June 14, 1960 C. F. VARN 2,940,350

PLURAL SLITTER CUTTERS AND THE MOUNTING MEANS THEREFOR

Filed Aug. 23, 1956 2 Sheets-Sheet 1

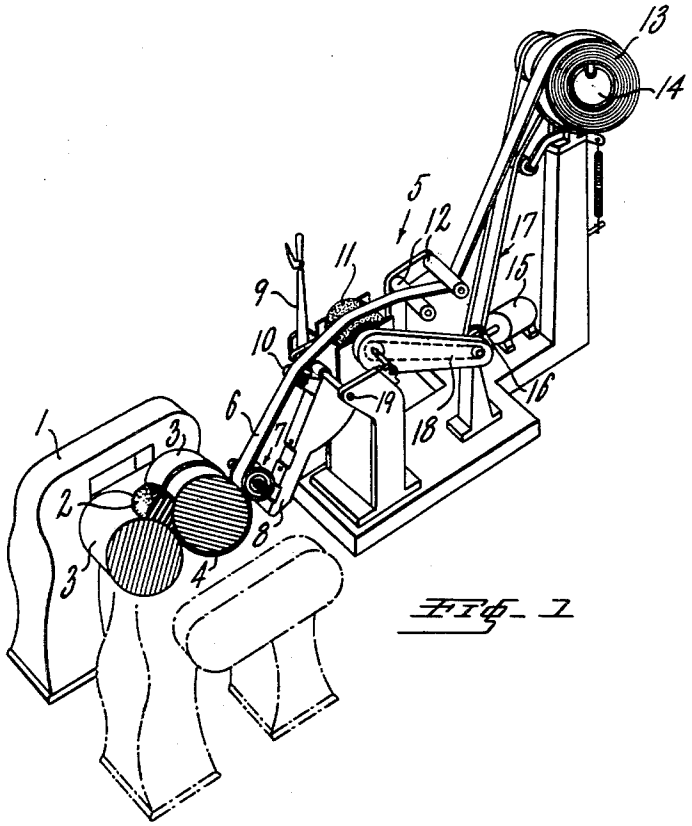


Fig. 1

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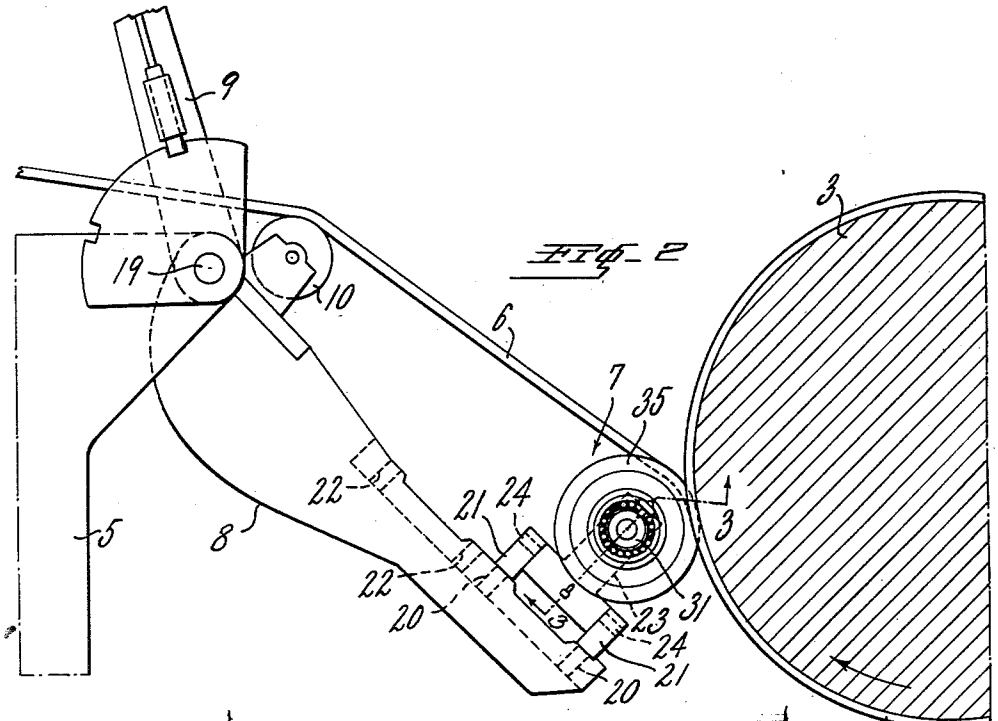


Fig. 2

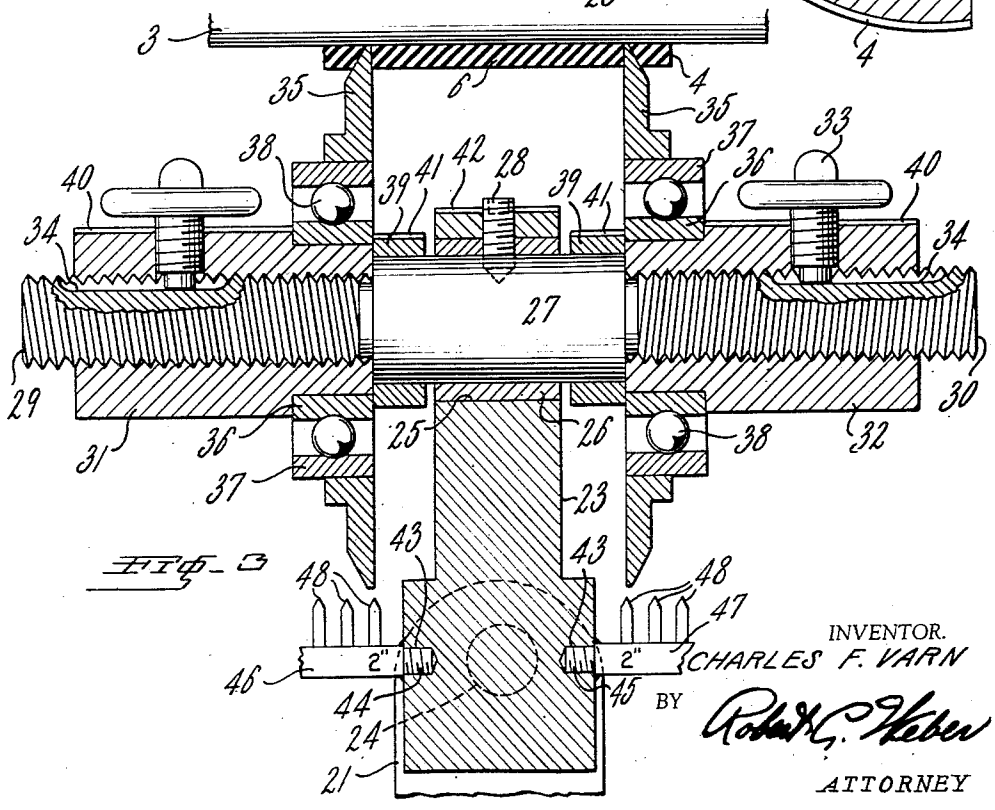


Fig. 3

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PLURAL SLITTER CUTTERS AND THE MOUNTING MEANS THEREFOR

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5 Claims. (Cl. 83—482)

This invention relates to an improved device for cutting a continuous strip from a sheet of elastomeric material on a mill roll as the sheet is continuously formed in the mill, and more particularly to an improved cutting device having spaced circular cutters which are readily adjustable for varying the width of strip cut thereby and which are mounted on bearings for free and true rotation to accurately control the width of the strip.

In the production of insulated wires and cables, for example, it is customary to employ a typical elastomeric material such as natural or synthetic rubber, or the like, as insulating and/or jacketing material, and to form the insulation and/or jacket around the wires or cables by extrusion in a machine commonly known as a tuber. Likewise, it is conventional practice to feed the elastomeric material to the tuber in the form of a continuous strip which has been cut from a sheet of the material on a mill roll as the sheet is continuously formed in the mill. The device for cutting the strip is normally mounted on a machine commonly known as a stripper, which stripper is also provided with a reel upon which the strip is wound and stored prior to being fed to the tuber.

As the size, output capacity and intake openings of the tubers vary in relationship with the size of the extruded article, it is frequently necessary to change the width of strip fed thereto. In addition, due to swelling of the strip after it is cut, it is necessary to adjust the width to avoid supplying a strip wider than the intake opening. Unfortunately, the cutters of the cutting devices presently available for such strippers are not adjustable for this purpose, and are usually set to cut a strip having a width comparable to that of the largest intake opening used for any one particular size and/or capacity of tuber. Thus, for smaller openings and/or less than maximum tuber capacity a considerable amount of hand labor is required to re-cut the strip to the proper width.

In addition, this lack of adjustability in prior art cutters eventually results in the formation of undesirable grooves in the face of the mill roll and a reduction in its effective operating life. This is particularly true in view of the fact that the relative positions between the stripper and mill can not readily be changed due to their bulk and weight; it thus being common practice to permit the fixed cutters to contact the mill roll in the same area for sustained operation, thereby damaging the roll.

Moreover, while some prior art cutting devices have rotatable circular cutters, as in the invention, the former are not mounted on bearings to ensure free and true rotation thereof. Thus, in conventional devices the cutters are much more likely to "freeze" (i.e., stop rotating) on their supports, thereby damaging the cutting device itself, as well as producing rough and torn edges on the strip, because of the excessive friction developed between the "frozen" cutter and the material being cut. In addition, the rapid wear of the engaging surfaces of the cutters and their supports eventually causes the cutters to "rotate out of true" (i.e., wobble), resulting in uneven and irregular strip edges. As a consequence, the width of the strip can not be accurately controlled for optimum feeding into the intake opening of the tuber.

Accordingly, it is an object of the present invention to provide an improved cutting device so constructed and arranged that the spacing between the circular cutters thereof is readily adjustable for varying the width of strip cut thereby and for preventing undesirable groove formation in the mill roll employed in conjunction therewith.

Another object of the invention is to provide an improved cutting device so constructed and arranged that the circular cutters thereof are mounted on bearings for free and true rotation to accurately control the width of the strip.

Still another object of the invention is to provide an improved cutting device so constructed and arranged that the peripheries of the circular cutters thereof are maintained in engagement with the periphery of the mill roll for continuous and proper cutting of the strip.

A further object of the invention is to provide an improved cutting device so constructed and arranged that the spacing between the circular cutters thereof can be quickly and accurately measured.

A still further object of the invention is to provide an improved cutting device so constructed and arranged that it is protected against damage, particularly when the spacing between the circular cutters thereof is to be fixed, as well as when rotation of the cutters is interfered with.

Other objects and advantages of the invention will become apparent upon consideration of the following specification and claims when read in conjunction with the accompanying drawings, wherein:

Fig. 1 is an isometric view of an improved cutting device constructed in accordance with the teachings of the invention, as incorporated in a conventional stripper and as operating in conjunction with a roll on a warming mill, which is shown partially in section and in phantom;

Fig. 2 is a side elevational view illustrating the improved cutting device in detail, as well as the manner in which it is mounted on the stripper and cooperates with the mill roll, and

Fig. 3 is an enlarged sectional view taken substantially on line 3—3 of Fig. 2.

Referring now to Fig. 1, there is shown a conventional warming mill 1 in which the stock 2 of uncured elastomeric material such as natural or synthetic rubber or the like, is warmed into a soft, pliable condition and formed between a pair of rolls 3 into a continuous sheet 4. Adjacent mill 1 is a conventional stripper 5 over which the continuous strip 6 passes after being cut to the desired width by the cutting device 7 comprising the present invention.

The cutting device 7 is mounted on a rocker arm 8 pivotally attached to stripper 5; the arm being raised or lowered in the usual manner by a manually operated lever 9 for adjusting the cutting device 7 so that it operatively engages sheet 4 on the adjacent mill roll 3, for cutting the continuous strip 6 therefrom. The strip then passes over guide roller 10, brush 11 and between guide rollers 12, all suitably mounted on stripper 5, until it reaches reel 13 on hub 14 of the stripper; whereupon, it is wound and stored prior to being fed to the tuber (not shown) for the extrusion operation. The stripper 5 is provided with an electric motor 15 which drives reel 13 through gear box 16 and belt-pulley drive 17, as well as brush 11 through belt-pulley drive 18, for effecting a continuous feeding of strip 6 from the cutting device 7 to storage reel 13.

As shown in Fig. 2, rocker arm 8 is pivotally mounted on stripper 5 at one end by means of a pivot pin 19, and at its other end rocker arm 8 is provided with a pair of

spaced bores 20 for the reception of eye bolts 21 in which the cutting device 7 is pivotally mounted for a purpose to be explained below. Should it be desirable to relocate the cutting device 7 on rocker arm 8, say for cutting a strip from a roll positioned much closer to stripper 5 than roll 3, the arm is provided with another pair of spaced bores 22 for the reception of eye bolts 21.

The cutting device 7, as best shown in Figs. 2 and 3, comprises a pivotal arm 23 having a pair of pivot pins 24 at its lower end, which pins are pivotally mounted in eye bolts 21 to permit arm 23 to rock about the common axis of pins 24 for maintaining the cutting device 7 in proper engagement with roll 3, as will be described more in detail below. At its upper end, pivotal arm 23 is provided with a cylindrical bore 25 having a bushing 26 press fit therein. A shaft 27 is positioned within bushing 26 and rigidly secured thereto by means of a set screw 28 extending into a shallow recess in the shaft. At one end, shaft 27 is provided with a left-hand threaded portion 29 and at the other a right-hand threaded portion 30, on which are movably mounted internally threaded collars 31 and 32, respectively. These collars may be locked on shaft 27 by means of set screws 33 which are engageable with flats 34 on threaded portions 29, 30. At their inner ends, each of collars 31, 32 has a circular cutter 35 rotatably mounted thereon by means of a ball bearing assembly composed of an inner race 36 attached to the collar, an outer race 37 attached to the cutter and a plurality of ball bearings 38 interposed therebetween.

As will be apparent, the spacing between cutters 35 along the axis of shaft 27 can readily be adjusted for varying the width of strip 6 cut and for preventing undesirable groove formation in the mill roll 3, by loosening set screws 33 and rotating collars 31, 32 in the same direction relative to threaded portions 29, 30, respectively. The maximum spacing between cutters 35 is determined by the length of the threaded portions 29, 30, while the minimum spacing is preferably fixed by stop collars 39 press fit on shaft 27 to ensure sufficient clearance between cutters 35 and pivotal arm 23.

As will also be evident, the ball bearing assembly serves to mount cutters 35 for free and true rotation on collars 31, 32 to produce sharply defined and even edges on strip 6, whereby the width of the strip can be accurately controlled for optimum feeding to the tuber (not shown). Likewise, very little, if any torque developed on cutters 35 by revolving roll 3 will be directly transmitted to collars 31, 32 because of the ball bearing mounting, which produces free (i.e., substantially frictionless) rotation of the cutters. Thus, there is little danger of damaging set screws 33 or stripping of the threads on collars 31, 32 or threaded portions 29, 30, which would occur if the collars were forced to rotate relative to the threaded portions while the set screws were in locking position. Even if the bearing assemblies "froze," which is highly unlikely, the set screws 33 and 28 are so designed that the latter would fail before relative rotation between collars 31, 32 and threaded portions 29, 30 would occur, thereby permitting shaft 27 to rotate to prevent further damage to the device, the stop collars 39 on the shaft preventing its displacement from arm 23.

As further protection against damaging engagement between set screws 33 and threaded portions 29, 30 in areas other than flats 34, each of collars 31, 32, stop collars 39 and the top of arm 23 are provided with V-grooves 40, 41 and 42, respectively. V-grooves 41 on stop collars 39 are aligned with previously aligned flats 34 on threaded portions 29, 30 when the stop collars are press fit on shaft 27, and the V-grooves 41 are aligned with V-groove 42 in arm 23 when the shaft is secured therein by set screw 28. Likewise, the set screws 33 extend transversely through collars 31, 32 in alignment with V-grooves 40 thereon. Thus, it will be apparent that merely by rotating collars 31, 32 to align V-grooves 40 thereon with V-grooves 41 and/or V-groove 42, set screws 33 will be aligned with flats 34 for engagement therewith without damage to threaded portions 29, 30.

To assist in setting up the desired axial spacing between cutters 35, the lower end of pivotal arm 23 is preferably provided with threaded bores 43 in parallel alignment with the axis of shaft 27 and perpendicular to the common axis of pivot pins 24 for the reception of bolts 44 and 45 of left and right marker bars 46 and 47, respectively. Each of the bars are provided with a plurality of upstanding markers 48, below which are inscribed numerals indicating the precise spacing in inches between the peripheries of cutters 35. In the position shown in Fig. 3, the peripheries of cutters 35 are aligned with the 2" markers 48, which for the particular embodiment illustrated, is the minimum spacing. To maintain bars 46, 47 in proper position, once the cutters 35 are aligned with markers 48, the bars are rigidly secured to arm 23, preferably by welding or brazing. It is to be noted that the spacing between markers 48 and the pitch of the threads on shaft 27 and collars 31, 32 are so selected that one revolution of the collars moves the cutters 35 from one of markers 48 to another, and that the set screws 33 in collars 31, 32 are aligned with flats 34 on threaded portions 29, 30, whenever the cutters 35 are aligned with markers 48. Thus, the spacing between the cutters can be quickly, easily and safely adjusted and measured to determine the proper width of the strip 6 to be cut.

As generally referred to above, and as shown in Figs. 1 and 2, the cutting device 7 is pivotally mounted on arm 8 in such a manner as to properly engage sheet 4 on roll 3 for effectively cutting strip 6 therefrom. Normally, arm 8 of stripper 5 lies in a plane substantially perpendicular to the axis of roll 3 so that the axis of shaft 27 will extend adjacent to and substantially along the axis of the roll, thereby permitting the peripheries of cutters 35 to continuously engage and be rotated by roll 3 for continuous cutting of strip 6. However, should arm 8 and roll 3 be jarred out of alignment, the pivot pins 24 on pivotal arm 23 permit the arm to pivot in eye bolts 20 held in bores 21 or 22 of rocker arm 8, thereby compensating for such misalignment and maintaining the peripheries of cutters 35 in engagement with the periphery of roll 3. Thus, it is evident that the cutting device 7 is substantially self-adjustable for maintaining continuous and effective cutting of the strip 6.

While the invention has been shown and described in a certain preferred form, it is to be understood that various changes and modifications may be made therein by those skilled in the art without departing from the principles of the invention, the scope of which is to be determined by the appended claims. As by way of example, and not as a limitation, the cutting device comprising the invention is not necessarily limited to use with the particular stripper shown and described but could readily be adapted to an apparatus so constructed and arranged that the continuous strip is fed directly from a Banbury sheeter mill or a warming mill to a tuber.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. An improved cutting device for severing a continuous strip from a sheet of material on a roll comprising a shaft having externally threaded cylindrical end portions and an axis extending adjacent to and substantially along the axis of the roll, an arm having a bore located in the upper end thereof receiving and supporting the portion of the shaft between said threaded end portions and securing the same against rotation, a pair of annular internally threaded collars mounted concentrically with and movable on said threaded end portions whereby the collars may be individually rotated so as to both change the position of said collars on said shaft and vary the spacing between said collars, means engageable with said collars and said threaded end portions for locking

said collars thereon to fix the spacing between said collars, a pair of bearing assemblies having inner races, outer races and a plurality of substantially frictionless bearings interposed therebetween, said inner races being rigidly and concentrically secured to the outer peripheries of said collars, and a pair of circular cutters rigidly and concentrically secured to the outer peripheries of said outer races for free and true rotation about said inner races, said collars and said shaft, to thereby produce sharply defined and even edges on the severed strip.

2. An improved cutting device as defined in claim 1 wherein said supporting arm is pivotally mounted at the lower end thereof on an axis perpendicular to the axis of the shaft so that the supporting arm will automatically pivot if the axis of the shaft and the axis of the roll are not parallel thereby compensating for such misalignment and maintaining the peripheries of the cutters in engagement with the periphery of the roll.

3. An improved cutting device as defined in claim 1 wherein said means engageable with said collars and said threaded end portions comprise set screws in the collars which engage flats on the threaded end portions, and said supporting arm has a pair of marker bars secured to opposite sides thereof and parallel to the axis of the shaft, said marker bars being divided into units of length and the threads on the shaft having a pitch such that one complete revolution of the collars on said shaft will move the cutters one unit on the marker bars thereby insuring that the set screws in the collars will be aligned with the flats on the threaded end portions whenever the cutters are aligned with the units on the marker bars.

4. An improved cutting device as defined in claim 1 wherein the portion of the shaft between the threaded end portions is cylindrical, the bore located in the upper end of the supporting arm is cylindrical, and means are

provided engaging the upper end of said supporting arm and said shaft portion for rigidly securing the shaft against rotation, said means and the means engageable with the collars and the threaded end portions being designed so that the former means will fail before the latter means if the circular cutters cease to rotate on the bearing assemblies whereupon the shaft will then rotate within the bore of said supporting arm.

5. In combination with the cutting device defined in claim 1, a rocker arm disposed perpendicular to the axis of the shaft of said cutting device, said rocker arm having a plurality of spaced pairs of bores for the reception of a pair of bolts attached to the lower end of the supporting arm of said cutting device whereby said cutting device may be mounted on said rocker arm at a plurality of positions, said rocker arm being pivotally adjustable so as to engage and disengage the cutting device and the roll.

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