United States Patent [19]

Byrt et al.

[11] **3,782,665**

[45] **Jan. 1, 1974**

[54] **WINDING OF CONTINUOUS WEBS OF SHEET MATERIAL**

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[73] Assignee: **Masson Scott Thrissell Engineering Limited,** Bristol, England

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[21] Appl. No.: **224,070**

[30] **Foreign Application Priority Data**

Feb. 5, 1971 Great Britain 4,045/71

[52] **U.S. Cl.** ..... **242/56 R**

[51] **Int. Cl.** **B65h 19/26**

[58] **Field of Search** ..... 242/56 A, 58.4, 56 R

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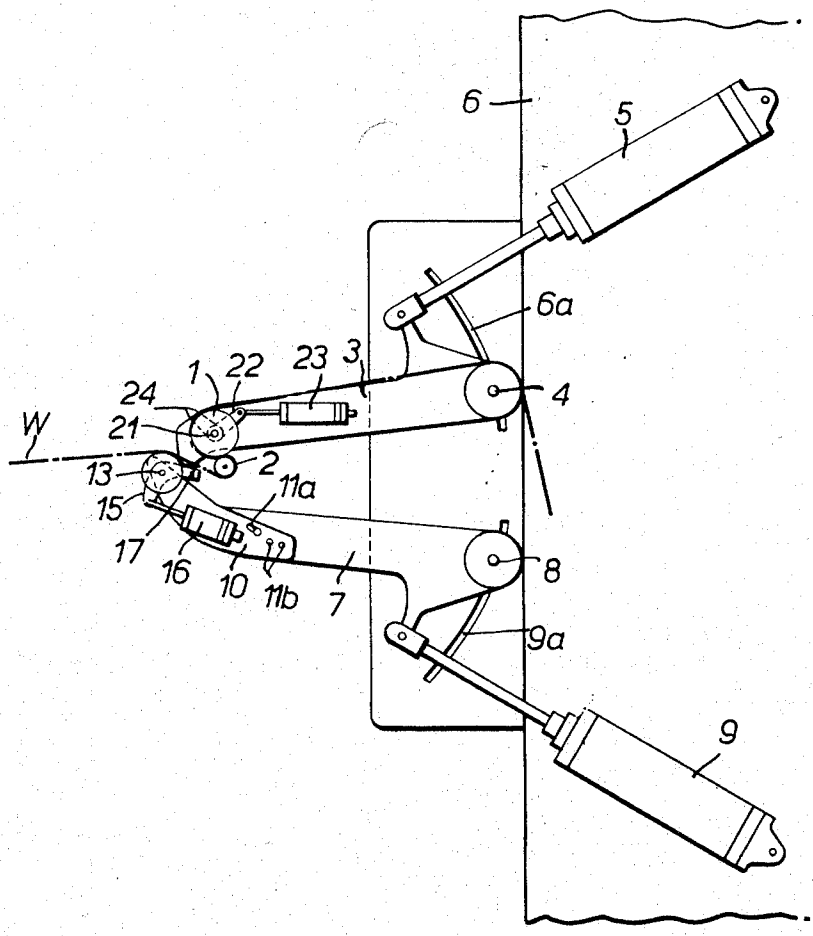
Assistant Examiner—Edward J. McCarthy
Attorney—Irvin S. Thompson

[57] **ABSTRACT**

Apparatus for transferring a continuous web of sheet material being wound onto a fresh core employs a rider roll to press the web as it runs onto the new core and a guide roll to retain the web against the core circumferentially well downstream of the rider roll so that the web is wrapped around a major portion of the circumference. A cutter and transfer device are operable to cut the web between the core and the guide roll and urge the new leading end of the web onto the core.

7 Claims, 12 Drawing Figures



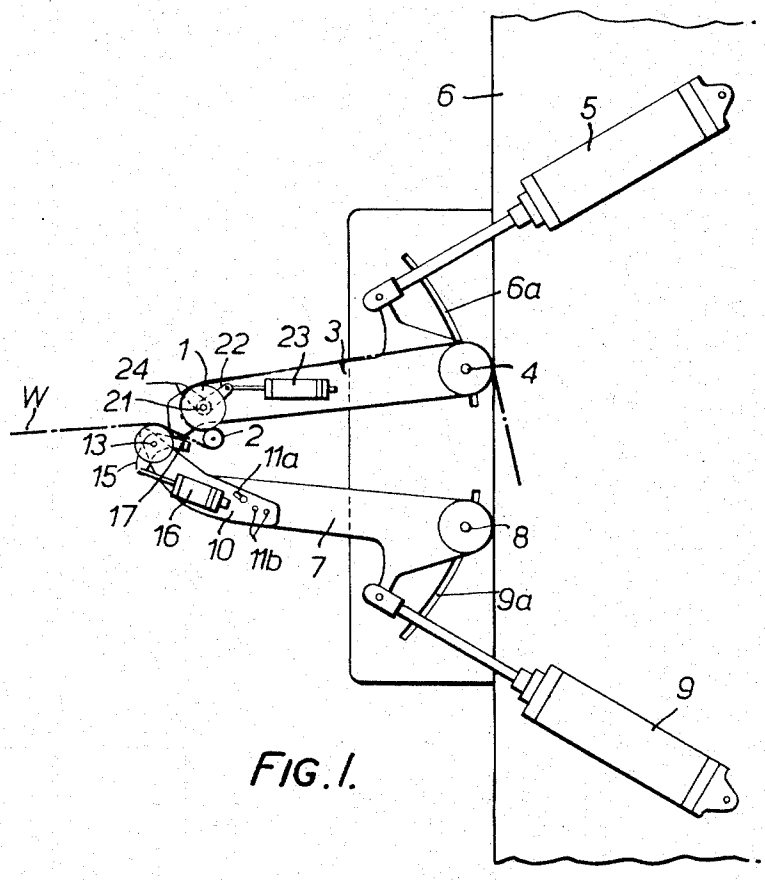


FIG. 1.

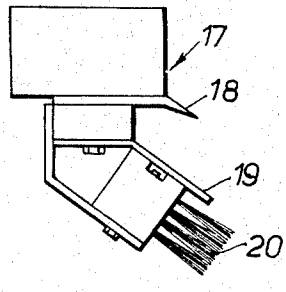


FIG. 3a.

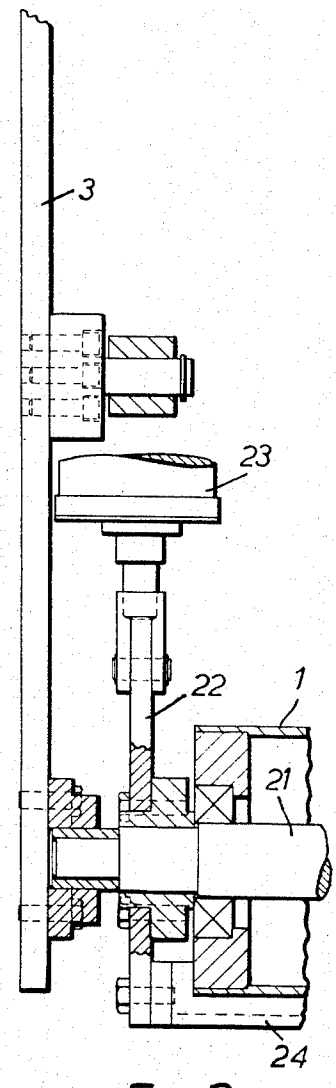


FIG. 2.

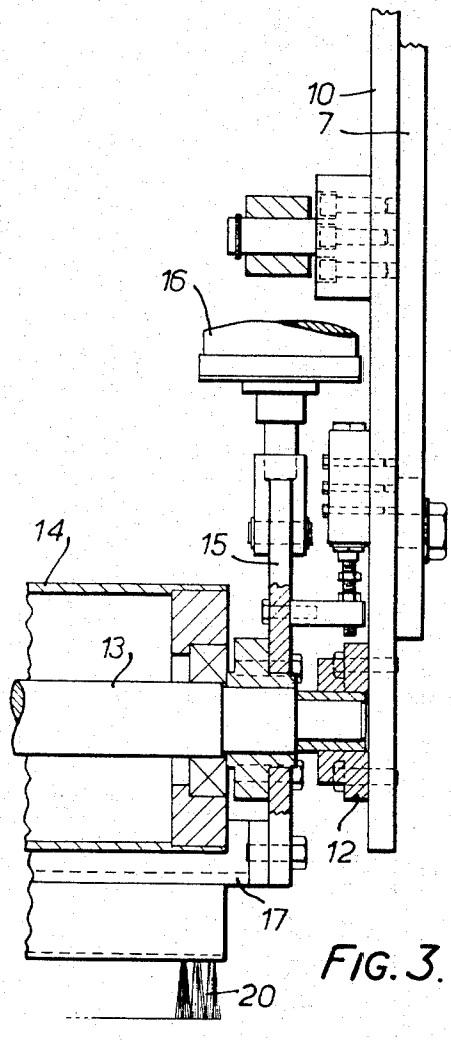


FIG. 3.

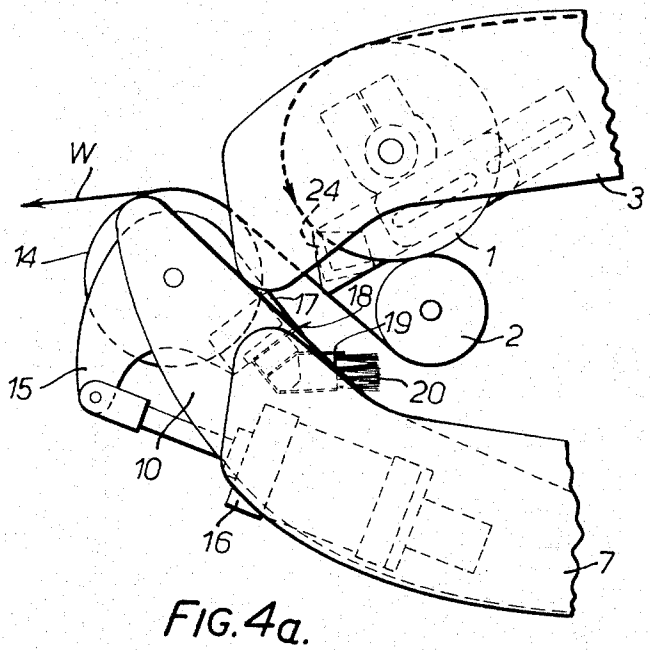


FIG. 4a.

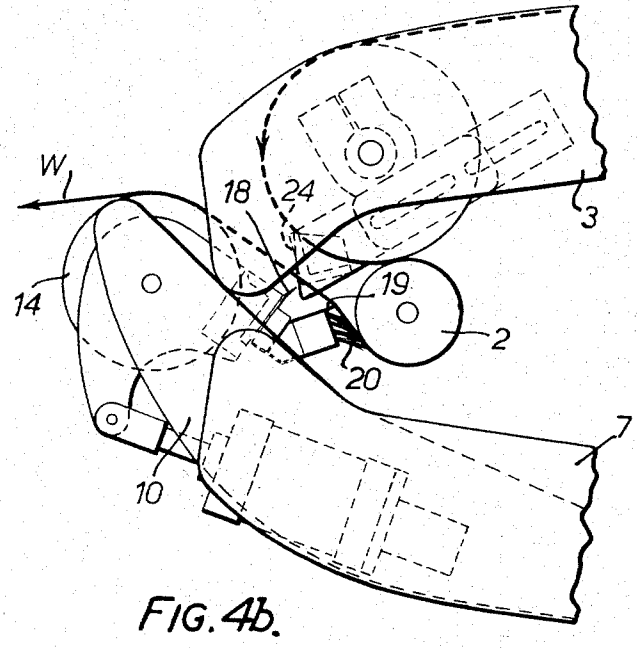


FIG. 4b.

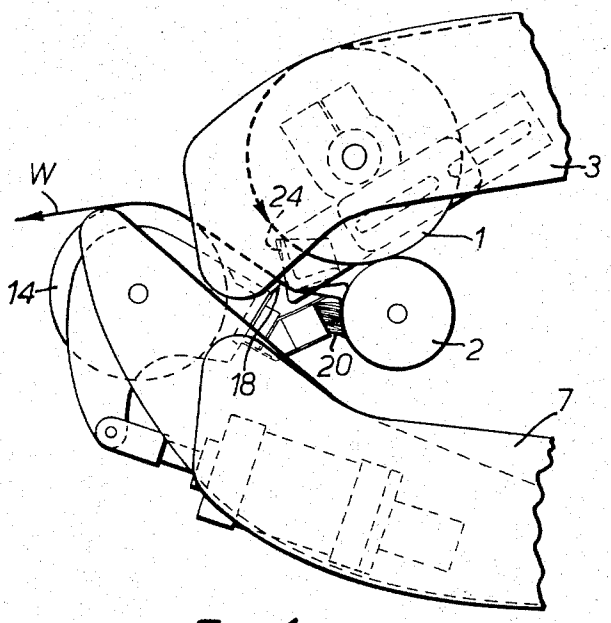


FIG. 4c.

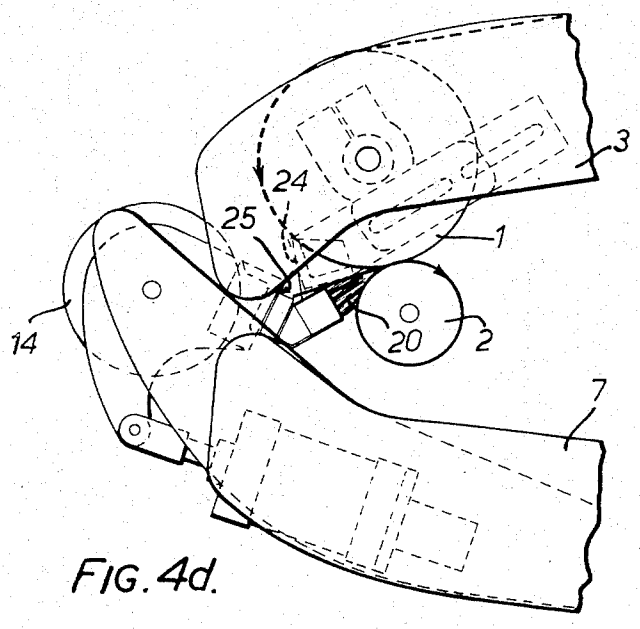


FIG. 4d.

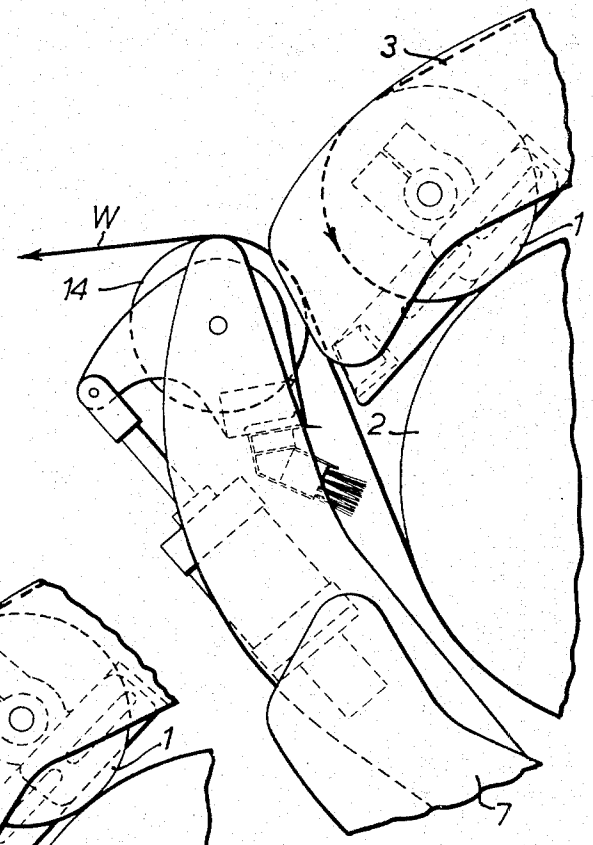


FIG. 5a.

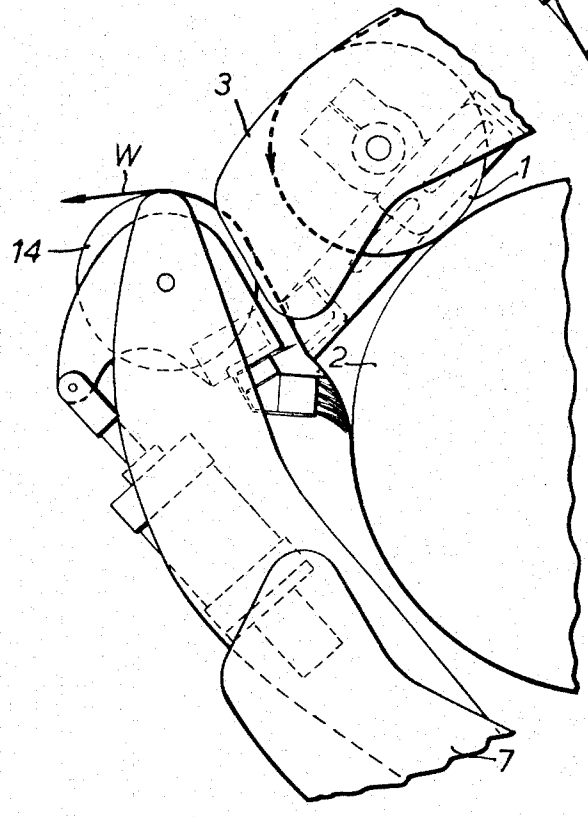


FIG. 5b.

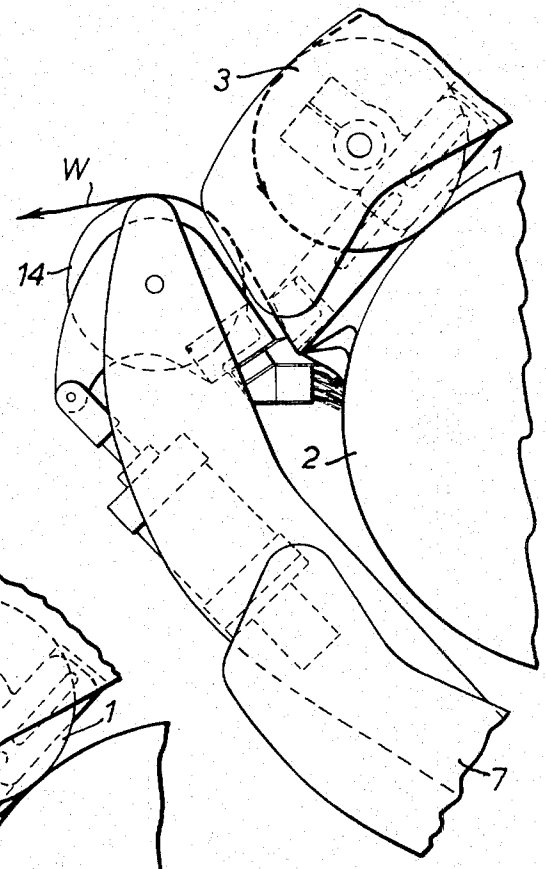


FIG. 5c.

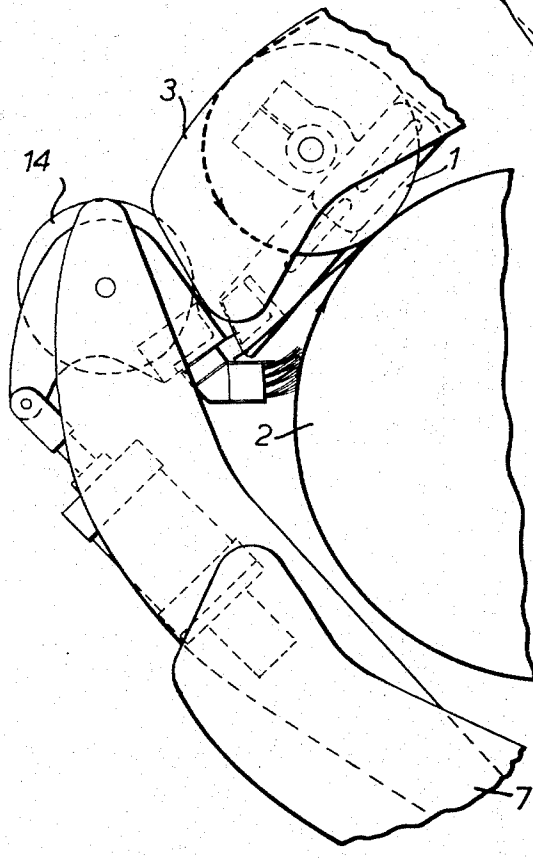


FIG. 5d.

WINDING OF CONTINUOUS WEBS OF SHEET MATERIAL

This invention relates to the winding of continuous webs of sheet material, such as carton board, paper, foil or films of synthetic plastics, on to reels. It is particularly concerned with methods and apparatus for the transfer of a running web to a fresh reel core, when the preceding reel has been completed.

In general there are two known methods of transferring a web from a completed reel to a new core in a continuous winding operation.

The first method employs an adhesive preparation on the new core. The running web is brought into close proximity with the new core which has been accelerated so that its surface speed corresponds to the speed of the running web. When it is desired to transfer the web to the new core the web is severed at a point between the finished reel and the new core. Simultaneously with the cutting operation a brush or roller presses the web against the adhesive core and completes the transfer.

A second method is accomplished without the use of adhesive on the new core. In this instance also the new core is accelerated to match the running web speed. A system of rollers guiding the web are brought into operation to cause the running web to follow a path which envelops the new core for a large proportion of its circumference. It is usual for at least two rollers to nip the web against the new core. When it is desired to bring about the transfer, a knife is operated to sever the web beyond the guide rollers and sweep it into the nip of the web enveloping the new core. The transfer is then completed.

It is with the second type of system that this application is concerned.

The advantage of this system of web transfer is twofold. Firstly it relieves the operator of the need to prepare the new core with adhesive, and also possibly of the need to strip the core of old material and adhesive tape. Secondly it makes possible the use of a rider or pressure roll on the surface of the new reel during a large and critical portion of the winding operation. The rider roll pressure can be controlled to give varying degrees of wound reel hardness and because of its squeezing action it removes air which would otherwise be trapped between the layers of wound material. Any trapped air tends to lubricate the two adjacent surfaces and can be the cause of reels telescoping during winding or subsequent handling.

Experience has shown that with either of these methods of web transfer, and with existing equipment, the start of the wind on the new core ends to be very uneven or "bunchy." This is particularly true of the enveloping system for the following reasons. Firstly, since the web is severed at some distance beyond the new core and at widely varying web speeds it is evident that the length of material which has to be tucked tightly around the new core is greater than the length of arc of circumference of the new core which is not already lapped by the running web. Secondly, since the new core has two rollers pressing against its surface it is impossible for this surplus web to be taken in except by bunching. This bunching may occur within the first revolution of the core after severing or at any number of revolutions thereafter. It is purely a random occurrence and on no account can either of the nips be removed

until bunching has occurred. Removal prior to bunching and over-winding will result in a slack start and consequent problems during unwinding. With light materials, such as cellophane, the effect of bunching is seen through many turns of winding and requires this material to be scrapped.

According to the present invention there is provided a method of winding a continuous web of sheet material on to a plurality of reels in sequence, wherein the transfer of the running web to a fresh reel core is effected by leading the web between the fresh reel core and a rider roll which rides upon it and then over a guide roller positioned close to the core so that the web envelops the greater part of the periphery of the core, and then cutting the web between the core and the guide roller and directing the leading end of the cut-off portion into the nip between the core and the rider roll. Preferably the leading edge is folded back on itself as it is directed into the nip. Preferably also the web is supported immediately ahead of the cutting position by a bar which directs the leading end of the cut-off portion away from the former path of the web, and assists in folding it.

According to a further aspect of the invention there is provided apparatus for performing the method described above comprising a rider roll arranged to ride upon the fresh reel core, a guide roller capable of being positioned close to the core so that a web can be run around the rider roll, the core and the guide roller so as to envelop the greater part of the periphery of the core, and a knife and transfer assembly associated with the guide roller and mounted so as to be capable of cutting the web between the core and the guide roller and directing the leading edge of the cut-off portion into the nip between the core and the rider roll.

Preferably the knife and transfer assembly includes a folding blade arranged to fold back the cut leading edge portion on itself as it is directed into the nip, and the knife and transfer assembly preferably also includes a brush for urging the web against the fresh core to increase traction.

A back-up bar is preferably disposed or disposable immediately ahead of the cutting position of the knife, on the opposite side of the web, to direct the leading edge of the cut-off portion away from the former path of the web, and to assist in folding it. The back-up bar is conveniently mounted on support means for the rider roll and may be pivotally mounted to be removable away from the cutting position of the knife.

The knife and transfer assembly may be pivotally mounted on a pair of arms which also carry the guide roller and which are themselves pivoted for moving the guide roller and the knife and transfer assembly up to the fresh reel core.

The invention may be performed in various ways and one embodiment will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic section elevation of an apparatus for transferring a running web to a fresh reel core,

FIG. 2 is a plan view, partly in section, of one end of the rider roll assembly forming the upper part of the apparatus of FIG. 1,

FIG. 3 is a similar view of the cutting and transfer assembly forming the lower part of the apparatus of FIG. 1,

FIG. 3*a* is a detailed elevational view of a brush and knife bar forming part of the transfer assembly,

FIGS. 4*a* to 4*d* are elevational views, to a larger scale, of the apparatus showing various stages in the cutting and transfer of a web on to a core of small diameter, and

FIGS. 5*a* to 5*d* illustrate similar stages in the transfer of a web to a core of relatively large diameter.

Referring first to FIGS. 1 to 3 of the drawings, a rider roll 1 for cooperating with a fresh reel core 2 is rotatably mounted between the ends of a pair of arms 3 pivoted on a horizontal shaft 4. The rider roll 1 is pressed against the fresh reel core 2, or on to the outside of a web W passing round the rider roll 1 and core 2, by means of a pair of pneumatic cylinders 5 acting between a rigid support 6 and points near the roots of the arms 3. The pivot shaft 4 can be adjusted along arcuate slots 6*a* in the support to suit different sizes of core 2.

The cutting and transfer mechanism consists of a pair of arms 7 of similar shape to arms 3 mounted on a horizontal pivot shaft 8 and pneumatically operated by air cylinders 9 mounted on the support 6. The shaft 8 can also be adjusted to any position within arcuate slots 9*a* to suit different sizes of core 2. The arms 7 support at their ends a pair of side plates 10 which are adjustable by means of slots 11*a* and multiple hole positions 11*b* to suit different sizes of core 2. The plates 10 carry pivot bearings 12 for supporting between them a shaft 13 on which is mounted a guide roller 14. Fixed to each end of the shaft 13 are a pair of bell crank levers 15 one end of each of which is actuable by an associated pneumatic cylinder 16 carried by the adjacent plate. A knife support bar 17 is attached to the other ends of the levers 15 to span the distance between them. The bar 17 carries a toothed cutting knife 18, a folding blade 19 and a brush 20, as shown most clearly in FIG. 3*a*.

The shaft 21 on which the rider roll 1 is carried also has a pair of bell crank levers 22 mounted thereon between the roll ends and the arms 3. One end of each lever 22 is actuable by an associated pneumatic cylinder 23 carried by the adjacent arm 3. A web back-up bar 24 is attached to the other ends of the levers 22 to span the distance between them, it is normally held in an inoperative, raised position as shown. This bar could be fixed in its lower, operative position as described below and the cylinders 23 and levers 22 be omitted, but it could there interfere with the free running of the web before and after transfer.

FIGS. 4*a*, *b*, *c* and *d* illustrate the transfer operation with a small diameter core 2 whereas FIGS. 5*a*, *b*, *c* and *d* illustrate the same conditions for a large diameter core. It should be understood that any core diameter between these extremes can be catered for merely by adjustment of the main arm pivots and plates 10 and web back-up bar 24, the object being to provide the maximum possible degree of of envelopment of the new core prior to cutting. Therefore only FIG. 4 will be described in detail, and the corresponding stages for a large core will readily be understood from FIG. 5.

FIG. 4*a* shows that the new core 2, which has been accelerated to match the web speed, has been brought into enveloping relationship with the rider roll 1 and guide roll 14. The web W thus travels from the right as seen in the Figures around the rider roll between the latter and the back-up bar 24 around the new core 2 and away to the nearly full reel (not shown) via guide roll 14. When it is desired to transfer the winding from the full reel to the new core the operator actuates controls for the common air supply to the cylinders 23 and then to the cylinders 16, causing the following events to occur. The pistons of the cylinders 23 extend causing the bell crank levers 22 to rotate and lower the backup bar 24 into an operative position adjacent the core 2 and opposite the bar 17. The pistons of pneumatic cylinders 16 are then retracted causing the bell crank levers 15 to rotate and plunge the knife 18, folder blade 19, and brush 20 into the web W. FIG. 4*b* shows that the tip of the folding blade 19 contacts the web first, deflecting it between the surface of the new core 2 and the back-up bar 24. Further movement, as shown in FIG. 4*c*, brings the tips of the teeth of knife 18 into contact with the web to pierce and sever it, the web being backed up by the bar 24. The brush 20 is also seen to be pressing the oncoming web against the core 2 to provide traction. The leading end of the web is deliberately caused to form a buckle fold in order to eliminate the surplus length which would otherwise occur. Further rotation of the core 2 is shown in FIG. 4*d*. The folded edge of the web is brushed into the nip formed by the rider roll 1 and the core 2. Since the brush 20 has been keeping the web in close contact with the core, no bagginess is possible and a good tight, cleanly folded edge start to the new reel results.

It should be noted that the back-up bar 24 precedes the knife 18 in the web movement direction and after cutting causes the cut edge to be pushed down the back of the knife into the square corner 25. This is important when handling heavy materials such as carton board since if the knife precedes the back-up bar it has been found that occasionally the web does not wrap the new core but continues to travel past the knife.

A major advantage of this system is its ability to handle webs of widely varying stiffness such as carton board through papers and foils to extensible materials such as polythene. The diagrams illustrate winding reels in a clockwise direction. The arms 3 and 7 are so designed that the rider roll and transfer knife mechanisms can be readily interchanged by the operator to facilitate continuous winding of reels in an anticlockwise direction.

What we claim is:

1. A method of winding a continuous web of sheet material on to a plurality of reels in sequence, wherein the transfer of the running web to a fresh reel core is effected by leading the web between the fresh reel core and a rider roll which rides upon it and then over a guide roller positioned close to the core so that the web envelops the greater part of the periphery of the core, cutting the web between the core and the guide roller from the side that was outermost when traversing the core while supporting the web on the opposite side immediately ahead of the cutting position by a bar and pressing the web from said outermost side in a direction to move the cut web between the bar and the core to initiate a fold, and completing the fold back of the new leading end as the latter is directed into the nip between the core and the rider roll.

2. Apparatus for performing the method of claim 1, comprising a rider roll arranged to ride upon the fresh reel core, a guide roller movable into position close to the core so that a web can be run around the rider roll, the core and the guide roller so as to envelop the greater part of the periphery of the core, a knife and transfer assembly associated with the guide roller and

mounted for cutting the web from the side that was outermost when traversing the core between the core and the guide roller and for directing the leading edge of the cut-off portion into the nip between the core and the rider roll and a back-up bar immediately ahead of the cutting position of the knife, on the opposite side of the web, the transfer assembly including means for pressing the web from said outermost side between the bar and said core to fold back the cut leading edge portion on itself as it is directed into the nip.

3. Apparatus as claimed in claim **2,** wherein the pressing means comprises a blade with its leading edge directed towards the web.

4. Apparatus as claimed in claim **2,** wherein the knife and transfer assembly also includes a brush for urging the web against the fresh core to increase traction.

5. Apparatus as claimed in claim **2,** wherein the back-up bar is mounted on support means for the rider roll.

6. Apparatus as claimed in claim **5,** wherein the back-up bar is pivotally mounted to be removable away from the cutting position of the knife.

7. Apparatus according to claim **2,** wherein the knife and transfer assembly is pivotally mounted on a pair of arms which also carry the guide roller and which are themselves pivoted for moving the guide roller and the knife and transfer assembly up to the fresh reel core.

* * * * *