Nov. 4, 1969 D. BARDENHAGEN ET AL 3,476,002

CUT-OFF FOR CIGARETTE RODS OR THE LIKE

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Fig. 1

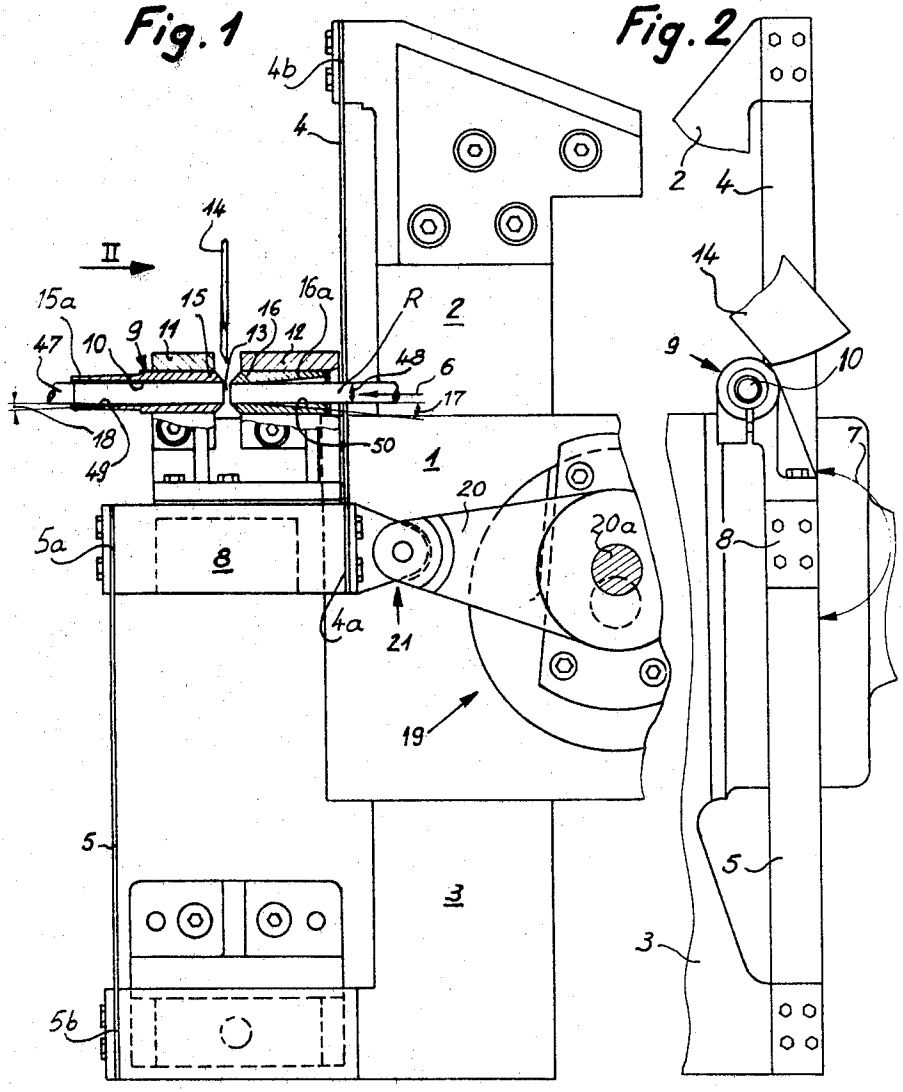


Fig. 2




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Filed Oct. 30, 1967 2 Sheets-Sheet 2

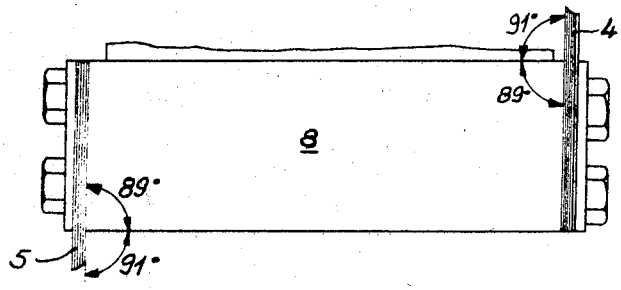


Fig. 3

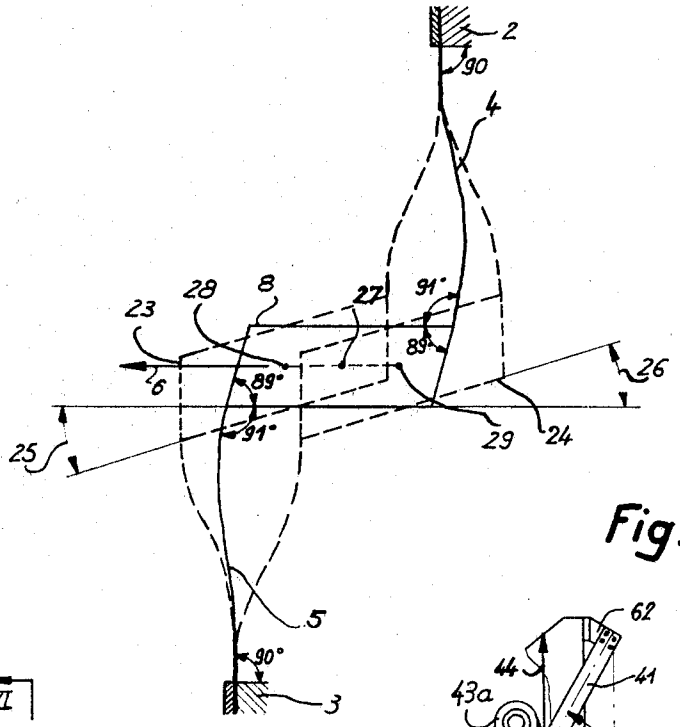


Fig. 4

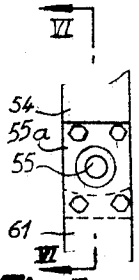


Fig. 5

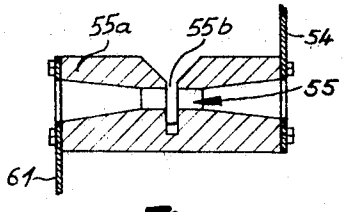


Fig. 6

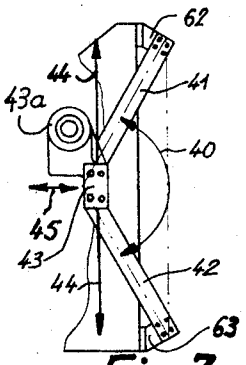


Fig. 7

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3,476,002

# CUT-OFF FOR CIGARETTE RODS OR THE LIKE

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Int. Cl. B26d 1/56, 5/20
U.S. Cl. 83—310 10 Claims

## ABSTRACT OF THE DISCLOSURE

The tube which supports and guides the rod in a cut-off for continuous cigarette rod or filter rod machines is connected with two prestressed spring blades which are respectively located in front of and behind the knife, as seen in the direction of rod travel. The projections of blades into a plane which is normal to the direction of rod travel are inclined with reference to each other. The blades are affixed directly to the guide or to a support which carries the guide.

## BACKGROUND OF THE INVENTION

The present invention relates to apparatus for severing a continuous rod in rod cigarette or filter rod machines. Such apparatus, commonly known as a "cut-off," embody a revolving knife which travels back and forth in the direction of rod travel and a guide serving to support that portion of the travelling rod which is being severed by the knife.

U.S. Patent No. 3,140,632 discloses a cut-off wherein the guide or ledger is mounted on two spring blades. The projections of the blades into a plane which is normal to the direction of rod travel overlap each other. A serious drawback of such constructions is that the guide performs excessive movements in directions at right angles to the direction of rod travel. This complicates the guidance of the rod during severing and causes excessive bending or flexing of the rod at the cutting station.

## SUMMARY OF THE INVENTION

It is an object of our invention to provide a cut-off wherein the spring blades which support the guide for a travelling rod are constructed and mounted with a view to minimize stray movements of the guide and to thus prevent undesirable flexing of the rod during severing.

Another object of the invention is to provide a cut-off of the just outlined character wherein the rod and its severed sections are treated gently prior, during and subsequent to cutting.

A further object of the invention is to provide a simple drive which can move the guide in synchronism with the knife in a cut-off of the above outlined character.

An additional object of the invention is to provide a cut-off which can be used for severing of wrapped tobacco fillers as well as for severing of filter rods.

A concomitant object of the invention is to provide a compact cut-off which can be installed in presently known continuous rod cigarette or filter rod machines.

Briefly outlined, our invention is embodied in a cut-off for a machine wherein a rod travels lengthwise and is subdivided by a knife or cutter arranged to move back and forth along the rod and to sever the rod at predetermined intervals during movement in the direction of rod travel at the exact speed of the rod. The improved cut-off comprises a novel device for supporting and guiding the rod. The device comprises a preferably tubular guide defining a channel for the rod, reciprocating means for moving the guide back and forth in and counter to



the direction of rod travel, and a bearing for the tube including a plurality of spring blades comprising a first and a second spring blade each having an end portion operatively connected with the guide upstream and downstream of the knife, as considered in the direction of rod travel. The projections of the first and second spring blades into a plane which is normal to the direction of rod travel (i.e., which is normal to the axis of the channel defined by the guide and to the direction of reciprocatory movement of the guide) are inclined with reference to each other. Such projections can make an angle of 180 degrees if the blades extend in opposite directions from the direction of rod travel or an angle which is less than 180 degrees, depending on the space allotted for the cut-off.

The blades may be connected directly to the axial ends of the guide or to a support which carries the guide.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved cut-off itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary side elevational view of a cut-off which embodies one form of our invention, the guide being shown in axial section;

FIG. 2 is an end elevational view of the cut-off as seen in the direction of arrow II in FIG. 1;

FIG. 3 is a larger-scale side elevational view of a support for the guide in the cut-off of FIGS. 1 and 2;

FIG. 4 is a diagram showing the support of FIG. 3 and the spring blades of the cut-off in several positions;

FIG. 5 is a fragmentary end elevational view of a second cut-off wherein the spring blades are affixed directly to the guide;

FIG. 6 is a section as seen in the direction of arrows from the line VI—VI of FIG. 5; and

FIG. 7 is a fragmentary end elevational view of a third cut-off.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 illustrate a portion of a cut-off for use in a continuous rod cigarette machine. The numeral 1 denotes a stationary fram member supporting two holders or arms 2, 3. The frame member 1 is affixed to the frame of a conventional rod cigarette machine which discharges a continuous cigarette rod R in the direction indicated by arrow 6. The holders 2, 3 respectively support the outer end portions 4*b*, 5*b* of two elongated spring blades or leaf springs 4, 5 which are spaced from each other as seen in the direction indicated by arrow 6. As best shown in FIG. 2, the projections or images of blades 4, 5 into a plane which is normal to the axis of the rod R are inclined with reference to each other. This plane is the plane of FIG. 2 because the rod R is transported along a horizontal path. In the embodiment of FIGS. 1 and 2, the projections of blades 4, 5 into the plane of FIG. 2 make an angle 7 of 180 degrees because these blades respectively extend vertically upwardly and vertically downwardly from the path of the rod R. The blades 4, 5 constitute a yieldable bearing for tubular guide 9 having a channel 10 for that portion of the rod R which is being severed by a revolving knife 14.

The lower end portion 4*a* of the blade 4 is located at the level of the upper end portion 5*a* of the blade

5, see FIG. 1. These end portions are operatively connected with the guide 9 by means of a support here shown as a block 8 which is located below and is laterally offset from the channel 10 (see FIG. 2). The end portions 4*a*, 5*a* are respectively affixed to the rear and front end faces of the support 8 by bolts or like fasteners and are respectively located upstream and downstream of the knife 14, as considered in the direction indicated by arrow 6.

The guide 9 consists of two tubular halves 11, 12 separated from each other by a transverse slot 13 into which the knife 14 extends during severing of the rod R. The rod R yields tobacco rod sections 47 of unit length or multiple unit length. The knife 14 resembles a sickle and the slot 13 is located exactly midway between the end portions 4*a*, 5*a* of the spring blades.

The two halves 11, 12 of the guide 9 respectively comprise inner tubular sections 15, 16 which are immediately adjacent to the slot 13 and surround two relatively short cylindrical portions of the channel 10. These sections 15, 16 snugly receive the adjacent portions of the rod R and their axial length approximates or equals their internal diameter 48 which is also the diameter of the rod R. It will be seen that the rod is confined from all sides without clearance during travel through the inner sections 15, 16 and is properly supported while the knife 14 travels through the slot 13. The inner sections 15, 16 are flanked by outer sections 15*a*, 16*a* which respectively form part of halves 11, 12 and surround conical portions 49, 50 of the channel 10. The portions 49, 50 flare outwardly in directions away from the inner sections 15, 16. The conicities or tapers of portions 49, 50 are indicated by angles 18, 17 shown in FIG. 1.

The means for reciprocating the guide 9 back and forth in and counter to the direction of rod travel (arrow 6) comprises a crank drive 19 whose output member 20 is articulately coupled to the support 8 at 21. The output member 20 is a crank arm which receives motion from an eccentric crank pin 20*a*. The operation of the drive 19 is synchronized with that of the drive for the knife 14. As stated before, the knife 14 rotates about its axis and travels back and forth in and counter to the direction of rod travel. Its cutting edge severs the rod R at a time when its travels in the direction of arrow 6 and at the exact speed of the rod. The drive 19 causes the guide 9 to travel back and forth in and counter to the direction of rod travel and to move in the direction of arrow 6 and at the exact speed of the rod when the cutting edge of the knife 14 passes through the slot 13.

As shown in FIG. 3, each spring blade comprises a package of laminations and such laminations consist of vitreous filaments held together by a resinous binder. The blades 4, 5 are prestressed because their end portions 4*a*, 5*a* are affixed to the support 8 in such a way that they make with the longitudinal direction of the support 8 angles shown in FIG. 3. The outer end portions 4*b*, 5*b* of the blades 4, 5 are parallel to each other. The inclination of the end portions 4*a*, 5*a* in the range of one degree. FIG. 3 shows the support 8 in a median or neutral position midway between two end positions. The support 8 will assume such median or neutral position in response to disconnection from the output member 20. The inclined mounting of end portions 4*a*, 5*a* in the neutral position of the support 8 insures that the spring blades 4, 5 remain stressed in each position of the support. The stresses upon both blades are identical but act in opposite directions in the two end positions of the support 8. Stressing of blades 4, 5 is desirable because these blades then prevent stray movements of the guide 9.

FIG. 4 shows the neutral position of the support 8 by solid lines. The front end position of the support 8 is shown by phantom lines at 23, and the rear end position by dotted lines at 24. The inclination of the end positions 23, 24 has been exaggerated for the sake of clarity. During movement from neutral position to the end position 23, the support 8 is tilted anticlockwise through an angle 25, and anticlockwise through an angle 26 during movement from neutral position to the end position 24. Since the blades 4, 5 are of identical length, have identical spring characteristics and dimensions, and are stressed to the same extent, the center 27 of the support 8 travels along a horizontal line in and counter to the direction indicated by arrow 6. The center 27 respectively assumes the positions 28, 29 when the support 8 respectively assumes the end positions 23, 24. Since the guide 9 is rigid with the support 8, it also moves back and forth in parallelism with the direction of rod travel. Also, and since the slot 13 is located midway between the end portions 4*a*, 5*a* of the blades 4, 5 this slot moves substantially in the same way as the center 27 of the support 8. A slight deviation of the path of slot 13 from a straight line is due to the fact that the guide 9 is located above and is laterally offset from the support 8. The curvature of the path for the slot 13 is indicated (greatly exaggerated) by the aforementioned angles 25, 26, i.e., it is due to slight tilting of the support 8 during movement from neutral position to the end positions 23 and 24. Such tilting is hardly discernible because the distance between the center 27 and slot 13 is very small.

In order to confine the slot 13 to movement along a straight or practically straight path, the cut-off of our invention can be modified in a manner as shown in FIGS. 5 and 6. In this embodiment of our invention, the support 55*a* constitutes a tubular guide having a channel 55 and a slot 55*b*. The end portions of spring blades 54, 61 are affixed directly to the end faces of the guide 55*a* and are provided with openings in registry with the channel 55. The center of the guide 55*a* (corresponding to the center 27 of the support 8) is located on the axis of the channel 55 and the slot 55*b* is disposed exactly midway between the end portions of spring blades 54, 61.

Instead of providing the blades 54, 61 with openings the upper end of the blade 61 can terminate below the lefthand end of the channel 55 and the lower end of the blade 54 can terminate above the right-hand end of this channel. In this embodiment of our invention, the output member of the drive which reciprocates the guide 55*a* is coupled to the guide at the right or at the left of FIG. 5 to avoid interference with the rod which travels through the channel 55.

Referring again to FIG. 4, the angles 25, 26 is one degree. This is due to the fact that the end portions 4*a*, 5*a* are affixed to the support 8 in a manner as shown in FIG. 3. The angles 17, 18 shown in FIG. 1 equal or slightly exceed one degree. In order to facilitate entry of the leading end of a fresh rod R into the channel 10, the angle 17 preferably exceeds the angle 18. The conicity of the outer section 15*a* (angle 18) is not absolutely necessary because the length of that portion of the rod R which projects beyond the left-hand end of the channel 10 at most equals the length of a section 47. Such section can readily participate in tilting movements of the guide 9. However, the bore of the outer section 15*a* preferably flares slightly in a direction away from the section 15 to insure gentle treatment of rod sections 47.

Referring finally to FIG. 7, there is shown a portion of a third cut-off wherein the angle 40 between the projections of spring blades 41, 42 onto a plane which is normal to the direction of rod travel approximates 120 degrees. The blades 41, 42 are of identical length and have the same characteristics. Their outer end portions are affixed to stationary holders 62, 63 corresponding to the holders, 2, 3 of FIGS. 1–2. The inner end portions of blades 41, 42 are secured to a support 43 which carries a tubular guide 43*a*. The oppositely directed ver-

tical components 44 of blades 41, 42 produce a tilting movement of the support 43 but no lateral movement. The horizontal components indicated by double-headed arrow 45 do not cause any pivoting but produce a lateral or sidewise movement of the support 43. However, such sidewise movement is much smaller than in the cut-off disclosed in aforementioned Patent No. 3,140,632. If such lateral movement is to be eliminated altogether, the manufacturer will construct the cut-off in a manner as shown in FIGS. 1–6. The embodiment of FIG. 7 is practical in instances wherein the allotted space cannot accommodate a cut-off with spring blades which make an angle 7 of 180 degrees.

The channel of the guide may constitute a bore; however it is equally within the purview of our invention to employ a substantially trough-shaped guide which defines an open-sided channel. As stated before, the improved cut-off can be used in all types of machines wherein a travelling rod must be severed at predetermined intervals. Typical examples of such machines are continuous rod cigarette or cigar machines and filter rod machines. The improved cut-off can operate at a speed of up to 4,000 revolutions of the knife 14 per minute.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a cut-off for a machine wherein a rod travels lengthwise and is subdivided by a knife arranged to move back and forth along the rod and to sever the rod at predetermined intervals during movement in the direction of rod travel, a device for supporting the rod during severing comprising a guide defining a channel for the rod; reciprocating means for moving the guide back and forth in and counter to the direction of rod travel; and a bearing for the tube comprising a plurality of spring blades including a first and a second spring blade each having an end portion operatively connected with said guide, the projections of said spring blades into a plane which is normal to the direction of reciprocatory movement of said guide being inclined with reference to each other.

2. A device as defined in claim 1, wherein the projections of said first and second blades into said plane make an angle of about 180 degrees.

3. A device as defined in claim 1, wherein said guide has a slot extending transversely of said channel to receive the knife while the latter severs the rod in said channel, and wherein said guide comprises two inner tubular sections surrounding portions of said channel upstream and downstream of said slot and snugly receiving the rod, the axial length of each of said inner sections approximating the internal diameter thereof.



4. A device as defined in claim 3, wherein said guide further comprises two outer tubular sections flanking said inner tubular sections and surrounding additional portions of said channel, said additional portions of said channel flaring in directions away from the adjoining inner sections.

5. A device as defined in claim 1, wherein said guide has a slot extending transversely of said channel to receive the knife while the latter severs the rod in said channel, and wherein said guide is tiltable by said blades in response to reciprocation thereof about an axis located in said slot.

6. A device as defined in claim 1, wherein said blades are prestressed and constitute leaf springs of identical length and of identical spring characteristics.

7. A device as defined in claim 1, further comprising a support for said guide, said end portions of said first and second blades being affixed to said support upstream and downstream of the knife, and stationary holder means, said blades having second end portions affixed to said holder means and said support being reciprocable with said guide between two end positions in each of which the end portions of said blades are substantially parallel to each other.

8. A device as defined in claim 1, wherein said blades consist of vitreous filaments held together by a resinous binder.

9. A device as defined in claim 1, wherein said channel is substantially horizontal and further comprising a support for said guide located below and laterally of said channel, said end portions of said blades being affixed to said support.

10. A device as defined in claim 9, wherein said reciproctaing means comprises a crank drive having an output member coupled to said support.

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U.S. Cl. X.R.

83—355, 444; 131—65