ABSTRACT: Making cigarette filters consisting of two filter plugs wrapped in a tube to define a compartment in which there is particulate filtering material, by the method of deforming the plugs and surrounding wrapper to increase the useful volume between the plugs into which the particulate material can be deposited, and then reforming to the desired shape, thus increasing the volume of particulate material in the finished filter and improving its efficiency.
MANUFACTURE OF FILTERS FOR CIGARETTES OR LIKE SMOKING ARTICLES

This application is a continuation-in-part of my Copending application Ser. No. 753,532 filed Aug. 19, 1968, now abandoned.

This invention concerns improvements in or relating to the manufacture of filters for cigarettes, or similar smokable articles, and is particularly concerned with the production of filters incorporating a particulate filtering material.

United States Ser. No. 753,532 discloses a problem which arises in connection with the manufacture of these articles and an improvement of manufacturing such filters which is directed towards overcoming this problem.

The present invention is also concerned with a similar problem and with an improved method of manufacture which is directed towards overcoming this. Recently considerable stress has been laid upon the value of particulate materials for filtering smoke to remove undesired substances therefrom. Such materials are incorporated in the filter of a cigarette, generally in a compartment between two plugs of a conventional nature of porous filtering material. Clearly in order to be effective it is necessary that the particulate material should be packed into the space between the plugs in such a way that smoke drawn through the filter has to pass through the material, that is to say it is necessary that the material shall fill the compartment within the filter between the plugs and not leave empty spaces along which the smoke can bypass the filtering material. In a modern method of manufacturing such filters, a continuous web of wrapping paper is formed into a bowd cross section, plugs of porous filtering material are arranged at spaced intervals along the so-formed web, portions of particulate material are inserted in spaces between the plugs and the wrapping paper is folded and sealed around the plugs and material to form a continuous rod which is then cut into lengths as required, through the plugs. In carrying out this method difficulty arises in introducing sufficient particulate material into the spaces between the plugs to ensure that there is no undesirable bypassing in the subsequent filter, without at the same time getting the material in places where it is not wanted, such as between the plugs and the wrapping paper.

It is an object of the present invention to provide an improved method of manufacturing filters for cigarettes and similar smokable articles which is particularly suitable for the production of filters incorporating a particulate filtering material.

According to the present invention there is provided a method of manufacturing filters for cigarettes and similar smokable articles which comprises continuously forming a continuous web of wrapping material into a trough extending along the web, arranging plugs of filtering material at spaced intervals along the trough, deforming the wrapping web together with the plugs arranged therein so as to adapt the cross-sectional shape thereof to define in the spaces between the ends of plugs a particulate material receiving space which is greater than in the undeformed state, delivering particulate material into the said receiving spaces between the plugs and closing the wrapping around the plugs and filtering material to produce a continuous filter rod of substantially circular cross section. This rod can then be cut to length as desired, through the filter plugs. Preferably the plugs are deformed by flattening their opposed sides. Additionally they can be deformed by flattening their lower peripheries along the bottom of the trough so as to give them on three sides a generally rectangu lar cross section. Deformation may be carried out by means of guides which are shaped to define a path for the web and have a cross-sectional shape along that path which is progressively adapted to conform to the required cross-sectional shape of the filter rod and its component parts in their various stages of assemblage.

The filter plugs can be chosen to have a larger cross-sectional size and a lower density than is required in the final filter and can be compressed during manufacture, preferably by the action of the guides.

The invention also extends to filter plugs and cigarettes manufactured according to the above described method; to apparatus for carrying out the method; and to a process of manufacturing filter tip cigarettes incorporating the method.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:

FIG. 1 is a cross-sectional view, in elevation of a part of an apparatus for manufacturing cigarette filters, and

FIGS. 2 to 10 are sectional views along the lines II to V, respectively of FIG. 2. FIG. 6 is a partial cross section taken along the line VI of FIG. 1.

Referring to the drawings the apparatus shown, which is generally similar to a part of that disclosed in U.S. Ser. No. 470,512 (now abandoned) comprises a garniture in which a garniture tape 1 carries a web of wrapping paper 2 through a succession of guides and under a granule inserter wheel 3. The garniture web 1 comprises an endless band which is flexible across its width and which runs through a garniture bed 4 having a shape which progressively changes along its length in the manner shown in FIGS. 2 to 8. Fixed to the garniture bed 4 is a device with the required cross-sectional shapes are a series of guides 5 and 7 through which the guides 5 and 7 the respective shapes of which can be seen from FIGS. 2 to 8. At the upstream end of the garniture bed 4, filter plugs 8 which are double the length required in the cigarettes are introduced under a guide 9 by means of an endless band 10. The filter plugs 8 are larger in cross section and less dense than is required so that they can finally be compressed to the size and density required in the cigarettes.

Between the guides 5 and over the garniture bed 4 there is disposed the granule inserter wheel 3 which is provided with a series of pockets 11 around its peripheral edge which serve to meter quantities of a granular filtering material 12 from a hopper situated above the wheel 3 and which is not shown, into the spaces between the plugs 8. Guides 13 extend around the wheel 3 to contain the granular material.

Downstream of the granule inserter wheel 3 there is disposed a horizontal rotating disc 14 which applies adhesive to an upstream edge of the paper web 2 to enable it to be sealed down. A further guide 15 supports the web 2 while the adhesive is being applied.

As the paper web 2 is carried into the garniture bed 4 on the garniture tape 1 the plugs 8 are located in position by the conveyor band 10 whilst the guides 5 deform the garniture tape 1 and paper web 2 from the shape shown in FIG. 2 to that shown in FIG. 3 in which the plugs 8 have started to be compressed to have a somewhat flattened bottom and flattened sides. This reduces the width of the plugs to not less than their final diameter (i.e., after final compression to the required size) but does not reduce their height, and the flattened sides of the plugs make sealing contact with the paper web over a considerable proportion of this height. This is more clear from FIG. 4 which shows the level to which the material is inserted into the spaces from the granule inserter wheel 3, that level being determined by the height above which the plugs 8 do not seal against the paper web 2 since any material inserted above this height will tend to become trapped between the plugs and the paper web 2 where its presence is undesirable. Once the spaces between the plugs 8 are filled with material 12, the garniture tape 1 and the paper web 2 move under the guide 6 which continues the folding of the paper web 2 around the plugs and the filtering material and which acts to compress the plugs 2 down to their final cross-sectional size. In one example the initial size of the plugs 8 is 27 mm. in circumference and this is compressed to about 24.5 mm. The compression of different-sized plugs would be in proportion to their size. As is conventional, an edge of the paper web 2 is left unfastening for gumming between the disc 14 and the guide 15 prior to being sealed down upon itself by the compression of the guides 6 and 7 which further compress and shape the rod, which has now been formed, to have a circular cross section. Subsequent apparatus, which is not shown, cuts the continuous rod so formed through the center of every other plug to form a dou-
ble length filter plug which is then combined with a tobacco rod at each of its ends and once again cut to form two filter tip cigarettes. It is found that in filters formed according to this method the granular material is well packed and the space between the plugs is well filled so that a generally satisfactory filter is produced which is efficient in exposing smoke drawn through it to the filtering action of the granular materials.

In a modification which is not illustrated, the filter plugs are initially more or less of the desired final cross-sectional size and density, and compression is applied to deform them so as to increase the extent of the peripheral surface of the plug which is in sealing contact with the paper web, as described above and this compression is subsequently relieved to allow the plugs to return to their original shape and size. It is preferred, however, to use oversized, low-density plugs in the manner disclosed above which are thus in a compressed state in the final form, since this makes it possible to provide a greater volume between two plugs which can accommodate the granular material.

The above described method of producing filter tips is included in a process for the production of filter tip cigarettes. Such a process is disclosed in U.S. Pat. No. 2,963,026, D. W. Molins et al. and entitled "Manufacture of Mouthpiece Cigarettes." What I claim as my invention and desire to secure by Letters Patent is:

1. A method of manufacturing filters for cigarettes and similar smokable articles which comprises continuously forming a continuous web of wrapping material into a trough extending along the web, arranging plugs of filtering material at spaced intervals along the trough, deforming the wrapping web together with the plugs arranged therein by compressing opposed sides of the plugs so as to adapt the cross-sectional shape thereof to define in the spaces between the ends of the plugs a particulate material receiving space which is greater than in the undeformed state, delivering particulate material into the said receiving spaces between the compressed plugs, and closing the wrapping around the compressed plugs and filtering material by further compressing the plugs and particulate material to produce a continuous filter rod of substantially circular cross section.

2. A method as claimed in claim 1 in which the lower periphery of a plug is flattened to give the plug on three sides a generally rectangular cross section.

3. A method as claimed in claim 1 further comprising selecting each plug to be of initially longer diameter and less density, prior to its deformation, than is required in the final filter, and compressing each said plug during manufacture to the desired diameter and density.

4. A method as claimed in claim 3 further comprising simultaneously deforming and compressing the plug.

5. Apparatus for making filters for cigarettes and similar smokable articles which comprises means to continuously form a continuous web of wrapping material into a trough extending along the web and having upstanding sides, means to arrange plugs of filtering material at spaced intervals along the web, means to compress the upstanding sides of the wrapping web together with the sides of the plugs arranged therein so as to adapt the cross-sectional shape thereof to define in the spaces between the ends of the plugs a particulate-material receiving space which is greater than in the undeformed state, means to deliver particulate material into the receiving spaces between the compressed plugs, and means to close the wrapping around the compressed plugs and filtering material while further compressing the plugs and particulate material to produce a continuous filter rod of substantially circular cross section.

6. Apparatus as claimed in claim 5 in which the means to deform the web and plugs comprises a channel-shaped guide of progressively changing cross section.

7. A method of making cigarette filter rods containing smoke-permeable stubs and quantities of particulate material in alternation along the length of a rod, said method comprising arranging on a wrapping strip at spaced intervals stubs which are of larger cross section and less density than required in the final product, folding the strip into conformity with the surfaces of the stubs into a trough shape, feeding particulate material into the trough-shaped strip and between the stubs, folding the trough-shaped strip into a tube about the stubs to enclose the particulate material, and compressing the stubs to a final circular shape of the desired cross-sectional size and density.

8. A method according to claim 7 wherein the stubs are compressed while the strip is folded.

9. Apparatus for making cigarette filter rods containing smoke-permeable stubs and quantities of particulate material in alternation along the length of a rod, which comprises means for arranging on a wrapping strip at spaced intervals stubs which are of a larger cross section and less density than required in the final product, means to conform the strip with the surfaces of the stubs into a trough shape and to compress each stub about a part of its circumference with the strip thereabout whereby a part of each stub is reduced to a predetermined cross-sectional size and density, means to feed particulate material into the trough-shaped wrapper strip and between the stubs, means to fold the trough-shaped strip into a tube about the stubs to enclose the particulate material and stubs and to compress the remaining part of the circumference of each stub with the strip thereabout whereby the predetermined reduction in the cross-sectional size and density of each stub is completed.

10. Apparatus according to claim 9 wherein the means to compress the strip into a trough shape and compress a part of each stub, to fold the trough-shaped strip into a tube and to compress the remaining part of each stub comprises a garniture bed and a garniture tape to move the strip along the bed in a trough which is formed at one part to conform the tape with the trough-shaped wrapper strip and at another part to conform it with the rod to be made and which has a progressively changing form between those parts.

11. Apparatus according to claim 10 wherein the means to fold the trough-shaped strip into a tube is disposed to act on the strip as it moves from the one part to the other part of the garniture.

12. A method of making cigarette filter rods comprising assembling smoke-permeable stubs which are of larger cross section and less density than required in the final product and quantities of particulate material in alternation along the length of a rod comprising means for assembling said smoke-permeable stubs and quantities of particulate material to form a tube, and compressing the stubs with the wrapper to a final shape of a predetermined cross-sectional size and density.

13. Apparatus for making cigarette filter rods containing smoke-permeable stubs and quantities of particulate material in alternation along the length of a rod comprising means for assembling said smoke-permeable stubs and quantities of particulate material in alternation along the length of a rod comprising means for assembling said smoke-permeable stubs and quantities of particulate material to form a tube and simultaneously compressing the stubs with the wrapper thereabout to a final shape of a predetermined cross-sectional size and density.

14. A method of making cigarette filter rods containing smoke-permeable stubs and quantities of particulate material in alternation along the length of a rod, said method comprising arranging on a wrapping strip at spaced intervals stubs which are of larger cross section and less density than required in the final product, conforming the strip with the surfaces of the stubs into a trough shape and simultaneously compressing each stub about a part of its circumference with the strip thereabout to reduce a part of each stub to a predetermined cross-sectional size and density, feeding particulate material into the trough-shaped strip and between the stubs, and folding the trough-shaped strip into a tube about the stubs to enclose the particulate material and simultaneously compressing the remaining part of the circumference of each stub with the strip thereabout to complete the predetermined reduction in the cross-sectional size and density of each stub.
15. In the manufacture of filters for cigarettes which comprises arranging filtering plugs at spaced intervals along a web of wrapping material, forming the web into trough shape about the plugs with the sides of the web extending substantially vertically upwards, delivering particulate filtering material on to the web between end faces of the plugs to be contained in spaces between said end faces and the trough-shaped web, and closing the web about the plugs and particulate filtering material to produce a filter rod, the improvement wherein to increase the capacity of the said spaces to receive and contain particulate filtering material, the opposite sides of the trough-shaped web and of the plugs therebetween are compressed so as to increase the height to which the upstanding sides of the web are in contact with the corresponding sides of the plugs.