of said plurality of inner sleeve members being filled with a predetermined medium;

inserting the first inner sleeve member within an outer sleeve
30 member;

inserting one end of a cigarette in a first end of said outer sleeve member;

drawing upon the cigarette while lit;

removing the first inner sleeve member from the outer sleeve
35 member;

selecting a second inner sleeve member from said plurality of inner sleeve members, said selected second inner sleeve member having

a passageway with a compartment having a second predetermined volume filled with a predetermined medium;

inserting the second inner sleeve member within the outer sleeve member;

5 inserting one end of a cigarette in a first end of said outer sleeve member;

drawing upon the cigarette while lit.

14. A smoking kit comprising:

10 a mouthpiece having a passage therethrough for delivery of cigarette smoke to a smoker;

an outer sleeve adapted to receive a cigarette at an upstream end thereof and the mouthpiece at a downstream end thereof; and

15 a plurality of inner sleeves sized so as to be individually received within the outer sleeve, the inner sleeves having differently sized compartments through which the cigarette smoke passes, the compartments being prefilled or fillable with flavoring, filtering and/or taste mediums.

20 15. The smoking kit of claim 14, wherein the inner sleeves are prefilled with flavoring, filtering and/or taste mediums.