

March 9, 1954

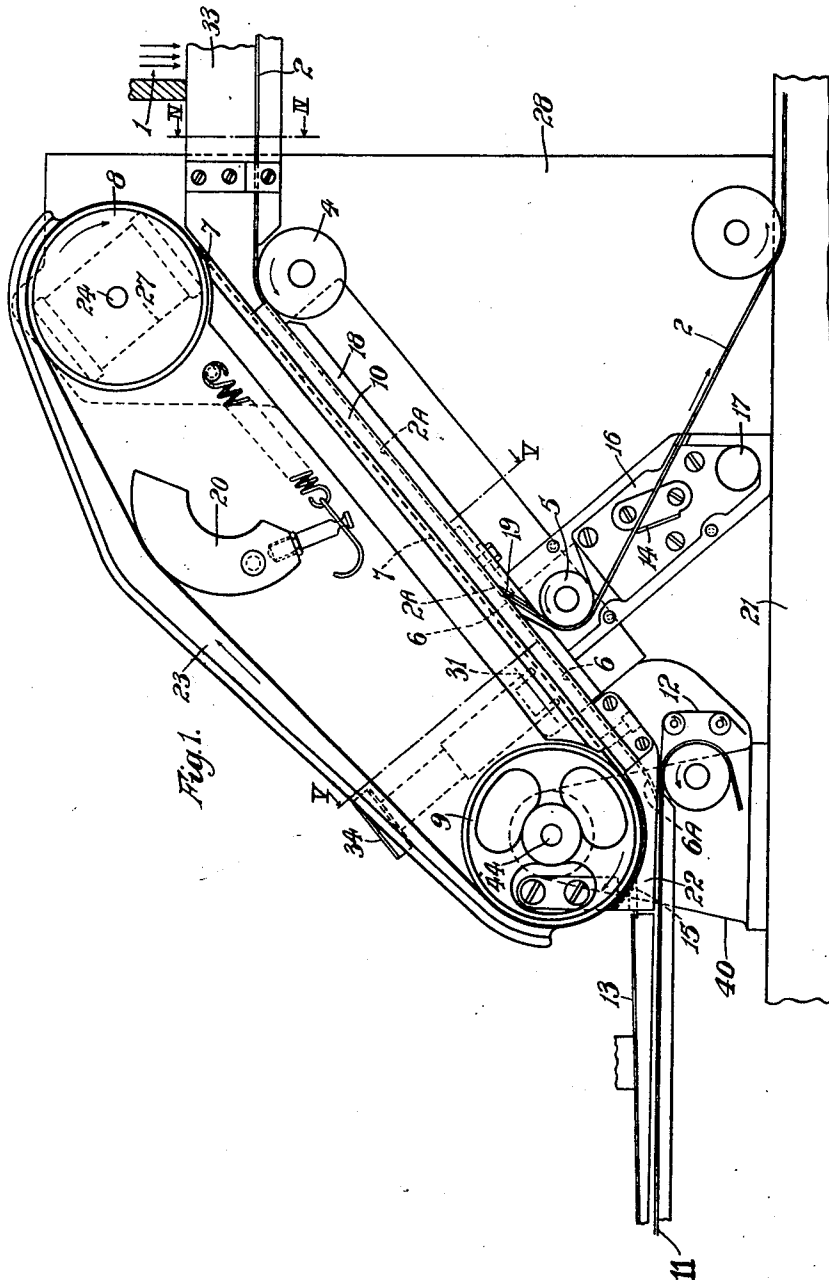
D. W. MOLINS ET AL

2,671,452

APPARATUS FOR MAKING CONTINUOUS FILLERS ON CIGARETTE
MAKING MACHINES OF THE CONTINUOUS ROD TYPE

Filed April 11, 1949

3 Sheets-Sheet 1



INVENTOR
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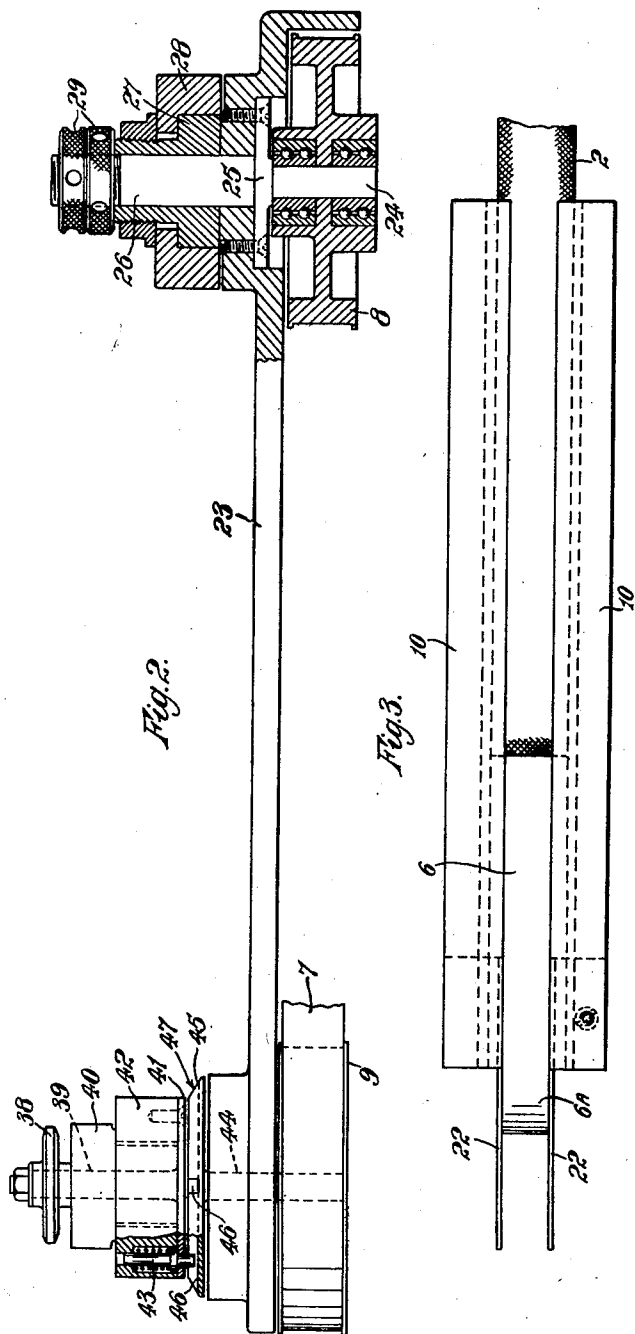
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig 5A



Fig 5B

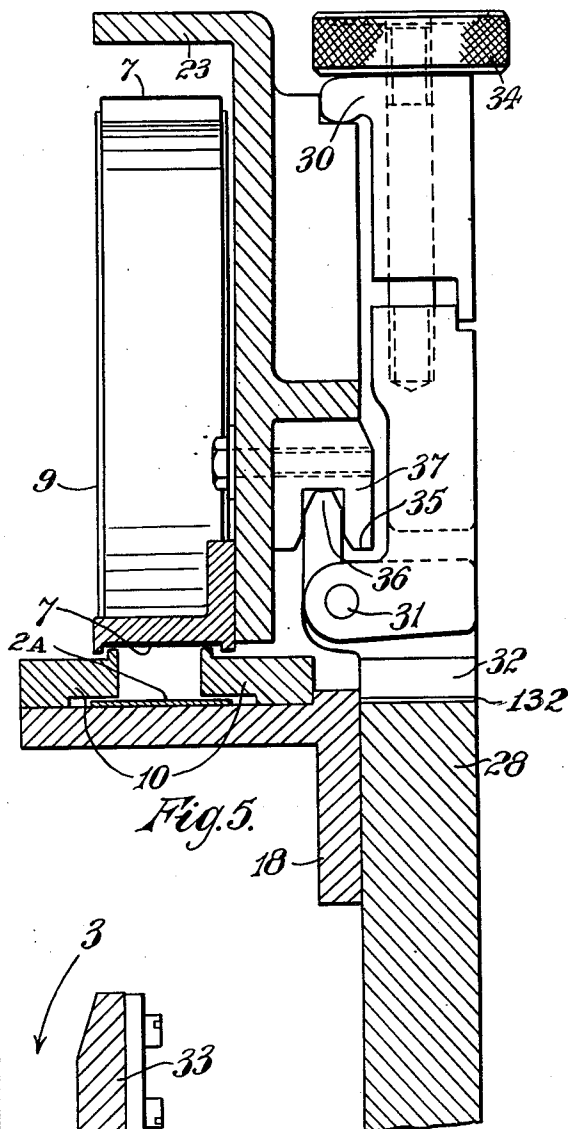
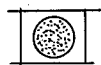


Fig. 5.

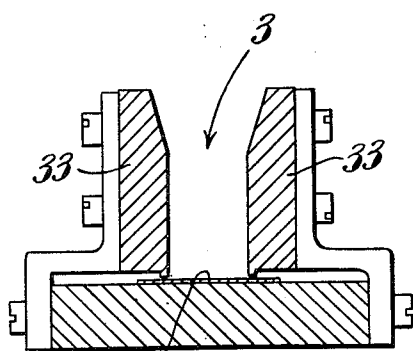


Fig. 4.

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UNITED STATES PATENT OFFICE

2,671,452

APPARATUS FOR MAKING CONTINUOUS
FILLERS ON CIGARETTE MAKING MA-
CHINES OF THE CONTINUOUS ROD TYPEDesmond Walter Molins and Felix Frederic Ruau,
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Application April 11, 1949, Serial No. 86,628

Claims priority, application Great Britain
April 22, 1948

10 Claims. (Cl. 131—66)

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This invention concerns improvements in or relating to an apparatus for making a continuous filler on a cigarette-making machine of the continuous rod type.

In such machines it is customary to shower tobacco onto a travelling surface so as to form a stream of loose tobacco and thereafter to pass the stream through rod forming mechanism in which a paper web is folded and secured around the tobacco filler, and thereby form it into a cigarette rod. The loose tobacco stream is often formed by showering tobacco onto an endless moving canvas band on which it is later compressed into a filler and then delivered to the continuous paper web.

The loose tobacco stream so showered is irregular in that the quantity of tobacco varies from point to point. Several proposals have previously been made for the purpose of reducing this irregularity, which affects weights of successive cigarettes.

The apparatus which is employed according to the present invention to reduce inequalities along the length of the tobacco stream makes use of a known system which broadly consists of reducing the speed of the tobacco in a confining passage. It is thought that to obtain the best results it is desirable to ensure, as far as possible, that the reduction in speed shall take place in a part of the confining passage where the conditions are reasonably the same. For instance, it is desirable that the nature of the surfaces of the walls of the passage in the part where the reduction of speed occurs should be the same.

It has been proposed in order to obtain such a result first, to compress the tobacco stream to such an extent and for such a length of time that the tobacco is in the form of a relatively highly cohesive filler rod which is capable of giving a relatively considerable endwise thrust or pressure and whose cross-section is the same as or smaller than that of the final cigarette rod, and to project the tobacco into a passage in which each wall throughout the length of the passage is composed of a surface having the same characteristics.

It is thought, however, that if the tobacco whose speed is reduced were loose, better results would be obtained since it is believed that the tobacco could in such case close up on itself by relatively free movements of different portions or even individual shreds of the tobacco in such a way as to effect a partial re-distribution or re-arrangement within the stream such as by

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intertwining or interknitting such portions or shreds so as to fill up sparsely filled portions and generally reduce inequalities in the stream. It will be appreciated that in order to adopt these methods a number of difficulties have to be overcome, the principal of which is that the frictional resistance of the part where it is desired, that, as far as possible, the reduction in speed shall occur, should be as small as possible in order to avoid choking, because although the tobacco stream may be given some small degree of cohesion, it is nevertheless to be maintained in a loose condition and therefore it can give little endwise thrust compared with the thrust that can be imparted by a filler rod which has been compressed down to cigarette rod size or smaller.

According to the present invention there is provided an apparatus for manipulating tobacco in the formation of a tobacco filler for a continuous cigarette rod on a cigarette making machine of the continuous rod type, which comprises, means for feeding a controlled loose stream of tobacco forwardly into and through a guide whose interior tobacco-engaging surface provides a substantially straight throughway and encloses and confines the tobacco laterally and is of a slippery nature and removing the tobacco from the guide at a slower speed than that at which tobacco is fed into it, the speed reduction being such that under the dimensional restraint of the said tobacco-engaging surface the aforesaid controlled loose stream is caused to close up, at least at its sparser portions, whereby the controlled loose stream is converted to a loose filler and the uniformity of distribution is improved.

Further according to the invention there is provided an apparatus for manipulating tobacco in the formation of a tobacco filler for a continuous cigarette rod on a cigarette making machine of the continuous rod type, which comprises, means for feeding a loose stream of tobacco forwardly into and through a confining passage, along part at least of whose length the tobacco-engaging surface which encloses and confines the tobacco laterally is of a slippery nature and provides a substantially straight throughway, the cross-sectional size of the passage being such that tobacco therein can form into a controlled loose stream, and removing the tobacco from said part of the passage at a slower speed than that at which it is fed into the passage so that the tobacco, before leaving the passage is formed into a loose filler in said part.

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Further according to the invention there is provided an apparatus for manipulating tobacco in the formation of a continuous cigarette rod on a cigarette making machine of the continuous rod type, comprising, means for feeding a stream of loose tobacco into and through a confining passage in a part at least of whose length, the tobacco-engaging surface which encloses and confines the tobacco laterally is of a slippery nature, and provides a substantially straight throughway, removing the tobacco from said part of the passage at a slower speed than that at which it enters the passage whereby the tobacco speed is reduced as the tobacco moves along the passage, the ingoing stream of loose tobacco being of such volume per unit length that it contracts slightly in cross-sectional area as it enters the passage and under the dimensional restraint of the passage becomes a controlled loose stream, the speed reduction being such that under the dimensional restraint of the passage the afore-said controlled loose stream is caused to close up at least at its sparser portions, whereby the controlled loose stream is converted to a loose filler and the uniformity of distribution is improved and removing the slower moving loose filler from the passage and reducing its cross-sectional area and enclosing it in a continuous paper web to form a cigarette rod.

Still further according to the invention there is provided an apparatus for manipulating tobacco in the formation of a continuous cigarette rod on a cigarette making machine of the continuous rod type, comprising means for feeding a stream of loose tobacco into and through a confining passage and removing it from the passage at a slower speed so as to reduce its speed in the passage whilst it is still in a loose condition and whilst it is moving in a substantially straight path in a part of the passage consisting wholly of tobacco-engaging walls, the entire surfaces whereof are slippery so as to form a loose filler in which irregularities are less than in the faster moving stream and in which the average density of the tobacco is not more than half the density of the final cigarette rod, removing the slower moving loose filler from the passage and reducing its cross-sectional area and enclosing it in a continuous paper web to form a cigarette rod.

The invention further comprises in a continuous rod cigarette making machine, means for reducing inequalities in the tobacco stream from which said rod is made, comprising a confining passage through which the tobacco is to be fed, means to remove the tobacco from the passage, means to cause a stream of loose tobacco to be fed into the passage and to move at the inlet end of the passage at a faster speed than that at which the tobacco is removed from the passage, wherein along a part at least of the length of the passage the tobacco moves in a substantially straight path and the tobacco engaging surfaces which enclose and confine the tobacco laterally in said part are of a slippery nature and wherein means is provided tending to cause the tobacco to enter said part at a speed faster than the removal speed and as a loose stream (e. g. a controlled loose stream) whereby tobacco entering said part at the faster speed has its speed reduced in that part in such manner that the tobacco is constricted by the walls of the passage, the arrangement and cross-sectional size of the passage being such that the tobacco is in the form of a loose filler before leaving the passage, and wherein one of said slippery surfaces is arranged to move in the direction in which the to-

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bacco moves through the passage so as to provide a slipping drive for the tobacco in said part.

Still further the invention comprises in a continuous rod cigarette machine, means for reducing inequalities in the tobacco stream from which said rod is made, comprising a confining passage through which the tobacco is to be fed, means to remove the tobacco from the passage, means to cause the stream of loose tobacco to be fed into the passage and to move at the inlet end of the passage at a speed faster than that at which the tobacco is removed from the passage and wherein means is provided to feed tobacco along one part of the passage as a controlled loose stream at a speed faster than the removal speed and wherein a subsequent part of the passage provides a substantially straight path for the tobacco and its tobacco-engaging surfaces, which enclose and confine the tobacco laterally, are of a slippery nature and wherein the tobacco is removed from said subsequent part at a speed lower than that at which the tobacco enters the passage, the arrangement and cross-sectional size of the passage being such that the tobacco is in the form of a loose filler before leaving the passage, and wherein one of said slippery surfaces is arranged to move in the direction in which the tobacco moves through the passage so as to provide a slipping drive for the tobacco in said subsequent part.

The confining passage may have a cross-sectional area such that the tobacco at the inlet end of the passage is in the form of a controlled loose stream, and opposed endless moving surfaces may form opposed walls along part of the passage to feed the said controlled loose stream and feed it forwardly at a faster speed than that at which the tobacco is removed.

The cross-sectional area of the confining passage may increase in the direction of movement of the tobacco through the passage, to provide room for lateral expansion of the tobacco stream as its speed becomes less.

The said surface which provides a slipping drive for the tobacco may be formed by a slippery surface of an endless band (e. g. a steel band) extending along the whole length of the passage and forming one of the said opposed endless surfaces arranged to move to feed the tobacco stream forwardly in the passage. The said endless band may be arranged to move at a faster speed than the speed of the other of the said opposed endless surfaces. The band is provided to feed the tobacco and as the surface is slippery the speed may be adjusted to give the desired result under any particular conditions.

The confining passage may be arranged to slope downwards in the direction of movement of the tobacco therethrough, the bottom wall of the passage having a curved portion at the outlet end of the passage to guide the tobacco stream into a substantially horizontal path as it leaves the passage.

A cigarette paper web may be arranged to move beneath the passage so as to receive tobacco leaving the passage.

Where throughout the specification the word "slippery" is used in relation to a tobacco-engaging surface, it is intended to describe a surface on which tobacco slips more easily, under a given set of conditions, than it does on the usual cigarette paper.

The term "loose" when used herein in relation to a stream of tobacco refers to a stream of tobacco partly or wholly confined laterally and

in which the particles are relatively loosely arranged as distinguished from the relatively tightly packed condition found when such stream is reduced to the cross-sectional size of the cigarette rod. When a tobacco stream (of the appropriate weight per unit length) is compressed to cigarette rod size, the tobacco may be said to possess a relatively high degree of packing, cohesiveness and ability to impart an endwise pressure or thrust. On the other hand, both a "controlled loose stream" and a "loose filler" (both as defined below) have an almost negligible ability to impart endwise pressure and little cohesiveness and accordingly not only should the frictional resistance offered by a confining passage in which the speed of the tobacco is to be reduced, be sufficiently low, but also the direction in which the tobacco moves should be straight, or substantially straight. Deviation should as far as possible be avoided or kept to a minimum so that the tobacco does not choke the passage. Any deviation which permits the tobacco when in a loose condition to suffer reduction in speed and yet pass without choking, is to be understood as coming within the expression "substantially straight" when used herein.

In the construction now to be described by way of example, at the end of the confining passage, which is inclined, there is a curved portion to enable the tobacco to be guided smoothly on to the travelling paper web which is moving horizontally. In such a case there is of course a deviation from the straight line but at that position it is thought that most, if not all the work of reducing the speed of the tobacco has been effected and the tobacco is thereafter removed by the endless moving surfaces constituted by the steel band and the paper web, which tend to grip the tobacco between them, and in any case such a slight deviation at that position does not cause choking.

Where the expression "controlled loose stream" is used herein it is intended to refer to a tobacco stream which is given some lateral compression and is wholly confined laterally but in which the particles are in a loose arrangement.

Where the expression "loose filler" is used herein it is intended to refer to a stream of loose tobacco which has had its speed reduced in a confining passage.

One construction according to the present invention will be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a front elevation of apparatus according to the invention;

Figure 2 is a plan view of part of Figure 1 and partly in section;

Figure 3 is a plan view of part of Figure 1, showing a conveyor band, a fixed plate, and side guides;

Figure 4 is a section of Figure 1 on the line IV—IV;

Figure 5 is a section of Figure 1 on the line V—V, and

Figures 5A and 5B are diagrammatic views illustrating the cross-sectional area of a cigarette made on the apparatus in comparison with that of the confining passage according to the invention.

In the following description various dimensions and speeds are given but it is emphasized that these are for guidance in the understanding of the invention and are not by way of limitation.

Referring to the drawings, tobacco is showered

from a hopper 1 onto a flat endless canvas or cotton band 2 which is arranged to run horizontally in a trough 3 beneath the hopper to receive the shower. The width of the band is 28 mm., and its side edges project outwardly beyond the inner faces of the side walls 33 of the trough which are 14 mm. apart. The band, which is of the usual type generally referred to as a "tobacco tape" and has a tobacco engaging surface of the nature commonly possessed by such tobacco-conveying tapes, passes over a roller 4 at the end of this horizontal run and slopes downwardly and forwardly and then passes rearwardly over a further roller 5. The sloping portion 2A of the tobacco tape forms the upper part of the bottom wall of a sloping passage for the tobacco received on the tobacco tape from the hopper. The tape is supported at the sloping part on an angle member 18. The lower part of the said sloping bottom wall consists of a steel plate 6, which is arranged in alignment with the sloping part 2A of the tobacco tape, and which has a highly polished surface. It will be seen from Figure 1 that the plate 6 almost touches the part 2A of the band 2, the purpose being to prevent the escape of tobacco, as far as possible, at the division between the two parts.

The upper wall of the passage is formed by the lower run of an endless flexible steel band 7 which passes over rollers 8 and 9 arranged at each end of the passage. The outer surface of this steel band (that is, the surface which forms the inside of the top wall of the passage) is also highly polished. The steel band is arranged to move so that its lower run moves in the same general direction as the sloping portion of the tobacco tape. The band instead of being made of steel could be made of any other suitable material having a polished surface. It may move at twice the speed of the band 2 or at any speed found to be the best for achieving the desired result. Owing to the change in the direction of movement of the tobacco, it is found preferable to make the band 7 travel considerably faster than the band 2, to ensure that the tobacco is moving at the desired speed in the direction of the passage.

The side walls of the passage are formed by adjustable side guides 10, Figure 5, arranged between the top and bottom walls of the passage. The side guides are made of steel or any other suitable material. The inner surfaces of the said walls are made as smooth as possible.

It will thus be seen that the passage just described is adapted to enclose on four sides tobacco which passes therethrough, the bottom wall of the passage being formed in two parts, the first part of which is arranged to move while the second part is stationary; and that the side walls are stationary and the top wall is arranged to move in the same general direction as the moving part of the bottom wall which as stated above, is constituted by the tobacco tape. It will also be seen that the lower part of the passage, consisting of the steel plate 6, part of the steel band 7 and parts of the side guides 10, constitutes a guide whose interior tobacco-engaging surface encloses and confines the tobacco laterally and is of a slippery nature.

In the construction illustrated the length of the whole passage is approximately 13 inches; the sloping part 2A of the tobacco tape occupies 8 inches of this length, while the stationary steel plate is about 5 inches long. The angle of slope of the passage is $39\frac{1}{2}^\circ$ from the horizontal, this

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angle depending respectively on the relative heights of the tobacco feed and the rod forming mechanism of the machine which is supported on the machine bed 21, and the length of the passage. This angle has been found by trial to be suitable for the purpose in view. A less steep angle may require a different speed of the steel tape to assist in satisfactory movement through this passage.

The parts in this case are so arranged that the top and bottom walls of the passage diverge slightly from the upper to the lower end of the passage—that is to say from the entrance to the outlet. The steel band 7 which forms the upper wall of the passage is 9 mm. from the tobacco tape at the upper or entrance end of the passage and 10 mm. from the steel plate 6 at the lower end.

In the example the side walls 10 converge from 14 mm. at the entrance to 13 mm. at the outlet, but the cross-sectional area in the example is greater at the outlet end than at the inlet end.

Figures 5A and 5B show to scale the proportions of the passage at the entrance and outlet respectively. In Figure 5A the cross-sectional area of the passage is shown as 14 mm. by 9 mm. or 126 square mm., while in Figure 5B the area at the outlet is shown as 13 mm. by 10 mm. or 130 square mm. In both these figures the circles represent a cigarette 3 mm. in diameter whose cross-sectional area is approximately 50 square mm., so that the average cross-sectional area of the passage is more than $2\frac{1}{2}$ times that of the cigarette.

The steel plate 6 is curved at its lower end where it is marked 6A to correspond with the curvature of the steel band 7 as the latter passes over its lower roller 9 which is at the outlet of the passage and which has a diameter of 102 mm. The centre line of the passage from its entrance to the curvature at the outlet is straight and the length of the straight portion of the lower part of the passage is such that it is thought that substantially the whole of the reduction of speed is effected in the straight part.

Beneath the outlet is arranged an endless conveyor band 11 generally referred to as the "cigarette tape," which carries a web of cigarette paper 12 horizontally past the outlet of the passage in the same general direction as that of the band 7 and the part 2A of the band 2 previously mentioned. The paper web is at a distance of 9 mm. below the lower roller 9 for the steel band. The tobacco tape is arranged to move at 1.4 times the speed of the paper web. Thus when the machine is adjusted to produce about 1000 cigarettes of 70 mm. length per minute (of a diameter of 8 mm. and weighing approximately 25 cigarettes to the ounce avoirdupois) the speed of the paper web will be approximately 3.8 feet per second, which is approximately 28% slower than the speed of the tobacco tape, which in such a case would be arranged to move at a speed of approximately 5.3 feet per second.

The paper web after passing the outlet of the passage moves beneath the usual tongue, shown diagrammatically at 13, and through the usual folding mechanism (not shown) whereby it is folded about the filler rod.

The above description covers all the essential features of the apparatus and remaining details shown on the drawings will now be briefly described.

In order to keep the tobacco tape 2 and steel band 7 clean and to avoid waste of tobacco,

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scrapers 14 and 15 respectively are provided. The scraper 14 scrapes tobacco from the tape 2 into a box 16, the front cover of which is omitted in Figure 1, from which it passes through a hole 17 forming a duct in the suction dust system of the machine. The scraper 15 scrapes tobacco from the band 7 and it drops on to the loose filler on the paper 12.

The angle-shaped member 18 which supports the tape 2 at the part marked 2A, has an adjustable end piece 19 whereby the distance between the end of the plate 6 and the tape surface may be adjusted to give the least possible clearance.

A pivoted arcuate member 20 is provided to tension the steel band 7.

To confine the tobacco as it moves in its curved path from the passage on to the paper 12, side plates 22 are provided which are fixed to the lower ends of the guides 10.

The lower end of the plate 6A is in practice brought as near to the paper web 12 as practicable to permit the web to pass. Likewise the side plates 22 are brought as close as possible to the paper web 12. Although not so shown in the drawings, the cigarette tape 11 carrying the paper web 12 commences to curl before reaching the tongue 13 preparatory to wrapping the paper around the tobacco.

The rollers 8 and 9 are supported in a plate-like frame 23. The roller 8 runs on a pin 24 fixed by a flange 25, Figure 2, to the frame and a pin 26 projecting from the flange is supported in a bush 27 slidable in a main support bracket 28. In this way the height of the band 7 from the tape 2 can be adjusted, the bush 27 being locked in position after adjustment by nuts 29. The frame 23 can be swung around the axis of the pin 26, which then rotates in the bush 27, so that the steel band can be removed from the passage for inspection or service. To enable the swinging movement to take place a catch 30, Figure 5, which is pivoted at 31 to a pivot bracket 32 fixed to the bracket 28 and normally held in close engagement with the frame 23, is released by undoing a nut 34. Then the catch can be swung about its pivot to release the frame 23. If it is desired to hold the frame 23 in the up position for any time, a lug 35 is rested on the top of the nut 34 which is moved back to the position shown in Figure 5 to afford such support. A lug 36 on the pivot bracket 32 engages in a slotted abutment 37 on which the lug 35 is formed to locate the frame in the operative position. The height of the steel band above the base of the passage may be regulated by shims 132 placed beneath the pivot bracket 32.

In order to enable the above described lifting of the frame 23 to take place, the roller 9, which is the driving roller for the steel band, is driven through a special form of coupling which will now be described. Referring to Figure 2, a sprocket wheel 38 is fixed on a spindle 39 journaled in a bracket 40 fixed to the bed 21 of the machine.

The spindle comprises a large flange 41 by which it is fixed to a boss 42 in which a spring-urged pin 43 is fitted. Thus the boss rotates with the spindle 39. The roller 9 is fixed to a spindle 44 journaled in a boss of the frame 23 and this spindle also comprises a large flange 45. The flange 45 has two diametral slots 46 in it, located at right angles to one another. When the spindles 39 and 44 are coaxial, the pin 43 couples the two flanges 41 and 45 and the roller 9 is rotated by the sprocket wheel. As the frame 23 is lifted for the above described pivotal move-

ment about the pin 26, the spring-urged pin 43 slides along the slot 46 it occupies and the coupling is broken. When it is desired to restore the parts to their original position the spring pin is depressed by a bevel 47 on the edge of the flange 45 and snaps into the first slot 46 it meets.

In operation, tobacco is showered from the hopper on to the moving tobacco tape 2 which carries it forwardly as a loose stream about 14 mm. wide.

The depth of the stream formed in the trough by the shower is indeterminate, since it may be formed from long tobacco or from shorter tobacco and the relative moisture content has further influence on the manner in which the tobacco builds up in the trough itself.

Thus there may be cases in which the stream may be considerably deeper than the depth of the passage. In such a case, although the depth of the stream would be reduced to that of the passage, the cross-sectional area of the latter is sufficiently large (in the present case more than 2½ times the size of the cigarette rod) relatively to the size of the eventual cigarette rod which in the example under consideration is 8 mm., that the tobacco stream having the dimensions of the passage is still relatively loose, and is in a sufficiently loose condition for the purposes of the present invention. In the present case the faster moving tobacco in the passage is a "controlled loose stream" and the slower moving tobacco is a "loose filler."

The tobacco tape 2 exerts sufficient tractive force on the controlled loose stream to feed the latter into the passage and the steel band 7 although this is smooth and polished, co-operates with the tobacco tape to feed the tobacco, which under the dimensional restraint of the passage is now in the form of a controlled loose stream, and the two between them feed the tobacco forwardly at a faster speed than the paper web 12 moves at. It will be seen, however, that the driving influence of the tobacco tape is effective only on tobacco in the upper part of the sloping passage, since the lower part of the passage has for its bottom wall, as described above, a stationary smooth steel plate, and constitutes a guide whose interior tobacco-engaging surface encloses and confines the tobacco and is of a slippery nature, the tobacco engaging surface in this construction consisting of four slippery walls. Thus the controlled loose stream becomes a loose filler as it passes through the lower part of the passage and while under the dimensional restraint of said part. During this time it is enclosed on all sides by smooth slippery surfaces of which only the steel band is moving, and it will be seen that tobacco in that part of the passage can slip relatively to the walls of the passage.

The tobacco as it leaves the passage in the form of a loose filler is received by the paper web which carries it beneath the tongue 13 which compresses the loose filler to reduce it to the desired cross-sectional size, whereafter the paper web is folded about it and secured in the usual manner to form a continuous cigarette rod which is cut into cigarette lengths.

It will thus be seen that tobacco is showered onto the tobacco tape on which it takes the form of a stream of loose tobacco, and is fed by the tobacco tape into the upper part of the passage, the width and depth of which are sufficiently great relatively to the size of the cigarette rod as to ensure that the stream in the passage is a

controlled loose stream. The tobacco then passes down the passage, being driven between the two moving surfaces provided by the tobacco tape 2 and the steel band 7. The tobacco then passes onto the lower or outlet portion of the passage, the bottom of which is now a smooth surface, and is delivered from that end as a loose filler onto the paper web. On leaving the passage the loose filler is given a very small compression by the portion of the steel band which passes around the lower roller, since this is 1 mm. closer to the paper than it is to the bottom wall of the passage at the outlet, though of course this compression is extremely light.

It should be observed that although the plate 6 forming the bottom wall of the lower part of the passage is curved at 6A as mentioned above to guide the tobacco leaving the inclined passage onto the cigarette paper web, the part of the passage in which the stationary plate forms the bottom wall is made of such a length and the path of the tobacco therethrough is such that it is thought that most, if not all the reduction of speed, and compacting, to substantially the extent desired, takes place in that straight portion of the passage. The top slippery steel band provides a slipping drive for the tobacco which it is thought partly or wholly compensates for any increase of frictional resistance which may result from increase in pressure due to endwise compacting of the tobacco stream.

It is found that by this construction the controlled loose stream of tobacco is, when in the passage, caused to close up at its more sparse portions, thus improving its uniformity.

Another point which should be noted is that the weight per unit length of the loose tobacco stream before its speed is reduced is below the weight per unit length desired in the final cigarette rod, and the velocity of the fast moving stream is sufficiently above the speed of the cigarette paper web that all or nearly all the portions of the fast moving stream have a weight per unit length below that desired in the cigarette rod. This is so because in practice the amount of variation is usually well below 20% to 25% of the desired weight per unit length, and thus when the fast moving stream is moving at the speed mentioned above, namely about 40% faster than the cigarette paper web, in normal practice, there should be relatively few, if any, points where the stream of loose tobacco has a weight per unit length greater than that desired in the final cigarette rod.

Further it will be seen that with the dimensions and arrangements given in this specific example the cross-sectional area of the passage increases only slightly. In some cases, however, due to the condition of the tobacco, greater increase in the cross-sectional area may be required.

Owing to the nature of the surfaces of the walls of the lower or outlet end of the passage, the tobacco easily slips over the smooth slippery surfaces of the steel band and the side and bottom walls, and so the controlled loose stream closes up on itself while still in its loose condition and thereby loses some of its irregularities. The smooth slippery metal band forming the top wall of the passage does, it is thought, help to feed the tobacco through the lower part of the passage, especially wherever the pressure of the tobacco in the passage may increase, and thereby helps to avoid choking.

It is thought that having the tobacco stream

in a relatively loose condition both during and after the change of speed and whilst still in the passage, enables the tobacco to close up on itself by relatively free movements of different portions or even individual shreds of the tobacco in such a way as to effect a partial redistribution or rearrangement within the stream of such portions or shreds, so as to fill up sparsely filled portions and generally reduce inequalities in the stream. Closing up of the tobacco under these conditions, it is thought, is more effective in reducing inequalities in the stream than would be the case if the tobacco were originally in a more compressed condition, and that it is more likely to produce greater uniformity of filling in the cigarettes produced. This is thought to be the case because it seems likely that such individual portions or shreds of tobacco may have more freedom to rearrange themselves in a relatively loose stream than in a relatively compressed stream such for example as a stream whose weight per unit volume is not less than half that of the tobacco in the ultimate cigarette rod) in which, it is thought the tobacco may be too closely bonded to permit any substantial rearrangement such as aforesaid, especially since the time available is a small fraction of a second. It is moreover thought that any such rearrangement of the tobacco in the relatively loose stream is likely to be permanent due to intermingling of displaced or rearranged portions with their neighbouring portions. It is thought that rearrangement of tobacco in a loose stream takes place much more readily and with less endwise pressure than in a relatively compressed stream, with the result that in the final cigarettes the tobacco shreds should be effectively intertwined or nestled with less tendency to project from the ends of the cigarettes than would be the case if greater endwise pressure were employed such as in a case where the uncompacted stream is first given a greater lateral compression before reducing its speed. This is because a relatively high degree of lateral compression gives the tobacco not only ability to impart a relatively considerable endwise pressure or thrust, but a relatively high resistance to change of shape. Consequently where the stream whose speed is to be reduced is not a loose stream, greater endwise pressure is required.

The various dimensions given above in the example described have been found to give good results. It will be observed, however, that inasmuch as the passage walls are fairly easily adjusted no difficulty should arise in determining the best setting for any particular circumstances. Quality and cut of tobacco, humidity, temperature and other factors all enter into the manipulation of tobacco and exact rules cannot be laid down to meet every eventuality.

The materials described for the top and side walls of the passage and the condition of their surfaces are such that they provide slippery surfaces on which tobacco slips more easily than it does on the usual cigarette paper.

An advantage of using a sloping passage as in the construction described is that the overall horizontal length of the device for a given length of passage is reduced as compared with a device having a horizontal passage. Thus a sloping passage avoids an increase of bed length in new machines and enables the device to be built into existing machines.

What we claim as our invention and desire to secure by Letters Patent is:

1. Apparatus for producing a tobacco filler on a cigarette machine of the continuous rod type,

comprising a passage-way having along its whole length internal tobacco-engaging surfaces which wholly confine tobacco laterally and all of which have along the whole of their length a lower coefficient of friction with tobacco than has the usual cigarette-paper web, the cross-sectional area of the said passage-way being greater than that of the cigarette rod to be produced on the machine, feeding means to feed lengthwise into and through the said passage-way a continuous stream of tobacco whose cross-sectional area is greater and whose density is lower than that of the said cigarette rod, and means to reduce the speed of the tobacco only while the latter is in the said passage-way so as to cause the tobacco to close up and condense lengthwise and thereby form a loose tobacco filler in the said passage-way, said passage-way having a length such that substantially the whole of the said endwise closing up of the tobacco occurs in the passage-way, and having a direction such that resistance to the movement of the tobacco through the passage is minimized and choking avoided.

2. Apparatus as claimed in claim 1, wherein one of the said surfaces is stationary and is arranged to support tobacco along the whole length of the passage-way.

3. Apparatus as claimed in claim 1, wherein one of the said surfaces is arranged to move throughout the whole length of the passage-way in the direction of movement of the tobacco to assist the movement of tobacco through the passage-way.

4. Apparatus for producing a tobacco filler on a cigarette machine of the continuous rod type, comprising a passage-way having internal tobacco-engaging surfaces which wholly confine tobacco laterally and all of which have along the whole of their length a lower coefficient of friction with tobacco than has the usual cigarette-paper web, one of said surfaces being stationary and being arranged to support tobacco along the whole length of said passage-way, the cross-sectional area of the said passage-way being greater than that of the cigarette rod to be produced on the machine, means to feed lengthwise into and through the said passage-way a continuous stream of tobacco whose cross-sectional area is greater and whose density is lower than that of the said cigarette rod, and means to reduce the speed of the tobacco while in the said passage-way so as to cause the tobacco to close up and condense lengthwise and thereby form a loose tobacco filler in the said passage-way, one of said surfaces being arranged to move in the direction of movement of the tobacco through the whole length of the passage-way to assist the movement of tobacco through the passage-way, said passage-way having a length such that substantially the whole of the said endwise closing up of the tobacco occurs in the passage-way, and having a direction such that resistance to the movement of the tobacco through the passage is minimized and choking avoided.

5. In a cigarette-making machine of the continuous rod type, means for improving the consistency of the tobacco stream by reducing its speed in a confining passage, comprising a confining passage through which the tobacco stream is passed and which has a tobacco-supporting bottom wall along the whole of its length, conveyor-means comprising an endless conveyor on which the tobacco is carried into the passage and which extends lengthwise along part of the length of the passage and forms the initial part of the said tobacco-supporting bottom wall, the other

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part of the said bottom wall being stationary and long enough to ensure that substantially the whole of the reduction of the speed of the tobacco can occur while the latter is supported on the said stationary wall, the passage comprising side walls and a top wall which latter comprises an endless moving surface, the whole of the said top wall and side walls and the stationary part of the bottom wall having tobacco-engaging surfaces which have a lower coefficient of friction with tobacco than has the usual cigarette-paper, that part of the passage which has the stationary bottom wall having a gradually increasing cross-sectional area considered in the direction of movement of tobacco therethrough, the cross-sectional area of the passage at its smallest section being larger than that of the cigarettes to be produced on the machine, and means to reduce the speed of the tobacco in the passage.

6. In a cigarette machine of the continuous rod type, apparatus for forming a tobacco filler, comprising a passage-way in which the filler is to be formed, and which has a cross-sectional area greater than that of the cigarettes to be produced on said machine, and which has internal tobacco-engaging surfaces wholly confining the tobacco laterally, all of said surfaces having a lower coefficient of friction with tobacco than has the usual cigarette paper, one of said surfaces constituting a stationary tobacco-supporting surface extending along the whole of the length of the passage-way and on which the tobacco slides, another of said surfaces having a portion opposed to said stationary tobacco-supporting surface and being arranged to move in the direction in which tobacco passes through the passage-way, means to form a tobacco stream whose density is lower than that of the filler to be formed in the passage-way, conveyor-means to feed said stream lengthwise so as to deliver it to the passage-way at said lower density, means to cause the speed of the tobacco to be reduced in the passage-way whereby the tobacco stream is caused to close up and condense lengthwise in the passage-way so as to reduce inequalities in the stream and form a filler whose cross-sectional area is determined by that of the passage-way, and whose density is less than that required in

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the tobacco just before entering the passage-way, but less than that required in the cigarettes to be produced on said machine.

7. Apparatus as claimed in claim 6, wherein the said conveyor-means comprises a substantially flat endless movable conveying surface which supports the tobacco and is arranged to move at a faster speed than that to which the speed of the tobacco is reduced.

8. Apparatus as claimed in claim 7, wherein the movable one of said tobacco-engaging surfaces comprises a portion of a substantially flat endless movable surface, and wherein another portion of said movable surface is opposed to said conveying surface and has a lower coefficient of friction with tobacco than has the usual cigarette paper, said movable surface co-operating with said conveying surface whereby the tobacco is engaged by said opposed surfaces.

9. Apparatus as claimed in claim 6, wherein the minimum cross-sectional area of the said passage-way is at least twice the cross-sectional size of the cigarettes to be produced on the said machine.

10. Apparatus as claimed in claim 5, wherein the minimum cross-sectional area of the said confining passage is at least twice the cross-sectional size of the cigarettes to be produced on the said machine.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,149,924	Molins	Mar. 7, 1939
2,163,414	Stephano	June 20, 1939
2,164,423	Podmore	July 4, 1939
2,286,306	Randolph	June 16, 1942
2,342,803	Herrmann	Feb. 29, 1944

FOREIGN PATENTS

Number	Country	Date
16,448	Great Britain	of 1893
445,044	Great Britain	Apr. 2, 1936
507,968	Great Britain	June 23, 1939