United States Patent

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[54] **CUTTER FOR SHEET WINDER**
6 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **242/56**
[51] **Int. Cl.** **B65h 19/20**
[50] **Field of Search** 242/56, 56.6; 83/381; 156/353

[56] **References Cited**

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2,723,717	11/1955	Clark et al.	242/56X
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3,047,248	7/1962	Birch, Jr. et al	242/56
3,049,311	8/1962	Birch, Jr.	242/56
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ABSTRACT: A cutter for a winder for sheet material having a cutter frame provided with a track at the top, cutters in the track, one or preferably both being supported on a set of rollers which engage in longitudinal slots in the cutters, the cutters relatively reciprocating. In the preferred form both cutters float on their rollers free from engagement with the bottom of the track.

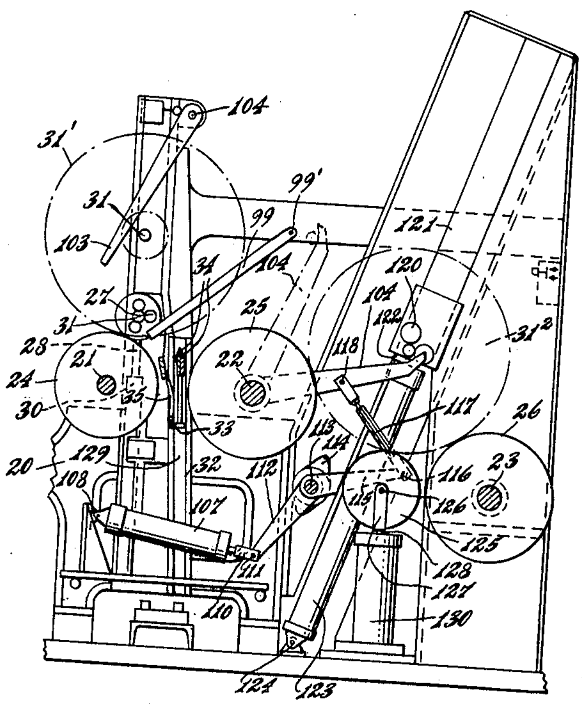


Fig. 1.

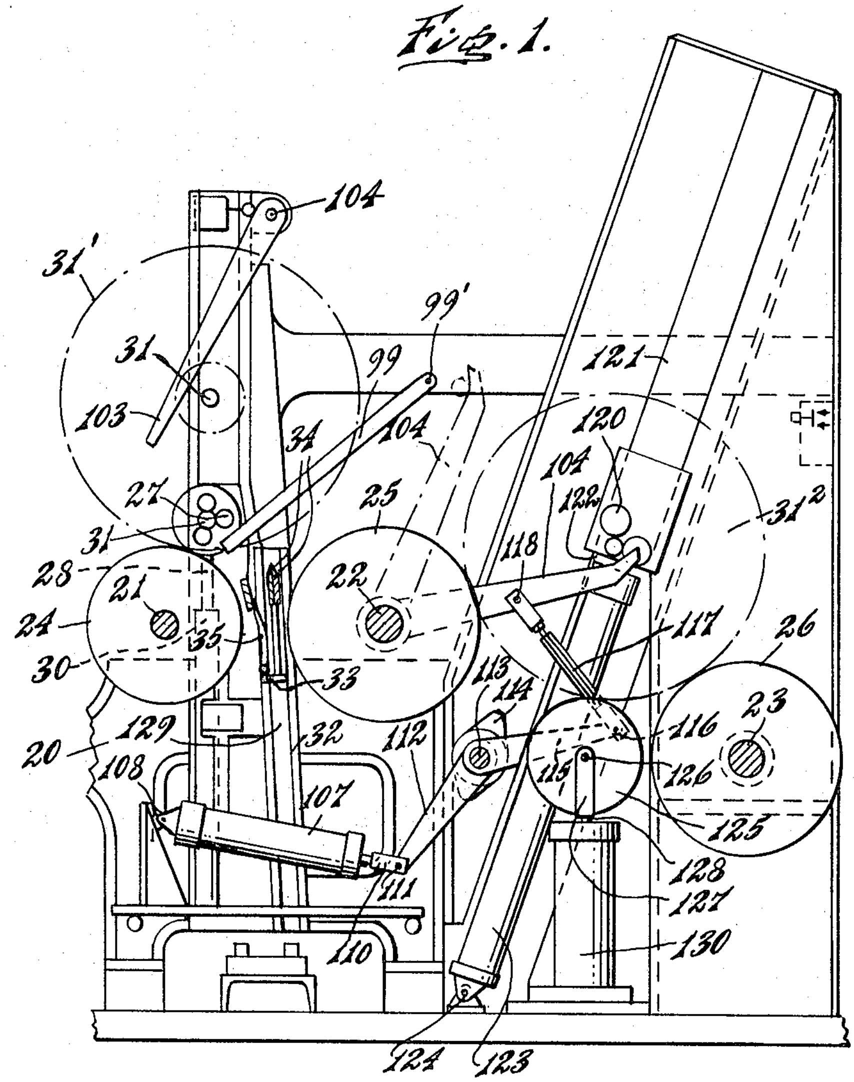
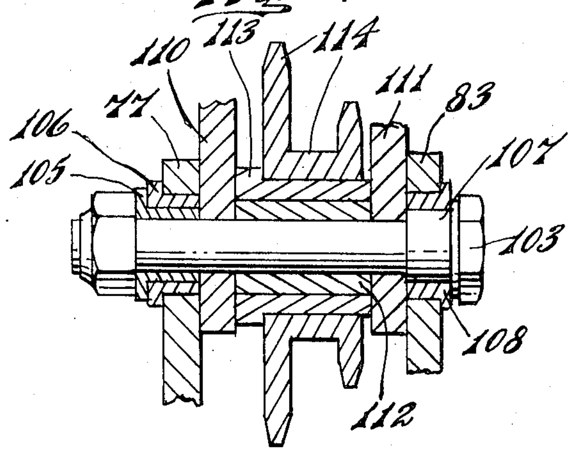


Fig. 7.



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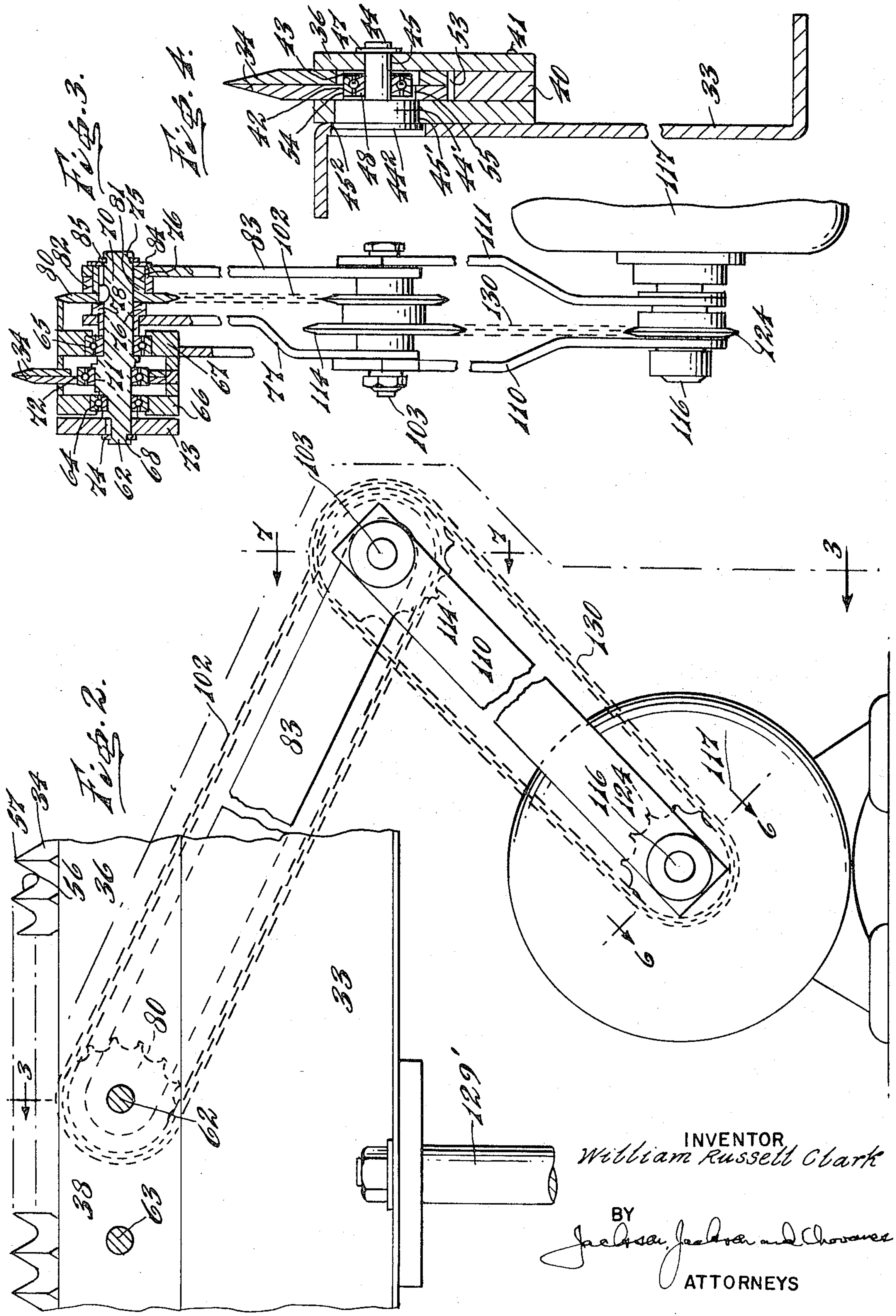

Fig. 2. Fig. 3. Fig. 4.

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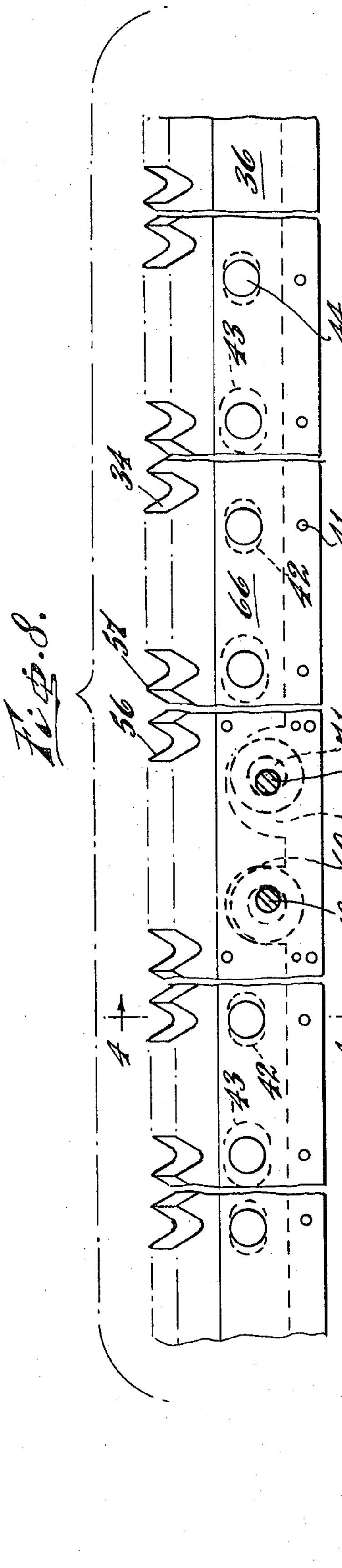

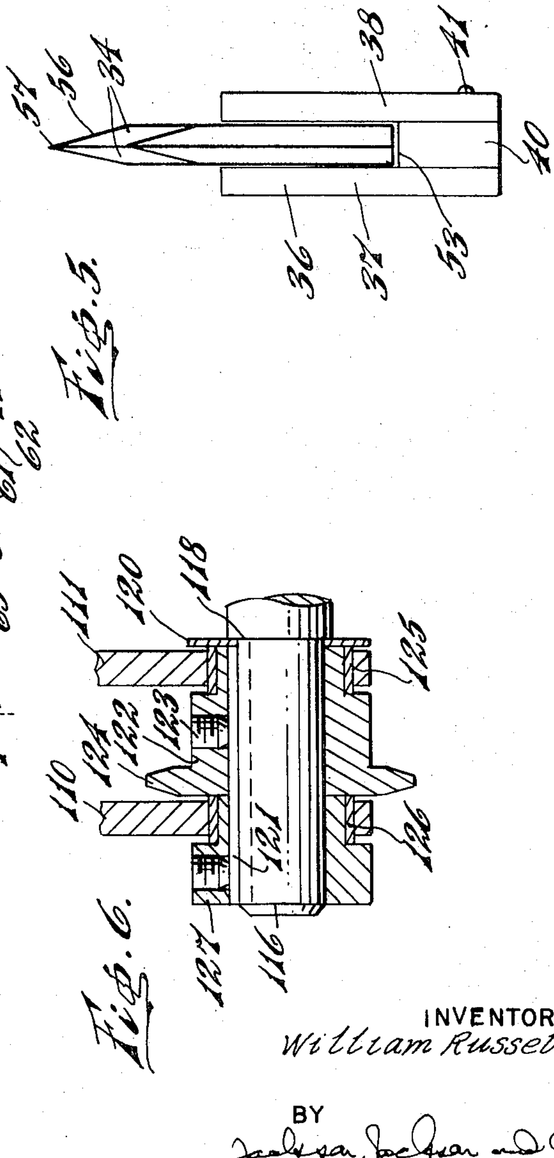

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CUTTER FOR SHEET WINDER

DISCLOSURE OF INVENTION

The present invention relates to a winder for sheet material, particularly cloth, plastic or paper, provided with an improved cutter.

A purpose of the invention is to accomplish cutting more rapidly and with less damage to either of the cut ends of the sheet material.

A further purpose is to cause more even cutting.

A further purpose is to produce less retardation on the cut end of the sheet material as it is being wrapped around the new shell, and thus produce a more uniform roll of sheet material.

A further purpose is to reduce the cost of cutters for sheet material and reduce the cost of sharpening such cutters.

A further purpose is to permit subdividing a very long cutter into a series of sets of reciprocating cutters, making the division or divisions at the middle of the cutter or at some other suitable point or points along its length.

Further purposes appear in the specification and in the claims.

FIG. 1 is a diagrammatic longitudinal vertical section of a winder for sheet material according to the invention, the section being taken just inside the frame at one end.

FIG. 2 is a fragmentary side elevation of the cutter frame and cutter frame drive in retracted position, with the gears sectioned away.

FIG. 3 is a diagrammatic section of FIG. 2 on the line 3–3.

FIG. 4 is an enlarged diagrammatic section taken on the line 4–4 of FIG. 8 and including the gate which is omitted in FIG. 8.

FIG. 5 is an end elevation of the cutter guides and cutters.

FIG. 6 is a fragmentary enlarged section on the line 6–6 of FIG. 2.

FIG. 7 is an enlarged fragmentary section on the line 7–7 of FIG. 2.

FIG. 8 is a fragmentary side elevation of cutters in the cutter guide, with the gears sectioned away, showing the relation of the eccentrics to individual cutters.

In the prior art, winders for sheet material such as cloth, plastic and paper are of the two-drum type, as shown for example by U.S. Pat. No. 2,676,764 by Aulen, granted Apr. 27, 1954 for Web Winder; U.S. Pat. No. 2,619,298 Aulen, granted Nov. 25, 1952 for Web Winder; U.S. Pat. No. 3,061,221 by Aulen granted Oct. 30, 1962 for Winding Machine; the three-drum type as shown by U.S. Pat. No. 3,045,940 by Aulen granted July 24, 1962 for Three-Drum Winder, or the center wind type.

The cutters used for cutting the sheet material when a new roll is to be formed are often of the longitudinally extending serrated knife variety as U.S. Pat. No. 2,619,298 in Aulen above referred to, or of the circular disc variety as shown U.S. Pat. No. 2,723,717 by Clark and Aulen granted Nov. 15, 1955 for Movable Gate Carrying Rotary Knife for Cutting Cloth on a Winding Machine. In the case of the serrated knife, the cutter is longitudinally stationary and merely moves up and down but in the case of the circular disc cutters, the cutters are rotated when cutting takes place. Another form of cutter is like a chain saw as shown U.S. Pat. No. 3,049,311 by Birch granted Aug. 14, 1962 for Apparatus for Web Winding.

The above cutters when wholly stationary except for the vertical motion tend sometimes to grab the cloth and produce an irregular tear in the cloth, and sometimes will not even cut at all. In some cases when the material is not cut, the cutting frame may be bent. This partly because there is no horizontal motion of the cutters.

The rotating disc type of cutter cuts faster but the discs are very expensive to produce. The chain saw type of cutter has extensive power requirements partly for overcoming friction in the chain, and must rise rapidly in order to be effective, and has a tendency to tear certain materials.

The present invention is designed to produce very fast cutting, thus minimizing the horizontal pull of the cutting frame by the material and cutting more evenly because of the unlikelihood of producing streamers or ragged ends.

The cutter of the invention has very moderate power consumption because of the antifriction support of the cutters themselves by the track.

In the present invention the cutters are in themselves of low cost, and their sharpening can be accomplished in an economical manner. The cutters of the present invention are readily replaced by others when they become worn or need sharpening.

The invention can be applied to a single set of cutters extending clear across the winder or the cutters can be broken down into units, one set covering half or one portion of the width and another set or other sets covering another half or another portion or other portions of the width, the cutters of the sets being driven from separate drives or intergeared or connected to a common drive.

While the invention is applicable to two-drum or three-drum winders, it will be illustrated conveniently as applied to a three-drum winder. The invention may be applied to peripheral or center winders.

It will be understood that the winder may be used for winding cloth, plastic, paper, foil, or other sheet material.

The winder as conveniently illustrated comprises a frame **20** having three parallel horizontal shafts **21**, **22** and **23**, each of which is driven in the same direction by suitable driving means. The shaft **21** is supported in the frame by suitable bearings and has keyed thereon a horizontal entering drum **24**. The shaft **22** is journaled in the frame on suitable bearings and has keyed thereon a horizontal middle drum **25**. The shaft **23** is journaled on the frame in suitable bearings and has keyed thereon a horizontal takeoff drum **26**. A suitable driving interconnection is provided between the drums. The takeoff drum will suitably be lower then the entering drum and the middle drum in the preferred embodiment. The winding machine above the entering drum has upwardly moving receiving pivot jaws **27** which are downwardly urged by piston and piston rod combinations **28** in pneumatic cylinders **30** supported at the sides in the frame. The upwardly moving receiving pivot jaws **27** pivotally support the pivot of the spitz bar of a new shell **31**.

Between the entering and the middle drum there are at the sides of the machine suitable guideways **32** guide a cutter frame or gate **33** which has at its upper ends cutters **34** inclined toward the direction from which the sheet material comes and also threading fingers **35** as well known in the art. The guideways **32** are preferably slightly inclined toward the direction from which the sheet material comes.

A track **36**, FIG. **5**, is mounted on the top of the cutter frame and has opposed sides **37** and **38** and a bottom **40** held together by suitable fastenings, which may be in the form of screws or pins **41**, FIGS. **4** and **8**. Each of the cutters **34** may desirably be identical but positioned oppositely, so that one cutter engages one side of the track and the other cutter engages the other side of the track while the cutters engage one another sideways at the middle of the track cross section,

Each of the cutters **34** has near each end one or preferably a plurality of elongated roller slots **42**, FIG. **8**, and opposite the roller slots of the opposite cutter a set of elongated somewhat higher roller clearance slots **43**. At the locations of the roller slots **42** of each cutter a roller pivot pin **44**, FIGS. **4** and **8**, extends across the track. The pin has a small end passing through a small opening **45** in one side of the track, has an intermediate head **44'** engaged in an opening **45'** hrough the opposite side of the track, and has an enlarged head **44²** passing through an opening **45²** in the structure of the cutter frame or gate. The pin is held in place by a snap washer **47** engaging in a suitable annular slot in the pin. On the small end of the pin an antifriction roller **48**, suitably a ball bearing roller, is supported, provided with an inner race and an outer race, the inner race being held between one of the tracks at one side and the head portion **44'** at the other side.

In the preferred embodiment, as seen in FIG. 4, each of the cutters clears from the bottom 40 of the track as shown at 53, there being a slight vertical freedom in the roller guiding slot so that the cutter moves back and forth resting on the top of the roller as shown at 54 with slight clearance from the bottom of the roller as shown at 55, the opposite cutter clearing entirely from the roller 48 which is supporting the particular cutter under discussion. Since the cutters will in the preferred embodiment be moving oppositely to one another, it is important that each cutter be supported and in effect floating on one set of rollers while the other cutter is supported and floated on the other set of rollers with clearance at the roller clearance slots.

The cutters are conveniently serrated at 56, FIG. 8, and have points 57 which are close together when viewed in cross section.

At a suitable point, conveniently the middle, each cutter has an eccentric engaging slot 60 and adjoining thereto an eccentric clearance slot 61 for clearing the opposite eccentric. Eccentric shafts 62 and 63 (FIGS. 2, 3 and 8) have at opposite sides axial antifriction (ball) bearings 64 and 65 which are mounted in opposite sides of a track housing 66 and 67 supported on the track, and journal concentric shaft portions 68 and 70. Between the concentric shaft portions there is an eccentric portion 71 which pivotally supports an eccentric antifriction roller 72 desirably in the form of a ball bearing. The outer race of this ball bearing engages the sides of the slot 60 of the cutter to reciprocate the cutter back and forth while the ball bearing on the other eccentric to manipulate the other cutter is provided with clearance by its corresponding slot 61.

The concentric portion 68 of each eccentric has keyed thereon a gear 73 which is held at the outer end by a snap washer 74 engaging in a corresponding slot. The gears 73 interconnect the eccentrics for the cooperating cutters and move the cutters simultaneously in opposite directions.

On one of the eccentric shafts there is provided an extension 75 of the axial portion and on this extension is provided a bearing 76 on which turns an inner link 77. The bearing has a flange 78 which engages the inner end of a sprocket 80 keyed on the shaft extension 75 and having a hub portion 81 which is surrounded by a bearing 82 which journals an outer coaxial link 83 held in place by a washer 84 and a snap-in washer 85 engaging in a cooperating groove in the outer end of the eccentric shaft.

The cooperating inner and outer links at the lower end interconnect with inclined links 110 and 111 which pivot on a bolt 103.

Links 77 and 83 at their opposite ends pivot on bolt 103 which receives a bearing 105 surrounded by a spacer 106 journaling the link 77. At the other end the bolt 103 has a bearing 107 surrounded by a spacer 108 which journals the link 83 (FIG. 7).

Immediately surrounding the bolt 103 there are links 110 and 111 which extend to the drive motor shaft to be described. Between links 110 and 111 a spacer 112 surrounds the bolt 103, and journaling on this is a bearing 113 on which turns a double sprocket 114. The smaller sprocket side of this double sprocket 114 interconnects by a chain 102 with the sprocket 80. The links 110 and 111 at their opposite ends surrounds shaft 116 of electrical drive motor 117 suitably mounted on the frame of the winder. The shaft has a shoulder 118 engaged by a washer 120. It has a keyway and a key 121 which rotationally secures to the shaft a sprocket hub 122 having a key locking set screw 123 (FIG. 6).

A sprocket 124 is fastened to the hub 122. The hub at opposite ends receives a bearing 125 for link 111 and a bearing 126 for link 110. Adjoining the hub and bearing 126 is a collar 127 held in place by a set screw. A chain 130 interconnects sprocket 124 with a larger diameter sprocket of the double sprocket 114.

It will thus be evident that whether the cutters are in lower or raised position, they can be driven by shaft 116 of the drive motor, driving sprocket 124 and chain 130 which drives the larger sprocket teeth on the double idling sprocket 114. The smaller diameter sprocket on the double sprocket 114 drives chain 102 which interconnects with sprocket 80 on one of the eccentric shafts. This drives that particular eccentric to reciprocate that particular cutter and through gears 73 drives the opposite eccentric shaft to reciprocate the opposite cutter oppositely. The cutter frame is raised by a fluid cylinder 129, FIG. 1, on the machine frame operating a piston and rod combination 129′ (FIG. 2). Although the cylinder 129 will usually be in the middle, the drive is effective even though it is on one side.

While the sheet material is winding on the takeoff drum and the middle drum, a new shell is placed in the jaws above the entering drum and turns with the entering drum just prior to cutting. This new shell can be inserted manually or on a track as well known in the art. At the time of cutting, the gate or cutter frame 33 rises with the cutters in reciprocating motion opposite to one another, supported at opposite ends by their rollers 48, and preferably floating on the rollers and free from engagement with the bottom of the cutter track. The threading fingers, as well known, carry the forward cut end around the new shell.

The roll 31′ then winds as in conventional winding practice on the entering drum until it increases in size and is ready for transfer. Transfer to the takeoff and middle drum is preferably made by transfer arms 103 pivoted on shaft 104 on the frame extending down to a position below the pivot ends 31 of the shell. The transfer arms 103 can be manually manipulated by a lever or the like or can be operated, as for example, by a pneumatic cylinder, not shown. As the roll moves forward to a position above the middle drum, the roll pivots come in contact with letdown arms 104 which are pivoted on shaft 22 and operated pneumatically. If desired, support rails 99 for the pivots of the shell as it is transferred above the knife can be provided, pivoted at 99′ and movable vertically by any suitable means, preferably a fluid cylinder, at the ends toward the entering drum. Pneumatic cylinder 107 pivoted on the frame at 108 has a piston and rod combination 110 which is pivotally connected at 111 with lever 112 keyed on shaft 113 journaled on the frame at 114. The shaft 113 also has keyed thereon at opposite ends levers 115 which are pivotally connected at 116 to adjustable links 117 which pivotally connect at 118 to intermediate positions on the letdown arms 104.

When the letdown arms have completed their operation, the rolls 31^2 rests against and turns with the takeoff drum 26 and the middle drum 25. In this position, pivot jaws 120 sliding in guideways 121 which extend diagonally upwardly and forwardly at the front of the machine may engage the pivot ends of the roll. Each of the pivot jaws is either upwardly or downwardly urged by a piston rod 122 which has a piston acting in a pneumatic cylinder 123 which is pivoted on the frame at 124. It will be evident that the location of the pivots with respect to the jaw will be changed when the pressure is upward rather than downward.

When the cloth roll 31^2 is wound to a size suitable for doffing, it has, of course, pushed the pivot jaws 120 up along the guideways 121 against or with the action of the cylinders. At this point, cutting is accomplished as already explained. In order to doff and load the cloth roll on a truck, hoist or the like, a doffing roll 125 is actuated which is placed below the roll of cloth, and is pivoted on an axis 126 parallel to the axis of the roll of cloth on bearing supports 127 which are mounted on piston rods 128 connected with pistons acting in pneumatic cylinders 130 on the frame. The jaws 120 must be raised at the time of doffing.

It will be evident that the use of the cutting device of the invention has the advantage of producing faster cutting, and more even cutting, and providing blades which can be produced less expensively, sharpened at lower coast, and replaced very easily.

It will be evident that the motor 117 can, if desired, drive more than one idler shaft 116 when more than one cutter unit is required because of the width of the winding machine.

It will be evident that the construction of the cutters will be subject to variation to most efficiently cut various types of material. The particular shape of cutter used will depend upon the thickness, strength and texture of the material.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

I claim:

1. In a winder for sheet material, spaced parallel horizontal drums, means for turning the drums in the same direction for winding a roll of sheet material thereon, the sheet material in one position of winding extending across between the drums, and a cutter frame in the space between the drums, guided for upward motion to cut the sheet material, means for moving the cutter frame upward, in combination with a track having opposed parallel sides extending horizontally on the top of the cutter frame and vertically movable with it, roller pivots extending from the track into the space between the track sides, rollers on the roller pivots in the space between the track sides, opposed cutters in the track and each engaging one of the track sides, at least one of said cutters having slots receiving rollers, said one cutter being reciprocable longitudinally on the rollers, the rollers on which said one cutter reciprocates clearing from engagement with the other cutter, and an eccentric operatively connected to said one cutter to reciprocate the same.

2. A winder of claim **1**, in which each cutter has slots receiving rollers of a different set, each cutter being reciprocated longitudinally on the rollers of a different set and the rollers on which each cutter reciprocates clearing from engagement with the other cutter, there being an eccentric operatively connected to each cutter to reciprocate the same.

3. A winder of claim **2**, in combination with gears interconnecting the eccentrics.

4. A winder of claim **3**, in which the roller pivots extend across from side to side of the track, there being slots in each cutter passing the roller pivots opposite the rollers on which the other cutter reciprocates.

5. A winder of claim **4**, in which the cutters float vertically on the rollers, free from engagement with the bottom of the track.

6. A winder of claim **1**, in which said one cutter floats vertically on the rollers, free from engagement with the bottom of the track.