APPARATUS FOR HANDLING CIGARETTES

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ATTORNEYS
This invention relates to apparatus for handling cigarettes or lengths of mouthpiece material suitable for combination with cigarettes to form mouthpiece cigarettes. The mouthpiece material may be in lengths each suitable for combination with a cigarette, and each such length may contain two or more portions of different material, or the mouthpiece material may be in multiples of such lengths. The cigarettes may be mouthpiece cigarettes or not. In this specification the term "rod-like article" will be used to mean either cigarettes or lengths of mouthpiece material as defined above.

According to the present invention there is provided apparatus for handling rod-like articles comprising a surface along which a rod-like article travels in its lengthwise direction, and a wheel arranged in the path of the article and rotatable at a substantially constant speed, the wheel having a yieldable periphery movable in the direction of travel of the article and spaced from the surface so that the article is trapped between the periphery of the wheel and the surface and leaves the wheel with a substantially constant speed.

In apparatus for handling rod-like articles difficulty may arise in feeding a succession of rod-like articles to have an operation performed on them as, for one reason or another, successive articles may be travelling at different speeds and this may render the operation inconsistent in its effect. The present invention provides means whereby such lack of uniformity of speed is, at least, reduced, each successive article being accelerated or decelerated as necessary when it comes under control of the wheel.

An example of apparatus where rod-like articles are travelling lengthwise, and it is desirable that their speeds should be constant, is in the cigarette-catching apparatus of a rod cigarette-making machine. In such apparatus the cigarettes leaving the cut-off may each be received in a flute of a rotating blunted drum, the flutes moving transversely of the direction of travel of the cigarettes as they leave the cut-off, and the cigarettes then being deposited by the drum on the catcher band, also travelling transversely to the direction of travel of the cigarettes leaving the cut-off, so that the cigarettes travel sideways in a row. A stop may be provided in each flute to arrest the cigarette therein so that the ends of the cigarettes are aligned. Uniformity of speed of the cigarettes is desirable in that too high a speed may cause a cigarette to rebound from the stop, too low a speed may result in a cigarette not reaching the stop, whilst cigarettes travelling at an intermediate speed may come to rest at their respective stops. Thus, accurate alignment of the ends of the cigarettes may not be attained, and cigarettes hitting the stops too hard may be damaged.

Accuracy of alignment of the cigarettes is particularly important where the cigarettes are to be collected automatically, as a cigarette excessively out of alignment may cause a jam. In any case, even where collection is not automatic it is facilitated by accurate alignment of the cigarettes.

Further according to the present invention, there is provided apparatus for receiving cigarettes travelling lengthwise from the cut-off mechanism of a continuous rod cigarette-making machine, and for conveying the cigarettes sideways in at least one side-by-side row, comprising a conveyor having channels arranged transversely of its direction of travel, each to receive a cigarette travelling lengthwise from the cut-off, and each containing a stop member to arrest the motion of the cigarette along the channel in order to align the ends of the cigarettes in the direction of travel of the conveyor, and a wheel having a yieldable periphery past which the channels move in succession, the wheel being rotatable at a substantially constant speed, the periphery of the wheel being movable in line with the channels, and spaced from the base of the channel adjacent the wheel at any moment, so that a cigarette travelling along the channel is trapped between the periphery of the wheel and the channel, and has a constant speed imparted to it, whereby accurate alignment of the ends of the cigarettes against the stop members is facilitated.

The conveyor may be a fluted drum, the flutes constituting the channels, and may be situated above a catcher band which moves in the opposite direction to the direction of rotation of the drum, so that the cigarettes are released from near the bottom of the drum on to the catcher band when they are travelling in the drum in the same direction as the upper run of the catcher band.

The yieldable periphery of the wheel may be constituted by bristles, thus forming a brush, and the bristles may be arranged helically around the wheel, the axis of the wheel being compensatingly inclined so that the bristles instantaneously in contact with the cigarette have a component of motion substantially equal to the sideways movement of the cigarette due to the movement of the conveyor.

The bristles may also be of progressively greater length, considered in the direction of rotation of the wheel, so that the initial pressure on the cigarette when the first bristles touch it is very light and this pressure progressively increases as the wheel rotates.

Spring means may also be provided to decelerate the cigarette as it approaches the stop.

The conveyor may convey the cigarettes sideways in two side-by-side rows, stop means being provided in alternate channels at about their mid-lengths, and in the other channels near their ends remote from the cut-off. In this case, the wheel may be provided in the region of the mid-length of the channels to control the cigarettes proceeding to the stop means at the end of the channels, and the bristles may be provided around no more than half the periphery of the wheel.

Some cigarettes may have gum on their surfaces which would tend to slow down their lengthwise travel in the channels, or there may be gum in a channel from a previous defective cigarette or, for some other reason, such as an accumulation of tobacco in a channel, cigarettes may tend to come to rest in a channel well before the stop is reached. Therefore, to make sure that all cigarettes will reach the stops it may be necessary for the bristles, as they enter the channels to have such a high velocity to overcome the tendency for some cigarettes to come to rest short of the stops that the other cigarettes which travel more freely in the channels would hit the stops at excessive speed. This is especially so where the cigarettes are being arranged in rows so that alternate channels are relatively long. It may therefore be arranged that the peripheral speed of the wheel, and the speed of lengthwise travel of the cigarettes is such that the wheel slows down all cigarettes which come under its influence.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

FIGURE I is a front elevation of a continuous rod cigarette-making machine embodying the invention,
FIGURE 2 is a plan view of apparatus according to the present invention for receiving cigarettes from the cut-off mechanism of a continuous rod cigarette-making machine, and

FIGURE 3 is a side view, partly in section, on the line 3-3 of FIGURE 2.

Referring first to FIGURE 1, the continuous rod cigarette-making machine comprises a hopper 100 which meters and showers cut tobacco on to a conveyor tape 101. The tape 101 is constrained to a U cross-section so that showers the continuous tobacco filler 102 on its inner face. The continuous tobacco filler is conveyed to the left on the tape 101 and passes under a compression wheel 102 to be compacted. A continuous paper wrapper 103, which is to be wrapped around the continuous tobacco filler to form a continuous cigarette rod, is carried on a reel 104. The paper wrapper passes through a printer 105, and upwards into the gap between the tape 101 and a garniture tape 106. The garniture tape 106 runs through the rod-forming mechanism of the machine shown generally at 107. The tobacco filler passes over a bridge piece 108 on to the paper wrapper on the garniture tape 106, and is carried through the rod-forming mechanism 107 where the paper wrapper is wrapped around it and is sealed by a paster 109. At 110 there is shown a heater which dries the gummed seam of the continuous cigarette rod. The continuous cigarette rod is severed into separate cigarettes by a cut-off mechanism 111.

Each cigarette as it is severed from the continuous cigarette rod is pushed lengthwise over a plate 1 by the forward end of the continuous rod and under a wheel 2, which may be constructed as disclosed in copending United States patent specifications. The wheel 2 has two helical grooves cut in its periphery, and it rotates with a peripheral speed about 10% in excess of the speed of the cigarettes as they arrive under it. The purpose of the wheel 2 is to accelerate the cigarettes, and thus space them apart, and to give them a sideways motion so as to resist the entry of the cigarettes into the flutes of a drum 3. The drum 3 rotates above a catcher band 12, and the cigarettes are retained in the flutes of the drum until they are at the underside of the drum, when they are released on to the catcher band which conveys them away from the drum in two side-by-side rows. Stops are provided in the flutes of the drum to align the cigarettes in the two rows.

Referring now to FIGURE 2, C₃ is a cigarette which is being pushed lengthwise on the plate 1 by the forward end of the continuous rod at the cut-off mechanism 111 (not shown in this figure). The two helical grooves in the periphery of the wheel are shown at 4 and 5.

The wheel 2 is hollow, and perforations are provided in each groove. The wheel rotates about an air valve (not shown) and the valve is connected to a source of suction. The wheel 2 rotates in timed relation with the arrival of the cigarettes from the cut-off mechanism so that, as each cigarette arrives, it is received in one of the helical grooves, is attracted to the wheel by the suction applied through the perforations, and is thus accelerated and spaced slightly from the succeeding cigarette and is also carried sideways. Cigarette C₃ is about to enter the helical groove 5, and the cigarette C₄, which is shown dotted, is already present in the groove 4 and has been displaced both forwards and sideways from the cigarette C₃.

To the left of the wheel 2 the fluted drum 3 has a set of flutes 7 alternating with another set of flutes 8 (see also FIGURE 3). The drum 3 rotates in the direction shown by the arrow, and is driven from the cigarette making machine in timed relation with the production of cigarettes and rotation of the wheel 2, so that each flute 7 or 8 is in line with one of the grooves 4 or 5 in the underside of the wheel 2, and is moving at substantially the same speed as the cigarette in that groove, as the cigarette moves lengthwise into the flute. Thus, each cigarette received in the groove 4 enters a flute 7, and each cigarette received in the groove 5 enters a flute 8. As shown, the cigarette C₃ is in the groove 4, and is also just entering a flute 7, cigarette C₄ is in the preceding flute 8, and cigarette C₂ is about to enter groove 5, and will pass into the succeeding flute 8. Thus one cigarette enters each flute 7 or 8.

The flutes 7 and 8 are formed by dividing walls 9 which are higher at the right hand end of the drum than at the left hand end, and the bases of the flutes 7 are at a greater radial distance from the centre line of the drum than the bases of the flutes 8, this difference in radial distance being equal to the reduction of height of the walls 9, so that the flutes 7 at the right hand end of the drum are of the same depth as the flutes 8 at the left hand end of the drum.

A stop 10 is screwed into each flute 7 intermediate its ends and at the region where the walls 9 are reduced in height, and a stop 11 is screwed into each flute 8 its end remote from the wheel 2. The stops 10 are in line in the direction of rotation of the drum 3, as also are stops 11. The purpose of the stops is to arrest the motion of the cigarettes along the flutes so that two rows of cigarettes with their ends aligned are produced.

Beneath the drum 3 is the catcher band 12 (see also FIGURE 3) which travels in the direction shown by the arrow, i.e. the same direction as the underside of the drum 3, and receives the two rows of cigarettes from the flutes 7 and 8 respectively. Means are provided to hold the cigarettes in the flutes as the drum rotates, until the cigarettes are to be released on to the band 12, and these means will be referred to later. The two rows of cigarettes C₂ and C₃ are shown on the band 12, and it will be clear that row C₂ has come from the flutes 7 and row C₃ from the flutes 8.

The bases of the flutes 7 and 8 are chamfered at the right hand end of the drum 3 where the cigarettes enter the flutes, so that the flutes are all deeper at this region, and it is arranged that the bases of both the flutes 7 and 8 are at the same radial distance from the centre line of the drum 3 at its right hand face. Thus, the chamfers extend further to the left in the flutes 7 than in the flutes 8, due to the greater radial distance of the bases of the flutes 7 from the centre line of the drum 3 than that of the flutes 8. The purpose of the chamfers is to slow down the lengthwise motion of the cigarettes in the flutes so that they do not hit the stops 10 or 11 too hard and, as the cigarettes in the flutes 7 have a shorter distance to travel before arriving at the stops 10 than the cigarettes in the flutes 8 have to travel before arriving at the stops 11, the chamfers extend further along the flutes 7, as mentioned above, so that more of the kinetic energy of the motion of the cigarettes in flutes 7 is converted into potential energy.

Clearly it is desirable that the cigarettes should arrive at the stops 10 or 11 at low speed to avoid damaging themselves on hitting the stops. It is found that the cigarettes in the flutes 8 arrive at the stops 11 with varying speeds so that some may stop exactly at the stops 10, those travelling slower may not reach the stops, and those travelling faster may rebound from the stops, thus upsetting the alignment of their ends. The speed at which the cigarettes enter the flutes is made high enough to ensure that cigarettes which have gum on their surfaces, or are slowed down in a flute for some other reason, will all reach the stops, and thus cigarettes which are not so held up would be travelling too fast when they reached the stops.

To reduce this effect the following arrangement is adapted. A wheel 13 carried on a shaft 14 is mounted above the drum 3, and is rotated at a constant speed by means of a gear of with the production shaft 14. This shaft is driven from a pulley 16, on a shaft 17 on which the wheel 2 is mounted, by means of a belt 18. The wheel 13 consists of a frusto-conical hub 13a, and a row of bristles 19 which are disposed helically around the hub 13a for approxi
mately 45°. The wheel 13 is driven in timed relation with the rotation of the drum 3 in the direction shown by the arrow, so that the bristles 19 enter each flute 8 as it passes underneath, and trap the cigarette against the base of the flute. The axis of the shaft 14 is inclined to the flutes at such an angle as to compensate for the helical disposition of the bristles 19 around the hub 15 so that the bristles move lengthwise through each flute 8. The bristles are of progressively greater length from the leading end of the row to its trailing end, and it is arranged that the leading end of the row lightly contacts the cigarette in the flute 8 somewhat along its mid portion. Continued rotation of the wheel 13 and lengthwise movement of the cigarette cause the longer bristles to contact the cigarette and exert gradually increasing pressure on the rear portion of the cigarette. The speed of rotation of the wheel 13 is such that the cigarettes in the flutes 8 are decelerated and, as they leave the control exerted on them by the bristles 19, they are all travelling lengthwise at the same speed. Thus, alignment of the cigarettes against the stops 11 is facilitated.

To finally decelerate the cigarettes as they approach the stops 11 a spring means is provided to lightly contact each cigarette after it has left the bristles 19. The spring means is shown at 20 in FIGURES 2 and 3, and consists of a spring blade 21 which is clamped at its lower end. The upper end of the blade 21 is shaped at 22 so that the side of the blade that the cigarettes first come under is further away from the drum 3 than the other side of the blade. This ensures that the leading end of a cigarette has lifted slightly from the base of the flute it is being carried in it does not jam against the side of the blade 21 but is pushed down into the flute. The blade 21 is arranged tangentially to the drum 3 so that, as the drum rotates, a progressively greater pressure is exerted on the cigarette to slow it down. As may be seen in FIGURE 3, cigarette C 3 is in the position where the maximum braking effect is being exerted on it and is just arriving at the stop 11. The pressure exerted by the blade 21 can be adjusted by means of the screw 22a bearing on its upper end.

FIGURE 3 also shows a curved pad 23 which prevents the cigarettes falling out of the flutes 8 until they reach the band 12. A similar curved pad is provided on the other side of the blade 21 but is not shown in the figures. A spring means 24, similar to the spring means 20, is provided to decelerate the cigarettes in the flutes 7 as they approach the stops 10. Curved pads similar to the pads 23 are also provided to hold the cigarettes in the flutes 7.

If desired, a wheel similar to the wheel 13 could be provided to impart a constant speed to the cigarettes in the flutes 7, but this is not normally necessary.

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

1. Apparatus for receiving cigarettes travelling lengthwise from the cut-off mechanism of a continuous rod cigarette-making machine, and for conveying the cigarettes sideways in at least one side-by-side row, comprising a conveyor having channels arranged transversely of its direction of travel, each to receive a cigarette travelling lengthwise from the cut-off, and each containing a stop member to arrest the motion of the cigarette along the channel in order to align the ends of the cigarettes in the direction of travel of the conveyor, and a wheel having a yieldable periphery past which the channels move in succession, the wheel being rotatable at a substantially constant speed, the periphery of the wheel being movable in line with the channels, and spaced from the base of the channel adjacent the wheel at any moment, so that a cigarette travelling along the channel is trapped between the periphery of the wheel and the channel, and has a constant speed imparted to it, whereby accurate alignment of the ends of the cigarettes against the stop members is facilitated.

2. Apparatus as claimed in claim 1, wherein the conveyor is a fluted drum, the flutes constituting the channels, a catcher band is provided below the drum, and the drum and the catcher band are driven so that cigarettes leaving the bottom of the drum to be received by the catcher band are travelling in the same direction as the band.

3. Apparatus as claimed in claim 2, wherein the yieldable periphery of the wheel is constituted by bristles to form a brush.

4. Apparatus as claimed in claim 3, wherein the bristles are arranged helically around the wheel, and the axis of the wheel is inclined at the helix angle to the channels so that the bristles in contact with a cigarette at any moment have a component of motion substantially equal to the sideways movement of the cigarette due to the movement of the conveyor.

5. Apparatus as claimed in claim 4, wherein the bristles are of progressively greater length, considered in the direction of rotation of the wheel, so that the initial pressure on the cigarette when the first bristles touch it is very light, and this pressure progressively increases as the wheel rotates.

6. Apparatus as claimed in claim 5, wherein the cigarettes are conveyed sideways on the conveyor in two side-by-side rows, stop means are provided in alternate channels at about their mid-lengths, and in the other channels near their ends remote from the cut-off, the wheel is provided in the region of the mid-length of the channels to control the cigarettes proceeding to the stop means at the ends of the channels, and the bristles are provided around no more than half of the periphery of the wheel.

7. Apparatus as claimed in claim 6, wherein the peripheral speed of the wheel is such that all cigarettes which come under its influence are slowed down.

8. Apparatus as claimed in claim 7 wherein spring means are also provided to decelerate cigarettes as they approach their stops.

References Cited in the file of this patent

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