

Nov. 24, 1953

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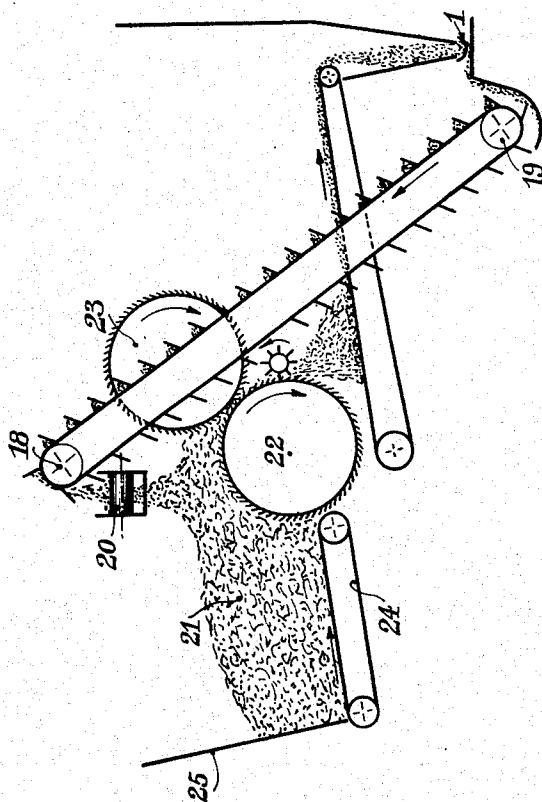
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AUTOMATIC TOBACCO FEEDING CIGARETTE MACHINE

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5 Sheets-Sheet 1

Fig. 1



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5 Sheets-Sheet 2

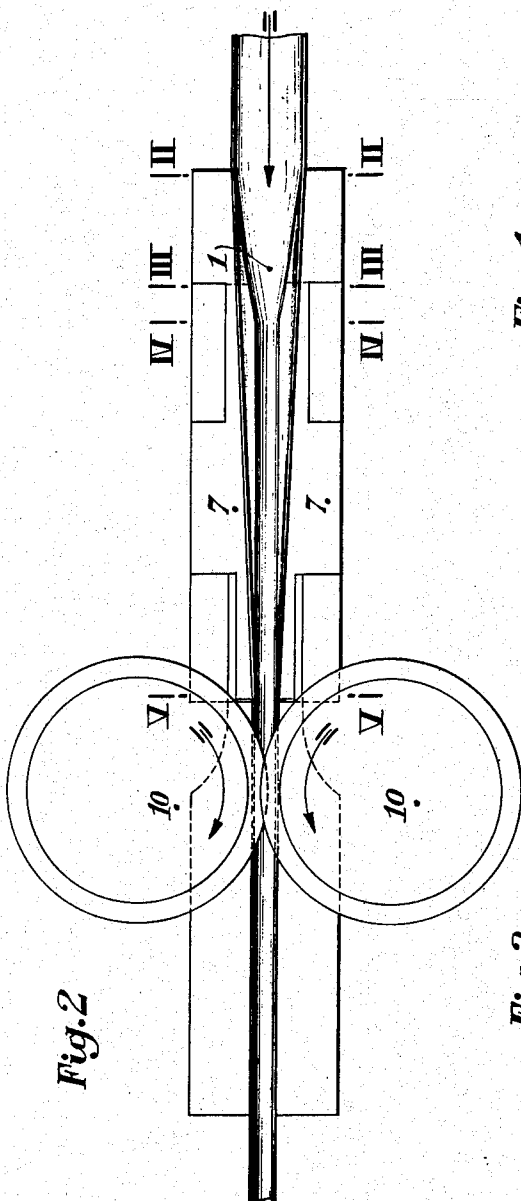


Fig. 2

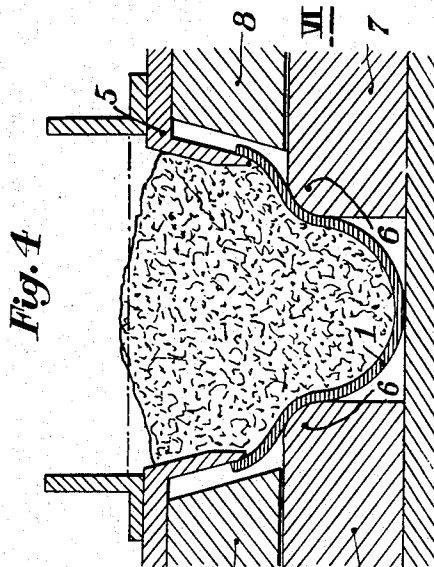


Fig. 4

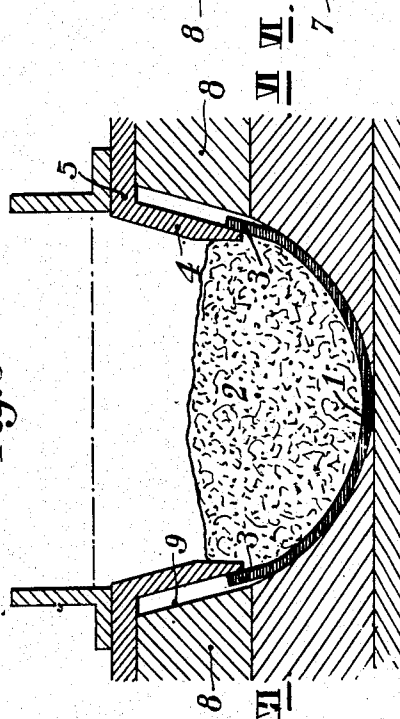


Fig. 3

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5 Sheets-Sheet 3

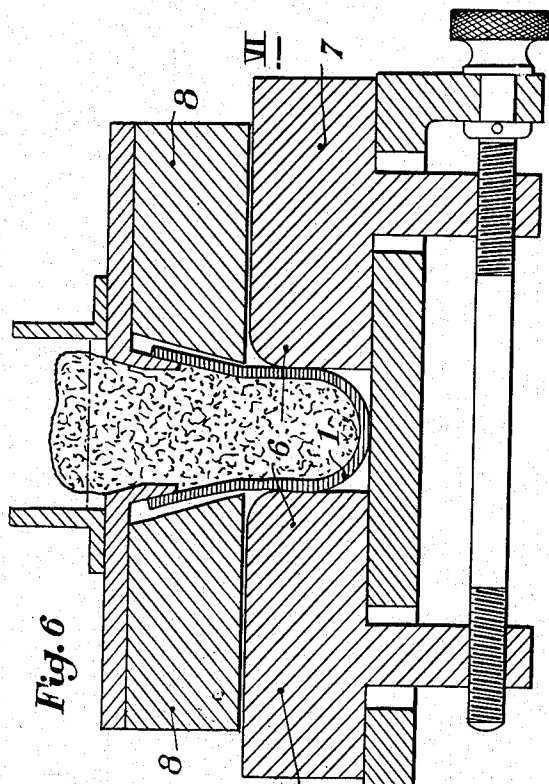


Fig. 6

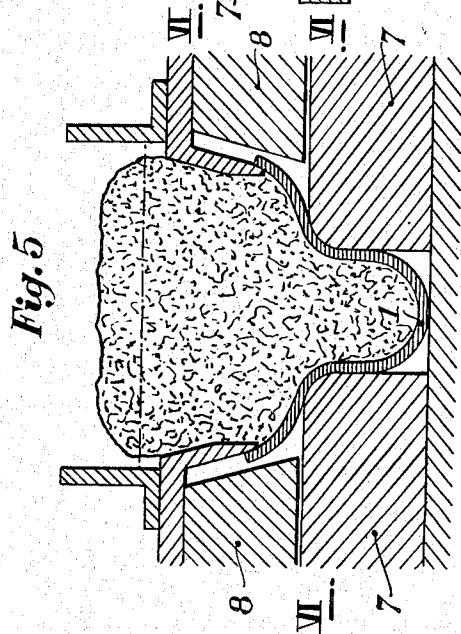
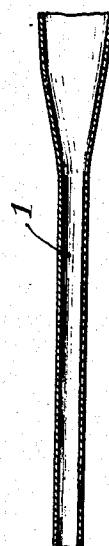


Fig. 5

Fig. 7



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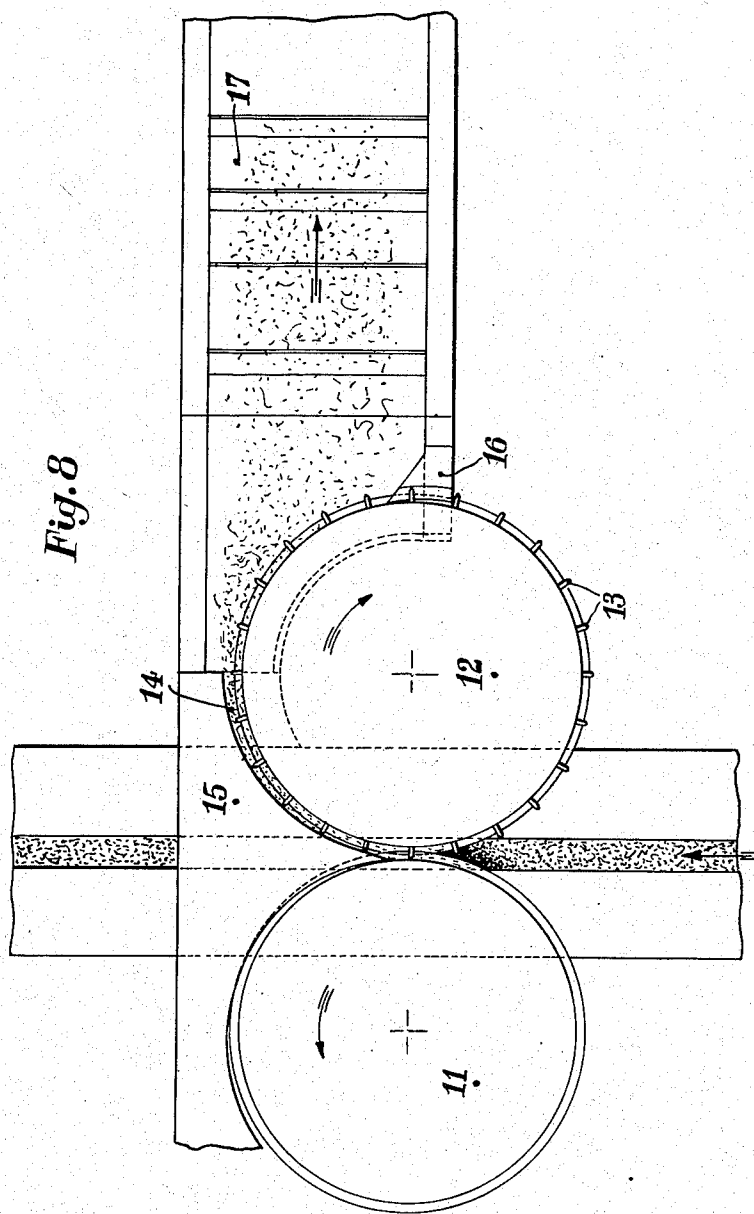
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AUTOMATIC TOBACCO FEEDING CIGARETTE MACHINE

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5 Sheets-Sheet 4



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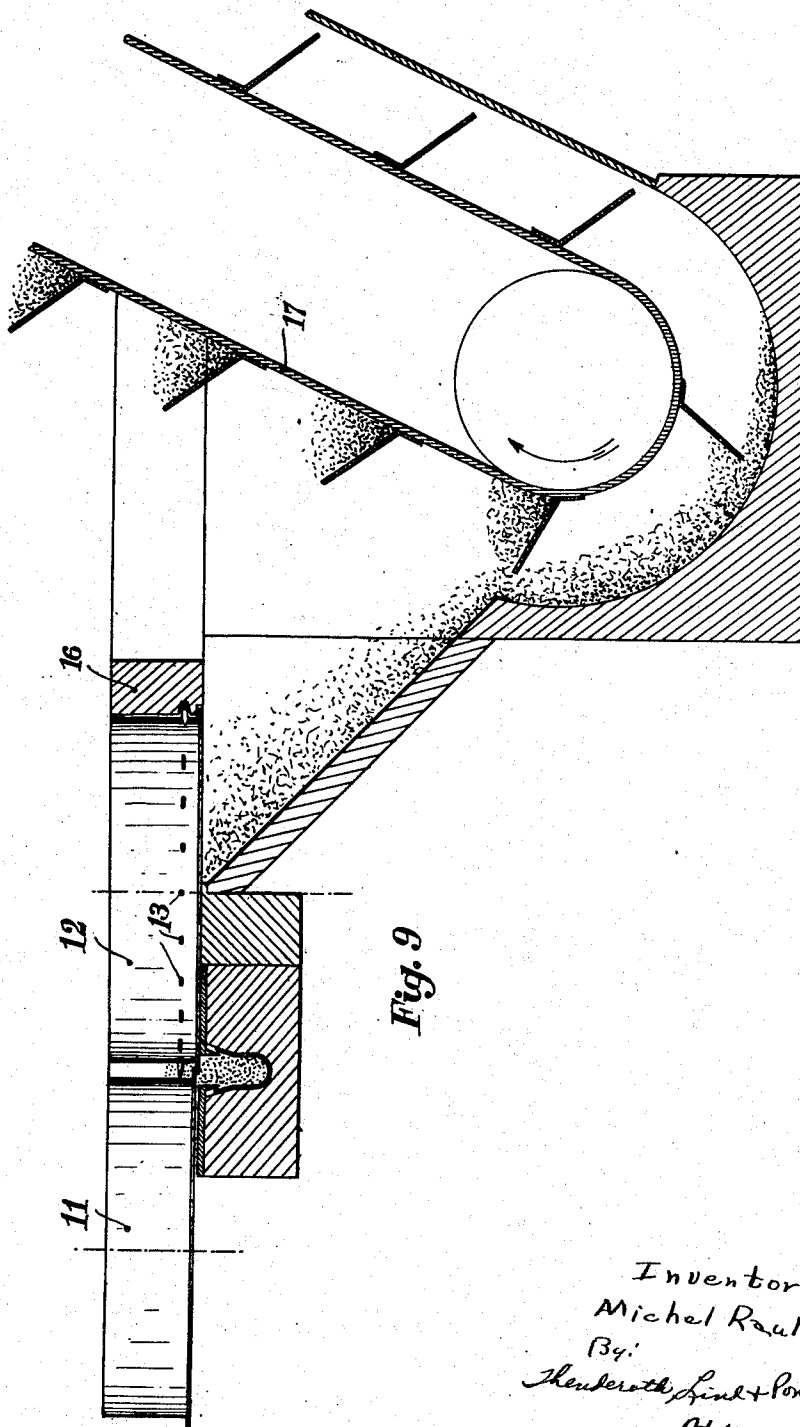
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AUTOMATIC TOBACCO FEEDING CIGARETTE MACHINE

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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AUTOMATIC TOBACCO FEEDING CIGARETTE MACHINE

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5 Claims. (Cl. 131—66)

1

The invention relates to an improved distributor arrangement for the continuous and automatic feed of tobacco in a continuous-roll cigarette-making machine said machine comprising special carding drums adapted to supply tobacco from a supply of tobacco present in a suitable container.

The tobacco is supplied from the distributor in the form of a shower of loose staples which is distributed as uniformly as possible so that it falls upon a belt conveyor adapted to bring it to a tobacco roll forming device and thence to a cigarette forming device.

In spite of the arrangements devised in previous machines to improve the "taking" of the tobacco by the carding drums and to subsequently compensate for the lack of uniformity of such a "taking" the layer of tobacco fibers or slivers present on the belt conveyor is far from being uniform. The layer of tobacco fibers, in cross section, exhibits pits and knolls, nodes and antinodes, which when taken by the devices forming the tobacco roll and the shaped cigarette finally leads to the production of cigarettes which individually vary considerably in weight, in compactness and in the amount filled, thus causing a particularly unpleasant result to the smoker of the finished cigarette.

This lack of uniformity ascribable to the unsatisfactory loading at the carding drum and also to the greater or lesser density of the tobacco staple shower falling upon the conveyor is further aggravated by the disadvantage of the considerable variations in the weights of the cigarettes produced due to the unsteady output of the distributor and because of the heterogeneous character and the physical condition of the tobacco fiber supply.

The resulting cigarette obtained from conventional machines in which the tobacco stream conveyed on the belt and fed as such to the processing members is converted into a compacted roll and exhibits the above-indicated defects which heretofore had to be accepted by the smoker in the absence of an improved device to remedy these defects.

The present invention aims at removing these defects to the fullest extent possible.

The principle of the invention is based upon a new distributor construction which is set to deliver an excess of tobacco over that which is necessary to obtain cigarettes of the desired mean weight and which thereafter removes the knoll from the tobacco layer, at a suitably chosen place, the tobacco stream being held down by gravity and other particles of tobacco only to provide a uniform tobacco layer in cross section that will necessarily form a properly filled and uniformly packed cigarette in the cigarette forming device. The surplus tobacco thus removed is returned

2

to the tobacco supply feeding the distributor to obtain substantial economies in the utilization of the tobacco.

The apparatus of the invention thus comprises a roll former constituted by a channel member, a conveying belt which is movable over said channel member, guards which are secured to the upper edges of opposite sides of said channel member and which have downwardly projecting flanges, these downwardly projecting flanges overlapping the sides of the belt rotatable supports which are mounted on opposite sides of the channel member and rotatable cutters fixed to the supports for rotation therewith and presenting overlapping cutting edges directly above the longitudinal axis of the channel member so that each cutting member is in slidable contacting relation with the corresponding face of a guard member, a laterally deflecting guide member which is positioned between the rotatable supporting members and is substantially on contact with one of these rotatable supporting members and with the upper surfaces of the cutting members and is in lateral spaced relationship to the other supporting member, said latter supporting member having teeth which project from the side surface thereof to facilitate the transfer of excess tobacco above the channel away from the location of said channel. This transfer of the excess tobacco permits the delivery of the excess to the start of the feed and since the return of the excess tobacco is delivered along the channel and along the bottom of the conveyor, the undulated sections of tobacco which have been removed are returned to the rod in such fashion as to maintain the dimensional uniformity of the tobacco in the rod former and so that the uniformity is maintained in the continuous operation. As indicated above, the tobacco stream is held down in the absence of any vertical pressure so that the particles of tobacco in the stream are held down by gravity and by other particles of tobacco only. For delivering the excess tobacco to the start of the feed, as mentioned above, a doctor blade may be located above the channel member and in advance of the cutter.

An object of the invention is the combination of a rod former comprising a channel member, a conveying belt movable therein, guards secured to the upper edges of opposite sides of the channel member having downwardly projecting flanges overlapping the sides of the belt, rotatable cutters moving on rotatable supports on opposite sides of the channel member having overlapping cutting edges directly above the longitudinal axis of the channel member, each cutting member in slidable contacting relation with the corresponding face of the guard member, a deflecting guide member between the rotatable supporting member in contact with one of the supporting mem-

3

bers and the upper surface of the cutting member and in lateral spaced relationship to the other supporting member, and teeth on the last named supporting member to transfer the excess tobacco above the channel away from the location of the channel.

A further object of the invention is directed to a tobacco filler distributor for continuous roll-cigarette making machines in combination with a rod former comprising a channel member and a conveyor belt provided with adjustable lateral plates disposed on either side thereof, said lateral plates adjusting the width of the conveyor in the channel and of the tobacco stream carried on the conveyor belt and fed to the cigarette making device, micrometrically upper adjustable blade means for accurately adjusting the upper part of the converging flexible conveyor belt between said lateral plates, the lateral plates and adjustable means reducing the width of the conveyor belt and the tobacco stream and raising the height of said stream above the predetermined height corresponding to the tobacco stream density, tobacco stream amount and tobacco stream cross sectional volume completely sufficient for the supply of the cigarette making device, said distributor provided with dividing cylinders to accurately remove the excess above the predetermined height and to provide a smooth top surface to the tobacco stream fed to the cigarette making device.

A further object of the invention is directed to the combination of a conveyor belt provided with lateral plates coacting to provide a progressively narrower U-shaped channel for the carrying of a tobacco stream in said conveyor belt, with a dividing and separating device to accurately remove the excess of tobacco fed to the conveyor belt by a tobacco supplying means distributing tobacco in substantially uniform manner to said conveyor belt, the tobacco stream carried on the progressively converging U-shaped conveyor being divided by a pair of cylindrical dividing means, the first of said dividing means comprising a smooth faced cylinder, the second of said dividing means comprising a cylinder provided with peripherally extended prickles, and means for returning the excess tobacco separated from the tobacco stream to the tobacco fed supplying the distributor and conveyor belt.

Other and further objects of the present invention will appear from the more detailed description set forth below, it being understood that such more detailed description is given by way of illustration and explanation only and not by way of limitation.

Various methods of securing the desired separation between the surplus tobacco and the remainder of it are set forth in accordance with the description below.

An embodiment will now be described which is based upon the reasonably accurate assumption that the density of the tobacco deposited on the belt conveyor remains constant, i. e. that the weight of tobacco which is thus deposited in loose although more or less interlocked staples is constant for a given volume.

This embodiment of the invention aims at securing a tobacco stream of constant volume, and the following procedure is adopted:

1. Setting the distributor to deliver a tobacco stream that contains more tobacco than is necessary to obtain cigarettes of the desired mean weight and consequently the cross-sectional area of which will be larger than the one correspond-

4

ing to the desired mean weight; determining such a surplus so that even in those regions of the tobacco stream in which pits are present due to lack of uniformity in the supply, the section of the sliver shall be at least equal to the section corresponding to the desired mean weight.

2. At a definite point in the travel of the tobacco stream, removing the tobacco present in excess over the section above indicated.

3. Supplying and forming the cigarette with that tobacco stream only, which just fills the said section and returning the remainder to the bulk of tobacco in the distributor.

For the formation of the cigarette, a flow of tobacco of constant density is thus obtained which is free from knolls as well as from pits, as long as a sufficient excess tobacco is delivered by the distributor. The surface unevennesses of the tobacco stream is thus removed at the same time as the said excess tobacco is separated from the stream.

The accurate adjustment of the quantity of tobacco in the stream carried along by the conveyor belt after the excess tobacco has been removed therefrom is conducted in that zone where the stream has the highest vertical dimension and, the smallest transverse dimension.

Since a fairly open channel is utilized beneath the distributor in order to obtain a uniform filling of tobacco in the channel, it is necessary to convert a wide and shallow stream of tobacco into a narrow and relatively high stream without modifying its density.

Experience has indicated that by gradually contracting the side walls of the tobacco-stream containing channel according to the invention, that the tobacco is pressed without rising to an appreciable extent and gives a result which is the opposite of the desired action. On the contrary, if the transverse dimension of the lower portion of the channel is suddenly reduced without altering that of the upper portion, experience also shows that the tobacco arriving past this point of contraction is lifted and then flows in the upper portion of the channel without being compressed.

Consequently, the device for narrowing the tobacco stream without altering the density thereof, according to the invention consists of a pair of lateral plates disposed on either side of and engaging the lower portion of the conveyor belt that carries the tobacco stream to provide a first adjustment which may be fixed for a particular rod size in the rod former. These plates are so arranged to produce an abrupt reduction in width of the lower portion of the stream of tobacco transferred by the belt. Micrometric upper adjusting means may be provided for adjusting the gap between these lateral plates. A doctor blade located above the channel member and in advance of the cutter is provided for separating the excess tobacco from the stream thus abruptly contracted at its lower portion.

The drawings illustrate by way of example one embodiment of the invention. In the drawings:

Fig. 1 is a sectional view illustrating the arrangement of the conventional tobacco supply means and interengaging spiked wheel feeders to the distributor, conveyor and dividing means of the invention;

Fig. 2 is a plan view of the apparatus of the invention;

Figs. 3-6 are cross-sectional views at a greater scale according to the lines II-II to V-V of Fig. 2 respectively.

Fig. 7 is a longitudinal sectional view at the same scale as Fig. 2, along the line VI—VI of the preceding figures.

Figs. 8 and 9 are respectively a plan-view and a sectional view of a device for carrying away any excess tobacco.

In Figure 1, the conventional delivery arrangement is illustrated, wherein the tobacco feeding reservoir 25, containing the loose tobacco staple 21, the fibres of which are cut to size, is moved along conveyor belt 24 to engage the interengaging feeding spiked wheels 22 and 23 which are adapted to distribute a uniformly spread shower of tobacco onto the conveyor belt 1.

After the tobacco stream has been vertically divided in accordance with the invention, the excess tobacco falling at the end of the conveyor belt is collected on a bucket conveyor 17 driven and moveably guided by wheels 18 and 19 to return the tobacco excess through an adjustable return distributor 20, provided with an adjustable picker wheel which distributes the tobacco fibres returned to the tobacco supply in substantially the same state of subdivision as the tobacco supply from feeding wheels 22 and 23.

The tobacco stream from the distributor is carried along by the conveyor belt 1 slidably driven on the channel 2 through its edge portions 3 guided and held by the flanged edges 4 of plates 5. Then the lower portion of the conveyor belt engages the rounded edges 6 of lateral plates 7 parallel with each other and with the medial axis of the belt. The upper portion of the conveyor belt is subsequently gradually narrowed by reducing the gap between the upper plates 8 the edges 9 of which retain a given slope as will be seen in Figs. 4-6. The upper plates 8 are slidably mounted over the lower lateral plates 7 as shown in Fig. 6; the wedge formed between the upper plates controls the gradual convergence of the upper part of the flexible conveyor belt 1 and the slidably adjustable lower plates 7, adjustable by a thumb wheel and screw threads permits the narrowing or widening the lower trough of the conveyor belt. The same figures and Figures 8 and 9 illustrate how the rotary cutters 10 are adapted to remove the excess tobacco according to the plane of cutting indicated in chain-dotted lines.

The rotary cutters 10 are equipped with needle projections or spikes which are 0.2 or 0.3 mm. thick, this being preferable to a greater thickness such as 1 mm. for example. These cutters have a diameter of 103 mm. and the distance between their centers is 102 mm.; they overlap accordingly, in the cutting area, by a distance of 1 mm.: a greater overlapping would unduly perturb the tobacco stream. The peripheral speed of the cutters is higher by 15% than the linear speed of the tobacco stream.

The excess tobacco which is above the plane of cutting passes between the cylinders 11 and 12. The cylinder 11 is smooth; the cylinder 12 is provided with projecting needles or spikes 13 which cause the excess tobacco to be removed. This tobacco is thus circulated in the space 14 comprised between the cylinder 12 and the stationary piece 15. On leaving this space, the tobacco is separated from the cylinder 12 the doctor blade located above the channel member and in advance of the cutter directs the tobacco away from the channel and the tobacco falls upon a paddle-conveyor 17. The cleaner 16 prevents residual bits of tobacco from remaining caught on the spikes 13.

The paddle conveyor 17 carries up the excess tobacco back to the distributor as shown in Figures 1 and 9.

The cross-sectional area of the channel underlying the distributor may be substantially semi-circular with a radius of 14.5 mm. This area amounts to about 330 sq. mm.

The tobacco filler for a 70-mm. cigarette weighing about 1,200 milligrams, occupies cross sectional area ranging from about 285 to about 315 sq. mm. according to the density of the tobacco fed from the distributor. The average area is about 300 sq. mm.

Therefore, with about 300 sq. mm. of tobacco the semi-circular area will not be filled completely and the level of the top of the tobacco stream will be substantially about 13.5 mm. above the bottom of the conveyor belt channel.

Of course, the position of the tobacco stream in relation to the bottom of the conveyor belt is not an absolute certainty; the tobacco stream is somewhat stirred in the vertical direction and may sometimes leave a gap of one millimeter above the belt surface. As a consequence, the position of the cutting or levelling plane afforded by the rotary cutters may vary by one millimeter in relation to the bottom of the tobacco stream.

A one millimeter variation in a 13.5 mm. high tobacco stream represents about 8% of variation. Thus, with this height, variations would occur in the weight of the separate cigarettes such as to destroy part of the advantages resulting from the cutting step. Therefore, it is of advantage to adjust the level of the cutting plane at more than 13.5 mm. above the bottom surface of the belt. A value of 20.5 mm. gives excellent results. With a tobacco stream 20.5 mm. high, a one-millimeter variation thus represents only 5% variation in the finished cigarette, a tolerance heretofore unobtainable.

This 20.5 mm. height could be obtained as well by resorting to a narrower channel beneath the distributor. A 300 sq. mm. cross-sectional area requires a 15-mm. wide channel approximately. In this case the difficulty lies in regularly filling the cross-section offered to the incoming stream of tobacco. Due to the narrowness of the channel offered to the tobacco the latter will not properly line the channel, and inner cavities or soft portions will be formed therein so that the section situated beneath the plane of cutting will have an irregular density which results in finished cigarettes having an irregular density.

To compensate for the irregularity, a uniform and complete filling of tobacco is provided in the narrow channel. A wide open channel is maintained beneath the distributor in order to avoid interfering with the fall of tobacco thereon and to have a regular tobacco filler forming a stream with the highest possible uniformity density.

The thickness of the lateral plates acting on either side of the conveyor belt is less than that of the tobacco stream, that is about 8 or 9 mm. The lateral plates act through their upstream ends by abruptly reducing the width of the channel in the lower portion thereof.

The rise in height of the tobacco stream resulting from this narrowing of the channel offered thereto, occurs without compressing or altering the evenness of density provided that on the one hand the tobacco stream is acted upon just as it is delivered beneath the distributor hopper, that is, employing a low-density, uncompressed tobacco stream, and that on the other hand an

abrupt contraction is applied to the lower portion of the conveyor channel. With the very fast contraction of this lower portion of the channel the tobacco stream rises and occupies the upper, wide-open portion of the channel.

As the cutting plane lies about 20.5 mm. above the bottom of the conveyor belt, the cross-sectional area available for the tobacco stream beneath this plane amounts to about 270 sq. mm. with about a 5-mm. gap between the lateral plates and about 300 sq. mm. with about an 8 mm. gap. and about 340 sq. mm. with about a 12 mm.-gap.

As a result, the rise in the height of the tobacco stream occurs exactly at the point where these lateral plates engage the tobacco stream, through the belt the up-stream ends of these plates being situated at the entrance of a tapered channel preceded by the cylindrical channel positioned beneath the distributor.

When this height rise is effected, the upper portion of the stream is so compressed in the tapered channel that the cutter-engaging stream of tobacco will have the necessary compactness to insure uniformity in weight, volume and upper surface (see sectional view IV—IV, Fig. 4).

The use of lateral plates for obtaining a relatively high tobacco stream is also advantageous in that it provides a means for adjusting the average weight of the manufactured cigarettes. By varying the gap between these lateral plates the cross-sectional area available for the tobacco stream under the plane of cutting varies accordingly as indicated above. This variation is about 10 sq. mm. per mm. of variation in the plate spacing. Practically about 1 mm. of the latter means about 40 milligrams of variation in weight.

A 40-milligram variation in the weight of a cigarette with a 10 sq. mm. variation in the cross-sectional area of the tobacco stream occurs without compression since 300 sq. mm. correspond to a cigarette weighing 1,200 milligrams.

A cigarette-making machine equipped with the device of this invention produces cigarettes the weight of which varies less than the cigarettes made on a conventional machine. In other words, less dispersion than that of cigarettes produced by conventional machines is afforded by the invention.

If this dispersion is noted in terms of the interval in milligrams which contains 95% of the individual weight of the cigarettes, it will be seen that with cigarettes weighing 1,200 milligrams this interval amounts to 290 milligrams in machines without the device of the invention, 220 milligrams in machines with the device of the invention.

For obtaining the desired accuracy the excess tobacco should be removed from the stream when the latter fills a narrow channel in a regular manner, slightly in excess of the normal content of this channel; for this purpose, the channel utilized is fairly wide or open beneath the distributor for not interfering with the fall of tobacco therein and the regular formation of the filler, so that the latter will have a density as constant as possible. For increasing the height of this tobacco stream a device is used whereby the tobacco rises without being compressed and without modifying its uniformity as far as its density is concerned.

The present application is a continuation-in-

part of applicant's co-pending U. S. application, Serial No. 76,294, filed February 14, 1949.

Having thus disclosed the invention what is claimed is:

1. In a cigarette making machine, a rod former comprising a channel member, a conveying belt movable over said channel member, guards secured to the upper edges of opposite sides of said channel member having downwardly projecting flanges, said downwardly projecting flanges overlapping the ends of said belt, rotatable supports mounted on opposite sides of said channel member, rotatable cutters fixed to said supports to rotate therewith having overlapping cutting edges directly above the longitudinal axis of said channel member, each cutting member being in slidable contacting relation with the corresponding face of a guard member, a laterally deflecting guide member having arcuate sides positioned between the rotatable supporting members and having one of its arcuate sides substantially in contact with one of these supporting members and having its lower surface in contact with the upper surfaces of the cutting members and having its other arcuate side in lateral spaced relation to the other supporting member, said latter supporting member having teeth projecting from the side surface thereof to facilitate transferring the excess tobacco above the channel away from the location of the channel.

2. A cigarette making machine as claimed in claim 1, wherein delivering means are provided to deliver the excess tobacco transferred away from said channel to the start of the feed at the bottom of the rod.

3. A cigarette making machine as claimed in claim 1, wherein said machine is provided with a doctor blade located above said channel member and in advance of said cutters to facilitate the transfer of the excess tobacco above the channel away from the location of said channel.

4. A cigarette making machine as claimed in claim 1, wherein said conveyor belt is provided with adjusting means on opposite sides thereof to reduce the width of the lower portion of the conveyor belt and the tobacco stream carried therein and to simultaneously increase the height of the tobacco stream, whereby the tobacco filler throughout the whole length of the conveyor belt is held down on said conveyor belt by gravity and other particles of tobacco in said stream only.

5. A cigarette making machine as claimed in claim 4, wherein said conveyor belt is further provided on opposite sides of said belt with micrometrically adjustable upper means for the fine adjustment of the spacing between opposite sides of said belt.

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