

Feb. 23, 1965

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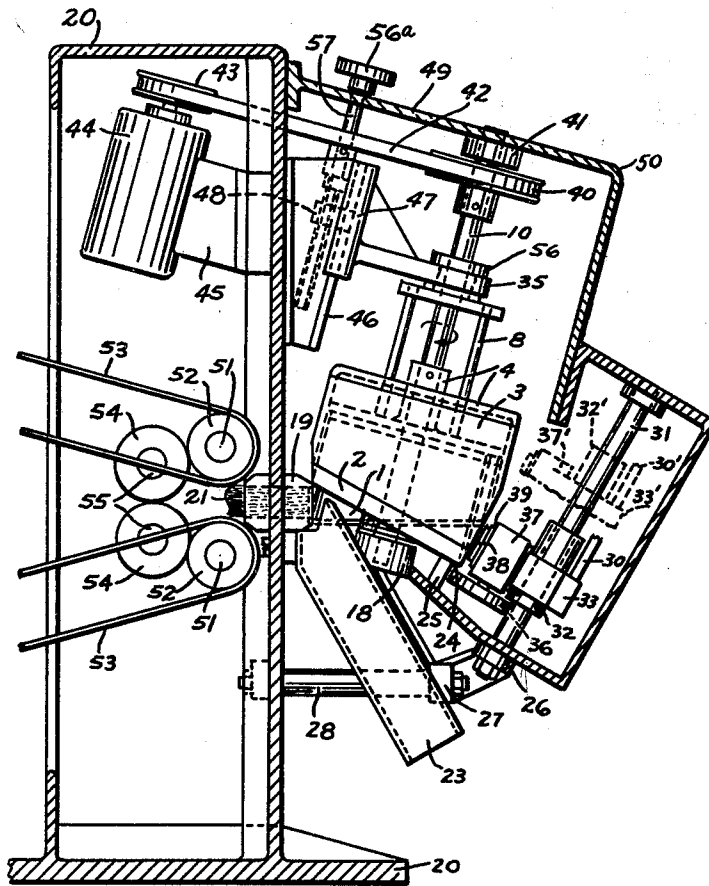
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TOBACCO CUTTING MACHINE WITH ROTATING KNIFE TOP

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3 Sheets-Sheet 1

Fig. 1.



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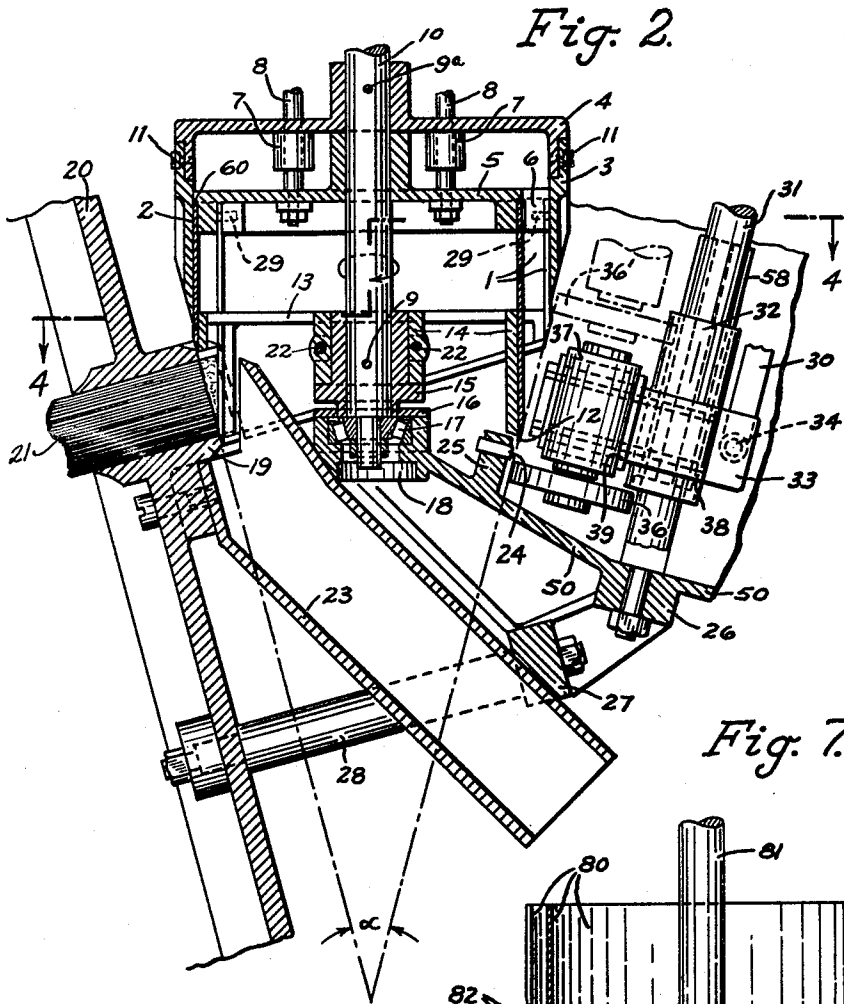


Fig. 2.

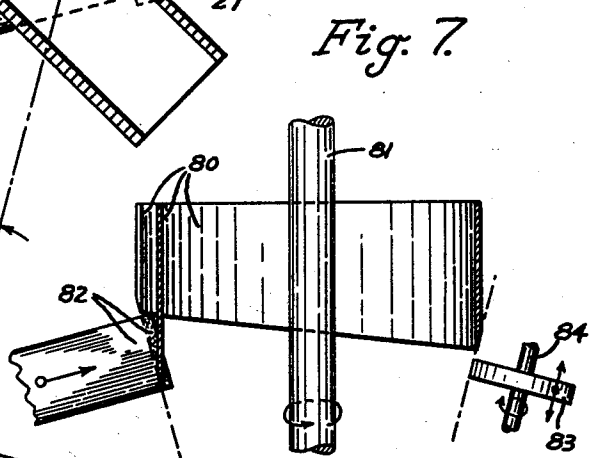


Fig. 7.

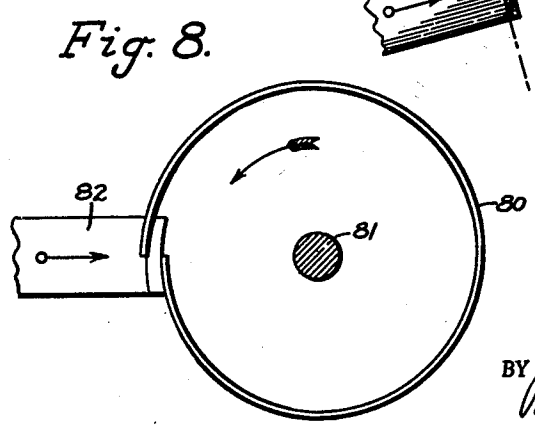


Fig. 8.

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Fig. 4.

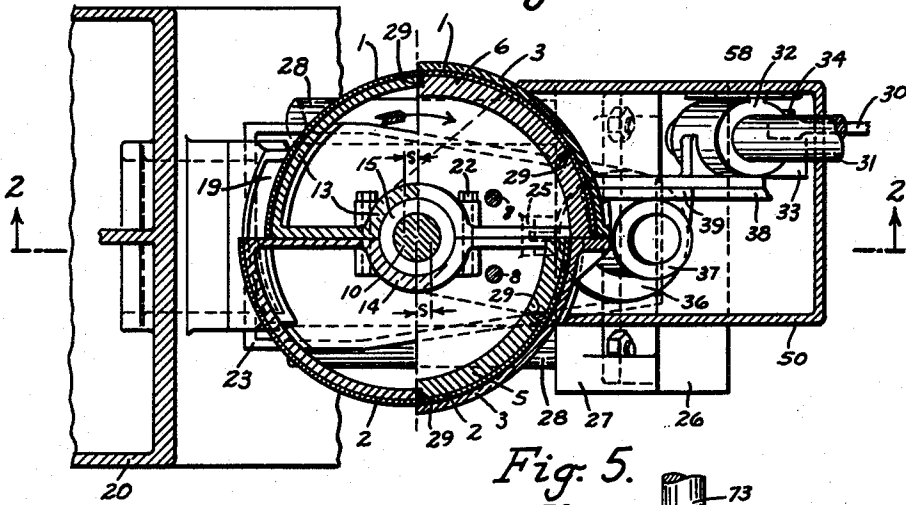


Fig. 3.

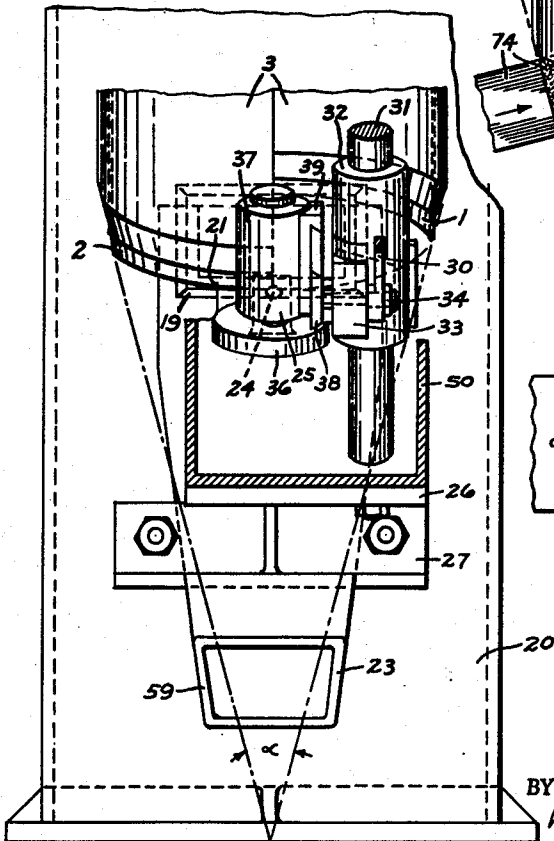


Fig. 5.

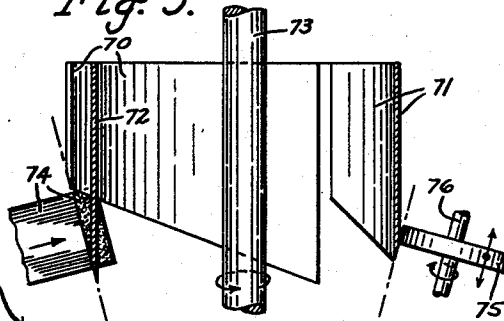
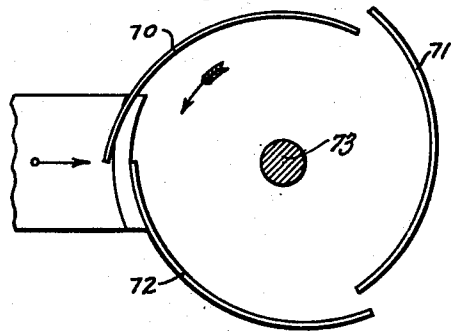


Fig. 6.



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TOBACCO CUTTING MACHINE WITH ROTATING KNIFE TOP

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Sch 27,096

10 Claims. (Cl. 146—106)

The invention relates to machines for cutting tobacco or similar fibrous material, such as tea.

Machines for cutting tobacco have been proposed which comprise a cutter head rotatably arranged in front of a nozzle through which tobacco to be cut is fed.

It is desirable that during rotation of the cutter head the cutting edge of each cutter will progressively engage the tobacco to be cut, since if, at the beginning of a cutting action, the entire cutting edge engages the tobacco to be cut an irregular chopping action rather than an even slicing action will result.

The present invention consists of a machine for cutting tobacco or similar fibrous material comprising a rotatable head provided with one or more cutters co-operating with an end of a nozzle for feeding the material to be cut to the cutter, the axis of rotation of the cutter head being arranged at an acute angle to the plane of cutting; cutters being so formed and arranged relatively to the said axis of rotation that, on each complete revolution of the cutter head, the cutting edge moves progressively across the width of said nozzle opening.

It is a further object of this invention to provide a cutting head, the cutting margin of its cutters at the cutting edge being arranged in the shape of a cone with the cutting edge spiralling so that it generally lies in acute angled relation to the axis of the head.

It is a further object of this invention to provide a cutting head, the cutters of which are, when a plurality of cutters are provided, arranged parallel but eccentrically to the axis of rotation; each cutter being cylindrically curved.

It is a further object of this invention to provide a cutter holding means adjustable by means settable from the outside of the machine.

In the improved machine the end of the nozzle may form a portion of a surface of a cone the apex angle of which equals twice the acute angle between the axis of rotation and the cutting plane and in which a grinding device having a rotatable grinding disc for sharpening the cutter or cutters is provided, the axis of rotation of the grinding disc forming an acute angle with the axis of rotation of the cutter head and which angle equals the acute angle between the axis of rotation of the cutter head and the plane of cutting, so that the grinding disc in its range of contact with the cutter or cutters moves on a portion of a conical surface, the apex angle of which equals twice one of said acute angles.

To make the invention clearly understood reference will now be made to the accompanying drawings, which are given by way of example and in which:

FIG. 1 is a side elevation, partly in section, of a tobacco cutting machine.

FIG. 2 is a sectional detail of the machine of FIG. 1 on a larger scale, taken substantially on the line 2—2 of FIG. 4.

FIG. 3 is a fragmentary front elevation partly in section of the machine of FIG. 1.

FIG. 4 is a section taken along the line 4—4 of FIG. 2.

FIG. 5 diagrammatically illustrates a modification of the arrangement of cutters of the machine.

FIG. 6 is a top plan view of the arrangement of FIG. 5.

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FIG. 7 diagrammatically illustrates another modification of a cutter arrangement; and

FIG. 8 is a top plan view of the arrangement of FIG. 7.

The tobacco cutting machine of FIGS. 1 to 4 comprises a box-like frame 20 and an auxiliary frame 50 connected to the main frame 20 and held in position relative thereto by struts 28 and nuts 27 (see FIG. 1).

Rollers 52 are supported on the frame 20 on shafts 51 around which belts 53 are trained for feeding tobacco to be cut to a feed nozzle 19; the rollers 52 being coupled together for equal movements by a train of wheels 54 rotatable upon shafts 55. The feed nozzle 19 is mounted in a wall of the frame 20 and extends therethrough. A cutter head in the shape of a drum is provided with curved cutters 1 and 2. The drum has a blade supporting end in the shape of a truncated cone with the apex angle α (see FIG. 2). The drum is keyed to a shaft 10 which is inclined from the vertical relatively to the free end of the nozzle 19 by an angle which equals $\alpha/2$. The shaft 10 is rotatably mounted at its upper end in a bearing 41 and at its lower end in an inclined roller bearing 17 (FIG. 2) supported by a seat 18. The bearings 41 and 17 are fixed to the auxiliary frame 50. Underneath the nozzle 19, which serves the purpose of feeding caked tobacco 21 to the cutter drum, is a downwardly inclined chute 23 supported by frame 20 for removing cut tobacco.

The drum comprises two relatively detachable segmental parts 13 and 14 (see FIG. 4) connected together by bolts 22 and keyed to a bushing 15 and the shaft 10 at 9. Above the parts 13 and 14, a disc 5 having a turned down skirt 6 is provided on the shaft 10, the periphery of the skirt 6 being formed by two circular arcuate portions which are eccentrically disposed relatively to each other and with respect to the axis of shaft 10 shown in FIG. 4. The skirt 6 is provided with grooves eccentric to each other in which arcuate blade-like cutters 1 and 2 are mounted. The cutters are fixed to the disc 5 and skirt 6 by studs 29 and they abut against the bottoms 60 of said grooves. The cutters 1 and 2 thus are adjustable bodily with the disc 5. The assembled cutters are housed within segmental parts 3, which in turn are connected to and supported by a lid 4 keyed to the shaft 10 at 9^a and attached to parts 3 at 11. Rods 8 are fixed to the disc 5 and slidably extend through bushings 7 on the lid 4. The rods 8 support a grooved collar 56 slideable along the shaft 10. Means to adjust the position of the collar along shaft 10 comprise an arm 35 rigid with a member 47 which is slideable along a guide frame 46 attached to the main frame 20. The member 47 has a nut 48 as a part thereof in which is screw threaded a spindle 57. The latter is rotatably mounted on frame 50 and has an external wheel 56^a. The cutter head is thus adjusted along rods 8 by rotating the spindle 57. To the shaft 10 is keyed a pulley 40 which is rotated by means of a V-belt 42 trained about a pulley 43 of an electric motor 44. The motor 44 is mounted on a bracket 45 attached to the main frame 20.

For sharpening the cutters 1 and 2, a grinding device is provided, having a grinding disc 36. This device is mounted on a shaft of an electric motor 37; the position of which can be adjusted relative to the cutters 1 and 2 by supporting guide means 38 and 39 in a direction at right angles to a supporting shaft 31, the axis of which parallels the side of the cone angle, and which has a bearing at 26 on frame 50. It can also be adjusted in a direction parallel to the shaft 31 by further guide means 32 and 33. By means of a rod 30 attached at 34 to the guide 33 the grinding device can be reciprocated through a well known gear mechanism (not shown). A diamond 24 is provided in a holding device 25 and lies with its outer face in said conical surface.

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In the modification of FIGS. 5 and 6 the cutter head comprises segmental arcuate cutters 70, 71 and 72 which are suitably connected as by a cutter head (not shown), corresponding generally to that shown in FIGS. 1 to 4, to a rotatable shaft 73 for rotation with said shaft. The cutters are arranged eccentrically relatively to the shaft 73 and are arched eccentric to each other. A rod of tobacco to be cut is indicated in FIG. 5 by reference numeral 74, a grinding disc by numeral 75, the grinding disc being mounted on a rotatable shaft 76. In this embodiment three cuts are performed on each complete revolution of the shaft 73. The cutting edges form parts of a conical surface of the apex angle α (see FIG. 2). The cutting edges of the cutters lie at an acute angle to the axis of shaft 73.

In the embodiment of FIGS. 7 and 8 a cutter 80 is provided which in plan view forms a spiral or part of a spiral about a rotatable shaft 81 to which the cutter 80 is connected as by a cutter head (not shown), generally corresponding to the head shown in FIGS. 1 to 4. A tobacco rod to be cut is indicated at 82. A grinding disc 83 is mounted on a rotatable shaft 81 the axis of which parallels the cone angle α . The cutting edge forms at the locus of cutting a conical surface having the apex angle α . Note that the cutting edge of the blade or cutter lies in a plane at an acute angle to the axis of shaft 81.

It will be recognized that the blade assembly at its cutting end 12 forms a frusto-conical body of rotation having the apex cutting angle. The axis of rotation of the blade assembly is parallel to the axis of the angle α .

The cutting edge of the blade (or blades) lies in a plane at an acute angle to the axis of rotation of the cutter head with the high point of the plane located at the advancing side of a blade or each blade so that the shearing action on the tobacco rod 21 takes place progressively from the top of the rod and then downward.

In operation the cutter head having a plurality of blades or cutters or a single spiral-shaped cutter rotates in front of the nozzle 19 in the direction of the inscribed arrows (see FIGS. 2 and 4). The cutting edge cuts with a progressive sliding or drawing movement a desired length of a rod of caked tobacco fed through the feed nozzle 19 until the lower part of the cutting edge on further rotation clears the tobacco rod. Since the length of the cutter when curved exceeds the height through which the cutter cuts and which is dependent on the inclination of the cutting edge, the sliding component of the cutting movement may be rendered high as compared to the cutting height.

The highest possible speed of rotation of the cutter head is dependent on the speed with which the cut tobacco is removed from the cutting edge through the chute 23 under the action of gravity. It has been found that with the machine described a high speed of rotation and thus a high output of cut tobacco is obtainable.

The cutters may be made of thin material, preferably of hardened springy band steel. The minimum strength of such steel band usable for the cutter is believed to be 0.5 mm. Steel band material can easily be bent into the required shape. If the steel band is essentially thicker it is recommended to shape it on a suitable shaping machine known per se to give it a permanent deformation. It should be mentioned that the cutter can be punched out of steel band without any or very little waste. Even if the cutters are thin, they obtain the required rigidity by their curvature. Moreover, the cutting forces act on the cutters mainly in the direction of the axis of rotation whereby wear of the cutters is kept within reasonable limits.

The reason it is necessary to locate the blades eccentric to the axis of rotation of the head will be apparent from the various views, but in particular it is shown in FIG. 2 that the feed exit opening of the nozzle 21 is located at an acute angle to the vertical. Now the leading edge of the blade is placed farther away from the axis

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of shaft 10 than the trailing edge because the cutting edge slices from the top and the distance of the blade from shaft 10 decreases as the blade moves downwardly across the tobacco rod in order that the cutting edge of the blade will always slice directly across the said acute angle end of the feed opening of the nozzle.

The invention has been described as applied to a tobacco cutting machine, but may alternatively be applied to machines for cutting similar fibrous material, for example tea.

What I claim is:

1. In a machine for cutting fibrous material such as tobacco the combination of a supporting frame, a rotary head mounted on a fixed axis of rotation upon said frame comprising an outer cylindrical shaped casing portion and an inner cylindrical shaped casing portion, means to variably extend and retract the inner casing with respect to the outer casing in the direction of the axis of the rotary head, a blade construction mounted between said casing portions on the inner cylindrical casing for movement therewith, said blade construction comprising an arcuate blade arrangement having a cutting edge protruding beyond said head and which cutting edge is tapered so that extended the taper would form a cone having a predetermined apex angle beyond and in the same facing direction as the cutting edge, and means for feeding bunched fibrous material including a nozzle the exit plane of which lies in a side of said cone line as extended from the cutting edge of the blade.

2. In and for a machine for cutting fibrous material such as tobacco, the combination comprising supporting means, a rotary head mounted on said supporting means and rotatable about a stationary axis of rotation, means for mounting a blade on said head for rotation therewith, means for moving said blade relatively to said head in the direction of said axis of rotation, said blade being arcuate and eccentric relatively to said axis of rotation, said blade having a cutting edge protruding beyond said head, said cutting edge being tapered so that the taper forms part of a conical surface the apex of which lies on said axis of rotation, and means for feeding fibrous material towards said cutting edge in a direction substantially perpendicular to said conical surface.

3. In and for a machine for cutting fibrous material such as tobacco, the combination comprising mounting means, at least one curved cutter carried by said mounting means, means for rotating said mounting means and therewith said cutter about an axis of rotation, said cutter being arranged eccentric to said axis of rotation and having an inner surface and an outer surface, said inner surface being parallel to said axis of rotation, a cutting edge on said cutter, said cutting edge being formed by a first marginal portion of said inner surface and a second marginal portion of said outer surface, said second marginal portion being inclined to said axis of rotation and forming a part of a conical surface having its apex on said axis of rotation, and means for feeding fibrous material towards said cutting edge in a direction perpendicular to said conical surface.

4. The combination defined in claim 3, and further comprising means for displacing said cutter in the direction of said axis of rotation, said cutting edge lying in a surface inclined to said axis of rotation, a means for sharpening said cutting edge, and guide means for reciprocating said sharpening means along a straight line forming an acute angle with and intersecting said axis of rotation, said acute angle equalling one half of the apex angle of said conical surface.

5. The combination defined in claim 3, wherein a plurality of cutters are provided.

6. The combination defined in claim 5, wherein said cutters are cylindrically curved, said second, inclined, marginal portions of the outer surfaces of all the cutters forming part of a single conical surface having its apex on said axis of rotation.

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7. The combination defined in claim 3, wherein said cutter in a section perpendicular to said axis of rotation is spirally curved about said axis of rotation.

8. A machine for cutting fibrous material such as tobacco, comprising mounting means, at least one curved cutter carried by said mounting means, means for rotating said mounting means and therewith said cutter about an axis of rotation, means for displacing said cutter in the direction of said axis of rotation, said cutter being arranged eccentric to said axis of rotation, a cutting edge on said cutter, said cutting edge being formed by a first marginal portion of an inner surface of said cutter and a second marginal portion of an outer surface of said cutter, said second marginal portion forming a part of a conical surface having its apex on said axis of rotation, means for feeding fibrous material towards said cutting edge in a direction perpendicular to said conical surface, means for sharpening said cutting edge, said sharpening means being arranged for acting on said second marginal portion, and guide means for reciprocating said sharpening means along a straight line forming an acute angle with and intersecting said axis of rotation, said acute angle equalling one half of the apex angle of said conical surface.

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9. A machine as defined in claim 8, wherein a plurality of cutters are provided.

10. A machine as defined in claim 9, wherein said cutters are cylindrically curved, the inclined marginal portions of the outer surfaces of all the cutters forming part of a single conical surface having its apex on said axis of rotation.

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