United States Patent [19]

Fujimoto

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[54] **SHEET CUTTING APPARATUS**

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[30] **Foreign Application Priority Data**

Apr. 30, 1970 Japan 45/37002

[52] **U.S. Cl.** **83/484,** 83/487, 83/587, 83/614

[51] **Int. Cl.** **B23d 19/00,** B26d 5/08

[58] **Field of Search** 83/484, 485, 487, 83/508, 614, 586, 587

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Primary Examiner—Andrew R. Juhasz
Attorney—John J. McGlew and Alfred E. Page

[57] **ABSTRACT**

A cutter receptor extends transversely across the path of movement of sheet material to be cut, and an endless belt is trained over a pair pulleys for movement adjacent and substantially parallel to the cutter receptor. A disk-shaped cutter is rotatably mounted on the endless belt and spring biased to press toward the cutter receptor to cut cut a predetermined length of sheet material during movement of the belt. One pulley is driven by a driving mechanism which is under the control of a control mechanism selectively operable to activate the drive mechanism to rotate the pulley to advance the cutter from a retracted starting position into rotating engagement with the cutter receptor and therealong to cut a length of sheet material, after which the rotation of the pulley is continued to return the cutter to its retracted starting position. In one embodiment of the invention, the driven pulley is fixed to a shaft on which there is rotatably mounted a gear. A coil spring has one end secured to the shaft and its other end secured to a housing rotatable with the gear, and a driving pinion meshes with the gear. The driven pulley is normally latched against movement but, when the latch is released, the spring rotates the driven pulley to drive the belt carrying the cutter. During the time that the pulley is latched against movement, the pinion rotates the gear to rewind the spring. Control elements are associated with the shaft and with the gear, and effect operation of a microswitch controlling energization of a motor for driving the pinion. In another embodiment of the invention, the driven pulley is rotated by an electric motor whose energization is controlled by control cams operatively associated with control switches.

10 Claims, 12 Drawing Figures

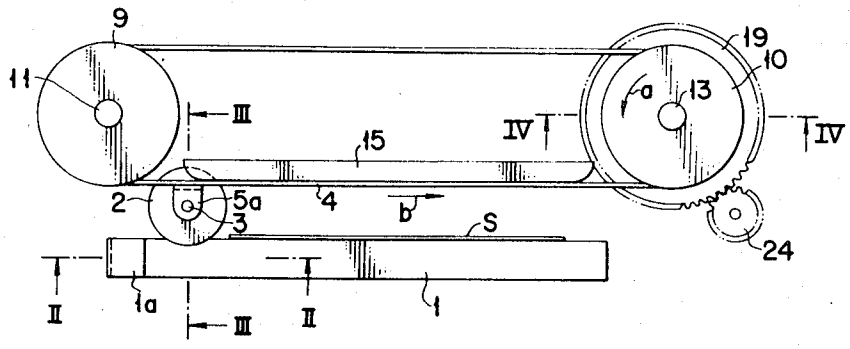


FIG. 1

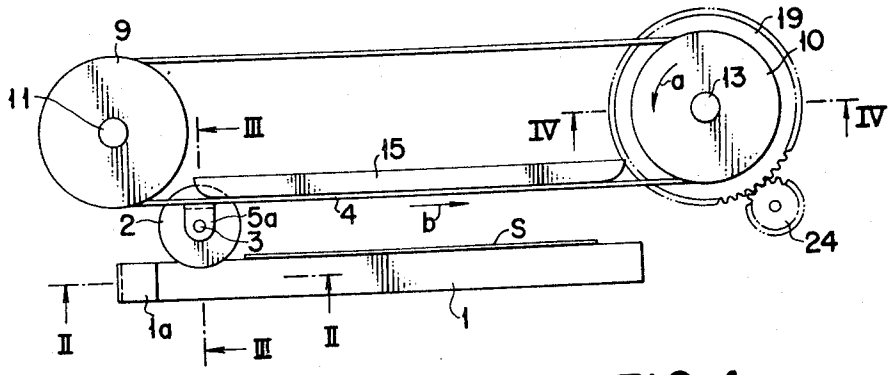


FIG. 2

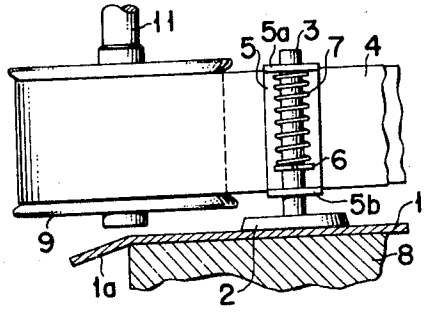


FIG. 3

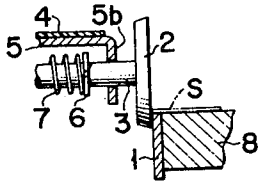


FIG. 4

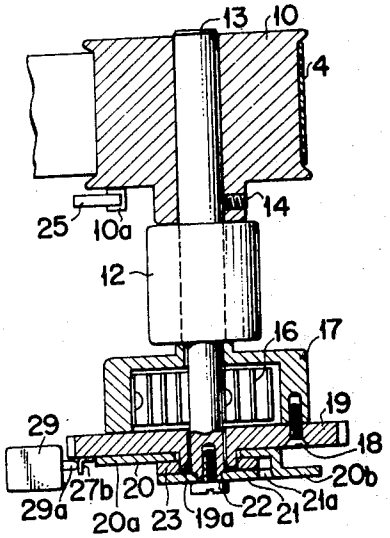


FIG.5A

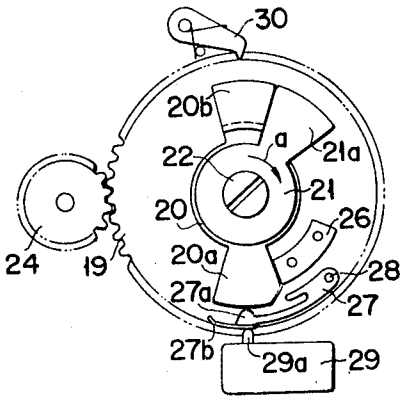


FIG.5B

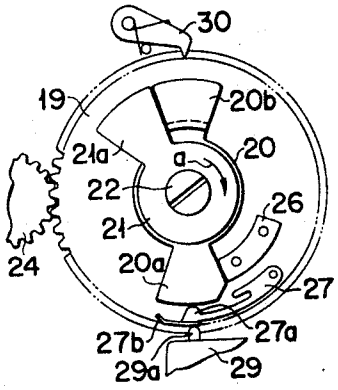


FIG.5C

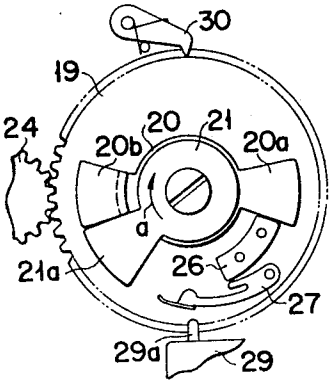


FIG.5D

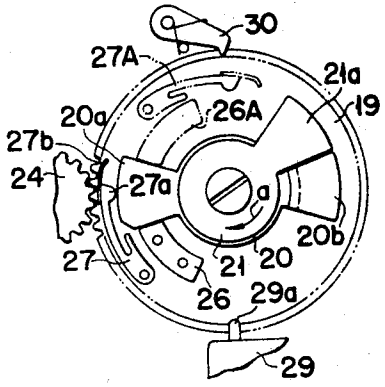


FIG.6

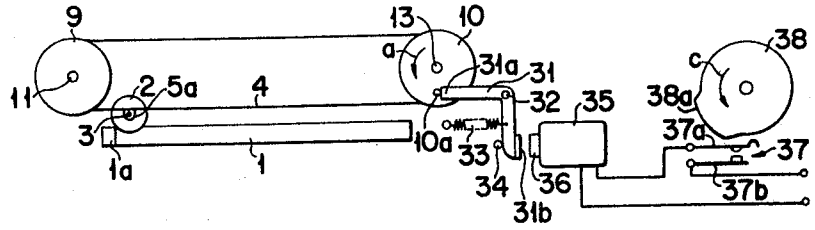


FIG.7

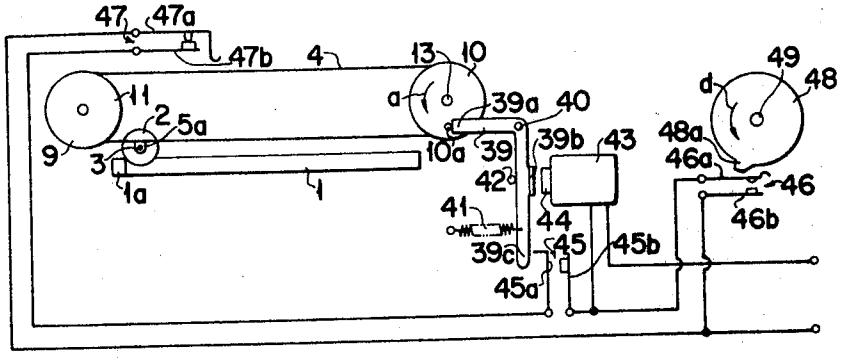


FIG.8

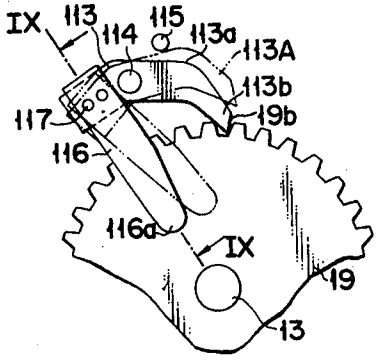
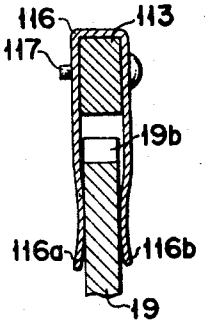


FIG.9



SHEET CUTTING APPARATUS

BACKGROUND OF THE INVENTION

A known sheet cutting apparatus includes a disk-shaped cutter and a cutter receptor, and the cutter is reciprocated relative to the receptor to cut the sheet material. In this known sheet cutting apparatus, it is necessary to vary the inclination of the disk-shaped cutter relative to the cutter receptor, when the cutter moves in one direction, from the inclination of the cutter, when the cutter moves in the opposite direction, so as to bring the leading edge of the cutter into engagement with the cutter receptor at all times. This known apparatus has the advantage of cutting the sheet material in either direction of movement of the disk-shaped cutter. However, it has an important disadvantage in that the support device for the cutter is complex in structure and the cutter is not reliable in performance.

SUMMARY OF THE INVENTION

This invention relates to sheet cutting apparatus of the type using a disk-shaped cutter cooperating with a cutter receptor to cut a predetermined length of the material. More particularly, the invention is directed to an improved apparatus of this type in which a disk-shaped cutter is rotatably mounted on an endless belt moving in one direction only.

In accordance with the invention, a cutter receptor extends transversely across the path of movement of the sheet material, and the endless belt is mounted adjacent and substantially parallel to the cutter receptor. The sheet material to be cut may be any type of sheet material such as, for example, a photosensitive sheet, a magnetic sheet, or similar sheet material, which moves along a predetermined path of travel.

The cutter is secured to a shaft which is rotatably mounted in a support secured to the endless belt, and a spring biases the cutter toward pressing engagement with the cutter receptor, the cutter being so mounted that its orientation, with respect to the cutter receptor, is maintained always at the same angle so that cutting can be carried out accurately and continuously. Thereby, the cutting apparatus of the invention is more reliable in performance and less complex in construction than sheet cutting apparatus in which a disk-shaped cutter is reciprocated along a cutter receptor in opposite directions to effect cutting.

One of the two pulleys over which the endless belt is trained is driven by suitable means, such as a spring or by an electric motor, and control elements are provided to control the rotation of the driven pulley so that the cutter is moved in one direction, by the endless belt, along the cutter receptor, and then returned along the other run of the endless belt to a retracted starting position. When a spring is used as the driving means for the driven pulley, electric motor driven means effect rewinding of the spring automatically, responsive to the control elements, after each "run" of the endless belt in one direction.

An object of the invention is to provide an improved sheet cutting apparatus incorporating a disk-shaped cutter cooperable with a cutter receptor to cut a predetermined length of sheet material moving along a path of travel.

Another object of the invention is to provide such a sheet cutting apparatus which is more reliable in performance than known sheet cutting apparatus of this type.

A further object of the invention is to provide such a sheet cutting apparatus which is less complex in construction than known sheet cutting apparatus of the same general type.

Another object of the invention is to provide such a sheet cutting apparatus in which the disk-shaped cutter is always maintained at a fixed angular orientation relative to the cutter receptor.

A further object of the invention is to provide such a sheet cutting apparatus in which, during a cutting operation, the disk-shaped cutter always travels in the same direction along the cutter receptor.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a schematic front elevation view of sheet cutting apparatus in accordance with one embodiment of the present invention;

FIG. 2 is a horizontal sectional view taken along the line II—II of FIG. 1;

FIG. 3 is a transverse sectional view taken along the line III—III of FIG. 1;

FIG. 4 is a horizontal sectional view taken along the line IV—IV of FIG. 1;

FIGS. 5A–5D are front elevation views illustrating one form of the drive mechanism used in the invention apparatus, and the manner in which it operates;

FIGS. 6 and 7 are schematic front elevation views of two different forms of control mechanism used with the apparatus of the invention;

FIG. 8 is a partial side elevation view of one form of blocking pawl associated with a ratchet in the apparatus embodying the invention; and

FIG. 9 is a transverse sectional view taken along the line IX—IX of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first of FIGS. 1 through 4, the outer periphery of a disk-shaped cutter 2 is maintained in contact with a cutter receptor 1 extending transversely across the path of movement of sheet material *S*, and preferably at right angles to such path of movement. Cutter 2 is secured to one end of a shaft 3 which is rotatably mounted in depending portions or ears 5*a* and 5*b* of a support 5 secured to the outer surface of an endless belt 4.

A stop ring 6 is fixed on that portion of shaft 3 disposed between ears 5*a* and 5*b*, and a coil spring 7, embracing shaft 3, is positioned between stop ring 6 and ear 5*a*. Spring 7 thus biases shaft 3, and disk-shaped cutter 2, toward cutter receptor 1 so that the periphery of cutter 2 will bear against receptor 1. Receptor 1, which is secured to the edge of a sheet table 8, has an end 1a which is bent to facilitate movement of cutter 2 into the cutting station and into engagement with receptor 1.

Endless belt 4 is trained about a pair of pulleys 9 and 10, and is arranged to move disk-shaped cutter 2 along cutter receptor 1 while the periphery of cutter 2 is pressed against the upper edge of receptor 1. One pul-

ley 9 is rotatably supported by a shaft 11, and the other pulley 10 is mounted on a shaft 13 rotatably journaled in a bearing 12, pulley 10 being fixed to rotate with shaft 13 by a setscrew 14.

Endless belt 4 always travels in the direction of arrow *b*, shown in FIG. 1, as pulley 10 is rotated in the direction of arrow *a*, also shown in FIG. 1, by a drive mechanism described hereinafter. Thus, disk-shaped cutter 2 is moved from the starting position, shown in FIG. 1, in the direction of arrow *b* to cut sheet material *S* in cooperation with cutter receptor 1 as cutter 2 moves along receptor 1. After the sheet material has been cut, cutter 2 moves, with endless belt 4, about pulleys 10 and 9 and returns to its starting position. As best seen in FIG. 1, a pressing plate 15 is engaged with the inner surface of the lower run of belt 4 within the range of linear cutting movement of cutter 2, to guide belt 4 and to hold cutter 2 so that it will press against receptor 1 in good sheet cutting relation therewith.

Any suitable means, such as an electric motor, for example, may be used for driving pulley 10, and any suitable means may be used for controlling the operation of the driving means. One form of driving mechanism is shown in FIG. 4 and two forms of control mechanisms are shown in FIGS. 6 and 7. In these figures, parts identical in construction or operation are designated by like reference characters.

Referring to FIG. 4, a barrel 17, in which a spiral spring 16 is mounted, and a gear 19, secured to barrel 17 by screws 18, are loosely mounted on the end portion of shaft 13 opposite the end portion mounting pulley 10, and on the opposite side of bearing 12. Gear 19 has a hub 19*a* on which there is loosely mounted a first rotary control member 20, having two segmental blades 20*a* and 20*b* arranged diametrically opposite each other, as best seen in FIG. 5*a*. A second rotary control member 21 having a single blade 21*a* is secured by a screw 22 to the end of shaft 13, and a washer 23, as best seen in FIG. 4, is loosely mounted on hub 19*a* of gear 19 and interposed between members 20 and 21.

As best seen in FIG. 1, a pinion 24 meshes with gear 19 and is operatively connected to a motor (not shown) for winding spiral spring 16, which has its inner end connected to shaft 13 and its outer end connected to the inner surface of barrel 17. A projection 10*a*, as best seen in FIG. 4, is secured on one axial end surface of pulley 10 and is adapted to engage a stop 25 to restrain pulley 10 and shaft 13 from rotating. If gear 19 is driven by the mentioned motor, when projection 10*a* is engaged with stop 25, spiral spring 16 can be wound up to store resilient energy therein.

Referring again to FIGS. 5A–5D, an abutment 26 is secured to one axial end surface of gear 19, and a switch presser 27 is mounted on a shaft 28 secured in gear 19. Abutment 26 is adapted to abut against one blade 20*a* of member 20, and the other blade 20*b* is bent or stepped at its outer end, as best seen in FIG. 4, so that it will not engage abutment 26. Presser 27, which is pivotally supported by shaft or pivot 28, is biased by a suitable spring (not shown) to pivot toward the axis of gear 19. The free end of presser 27 has a pressed projection 27*a* adapted to be pressed, by an end edge of blade 20*a* of member 20 and a bent pressing portion 27*b* of presser 27, against an actuator 29*a* of a switch 29 mounted adjacent one axial end surface of gear 19.

Spiral spring 16 is fully wound when disk-shaped cutter 2 is disposed in a starting position, as shown in FIG. 1. At this time, pulley 10 and shaft 13 are stationary, as projection 10*a* engages stop 25 to lock pulley 10 against rotation. When this is the case, blade 20*a* of control member 20 urges projection 27*a* of presser 27 toward the outer periphery of gear 19 and against the biasing force of the spring, as shown in FIG. 5A, so that the actuator 29*a* of switch 29 is depressed by pressing portion 27*b* of presser 27.

Switch 29 is a normally closed switch arranged to control the energization of the spring winding motor connected to gear 24. When its actuator 29*a* is depressed, gear 24 is not driven and gear 19 remains stationary. Under these conditions, gear 19 is subjected to the driving force of spiral spring 16 acting in a direction opposite to the arrow *a*.However, rotation of gear 19 is prevented by a locking pawl 30 engaged therewith, as illustrated in FIG. 5A. Pawl 30 is biased, by suitable means, to engage gear 19 and is also disengageable to permit gear 19 to rotate. This locking pawl is shown only somewhat schematically in FIGS. 5A–5D, and the construction of the locking pawl is illustrated more clearly in FIGS. 8 and 9, as will be described hereinafter.

Stop 25 (FIG. 4) is momentarily released from engagement with projection 10*a* of pulley 10, either manually or automatically, when the cutting of sheet material *S* is begun, and is returned to its engaging position at a suitable time to engage projection 10*a*. If stop 25 is released from engagement with projection 10*a* of pulley 10, by a command to commence cutting after a predetermined length of sheet material *S* is fed to sheet table 8 (FIG. 2) while cutter 2 is disposed in a starting position as shown in FIG. 1, spiral spring 16 will begin to unwind itself rapidly and cause shaft 13 to rotate in the direction of the arrow *a* in FIG. 1 due to the release of its stored energy. The unwinding of spiral spring 16 takes place in an instant, so that cutter 2 is moved at high speed in the direction of the arrow *b* by endless belt 4 driven by pulley 10 rotating with shaft 13. The predetermined length of sheet material *S* thus is cut by cutter 2 in cooperation with cutter receptor 1.

As shaft 13 rotates in a direction of the arrow *a*, rotary member 21 also rotates in the direction of arrow *a*, as shown in FIG. 5A, and assumes the position shown in FIG. 5B after making substantially one revolution. In the position of FIG. 5B, blade 21*a* engages blade 20*b* of rotary member 20. Rotary member 21 continues to rotate in the direction of the arrow *a* even after its blade 21*a* engages blade 20*b*, so as to rotate rotary member 20 along with rotary member 21. As a result, blade 20*a* of rotary member 20 is brought out of engagement with presser 27, thus permitting switch 29 to close. When switch 29 is closed, gear 19 is driven by the spring winding motor and causes gear 19 to rotate in the direction of arrow *a*. The unwinding of spring 16 still continues, so that rotary member 21 continues its rotary motion and moves rotary member 20 until blade 20*a* of the latter is brought into engagement with the rear edge of abutment 26, as shown in FIG. 5C. By this time, rotary member 21 has completed substantially one and one-half revolutions since beginning its rotary motion. Also, cutting of the predetermined length of sheet material *S* has been completed, and stop 25 is restored to its locking position about this time.

If blade 20*a* of rotary member 20 is brought into engagement with abutment 26, then the two rotary members 20 and 21 are moved, by the stored energy of spring 16, in slaved relation to gear 19 through abutment 26. When this is the case, the two members 20 and 21, abutment 26 and presser 27 all move, with gear 19, in the direction of arrow *a*. During this rotation, spiral spring 16 remains unwound.

If rotary member 21 is restored to its starting position as shown in FIG. 5D after making two revolutions, stop 25, which has been moved to its locking position by that time, engages projection 10*a* of pulley 10 so that pulley 10 is locked and endless belt 4 remains stationary. The drive mechanism is designed in such a manner that, when belt 4 stops its movement, disk-shaped cutter 2 is disposed once again in its starting position illustrated in FIG. 1. Shaft 13 also is locked against movement, and only gear 19 rotates in the direction of arrow *a* so that winding of spiral spring 16 is initiated at this time. Rotation of gear 19 by itself results in abutment 26 and presser 27 making substantially one revolution to move from the dash-and-dot line positions 26A and 27A, respectively, as shown in FIG. 5D, to the respective positions shown in solid lines and in which abutment 26 engages that side of blade 20*a* opposite to the side previously engaged, and presser 27 is pushed by blade 20*a* toward the outer periphery of gear 19 so as to depress actuator 29*a* of switch 29. Gear 19 makes a further three-quarter revolution, so that abutment 26 engages and moves rotary member 20. By the time blade 20*a* of member 20 has engaged blade 21*a* of member 21, which remains stationary in its starting position to which it has been restored as shown in FIG. 5A, presser 27, which has been rotating with gear 19 after it has been permitted by blade 20*a* to move toward the center of gear 19, returns to the position in which it is engaged with actuator 29*a* of switch 29, so that switch 29 is open to deenergize the spring winding motor.

If the spring winding motor is deenergized, gears 24 and 19 come to a halt and all the parts concerned are restored to their position shown in FIG. 5A with spring 16 being fully wound. At this time, abutment 26 has made about one and one-half revolutions from its dash-and-dot line position shown in FIG. 5D, so that spiral spring 16 is wound exactly the same amount as it has been unwound. The use of a drive mechanism incorporating spring 16 as a source of energy for driving pulley 10 permits moving cutter 2 at a very high speed in its linear cutting motion, thereby increasing the efficiency of the sheet cutting operation.

Referring to FIG. 6, a control lever 31 having, on one arm thereof, a locking portion 31*a* corresponding to stop 25, is pivotally supported by a shaft or pivot 32. Lever 31 normally is biased by a spring 33 to pivot clockwise about pivot 32, and is limited in such clockwise movement by its other arm 31b engaging a stop 34 so that locking portion 31*a* is in a position in which it is engaged by projection 10*a* of pulley 10 to lock pulley 10 against rotation. Arm 31*b* includes a bent portion positioned adjacent the core 36 of an electromagnet 35 connected to a power source through a normally open switch 37, which has a movable contact 37*a* engaging a cam 38 supported on a shaft 39 connected to a drive (not shown). Cam 38 normally is rotated in the direction of an arrow *c*.

As cam 38 is rotated, contact 37*a* of switch 37 is depressed by a cam portion 38*a* to engage fixed contact 37*b* to energize electromagnet 35. Energization of electromagnet 35 results in arm 31*b* of lever 31 being attracted toward core 36, so that lever 31 is pivoted counterclockwise about shaft 32, thereby releasing locking portion 31*a* from engagement with projection 10*a* of pulley 10. Electromagnet 35 remains energized while cam 38 continues to depress movable contact 37*a*, so that lever 31 is maintained in a position in which pulley 10 is unlocked. If pulley 10 is unlocked, then it is driven by a drive mechanism using a motor, for example, so as to move disk-shaped cutter 2 along a linear path to cut the sheet material.

Cam 38 is so designed and constructed that it maintains switch 31 closed until cutter 2 returns to its starting position, after moving with endless belt 4 through substantially the entire length of this belt. When cutter 2 is restored to its starting position, locking portion 31*a* of lever 31, which has already been released by electromagnet 35 by this time, is restored to its locking position in which it engages projection 10*a* of pulley 10 to lock pulley 10 against rotation. Cam 38 further is designed and constructed in such a manner that its reentrant or non-protruding edge portion corresponds in length to the time required for feeding the sheet material *S*.

Referring to FIG. 7, a control lever 39 having, on one arm thereof, a locking portion 39*a* corresponding to stop 25, is pivotally supported by pivot 40. Lever 39 is biased by a spring 41 to pivot clockwise about pivot 40, with the range of its pivotal movement being restricted by a stop 42. When lever 39 is engaged with stop 42, locking member 39*a* is engaged with projection 10*a* of pulley 10 to lock the pulley against rotation. The other arm of lever 39 includes a portion 39*b* cooperable with the core 44 of an electromagnet 43, and a switch operating portion 39*c* engageable with a movable contact 45*a* of a normally open switch 45.

Electromagnet 43 is connected to a source of potential by a normally open switch 46. Switch 45, and a normally closed switch 47 connected in series with switch 45, are connected in parallel with electromagnet 45 and its source of potential. Switch 46 has a movable contact 46*a* engaging a cam 48 formed with a relatively short projecting edge portion 48*a*. Switch 47 has a movable contact 47*a* with a forward end disposed in a position at which the return movement of cutter 2 has been substantially completed.

Cam 48 is supported by a shaft 49 connected to a drive (not shown) so as normally to be rotated in the direction of an arrow *d*. If cam 48 is rotated and its projection 48*a* engages movable contact 46*a* of switch 46, contact 46a engages fixed contact 46*b* to energize electromagnet 43. Energization of electromagnet 43 attracts portion 39*b* of lever 39 against core 44 overcoming the bias of spring 41, so that lever 39 is pivoted counterclockwise and locking portion 39*a* is released from engagement with projection 10*a* of pulley 10.

When lever 39 is so pivoted counterclockwise, portion 39*c* engages movable contact 45*a* of switch 44 to engage this contact with a fixed contact 45*b*. Switch 46 is opened again immediately after being closed, because protruding edge portion 48*a* has a very small circumferential length. However, since switch 45 is closed before switch 46 is opened, electromagnet 43 is maintained energized and locking portion 39*a* of lever 39

remains released from engagement with projection 10*a* of pulley 10.

When lever 39 is disengaged relative to pulley 10, the pulley is driven by the drive mechanism in the direction of the arrow *a*, thereby actuating cutter 2 through the medium of endless belt 4. Cutter 2, upon its return to its starting position after finishing cutting of a predetermined length of the sheet material, pushes the forward end of movable contact 47*a* of switch 47 upwardly to disengage fixed contact 47*b*. Accordingly, electromagnet 43 is deenergized and lever 39 is restored to a position in which it can lock pulley 10 against rotation. When cutter 2 is restored completely to a starting position, locking portion 39*c* of lever 39 locks pulley 10 against rotation.

FIGS. 8 and 9 show one example of a locking pawl, such as pawl 30 of FIGS. 5A–5D, for permitting gear 19, in the drive mechanism using the spiral spring, to escape. The locking pawl is molded of nylon or other synthetic resin material. This construction of the locking pawl has advantages in that escape of gear 19 can be effected accurately and soundlessly, in addition to which the construction is very simple. The locking pawl 113 will now be described.

In FIG. 8, locking pawl 113 is pivotally supported by a pivot 114 connected to a fixed member (not shown), and a stop 115, for limiting pivotal movement of pawl 113, is provided in a position in which it faces an upper edge 113*a* of pawl 113. The locking pawl 113 is illustrated as having a forward end 113*b* thereof in engagement with a tooth 19*b* of gear 19, and the base of a contact arm 116 is secured by rivets 117 to the base of pawl 113 opposite its forward end 113*b*. Contact arm 116, which is in the form of a plate spring of phosphor bronze, or other similar resilient material, has free ends 116*a* and 116*b*, which embrace the peripheral portion of gear 19 and press against axially opposite end surfaces of the gear, as best seen in FIG. 9.

When gear 19 rotates in the direction of arrow *a*, free ends 116*a* and 116*b* of contact arm 116 are moved in the direction of rotation of the gear by friction and in slaved relation. As contact arm 116 pivots counterclockwise about shaft 114, while free ends 116*a* and 116*b* slide on the axially opposite end surfaces of gear 19, locking pawl 113, which is substantially integral with contact arm 116, pivots to the position 113A shown in phantom lines, and in which upper edge 113*a* abuts stopper 115. Consequently, forward end 113*a* of pawl 113 is released from engagement with tooth 19*b* of gear 19, thereby permitting rotation of gear 19. Gear 19 rotates while the free ends of the contact arm 116 are maintained in sliding contact with the opposite axial end surfaces of the gear, so that locking pawl 113 is positively maintained in a position in which its forward end is spaced away from the gear teeth.

When gear 19 stops rotating and tends to rotate in a direction opposite to the arrow *a*, free ends 116*a* and 116b of arm 116 also tend to rotate in the same direction in slaved relation, and pivot clockwise about pivot 114. Locking pawl 113 thus is restored from its position 113A to its position shown in solid lines, where it engages a tooth of gear 19 and locks this gear to prevent reverse rotation thereof.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Sheet cutting apparatus comprising, in combination, a cutter receptor extending transversely across a path of movement of sheet material to be cut; an endless belt mounted for movement adjacent and substantially parallel to said cutter receptor; a disk-shaped cutter rotatably mounted on said endless belt for pressing engagement with said cutter receptor to cooperate with the latter to cut a predetermined length of the sheet material during movement of said endless belt in only one direction; a pair of pulleys mounting said endless belt; unidirectional drive mechanism operable to rotate one of said pulleys to drive said endless belt in one direction only; and control mechanism for said drive mechanism selectively operable to activate said drive mechanism to rotate said one pulley to drive said endless belt to advance said cutter, along one run of said chain, from a retracted starting position into rotating engagement with and along said cutter receptor to cut a predetermined length of sheet material and then to return said cutter along the other run of said chain, while said cutter is retracted from said cutter receptor to its retracted position.

2. Sheet cutting apparatus comprising, in combination, a cutter receptor extending transversely across a path of movement of sheet material to be cut; an endless belt mounted for movement adjacent and substantially parallel to said cutter receptor; a disk-shaped cutter rotatably mounted on said endless belt for pressing engagement with said cutter receptor to cooperate with the latter to cut a predetermined length of the sheet material during movement of said endless belt in only one direction; a pair of pulleys mounting said endless belt; drive mechanism operable to rotate one of said pulleys to drive said endless belt in one direction only; control mechanism for said drive mechanism selectively operable to activate said drive mechanism to rotate said one pulley to drive said endless belt to advance said cutter from a retracted starting position into rotating engagement with and along said cutter receptor to cut a predetermined length of sheet material and then to return said cutter to its retracted starting position; said drive mechanism comprising a spiral spring having one end connected to said one pulley; a gear rotatable coaxially relative to said one pulley and having the opposite end of said spiral spring connected thereto; means selectively operable to lock said one pulley against rotation; and a motor driven pinion engaged with said gear to rotate said gear in a spring winding direction when said one pulley is locked against rotation; said control mechanism including a switch operable to energize a motor to rotate said motor-driven pinion to effect rewinding of said spring.

3. Sheet cutting apparatus, as claimed in claim 2, including a shaft having said one pulley fixed thereon and rotatably mounting said gear; said spiral spring having one end secured to said shaft and its other end secured to said gear; said control mechanism including a first rotary control member operable, responsive to release of said one pulley for rotation by said spring, to actuate said switch; and a second rotary control member movable in slaved relation with said one pulley while the latter rotates through a predetermined number of revolutions responsive to unwinding of said spiral spring;

said second control member engaging and rotating said first control member to perform a control operation.

4. Sheet cutting apparatus, as claimed in claim 3, in which said first control member is rotatably mounted on said shaft in engagement with an end surface of said gear; said second control member being secured to said shaft for rotation therewith; an abutment on said one end surface of said gear; said first control member including first and second diametrically opposite wings, said first wing being arranged to engage said abutment to rotate said gear along with said first control member, and said second wing being offset to clear said abutment; said second control member comprising a radially extending wing engageable with said second wing of said first control member.

5. Sheet cutting apparatus, as claimed in claim 4, including a switch presser pivotally mounted on said one end surface of said gear adjacent the periphery of said gear and biased radially inwardly; said switch being mounted adjacent the periphery of said gear and having a switch actuator engageable by said switch presser upon radially outward movement of said switch presser; said first wing of said first control member being engageable with said switch presser to move the same outwardly to engage said switch actuator to operate said switch.

6. Sheet cutting apparatus, as claimed to claim 5, including pawl means engageable with said gear to provide for rotation thereof in one direction only while blocking reverse rotation of said gear.

7. Sheet cutting apparatus, as claimed in claim 1, in which said control mechanism comprises a control lever operable to lock said one pulley against rotation; an electromagnet cooperable with said control lever; a switch controlling energization of said electromagnet; and a cam operable to close said switch during the time the sheet material is being cut to energize said magnet to release said control lever from said one pulley to provide for rotation of said one pulley.

8. Sheet cutting apparatus, as claimed in claim 7, in which said lever is a two-arm lever pivoted intermediate its ends; a stop secured to said one pulley; one arm of said lever being positioned against said stop when said electromagnet is deenergized; the other arm of said lever being cooperable with said electromagnet.

9. Sheet cutting apparatus, as claimed in claim 1, in which said control mechanism comprises a control lever operable to lock said one pulley against rotation; an electromagnet cooperable with said control lever; a switch controlling energization of said electromagnet; a cam operable temporarily to close said switch to energize said electromagnet; and circuit means operatively associated with said control lever and maintaining said electromagnet energized, after opening of said switch, to release said control lever from said one pulley during the time the sheet material is being cut; said circuit means effecting deenergization of said electromagnet responsive to said disk-shaped cutter being returned to a position near its starting position, to position said control lever to lock said one pulley when said disk-shaped cutter attains its starting position.

10. Sheet cutting apparatus, as claimed in claim 6, in which said pawl means comprises a pivoted pawl engageable with ratchet teeth of said gear; contact arm means secured to said pawl and frictionally engaged with said gear; said contact arm means, upon rotation of said gear in said one direction, pivoting said pawl away from said gear; and a stop limiting such pivoting of said pawl; said contact arm means, upon attempted rotation of said gear in the opposite direction, pivoting said pawl to reengage the ratchet teeth of said gear.

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