Oct. 5, 1954 K. KÖRBER ET AL 2,690,777

ROTARY TOBACCO CUTTER HAVING A VERTICAL RECIPROCATING TRIMMING KNIFE

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FIG : 2

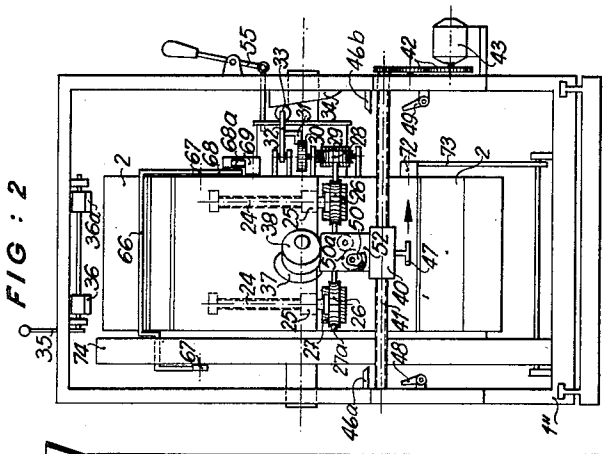

FIG : 1

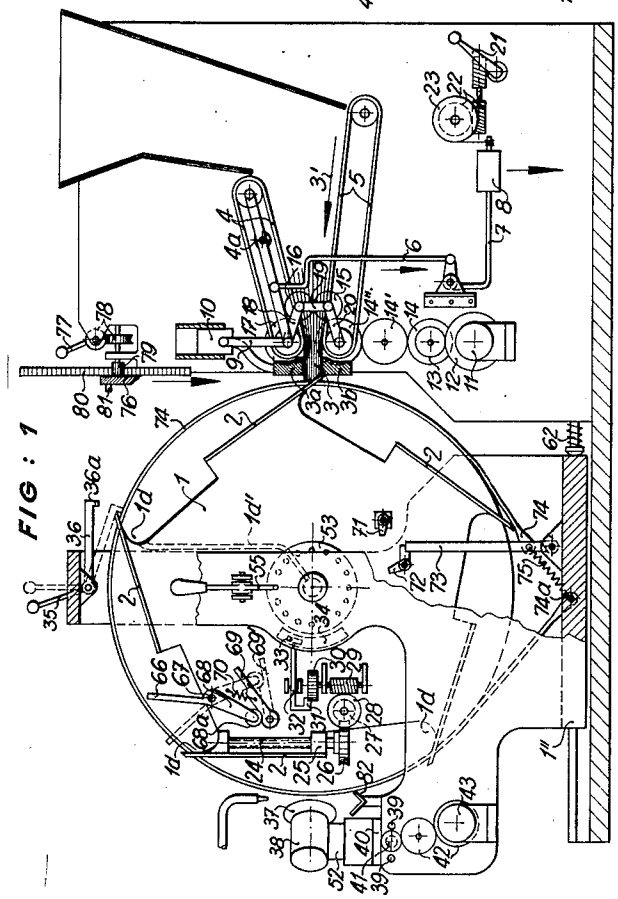

FIG : 3

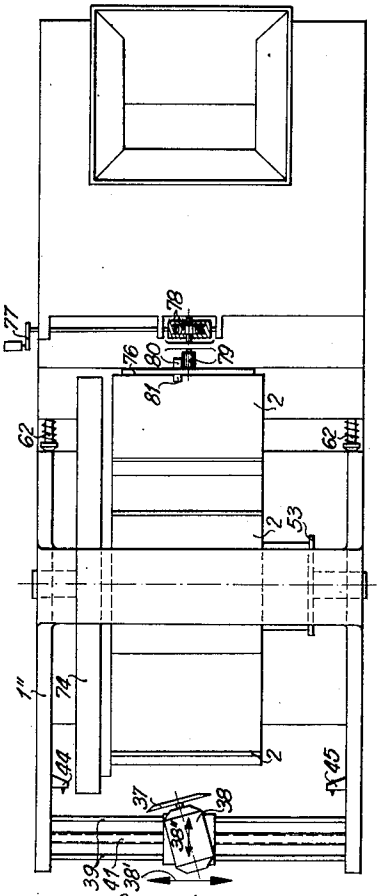

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FIG : 4

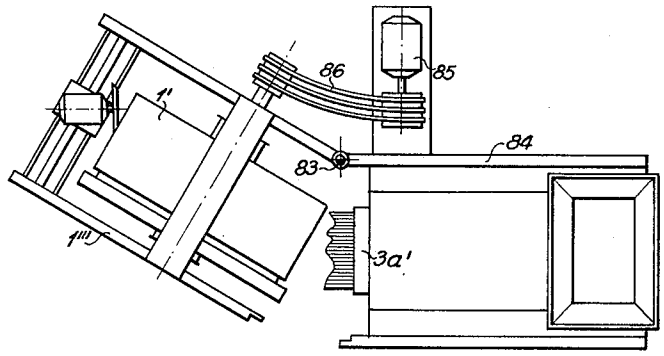
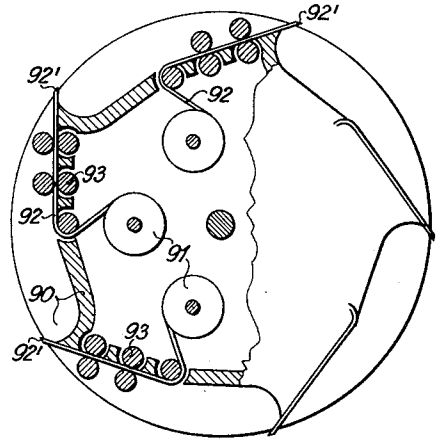


FIG : 5



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ROTARY TOBACCO CUTTER HAVING A VERTICAL RECIPROCATING TRIMMING KNIFE

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1 Claim. (Cl. 146—78)

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The present invention relates to a tobacco cutting machine in which a roller provided with knives at its periphery rotates in front of a mouthpiece through which a compressed tobacco strip is delivered. The shaft of this cutter roller lies transversely to the direction of the tobacco strip movement and the knives of the roller move directly across the mouthpiece.

When such machines are brought into operation the initial end of the tobacco strip which is not yet compressed can be cut off to a suitable extent. An essential feature of the invention consists primarily in the fact that the cutter roller is arranged in a displaceable manner relatively to the tobacco mouthpiece in order that it can be moved to the mouthpiece and the initial end of the tobacco strip can be cut off to the necessary extent by means of a special cutting device. A further feature of the invention therefore lies in the presence of this special cutting device. Where the tobacco strip contains foreign bodies the cutter roller must be capable of being moved away from the mouthpiece in order to be able to remove the foreign body. Therefore it is necessary that the cutter roller can be stopped as quickly as possible if such a foreign body should be present in the tobacco strip. A further feature of the invention is therefore the presence of a device which on striking a foreign body in the tobacco strip both stops the driving motor for the cutter roller and also operates a brake which retards the cutter roller.

Since the knives become worn during cutting the tobacco provision must be made for automatic adjustability and automatic grinding of the knives. It has however been shown that the wear of the knives is not uniform. The invention therefore provides with each knife a device which automatically adjusts each knife individually. The grinding of the knives is effected by means of a grinding wheel driven by a motor which receives both a back and forth movement parallel to the axis of the cutter roller and also a movement perpendicular to the back and forth movement.

All the said devices are located together with the cutter roller in a separate machine frame separable from the other frame or housing in which the tobacco feed and the tobacco mouthpiece are located. This former frame can for this purpose either be slid or shifted from the mouthpiece or the frame is pivoted to the other machine frame or housing and can be turned relatively thereto. For the drive of the cutter roller and for the tobacco feed a separate drive is provided in each case.

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In order to permit satisfactory cutting of the tobacco strip care must be taken that the knives on the periphery of the cutter roller cut the upper surface of the tobacco strip with a shearing action. The invention contemplates an inclined positioning for the shaft of the knife roller or in place thereof to form the tobacco mouthpiece in such a way that the upper surface of the tobacco strip passing through the mouthpiece forms an angle of about 5° with the horizontally arranged shaft of the cutter roller. The tobacco feed through this mouthpiece is described below in greater detail.

Referring to the accompanying drawing Figs. 1 to 3 represent the construction example in which the cutter roller can be slid away from the tobacco mouthpiece, Fig. 1 being a cross section through the machine, Fig. 2 a front view and Fig. 3 a plan. Fig. 4 shows a diagrammatic plan of a modified form on reduced scale of a tobacco cutting machine in which the cutter roller can be turned relatively to the tobacco mouthpiece. Fig. 5 shows in greater detail another arrangement of the knives. The inclined positioning of the mouthpiece is not separately shown on the drawing, it will however, be sufficiently understood in the course of the following description.

1 represents the cutter roller which is supported on a horizontally journalled shaft in a slide 1'' and moves in front of a mouthpiece of which the upper jaw is marked 3*a* and the lower jaw 3*b*. The tobacco strip 3 is forced through this mouthpiece in the direction 3' by means of conveyor bands 4 and 5. The lower conveyor band 5 serves only for the conveyance movement 3' while the upper band 4 receives in addition an upward and downward movement. For this purpose the conveyor band 4 is pivotally mounted on a shaft 4*a* and is forced downwardly by a weight 8 by means of the connection rods 6, 7. The up and down movement of the band 4 around the shaft axis 4*a* is transmitted by means of a lever 9 to a slide member 10 mounted in the machine frame and which is connected to the upper mouthpiece jaw 3*a* so as to participate in the up and down movement of the band 4. The lower mouthpiece jaw 3*b* remains stationary. The driving of the two bands is effected from a motor 11 by means of the gear wheels 12, 13, 14, 14', 14'', 15, 16, 17, of which the wheels 15 and 16 are adapted to have a scissors like motion by means of the connection levers 18, 19, 20, so that transmission of the drive is independent of the up and down movement of the band 4.

By means of the conveyor device described, satisfactory delivery through the mouthpiece 3*a*,

3b of the tobacco strip 3 is ensured. When it is not in operation the crank 21 can be rotated whereby a cable drum 23 is rotated through the worm drive 22 and the weight 8 and thereby, through the rods 6 and 7, the conveyor band 4 are raised.

In front of the mouthpiece 3a, 3b which for example is inclined to the horizontal at an angle of about 5° rotate the knives 2 which are secured in an adjustable manner to the periphery of the roller 1 rotatable on a horizontal shaft. For this purpose each knife 2 is adjustable by two spindles 24 of which only one pair is shown on Fig. 2 and on each of which is provided a nut 25 connected to the knife 2 concerned. The spindles 24 are driven by means of a worm wheel 26 and a worm 27. On the shaft 27a (Fig. 2) of the worm 27 is disposed a worm wheel 28 which is freely rotatable and can be coupled by means of a clutch not shown to the shaft 27a. The worm wheel 28 engages the worm 29 (Fig. 1 also) on which a feed wheel 30 is provided which is operated through a pawl 31, a transmission lever 32 and a roller 33 when the knife roller 1 in its rotation causes one of the feed rollers 33 to bear against a stationary cam 34.

Each knife 2 embodies the adjusting mechanism described which during one rotation of the roller 1 is fed by one tooth and thereby operated to a very small extent so that each knife blade is adjusted to a slight extent for each passage across the tobacco strip 3. An adjustable arm may be disposed on the nuts 25 which for example operate an acoustic signal when the knife is worn away to the limit. In order that in any case the knives can be slid forward no further than the limit, the spindles are not threaded at their ends with the result that the feed nuts 25 can no longer operate.

When a knife 2 is to be changed the worm-wheel 28 is freed and the shaft 27a rotated by hand whereby the new knife can be fitted rapidly without operating through the worm drive reduction train. In order that the edge of the new knife shall always be set in the same cutting position a lever mechanism is provided above the roller 1 on the frame of the machine which can be brought into position as a stop for the knife edge in the rotary zone of the knife. This lever mechanism comprises e. g. an adjusting lever 35 provided with a hand grip and a stop lever 36 subject to the action of a spring; the front piece 36a of the lever 36 is adjustable. When not in use the lever mechanism is set permanently out of the range of the knives 2 and it is only turned into the paths of the knives when required. In order that the roller 1 can be secured for this purpose there is provided on the end face of the roller 1, for example a locking ring 53 in the apertures or other recesses of which a locking pin 54 (Fig. 2) can be introduced, being controlled by a lever 55.

After each feed of the knives these are sharpened during the running of the machine. For this purpose a rotary grinding wheel 37 is provided driven by a motor 38 for example in an inclined position in order that a cone shaped grinding wheel 37 can sharpen the edges of the knives 2 when it is correspondingly moved. The grinding wheel 37 can be used until it is reduced to a small diameter. Movement of the wheel is effected (Fig. 3) both in the direction 38' along the cutting edge as also in the direction 38''. For this purpose the motor 38 is located on a slide 40 guided for example on the rails 39 and is slidable parallel to the axis of the roller 1 by the fact that the slide 40 carries a spindle 41 which is driven from a motor 43 by means of a gear drive 42 (see also Fig. 2). At the ends of the movement 38' the wheel engages a diamond 44 or 45 (Fig. 3) for trueing the grinding surface of the cone-shaped grinding wheel 37 when this reaches one of the end positions of the movement 38'. A water jet cools the trueing device. The backward and forward movement of the slide 40 is automatically controlled in that in known manner (see Fig. 2) an abutment 47 is fixed for example to the slide 40 which at the two end positions reverses a lever 48 or 49 and thereby reverses the direction of rotation of the spindle 41. Also the feed in the direction 38'' (Fig. 3) is effected automatically since a lever 50 provided with feed pawls (Fig. 2) bears against the cams 46a 46b and thereby operates a feed wheel 50a which moves a support 52 in the direction 38'' through a spindle not shown.

If when cutting the tobacco strip 3, foreign bodies are present in the tobacco a mechanism is utilised which will be further described below. On the cutter roller 1 is a feeler strip 66 which is pivotally mounted at 67 and a lever 68 is rigid therewith which bears on a lever 69 by means of a roller 68a which lever is in turn under the influence of a spring 70. If an end of the tobacco strip which is not cleanly cut through or a foreign body which is not cut through, projects too far from the mouthpiece 3a, 3b the upper edge of the feeler strip 66 strikes the foreign body so that the strip 66 is turned to the dotted line position shown. Thereby the lever 68 with the roller 68a at its free end rotates into the dotted line position and tilts the lever 69 in the clockwise direction. In this position 69' the free end of the lever 69 comes into the path of the stationary motor switch 71 and a lever 72 on the further rotation of the roller 1, and the latter lever locks a lever 73 to which one end of a band brake 74 is fixed. The other end of the brake 74 is secured at 74a to the machine frame. On striking 71 the motor not shown for driving the roller 1 is stopped and by striking 72 the lever is freed whereby the band brake 74, 74a is brought into action by the tension spring 75 and the roller 1 is brought to a standstill.

The drive of the roller 1 not shown, is effected separately from the drive 11 for the tobacco conveyor, for example by means of a flange motor on the slide 1''. After the cutter roller has been stopped it is moved away from the mouthpiece 3a, 3b by means of the slide 1'' and after removal of the foreign body, brought again to the working position at the mouthpiece 3a, 3b. A buffer 62 ensures that on insertion of the slide 1'' damage to the knife edges is avoided and a smooth starting of the cutter roller 1 is ensured.

In order that in the inoperative position of the slide 1'' a piece of the tobacco strip 3 can be trimmed a trimming knife is provided on the machine which when starting the machine and when the knife 1 is separated from the mouthpiece can also be used for cutting the still insufficiently pressed initial end of the tobacco strip. This trimming knife according to Fig. 1 consists for example of a knife plate 76 which can be raised and lowered by means of a hand crank 77, a worm drive 78, pinion 79 and a rack 80 (see also Fig. 3). In order that the trimming knife 76 cannot in the lowest position, not shown, strike the knife roller in the horizontally displaced or pivoted position a projection 81 or the

like on the knife plate **76** is provided against which the knife roller **1** will act if it should be brought into the operating position in error.

In order that when cutting the tobacco strip the tobacco shall not collect below the knife edges the recessed parts *1d* of the roller **1** are connected through passages, one of which is indicated at *1d'* (Fig. 1) with the hollow shaft of the roller **1** and the shaft is connected to a pressure system not shown whereby tobacco collecting in the spaces *1d* may be blown away. Below the mouthpiece *3a*, *3b* a suction device may be provided in order to remove tobacco waste or residue produced when cutting. A collecting channel **82** below the grinding wheel **37** serves for collecting the grinding dust in order that this shall not come into contact with the cut tobacco.

Fig. 4 shows diagrammatically that the machine frame *1'''* can also be hinged by means of a link **83** to the other frame **84** serving for the tobacco conveyance, in order that the cutter roller *1'* can be turned away from the mouthpiece *3a'*. This figure also shows that instead of using a motor flanged to the frame *1'''* a motor **85** on the frame **84** may be used which drives the cutter roller *1'* by a belt drive **86**.

In Fig. 5 another construction of the knives is shown, this figure being a partial section through the knife roller **90**, in which rollers **91** corresponding in number to the knives are journalled and on which steel strips **92** serving as knives are coiled, the ends **92'** of the strips being sharpened continuously by means of the grinding device. The knife strips **92** are fed between rollers of which the roller **93** only is rotated to a slight extent at each revolution of the roller **90** by means of the adjusting device described and thereby the knife strips **92** are fed to a slight extent.

What we claim is:

In a tobacco cutting machine, a frame, a cutter roller rotatably mounted in said frame, means operatively associated with said cutter roller for rotating the cutter roller, means mounted in said frame for feeding tobacco towards the periphery of said cutter roller, a mouthpiece associated with said feeding means and disposed adjacent the periphery of said cutter roller for compressing the tobacco, a plurality of knives mounted in said cutter roller with their edges projecting beyond the periphery of said cutter roller, means in said cutter roller for automatically advancing said knives individually and successively in dependence upon the rotation of said cutter roller, means in said frame for moving said cutter roller towards and from said mouthpiece, knife means mounted in said frame for initial trimming of the tobacco protruding from said mouthpiece toward said cutter roller, means operatively associated with said knife means for reciprocating said knife means in cutting relation with said mouthpiece, and means on said knife means for engagement with said cutter roller should it accidentally be in position adjacent said mouthpiece at the time of reciprocation of said knife means, thereby preventing damage to said knife edges.

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