May 29, 1962 D. W. MOLINS 3,036,578

TOBACCO MANIPULATING MACHINES

Filed March 28, 1958 3 Sheets-Sheet 1

Fig. 1

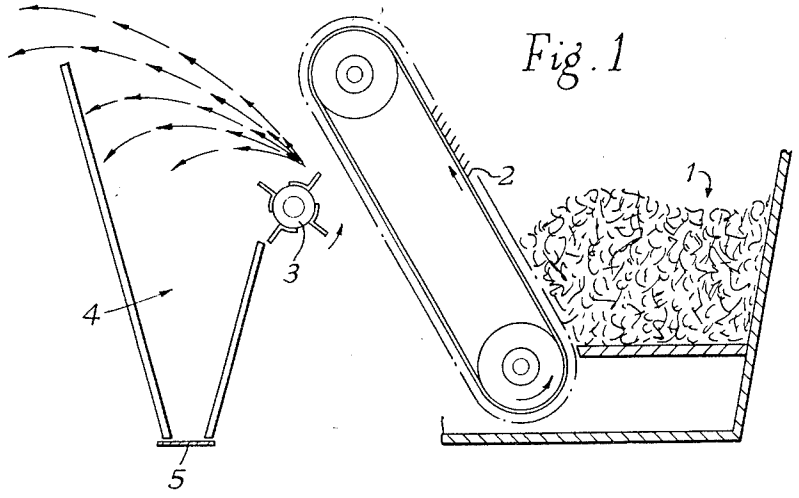
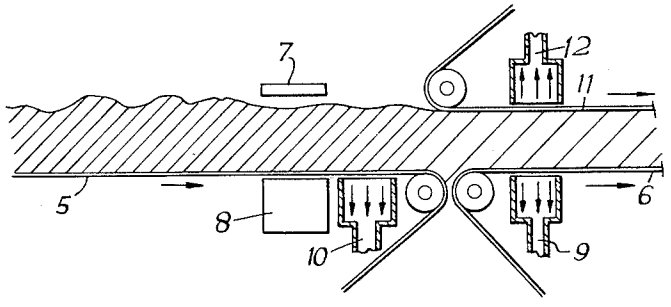


Fig. 2.



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Filed March 28, 1958 3 Sheets-Sheet 2

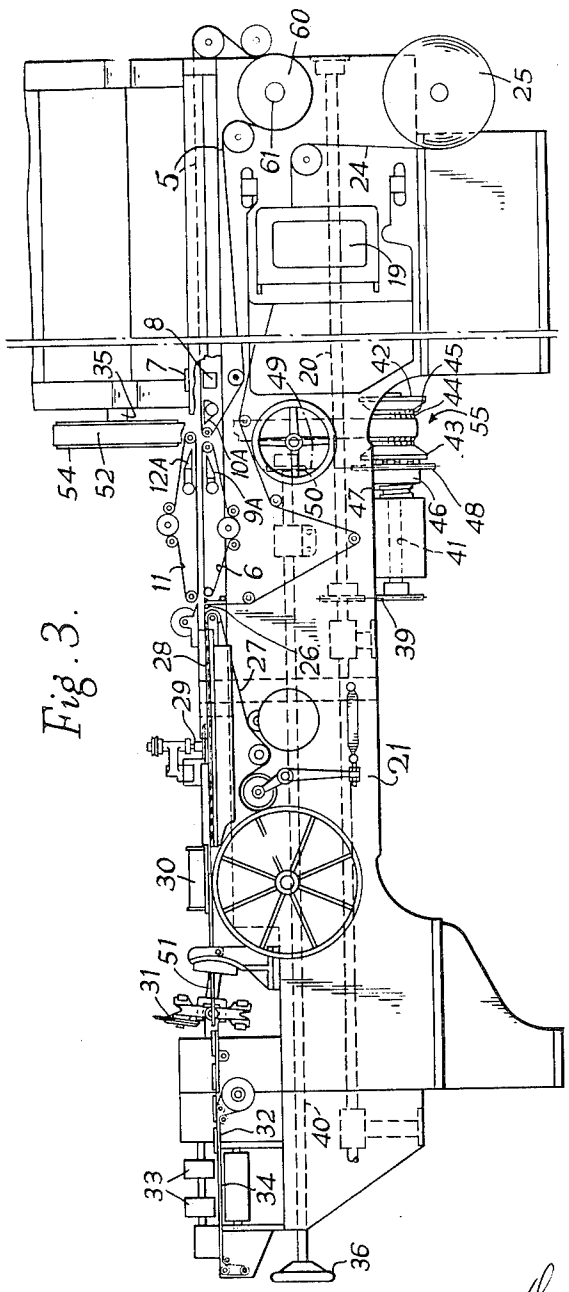


Fig. 3.

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Filed March 28, 1958 3 Sheets-Sheet 3

Fig. 4.

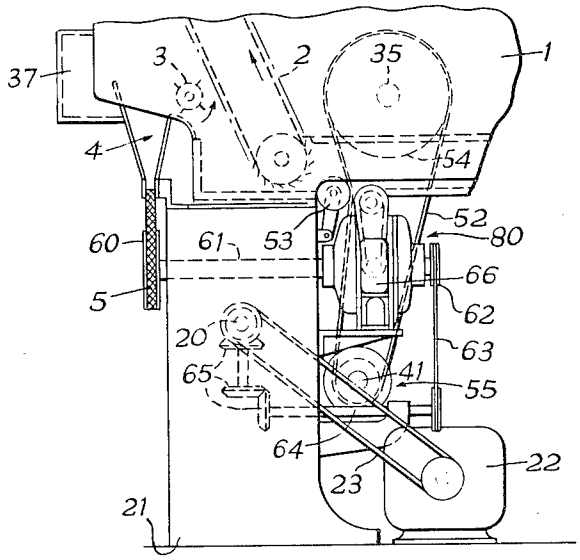
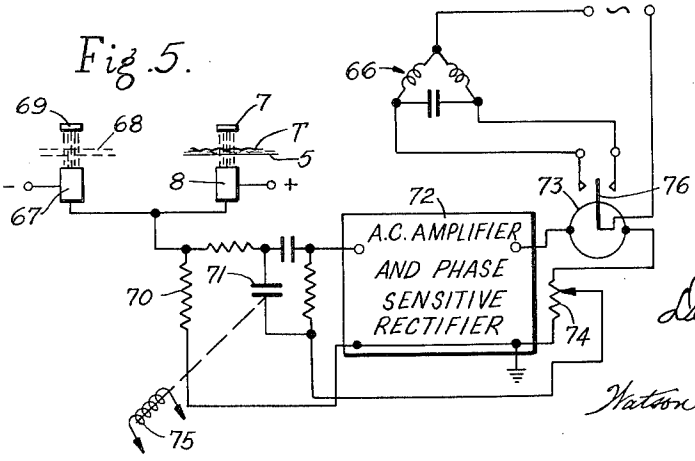


Fig. 5.



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TOBACCO MANIPULATING MACHINES

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Claims priority, application Great Britain Mar. 28, 1957
2 Claims. (Cl. 131—21)

This invention concerns improvements in or relating to tobacco manipulating machines, that is, machines such as continuous rod cigarette making machines where shredded tobacco is fed from a supply in a hopper, and showered on to a conveyor, and formed into a filler which can be enclosed in a wrapper to form a continuous wrapped rod which may be cut into lengths, such as separate cigarettes.

The production of a filler of substantially uniform density which is commercially desirable, is a very difficult matter and hitherto much attention has been paid to the design and construction of the hopper mechanism in an attempt to provide a fairly uniform shower and in consequence these hoppers have been large, complex and costly.

It is proposed in the present invention to provide simple and economically constructed devices for forming the shower and to manipulate the collected shower to improve its uniformity.

According to the invention there is provided a tobacco manipulating machine comprising a conveyor for receiving and collecting tobacco shreds as a stream or filler (for example, a continuous stream or filler comprising tobacco sections alternating with stub sections), a further conveyor receiving the stream from the first conveyor and means for manipulating the stream to reduce its cross-section, a device for measuring the mass of the stream on the first conveyor at the delivery end thereof and for altering the speed of said conveyor so that the quantity of tobacco delivered to the second said conveyor varies in inverse proportion to the measured mass of the stream on the first conveyor. The term "stub section" means a length of material such as is used to provide a cigarette with a filter or other mouthpiece.

The tobacco fed to the conveyor may be as a shower and shower forming devices may comprise a hopper having an endless carded band which lifts tobacco from a mass in the hopper and raises it to a position at which it can leave the upper end of the band and fall on to a throwing device such as a bladed wheel which throws the tobacco across the top of a chute down which some tobacco can fall while stems and heavy particles pass beyond the chute for separate collection, the tobacco falling down the chute being collected as a stream on a conveyor moving lengthwise of the chute. This conveyor which constitutes the first conveyor mentioned in the previous paragraph may move slower than the second conveyor and the stream is therefore deeper (and/or wider) than the stream on the second conveyor.

The measuring or detecting device, which may be a radiation gauge, is positioned near the delivery end of the first conveyor and is coupled in any known manner to speed changing devices for altering the speed of the first conveyor.

Means may be provided for exerting suction through the first conveyor near its delivery end so as to tend to hold tobacco thereto while the second conveyor is subjected in a similar manner to suction so as to pull tobacco away from the first conveyor whereby the transfer of tobacco is suitably controlled. An upper conveyor may be associated with the second conveyor and be similarly provided with suction devices so that the stream on the

first conveyor is entirely and effectively transferred to the second conveyor.

Manipulation of the stream to reduce the cross-section is preferably effected by a speed difference between the two conveyors, the second conveyor being faster so that the stream first formed is drawn out or attenuated as it passes to the second conveyor. This operation may be repeated at any subsequent transfer.

From the second conveyor the tobacco may be transferred to another conveyor on which it is formed into the final filler or, if desired, the second conveyor may itself be arranged to form the filler, all according to the chosen difference in the speeds of the first and second conveyors, or alternatively to the different cross-sections of stream desired on the respective conveyors.

Usually it will be desirable to transfer tobacco on the first conveyor to a further conveyor for filler formation and the transfer may be effected by a picking operation or by a suction transfer device or direct delivery.

The invention will be more fully described with reference to the accompanying drawings in which:

FIGURE 1 is a sectional view of a hopper chute and the first conveyor.

FIGURE 2 is a section along the first conveyor showing the transfer to the second conveyor.

FIGURE 3 is a small scale view of a cigarette making machine embodying the invention.

FIGURE 4 is a view of the right-hand end of FIGURE 3.

FIGURE 5 is a circuit diagram showing the essentials of the beta ray control.

In FIGURE 1, a hopper 1 has a sloping carded conveyor 2 which picks up tobacco from the mass at the bottom of the hopper and conveys it upwards so that it falls off as the conveyor turns round its supporting pulley. If necessary the tobacco may be picked from the carding on the conveyor 2 in the known manner. The tobacco falling from the carded conveyor drops on to a rapidly rotating bladed wheel or winnower 3 which throws it as indicated by the arrow lines across the top of a chute 4. Much of the tobacco does not rise high enough to pass the far wall of the chute and falls down the chute, but hard, heavy pieces such as pieces of stem go over said wall and are collected in a box which may be seen at 37 in FIGURE 4.

Tobacco falling down the chute is deposited on a conveyor 5 shown in section and moving at right angles to the plane of the drawing. In this way the tobacco showered by the winnower forms as a stream on said conveyor.

Referring now to FIGURE 2, the stream formed on the conveyor 5 is shown as being very irregular in depth, which means generally that there is more tobacco at the deeper portions, though the drawing is deliberately exaggerated. Near to the delivery end of the conveyor is a second conveyor 6 and it will be seen that tobacco must be transferred to the second conveyor, but to ensure proper transfer and an improved distribution on the second conveyor the following devices are provided. The density of the tobacco near the end of the first conveyor is measured by a radiation gauge having a source 7 and a ray-responsive device 8.

According to the result of the measurement, the speed of conveyor 5 is altered in any known way so that the tobacco during transfer is reduced or increased in amount per unit of time passing to the conveyor 6. A suction device 9 associated with conveyor 6 causes the latter to engage the tobacco with a somewhat positive grip as the conveyor band may be made fairly porous and in order that this does not result in pulling unwarranted amounts of tobacco from the conveyor 5, the latter is also provided with a suction device at 10. By suitably arranging

the extent and power of the suction devices the transfer of tobacco takes place at a rate determined only by the difference in speeds of the two conveyors. The conveyor 6 travels at a constant speed which may be three times the speed of conveyor 5 and assuming that conveyor 6 is travelling at a constant speed the mass per unit length on conveyor 6 will be one third of that on conveyor 5. However, the speed of conveyor 5 will fluctuate according to the speed control exerted on conveyor 5 as a result of the action of the radiation gauge and the stream on conveyor 6 will be more uniform than that on conveyor 5.

Above the conveyor 6 is another conveyor 11 provided with a suction device at 12. With this arrangement the pull on the tobacco is more precise and effective than with a single conveyor 6.

Referring now to FIGURES 3 and 4 which show a small scale representation of a complete cigarette machine embodying the invention the various mechanisms of the machine are driven from a mainshaft 20 housed within the bed 21 of the machine. The mainshaft is shown as driven from an electric motor 22 by a belt 23.

A paper web 24 is drawn from a reel 25 over the various rollers shown in FIGURE 3, passing through a printer 19 and finally over a small roller 26 which leads it on to an endless tape 27. The loose tobacco filler, formed as hereafter described, is delivered to the paper web at the position occupied by the small roller 26 and the tape 27 carries the loaded web through folders and other devices indicated by the reference 28 where the paper is wrapped around the tobacco filler to form a continuous cigarette rod marked 51. The edges of the paper are secured together by paste from a paster 29 whereafter the rod passes beneath a heater 30 which dries the paste, after which the rod is cut into separate cigarettes by a cut-off 31. These cigarettes pass on to an endless tape conveyor 32, which carries them to a deflector device 33 where deflector blades move the cigarettes out of the rod line and deliver them to a catcher band 34. The mechanism of the hopper 1 is driven from a shaft 35 whose speed can be regulated in any known automatic manner but for simplicity regulation is shown in the present case as being effected by a handwheel 36 on a shaft 40, as will now be explained. A shaft 41 which is driven from the mainshaft 20 by a chain 39 is provided with an expanding pulley device 55. This consists of a fixed cone 42 and a movable cone 43 slidable on a spline on the shaft 41. Between the cones are a number of curved segments 44 which can slide in grooves in the cones as the latter move towards and away from one another and are held to the cones by spring rings 45. The movable cone 43 is moved by a screwed bush 46 which runs on a fixed screw 47 which constitutes a bearing for the shaft 41, the bush being rotated by a sprocket wheel 48 rotatable by the handwheel shaft 40 through a chain 49 and sprocket wheel 50, the hub of the sprocket 48 comprising the screwed bush 46. Suitable thrust rings are provided and as the bush 46 rotates one way the cone 43 is moved in towards the other or, in the reverse direction, the pull of a belt 52 running on the expanding pulley 55 opens the cones. A jockey pulley 53, FIGURE 4, takes up the slack in the belt 52 which passes over a larger pulley 54 on the shaft 35.

The tape 5 is driven in the following manner. As will be seen from FIGURE 3 the tape passes round a driving drum 60 fixed on a shaft 61. At the other end of the shaft 61 is a variable speed gear device 30 known as a variator (British patent specification No. 618,774, filed January 29, 1946) whose output shaft is connected to the shaft 61. The input shaft of the gear has a pulley 62 on it connected by a belt 63 to an intermediate shaft 64 coupled by bevel wheels 65 to the mainshaft 20. A

reversible electric motor 66 shifts the regulating shaft of the variator and this motor is started or stopped as necessary under control of the radiation gauge 7, 8. In FIGURES 3 and 4 the suction nozzles are shown in a slightly different shape and are therefore marked 9A, 10A, and 12A respectively.

As shown in FIGURE 3 the conveyor carries the attenuated stream along to a position where it is delivered to a further conveyor, in this case the paper web 24 carried by and moving at the same speed as the garniture tape 27. Delivery to such a further conveyor may be effected by direct transfer as shown in FIGURE 3.

Referring now to FIGURE 5 the ionization chamber 8 of the gauge is connected with another similar chamber 67 of another radiation gauge which has a given absorber 68 between its chamber and its source 69 and acts in the known manner as a balancer as its absorber is nominally equivalent to the tobacco mass T passing through the other gauge. The difference between the chamber outputs is fed to a resistor 70 to develop a D.C. voltage across it. This voltage is converted to A.C. by a dynamic condenser 71 and amplified and converted back to D.C. by an amplifier and a phase-sensitive rectifier, indicated by a block diagram 72 and fed to a relay 73 and thence to a feedback resistor 74 in which the output current develops a voltage which is fed back to the lower end of the dynamic condenser to oppose the voltage produced by the input current. An A.C. drive for the dynamic condenser is shown at 75. According to the position of the tongue 76 of the relay 73, A.C. is fed to one or other of the coils of the motor 66 and the motor rotates in a corresponding direction and, if the motor moves, the speed tape 5 is increased or decreased by the change in the speed ratio of the variator.

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

1. A continuous rod cigarette making machine comprising a lengthwise moving conveyor and means for showering tobacco onto said conveyor to form a stream thereon, a second conveyor arranged to receive the stream endwise from the first conveyor and moving faster than the first conveyor whereby the stream is drawn out lengthwise during transfer and its cross section is reduced, a device for measuring the mass of the stream on the first conveyor and positioned at the delivery end of said conveyor and having apparatus associated therewith for altering the speed of said first conveyor so that the quantity of tobacco delivered per unit of time to the second conveyor varies in inverse proportion to the measured mass of the stream on the first conveyor, said machine comprising means for exerting suction through the first conveyor near its delivery end so as to tend to hold tobacco thereto and means for exerting suction through the second conveyor so as to pull tobacco away from the first conveyor, whereby the transfer of tobacco is suitably controlled.

2. A machine as claimed in claim 1 comprising an upper conveyor associated with the second conveyor and provided with suction devices, so that the stream on the first conveyor is entirely and effectively transferred to the second conveyor.

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