United States Patent

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[54] **CUTOFF FOR CIGARILLO MACHINES**
5 Claims, 5 Drawing Figs.

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[51] Int. Cl. B26d 7/08, B26d 5/20
[50] Field of Search 83/174, 355, 490

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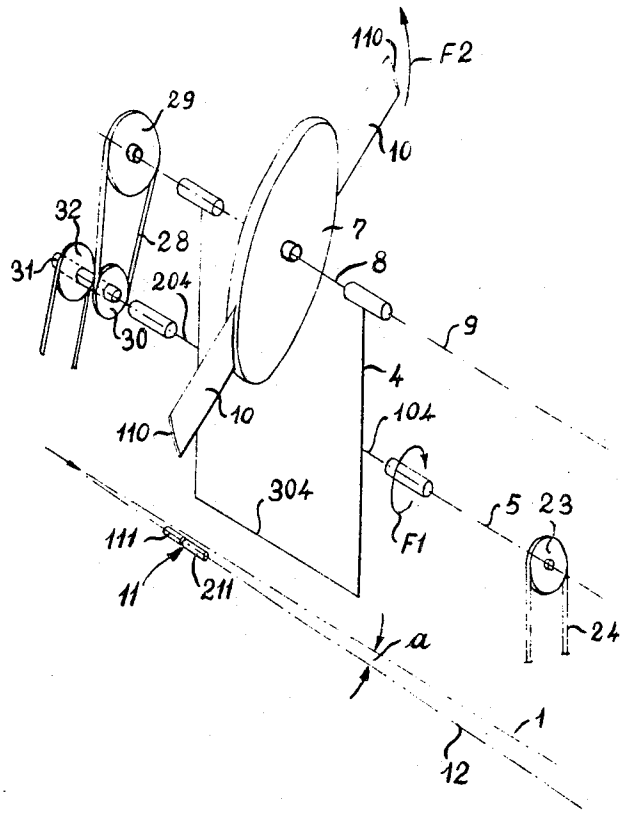
ABSTRACT: Assembled on an arm rotating about an axis parallel to axis of the cigarillo rod is a blade-holding disc rotating about an axis parallel to the axis of revolution of arm. Fastened to said disc are one or more substantially radial narrow blades, inclined in relation to a plane perpendicular to axis of the cigarillo rod and having an Archimedean-spiral-segment-shaped peripheral cutting edge. The rod to be cut passes through a ledger, whose axis is inclined in relation to the axis of the rod of an angle substantially equal to the angle of inclination of the blades.



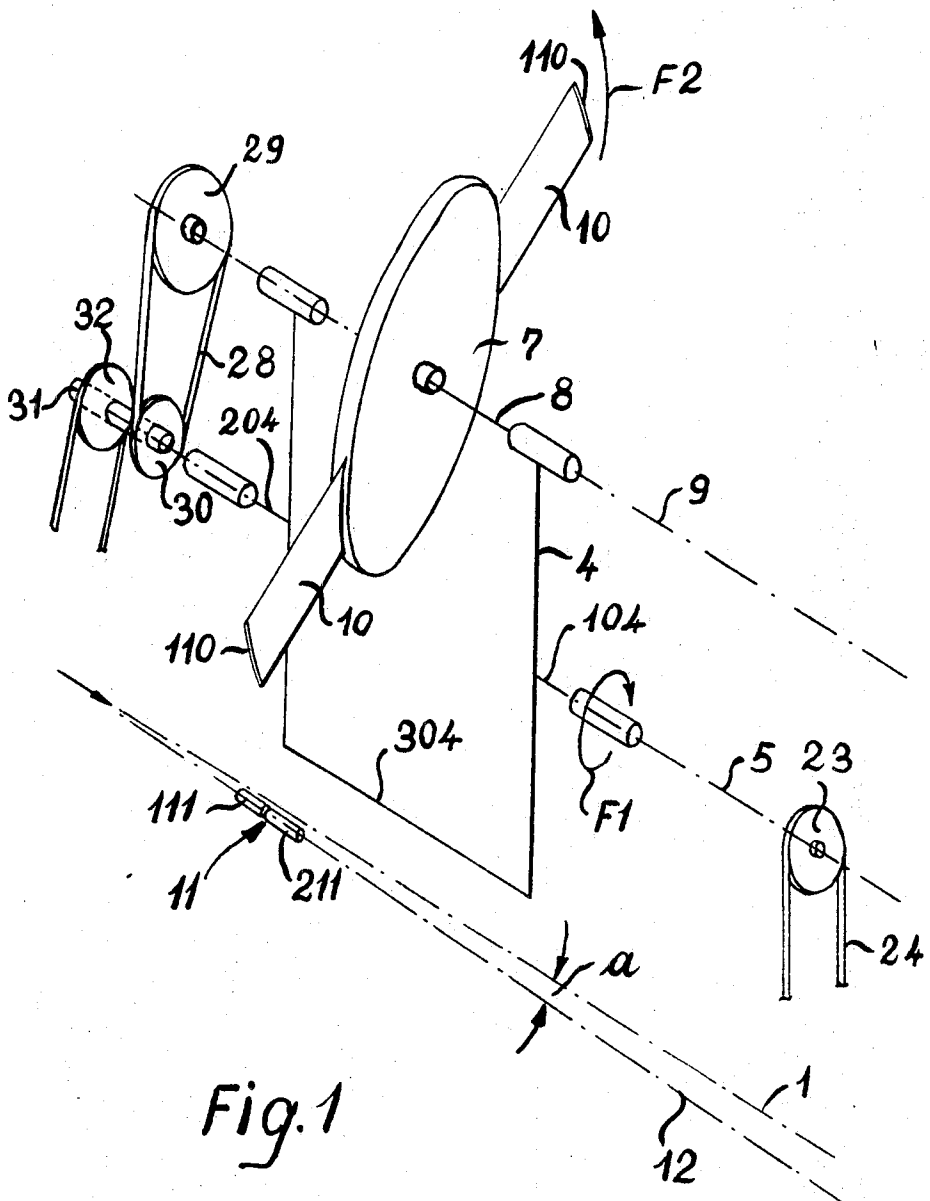


Fig. 1

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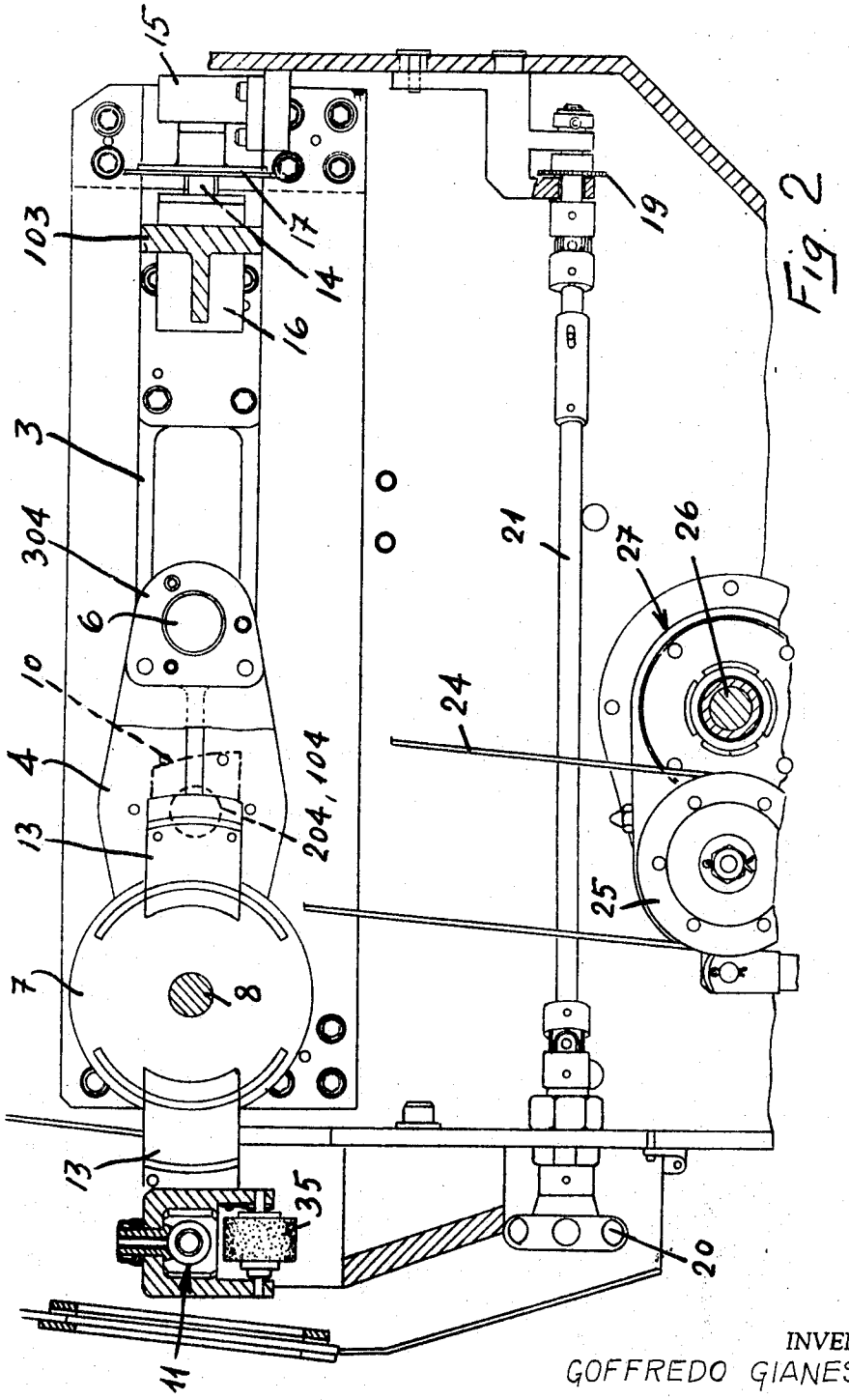

Fig. 2

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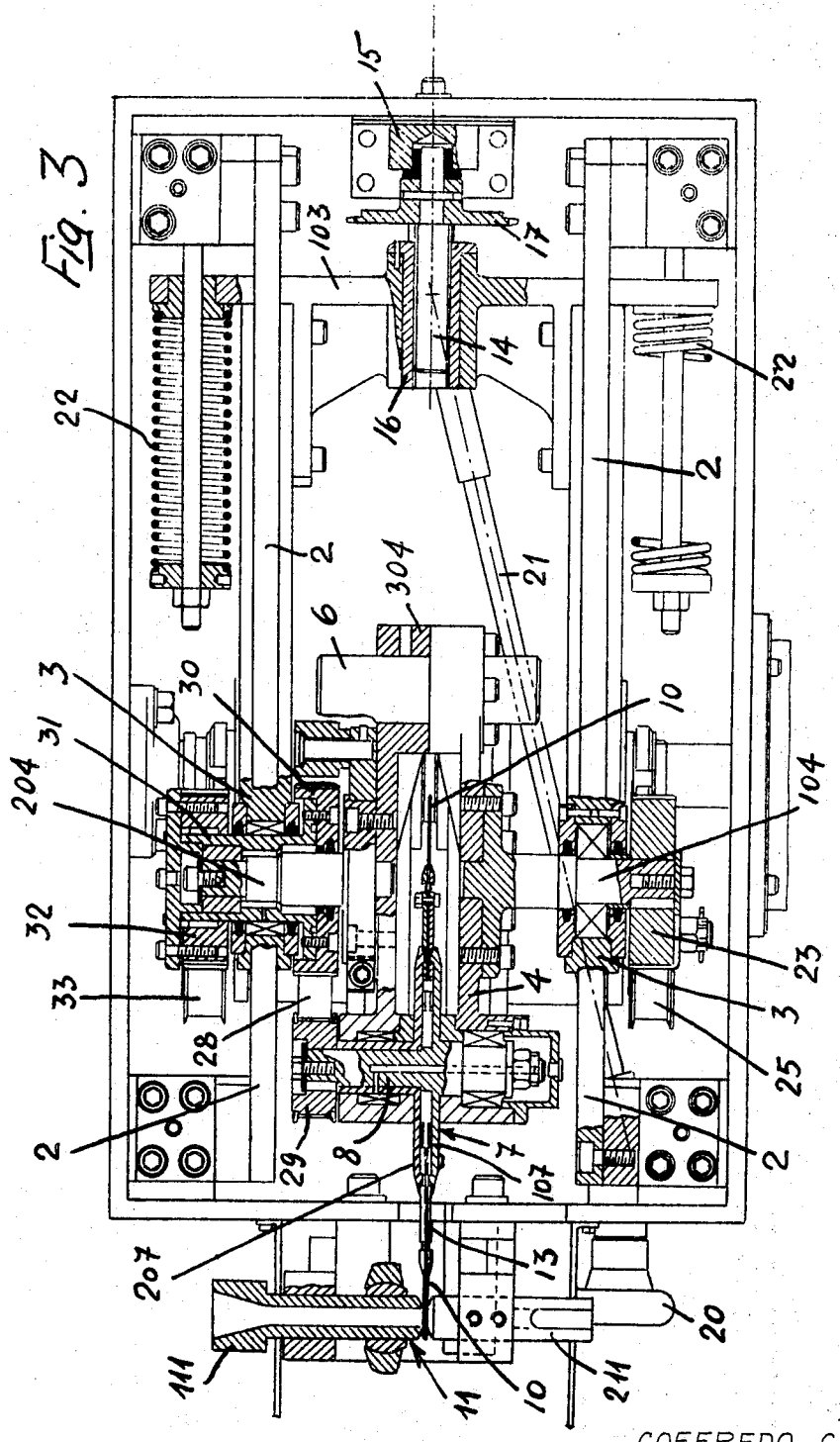
Fig. 3



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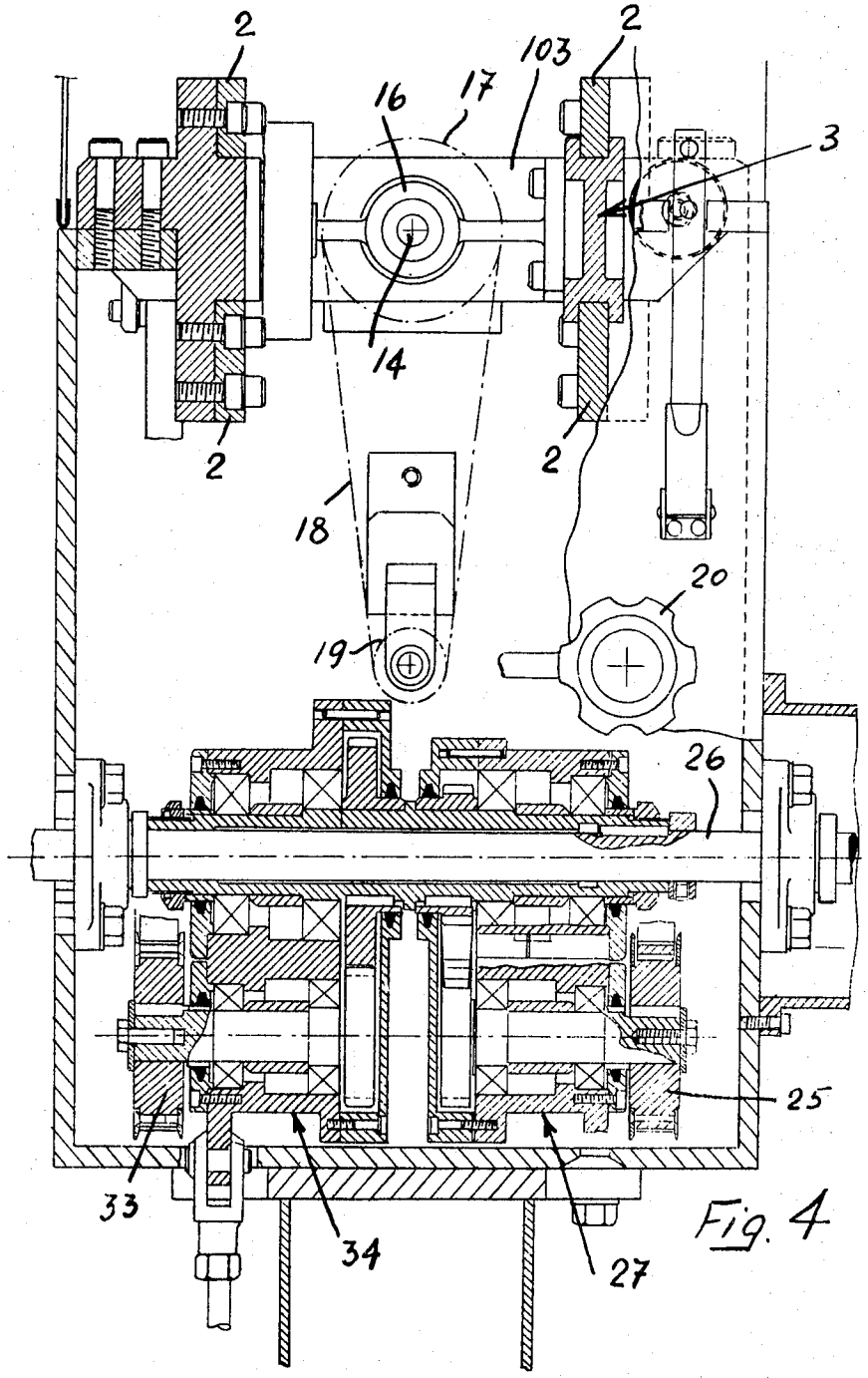

Fig. 4

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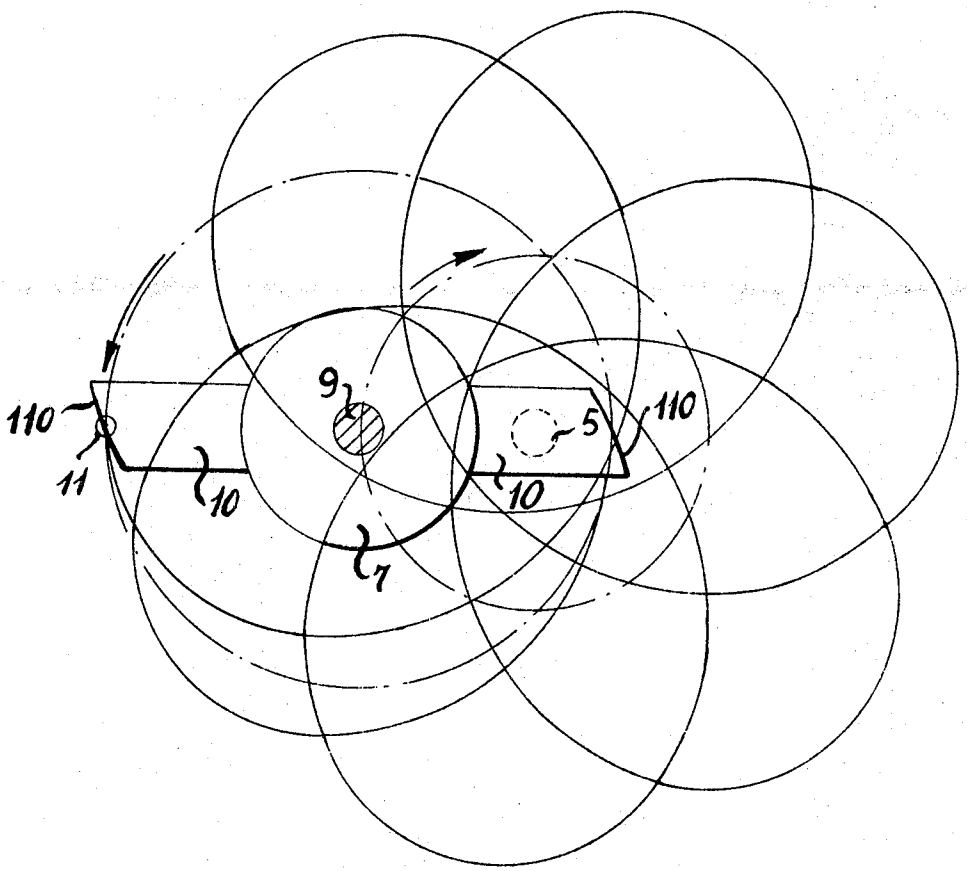
Fig. 5



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CUTOFF FOR CIGARILLO MACHINES

This invention relates to cutoffs for cigarillo machines or the like, and aims at achieving an improved cutoff, particularly suitable for cigarillo machines or the like.

In particular the invention relates to cutoffs of the above type comprising a knife-holding arm rotating about an axis parallel to that of the rod forming section and on which arm there is mounted a knife which rotates about an axis, eccentric and parallel to that of rotation of the arm and has a peripheral cutting edge which passes periodically through the narrow interspace or slit between two tubes, coaxial and aligned, which form the so-called tubular ledger through which the rod slides.

In the known cutoffs of this type for cigarette-making machines, the rod and the ledger are perfectly coaxial with the rod forming section, while the rotary knife consists of a circular disc with a continuous cutting edge, which is so shaped and designed that its cutting edge follows the motion of the rod while it is being cut, since, as a consequence, also the ledger is mounted movable forward and backward, that is, impressed with a reciprocating motion in the rod longitudinal direction in order to follow the knife oscillations.

These known cutoffs with reciprocating-motion ledger are not very suitable for cutting cigarillos, whose diameter varies considerably according to the cases, for instance from 9 to 17 mm, while also the length of the cigarillos which must be cut from the rod varies considerably, said cigarillos having lengths varying from 70 to 300 mm. In fact, to obtain with the known cutoffs the relatively long lengths of cigarillos, the reciprocating motion ledger must accomplish extensive excursions, obtainable with rather complicated and expensive devices, while another difficulty is the realization of the cutoff in such a way as to enable to vary the length of the cigarillos by small entities within very wide limits in order to cover all the range of requested lengths and diameters.

The invention aims at obviating the above inconveniences and provides for this purpose a cutoff of the type described at the beginning, wherein the rotary knife consists of one or more substantially radial blades, angularly interspaced and relatively narrow, inclined in relation to their axis of rotation and provided with a peripheral cutting edge having, preferably, an Archimedean-spiral-segment shape, wherein the peripheral speed of the cutting edge of the blade(s) is considerably higher than the rod sliding one and wherein the ledger is mounted fixedly, with the axis inclined in relation to the cigarillo rod axis, in such a way that by taking advantage of the particular elasticity of the cigarillo rod, said rod is slightly deviated from the respective forming line and disposes itself during the cutting operation in a substantially perpendicular position in relation to the blade surface.

The fixed arrangement of the ledger eliminates difficulties caused by the ledger reciprocating motion. The inclination of the blade(s) in relation to their axis of rotation and to a plane perpendicular to the axis of the rod causes the blade section, which engages the rod during the cut, to move with the rod in its direction of motion, to avoid the very short temporary stop and the consequent axial compression of the moving rod. This axial compression of the rod is eliminated by the relatively small width of each blade since the length of the cutting edge of each blade is the minimum required to cut the rod and disengage the blade from the rod as soon as said rod is cut. This also prevents the rod wrapper from being damaged. A contribution to the elimination of the axial compression also occurs by the high cutting speed obtained by increasing the speed of rotation of the blade(s) rather than that of the knife-holding arm. In fact, in this latter case, very high centrifugal forces would be obtained on the shaft of the blade(s) involving a corresponding excessive and expensive sizing of the respective supports on the knife-holding arm. At the same time, the inclination of the axis of the ledger and consequently, in the cutting area, of the rod in relation to the axis of the rod forming section, the inclination obtained by taking advantage of the cigarillo rod elasticity provides a correct and rational cut of the rod. This cut is perfectly perpendicular to the rod axis when the angle of inclination of the ledger axis, and consequently of the rod, in relation to the axis of the cigarillo rod, is equal to the angle of inclination of the blade(s) in relation to a plane perpendicular to the axis of the rod. Furthermore, the inclination of the blade(s) in relation to the plane perpendicular to the axis of the rod and the particular Archimedean-spiral-segment shape of the cutting edge of each blade, enable to obtain the sharpening of the individual blade(s) by means of a cylindrical grinder whose shaft is transversal to the cigarillo rod axis.

With the cutoff according to the invention, the cutting frequency and consequently the length of the single cigarillos cut from the rod depend upon the number of blades and the speed of rotation of the knife-holding arm or better upon the ratio between the speed of rotation of the blade(s) and that of the knife-holding arm. Therefore, by varying the number of the blades, a large-step variation of the cut cigarillo length is obtained, for instance, transition of a single-cigarillo length to a double-cigarillo length, while by varying the speed of rotation of the knife-holding arm, for instance, by means of appropriate speed change gear or the like, short-step or continuous variations of the cigarillo length is obtained.

The above features of the invention and the resulting advantages may be understood from the following description of a preferred embodiment, illustrated as a non restrictive example in the accompanying drawings wherein:

FIG. 1 is an exploded perspective view of the layout of the cutoff according to the invention;

FIG. 2 is a side elevation view of the cutoff with some of the parts in section;

FIG. 3 is a plan view of the cutoff with some of the parts shown in section;

FIG. 4 is a vertical section through the cutoff, and

FIG. 5 shows a disc rotatable on a shaft mounted between two revolving arms and holding knife blades which describe a multi-lobe closed curve.

With reference to the figures, the reference numeral 1 indicates the axis of the continuously advancing rod in a cigarillo machine. A slide 3 having a U-shape open towards the cigarillo rod axis is mounted slidable on two parallel guides 2, substantially horizontal and perpendicular to axis 1 of the rod and each consisting of two superimposed and interspaced bars. On slide 3, between its two longitudinal arms, there is mounted a U-shaped rotatable knife-holding arm 4 which is provided, in the middle of the "U" arms, with transversal pins 104, 204, coaxial with each other, by means of which the knife-holding arm 4 is fitted, free to rotate, on slide 3. The axis of rotation 5 of said knife-holding arm 4 is defined by the two pins 104, 204 and is parallel to the axis 1 of the cigarillo rod advancing section.

Cross bar 304 of the "U" constituting the knife-holding arm 4, is provided with a suitable counterweight 6, while at the diametrally opposite position between the free ends of the "U" there is a rotary blade-holding disc 7, fastened at the center of the shaft 8 which is mounted, free to rotate, in suitable supports of the knife-holding arm 4. The axis of rotation 9 of knife-holding disc 7 is parallel to that 5 of the knife-holding arm 5 and thus also to the axis 1 of the rod being formed.

In the illustrated embodiment, disc 7 has two diametrally opposite blades 10, substantially radial and relatively narrow, slightly inclined in relation to a plane perpendicular to axis 1 of the rod. The peripheral cutting edge 110 of each blade 10 is shaped like an Archimedean-spiral-segment.

A so-called tubular ledger 11 is provided in the area of the cutoff. Ledger 11 is mounted in a fixed but adjustable position and consists of two aligned and coaxial tubes 111, 211, spaced so as to form a narrow slit through which the blades 10, which are rather narrow, can pass, as clearly illustrated on FIGS. 1 and 3. Axis 12 of said ledger 11 is out of the axis 1 of the cigarillo rod and is slightly inclined in relation to axis 1 of said rod, as clearly illustrated in FIG. 1. Angle "a" between axis 12 of ledger 11 and axis 1 of the rod is equal to the angle of inclination of blades 10 in relation to the plane perpendicular

to axis 1 of the rod and depends upon the ratio between the peripheral speed of the cutting edge 110 of blades 10 and the rod sliding speed. According to the invention, the peripheral speed of the cutting edge 110 of blades 10 is considerably higher than the rod sliding speed (for example 30 to 50 times as much), and consequently angle "a" between axis 12 of ledger 11 and axis 1 of the rod is rather small, say 1°—2°.

The rod formed along the axis 1 is deviated from said axis and slides through the fixed ledger 11, along axis 12 of said ledger. This deviation is allowed by the considerable elasticity of the cigarillo rod and does not damage in any way the rod wrapper. The knife-holding arm 4 is rotated about axis 5, for example, in the direction of arrow F1 of FIG. 1 and, at the same time, also blade-holding disc 7 is caused to rotate about axis 9, for example, in the direction of arrow F2 of FIG. 1. Consequently, the peripheral cutting edge 110 of each blade 10 has two motions, one of rotation about axis 9 of blade-holding disc 7 and one of revolution about axis 5 of the knife-holding disc 4. The cutting edges 110 of the two blades 10 describe, therefore, a closed multi-lobe cycloidal trajectory, for example as shown in FIG. 5, and pass periodically through the slit between the two tubes 111 and 211 of ledger 11, determining the cutting of the rod in cigarillos of predetermined length.

The length of the cutting edge 110 of each blade 10 is the minimum indispensable to obtain the rod cut. Furthermore, because of the inclination of blade 10, the blade section which engages the rod during the cut, moves together with the rod in its direction of motion. The high peripheral speed of the cutting edges 110 of blades 10 does not require that the rod stop while it is being cut and no axial compression is exerted upon it. At the same time, because of the inclination of axis 12 of ledger 11 and consequently of the rod in relation to its axis and consequently in relation to the axis of rotation 9 and to axis of revolution 5 of blades 10, the surface of blades 10 is perpendicular to axis 12 of said rod, during the cut, and consequently the rod is cut perpendicularly to its axis 12.

The cutting frequency and, therefore, the cigarillos length cut depends upon the number of blades 10 provided on the blade-holding disc 7, as well as upon the ratio between the speed of rotation of knife-holding arm 4 about axis 5 and the peripheral speed of cutting edges 110 of blades 10. By varying the number of blades 10, a large-step variation of the cut cigarillo length is obtained. Therefore, for example, with two diametrally opposite blades, as in the illustrated embodiment, single-length (averagely 100 mm) cigarillos are obtained, while with one blade double-length cigarillos (averagely 200 mm) are obtained. By varying the ratio between the speed of revolution of blade 10 about axis 5 and the peripheral speed of cutting edge 110 of blades 10, small-step variations of the cigarillo length are obtained, in order to determine the various sizes of the cigarillos per each length obtained with a different number of blades, for example 70 to 150 mm for the single length obtained with two diametrally opposite blades, and 140 to 300 mm for the double length obtained with a single blade. For this purpose, the speed of rotation of blade-holding disc 7 about axis 9 is kept constant, while the speed of rotation of the knife-holding arm 4 about axis 5 is changed, continuously or stepwise, by means of any suitable variator or change gear provided in the knife-holding arm operating assembly. As an example, the speed of rotation of knife-holding arm 4 is so changed that the interval between a size of the cigarillos and the successive one is 1 mm in the range of the single lengths, and 2 mm in the range of the double lengths.

By varying the speed of rotation of the knife-holding arm about axis 5, a change is also obtained of the peripheral speed of the cutting edges 110 of blades 10 deriving from the combined movement of blades 10, composed of the rotation about axis 9 and of the revolution about axis 5. To keep substantially constant the ratio between the peripheral speed of the cutting edges 110 of blades 10 and the rod sliding speed (a determining ratio for angle "a" of inclination of blades 10 in relation to a plane perpendicular to axis 1 of the rod and consequently for the angle of equal value between axis 1 of the rod and axis 12 of the fixed ledger 11 and of the deviated rod), blades 10 are mounted adjustable radially on the respective blade-holding disc 27. Furthermore, means are provided to move slide 3 on guides 2 from and towards the rod, as well as to hold back slide 3 in the adjusted positions in order that the cutting edge 110 of blade(s) 10 passes always through the transversal slit of ledger 11 and cuts the rod. Thus, the cutting edge 110 of the blade(s) 10 can be adjusted on different diameters in relation to the axis 9 of rotation of the blade-holding disc 7, in accordance with the speed of rotation of the knife-holding arm 4 and so as to keep substantially constant the ratio between the rod sliding speed and the peripheral speed of cutting edge 110 of the blade(s).

The above arrangement can be achieved in many different ways. In the illustrated embodiment, blade-holding disc 7 consists of the coaxial plates 107, 207 (FIG. 3) which can be tightened and locked axially to each other and respectively released and separated from each other. Inserted between the two plates 107, 207 are plates 13, substantially radial, each carrying externally a blade 10. Said plates 13 are tightened between plates 107, 207 with which they engage, for example, by means of appropriate positioning joints. Each plate 13 can be adjusted and locked between plates 107, 207 in at least two different radial positions, that is, at least two different distances from the axis of rotation 9 of blade-holding disc 7 so as to pre-set the cutting edge 110 of the respective blade 10 alternatively on at least two different diameters, of which the outer one corresponds to the speeds of rotation of the knife-holding arm 4 higher than a certain value, while the inner diameter corresponds to the speeds of rotation of the knife-holding arm 4 lower than the above value. In the illustrated embodiment, the mechanism which moves slide 3 on guides 2 comprises a threaded shaft 14, parallel to guides 2 and engaged, free to rotate but not to slide axially, with a fixed support 15 arranged behind the rear cross bar 103 of slide 3. This shaft 14 is screwed in a corresponding threaded bushing 16, fastened centrally to cross bar 103 of slide 3. A sprocket wheel 17 is fastened to shaft 14. Said sprocket wheel 17 is connected by means of chain 18 to a sprocket 19 which can be actuated by knob 20 by means of articulated shaft 21. Slide 3 is urged to move in a forward and backward direction by appropriate springs 22. It appears evident that by rotating the threaded shaft 14 by means of knob 20 and shaft 21, as well as by means of chain drive 19, 18, 17, slide 3 is moved forward and backward on guides 2. This shifting helps the trajectory of cutting edge 110 of blade(s) 10 get more or less close to the rod, according to its diameter and/or to the radial position of the blade(s) 10 on the respective blade-holding disc 7, that is, adjust the cutoff transversally in relation to the ledger 11 in the suitable cutting position.

The knife-holding arm 4 and the blade-holding disc 7 can be operated by any means whatsoever. In the illustrated embodiment, pin 104 of arm 4 has a toothed-belt pulley 23 which is actuated, by means of corresponding belt 24, by a toothed-belt pulley 25 driven by drive shaft 26 by means of a drive and change gear assembly 27. The speed of rotation of the knife-holding arm is changed by mere replacement of at least one gear in the driven and change gear assembly 27. Obviously, assembly 27 can be achieved also as a speed change gear or variator proper.

The blade-holding disc 7 is actuated in an analogous manner by means of a toothed belt 28 which connects to each other a respective toothed pulley 29, fastened to the shaft 8 of the blade-holding disc 7, and a toothed pulley 30 mounted, free to rotate, on the other pin 20 of the knife-holding arm 4. This pulley 30 is integral with a bushing 31 which is mounted, free to rotate, into the respective slide 3, coaxially to the respective pin 204 of knife-holding arm 4, and in which bushing 31 said pin 204 is supported, free to rotate. Another toothed-belt pulley 32 is fastened to bushing 31. Said pulley 32, is coupled, by means of the respective belt, to a toothed-belt pulley 33 driven by drive shaft 26 by means of another drive 34.

By virtue of the fact that the cutting edge **110** of the blades **10** has an Archimedean-spiral-segment shape, and by virtue of the inclination of the blades **10** in relation to a plane perpendicular to the axis **1** of the rod, the cutting edge **110** of blades **10** can be sharpened by means of a cylindrical grinder **35** (FIG. 2) having an axis transversal to the rod forming section. The wear of blades **10** resulting from the sharpening operated by cylindrical grinder **35** is taken up through the displacement of slide **3** on guides **2** towards the rod forming section by means of the above-described adjusting device.

It is understood that the invention is not limited to the embodiment which has been illustrated and described but that numerous other arrangements and modifications may be made. In particular the cutoff according to the invention, although destined specially to cigarillo machines, may be used in any other mechanism whatsoever, wherein similar problems are encountered, and possibly also to cigarette makers, without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. A cutoff mechanism for cigarillo rods formed by cigarillo making machines and advancing continuously in the direction of the rod axis, said cutoff mechanism comprising a tubular ledger constituted by two slightly spaced co-axial tubes through which said rod advances, a number of narrow knife blades radially projecting out of a blade-supporting member mounted on a first rotatable shaft, a second shaft parallel to said first rotatable shaft and connected thereto by means of rigid arms and means for rotatably driving said first and said second shaft so as to promote the rotation of said blades about their supporting member and the simultaneous revolution of said supporting member about the axis of said first shaft, the velocity ratios of said two shafts being so chosen that said blades describe with the projecting end edges a closed multi-lobe cycloid curve and said narrow blades being so positioned with respect to said tubular ledger that at least one of the lobes of said cycloid curve passes through the slit between the said two co-axial tubes of said ledger and severes from said cigarillo rod a cigarillo of a predetermined length, and means to mount said tubular ledger fixedly with its axis inclined in such direction and in such amount with relation to the said cigarillo rod axis that, when said cigarillo rod is being cut by one of said revolving blades, it is slightly deviated from its sliding direction and arranges itself substantially perpendicular to the surface of the cutting blade during the cutting operation.

2. A cutoff mechanism for cigarillo rods formed by cigarillo making machines and advancing continuously in the direction of the rod axis, said cutoff mechanism comprising a tubular ledger constituted by two slightly spaced co-axial tubes through which said rod advances, a number of narrow knife blades radially projecting out of a blade-supporting member mounted on a first rotatable shaft, a second shaft parallel to said first rotatable shaft and connected thereto by means of rigid arms and means for rotatably driving said first and said second shaft so as to promote the rotation of said blades about their supporting member and the simultaneous revolution of said supporting member about the axis of said first shaft, the velocity ratios of said two shafts being so chosen that said blades describe with the projecting end edges a closed multi-lobe cycloid curve passes through the slit between the said two co-axial tubes of said ledger and severes from said cigarillo rod a cigarillo of a predetermined length, and means to mount said tubular ledger fixedly with its axis inclined in such direction and in such amount with relation to the cigarillo rod axis that, when said cigarillo rod is being cut by one of said revolving blades, it is slightly deviated from its sliding direction and arranges itself substantially perpendicular to the surface of the cutting blade during the cutting operation; whereby the cigarillo rod axis is inclined with respect to the ledger axis and the knife blades are also inclined with respect to a plane perpendicular to the rod axis; both said angles being equal between them.

3. A cutoff mechanism for cigarillo rods formed by cigarillo making machines and advancing continuously in the direction of the rod axis, said cutoff mechanism comprising a tubular ledger constituted by two slightly spaced co-axial tubes through which said rod advances, a number of narrow knife blades radially projecting out of a blade-supporting member mounted on a first rotatable shaft, a second shaft parallel to said first rotatable shaft and connected thereto by means of rigid arms and means for rotatably driving said first and said second shaft so as to promote the rotation of said blades about their supporting member and the simultaneous revolution of said supporting member about the axis of said first shaft, the velocity ratios of said two shafts being so chosen that said blades describe with the projecting end edges a closed multi-lobe cycloid curve and said narrow blades being so positioned with respect to said tubular ledger that at least one of the lobes of said cycloid curve passes through the slit between the said two co-axial tubes of said ledger and severes from said cigarillo rod a cigarillo of a predetermined length, and means to mount said tubular ledger fixedly with its axis inclined in such direction and in such amount with relation to the cigarillo rod axis that, when said cigarillo rod is being cut by one of said revolving blades, it is slightly deviated from its sliding direction and arranges itself substantially perpendicular to the surface of the cutting blade during the cutting operation; whereby the cutting edge of each blade is shaped like an Archimedean-spiral-segment, a cylindrical grinder having its axis transversal to the cigarillo rod being mounted so as to grind each blade after each cut.

4. A cutoff mechanism for cigarillo rods formed by cigarillo making machines and advancing continuously in the direction of the rod axis, said cutoff mechanism comprising a tubular ledger constituted by two slightly spaced co-axial tubes through which said rod advances, a disc consisting of two co-axial plates mounted on a first rotatable shaft and having a number of narrow knife blades radially projecting out of said disc mounted on a first rotatable shaft, means permitting the locking of said blades in a plurality of radial positions, a second shaft parallel to said first rotatable shaft and connected thereto by means of rigid arms and means for rotatably driving said first and said second shaft so as to promote the rotation of said blades about their supporting member and the simultaneous revolution of said supporting member about the axis of said first shaft, the velocity ratios of said two shafts being so chosen that said blades describe with the projecting end edges a closed multi-lobe cycloid curve and said narrow blades being so positioned with respect to said tubular ledger that at least one of the lobes of said cycloid curve passes through the slit between the said two co-axial tubes of said ledger and severes from said cigarillo rod a cigarillo of a predetermined length.

5. A cutoff mechanism for cigarillo rods formed by cigarillo making machines and advancing continuously in the direction of the rod axis, said cutoff mechanism comprising a tubular ledger constituted by two slightly spaced co-axial tubes through which said rod advances, a number of narrow knife blades radially projecting out of a blade-supporting member mounted on a first rotatable shaft, a second shaft parallel to said first rotatable shaft and connected thereto by means of rigid arms and means for rotatably driving said first and second shaft so as to promote the rotation of said blades about their supporting member and the simultaneous revolution of said supporting member about the axis of said first shaft, the velocity ratios of said two shafts being so chosen that said blades describe with the projecting end edges a closed multi-lobe cycloid curve and said narrow blades being so positioned with respect to said tubular ledger that at least one of the lobes of said cycloid curve passes through the slit between the said two co-axial tubes of said ledger and severes from said cigarillo rod a cigarillo of a predetermined length, guides transversal to the cigarillo rod axis, a slide slidable forwards and backwards along said guides, and means for mounting on said slide said rotary blade-supporting member.