Feb. 28, 1961 P. ZERNOV 2,973,158

CUT-OFF KNIFE ASSEMBLY FOR CONTINUOUS REWINDERS

Filed Sept. 19, 1958 3 Sheets-Sheet 1

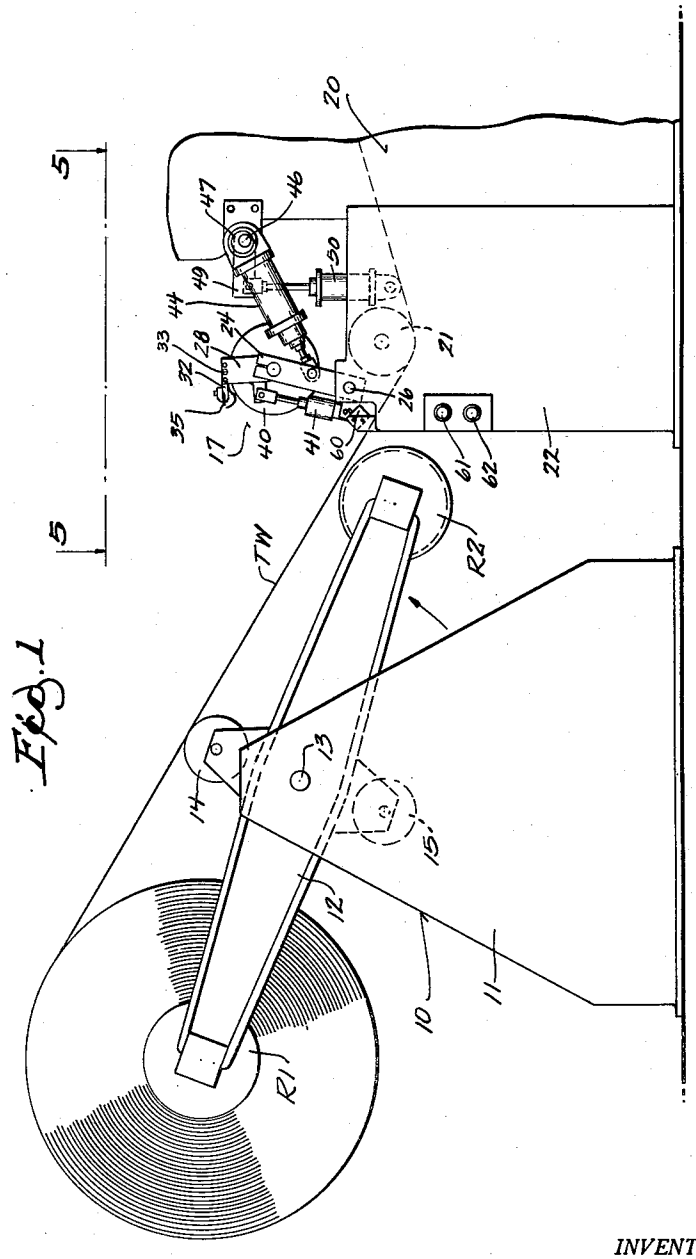



Fig. 1

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Filed Sept. 19, 1958 3 Sheets-Sheet 2

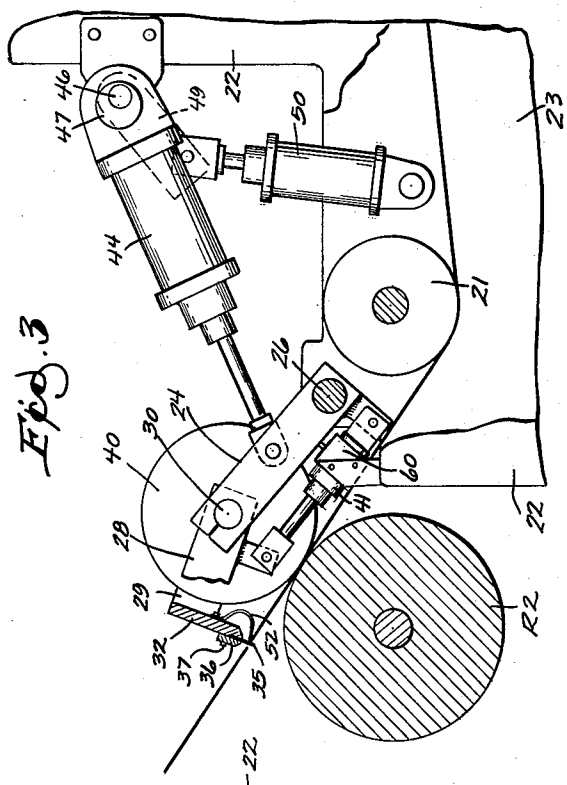


Fig. 3

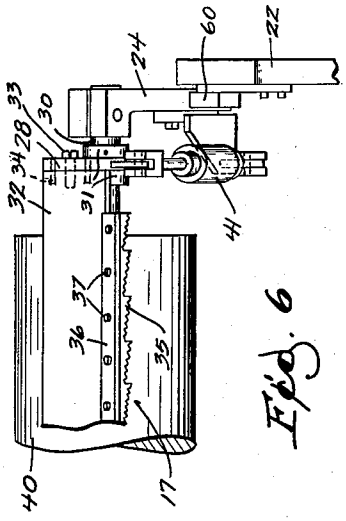


Fig. 6

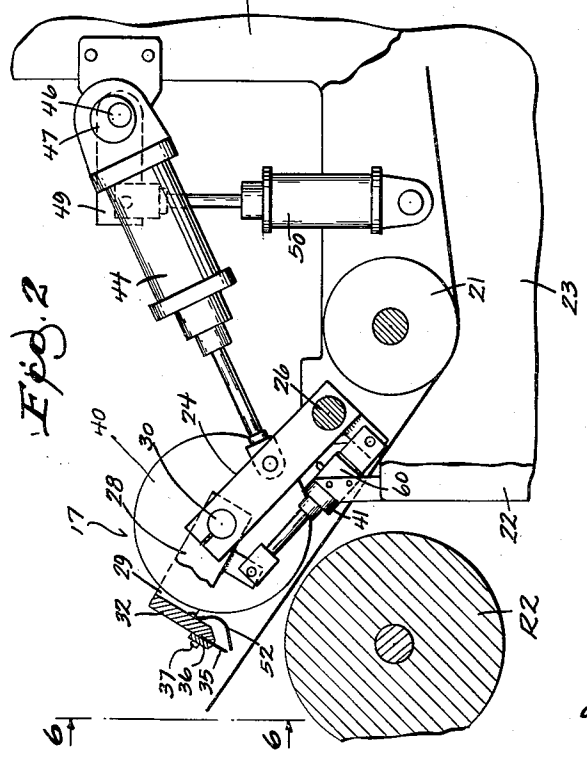


Fig. 2

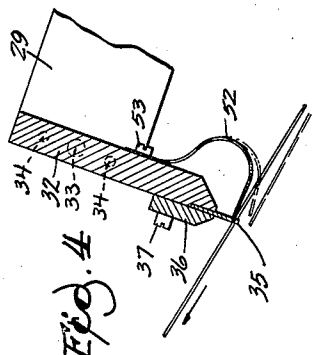


Fig. 4

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Filed Sept. 19, 1958 3 Sheets-Sheet 3

Fig. 7

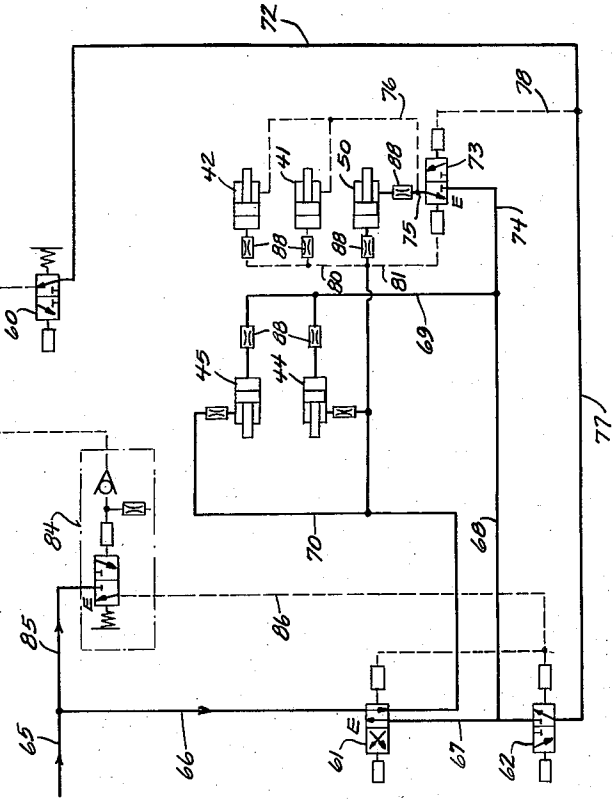
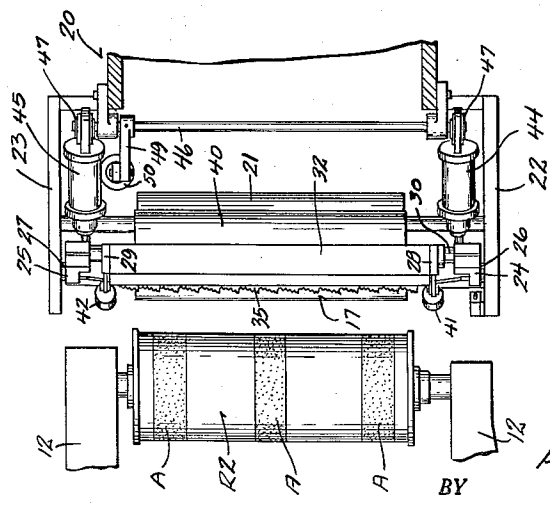



Fig. 5




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United States Patent Office 2,973,158 Patented Feb. 28, 1961



2,973,158

# CUT-OFF KNIFE ASSEMBLY FOR CONTINUOUS REWINDERS

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Filed Sept. 19, 1958, Ser. No. 762,054

1 Claim. (Cl. 242—56)

This invention relates generally to apparatus for winding a web of material, wherein the continuously moving web is transferred from a completed roll to a new roll so that successive rolls of web are formed without interrupting the winding operation and the web is transferred while in motion from a completed roll to a new roll. More particularly, the invention relates to an improved cut-off knife and presser roll assembly for severing the web and commencing the winding of the web on a new roll.

Swinging cut-off knives, per se, are well-known in this art wherein when one roll has been completed and it is desired to commence a new roll, the knife swings into cutting relationship with the web. It has been proposed in the past to associate various controlling or guiding means with the knife to engage the severed web end and direct it about a new core or shaft. The direction in which the cut-off knife swings relative to the new roll, and its proximity therewith affect the manner in which the new leading edge of the severed web will engage the new core. However, manufacturing tolerances and the enormity of the parts involved limit the proximity to which the knife can be moved relative to the rapidly rotating new roll. Furthermore, the prior art attempts to sever the web and quickly and smoothly cause it to adhere to the new core, have usually involved a considerable amount of complex mechanism which requires frequent attention and adjustment.

In accordance with the present invention, an improved flying cut-off knife and presser roll mechanism has been provided for a continuous rewinder, in which the presser roll and knife are simultaneously caused to engage the web to sever the latter and cause it to adhere to adhesive material carried on the new roll.

Another more specific aspect of the invention contemplates that the presser roll and knife are initially moved as a unit to a point closely adjacent the web. Upon reaching this point, the presser roll is then shifted into contact with the web and simultaneously with this latter movement the knife is shifted relative to the roll to sever the web. After the web is built up to a predetermined extent on the new core, the knife and presser roll assembly are automatically returned to their original position.

Another more specific object of the invention is to provide a flying cut-off knife for a continuous rewinder, which knife has means associated therewith for immediately freeing the newly-formed leading edge from the knife so as to insure that this edge follows the new core to start a new roll of material.

These and other objects and advantages will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings, in which:

Figure 1 is a side elevational view of a cut-off knife and presser roll unit made in accordance with the present invention and as used with a conventional turnover rewinder;



Figure 2 is an enlarged fragmentary view of the unit shown in Figure 1, certain parts being shown in section or broken away for the sake of clarity in the drawings, and showing the unit at the end of its initial movement;

Figure 3 is a view similar to Figure 2 but showing the knife and presser roll immediately at the completion of their second phase of movement;

Figure 4 is a fragmentary view of the knife as shown in Figure 3, but on an enlarged scale;

Figure 5 is a view taken generally from the line 5—5 in Figure 1;

Figure 6 is a fragmentary view taken generally along the line 6—6 of Figure 2, but on an enlarged scale; and

Figure 7 is a pneumatic diagram for the various switches and operating cylinders.

Referring in greater detail to the drawings, the turnover rewinder **10** is of the type shown in my co-pending United States application Serial No. 762,646, filed September 22, 1958, issued on January 31, 1961, as Patent No. 2,969,930, and entitled "Continuous Rewinder For Web Material," and reference may be had to that application if a complete description of it is desired. However, it is believed sufficient to say for purposes of this disclosure that this two-position rewinder comprises a stand **11**, a roll-carrying frame **12** including a centrally disposed shaft **13** rotatably mounted in the sides of the stand and having web roll receiving cores or rolls R1 and R2 rotatably mounted in its end portions, and guide rolls **14, 15** mounted on opposite sides of the frame and adjacent the shaft **13**.

Each of the rolls R1 and R2 includes a mandrel having mounted thereon a series of layers A of tape material provided with an adhesive outer surface so that the tensioned web TW will adhere to the rolls, as will appear. Each of the rolls R1 and R2 has conventional means (not shown) for driving them so that the web continues to be wound upon a roll as long as it is in position.

With the web secured to roll R1, the frame **12** is rotated in a counter-clockwise direction to the position shown in Figure 1 and the roll R1 is rotated to wind the desired amount of material therein. When a sufficiently large roll of material is thus formed, the knife and presser roll unit **17** is brought into operation to sever the web and cause the new leading edge so formed to be pressed into engagement with the adhesive A carried by the new roll R2. In this manner, a new roll is started on roll R2 and the frame then rotated counterclockwise to lower the completed roll to the ground where it may be readily removed from the frame. A new roll is then placed in the frame and the procedure above mentioned is repeated to effect a continuous rewinding operation.

A tensioning material supply means **20** is provided adjacent the rewinder and includes a roller **21** mounted between the side walls **22, 23** and under which roller the web TW passes as it leaves this supply means.

In accordance with the present invention, a flying cut-off knife and presser roll assembly **17** is mounted adjacent the upper end of the supply means **20**, for swinging from the uppermost or inoperative position shown in Figure 1, to the pre-set or initial position shown in Figure 2, and then to the operative or cutting position of Figure 3, from which it is later returned to the starting or inoperative position of Figure 1.

The assembly **17** includes arms **24, 25** pivoted on their respective stub shafts **26** and **27** that are carried in the side walls **22, 23**. Auxiliary arms **28, 29** are pivotally mounted at one of their ends on the shaft **30** which extends between the free ends of arms **24** and **25**. Guide blocks **31** (Fig. 6) are secured to shaft **30** for guiding the auxiliary arms in their swinging movement. A knife-

supporting bar 32 is secured between the free ends of the auxiliary arms by cap bolts 33 and pins 34.

The knife 35 is held securely against the front edge of bar 32 by the back-up bar 36 and cap bolts 37, the latter of which extend through both the bar 36 and the knife and are threadably engaged in the bar 32. As best shown in Figure 5, the knife has a series of inclined steps, the leading edge of each of which are serrated. This particular type of knife has been found to be particularly effective for extremely fast cutting of a rapidly moving and tensioned web.

The shaft 30 rotatably supports the presser roll 40 which is adapted to press the web into contact with the adhesive A on the rolls R1 or R2, as will more fully appear.

The knife is also swingable relative to this presser roll by means of the double-acting air rams 41 and 42 which are pivotally mounted at one of their ends to their respective auxiliary arms 28 and 29 and at their other ends to their respective arms 24, 25. Thus, actuation of the rams 41 and 42 causes the knife to swing relative to the presser roll.

Another pair of double-acting pneumatically-operated rams 44 and 45 are pivotally connected at one of their ends to their respective arms 24, 25 and are connected at their other ends to a cross shaft 46 by means of eccentrics 47 secured thereto. Actuation of rams 44 and 45 cause the knife and presser roll to swing as a unit and move the latter during its initial or pre-set movement to a position closely adjacent the web as shown in Fig. 2.

Also secured at one end of the eccentric shaft 46 is an arm 49 which is swingable by a double-acting air cylinder 50 pivotally connected to the free end of arm 49 and to the side wall 23. When the rams 44 and 45 have moved the knife and presser roll assembly 17 to the pre-set position of Figure 2, ram 50 is then contracted to swing arm 49 downwardly, thus causing shaft 46 and its eccentric 47 to rotate slightly and shift the rams 44, 45 and assembly 17 as a unit.

At the same time that ram 50 is contracted, the rams 41, 42 are also contracted to swing the knife downwardly relative to the presser roll and into cutting engagement with the web. Stated otherwise, simultaneous actuation of the ram 50 and rams 41, 42 causes the roller 40 and knife 35 to move through their second phase of movement, thereby urging the web into contact with the adhesive on the web roll and simultaneously severing the web.

Means are carried by the knife to immediately wipe the newly-formed leading edge of the web off the serrated and notched knife, so as to insure that this new edge will follow the new roll and be wound therearound. If the new edge of the web adhered even momentarily to the knife after the cut, the web might tend to bunch up behind the knife and peel off from the adhesive on the new roll. It is therefore important that the newly-formed leading edge of the web be freed immediately from the knife. The means for clearing the web from the knife may take any suitable form, and a curved spring member 52 has been shown as attached by cap screws 53 to the bar 32. The spring 52 is shaped so that its free edge lies closely adjacent the rear side of the blade. The tension of this steel spring is such that it will not restrict the easy penetration of the blade through the web and will compress to the position shown in Figures 3 and 4 as the blade performs the cut. Immediately upon the severance of the web, this spring wiper means 52 returns to its normal unflexed position and in doing so acts to force the leading edge from the knife. The leading edge is then free to follow the roll R2 in its rotation, and is tucked under the incoming web under the presser roll.

As shown in Figure 3, the knife has reached the extent of its downward travel and it never comes into contact with the web roll. After the new web roll is built up on the roll R2 to a certain extent, say about one inch of thickness, the assembly 17 and more particularly arm 24 have been raised sufficiently to release the manually operated spring-returned selector valve 60 mounted on the side wall 22, and the function of the valve and also the pneumatic circuit of Figure 7 for operating the air cylinders above-mentioned will now be described.

A pair of manually operated and air-returned valves 61 and 62 (Figures 1 and 7) are provided for actuation by the operator, the valve 61 being the pre-set control valve which causes the assembly 17 to swing as a unit from the position shown in Figure 1 to that of Figure 2. After this initial movement of assembly 17, the operator then pushes valve 62 which causes simultaneous actuation of rams 50 and 41, 42 to move the knife and presser roll through their second phase of operation, as above described.

The operation of the pneumatic circuit is as follows. Air pressure is supplied via line 65 from a source (not shown) and is directed via conduit 66 to the pre-set valve 61. When this valve 61 is pressed by the operator, air pressure passes through conduits 67, 68 and 69 to extend the rams 44, 45 air being exhausted from the rod end of these rams via conduit 70 and out the exhaust E of valve 61. As the assembly 17 is thus lowered to the Figure 2 position, the spring-returned valve 60 is tripped by arm 24 and air is prevented from passing through conduit 72. The air-operated valve 73 is blocked at this time and air is thus prevented from passing via conduits 74, 75 and 76 to the rod ends of cylinders 50, 41 and 42.

The operator then presses the "operate" control valve 62 and air pressure passes via conduits 77 and 78 to shift the valve 73 and permit air to go simultaneously to the rod end of cylinders 50 and 41, 42. The head end of these cylinders are exhausted via conduits 80 and 81 to the exhaust E of valve 73. As previously mentioned, the presser roll is then held in contact with the roll being formed and when a sufficient amount of roll has been built up, the arm 24 is lifted from valve 60 and the latter is moved by its spring to the normal position. As a result, air pressure is permitted to pass via conduit 82 to the air-operated valve 84 which also may receive air pressure via the pressure source conduit 85. Air from conduit 82 shifts valve 84 to permit air pressure to pass via conduit 86 to reset valves 61 and 62 to normal. As a result, all of the air cylinder units and the valve 73 return to normal, as illustrated in Figure 1.

Various conventional flow control valves 88 have been indicated in Figure 7 and they serve to regulate the flow of air therethrough. In this manner, for example, the speed of operation of ram 50 may be adjusted by the flow control valves associated therewith.

By means of the present invention there has been provided a particularly effective cut-off knife and presser roll assembly that is brought into operation in two stages, during the latter of which the knife and roll are simultaneously actuated to sever the web and press the new edge into engagement with the new mandrel. After a predetermined amount of web has been wound on the new roll, the various parts are automatically returned to their starting position. A particularly efficient knife has been provided having means for insuring positive removal of the new leading web edge therefrom.

Various modes of carrying out the invention are contemplated as being within the scope of the following claim particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

A cut-off knife and presser roll assembly for a continuous rewinder of the type having a moving tensioned web and an empty core adapted to be moved adjacent to said web, said assembly being swingably mounted, said assembly including a presser roll adapted to press said web against said core for adhesion thereto, mecha-

nism for swinging said assembly in a radial direction relative to said core between a position away from said web and a position adjacent to said web where said pressure roll bears against the web, said assembly also including a knife which is swingable relative to and directly toward said core for severing said web simultaneously with the pressing of the web against the core, said cutting occurring on the discharge side of said presser roll and as the knife moves directly radially toward said core, and a double-acting ram carried by said assembly to shift said knife into cutting engagement with said web.



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