

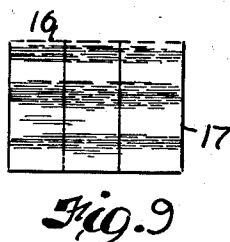
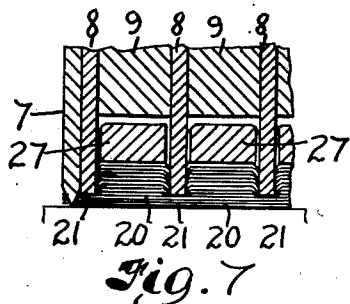
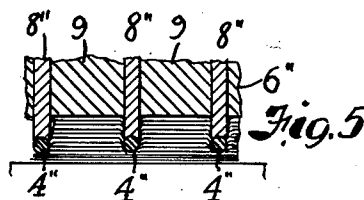
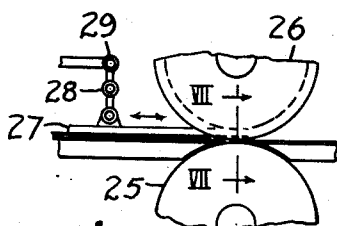
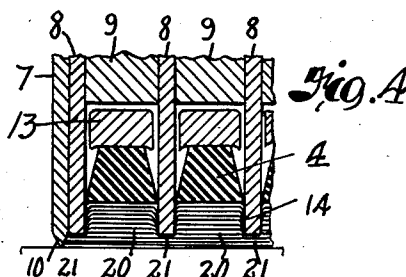
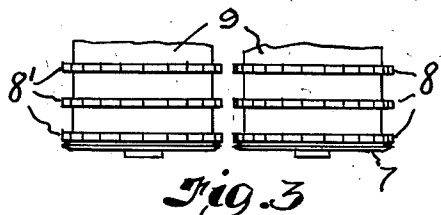
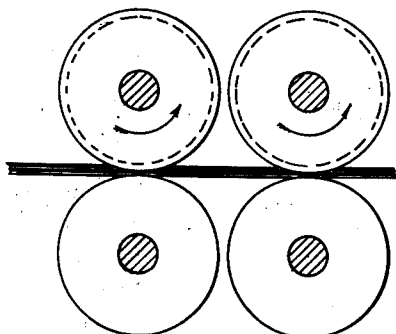
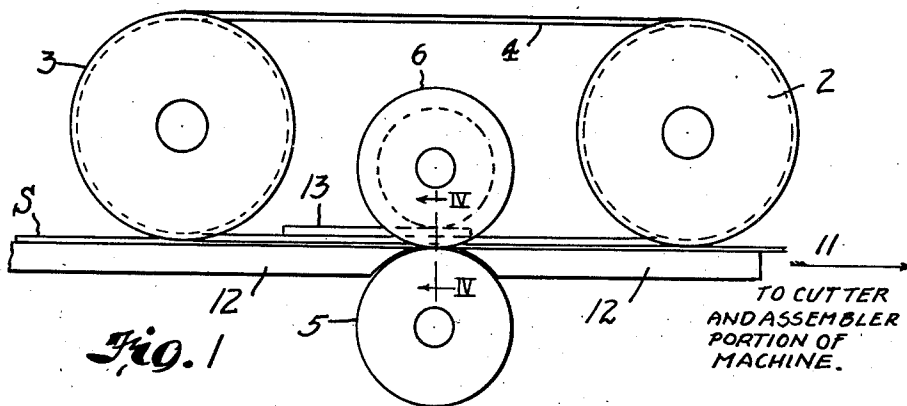
Feb. 5, 1957

G. DAVIDSON

2,780,573

CIGARETTE FILTER CONSTRUCTION

Filed Feb. 5, 1954



INVENTOR.
GLENN DAVIDSON
BY
Oberlin & Limbach
ATTORNEYS.

1

2,780,573

CIGARETTE FILTER CONSTRUCTION

Glenn Davidson, Aurora, Ill.

Application February 5, 1954, Serial No. 408,408

4 Claims. (Cl. 154—106)

In the manufacture of cigarette mouthpiece filters, the customary lines of adhesive to hold the multiplicity of paper sheets together introduce a degree of rigidity which in the case of some papers renders it difficult to easily assemble in the final rolled form. Where it is attempted to consolidate and unite the paper layers by omitting adhesive and rely upon machine compression, a difficulty enters that at the bite of rolls through which the assembly must be fed there is a creepage tending to pile up and distort, such as to defeat the formation of an even and satisfactory ribbon. In the present invention this problem is eliminated, and an assembly of sheets to make up a filter ribbon may be formed by travel through a roll compression zone, and provide a structure having adherence along spaced-apart lines, and being pliantly amenable to all further assembly operations in the final cigarette, without loosening or displacement, and without the disadvantage of liquid adhesive. Another problem which has faced the industry is the production of filters with higher filtering coefficient (f. c.) than has been available with the constructions heretofore had. In the present invention, this difficulty is also solved. Additional features and advantages of the invention will appear from the following description.

To the accomplishment of the foregoing and related ends, said invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a side elevational view of means for production of filter construction in accordance with the invention;

Fig. 2 is a fragmentary elevational view of a slight modification of the middle section of the foregoing;

Fig. 3 is a fragmentary plan view of the same modified construction;

Fig. 4 is an enlarged section on line IV—IV, Fig. 1;

Fig. 5 is a similar section showing another slight modification;

Fig. 6 is a fragmentary side elevational view of the middle portion of the mechanism as of Fig. 1 in still another slightly modified form;

Fig. 7 is an enlarged section on the line VII—VII, Fig. 6; and

Figs. 8 and 9 are plan views of mouthpiece filter section material as leaving the manufacturing operation of Figs. 1 and 2 respectively.

A multiplicity of superposed sheets S is fed to a zone to come into the bite of rolls, one of which, 5, Fig. 1, is smooth faced, and the other, 6, applies pressure at selective small areas to cause compression adherence, and the intervening areas being free from such extreme pressure. If it be attempted to use continuous relief

2

areas on such roll, the creepage aforementioned leading up to the nip of the roll would be prohibitive, as forming distortions and unevenness defeative of desired functioning. I have solved this difficulty by providing the relief areas of the roll 6 in discontinuous linear relationship, such that for the assemblage of multiple layers of paper going through the rolls, the compression is in interrupted or dash-like lines. There is compression-adherence of the paper assembly thus at the areas which receive the pressure, and by this arrangement there is no creepage or build-up in front of the nip of the roll. If instead of interrupted lines of compression-adherence, it be desired to have continuous lines of compression-adherence, while this could be attained by a single compression means involving a continuous relief area on a roll, I have found that the continuous-line result can be attained by the form of the invention shown in Figs. 2 and 3, with a tandem arrangement of compression-adherence areas. Here, the periphery provides narrow areas 8' interrupted, somewhat resembling a circular saw if the points of the teeth were ground off to leave spaced truncated projections as the periphery. And the gearing together of the successive rolls is so synchronized that the second roll applies the pressure of its series of peripheral compression projections to compress the portions which are skipped by the first roll. Hereby, the end result is a continuous line 16 of compression-adherence in the superposed tissue. Whether the structure of the roll in Fig. 1 is of discs with interrupted or spaced projections 8' as in Fig. 3, the single roll then forming a line of interrupted compression-adherence 16', Fig. 8; or the tandem arrangement of rolls for effecting compression-adherence of the superposed sheets S as shown in Figs. 2 and 3 be used, in any case the creepage and distortion difficulty is obviated.

The means for feeding the plurality of superposed thin sheets of paper S may involve drive and driven pulleys 2, 3, Fig. 1 which carry belts 4 to come into contact with the paper sheets S and forward the same together through the rolls 5 and 6. Foregoing, I have shown how the creepage problem can be eliminated by applying adherence-compression to the paper sheets by means of roll surfacing having interrupted or discontinuous compression areas. I have found that the distortion problem in the paper also can be eliminated by providing positive gripper means to force the assembly of paper into the nip of the rolls, and if this be done, roll 6 can successfully operate even though its relief compression areas were to be continuous. Rolls such as roll 6 may be of integral construction, but it is generally preferable to have an assemblage of discs 7, 8, 9 suitably bolted together to operate as an integral roll. The number of these discs may be as desired and according to the width of ribbon-like product desired from the machine. As shown in the Fig. 4 form, the disc 7 is provided with a cutting edge 10, and its action is to both compress the superposed thin sheets at its point of contact against the lower smooth roll, and also sever the paper. As gripper means for positive feed of the paper into the bite of the rolls, the belts 4 not only serve as general guide-means, but here are in the form of rubber V-belts, which contact and feed the sheets S and move them as a unit, into and through the roll pair 5, 6 and to the discharge end 11 to the cutter and assembly portion of the machine, this latter being of desired suitable detail, as for instance U. S. Patent No. 2,013,202, the detail of the cutter and assembler not being concerned in the present invention. It is understood that the contour of the roll 6, by reason of its assemblage of discs 7, 8, 9 provides sufficient space between the compression discs for the gripper V-belt. The paper assemblage S is for-

3

warded thus by the gripper belts along the smooth support table 12, and if desired, pressure shoes 13 may be mounted to bear against the V-belts through the bite of the roll pair 5, 6, the roll discs between the compression discs, as aforementioned being sufficiently recessed to accommodate the belts and the pressure shoes. The mounting of the pressure shoes 13 involves backing springs, as need not be further detailed here, being of a type known generally. Thus, starting as afore-noted with a plurality of sheets of thin paper S, these are brought into the roller zone where they are shaped together in the space defined by the sides of successive discs 8 and lying between the lower smooth roll and the gripper belt 4, as best shown in Fig. 4. At the same time they are subjected to particular linear compression by said disc sections 8, this effecting an adherence of the assembled thin sheets or tissue, which is superior to what would be attained by a liquid adhesive. This linear adherence by compression from the thin discs 8 forms a ribbon product, which, as shown in the fragmentary plan view of Fig. 9, has adhesion lines 16 of compression, the discs 7 accomplishing the adherence and at the same time slitting edges 17.

While a gripper belt or draw belt in the form of a V-belt as described in connection with Fig. 4 is generally satisfactory, in some cases another form of belt such as wires 4', Fig. 5 are convenient, these being of sufficient section to function about the drive and driven pulley and provide compression against the paper assembly. Here the discs 8'' in the upper roll 6'', which are of smooth periphery, bear against the wire belts 4', and result in a continuous line of compression adherence in the ribbon as it emerges from the "molding" zone. The product is as illustrated in Fig. 9, plan view.

Instead of continuous traveling gripper means on the belt order as foregoing, in some cases and with some materials it suffices to draw the feed paper superposed sheets through the bite of the roll pair 25, 26, Fig. 6, and a reciprocating gripper 27, pivoted at 28, is reciprocated back and forth by suitable means, for example a crank and connecting link 29, the gripper 27 thereby urging the paper assemblage at the bite of the roll; and as shown at Fig. 7 in enlarged cross-section the paper assemblage again is formed as a continuous ribbon with portions 20 of un-adhered layers, and lines 21 of compressed adherence, the compression discs 8 here being the same as in Fig. 4, and again there may be slitting or trimming discs 7 to cut in widths as desired, but preferably of a width just equal to the circumference of the finished cigarette.

The compression means for forming the compression-adherence areas in the assembled paper may thus be used alone as the means for obviating distortion at the nip of the rolls, in such case the belts 4 being merely guiding means; or positive gripper means may be employed, as noted, to obviate distortion at the nip of the rolls, such gripper means being of rubber V-belt character as described, or of reciprocating mechanical gripper character; or again I may employ both the interrupted surface compression roll and the positive gripper means together. In any case, a filter ribbon product is obtained, free from manufacturing difficulty, and which is uniformly even in its construction, having linear areas of compression-adherence, interrupted, or continuous if the tandem compression-adherence rolls be employed, and between the lines of compression-adherence the paper assemblage is compact, but not compressed, and thereby admirably adapted to accomplish its filter function.

For attaining a higher standard of filtering efficiency (f. c.), I have discovered that a surprising increase in the filtering efficiency results if crepe paper is employed and is fed in orientation with the ridges and depressions of the creping transverse to the longitudinal dimension of the paper. In this manner a particularly important

4

aspect of the invention is the obtaining a maximum filtering effect per gram of paper used. And, the weight in grams of the tobacco tars absorbed by one gram of paper is here termed the filtering coefficient (f. c.). Thus, as seen in plan view, Fig. 8, the ridges and depressions of crepe paper 30 are transverse of the longitudinal axis of the ribbon creped waves, in other words, extend across the ribbon at right angles to its length; and, whereas it is found that if the crepe ridges and depressions or creped waves extend lengthwise of the mouthpiece filter plug ribbon, the f. c. is substantially the same as for flat sheets of the same thickness; the filter action is very greatly improved where the creped waves extend across the ribbon.

Embossing, in various designs, applied to thin sheets also very essentially raises the f. c., in much the same manner as creped waves extending across the ribbon.

As seen, the thin sheets or strands are adhered to each other by areas of compression along lines parallel with the length of the ribbon and spaced somewhat in from the edges of the ribbon. For example, a desirable arrangement is two such lines spaced to divide the width of the ribbon approximately into thirds. Although a single such line near the center of the ribbon also works well.

A continuous line of compression adherence is mostly desirable but in no sense a necessity. Such a continuous line of compression adherence produces a "valley" effect in the assembly simulating the "fly-cutter" kerfs shown in Fig. 22, of my Patent No. 2,208,839. Such "valleys" are of substantial assistance in smoothly folding the ribbon (or sections thereof) around an axis parallel to its length.

Either a continuous line or a discontinuous line of compression adherence at or near each edge of the ribbon is highly desirable to prevent damage to the ribbon (or section thereof) while being assembled into the final cigarette. These lines of adherence are in addition to those mentioned above, which are primarily helpful in giving smooth folding around the axis parallel to the length of the ribbon.

In fact, we find that certain types of thin sheets even though creped or embossed are sufficiently soft to fold reasonably well around an axis parallel with the length of the ribbon when adhered only by lines of compression-adherence at or near the longitudinal edges. On the other hand, if such soft sheets were adhered by corresponding lines of adhesive, the adhesive, when enough is applied to produce the necessary adherence, migrates so far along the sheets toward the center of the ribbon as to render the entire assembly too rigid as to be satisfactorily folded.

As a further feature, sheets of thin paper for molding into mouthpiece filter plug ribbons may be of stock which is "loaded" with "filter aid" material, such as fuller's earth, silica gel, aluminum oxide, etc.

Further, thin sheets of materials such as cotton laminae, formed by dry methods on a textile "carder," also asbestos paper, and very thin fabrics, may be interleaved between the thin sheets of suitably soft paper, and this assembly also bonds together satisfactorily along lines of compression-adherence. Such materials may be concisely called "paper like" in that they are in the form of thin sheets and amenable to compression-adherence provided they are with the sheets of paper.

The mouthpiece filter ribbon, passing to the cutter and assembler portion of the cigarette machine may be cut and attached to a heavier sheet of paper if desired and this may be done either before or after or simultaneously with the formation of the lines of compression-adherence.

A multiple width, and appropriate subsequent or simultaneously slitting, into unit ribbons is particularly desirable in practice, although a single width ribbon may be formed if preferred.

5

This application is a continuation in part and as to common subject matter, of my patent application Serial No. 744,925, filed April 30, 1947, now Patent No. 2,668,544, dated February 9, 1954. Where my improved "ribbon," such as shown in Figs. 8 and 9, is provided with two intermediate lines of compression-adherence, the resulting filter element, when such ribbon is rolled into a cylinder or rod and the latter thereupon cut into suitable lengths and inserted in the cigarette, will resemble that shown in Fig. 10 of said patent. On the other hand, where lines of compression-adherence are provided along the lateral edges only of the ribbon, the resulting filter element will resemble that shown in Fig. 11 of said patent.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In the manufacture of cigarette mouth-piece material, the steps of superimposing in registry a plurality of creped paper strips having transversely extending crepe waves, to form a ribbon, gripping such ribbon laterally and movably to advance the same lengthwise, and feeding the ribbon in this manner into the nip of opposed rolls formed cooperably to produce lines of compression-adherence of the strips which are parallel with the length of the ribbon, the gripping action compacting the ribbon

6

laterally sufficiently to force the same between the compression rolls without relative displacement of the composite strips.

2. The process set forth in claim 1 characterized further in that the lines of compression-adherence are formed in the ribbon at a spacing which is substantially equal to the circumference of cigarette.

3. As an article of manufacture for use in the making of cigarette filter plugs, a ribbon comprising a plurality of strips of creped paper having transversely extending crepe waves, said strips being adhered together by a line of compression-adherence which is parallel to the length of the ribbon, the ribbon being of indefinite length and of width approximately equal to the circumference of a cigarette.

4. The article set forth in claim 3 characterized further in that said strips are adhered by two lines of compression-adherence respectively at the longitudinal edges of the ribbon.

References Cited in the file of this patent

UNITED STATES PATENTS

1,941,255	Fourness	Dec. 26, 1933
2,202,839	Davidson	June 4, 1940
2,321,985	Briggs	June 15, 1943
2,668,544	Davidson	Feb. 9, 1954

FOREIGN PATENTS

236,957	Great Britain	Oct. 7, 1926
---------	---------------	--------------