Aug. 9, 1966 E. YARON 3,264,924

CUTTING MECHANISM

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FIG. 2

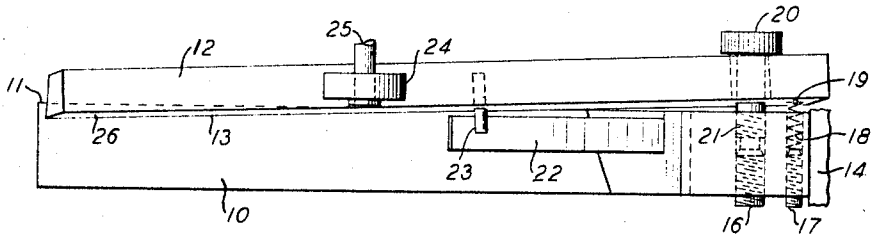


FIG. 1

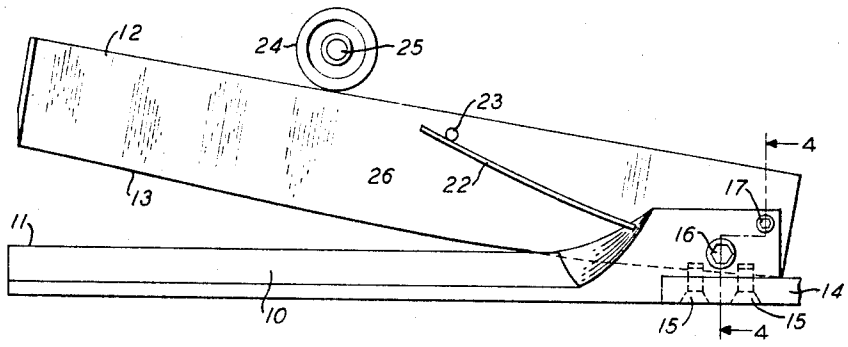


FIG. 3

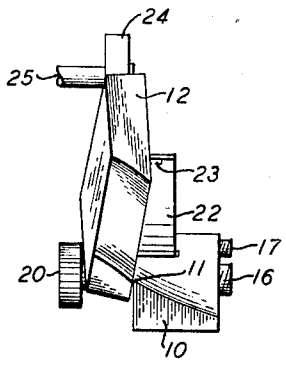
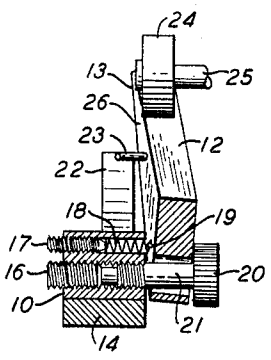


FIG. 4



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FIG. 6

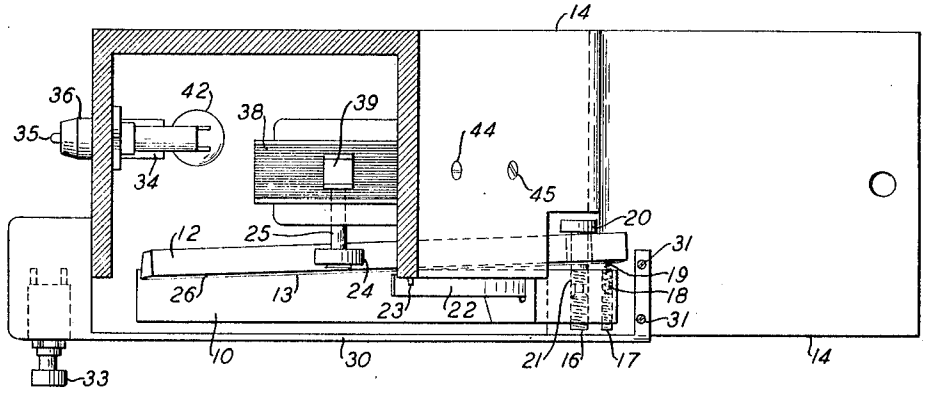


FIG. 5

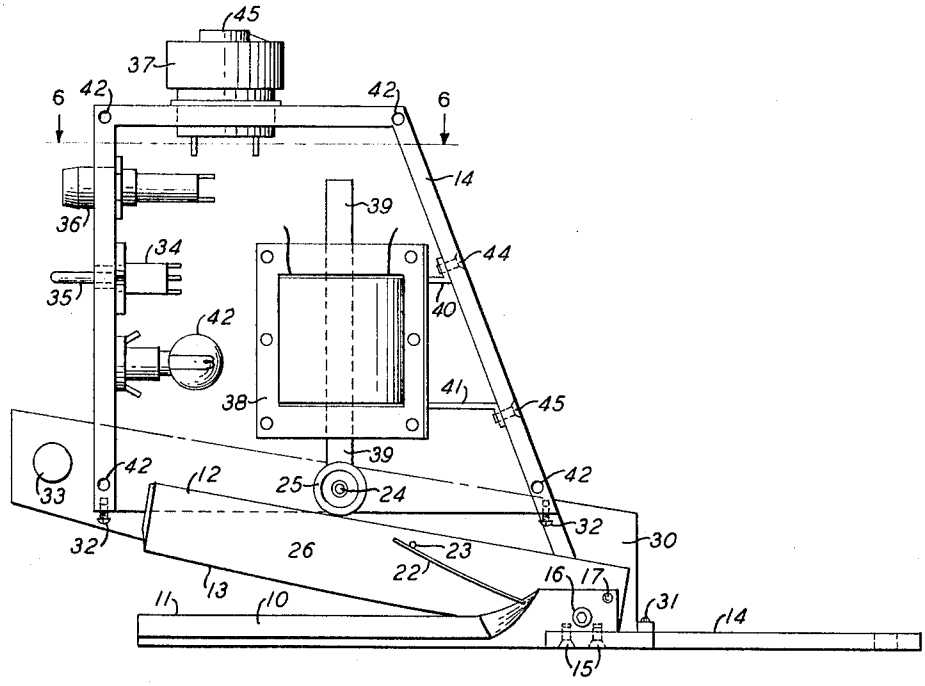
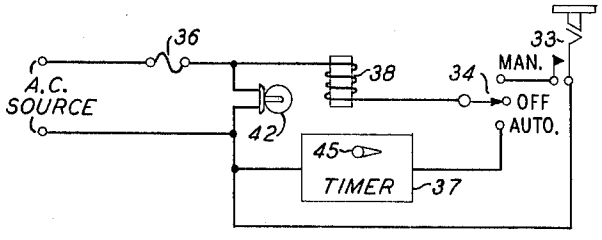


FIG. 7



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CUTTING MECHANISM

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8 Claims. (Cl. 83—575)

This invention relates to cutting mechanisms and more particularly to a cutting attachment for sewing machines.

In the garment manufacturing industry, after seam binding is sewn to the edge of a garment it is necessary to cut the seam binding before it is sewn to the next garment. The cutting mechanism must be powerful to insure the cut is made in a single stroke; it must be of sound construction since it is used repeatedly for extended time intervals. An illustrative sewing machine attachment for cutting seam binding is shown in Patent 2,881,833, issued April 14, 1959, to Joseph M. Hoffee.

One of the major problems to be overcome in the design of a cutting mechanism is the positioning of the blades. If the blades are loose the material to be cut will not be severed and instead will be merely bent between the blades. If the blades are too tight the blades and especially the cutting edges may wear excessively. The problem to which my invention is directed is most severe with a cutting mechanism which is used repeatedly; however, the invention is equally applicable to less complex devices, e.g., the ordinary household scissors.

In the above-identified Hoffee patent the blades are positioned by an adjustable external spring. This biasing arrangement is rather complex. It is a principal object of this invention to provide an improved cutting mechanism wherein a simple biasing arrangement insures sufficient tension between and minimum wear of the blades.

In the illustrative embodiment of the invention one of the blades is stationary. This blade is positioned horizontally with a cutting edge at its top. The second blade is pivotally attached to the first with a cutting edge at its bottom. A solenoid is provided on top of the second blade. While the blades are normally maintained in an open position, when the solenoid is energized a plunger is extended down to force the second blade to rotate relative to the first.

At the rear of the first blade, past the pivot attachment, there is a small hole on the inner face. Inserted in this hole is a small compressible spring. The free end of the spring carries a ball bearing which is forced by the spring against the rear inner face of the second blade. This biasing arrangement tends to separate the rear sections of the two blades and, due to the pivot connection, to force the front sections of the two blades containing the cutting edges toward each other. Atlhough the two rear sections move relative to each other as the second blade rotates, the tension is maintained due to the spring action. The ball bearing at the tip of the spring allows the second blade to move relative to the first blade and the attached spring.

The hole at the rear of the first blade is positioned at a level higher than that of the center of the pivot connection. The spring thus not only forces the front sections of the blades toward each other, but because it is positioned at a level higher than the pivot connection it causes the blades to be rotated slightly with respect to each other. The top of the second blade is rotated away from the first blade and the lower (cutting) edge of the second blade is rotated toward the first blade. During a cutting action this results in reduced wear of the blades. The only contact of the blades is the contact of the two cutting edges.

It is a primary feature of this invention to provide a spring between two blades, attached to a first and movable with respect to the second; the spring separating the two blades at the rear portions past the pivot connection away from the cutting sections and being attached to the first blade at a level higher than the center of the pivot connection.

Further objects, features and advantages of the invention will become apparent upon consideration of the following detailed description in conjunction with the drawings in which:

FIG. 1 is a front view of an illustrative embodiment of the invention;

FIG. 2 is a top view of the same cutting mechanism;

FIG. 3 is a side view of the cutting mechanism looking toward its front;

FIG. 4 is a section view taken along the line 4—4 on FIG. 1;

FIG. 5 is a front view of a sewing attachment incorporating the cutting mechanism of the invention;

FIG. 6 is a section view taken along the line 6—6 on FIG. 5; and

FIG. 7 is a schematic wiring diagram for the sewing attachment.

The blades are shown in FIGS. 1, 2, 3 and 4. All four figures show the blades in the open position. Blade **10** has an inner face **27** with a cutting edge **11**. Blade **12** has an inner face **26** with a cutting edge **13**. Faces **26** and **27** are both flat. Blade **10** is attached by two screws **15** to base portion **14** of a housing which encloses the blades. The housing, except for portion **14**, is not shown in order that the blades be fully exposed. In the rear of blade **10**, on the outer face, is an Allen screw **16** extending through approximately half the blade thickness. The hole into which the Allen screw is screwed is extended all the way through the blade and is threaded. Another screw having a head **20** and a shank **21** is screwed into the hole at the inner face of blade **10**. The tip of the shank is threaded but the back portion is not. This back portion is enclosed by a non-threaded hole in blade **12**, the blade being held against blade **10** by head **20**. Allen screw **16** is screwed in an amount such that when the pivot screw (**20**, **21**) is tightened the non-threaded portion of shank **21** between the inner face **27** of blade **10** and the head **20** is longer than the width of blade **12**. Thus in the absence of a bias arrangement, while blade **12** is free to rotate relative to blade **10**, the two inner faces are not held flush against each other. A leaf spring **22** is inserted in a slot in the rear portion of blade **10**. There is a pin **23** extending through blade **12** which is above the free end of leaf spring **22**. Thus in the normal position, the leaf spring forces the upper blade **12** to be rotated clockwise with respect to the lower fixed blade **10**, and the blades are in the open position. Shaft **25**, which is pushed down by the plunger in the solenoid shown in FIG. 5, has a roller bearing **24** at its end. As the shaft is forced down the bearing forces the blade **12** down to effect the cutting action. Since shaft **25** moves straight down in a vertical plane, as blade **12** rotates around the pivot screw the shaft moves slightly along the top of blade **12**. The roller bearing is provided to prevent wear.

To the rear of and at a level higher than Allen screw **16**, on the front face of blade **10**, there is another Allen screw **17**. This screw is screwed into a hole extending clear through blade **10**. Only the front portion of the hole is threaded. A spring **18** is inserted in the rear of the hole, and a ball bearing **19** is placed in the tip of the spring. The Allen screw **17** is adjusted to provide the proper tension for the spring. The ball bearing, which is forced against the inner face of the rear portion of blade **12**, is provided so that as blade **12** rotates the tip of the spring does not wear as blade **12** moves against it.

It will be recalled that the pivot screw does not hold blade **12** flush against blade **10**. Spring **18** provides the

bias which holds the blades in the proper positions relative to each other. Because the spring is to the rear of the pivot, the rear portion of blade **12** is forced out away from blade **10** and the front portion of blade **12** is forced toward blade **10**. Because the spring is above the pivot, the top portion of blade **12** is forced out away from blade **10** and the lower portion of blade **12** is forced toward blade **10**. The net effect is that the plane of face **26** is not parallel with the plane of face **27**. In fact, the two blades touch at only one point—where cutting edge **13** and cutting edge **11** cross over. This point of contact moves as blade **12** is rotated during the cutting action. As blade **12** is rotated toward the closed position, the point of contact moves toward the front of the blades until finally the tip of edge **13** contacts the tip of edge **11**. As the blades close, the only contact is the tip of one edge with the face of the other blade.

The bias arrangement is adjustable in two respects—the spring tension may be adjusted by Allen screw **17** and the length of the portion of shank **21** between blade **10** and head **20** may be varied by Allen screw **16**. The latter adjustment controls both the rotation of blade **12** with respect to blade **10** and the amount by which the two lower edges cross over each other in the open position. The rotation and blade cross-over insure minimum wear, and provide the proper positioning of the blades to effect the smoothest cutting action.

The rotated position of blade **12** and the edge cross-over are seen most clearly in FIGS. 2, 3 and 4. The two blades contact each other at only the one point where the two edges intersect. As blade **12** closes during a cutting action the front portion of it is forced away from blade **10** in order that the blades close. The spring maintains the proper tension. As the tips of the two edges pass each other the only contact between the blades is the tip of edge **11** against face **26**. Face **27** may be inclined slightly so that edge **13** does not wear against it as the blades close.

FIG. 5 is a front view and FIG. 6 is a section view along line **6—6** on FIG. 5 of a complete mechanism incorporating the blades of my invention. The housing **14** encloses the blades, the latter being attached to the housing by screws **15**. A flat metal plate (not shown) is attached to the bottom of the housing by screws **32**. The plate extends across the housing but is cut out to enable the shaft **25** and blade **12** to move down. Another plate (not shown) attaches to the side of the housing and is secured by four screws (not shown) screwed into holes **42**.

A guard **30**, shown in phantom on FIG. 5, is secured to the housing by two screws **31**. The guard is included to shield the blades. Of course, the blades are exposed at the bottom of the housing to permit material to be fed through them. A pushbutton **33** is attached to the guard. When this pushbutton is operated the solenoid is energized. The electrical connections are shown in FIG. 7. In FIGS. 5 and 6 various terminals are shown but their interconnections are omitted for the sake of clarity.

A solenoid **38** with brackets **40** and **41** is attached to housing **14** by screws **44** and **45**. A plunger **39** passes through the solenoid. At the bottom of the plunger is attached a shaft **25** at whose end is roller bearing **24**. When the solenoid is energized the plunger is forced down. The roller bearing **25** causes blade **12** to effect the cutting action.

Four other elements are attached to housing **14**; lamp **42**; three-way toggle switch **34**, fuse **36** and delay **37**. The lamp is provided to illuminate the blades and the switch is used to provide either manual or automatic operation. Fuse **36** is included for protective purposes. Delay **37** controls the automatic repeated operation of the cutting mechanism, without requiring the pushing of pushbutton **33**, when switch **34** is in the automatic position. Delay **37** is shown with only two terminals. Commercial devices of this kind are generally provided with more terminals and for this reason it is to be understood that delay **37** is only symbolic. The action it controls is to momentarily connect its two terminals every few seconds. The delay itself can be adjusted by turning knob **45** in accordance with the particular application for which the cutting mechanism is used.

The electrical connections are shown in FIG. 7. Fuse **36** is in series with the power source. Lamp **42** is connected across the source to illuminate the cutting area as long as the mechanism is in operation. If toggle **35** (FIG. 5) is in the off position winding **70** of solenoid **38** is not energized since contact **71** is in the off position. If the toggle is in the manual position, contact **71** is connected in series with pushbutton **33** and the solenoid is energized whenever the pushbutton is operated. If the toggle is in the automatic position the solenoid winding is connected through delay **37** to the power source. Depending on the position of knob **45** the delay mechanism allows a momentary current to flow once each few seconds. This controls the repeated automatic energization of the solenoid.

Although the invention has ben described with reference to a particular embodiment it is to be understood that the above-described arrangement is only illustrative, and that numerous variations may be made therein and other arrangements may be devised without departing from the spirit and scope of the invention.

What is claimed is:

1. A cutting mechanism comprising two blades each having an inner face with a cutting edge, a first one of said blades having a screw-threaded aperture on its inner face, the second one of said blades having an aperture extended therethrough, a screw having a shank and a head of larger diameter, said shank being smaller in diameter than said aperture in said second blade and said head being larger in diameter than said aperture, said shank extending through said aperture in said second blade and being screwed in said screw-threaded aperture on said inner face of said first blade for locating the inner face of said first blade proximate to the inner face of said second blade, said shank having a length such that the length of the shank between the inner face of said first blade and said head is slightly greater than the thickness of said second blade, a second aperture on the inner face of said first blade, a spring in said second aperture, ball bearing means carried at the tip of said spring proximate to the inner face of said second blade, and means connected between said first and second blades for normally maintaining said first and second blades in an open position.

2. A cutting mechanism in accordance with claim **1** wherein said second aperture is positioned on said first blade in a manner such that said spring forces said cutting edges to extend across one another when said first and second blades are in an open position and further forces said first and second blades to be rotated slightly relative to each other so that when said first and second blades are in a closed position the only contact of said inner faces is the contact of the cutting edge on one of said blades with the inner face of the other of said blades.

3. A cutting mechanism comprising first and second blades each having a front cutting portion, a pivot portion and a rear portion; said first blade having a cutting edge along the top of its cutting portion; said second blade having a cutting edge along the bottom of its cutting portion; pivot means for connecting the pivot portions of said first and second blades for allowing said blades to rotate relative to each other to enable said cutting edges to engage in a cutting action; an aperture on the inner face of the rear portion of said first blade; a spring mounted in said aperture; and a ball bearing contained at the tip of said spring for rolling on the inner face of the rear portion of said second blade; said aperture being positioned on the rear portion of said first blade at a level higher than the level of the center of said pivot means.

4. A cutting mechanism comprising two blades each having a front cutting section, a pivot section and a rear section; each of said blades having a cutting edge along its cutting section; pivot means for connecting the pivot sections of said two blades for allowing said blades to rotate relative to each other to enable said cutting edges to engage in a cutting action; and means connected between the rear sections of said blades for forcing said front cutting sections toward each other and for turning said blades away from each other such that during a cutting action the only contact between said front cutting sections is the contact of the cutting edge of one of said cutting sections with the cutting edge of the other of said cutting sections.

5. A cutting mechanism in accordance with claim 4 wherein the rear section of one of said blades includes an aperture on the inner face thereof and said last-mentioned means includes a spring inserted in said aperture and a bearing member contained in the tip of said spring for contacting the inner face of the rear section of the other of said blades; said aperture being positioned on said one blade at a level above the center of said pivot means in the direction of the cutting edge of said one blade.

6. A cutting mechanism comprising a housing open along a portion of its bottom; a first blade attached to said housing having a cutting section extending out of the open portion of said housing; said cutting section of said first blade having a cutting edge at its top; a second blade rotatably attached to said first blade; said second blade having a cutting section with a cutting edge at its bottom for engaging in a cutting action with the cutting edge of said first blade when said second blade is rotated relative to said first blade; a solenoid inside and attached to said housing above said second blade; said solenoid having a plunger for forcing said second blade to rotate when said solenoid is energized; means for energizing said solenoid; an aperture on the inner face of said first blade at a position past the point of rotatable attachment to said second blade away from the cutting section of said first blade and at a level higher than that of said point of rotatable attachment; a compressible spring mounted in said aperture; and a ball bearing contained at the tip of said spring for making contact with the inner face of said second blade.

7. A cutting mechanism comprising a housing open along a portion of its bottom; a first blade attached to said housing having a cutting section extending out of the open portion of said housing; said cutting section of said first blade having a cutting edge at its top; a second blade rotatably attached to said first blade; said second blade having a cutting section with a cutting edge at its bottom for engaging in a cutting action with the cutting edge of said first blade when said second blade is rotated relative to said first blade; a solenoid inside and attached to said housing above said second blade; said solenoid having a plunger for forcing said second blade to rotate when said solenoid is energized; means for energizing said solenoid; and means connected between the inner faces of said first and second blades past the point of rotatable attachment of said blades away from said cutting sections for forcing said cutting sections toward each other and for turning said second blade away from said first blade such that during a cutting action the only contact of said cutting sections is the contact of the cutting edge of said second blade with the cutting edge of said first blade.

8. A cutting mechanism in accordance with claim 7 wherein said last-mentioned means includes an aperture on the inner face of said first blade, a spring contained in said aperture, and a bearing member contained at the tip of said spring for making contact with the inner face of said second blade; and further including a ball bearing member attached to said plunger for allowing relatively frictionless movement between said second blade and said plunger when said solenoid is energized.

No references cited.

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