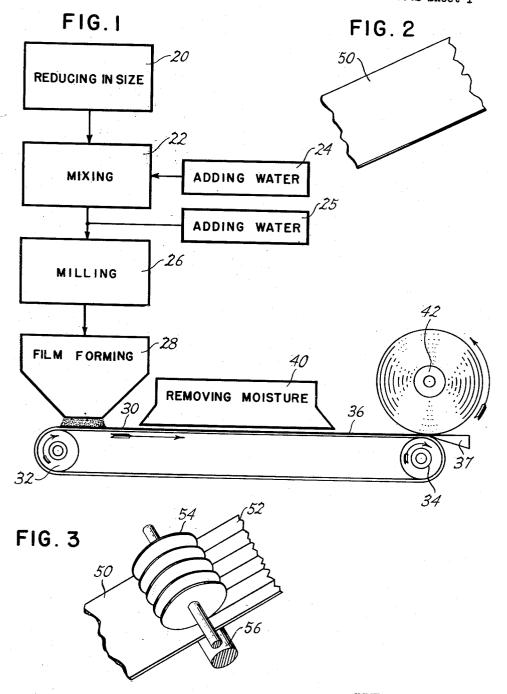
TOBACCO PRODUCT AND METHOD OF FORMING

Filed Feb. 12, 1949

2 Sheets-Sheet 1

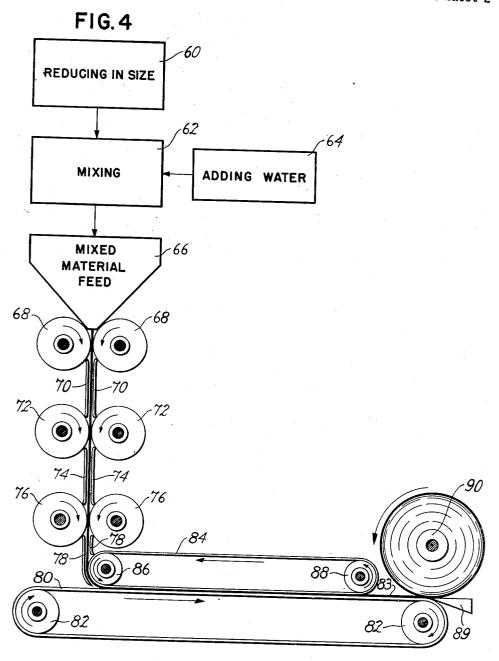


INVENTOR
DELBERT F. JURGENSEN JR.
BY GYRIL P. MANGION
BY CYRIL P. MANGION
Butwork C. Lepham

TOBACCO PRODUCT AND METHOD OF FORMING

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2 Sheets-Sheet 2



INVENTOR
DELBERT F. JURGENSEN JR.
BY CYRIL P. MANGION
Maturit A. Claphen
ATTORNEY

## 2,707,472

TOBACCO PRODUCT AND METHOD OF FORMING

Delbert F. Jurgensen, Jr., Tuckahoe, N. Y., and Martin H. Gurley, Jr., Needham, and Cyril P. Mangion, West Medford, Mass., assignors, by direct and mesne assignments, to American Machine & Foundry Company, New York, N. Y., a corporation of New Jersey Application February 12, 1949, Serial No. 76,032

14 Claims. (Cl. 131-15)

This invention relates to reconstituted tobacco sheet, web or film material, and to improved methods of forming tough, flexible sheets, films and webs from tobacco, which retain substantially all characteristic properties of color, taste and aroma normally present in the tobacco 15 from which they are made.

In the tobacco industry, and particularly that part of the industry relating to the manufacture of cigarettes, cigars and like smoking articles, large quantities of tobacco are rejected annually and sold as waste because 20 it is either impossible or impracticable to utilize them in the manufacture of smoking articles. Obviously, the loss of these materials is a serious matter from the point of view of the manufacturers and, therefore, it would be highly desirable if such material could be salvaged and 25 used in the manufacture of smoking articles. Materials now disposed of as waste are tobacco stems, dust, scrap, clippings and other portions which, although unsatisfactory in physical form for use in connection with the manufacture of smoking articles, may contain desirable 30 constituents which could contribute to the smoking quality of various tobacco products.

From time to time attempts have been made to form tobacco sheets or films which would solve the problem of satisfactorily utilizing tobacco waste materials. Proc- 35 esses have been developed for forming tobacco paper utilizing well known processes and techniques in which tobacco waste, such as stems and scraps has been reduced to pulp by the use of chemicals and then according to ordinary paper making techniques, converted into 40 These techniques are unsuitable for use in connection with the present invention in forming our improved tobacco sheet material and carrying out the processes therefor because of the radical changes to which of valuable constituents and properties of natural to-

One method of solving the above noted problem is that disclosed in Wells and Sowa, U. S. Patent No. 2,433,877, granted January 6, 1948, relating to Tobacco 50 Sheet Material. Our invention constitutes an improvement to the technique described in this patent because it makes possible the production of satisfactory sheets, films and webs in a minimum of processing time, and therefore reduces production costs materially.

According to one form of our invention, a suitable quantity of tobacco, such as stems, fines, clippings, scrap, in desired proportions, is placed in a mixer, such as a Banbury mixer, although any similar mixer having the same operating characteristics can be used. If stems 60 are used, it is found desirable to pass them through a comminutor and reduce them to small size. The desired proportions of tobacco materials are then placed in a Banbury mixer with sufficient moisture so that when mixed therein, the tobacco is subjected to a prehydrat- 65 ing of tobacco and the manufacture of cigarettes, cigars ing operation under pressure. Upon removal from the mixer, a predetermined quantity of water is added and this mixture is then milled in a ball mill or suitable colloid mill in a manner similar to that described in the above referred to Wells and Sowa patent, but for a much 70 added either before or after the comminuting step. shorter time. It is found that the resulting slurry can be cast into a sheet having qualities approaching quite satisfactorily a sheet formed from a slurry made by the

technique disclosed in the above referred to Wells and Sowa patent.

Our invention also includes a modified method of rapidly forming self-supporting continuous reconstituted tobacco sheets or films in which a mass of the Banburyized tobacco processed in the manner described above (not mixed with additional water and ball milled), is fed between several sets of rollers and rolled thereby into the desired sheets or films or passed back and forth through a set of rollers until the desired sheet or film thickness is obtained.

The invention consists in the provision of a novel method of producing reconstituted tobacco sheets or films wherein a minimum of time is required to reduce the tobacco in an aqueous fluid to a point where a dispersion containing colloidal particles results which can be formed into self-supporting continuous films by the above referred to method of Wells and Sowa.

The invention also includes a modified method for producing reconstituted tobacco sheets or films in which a mass of prehydrated tobacco particles are rolled into thin self-supporting continuous sheets and films.

The invention is also characterized by a method for forming thin, self-supporting, continuous, reconstituted tobacco sheets or films in which the tobacco used is rapidly prehydrated before being finally milled in additional water and formed into such films, or rolled without further addition of water or additional mixing or milling directly into such thin films or sheets.

It is an object of our invention to provide a method of making reconstituted tobacco sheets, including the step of subjecting the tobacco to a rapid mixing operation under pressure to prehydrate the tobacco.

It is an object of the invention to prehydrate a quantity of tobacco, preferably finely divided tobacco, under pressure, and then subject the prehydrated tobacco to a relatively short water wetting and milling operation to produce a slurry or dispersion containing colloidal tobacco particles, which slurry can be formed into continuous, self-supporting reconstituted tobacco sheets by the above referred to method of Wells and Sowa.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be hereinafter fully dethey subject these tobacco materials involving the loss 45 scribed, and then set forth in the claims hereunto appended.

In the accompanying drawings, which illustrate a preferred embodiment of the invention, and form a part of this specification, and wherein the several reference characters designate the same or like elements:

Figure 1 is a schematic and diagrammatic view of a preferred method of carrying out our invention;

Figure 2 shows a sheet of reconstituted tobacco material or film;

Figure 3 is a view showing diagrammatically one way of forming filaments or shreds of reconstituted tobacco sheet material; and

Figure 4 is a schematic and diagrammatic view of a modified method of carrying out our invention.

The tobacco used may be of any suitable type, for example, whole leaves or scrap portions thereof, or suitable mixtures of each. Our invention also contemplates the use of so-called tobacco waste products such as stems, dust, chips, fines or clippings, resulting from the processand the like.

A quantity of tobacco, such as stems and scrap, is run through a conventional type of comminutor 20 to reduce the tobacco in size. Tobacco fines or dust, if used, can be

A quantity of comminuted tobacco being processed is then fed into a mixer 22 and moisture is added at 24. A suitable mixer can be of the type as shown in U. S.

Patents numbered 1,523,387, 1,836,355, and 1,881,994, issued, respectively, on January 20, 1925, December 15, 1931, and October 11, 1932, to Banbury, or other mixer having the same general operating characteristics. The mixer is referred to hereinafter in the specification as a 5 "Banbury" mixer.

We have found that Banbury mixer pressures ranging up to 250 pounds per square inch have given satisfactory results. The desired pressure is provided by means of a vertically movable piston or block located in the charg- 10 ing neck of the mixer, and adapted to press upon the charge of comminuted tobacco in the mixing chamber. A mechanism adaptable for performing these functions is shown in Banbury Patent 1,523,387. The pressure member can be operated by suitable mechanical means, 15 or by a suitable fluid actuated system. Conventional pressure control means can be used for controlling the amount of pressure, as required.

We have found that a moisture content of between nine and thirty per cent of the weight of the tobacco 20 being processed in the mixer gives good results. The moistened tobacco is then processed in the Banbury mixer under pressure for a period of time which generally ranges between fifteen and thirty minutes, or in some cases, up to one hour, depending upon the amount 25 and type of charge and its moisture content. It is believed that the effect of the mixing operation is to prehydrate the tobacco being processed in the mixer. The rotators in the mixer grind and reduce the tobacco under pressure and cause a desired partial or so-called "pre"-hydration. 30 This results in the formation of a "prehydrated" tobacco which when placed in a ball mill indicated generally at 26, and processed in accordance with the above referred to Wells and Sowa patent, will reach its final degree of milling and hydration within a comparatively short period 35 of time.

In order to maintain the temperature of the mass in the Banbury mixer at a point below which the tobacco would be harmed or not in excess of 212° F., the jacket of the mixer is cooled in any suitable manner as by the 40 delivery of cold water thereon, by means of a series of water jets placed about the jacket, or by a jacket through which cold water is circulated or by the addition of ground, solid, carbon dioxide to the contents of the mixer.

The Banburyized tobacco mass is then removed from mixer 22 and a quantity of water is added at 25 in order to form a slurry of a suitable tobacco-water ratio in a manner similar to the technique disclosed in the above referred to Wells and Sowa patent. This ratio may be from 1:6 to 1:12 parts by weight, although other suitable 50 lower or higher tobacco-water ratios may be used. The ball milling cycle of the prehydrated tobacco slurry in mill 26 is substantially complete in a period of time ranging from one to two and one-half hours. This is a marked decrease in ball milling time from that of previous methods, such as disclosed in the above referred to Wells and Sowa patent, where a much greater time, ranging from six to eighteen hours, is required in order to obtain a satisfactory sheet or film. It is believed that the material decrease in milling time, which is an important advantage, is due to the fact that the tobacco has been previously hydrated in mixer 22 and therefore a more rapid final hydration is effected in mill 26.

At the conclusion of the milling operation 26, the slurry is subjected to forming operations resulting in a sheet. The slurry is transferred to a film or sheet casting unit 28 of any suitable conventional type, and cast in known manner on an endless belt 30 running on drums 32, 34 into continuous, endless sheets or webs 36.

As indicated in Figure 1, moisture may be removed from web or film 36 by any well known type of moisture extracting device, such as 49, after which the web or film 36 is separated by doctor blade 37 and can be wound

Figure 2 illustrates a piece of a web or sheet 50 separated from endless, continuous web 36.

Figure 3 shows diagrammatically the formation of shreds or filaments from sheet material 50. A plurality of rotary spaced knives 54, coacting with rotary ledger roller 56, can be employed for this purpose. Suitable filaments 52 can also be formed directly from slurry in a manner similar to that disclosed in the Wells and Sowa patent above referred to.

In the modified method disclosed in Figure 4, a predetermined quantity of tobacco, such as stems and/or scrap, is run through a conventional type of comminutor 60 to reduce the tobacco to a desired size. If tobacco fines and dust are available, and it is desired to admix them to the stems and/or scrap being processed, such materials can be added before or after the comminuting step in proper portion and passed through the comminutor 60 with the stems and/or scrap.

The quantity of comminuted tobacco is then placed in a mixer such as a Banbury mixer, indicated generally at 62, and a predetermined quantity of water is added at 64 to bring the moisture content of the mass of comminuted tobacco being Banburyized to between nine and thirty per cent by weight of the tobacco. The mass of moistened tobacco is then processed in mixer 62 under pressure until the desired degree of prehydration has been reached. This is generally effected in from fifteen to thirty minutes, although in some cases, it may be desirable to continue the mixing operation for an hour, depending upon the quantity and type of tobacco constituting the charge fed to mixer 62, and its moisture content.

The Banburyized prehydrated or partially hydrated tobacco is then removed from mixer 62 and transferred to a suitable conventional type of mixed material feeding device, indicated generally at 66 in Figure 4. This device feeds the Banburyized partially hydrated tobacco between sets of closely positioned, milling and sheet forming rollers which subject the Banburyized tobacco material to pressure and simultaneously therewith substantially complete the hydration of the tobacco as it passes downwardly between rollers 68 as a sheet or web through spaced guide plates 70 to a second set of milling and sheet forming rollers 72. The tobacco passes next into the forming operations, resulting in a sheet. It moves downwardly between spaced guides 74 into the bight of a pair of film forming rollers 76 which complete the rolling of the web 83, formed from the hydrated tobacco acted upon by rollers 68 and 72, and delivers it as a thin, self-supporting, continuous sheet or film 83 between curved spaced guides 73 onto endless conveyor belt 80 running on spaced pulleys 82.

In general, it is desirable that the Banburyized tobacco, fed from device 66 to milling and sheet forming rollers 68, have a predetermined moisture content such that the sets of rollers mentioned can effect the desired hydrating operation as the material is passed downwardly therebetween. A preferred moisture content range has been found to be between fifteen and twenty-five per cent.

Rollers 68, 72 and 76 can be mounted for operation somewhat in the manner disclosed in U. S. Patent No. 772,892 issued October 18, 1904, to Lauhoff and in U.S. Patent 1,099,260 issued June 9, 1914, also to Lauhoff. It should be noted, however, that we employ a plurality of sets of rollers such that the web of material being formed by the passage therethrough is subjected to a plurality of individual expressing operations in being rolled to its final, continuous self-supporting film or web formation. If desired, the web could be passed back and forth through rollers in order to obtain the desired degree of 70 homogeneity in being formed from more or less granular condition as fed from device 66 into the range of operation of sheeting and feed rollers 63, 72 and 76 and to obtain the desired thickness of sheet. We have found that the subjection of the Banburyized tobacco to the action of on a reel 42 or cut to desired sheet size (not shown). 70 the plurality of sets of rollers spaced one from the other,

as indicated in Figure 4, makes possible formation of a uniform, continuous, self-supporting web or film which cannot be effected by the rolling mechanism disclosed in Quester or Lauhoff.

A belt 84, running on spaced pulleys 86, 88, is provided with a horizontal lap closely adjacent the upper lap of belt 80 and coacts therewith to feed the endless self-supporting continuous web of reconstituted tobacco sheet material to a reel 90 which is rotated to roll up the web of material issuing from between belts 80 and 84. A doctor 10 blade 89, having its active edge adjacent the discharge end of belt 84, strips the web or film from belt 80 and insures its delivery in an unbroken condition to reel 90.

If desired, instead of rolling web 83 up on a reel 90, it can be cut into strips in the manner described here- 15 inabove and shown in Figure 3.

The invention above described may be varied in construction within the scope of the claims, for the particular embodiments selected to illustrate the invention are but a few of the possible concrete forms which our invention 20 may assume. The invention, therefore, is not to be restricted to the precise details of the structures shown and described.

What is claimed is:

1. The method of forming self-supporting sheets of 25 tobacco which comprises comminuting a quantity of tobacco, modifying the moisture content of said comminuted tobacco so that the moisture therein is from 9% to 30% of the weight of said tobacco, mixing the parts of said comminuted tobacco while maintaining same confined and 30 under the application of a pressure not exceeding 250 pounds per square inch while maintaining a temperature not exceeding 212° F., said mixing operation taking place for a period of time between one quarter hour and one hour, adding an aqueous fluid to the latter, and milling 35 said mixture of aqueous fluid and said quantity of mixed comminuted tobacco to produce a dispersion containing colloidal tobacco, and subjecting the latter to forming operations resulting in a sheet.

2. The method of forming self-supporting sheets of to- 40 bacco which comprises comminuting a quantity of tobacco, modifying the moisture content of said comminuted tobacco so that the moisture therein is from 9% to 30% of the weight of said tobacco, mixing the particles of said comminuted tobacco while maintaining same substantially 45 completely confined and under the application of a pressure not exceeding 250 pounds per square inch while maintaining a temperature not exceeding 212° F., said mixing operation taking place for a period of from 15 minutes to 60 minutes, increasing the moisture content of said 50 quantity of mixed comminuted tobacco to form a tobacco water slurry having a tobacco water ratio ranging between 1:6 to 1:12 parts by weight, milling said slurry to form a dispersion containing colloidal tobacco and subjecting the latter to forming operations resulting in a sheet.

3. The product made by the method defined in claim 1. 4. The method of forming reconstituted tobacco sheet material which includes subjecting a quantity of finely divided tobacco containing 9% to 30% moisture to mixing and grinding for a time between one quarter hour and 60 one hour, maintaining said quantity of tobacco material while being mixed and ground under 212° F. and at a pressure under 250 pounds per square inch and feeding said quantity of tobacco material between sets of milling rollers to reduce its size further and continuing the operation of sheeting said material until self-supporting continuous, reconstituted tobacco sheets or films are formed.

The product made by the method defined in claim 4. 6. The method of forming reconstituted tobacco sheet material which comprises reducing a quantity of tobacco 79

to a mass of small size particles, placing said mass of particles having a moisture content of 9% to 30% in a pressure container and mixing and grinding said tobacco particles in said pressure container at a pressure less than 250 pounds per square inch for a period of time between 75 28, page 187, February 1936.

one quarter hour and one hour and at a temperature less than 212° F., removing said mass of tobacco particles from said container and progressively manipulating, comminuting and forming said mass into self-supporting continuous reconstituted tobacco sheets, said reconstituted tobacco sheets including substantially all characteristics of color, taste and aroma normally present in tobacco.

7. The method of forming tobacco sheets and films comprising comminuting a quantity of tobacco to form a mass of finely ground tobacco, adding moisture to said mass of finely ground tobacco to bring the moisture content of said mass between 9% and 30% by weight, comminuting said mass at a temperature below 212° F. and a pressure below 250 pounds per square inch for a period between one quarter of an hour and one hour, and subjecting said moistened mass of finely ground tobacco to rolling pressure whereby said mass of tobacco is comminuted and rolled into self-supporting continuous reconstituted tobacco sheets and films.

8. The method of forming self-supporting sheets of tobacco which comprises comminuting a quantity of tobacco, modifying the moisture content of said comminuted tobacco so that the moisture therein is from 9% to 30% of the weight of said tobacco, mixing the particles of said comminuted tobacco while maintaining the same confined and under the application of a pressure not exceeding 250 pounds per square inch while maintaining a temperature not exceeding 212° F., said mixing operation taking place for a period of from one quarter of an hour to one hour and further treating the comminuted tobacco to obtain a finer comminution of said comminuted tobacco and subjecting the latter to forming operations resulting in a sheet.

9. The method of forming self-supporting sheets of tobacco which comprises comminuting a quantity of tobacco, modifying the moisture content of said comminuted tobacco so that the moisture therein is from 9% to 30% of the weight of said tobacco, mixing the parts of said comminuted tobacco for a time between one quarter hour and one hour while maintaining said parts under a pressure less than 250 pounds per square inch and at a temperature less than 212° F., adding an aqueous fluid to the latter and further comminuting said tobacco to produce a dispersion of colloidal tobacco and subjecting the latter to forming operations resulting in a sheet or film.

10. The product made by the method defined in claim 2.

11. The product made by the method defined in claim 6. 12. The product made by the method defined in claim 7.

13. The product made by the method defined in claim 8. 14. The product made by the method defined in claim 9.

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