May 28, 1963 D. W. MOLINS ETAL 3,091,244

TOBACCO-MANIPULATING APPARATUS

Filed Nov. 30, 1959 6 Sheets-Sheet 1

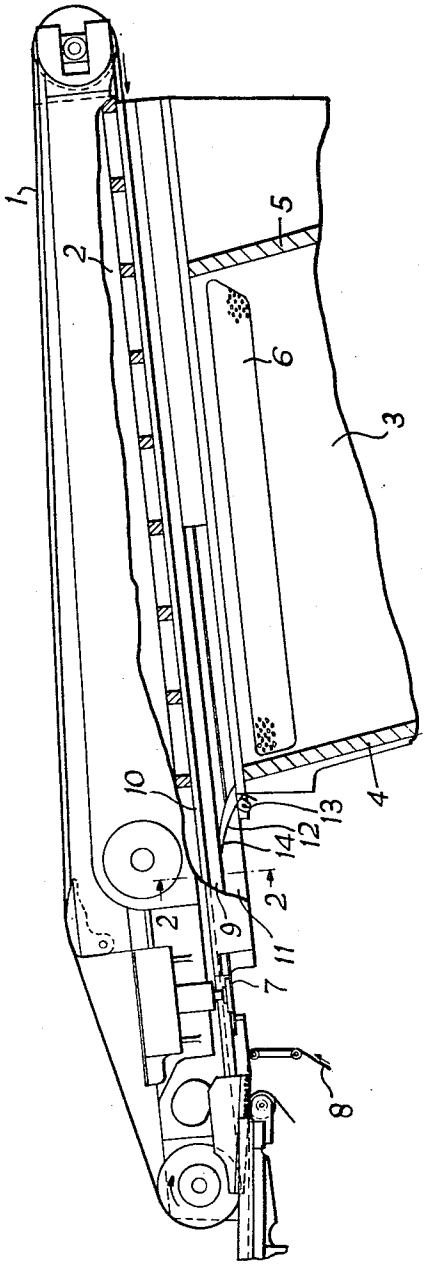

Fig. 1.

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TOBACCO-MANIPULATING APPARATUS

Filed Nov. 30, 1959 6 Sheets-Sheet 2

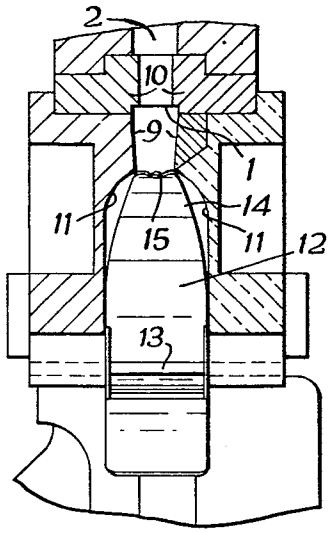

Fig. 2.

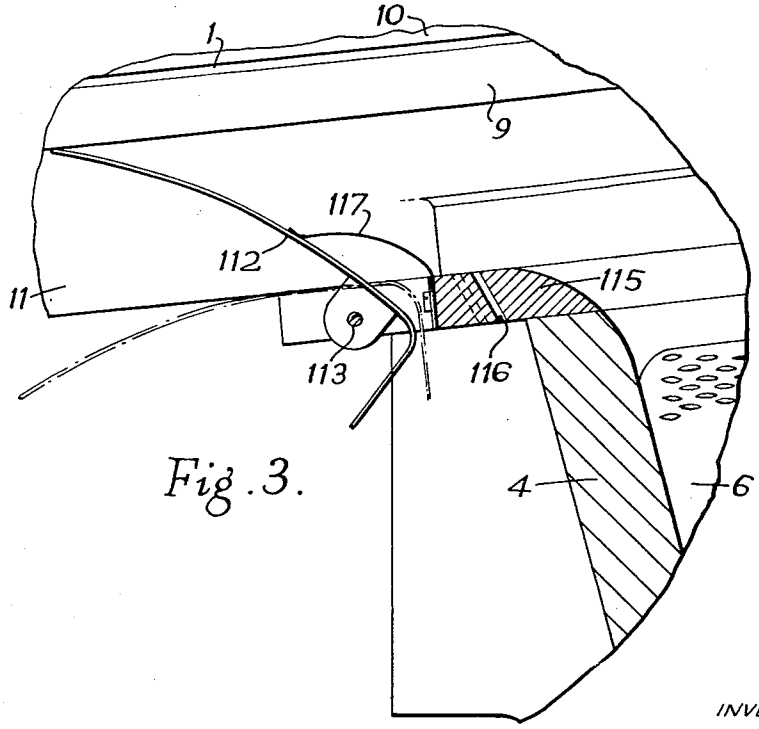

Fig. 3.

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TOBACCO-MANIPULATING APPARATUS

Filed Nov. 30, 1959 6 Sheets-Sheet 3

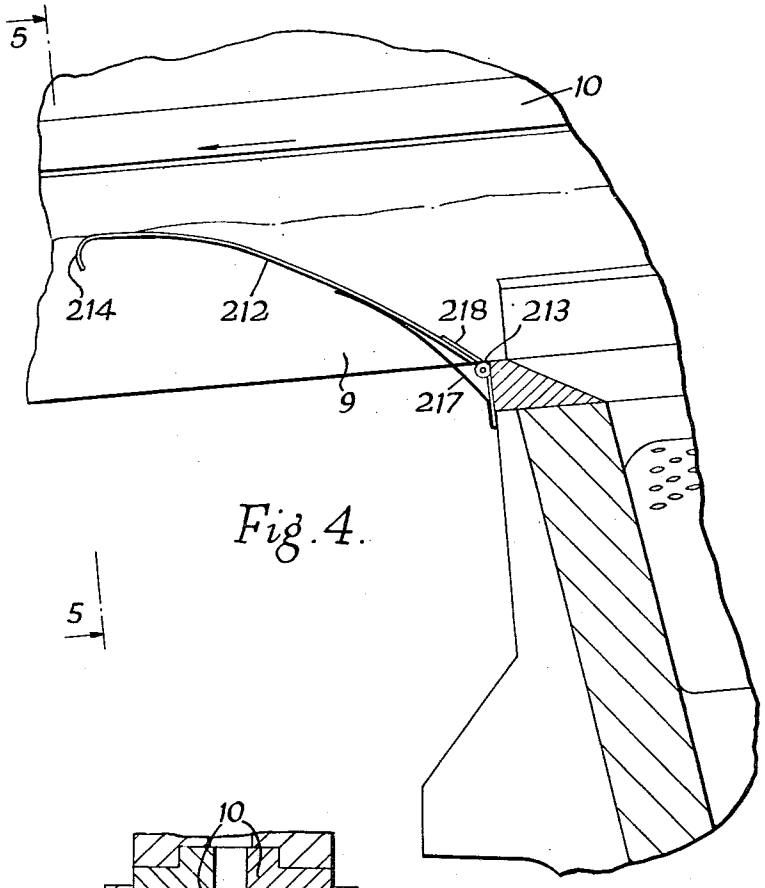

Fig. 4.

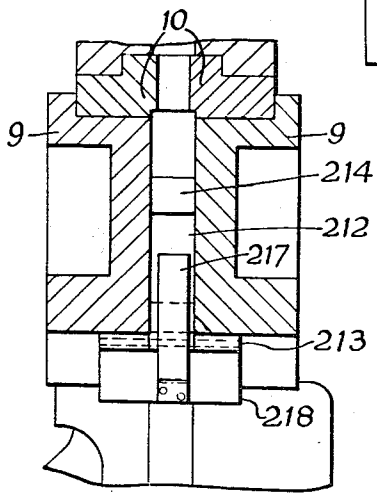

Fig. 5.

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TOBACCO-MANIPULATING APPARATUS

Filed Nov. 30, 1959 6 Sheets-Sheet 4

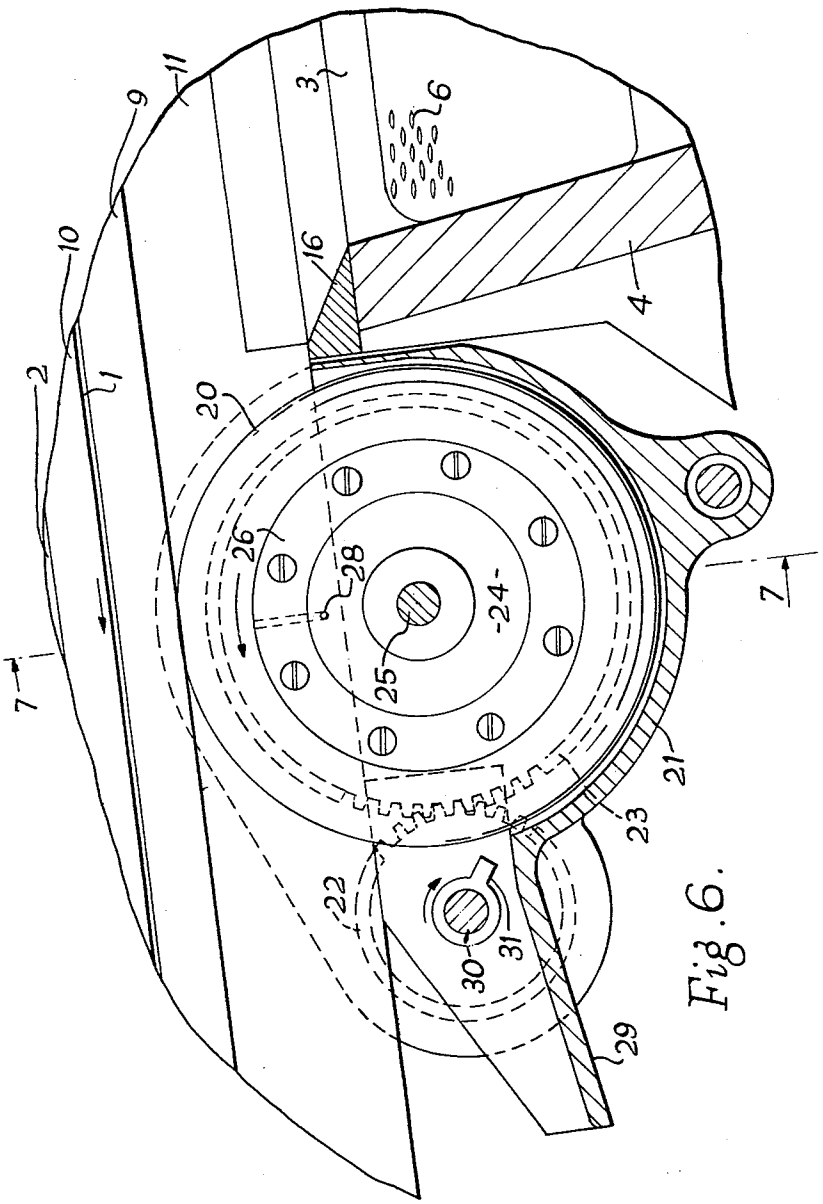

Fig. 6.

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May 28, 1963 D. W. MOLINS ETAL 3,091,244

TOBACCO-MANIPULATING APPARATUS

Filed Nov. 30, 1959 6 Sheets-Sheet 5

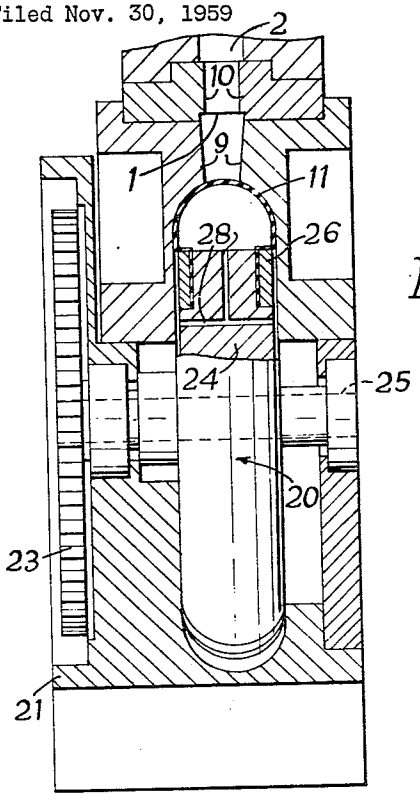

Fig. 7.

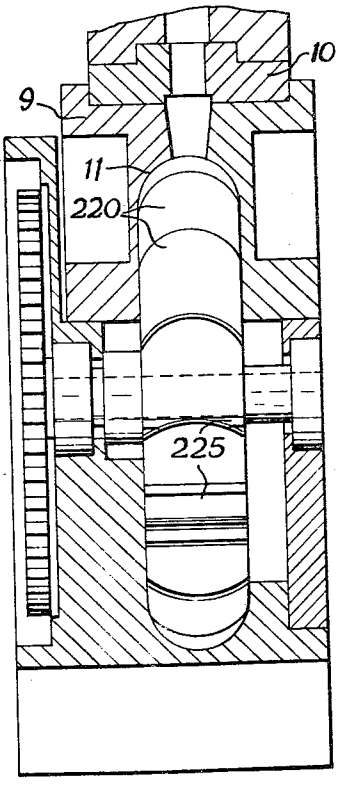

Fig. 9.

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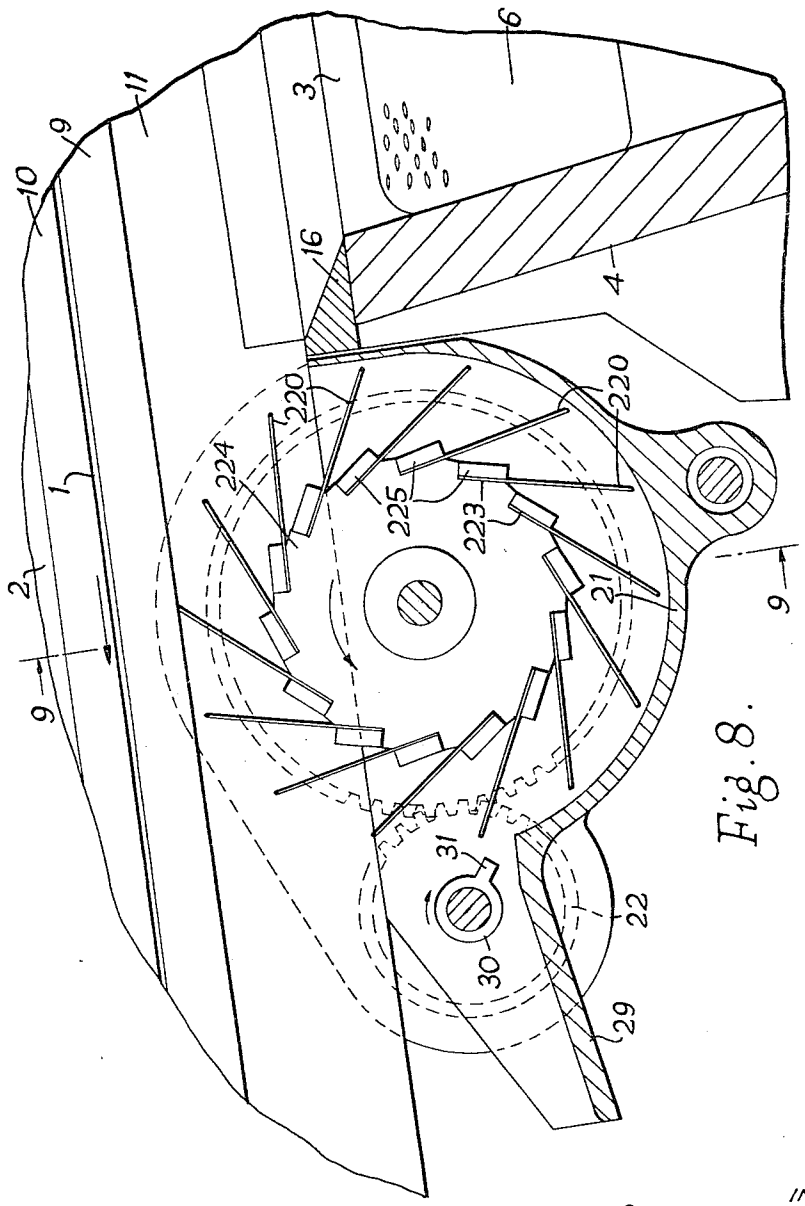

Fig. 8.

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3,091,244

TOBACCO-MANIPULATING APPARATUS

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Claims priority, application Great Britain Dec. 5, 1958
14 Claims. (Cl. 131—84)

This invention concerns improvements in or relating to tobacco-manipulating apparatus in which a tobacco filler is formed on an air-pervious conveyor band and is held to the band by suction applied through the conveyor band.

An example of such apparatus is disclosed in the complete specification and drawings of U.S. Patent No. 3,030,965, granted April 24, 1962. In that apparatus, tobacco particles are fed into a passage which extends to a perforated conveyor band, and a high velocity air stream is caused to flow through the passage so as to carry the tobacco particles to the conveyor. A suction chamber extendng along the conveyor band draws air through the conveyor, and as this chamber extends beyond the passage, it draws air not only from the passage but also from atmosphere in the region beyond the passage.

The passage has side walls and end walls. The side walls extend to the conveyor band, but in order to enable the conveyor to carry the filler out of the passage, at least that end wall past which the loaded conveyor moves necessarily terminates some distance short of the conveyor band, the distance being sufficient to provide clearance for the greatest depth of filler which is likely to be built up on the conveyor in the passage.

It has been found that with such a construction, there is in some cases a tendency for air to be drawn by suction from atmosphere through the gap between the filler and the said end wall so as to enter the passage. The air which thus passes through the gap moves lengthwise of the filler against the direction of endwise movement of the latter, and this is found to have a disturbing effect on the formation of the filler by displacing tobacco lengthwise of the filler. This is particular noticeable at times when the machine is stopped and the conveyor band is stationary, and the tobacco feed inoperative, although air continues to flow through the conveyor, since in that case the undesired air flow through the gap affects the same portion of filler on the stationary conveyor for a considerable time, and may cause a substantial displacement of tobacco. Thus when the machine is re-started and the loaded conveyor again moves forwardly, a choke may occur owing to excessive bulk of the filler in the region just inside the passage.

According to the present invention there is prorided, in tobacco-manipulating apparatus in which a tobacco filler is formed on an air-pervious conveyor by means of an air stream flowing through a passage towards the conveyor, and in which air is drawn through the band by suction means, closure means located adjacent that end wall of the passage past which the conveyor carries the filler formed thereon in the passage, the said closure means having an operative part to contact the filler on the conveyor and being arranged so as substantially to close the gap between the said end wall and the filler, at least said operative part of the closure means being movable so as to accommodate itself to variations in the depth of the filler being carried past it.

The apparatus may comprise side guides forming a trough through which the conveyor and the filler move, and the closure means may be arranged to extend between the said side guides.

The closure means may, for example, take the form of a flap which may be pivoted to allow movement of the operative part to accommodate variations in the depth of the filler.

The side guides may have opposed parallel faces and the flap may be rectangular so as to form a seal with the opposed faces which is substantially equally effective at different angles of the flap caused by variations in the depth of the filler.

The arrangement may be such that the flap is urged towards the filler by air pressure due to the suction means and it may be arranged that the flap moves away from the filler under the action of gravity when the suction means is inoperative. In addition, spring means may be provided to urge the flap either towards or away from the filler.

The closure means may be resilient, e.g. the closure means may be in the form of a ring which has its outer surface arranged to contact the filler so that it can substantially close the gap whilst being able to accommodate itself to variations in the depth of the filler.

The ring may be constituted by a thin-walled, air-filled tyre (e.g. of polyvinylchloride) carried by a rotatable wheel and the interior of the tyre may be in communication with atmosphere through a flow restrictor to enable the part of the outer surface of the tyre which is at any moment in contact with the filler to distort very easily to accommodate variations in the depth of the filler (e.g. the flow restrictor may be a drilling in the wheel).

Alternatively, the closure means may be constituted by a plurality of resilient paddle elements (e.g. of spring steel) equally spaced around and carried by a rotatable wheel, the paddle elements having their outer edges arranged to contact the filler and being inclined rearwards from the direction of rotation.

In either case the wheel may be driven to rotate so that the peripheral speed of the operative part of the closure means (i.e. the speed of the outer surface of the ring or the speed of the outer edges of paddle elements) is equal to the linear speed of the filler on the conveyor.

The side guides may be recessed to provide an enlarged portion of the trough adjacent the filler and the closure means may be shaped to extend into the recesses in the side guides.

Apparatus in accordance with the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a side elevation partly in section of part of a continuous rod cigarette-making machine incorporating a flap according to the present invention,

FIGURE 2 is a sectional end view on the line 2—2, FIGURE 1,

FIGURE 3 shows a first modification,

FIGURE 4 is a view corresponding to FIGURE 3 and shows a second modification,

FIGURE 5 is a sectional end view on the line 5—5 of FIGURE 4,

FIGURE 6 is a view corresponding to FIGURES 3 and 4 and showing a first form of rotatable wheel in place of the flap,

FIGURE 7 is a sectional end view on the line 7—7 of FIGURE 6,

FIGURE 8 is a view corresponding to FIGURE 6 and showing a second form of rotatable wheel, and

FIGURE 9 is a sectional end view on the line 9—9 of FIGURE 8.

The apparatus shown in FIGURE 1 forms part of a continuous rod cigarette-making machine which is basically similar to the machine disclosed in U.S. Patent No. 3,030,965 referred to above.

Referring to FIGURE 1, the apparatus comprises a perforated metal conveyor band 1 arranged to move, in the direction shown by the arrow beneath a suction chamber 2 which draws air upwardly through the conveyor band.

A passage formed by side walls 3 and end walls 4 and 5 extends upwardly to the band 1. Means (not shown) are provided to supply air to the lower end of the passage, and the arrangement is such that air flows up the passage in a continuous stream at high velocity. Tobacco-feeding means (not shown) are arranged to feed tobacco particles into the passage in such a way that they are impelled upwardly at high velocity to the band 1 by the air stream, and build up on the band to form a filler.

Some of the air which flows up the passage is drawn off through a perforated, louvred plate 6 by suction means. This feature is disclosed in U.S. Patent No. 3,019,793, granted February 6, 1962.

Both the band 1 and the suction chamber 2 extend a substantial distance beyond the end wall 4 of the passage, that is, to the left of the wall 4 as viewed in FIGURE 1, and air is drawn through that part of the band from atmosphere. This enables the tobacco filler which has been built up on the band in the passage to be held suctionally on the underside of the band 1. A trimming device is provided to remove surplus tobacco from the tobacco filler. This device comprises a pair of cooperating discs 7 (one of which is visible in FIGURE 1) arranged beneath the band 1. Beyond the trimming device, the band 1 extends over a paper web 8, on to which the tobacco filler is led while still suctionally held on the band 1; when suction is cut off from the band, the filler is released and is thereafter conveyed by the paper web, which is then wrapped around it to form a continuous wrapped rod.

The band 1 runs through a trough formed by side guide members 9 and 10, the latter being recessed, as shown in FIGURE 2, to form shoulders engaging the edge portions of the band 1. The guides 9 (which form the uppermost parts of the side walls 3 of the passage) are, to the left of the end wall 4 as viewed in FIGURE 1, recessed at 11 as shown in FIGURE 2, to provide an enlarged portion of the trough. Between the recessed parts 11 of the side guide members is mounted a closure means in the form of a flap 12, pivoted at 13 and freely movable about its pivot. An operative part 14 of the flap 12 can engage the side guide members 9 when the flap is swung clockwise (as viewed in FIGURE 1) about its pivot, and the flap is shown in that position in FIGURES 1 and 2. When air is flowing upwardly through the band 1, as in the normal operation of the machine, the flap 12 is urged upwardly by air pressure towards the position in which it is shown in FIGURES 1 and 2.

The end 14 of the flap has a recessed edge 15, FIGURE 2.

The tobacco filler when fully built up on the band 1, and when carried by the latter out of the passage past the end wall 4, usually extends downwardly from the band a short distance into the widened portion of the trough, that is, between the recessed parts 11 of the side guides. The lowermost part of the filler will then engage the recessed edge 15, which is shaped so as more or less to accommodate the filler surface, and will force the flap downwardly against the pressure of the upwardly flowing air. The flap is suitably weighted to enable it to be easily depressed by the pressure of the filler, while at the same time it is light enough to respond readily to the air pressure which urges it upwardly.

The purpose of the flap is to close, or substantially close, the gap betwen the filler and the end wall 4 of the passage. As explained above, there is found to be a tendency for air to flow from outside the passage, over the top edge of the wall 4, into the passage. This may, in the construction illustrated, be at least partly due to the influence of the suction means drawing air from the passage through the apertured plate 6, FIGURE 1. It will be seen, however, that any air flowing over the wall 4 towards the right, FIGURE 1, will flow lengthwise past the filler, and this is found to have a detrimental effect on the structure of the tobacco filler, in that some of the tobacco may be displaced lengthwise of the filler. This is (as explained above) particularly noticeable at times when the machine is for some period out of operation, with the band 1 stationary and the tobacco feed inoperative, but with the suction means still in operation. It will be seen that at such a time, any flow of air along the stationary filler in the region of the end wall 4 may have a cumulative effect on the structure of the filler and may cause a substantial displacement and piling up of tobacco on the band 1 inside the passage. As a result, when the machine is restarted and the band 1 again moves, there is a risk of a choke.

By the provision of the closure flap 12, the gap between the filler and the wall 2 is substantially closed, at any rate to a sufficient extent to prevent any serious flow of air into the passage from outside. The flap 12 can yield downwardly to accommodate varying depths of the filler, but is lightly pressed upwardly by air pressure so as to close the gap as long as air is flowing.

When the air ceases to flow, the end 14 of the flap falls by gravity; that is to say, the flap swings counterclockwise (FIGURE 1) about its pivot.

FIGURE 3 shows a modified construction, in which a flap 112, pivoted at 113, is lightly urged downwardly (i.e. counterclockwise as viewed in FIGURE 3) by a light spring 117. The spring is mounted on an extension 115 of the end wall 4. The extension 115 has holes 116 formed therein, the holes being sloped upwardly towards the left, as viewed in the figure. The purpose of these holes is to direct air from outside the passage in a direction away from the passage, so as to help to deflect any air which may tend to flow past the flap 112 towards the right, FIGURE 3.

A further modification is illustrated in FIGURES 4 and 5. As previously described, the guide members 10 are recessed to form shoulders engaging the edge portions of the band 1 but in this modification the side guide members 9 have their opposed faces parallel and unrecessed and the flap 212 is pivoted at one end at 213 by means of a hinge 218. The flap 212 is rectangular to extend between the opposed parallel faces of the side guide members 9. The flap 212 is slightly curved along its length and has its free end 214 curved more sharply away from the surface of the filler so as to reduce the possibility of the flap impeding the movement of the filler. The hinge 218 is secured to an extension 215 of the end wall 4. Compared with the previous constructions which are counterbalanced to some extent, the whole of the weight of the flap 212 tends to swing it in an anticlockwise direction away from the filler. A light spring 217 is therefore secured at one end to the hinge 218 and bears on the underside of the flap 212 to partly balance its weight. With this construction also air pressure urges the flap towards contact with the filler. The spring 217 prevents the flap 212 falling away too far when air pressure is absent.

As the flap 212 is rectangular and the opposed faces of the side guide members 9 are parallel a seal is provided which is substantially equally effective at different angles of the flap due to different heights of the filler.

In FIGURES 6 and 7 the band 1 again runs through a trough formed by side guide members 9 and 10, the latter being recessed, as shown in FIGURE 7, to form shoulders engaging the edge portions of the band 1 as in the previous constructions. The guides 9 (which form the uppermost parts of the side walls 3 of the passage) are, to the left of the end wall 4 as viewed in FIGURE 6, recessed at 11 as shown in FIGURE 7, to provide an enlarged portion of the trough similar to that shown in FIGURES 1 and 2.

In this construction the closure means is in the form of a resilient ring 20 mounted on a rotatable wheel 24 so that the ring is between the recessed parts 11 of the guide members 9 and its outer part is arranged to contact the filler. The lower part of the ring 20 is enclosed in a housing 21 and the wheel is rotated in the direction of the curved arrow by gears 22 and 23. It will be noticed that the wheel housing approaches very near to the extension 15 of the wall 4. The wheel body 24, in the example shown is made of a laminated textile fabric impregnated with a plastic material and a spindle 25 fixed in the hub is fixed to the gear 23. The periphery of the body is shouldered as shown in section at FIGURE 7 and two rings 26 are provided which are removably fixed to the body. The ring 20 is provided by a thin-walled tyre made of polyvinylchloride and shaped by moulding to the cross-section shown in FIGURE 7. After the tyre has been applied to the body the rings 26 are fixed to hold the tyre in position. Thus the cross-section of the tyre and wheel is substantially the cross-section of the trough formed between the side guide members 9.

The tyre shown is extremely resilient and is also capable of being distorted by an extremely small force so it will be apparent that the contour of the part of the tyre running in contact with the filler will immediately assume the instant shape of the filler and immediately expand to its normal shape as it runs out of contact with the filler. In this way there is provided an effective air seal for the passage outlet, without risk of displacement or distortion of the filler.

The tobacco filler when fully built up on the band 1, and when carried by the latter out of the passage past the end wall 4, usually extends downwardly from the band a short distance into the widened portion of the trough, that is, between the recessed parts 11 of the side guides.

The purpose of the tyre is as stated to close, or substantially close, the gap between the filler and the end wall 4 of the passage. As explained above, there is found to be a tendency for air to flow from outside the passage, over the top edge of the wall 4, into the passage. This may, in the construction illustrated, be at least partly due to the influence of the suction means drawing air from the passage through the apertured plate 6, FIGURE 6. It will be seen, however, that any air flowing over the wall 4 towards the right, FIGURE 6, will flow lengthwise past the filler, and this is found to have a detrimental effect on the structure of the tobacco filler as previously explained.

The lower part of the tyre at any instant seals closely with the interior of the housing 21 which approaches very near to the extension 15 of the end wall 4 and therefore, by the provision of the tyre 20, the gap between the filler and the wall 4 is substantially closed, at any rate to a sufficient extent to prevent any serious flow of air into the passage from outside.

In order to enhance the resilience of the tyre its interior is placed in communication with the atmosphere by the wheel body being provided with small air passages at 28 which act as flow restrictors. Thus as the outer part of the tyre is depressed by contact with the filler air can escape through the holes while if the filler is running a little light or fairly evenly air can pass into the tyre and keep it in close contact with the filler to preserve the seal.

As shown in FIGURE 6, the housing 21 terminates at its left-hand end in a downwardly extending chute 29. The purpose of the chute 29 is to carry away any tobacco particles which may be dislodged from the filler by the wheel 20. A rotatable member 30 which is driven by gear 22 in the direction shown by the curved arrow has a projection 31 and is provided in the chute 29 to impel any such dislodged particles down the chute.

In FIGURES 8 and 9 there is shown a different form of closure means mounted on a rotatable wheel, otherwise the apparatus is similar to that shown in FIGURES 6 and 7 and like numerals are used where possible. The rotatable wheel shown at 224 is provided with fourteen flats 223 equally spaced around its periphery and inclined outwards at equal angles. A thin flexible paddle element 220 of spring steel is clamped at its inner end to each flat 223 by means of a pad 225 which is secured to the flat by means of screws (not shown). The paddle elements 220 are of equal length and form the closure means which, due to the flexibility of the paddle elements 220, is resilient. As shown in FIGURE 9 the outer ends of the paddle elements are rounded so as to fit the shouldered portions 11 in the side guides 9 and the widths of the paddle elements are such as to fit closely between the guide members 9.

The wheel 224 is driven in a similar manner to the wheel 24 in FIGURES 6 and 7 and the outer edge of each paddle element 220 lightly contacts the filler as it reaches the topmost part of its travel. In addition, the paddle element of the lower part of the wheel at any instant seals closely with the interior of the housing 21 and this housing at its right-hand end seals closely with the extension 15 of the end wall 4. Therefore the gap between the filler and the end wall 4 is substantially closed at least to a sufficient extent to prevent any serious flow of air into the passage from outside.

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

1. Tobacco manipulating apparatus comprising an air pervious conveyor, side guides forming a trough through which the conveyor moves, wall means defining a passage leading to one side of the conveyor, a suction chamber at the side of the conveyor opposite to the passage to draw air through the conveyor and the passage to impel tobacco introduced into the passage to flow through the passage to the conveyor to build up a continuous tobacco filler thereon and hold it to the conveyor which conveys it between the side guides, said wall means comprising side walls spaced apart laterally of the conveyor and extending thereto and a downstream end wall and an upstream end wall spaced apart in the direction of movement of the conveyor, the downstream end wall being spaced from the conveyor for the conveyor to carry the tobacco filler past it out of the passage and leave a gap between the filler and the downstream end wall, and closure means located adjacent said downstream end wall and the conveyor substantially to close said gap, the side guide being recessed to provide an enlarged portion of the trough adjacent the filler and the closure means being shaped to extend into the enlarged portion of the trough, said closure means having an aperture part movable with respect to the conveyor and lightly in contact with the surface of the tobacco filler at least when air is flowing through the passage and the conveyor, to accommodate itself to variations in the depth of the tobacco filler.

2. Apparatus as claimed in claim 1 wherein the closure member is a flap.

3. Apparatus as claimed in claim 2 wherein the flap is pivoted to allow movement of the operative part to accommodate variations in the depth of the filler.

4. Apparatus as claimed in claim 3 wherein the flap is urged towards the filler when air is flowing through the passage and the conveyor.

5. Apparatus as claimed in claim 4 wherein the flap is arranged to move away from the filler under the action of gravity when there is no airflow through the passage and the conveyor.

6. Apparatus as claimed in claim 4 wherein spring means are provided to urge the flap away from the filler.

7. Apparatus as claimed in claim 1 wherein the closure means is resilient.

8. Tobacco manipulating apparatus comprising an air pervious conveyor, side guides forming a trough through

which the conveyor moves, wall means defining a passage leading to one side of the conveyor, a suction chamber at the side of the conveyor opposite to the passage to draw air through the conveyor and the passage to impel tobacco introduced into the passage to flow through the passage to the conveyor to build up a continuous tobacco filler thereon, and hold it to the conveyor, which conveys it between the side guides, said wall means comprising side walls spaced apart laterally of the conveyor and extending thereto and a downstream end wall and an upstream end wall spaced apart in the direction of movement of the conveyor, the downstream end wall being spaced from the conveyor for the conveyor to carry the tobacco filler past it out of the passage and leave a gap between the filler and the downstream end wall, a wheel mounted for rotation adjacent the downstream end wall and the conveyor and having a central hub part and a resilient outer annular part substantially to close said gap, the side guides being recessed to provide an enlarged portion of the trough adjacent the filler and the said outer annular part being shaped to extend into the enlarged portion of the trough so that the periphery of the said outer annular part runs on the filler, the resilience of the outer annular part enabling the periphery to accommodate itself to variations in the depth of the filler.

9. Apparatus as claimed in claim 8 wherein the said resilient outer annular part is a pneumatic tire.

10. Apparatus as claimed in claim 9 wherein the wheel comprises means venting the interior of the tire to atmosphere.

11. Apparatus as claimed in claim 8 wherein the said resilient outer annular part is constituted by a plurality of flexible paddle elements equally spaced around and mounted on the central hub part of the wheel so that their outer edges define the periphery of the said annular part, the paddle elements being inclined rearward from the direction of rotation of the wheel.

12. Apparatus as claimed in claim 8 and comprising means to drive the wheel so that the speed of the periphery of the said outer annular part is equal to the speed of the filler on the conveyor.

13. Apparatus as claimed in claim 8 and comprising a housing which extends between the side guides and the downstream end wall and extends around the wheel to prevent airflow between the wheel and the downstream end wall.

14. Apparatus as claimed in claim 13 wherein the filler is carried on the underside of the conveyor and the housing has a downwardly extending chute to carry away tobacco particles which may be dislodged from the filler by the closure means, and comprising a rotatable member is provided to impel dislodged particles down the chute.

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