Jan. 22, 1963 C. S. McARTHUR 3,074,413

CIGARETTE MAKING MACHINE

Filed March 13, 1959 2 Sheets-Sheet 1

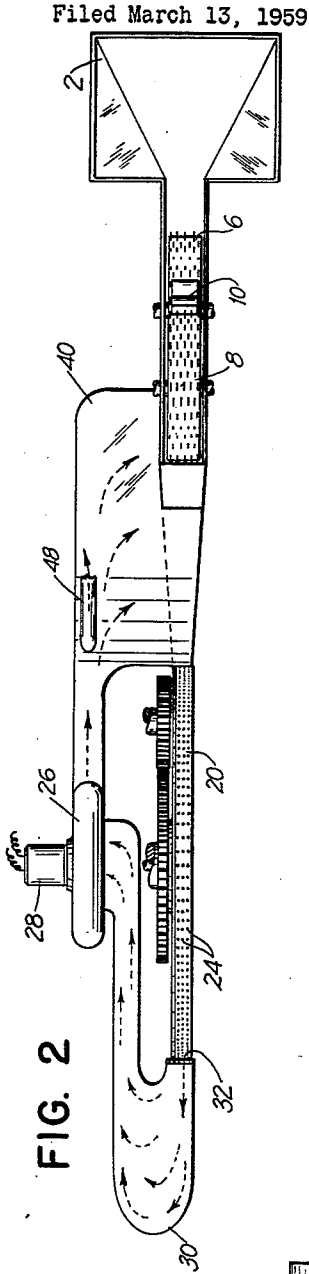


FIG. 2

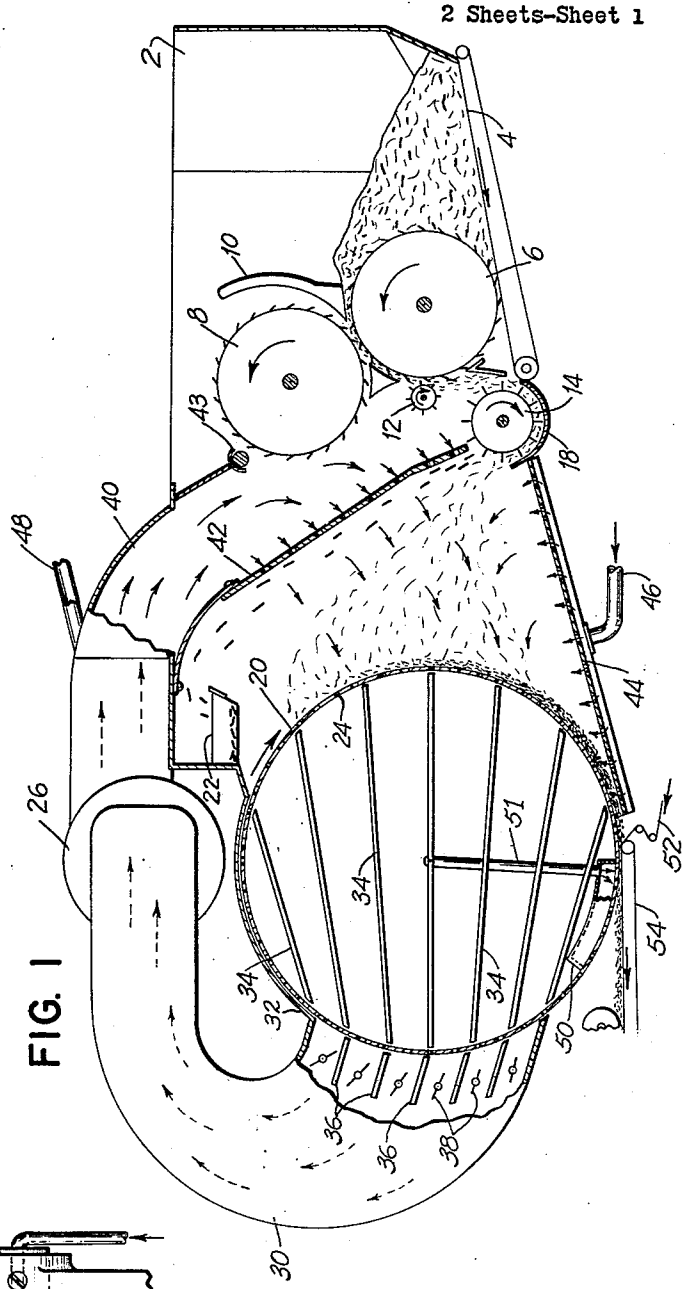


FIG. 1

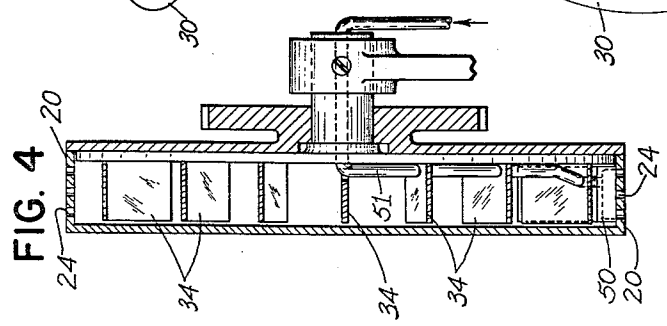


FIG. 4

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2 Sheets-Sheet 2

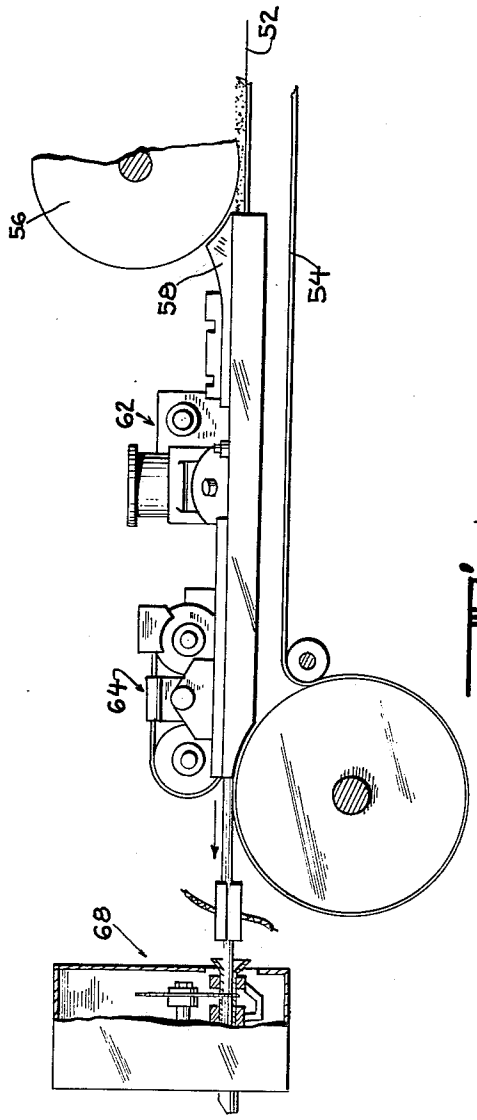


Fig. 3

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CIGARETTE MAKING MACHINE

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This invention relates to apparatus for manipulating tobacco of the type normally employed for producing a continuous rod or rope of tobacco.

It is well known that the rope of tobacco produced by cigarette marking machines in common use today contains variations in mass per unit length which result in variations in the individual weights of the cigarettes finally produced. These variations are objectionable for a number of reasons. The smoker in consuming one cigarette which is filled differently from the next would find that the burning rate would be different depending on the density of tobacco in the cigarette. This would affect the temperature and the taste of the smoke produced.

The manufacturer of such cigarettes is also interested in maintaining a constant weight because such uniformity would enable him to maintain a much better control over the quality and the yield; that is, the number of cigarettes produced from a given amount of tobacco. Existing machinery almost universally employs the method of showering separate strands of tobacco downwardly onto a moving horizontal band or cigarette paper web for the purpose of forming the endless stream of tobacco. Where the tobacco meets the band it suffers a violent change in direction of motion which entails slipping and bouncing of the tobacco particles resulting in a disturbance in terms of uniformity of flow. This fault becomes worse as the speed of the machine is increased, so that in practice this is one factor contributing to the limitation of machine speeds. Thus, if it is desired to increase machine speeds much above those which are currently employed today, it is necessary to find means of avoiding the disturbance at the point in which the tobacco rope is built up from individual strands of tobacco.

It is an object of this invention to provide means for producing a rope of tobacco which is more uniform than that produced by previous mechanisms.

Other objects and features of this invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters or reference have been applied to corresponding parts throughout all of the views which make up the drawings.

FIG. 1 is a view in elevation of the apparatus according to the invention, with portions thereof shown in section;

FIG. 2 is a plan view thereof, with a portion shown in section;

FIG. 3 is a view in elevation of the cigarette rod forming mechanism with a portion shown in section; and

FIG. 4 is a partial vertical section, taken to an enlarged scale.

The machine constructed according to this invention may be briefly described as follows:

Tobacco in bulk is placed in a hopper **2** in which it rests upon a feeding band **4** which carries it forwardly towards a carded roller **6** which rotates in the direction of the arrow shown. Above this roller **6** is carried another carded roller **8** rotating in the direction of the arrow, the function of which is to brush back or remove the surplus tobacco carried in the tines of the carding on **6**, permitting only the desired amount to pass between the rollers.

In order to improve the uniformity of the filling of

the tobacco in the tines of the carding on **6**, reciprocating tampers **10** are provided which periodically press the tobacco into the carding. Continued counter-clockwise movement of the drum **6** carries the carpet of tobacco which is formed in its carding teeth to the rotating picker roller **12** which removes the tobacco from the tines of the carding on the drum **6** in the form of a shower of substantially discrete particles. These are thrown against a rotating winnower **14**, which, in conjunction with the concave **18**, causes the separate strands of tobacco to be thrown in the form of a stream or shower generally in the direction of the drum **20**.

It is well known that the usual process of preparing tobacco for cigarette manufacturing and other purposes entails the removal of stem and other undesirable portions of tobacco, but because it is virtually impossible to perform this operation with 100% efficiency, it is necessary on most cigarette-making machines to provide devices whereby the undesirable particles of stem and other matter may be removed. It is the function of the winnower **14** to perform this separation.

It will be appreciated that in throwing a shower in the manner described, the heavy particles of stem will have imparted to them more energy than is imparted to the lighter strands of tobacco and because of the momentum contained in the particles, the heavier portions will travel further than the lighter portions. In this way, the particles of stem will take a different trajectory from the particles of laminae or strands of tobacco, so that the stem may be collected in a suitable box **22** to be disposed of as required.

By referring to FIGURE 2, it will be seen that for the purposes of this invention the feed is considerably narrower than is usual. This is because the drum **20** on which the shower of tobacco is to be collected is also very narrow and is in fact of such a width that it will produce a rope of tobacco of the desired width for forming by usual means into a cigarette rod.

The drum **20** is constructed with a large number of holes **24** drilled around its periphery, the drum being made of any suitable material such as steel in order that it may have a sufficiently long life to withstand the abrasive quality of the tobacco being handled.

Air is drawn through these holes so that the tobacco projected by the winnower **14** is carried by means of the air current towards the drum **20** where the air will pass through the holes, leaving the tobacco strands on its surface. In addition, it will be understood that the tobacco already deposited on the holes will partially prevent the passage of air through them, so reducing the velocity of air in that particular region. On the other hand, holes which have no covering will offer no such resistance and will in fact be compelled to pass relatively more air because of the partial blockage of other holes. In this way, the air, carrying tobacco strands with it will be drawn to those portions of the drum which are uncovered and after a covering of tobacco is already deposited on the drum, will be drawn to those portions less thickly covered, so compensating for variations existing in the primary shower.

The drum **20** rotates in the direction of the arrow shown. To form a continuous rope, tobacco accumulated on the drum surface is carried away from the zone of the tobacco shower to the rod-forming mechanism, continuously exposing a clean peripheral portion of the drum **20** which has the holes exposed and to which the tobacco will be readily attracted to continue the buildup of the rope.

It will be understood that with such small holes as are necessary to prevent the passage of strands of tobacco through them, a tendency will exist for particles of to-

bacco to choke the holes. With the arrangement described, air could be drawn through the center of the drum in order to provide the stream of air through the holes, but according to this invention, the air is drawn generally diametrically across the drum through holes in the periphery of the drum opposite to those which collect the tobacco, so that the air in passing will tend to blow out the particles of tobacco which may be lodged in the holes and so keep them clean.

As will be seen, the drum is one part of a closed air circuit. A centrifugal fan **26** is provided which when driven by the motor **28** will move a suitable volume of air. This fan draws air through the large pipe **30** which terminates in a curved portion **32** fitting closely around the outside periphery of the upper portion of the perforated drum **20** as seen in FIG. 1, in such a manner that a substantially air tight seal is made. Air drawn through the holes and so out of the drum in this region enters the drum through a similar group of holes situated in the general region which is substantially diametrically opposite. Under these conditions, the drum in rotating causes an endless stream of holes to continuously pass through both regions, thus continuously reversing the direction of air flow through the holes.

In order to be able to control the quantity of air passing through the holes which collect tobacco from the tobacco shower, a series of stationary baffles **34** are provided as chords subtending from one side of the drum to the other; that is, from the side on which the tobacco is collected to the side through which the air is drawn. The end of the pipe **30** is also provided with a series of baffles **36** which match the ends of the corresponding baffles **34** inside the drum in such a manner that a series of channels extend roughly diametrically across the drum, through which the air must pass. Between the extension pieces **36** each channel is provided with a butterfly valve **38** which may be adjusted to control the amount of air passing. In this manner a number of zones of variable pressure are provided whereby the buildup of tobacco from the tobacco shower may be regulated.

Also, the strands of tobacco, when they reach the drum, are built up into a tobacco blanket as the drum rotates and are held thereon with a substantial force due to the pressure of air passing between them and through the holes in the drum. This effectively prevents the strands from moving or bouncing as they are deposited, ensuring that the rod is built up of strands which are positioned by being attracted to those areas which permit most air to pass which would be the areas currently carrying the thinnest covering of tobacco. This ensures that the buildup of the stream of tobacco is self-compensating, many errors which may arise being self correcting by reason of the effect of such errors on the air stream, producing a stream which is very uniform and dense in structure.

In order that this machine may not contaminate the atmosphere in its immediate vicinity with large quantities of dusty air, this mechanism is designed to keep the same air in circulation continuously, thus making it unnecessary to provide filters, etc., for removing dust. The air after leaving the fan **26** passes through the pipe **40**, where it approaches the perforated plate **42** whose purpose is to divide the air stream and cause it to flow substantially uniformly through the shower of tobacco. If desired, the holes in plate **42** may be graduated in size in order to graduate the velocity of the air passing across the shower.

In order to provide a seal against the rotating drum **8**, a resilient roller **43** is provided which presses tightly against the tines on the carding of that roller so that the air pressure inside cannot leak out by any substantial amount. In order to avoid an accumulation of small particles which may fall out of the shower of tobacco produced by the winnower **14**, the bottom **44** consists of a perforated plate which is built in the form of a box into which air can be introduced by a pipe **46**, which air is taken from the main stream via pipe **48**, which is connected directly to pipe **40**. In this way, air is blown upwardly from the perforated plate **44** and will carry with it any particles of tobacco which may drop out of the main tobacco shower so that they are reintroduced into that shower to be ultimately joined with the rope of tobacco formed on the periphery of the drum **20**. The holes in plate **44** may be graduated in size.

As the drum **20** rotates, it causes the layer of tobacco formed on its periphery to move out of the space formed by the surface of this periphery and the extremity of the plate **44**, a suitable seal being provided at this point to prevent the passage of an undue quantity of air along with the tobacco.

Further movement of the drum **20** causes it to carry the tobacco layer to a point above the cigarette paper **52** onto which the layer must be transferred. The mode of transfer is shown in FIGURE 1. In order to facilitate the removal of the tobacco layer, the suction in the drum **20** which holds the layer in place must be cut off. This may be accomplished by providing a stationary shoe **50**, which may be hollow and be provided with air pressure through a high-pressure line **51** to assist in the removal of the rope of tobacco adhering to the drum by blowing it off. Alternately, a simple scraper may be provided to control the separation and cause the tobacco to lie on and move with the cigarette paper web **52**, which is moving at substantially the same velocity as the periphery of the drum **20**. This cigarette paper web **52** is carried on the usual folder tape **54** so that the tobacco and paper pass through the usual cigarette rod forming means, consisting of a compressor wheel **56**, a tongue **58**, a paster **62**, a sealer **64**, and finally, a cutoff device **68**, as shown in FIG. 3, which cuts the rod into discrete lengths, which are finally delivered onto a collecting device from which they are removed and fed into packaging machines.

From the above description it will be seen that the complete machine, consisting of the tobacco feeding means and the cigarette rod forming device, is arranged in a straight line forming an inline machine as compared with the orthodox machine which is in the shape of an L, or a rightangle machine. Also, the tobacco feed according to this invention is much narrower than the usual feed because of the method of forming the tobacco rope which does not necessitate the width required to efficiently collect a shower on a laterally moving band. For this reason, the overall size of a machine according to this invention will be much smaller than known machines and it will also be of a much more convenient shape for fitting into an operation such as is normally found in cigarette making factories, where large numbers of machines stand side by side.

The invention hereinabove described may be varied in construction within the scope of the claims, for the particular device selected to illustrate the invention is but one of many possible embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. Apparatus for forming a continuous stream of tobacco comprising means to circulate a current of air through the apparatus in a closed circuit, a device to introduce a continuous flow of tobacco particles into the air current, a rotating hollow drum whose periphery is perforate, a portion of said periphery intercepting said current of tobacco laden air so that the tobacco is deposited on said periphery forming a felted mass whilst the air passes through the periphery, a plurality of stationary chordal guides inside the drum forming channels to guide the air to that portion of the periphery of the drum substantially diametrically opposite to its zones of entry, where said air passes out of the drum via the perforate periphery on its way to complete the closed circuit,

thereby removing any tobacco particles from said perforate periphery in so passing, the movement of the drum being such as to carry the felted mass of tobacco from a zone of formation to a zone of delivery, where means for continuously removing the felted mass which forms the endless stream are provided and means for receiving the endless stream.

2. Apparatus for forming a continuous rope of tobacco comprising means to circulate a current of gas in a closed circuit through the apparatus, means to introduce a continuous flow of tobacco particles into the gas current, a rotating hollow drum whose periphery is perforate, a portion of said periphery intercepting said current of tobacco laden gas to collect the tobacco thereon whilst permitting the gas to pass therethrough, a plurality of stationary chordal guides inside the drum forming channels to guide the air inside the drum to that portion of its periphery situated substantially diametrically opposite to that portion through which the gas entered, said gas passing through the periphery of the drum adjacent to the termination of said channels to complete the closed circuit, the rotation of the drum carrying the collected tobacco from the zone of collection to the delivery zone where means are provided for the continuous removal of the collected tobacco in the form of an endless rope, and means for receiving said rope.

3. Apparatus for forming a continuous rope of tobacco comprising means to circulate a current of gas in a closed circuit through the apparatus, means to introduce a continuous flow of tobacco particles into the gas current to form a current of tobacco carrying gas, a rotating hollow drum with a perforated periphery, a portion of the periphery intercepting the current of tobacco carrying gas to collect the tobacco thereon whilst the gas passes through the perforated periphery of said drum, a plurality of stationary chordal guides inside the drum, said guides forming channels to guide the air inside the drum so that it passes across the drum and out of the drum through a portion of the periphery substantially opposite to that portion of the periphery through which it entered the drum, a duct to conduct the gas from its zone of exit from the drum through the remainder of the circuit, a plurality of stationary guides inside said duct adjacent to the periphery of the drum, each of said guides forming a continuation of a corresponding guide inside the drum, adjustable valves inside of the channels formed by the guides in the duct to make possible separate control of the quantity of gas passing through each channel, the

tobacco deposited on the drum being carried from the position where it is deposited on the drum to a position remote therefrom where it is removed from the drum as a continuous rope, and means for receiving said rope.

4. Apparatus for forming a continuous rope of tobacco comprising a rotating drum with a perforate periphery, a current of gas passing through a substantially large segment of the periphery of the drum, means for introducing into the gas current a spray of separate tobacco particles so that the gas entrains the tobacco particles at a substantial distance from the drum to permit a free dispersal of the tobacco particles in said gas current, to carry them to the perforate periphery of the drum on which they are deposited whilst the gas passes therethrough, a casing adjacent said drum, the gas current flowing therethrough, the lower portion of the casing being in the form of a perforated plate forming one side of a base into which gas is forced to cause jets of gas to issue from each perforation for the purpose of blowing upwardly any particles of tobacco which may fall out of the initial tobacco spray, causing such upwardly blown particles to re-enter the initial spray so that they are carried by the gas current towards the perforate drum and deposited thereon, means to remove the tobacco from the drum in the form of a rope at a position remote from the zone of formation, and means for receiving said rope.

5. Apparatus for forming a continuous rope of tobacco as in claim 4 in which the holes in the perforated plate which forms the lower portion of the casing are graduated in size.

References Cited in the file of this patent

UNITED STATES PATENTS

1,647,255	Stein	Nov. 1, 1927
1,755,080	Schunemann	Apr. 15, 1930
1,877,683	Mustonen	Sept. 13, 1932
2,173,087	Eissmann	Sept. 19, 1939
2,230,195	Warren	Jan. 28, 1941
2,769,446	Dank	Nov. 6, 1956

FOREIGN PATENTS

286,421	Great Britain	Mar. 8, 1928
469,587	Germany	Dec. 14, 1928
481,382	Germany	Aug. 20, 1929
378,143	Great Britain	Aug. 11, 1932
615,407	Germany	July 4, 1935
900,182	Germany	Dec. 21, 1953