The present invention is related to filter tips for cigarettes and, in particular, to a filter tip for cigarettes which is adjustable and permits adjustment by the smoker of the degree to which the cigarette smoke is filtered.

It is well known that since the announcement of a number of recent studies which have indicated the possibility of the presence of carcinogenic agents in cigarette smoke, there has been a very large increase in the demand for filter tip cigarettes as opposed to straight cigarettes. From a position which a few years ago occupied only a small percentage of the total cigarette market, filter tips have moved to a position in which the demand for filter tip cigarettes equals or surpasses the demand for straight cigarettes. With the increased importance of filter tip cigarettes due to their believed aid in removing or reducing the carcinogenic agents in cigarette smoke, there has been a corresponding increasing effort made to develop a variety of different types of filters for cigarettes.

With the past few years filters have been developed which use a variety of filtering materials. These filtering materials vary from absorbent cotton wadding to papers treated with chemical agents and even filters containing small amounts of activated charcoal. Other varieties currently in use include a double filter, a filter having a tip, and a filter having a spiral shaped passage for the smoke which is termed a "spin filter". In spite of the great variety of different types of filters available today, however, there is no filter which permits a smoker to adjust the degree to which the smoke is filtered to suit his individual preference and taste.

Accordingly, it is a primary object of this invention to provide means in the tip of a cigarette for filtering the cigarette smoke which permits the smoker to control the degree of filtering obtained.

It is another object of this invention to provide an adjustable filtering means for a cigarette which is highly efficient but simple and inexpensive to produce.

It is another object of the present invention to provide an adjustable filter for a cigarette which may be readily fabricated by the mass production methods used in the cigarette manufacturing art.

It is a further object of the instant invention to provide an adjustable filter for a cigarette which may be adjusted by the smoker through rotation of the filter tip relative to the main body of the cigarette.

It is a still further object of the present invention to provide filtering means for a cigarette which can be quickly, easily and selectively adjusted by a smoker.

To achieve the foregoing objects, and in accordance with its purpose, the present invention provides means which, as embodied and broadly described, comprise on the tip of a cigarette a filter casing rotatable relative to the main body of the cigarette and an appropriate filtering element within the filter casing which is adjustable in volume responsive to rotation of the casing relative to the cigarette, and provides a variable amount of filtration of cigarette smoke at the option of the smoker.

In the present embodiment, various types of treated filtering paper arranged in collapsible fan or honeycomb type shapes form the filtering elements of the filter. Suitable means are provided for opening or closing the filtering element to the extent desired responsive to rotation of the filter casing relative to the main body of the cigarette.

Additional objects and advantages of the invention will be set forth in part in the description which follows and in part will be obvious from the description or may be learned by practice of the invention, the objects and advantages being realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements shown and described.

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one embodiment of the invention and, together with the description, serve to explain the principles of the invention.

Of the drawings:

FIG. 1 is an exploded perspective view of a preferred embodiment of the invention which shows a portion of the main body of a cigarette, the filter casing, the actuating means for adjusting the filtering elements and one of the filtering elements proper;

FIG. 2 is a perspective view of the filtering end of a cigarette showing the preferred embodiment of FIG. 1 as it appears when completely assembled;

FIG. 3 is a plan view of the preferred embodiment of FIG. 1 of the filtering end of the cigarette as it would appear to a smoke with the filtering elements adjusted almost to their full open position to provide almost complete filtering of the smoke;

FIG. 4 is a view similar to FIG. 3 but shows the filtering elements in a substantially closed or collapsed position to provide a minimum filtering of the smoke;

FIG. 4a is a detail of the honeycomb type collapsible filtering element of the embodiment of FIG. 1 showing it as it would appear in an enlarged cross section;

FIG. 5 is an assembled perspective view of another embodiment of the present invention showing a series type of filter having a number of filtering elements arranged to filter the smoke in series. Only the uppermost element is shown in detail, the other elements being shown schematically in broken line form;

FIG. 6 is a perspective view of one of the filtering elements of the embodiment of FIG. 5 showing it as it would appear with the filtering element in the closed or collapsed position;

FIG. 7 is a view similar to FIG. 6 showing one of the filtering elements in a substantially fully open or full filtering position;

FIG. 8 is a plan view of the filtering end of the cigarette as it would appear to the smoker and showing the filtering elements in a substantially closed position;

FIG. 9 is a view similar to FIG. 8 showing the filtering elements in a substantially fully open or full filtering position.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory but are not restrictive of the invention.

Reference will now be made in detail to the present preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings.

In accordance with the invention, means are provided for adjusting filtering cigarette smoke. As embodied, this means comprises a filter tip for a cigarette having a tubular casing, a collapsible filtering element and an actuating means within the casing for alternately expanding or contracting the filter element to a desired degree to obtain variable amounts of filtration of ciga-
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rette smoke. In the accompanying drawings, two different embodiments for achieving the results of the present invention are shown. The preferred embodiment is shown in FIGS. 1 through 4a and an alternative embodiment is depicted in FIGS. 5 through 9.

As embodied in the preferred embodiment and as shown in FIGS. 1 through 4a, the invention includes an adjustable filter tip means for a cigarette comprising an outer casing 10 and an inner casing 16, preferably constructed of stiff paper or cardboard sufficiently strong to maintain the integrity of its form during use.

The casing 10 is rotatably attached to the main body of the cigarette 12 to permit rotation of the casing relative to the cigarette proper. As embodied, the adjusting means for adjusting the volume of the filtering elements within the filter tip comprises two V-shaped strips 14, preferably of stiff paper construction, which are secured together by an adhesive or other appropriate means at the main fold or trough of the V's so that when assembled, the V's form an X in cross section, as can be clearly seen in FIG. 1.

In accordance with the invention, an appropriate filter means in the form of a filtering element is provided. As embodied, this filtering element comprises a columnar body 16 having a fan-shaped cross section which, in cross section, is comprised of a great multiplicity of treated filter paper strips arranged in cellular form, preferably in a form which resembles a honeycomb in cross section or which produces tubes of hexagonal cross section when extended. This form of filter is illustrated in an enlarged schematic cross section in FIG. 4a. The honeycomb cross section pattern may be easily obtained in practice by offset glue stripping of alternate sheets of filter paper which are laid one on top of the other after the glue has been applied. When the glue has set, the sheets of filter paper are separated by tensile forces pulling in opposite directions to yield a honeycomb pattern such as that depicted in FIG. 4a. The points at which the sheets of filter paper are glued together are designated 18 in FIG. 4. The columnar filtering elements are in turn fixed to each of the interior sides of the V-shaped groove in the V-shaped strips 14, as can be best seen in FIG. 4.

In accordance with the invention, means are provided for opening and closing the columnar filtering element 16 much as a fan is opened and closed. As embodied, the means by which the opening and closing of the columnar element 16 is achieved comprises an arrangement in which one pair of directly opposing edges of the assembled V-shaped strips (which as assembled form an integral X-shaped actuating device 20) are attached to the interior surface of the tubular casing 10. The remaining side of the columnar sections of the actuating device 20 is firmly secured to the rim 22 of the main body of the cigarette at its filtering end.

In operation and as can best be seen in FIGS. 3 and 4, rotation of the casing 10 relative to the main body of the cigarette 12 causes the trough angle in the V-shaped strips 14 to vary. As the angle varies from obtuse to acute, as shown in FIGS. 3 and 4, the filter elements 16 are changed from an expanded to a compressed, or from an open to a closed position, since the sides of each V of the V-shaped strips 14 act in the same manner as do the actuating struts on the side of a fan in opening and closing the actuating fan. Similarly, the positions of the filter shown in FIG. 4 and FIG. 3 illustrate how it is moved from the closed to the open position.

An alternative embodiment of the invention is illustrated in FIGS. 5 through 9. In this embodiment and in accordance with the invention, means are provided for filtering the smoke of the cigarette through a series of selective absorbent filter elements. As embodied and as shown in FIG. 5, this means comprises an outer tubular casing 24 which is similar in shape and construction to the tubular casing 10 of the first embodiment. The casing 24 is attached to the main body 26 of a cigarette in a manner that permits it to be rotated relative to the main body of the cigarette.

In accordance with the invention, adjustable filtering elements are provided in series within the tubular casing 24. As embodied, these adjustable filtering elements comprise a series of circular filter paper disks 28 which are provided with folds in a manner such that the disks may be collapsed together as described above and illustrated in FIGS. 6 and 7. FIG. 6 depicts the disk in the closed position and FIG. 7 shows the disk in the open position. It may be observed that although the disk in the open position completes a full circle, in the closed position it occupies very little space.

In accordance with the invention, a plurality of these disks may be used within the tubular casing 24. A position anchoring member 30 is firmly secured to the main body 26 of the cigarette and one edge of each of the filter disks is, in turn, attached to the member 30. The other edge of each filter disk 30 is secured to the inner surface of the tubular rotatable casing 24.

In operation, and as shown in FIGS. 8 and 9, the filter disks may be adjusted to a fully closed, to a fully open, or to any intermediate position by rotation of the casing 24 relative to the main body 26 of the cigarette. Upon rotation, the casing 24 will carry with it the edge of the filter disk 28 which is in the rotated position. A position anchoring member 30 holds the other edge of the filter disk 30 in a fixed position with respect to the main body 26 of the cigarette. The rotation of the casing 24 thus controls the degree to which the filter disk 30 is extended or contracted. Accordingly, by rotation of the casing between his finger tips, a smoker may selectively control the amount of filtering to which smoke traveling through the filter tip will be subjected.

From the foregoing description of the present invention, it will be apparent that this invention provides a practical means by which a smoker may obtain the degree of filtration desired.

The invention in its broader aspects is not limited to the specific embodiments shown and described, but also includes within the scope of the accompanying claims any departures made from such embodiments which do not sacrifice its chief advantages. What is claimed is:

1. In a cigarette having a filter attached to one end thereof, an adjustable filter comprising a casing secured to and rotatable relative to the main body of the cigarette, a collapsible and expandable filter disposed within the casing, and means secured to the main body of the cigarette and to the filtering element for compressing or expanding the filtering element responsive to rotation of the casing relative to the main body of the cigarette.

2. The invention as described in claim 1, in which the means for compressing and expanding the filtering element comprises a member having an X-shaped cross section, and in which the filtering elements are secured to the member in two opposite grooves of the X-shaped member and in which one pair of opposite edges of the X-shaped member is attached to the casing and in which the other pair of opposite edges of the X-shaped member is secured to the main body of the cigarette to permit variance of the angle between the planes comprising the X-shaped member responsive to rotation of the casing relative to the main body of the cigarette.

3. The invention as defined in claim 2, in which the means for compressing and expanding the filtering element comprises a position anchoring member attached to the main body of the cigarette and extending into the casing, one side of the filtering element being secured to the position anchoring member, another side of the filtering element being attached to the rotatable casing and extending from the casing responsive to rotation of the casing with respect to the main body of the cigarette.

4. The invention as described in claim 1, in which the
filtering element itself comprises a plurality of strips of filtering paper secured to one another in a manner such that when the strips of paper are separated by tensile force, the strips of paper form a multiplicity of longitudinal cells having a honeycomb pattern in cross-section.

5. The invention as defined in claim 1, in which the filtering element comprises at least one substantially circular sheet of filtering material folded in a manner such that it can be compressed or expanded like a fan.

6. The invention as defined in claim 5, in which the adjustable filter includes a plurality of the substantially circular type filtering elements arranged in series.

No references cited