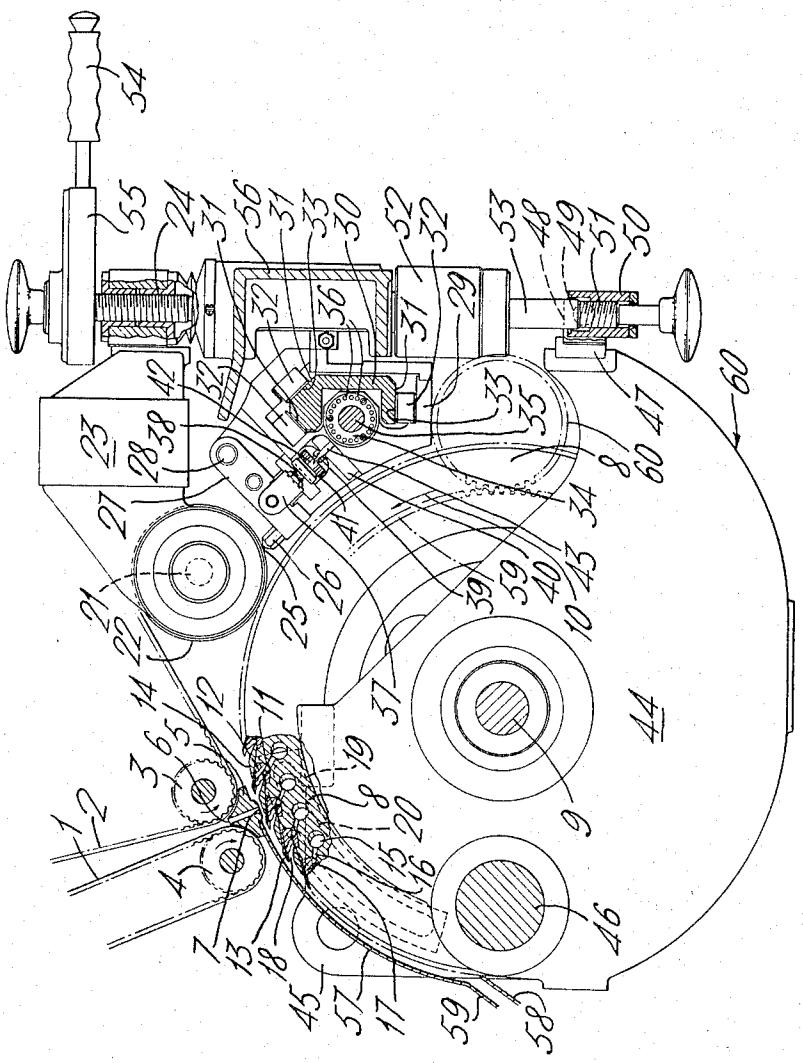
May 23, 1967 D. W. MOLINS 3,320,991

TOBACCO CUTTING MACHINES

Filed Feb. 16, 1965



Inventor

Desmond W. Molins

By Watson, Cole, Grindle & Watson

Attorneys

United States Patent Office 3,320,991
Patented May 23, 1967

3,320,991

TOBACCO CUTTING MACHINES

Desmond Walter Molins, London, England, assignor to The Molins Organisation Limited, London, England, a corporation of Great Britain

Filed Feb. 16, 1965, Ser. No. 432,973
Claims priority, application Great Britain, Feb. 18, 1964, 6,733/64
7 Claims. (Cl. 146—119)

This invention relates to improvements concerning tobacco cutting machines and, in particular, to cutting machines having rotating knives and to means for the sharpening thereof. The knives are held in a cylinder and rotate about an axis parallel to the face of the tobacco being cut. In this respect the action of the cutting machine is similar to that of a lawn mower. Since the face of the tobacco to be cut remains in a fixed plane, the knife cylinder must be advanced towards this face as the knives become shortened through grinding. This movement is balanced by a similar movement of a grinding cylinder towards a trueing diamond which always remains on a fixed line parallel to the axis of the grinding cylinder. Mechanism is provided which, on actuation, moves both knife and grinding cylinders by equal amounts though in opposite directions.

Tobacco cutting machines of the type having a rotatable member with knives disposed around its periphery are known. One of the problems associated with such machines relates to keeping the knives suitably sharpened. Smoking tobacco, being the leaves of a plant, usually has included a small amount of inorganic matter, such as soil, which has a blunting effect on the knives during cutting operations. Consequently, means have to be included in such machines for grinding the knives, usually while cutting is in progress. The means employed can be summarised as including within the rotatable member a complicated mechanism for periodically feeding each knife forward towards the plane of cutting and towards a grindstone. In this way and by keeping the grindstone face trued, the cutting edges of the knives are maintained in a sharp condition and correctly spaced in relation to the cutting plane. The knife feeding mechanism is, however, expensive and complicated. It is thus an object of this invention to provide a tobacco cutting machine without this knife feeding mechanism whilst maintaining the knives with sharp edges.

According to the present invention there is provided a tobacco cutting machine for shredding tobacco comprising: a mouthpiece through which tobacco is fed; a member rotatable about an axis parallel to the longitudinal axis of the mouth piece and having a plurality of knives peripherally disposed with the edges of the knives passing across the mouthpiece; a trueing diamond movable along a fixed path parallel to the said longitudinal axis; a rotatable grinding cylinder having its axis parallel to the said path; and means for moving the axes of the member and the grinding cylinder in a general direction towards the mouthpiece and the said path respectively.

It has been further found that by increasing the number of knives disposed around the rotatable member its speed can be reduced with a resultant improvement in the machine's performance and in the problems associated with its maintenance. A still further increase in the number of knives leads to a corresponding decrease in the quantity of tobacco being cut by the action of each knife. This results in a shallower mouthpiece and in a reduction in the degree to which the tobacco is compressed within the mouthpiece. Beneficial results are thereby obtained since there is likely to be less discoloration in the tobacco and to be a reduction in the quantity of "flakes" produced. A "flake" is a number of individual strands of tobacco

compressed together so as to form a unit which must subsequently be broken down and opened out into its individual strands.

The member may be a drum rotatable about a horizontal axis, above which the mouthpiece is positioned, while the said means may comprise a common mechanism for raising the axis of the member and lowering the axis of the grinding cylinder. The edges of the knives may be disposed at an angle to the axis of the member.

The shredded tobacco may be carried away from the mouthpiece along a passage, and an air stream may direct the shredded tobacco away from the knives into the passage.

Feed means may be included to supply tobacco to the mouthpiece in a state of comparatively low compression (i.e., a compression comparable with that of cut tobacco in a cigarette).

Apparatus in accordance with the invention will now be described by way of example with reference to the accompanying drawing which shows an end view, partly in section, of a tobacco cutting machine.

Referring to the drawing, feed bands, in this case, endless belts known by the trade name of Timex belts, part of which are shown at 1 and 2, have uncut tobacco fed between them by known means and at a controlled rate. The bands are driven by means of driving pulleys 3 and 4 in the direction shown by the arrows thereon and are inclined towards each other so that, as the tobacco is fed forward, it becomes compressed to such a degree that it can enter a mouthpiece 5 which is 16" long (in a direction at right angles to the plane of the drawing). The mouthpiece 5 has a chamfer 6 at its inlet end so as to facilitate the entry of the tobacco. The outlet end 7 of the mouthpiece is approximately 3/8" wide, i.e., in the plane of the figure.

Positioned below the mouthpiece 5 is a member or drum 8 which is rotatable about a shaft 9 in the direction of the arrow 10. The shaft 9 is not driven. Fixed to one end of the drum 8 is a gear ring 59 which is caused to rotate by a driven gear 60. The periphery of the drum 8 is machined to provide a series of forty-five equally spaced recesses 11 into each of which is fitted a knife carrier 12. The knife carriers 12 are secured to the body of the drum 8 by set screws which are not shown for lack of space. Knives 13 are sandwiched between the knife carriers 12 and clamp plates 14 which are also secured to the drum 8 by set screws not shown. To obtain a clean cut with a progressively increasing cutting load the knives 13 are set at an angle of 2° to a plane containing the axis of the drum 8. This entails that the recesses 11 are also set at the same angle of 2°.

Adjacent to and parallel with each recess 11 a hole 15 is drilled through the body of the drum 8. Each hole 15 communicates with its appropriate recess 11 by means of a plurality of openings 16 drilled along the length thereof. Each opening 16 communicates with a restricted passage 17 in the knife carriers 12. The restricted passages 17 open to atmosphere in a U-shaped channel 18 formed by a knife 13, associated knife carrier 12 and the clamp plate 14 of the immediately adjacent counterclockwise (as seen when facing the drawing) knife. Valve plates are positioned at each end of the drum 8, one of which 19 is shown in dotted lines, so as to cover the ends of the holes 15 as the drum 8 rotates past the valve plates. Each valve plate is provided with an arcuate recess 20 which communicates with a pressure source by conventional means. The valve plates 19 are adjustable circumferentially around the drum 8.

The centre plane (in a direction at right angles to the plane of the drawing) of the mouthpiece 5 is directed substantially towards the axis of the shaft 9 and makes

an angle with a vertical plane running through the same axis of approximately 22½°. At a further angle of 22½° from the vertical plane running through the axis of the shaft **9** lies the axis of a drive shaft **21** of a rotary grindstone **22** which is in contact with the knives **13** and which extends across the whole length of the drum **8** (i.e., in a direction at right angles to the plane of the drawing). The grindstone is driven by a motor which is not shown and which together with the grindstone **22** is carried on a bracket **23**, this bracket being movable in a vertical direction on a right hand threaded lead screw **24**.

The grindstone **22** is trued by a diamond **25** fixed to a diamond carrier **26**. The diamond carrier **26** is attached to one end of an arm **27** which is pivoted at **28** to a carriage **29**. The carriage **29** is movable along a rail **30** which extends in directions at right angles to the plane of the drawing. The rail **30** is provided with three faces **31** disposed at 120° to each other. Three pads **32**, each having a low friction surface **33**, such as nylon, are attached to the carriage **29** and ride on the three faces **31** of the rail **30**. Attached to the carriage **29** is a nut **34** threaded over a lead screw **35**. The nut **34** is in two halves so that backlash between the lead screw **35** and the nut can be eliminated. One half of the nut **34** is provided with locating holes **36** so that it can be locked in a variety of positions for this purpose. By rotating the lead screw **35** the nut **34** and thus the whole carriage **29** is caused to move therealong. The means for driving the lead screw **35** and for reversing its direction of rotation so as to move the carriage **29** in the reverse direction are not shown but are well known and accepted in principle.

The position of the diamond **25** can be varied within small limits in the plane of the drawing. Fixed to the arm **27** is a nut **37** into which is threaded a screw thread **38**. Integral with the screw thread **38** are a further screw thread **39** threaded into a nut **40** fixed to the carriage **29** and a small hand wheel **41** having ten equally spaced grooves **42** cut into its periphery. By suitably varying the pitches of the two screw threads **38** and **39** the movement of the diamond **25** can be made to vary within the required limits. Fine adjustment is obtained with the aid of a pointer **43** and is such that rotation of the handwheel **41** whereby one groove **42** moves past the pointer **43** by one space causes the diamond **25** to move 0.001" towards or away from the grindstone **22**.

The shaft **9** about which the drum **8** rotates is journalled in two end frames **44** and **45** of a cradle shown generally as **60** which pivots about pins **46**. A cross member **47** assists in tying together the two end frames **44** and **45** and has fixed to it a block **48** having two internal trunnions of which one, **49**, can be seen in the drawing. Attached to the trunnions **49** is a nut **50** through which a left hand lead screw **51** is threaded. The left hand lead screw **51** is joined to the right hand lead screw **24** through a ball type clutch **52** which allows rotation of their common spindle **53** in one direction only. Attached to the top of the spindle **53** is a handle **54** which is engageable therewith through a pawl and ratchet wheel housed under a cover **55**. The lead screw **51** has a triple start thread. The housing of the clutch **52** is suspended from the lower end of the lead screw **24**.

To the left of the drum **8** a cover plate **57** prevents tobacco flakes cut by the action of the knives **13** passing the mouthpiece **5** from being blown outwards by the action of the air jets. The flakes are carried round by the drum **8** until they reach a scraper **58**. The scraper **58** and an out-turned end **59** of the cover plate **57** enable the cut tobacco flakes to be delivered away from the drum **8**.

The operation of the tobacco cutting machine will now be described. Hand setting mechanism which is not shown enables the drum to be set in relation to the mouthpiece so that a new set of knives clears the outside of the mouthpiece by .001". The drum **8** is driven at 80 r.p.m. and contains 45 knives. This arrangement has been selected so that the knives do not require resharpening with any frequency. The life of a tobacco cutting machine knife depends upon the degree to which the cheese is compressed and the number of inch cuts made before the knife edge becomes blunted (to maintain the regularity of cutting of the tobacco, i.e., so that all the cut strands have a common width, it has been found necessary to compress the tobacco into a solid mass known as a "cheese"). With the guillotine type tobacco cutting machine, having a cheese depth of approximately 8" and driven at 600 r.p.m. it is necessary to remove the knife for resharpening after 7 minutes running time. Thus the inch cuts, which is equivalent to (the number of minutes run) × (r.p.m.) × (cheese depth)

$$=7\times600\times8=33{,}600 \text{ inch cuts}$$

With the present arrangement the inch cuts per knife equals (running time) × (r.p.m.) × (depth of cheese)

$$=\text{running time}\times80\times\tfrac{3}{8}$$

Assuming that each knife will produce the same number of inch cuts as does that in a guillotine type of machine,

$$\text{running time}=\frac{33{,}600}{80\times\frac{3}{8}}$$

$$=1120 \text{ minutes}=18 \text{ hours, } 40 \text{ minutes}$$

It will thus be seen that even allowing for a large margin of safety, resharpening of the knives will not be necessary more frequently than once per eight-hour shift.

Since the centre line of the mouthpiece **5** and the axis of the grindstone **22** are symmetrically arranged around a vertical plane passing through the axis of the drum **8** it follows that regrinding of the knives **13** will cause their cutting edges to be a fixed distance from the mouthpiece. In a similar way, since the point of contact between the grindstone **22** and the drum **8** and the trueing diamond **25** are symmetrically arranged around a vertical plane through the axis of the grindstone, it follows that, when the grindstone is lowered for trueing, its contact surface in relation to the drum **8** will be fixed. Thus the position of the diamond **25** is related to the mouthpiece **5** so that downward movement of the grindstone and upward movement of the drum always results in the knives being maintained at a fixed distance from the mouthpiece.

Assuming that the machine has been operating and the knives are blunt, the diamond **25** from the original setting, will be in a position to trim 0.000925 off the stone surface.

The diamond **25** then traverses the grindstone **22** by operation of the lead screw **35** by a manual actuation of the driving motor thereof, thereby creating a gap of 0.000925 between grindstone and knives. The handle **54** is moved in an anticlockwise direction so that the pawl operates the ratchet wheel when the lead screw **24** lowers the grindstone by a predetermined amount 0.001".

Simultaneously the nut **50** is raised by the operation of left hand lead screw **51**. Since this screw has a three start thread, the nut **51** is raised three times the distance the grindstone **22** is lowered. Due to the leverage of the system, the drum **8** is raised by 0.001" and thus the knives **13** move 0.000925 towards both the mouthpiece and the grindstone.

The grindstone being lowered relative to the position of the diamond point as described above, the diamond is again in the correct position for trimming when it becomes necessary to repeat this sequence of operations.

The diamond **25** trues the grindstone **22** one cutting stroke only, and remains at an end position after completing one stroke. When trueing is next required, the diamond **25** traverses in the reverse direction.

Each slice of tobacco as it is cut will tend to enter the U-shaped opening **18** and will be blown out by the air jet issuing from the restricted passage **17**. In being blown out the strands of tobacco tend to separate and this effect will be intensified by them being projected against the cover plate **57**. The rotational movement of the drum

and the entry of new slices of tobacco each time one of the knives **13** makes a cut will feed the flakes along the passage formed between the cover plate **57** and the drum **8** until the tobacco which should now be thoroughly separated is deflected away from the drum by the scraper **58** which directs the cut tobacco where required or into a cigarette-making machine proper.

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

1. A tobacco cutting machine for shredding tobacco comprising: a mouthpiece through which tobacco is fed; a member rotatable about an axis parallel to the longitudinal axis of the mouthpiece and having a plurality of knives peripherally disposed with the edges of the knives passing across the mouthpiece; a trueing diamond movable along a fixed path parallel to the said longitudinal axis; a rotatable grinding cylinder having its axis parallel to said path; and a common mechanism for raising the axis of the member and lowering the axis of the grinding cylinder in general directions towards the mouthpiece and said path respectively.

2. A tobacco cutting machine as claimed in claim **1**, wherein the member is a drum rotatable about a horizontal axis, above which the mouthpiece is positioned.

3. A tobacco cutting machine as claimed in claim **1**, wherein the edges of the knives are disposed at an angle to the axis of the member.

4. A tobacco cutting machine as claimed in claim **1**, wherein the shredded tobacco is carried away from the mouthpiece along a passage.

5. A tobacco cutting machine as claimed in claim **4**, wherein an air stream directs the shredded tobacco away from the knives into the passage.

6. A tobacco cutting machine as claimed in claim **1**, wherein the longitudinal axis of the mouthpiece and the said path are equidistant from a vertical plane passing through the axis of the member.

7. A tobacco cutting machine as claimed in claim **1** comprising feed means arranged to supply tobacco to the mouthpiece in a state of compression comparable with that of cut tobacco in a cigarette.

References Cited by the Examiner

UNITED STATES PATENTS

2,646,095	7/1953	Schreiber	146—119
2,819,746	1/1958	Baglioni	146—118
2,829,692	4/1958	Innocenti	146—119

WILLIAM W. DYER, JR., *Primary Examiner.*

W. GRAYDON ABERCROMBIE, *Examiner.*