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TOBACCO MANIPULATING MACHINES

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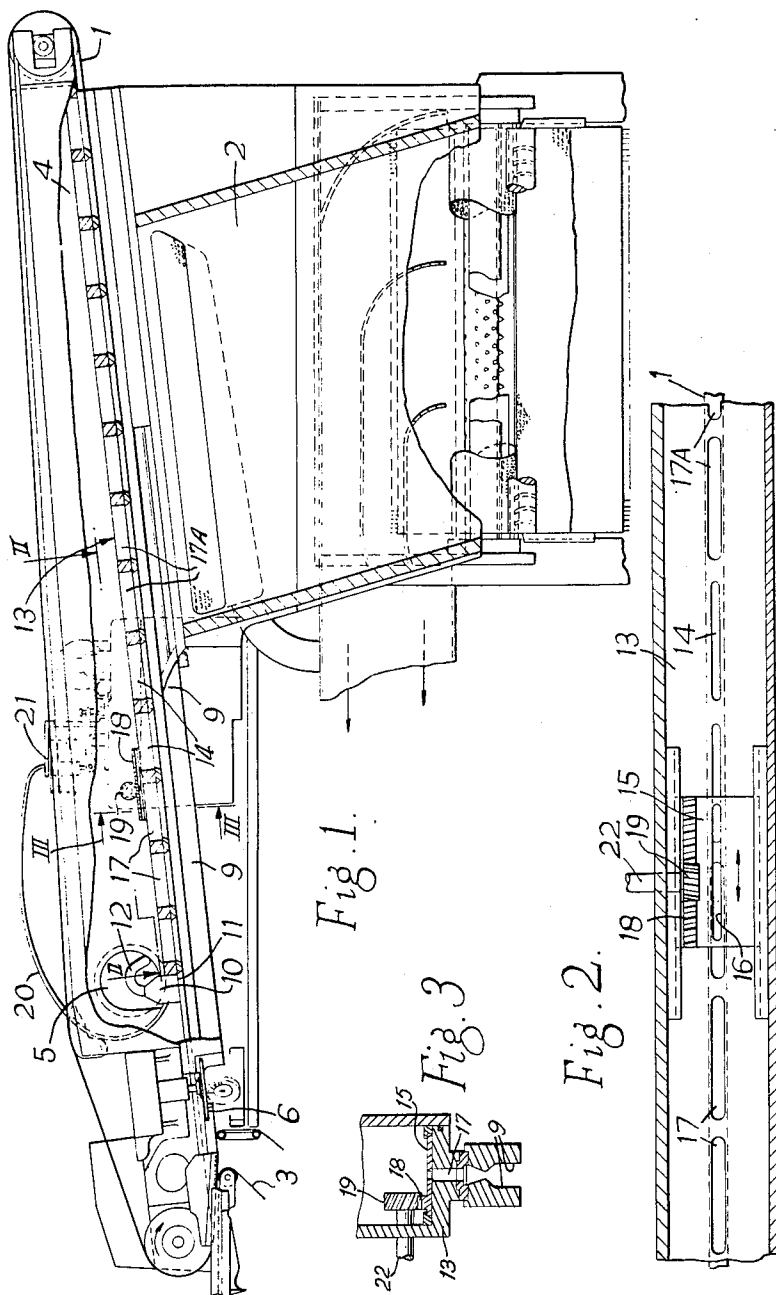


Fig. 1.

Fig. 3

Fig. 2.

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TOBACCO MANIPULATING MACHINES

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6 Claims. (Cl. 131—21)

This invention relates to tobacco manipulating machines in which cut tobacco is formed into a continuous tobacco filler for use in continuous rod. More specifically the invention relates to a method and apparatus for producing a continuous tobacco filler having uniform density.

Machines for manipulating tobacco to form an elongated continuous filler which is conveyed lengthwise and assisted by suction have been known for many years. One of the major problems with this type of machine is to maintain the mass per unit length of the filler uniform since any variations in mass cause undesirable fluctuations in the density of the tobacco filler in the cigarette rod produced therefrom. One means of reducing these density variations is to provide means for detecting variations in the mass of the filler as it passes a given position on the conveyor and then further along the conveyor to provide trimming means, controlled by the detecting means, for removing varying amounts of surplus tobacco as is necessary to produce a filler having a nearly constant mass as possible. This means of controlling variations in mass has not been very satisfactory, because it does not produce a perfect result.

It is an object of the present invention to provide a method and apparatus for obtaining a continuous filler for use in cigarette rod having a consistently uniform mass per unit length.

Briefly, according to the present invention, a method and apparatus is provided for improving the uniformity of the mass per unit length of the filler as it is conveyed through the tobacco manipulating machine. The method comprises the steps of subjecting a controlled length of the continuously moving filler on the conveyor to a substantially uniform pressure to compact the filler, detecting variations in the mass per unit length of the filler and controlling in accordance with said variations the length of the filler and consequently the time to which the filler is subjected to said compacting pressure. The method is based on the fact that by varying the length of time the filler is subjected to the compacting pressure the density of the filler may be correspondingly varied. The compacted filler is trimmed following the detecting operation either by a trimming device set a fixed distance from the conveyor or by a trimming device which is adjusted in response to further sensing means operating on the filler and located beyond the trimming device.

For a better understanding of the nature of this invention reference is made to the following detailed description of one preferred embodiment thereof in conjunction with the accompanying drawings: wherein,

FIGURE 1 is a front elevation partly in section of part of a continuous rod cigarette-making machine,

FIGURE 2 shows on an enlarged scale a fragmentary sectional plan view taken substantially on the line II—II

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in FIGURE 1, the perforations in the conveying band being omitted for clarity, and

FIGURE 3 shows on an enlarged scale a fragmentary sectional view taken substantially on the line III—III in FIGURE 1.

In the machine illustrated in FIGURE 1 the lower course of a perforated endless conveyor band 1 runs from right to left as shown in the drawing through the upper portion of a passage 2, the passage being narrow in the direction perpendicular to the plane of FIGURE 1. From the passage 2 the band runs through a channel open to the atmosphere and which is defined by opposed walls 9. Above the lower course of the conveyor band 1 is a suction chamber 4 with an exhaust pipe 5 which communicates with pumping means which is not illustrated. A continuous flow of air, inducted by the pumping means is drawn through the lower course of conveyor band 1 into the suction chamber 4. The current of air drawn through the portion of the conveyor band 1 in the upper portion of passage 2 flows upwardly through passage 2 carrying with it cut tobacco which is deposited on the under side of the moving conveyor band 1 where it is held suctionally. The tobacco filler as it builds up is carried by the conveyor band 1 out of passage 2 into the channel where the tobacco is confined laterally by the walls 9. An amount of cut tobacco in excess of that required for the cigarette rod is built up on the conveyor band before it leaves passage 2. In the channel the tobacco continues to be held suctionally by air drawn from the atmosphere through the conveyor band 1 into the suction chamber 4.

Further along the channel a trimming device 6 is provided which removes surplus tobacco from the filler. The trimming device 6 comprises two co-operating trimming discs only one of which is shown in FIGURE 1. It is in a fixed position relative to the conveyor band 1 so that the filler will be trimmed to a constant cross-sectional area, i.e., the area delineated by discs of the trimming device, the walls 9 and the band 1. The mass per unit length of the trimmed filler will depend on the density or compactness of the filler before trimming and any variations in the density of the built-up filler before the trimming operation will result in corresponding variations in the mass per unit length of the filler after trimming ultimately resulting in a cigarette rod in which the density of the tobacco filler will vary along its length. After passing the trimming device the filler is transferred from the conveyor band 1 onto a continuously moving paper web 3 which is folded over the trimmed filler to form the continuous paper wrapper on the cigarette rod. The above detailed description is of a conventional tobacco manipulating machine such as is described in United States Patent No. 3,030,965 issued to Francis A. M. Labbé April 24, 1962, and forms no part of the present invention. The following is a detailed description of the improvement in the above described machine which avoids or at least reduces variations in the mass per unit length of the trimmed filler.

Air flow passing through the filler into chamber 4 is restricted to some extent by a slotted plate 13 located immediately above the conveyor band 1. The plate 13 contains both large slots 17 and 17A and narrow slots 14. The large slots 17A are inside the filler forming part of the machine and over the passage 2 and the

narrow slots 14 and large slots 17 are down stream from slots 17A. When the built-up tobacco filler moves to the left as viewed in FIGURE 1 away from the confines of the passage 2, it is open to atmosphere. The pressure of the air passing through the tobacco filler and the slots 14 falls from atmospheric pressure to the pressure present in the suction chamber 4. The proportion of this over-all pressure drop which is produced by the slots 14 will depend on the size of these slots. As the remainder of this over-all pressure drop is produced across the tobacco filler the pressure drop across the filler will also depend on the size of slots 14. Superimposed over the portion of slotted plate 13 containing narrow slots 14 and the first adjoining large slot 17 is a sliding plate 15 having a single long slot 16 which is of the same width as the slots 14. The movement of the sliding plate 15 lengthwise along slotted plate 13 is mechanically controlled through a rack 18 on one side of the sliding plate which is engaged by pinion 19 mounted on shaft 22. Rotation of the pinion will cause the sliding plate 15 to move along the slotted plate 13 permitting the long narrow slot 16 in the sliding plate 15 to cover varying proportions of large slot 17 immediately below it.

Above the conveyor band 1 and downstream from the sliding plate 15 is provided a sensing chamber 10 which has an opening 11 in communication with the conveyor band, the length of the opening 11 being less than a cigarette length. A pipe 12 extends from chamber 10 into the exhaust pipe 5 so that air is drawn through the filler, the conveyor band and the chamber in the same manner as air is drawn through the conveyor band elsewhere. Variations from point to point along the length of the filler in the air permeability of the filler which are an indication of variations in density of the filler from point to point along its length, cause corresponding variations in the air pressure drop. There will be a greater flow of air through a length of filler which is less dense than through a length of filler which is more dense, and thus there will be a higher pressure in chamber 10 in the first case than in the second case. The sensing chamber 10 is connected by a small diameter pipe 20 to a bellows device 21 so that the bellows may move in and out in accordance with changes in the pressure in the sensing chamber 10, and this movement is utilized through the use of a suitable amplifying device such as an electro-mechanical device of known construction to cause shaft 22 and pinion 19 to rotate thus moving sliding plate 15.

It will be readily observed that between the left-hand edge of sliding plate 15 and the sensing chamber 10 the tobacco filler will be subjected to a substantially uniform pressure drop which is greater than the pressure drop across the tobacco filler when it was passing the narrower slots 14, as a smaller pressure drop will occur across the slots 17 than across the slots 14. By varying the length of and correspondingly the length of time the tobacco filler is subjected to the greater pressure drop in response to fluctuations in the density of the filler as detected by the sensing chamber 10 the filler becomes compacted and will be more uniform in density than it was when the filler was positioned on the portion of the conveyor length beneath slots 14. If the sliding plate 15 moves to the left as viewed in FIGURES 1 and 2 there will be a greater length of tobacco filler subjected to the air flow through the narrow slots 14 and 16 and a shorter length of the tobacco filler subjected to the air flow through the wider slots 17. In this way a very delicate adjustment is provided to the aforesaid given length of tobacco filler over which the maximum air pressure is employed. Adjustments in pressure drop caused by movement of sliding plate 15 are nominal compared with the over-all pressure drop along the full length of the conveyor band thus the over-all pressure drop

remains substantially constant, irrespective of these minute adjustments.

The tobacco filler normally travels at a uniform speed and, therefore, by adjusting the length of tobacco filler which is subjected to the greater pressure drop under wider slots 17 the length of time to which the continuously moving filler is subjected to this compacting pressure is varied thereby making it possible to produce a tobacco filler having very little, if any, variation in density before the filler is subjected to the trimming operation, and an improved cigarette rod is thus produced having a substantially constant density along its length.

What I claim as my invention and desire to secure by Letters Patent is:

1. In the manufacture of cigarettes on a continuous rod cigarette-making machine, a method of forming a continuous trimmed tobacco filler which comprises the steps of forming an elongated continuous tobacco filler having at all points along its length an excess of tobacco over that required in the continuous cigarette rod, trimming the filler to remove the surplus tobacco whilst conveying the filler in the direction of its length, applying a substantially constant compacting pressure to the filler, at least before it is trimmed to increase the density of the filler during the trimming operation, detecting variations in the density of the filler, and varying in accordance with said variations in density the period of time during which said compacting pressure is applied.

2. A continuous rod cigarette-making machine comprising means to form an elongated continuous tobacco filler having at all points along its length a surplus of tobacco over that required in the cigarette rod, a conveyor to convey the filler lengthwise, a trimming device to remove the surplus tobacco, a sensing device to detect variations in the density of the filler, means to apply a substantially constant compacting pressure to a length of the filler at least before it is trimmed, to increase the density of the filler at the trimming device, and means responsive to the variations sensed by said detecting device to vary the length of the filler to which the compacting pressure is applied.

3. A machine as claimed in claim 2 wherein the sensing device is situated to immediately precede the trimming device to detect variations in the density of the filler after the compacting pressure has been applied to the filler.

4. A machine as claimed in claim 2 wherein the conveyor is air pervious, and further comprising a suction chamber to draw air through the filler and the conveyor to hold the filler to the conveyor, and wherein the means to apply the said compacting pressure to the filler comprises means to increase the air flow through said length of the filler to vary the pressure applied to said length of the filler compared with the airflow through the filler at least immediately upstream of said length.

5. A machine as claimed in claim 4 and comprising a first air-permeable plate between the conveyor and the suction chamber, the first plate having a first area having a first value of air permeability along said length of the filler, and having a second area having a second and lower value of air permeability at least immediately preceding said length of the filler, whereby the air flow through said length of the filler is increased, and wherein the means to vary said length of the filler comprises a second plate having the same air permeability as the lower value of air permeability of the fixed plate, means mounting said second plate against the first plate for sliding movement relative thereto, and between a position in which the second plate overlaps the first area of the first plate, and a position in which the second plate overlaps the second area of the first plate, and means operable by said sensing device to vary the position of the second plate between said two positions.

6. A machine as claimed in claim 4 and comprising a first plate between the conveyor and the suction cham-

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ber, the first plate having means defining a first set of apertures immediately preceding said length of the filler in the direction of travel of the filler, and means defining a second set of apertures larger than the apertures of said first set along said length of the filler to increase the air flow through said length of the filler, and wherein the means to vary said length of the filler comprises a second plate mounted against the first plate for sliding movement relative thereto and having means defining an aperture of the same size as the apertures of said first set, and means operable by said sensing device to move the second plate in the direction of the lengthwise dimension of the filler to vary the amount of overlap between the aperture in the second plate and the first and second sets of apertures in the first plate.

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