A process and device for the production of coherent tobacco structures of coarse comminuted tobacco materials, in particular ribs and wastes, wherein the starting tobacco material is comminuted in a coarse grinding device to a particulate size of approximately 150–200 μm; moistened with a liquid, consisting of an alkali and/or silicic acid sol, in a weight ratio of approximately 1:1.1 to 1:1.5 tobacco to liquid; kneaded in a mixing device to form a dough-like mass which is then shaped to form leaf-like structures; and applied in dosed amounts to a plastic transport belt whereupon the separate portions are spread under pressures up to a maximum of approximately 20 kg/cm² (approx. 284.4 psi) to form individual flakes by means of a plastic spreading belt which runs in the same direction as the transport belt, but at a somewhat slower speed.

11 Claims, 1 Drawing Figure
3,894,544

1

PROCESS FOR PRODUCING TOBACCO STRUCTURES

CROSS-REFERENCE

This is a continuation-in-part application based on my earlier application Ser. No. 284,677 filed on Aug. 29, 1972, now abandoned, with claim to Convention priority based on West German application Serial No. P 2230314.6 filed June 21, 1972. Convention priority for this application is also claimed based on Greek application Ser. No. 2003/17/6 filed May 23, 1973.

BACKGROUND OF THE INVENTION

This invention relates to a process for the production of coherent tobacco structures of coarsely comminuted tobacco materials, in particular ribs and wastes, which are moistened and kneaded to form a dough-like mass which is then shaped to form leaf-like structures. In all of the known processes for producing reconstituted tobacco from tobacco wastes, ribs etc., the reconstituted tobacco is first produced in the form of a coherent endless band of fibers. This primary product is continuously removed from appropriate shaping machines and/or from a transport belt and is then reduced in size to form so-called flakes or tobacco flakes or may be cut to a desired width. This mode of operation suffers from the drawback that the reconstituted tobacco structure has a paper-like flat shape and thus has a poor filling capacity.

Proposals are also known for producing tobacco paste through the small opening of an extruder or by specially designing a band in the shape of a fiber. In spite of the apparent simplification of the direct method of fiber production which is supposed to be offered by such processes, it is especially disadvantageous in practice because, among other things, the tobaccos used for smoking articles are of different kinds and the fiber shapes cannot be mixed with each other, since otherwise greater amounts of waste would be formed.

The present invention provides a process of the type discussed above which overcomes the cited drawbacks of the known processes and at the same time permits production of an end product which is more favorable with respect to both quality and health than can be obtained from the same starting material with the known processes and an apparatus for performing the process.

SUMMARY OF THE INVENTION

The present invention involves a process for the production of coherent tobacco structures embodying the use of a coarse grinding device, e.g., a hammer mill which comminutes the starting tobacco material, such as ribs and wastes, to a particulate size approximately 150–200 μm; a moistening device for admixing the comminuted tobacco material with a liquid, consisting of an alkali and/or silicic acid sol, expediently in a weight ratio of approximately 1:1.1 to 1:1.5 tobacco to liquid; a softening silo into which the moistened tobacco material is fed containing a mixing means and a continuously operating discharge device whereby the capacity of the silo is matched to the flowthrough rate such that the average residence time of the moist tobacco material in the silo amounts to at least 1 hour; a continuously operating kneading device which receives the discharged moist tobacco material and subjects it to an intensive mixing, kneading and shearing process without an appreciable reduction in size while supplying additives thereto; a dosage device which doses the dough-like mass emerging from the kneading device into portions of predetermined size; and a shaping device in the form of an endless plastic transport belt which receives the portions from the dosage device at specific intervals and a plastic spreading belt running in the same direction as, but at a slightly slower speed than, the transport belt and cooperating with it to spread the portions under pressures up to a maximum of approximately 20 kg/cm² (approx. 284.4 psi) to form individual flakes.

2

BRIEF DESCRIPTION OF THE DRAWING

Other and further features of the invention will now be more particularly described with reference to the accompanying drawing which is a schematic view, in part in sectional elevation, showing a preferred embodiment of a device in accordance with the invention for carrying out the process of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the invention, the starting tobacco material, after being formed into a dough-like mass, is directly applied to a transport belt in individual, separate portions and the portions are then spread under pressures up to a maximum of approx. 20 kg/cm² (approx. 284.4 psi) to form individual flakes by means of a spreading belt which runs in the same direction as, but at a slightly slower speed than, the transport belt.

The tobacco material used as the starting material in the process is comminuted to a particulate size of approximately 150–200 μm and admixed with a liquid, expediently in a weight ratio of approximately 1:1.1 to 1:1.5 tobacco to liquid. Before further processing to form a dough-like mass, it is advisable to let the mixture of tobacco material and liquid stand and soften for a considerable period of time, preferably at least 1 hour. It is especially expedient during softening to maintain the mixture at an elevated temperature or to heat it preferably to temperatures up to 100°C.

The tobacco materials soaked with the liquid, in particular ribs or tobacco scrap, will be found to heat up by themselves under suitable conditions when left to stand, probably due to fermentation processes. Accordingly, if desired, and in order to compensate for the inherent cited of heat is not sufficient, the tobacco material mass soaked with the solution may be heated to temperatures, preferably in the range from 30°C to 70°C. The use of a tobacco material-liquid weight ratio in the afore-cited range is especially advantageous if the moistened tobacco material is to be heated to an elevated temperature by means of fermentative heating during the rest period. It has been found that if at least an equal amount by weight of silicic acid sol is not admixed with the tobacco material to be treated, then difficulties will arise with regard to the uniform moistening of each individual tobacco particle. This problem arises particularly with tobacco material mixtures whose individual components differ with regard to the capacity to absorb moisture, since the major portion of the employed liquid is taken up in this case by the especially hygroscopic components of the mixture while the remaining tobacco parts, e.g., ribs, remain almost dry.

On the other hand, excessive amounts of liquid, that is, amounts which surpass the cited maximum limit of
the afore-cited quantity ratios, not only impair the economy of the process by increasing drying expenditure, but also have a disadvantageous effect on the enzymatic and/or microbiological fermentation processes which lead to the desired inherent heating of the moistened tobacco material.

When a stack of tobacco is opened after fermentative heating, a small percentage of the admixed liquid evaporates without the application of drying energy from the outside. The tobacco material mass in this state is preferably introduced into a stirring means or into a kneading and mixing device where the individual particles are intimately mixed and are pressed together. The dough-like mass which is obtained in this manner can then be directly processed to form tobacco-like structures (tobacco flakes) in accordance with the invention.

Known additives such as burn promoters, moistening and binding agents, etc., can be admixed with the tobacco material mass depending on the properties of the tobacco and according to the desired results.

In the process of the invention, a relatively coarsely comminuted tobacco material is used as the starting material as already mentioned. The grain is preferably selected such that the tobacco material remains almost completely on a sieve having a mesh size of 0.24 mm (or 0.0098 in. based on the German Industrial Standard DIN 1171). The grain size distribution of the tobacco material before, and after the processing of the moistened tobacco material which has been softened at an elevated temperature to form a dough-like mass, is not critical; they are preferably selected, however, to be as coarse as possible in order to keep the plant and operational costs for grinding the starting material as low as possible. A particle size of about 1.0 mm (0.0394 in.) and preferably about 0.5 mm (0.0197 in.) should expediently not be exceeded.

Preferably alkaline liquids are used for moistening and softening the tobacco material. Very good results may also be obtained with most tobacco materials using silicic acid sols whose pH value is between about 7.5 and 9. In specific tobacco sorts, however, acidic liquids with a pH value of up to about 4 may also be found favorable.

The use of aqueous silicic acid sols is especially expedient. The silicic acid sols offer in particular the following advantages:

1. Due to their alkalinity, they have an especially marked softening effect and hydrolize the binding substances, e.g., pectins, specific for tobacco.

2. The silicic acid contained in the silicic acid sols is distributed very finely and uniformly in the tobacco material and even partially penetrates into the cells so that the silicic acid can be precipitated out as an extremely fine and uniformly distributed gel with a high adsorption capacity after it has been mixed with the tobacco material. The silicic acid gel acts as a built-in adsorption filter for the tobacco smoke and consequently leads to milder products which are also lower in nicotine and tar.

Since most tobacco materials become bitter when treated with strong alkaline liquids, i.e., they supply a bitter and sharp-tasting smoke, it is advisable to neutralize the alkalinity to a pH value of from 9 to 7 and in particular to at least 8.5 when using such alkaline liquids, for example alkaline silicic acid sols, to moisten the tobacco material.

The pH value of the treated tobacco material should, as a rule, not be shifted if at all possible. It is therefore advisable to treat most cigar tobaccos with weak alkaline liquids whose pH value, for example, lies in the afore-cited range. Certain naturally weakly acidic cigar tobaccos, however, should be treated with weakly acidic to neutral liquids, for example, having a pH value of about 4 to 7 and in particular about 4.5 to 6.5.

Since no coherent endless tobacco structures are produced in the process of the invention, there is no great need for creating a resistance to tearing of the compacted products (in the shape of tobacco leaves) so that the amount of foreign binders, e.g., carboxymethyl cellulose, etc., can be reduced to a greater or lesser degree as compared to the known processes and the use of a binder foreign to tobacco can even be entirely eliminated in certain cases. In addition, the mode of operation proposed in accordance with the invention offers the advantage that the small leaf parts or tobacco flakes obtained by compacting portions of the dough-like mass on the belt are thinner at the edge than the middle parts of the tobacco flakes separated therefrom. Thus, the edge parts dry faster, i.e., drying of the separated structures, similar to a tobacco leaf, takes place non-uniformly, thereby yielding wavy tobacco flakes which have a substantially more favorable filling capacity than, for example, flakes obtained by cutting endless tobacco foil bands.

In a preferred embodiment of the device for carrying out the process of the invention, two plastic belts are provided between which the portions of the dough-like mass are shaped into tobacco flakes.

These plastic belts are advantageous due to the fact that very long devices do not have to be built, such as used up to the present time, because of the feasibility of transporting the transport belt carrying the tobacco flakes back and forth under the shaping plane by means of guide rollers. In this case, the lower side of the transport belt supporting the tobacco flakes may be heated and the belts may also have a gauze-like structure which permits quicker drying.

As has already been stated above, the tobacco material moistened with liquid is processed in a continuously operating mixing and kneading device to form a dough-like mass before it is applied to a transport belt in portions and compacted.

Comparison tests have shown that if tobacco material which has merely been moistened with liquid, i.e., without mixing and kneading treatment, is applied in dosed amounts directly to the transport belt, the moist tobacco material clumps are not compacted to form sufficiently firm coherent tobacco flakes, but are shaped into worm-like structures which are not a useful end product and must therefore be shaped again.

Hence, the process of the invention makes it possible to operate with an especially low compacting pressure, although the starting material is compounded with only a slight amount of liquid so that only a slight amount of liquid must be removed by drying. This fact, as well as the fact that the shaping of the dough-like mass proposed in accordance with the invention between two belts running at slightly different speeds, enables one to use cheaper, elastic plastic belts in the process of the invention rather than expensive metal belts which are susceptible to corrosion. A special advantage of the inventive process is that it produces irregularly waved flakes which have a large filling capacity.
By regulating the adherability of the compacted paste-like tobacco flakes on the plastic transport belt, the lower or return side of the endless belt, which heretofore has not been utilized, can now be used to dry the tobacco flakes in accordance with the invention by heating it thereby permitting the total length of the belt to be reduced.

A further advantage is that the individual tobacco flakes can be removed or peeled off the belt in the process of the invention without having to completely dry them out or without having to remoisten them again while on the belt as has been necessary in the production of endless tobacco foil bands common up to now.

Referring now particularly to the drawing, tobacco material T to be processed to form tobacco structures is first coarsely comminuted to the desired dimensions in a grinding device 1, such as in particular a hammer mill without a filter insert. The tobacco material T is then discharged preferably onto a transport device 2, e.g., a conveyor belt which is expeditiously designed as a conveyor type weigher, in dosed amounts. The tobacco material T on the transport device 2 is then moistened, preferably by spraying a liquid S in a weight ratio of approximately 1:1.1 to 1:1.5 tobacco material to liquid, by means of a moistening device 3 which is expeditiously equipped with spray nozzles 3a. In accordance with a preferred embodiment of the apparatus in accordance with the invention, the transport device 2 is designed as a conveyor type weigher, as already mentioned above via a control device 23 by means of which the applied amount of liquids is automatically coordinated to the quantity of tobacco material T located on the conveyor type weigher. The moistened tobacco material T leaves the transport device 2 and arrives in a preferably heastable silo 4 which expeditiously has a discharge device 4e at its lower end which continuously discharges the moistened and softened tobacco material. The volume thereof is matched to the production capacity of the apparatus such that the average residence time of the moistened tobacco material amounts to at least 1 hour, preferably at least about 2 hours. When processing tobacco material which requires a softening time of appreciably more than 2 hours, two parallelly arranged silos are preferably employed which are alternately filled and emptied. If desired, the transport device 2 may be complemented by a moisture conditioner which is disposed above the silo 4 and the moistening device 3 is arranged such that the coarsely comminuted tobacco material falling from the grinding device 1 into the silo 4 is uniformly moistened. In this embodiment of the apparatus in accordance with the invention, it is advisable to equip the silo 4 with a stirring or mixing means 4b which is effective at least in the upper part thereof. In order to be able to soften the tobacco material at elevated temperatures, it is advisable to design the silo 4 so as to be heated, for example, by providing it with a vapor-heated double jacket 4c.

The moistened and softened tobacco material is transported from the silo 4 directly into a continuously operating kneader 5, into which the conventionally required tobacco additives, such as binders, softeners and burn promoters, etc., are supplied in dosed amounts from the reservoirs 6a, 6b, 6c. In accordance with the invention, a kneader 5 is preferably used which comprises a rotor 5a provided with blades and a stator 5b equipped with kneading teeth 5c as essential parts. A very intensive shearing, compacting and kneading effect is achieved due to the very narrow gaps between the rotating blades and the stationary kneading teeth. The rotary movement of the rotor is superimposed on an oscillating movement in kneading devices preferably used for the purposes of the invention thereby producing an optimum homogenous distribution of the mixing components.

The tobacco mass emerging from the kneading device 5 has a dough-like character. The dough-like tobacco material mass leaves the kneader 5 and is applied in a thickness corresponding to portions or clumps via a dosage device 6 onto a transport belt 7. The dosage device 6 may preferably be in the form of a perforated plate through which the kneaded mass is extruded and subsequently reduced in size to form pieces approximately 3 mm in diameter (approx. 0.118 in.) and approximately 5 mm in length (approx. 0.197 in.). Depending on the intended end use, the size of the portions may be selected such that tobacco flakes are formed which can be directly used as a cigar filler without subsequent comminution or which can be mixed to form cigarette tobacco without subsequent comminution suitable for feeding into a conventional cutting machine for cigarette tobacco.

Transport belt 7 is preferably an endless plastic belt, which is driven by means of one or more roller(s) 8, 8′. The tobacco clumps or portions are then compressed to form tobacco structures using a relatively low compressing pressure by means of an endless spreading belt 7′ which is preferably designed with perforations, said belt running at a slightly slower speed than the transport belt 7. The clumps of dough-like tobacco material mass are supplied from the dosage device 6 to the transport belt 7 at mutual distances which are set such that the compacted tobacco structures do not overlap. In accordance with the invention, driving rollers 16, 16′, which are especially driven by the same motor and which expeditiously run synchronously with the roller or rollers 8, 8′, are provided as the drive system for the transport belt 7 and the cooperating spreading belt 7′, which is preferably of plastic as well.

The compacted tobacco structures are then pre-dried on the transport belt 7, preferably by means of a pre-drier 9. After the pre-drying operation, they are removed, for example, by means of a scraper 10 and then conditioned by the grinding device 1 disposed above the silo 4 and the moistening device 3. The conditioned tobacco structures are then operated through a conditioning device 12 on a conveyor belt 11 which is preferably designed to be permeable to air.

It is advisable to coat the belt 7′ with lubricants or separating agents, such as silicon oils, diethylene glycol or glycerin and/or to heat it in order to ensure that the compacted tobacco structures adhere to the transport belt 7 practically completely when the transport belt 7 is separated from the spreading belt 7′. The dried tobacco structures are removed from the transport belt 7 expeditiously by means of the scraper 10.

The following examples are presented to illustrate the invention.

**EXAMPLE 1**

10 kg Rio Grande ribs which have been comminuted in a hammer mill without a sieve insert are stirred into 15 liters of water at a temperature of 80°C and are then left to stand for 2 hours. The moistened tobacco material is then introduced into a continuously operating
kneader, 500 g of carboxymethyl cellulose, 500 g of di-
ethylene glycol and 200 g of magnesium formiate being
admixed at the same time. The dough-like mass which
continuously emerges from the kneader in the form of
a granulate is applied to the transport belt in dosed
portions. The tobacco paste clumps are com-
pacted on the transport belt to form flakes. The size of
the tobacco paste clumps is selected such that the in-
dividual compacted tobacco flakes have an area of about
1 cm² (0.155 sq. in.). Furthermore, the tobacco paste
clumps are applied to the transport belt in dosed
amounts at such distances that the compacted tobacco
flakes do not come into mutual contact. The tobacco
flakes adhering to the belt are pre-dried for 10 seconds
and are then removed by means of a scraper. The al-
ready coherent tobacco flakes are then conditioned on
a perforated belt driver.

EXAMPLE 2

1 kg of comminuted tobacco material consisting of
70% ribs and 30% so-called tobacco scrap is moistened
with 1.2 kg water while being stirred. During further
mixing of the mass, vapor is introduced and attention
must be paid to the fact that no condensation is formed.
The temperature of the tobacco mass is maintained at
70°C. After the mixture has been treated in the afore-
mentioned manner for one hour, it is further processed in
a manner analogous to Example 1.

What is claimed is:

1. A process for the production of coherent tobacco
structures of coarsely comminuted tobacco materials,
in particular ribs and wastes, which are moistened and
kneaded to form a dough-like mass which is then
shaped to form leaflike structures, wherein the im-
provement comprises the steps of:

a. comminuting the starting tobacco material to a
particulate size of approximately 150 to 200 μm;
b. moistening the comminuted tobacco by mixing
with a liquid in a weight ratio of 1:1.1 to 1:1.5 to-
become to liquid;
c. kneading the moistened tobacco material to form
d. directly applying the dough-like mass to a trans-
port belt in individual, separate portions to form
spaced pieces; and

e. then spreading the portions on the transport belt
under relatively low compression pressures up to a
maximum of approximately 20 kg/cm² to form indi-
vidual flakes by means of a spreading belt which runs
in the same direction as the transport belt and
at a speed slightly slower than the transport belt.

2. A process according to claim 1 wherein the moist-
ening liquid comprises a liquid which softens the to-
bacco material and which is selected from the group
consisting of an alkali, and a silicic acid sol.

3. A process according to claim 1, wherein the spreading belt is of plastic.

4. A process according to claim 3, wherein the trans-
port belt and/or the spreading belt is driven by several
small rollers driven by the same motor and whose mu-
tilated spaced relation can be adjusted.

5. A process according to claim 1, wherein the to-
bacco flakes are separated from the belt by external
heating and/or treatment with a lubricant.

6. A process according to claim 5 wherein the lubri-
cant is selected from the group consisting of diethyle-
glycol, glycerin, silicon oil and combinations thereof.

7. A process according to claim 1 wherein the to-
bacco flakes are transferred from the transport belt to
a plastic conveyor belt and then dried thereupon.

8. A process according to claim 1 wherein the size of
the portions is selected such that tobacco flakes are
formed which can be directly used as a cigar filler with-
out subsequent comminution.

9. A process according to claim 1 wherein the size of
the portions is selected such that tobacco flakes are
produced which can be mixed to form cigarette to-
bacco without subsequent comminution and can be fed
into a conventional cutting machine for cigarette to-
bacco.

10. A process according to claim 1 wherein the kneaded mass is extruded through a perforated plate
and is subsequently reduced in size to form pieces ap-
proximately 3 mm in diameter and approximately 5
mm in length.

11. A process according to claim 1 wherein the size of
the portions is selected such that tobacco flakes are
produced which have an area of about 1 cm².

* * * * *