Dec. 27, 1955 F. C. BOWER. ET AL 2,728,532

WEB WINDING

Filed Jan. 23, 1953 2 Sheets-Sheet 1

FIG-1

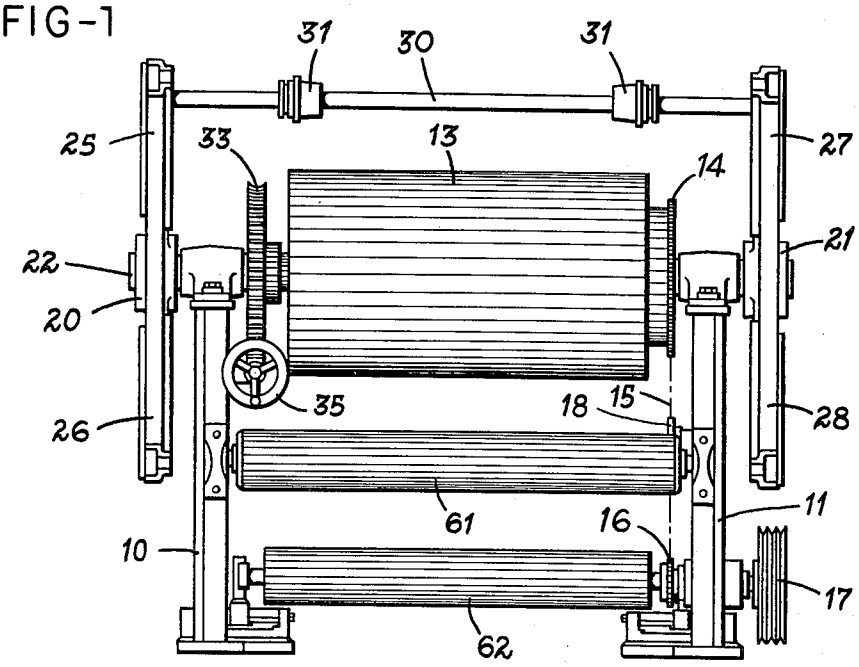
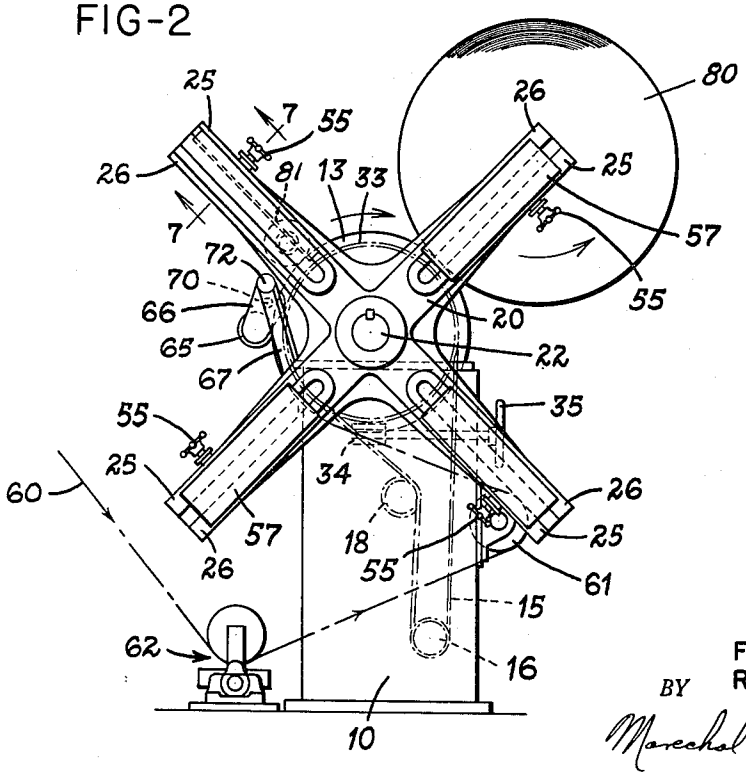


FIG-2



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WEB WINDING

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FIG-3

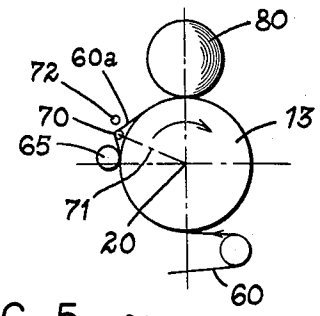


FIG-4

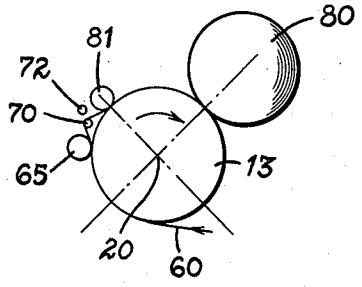


FIG-5

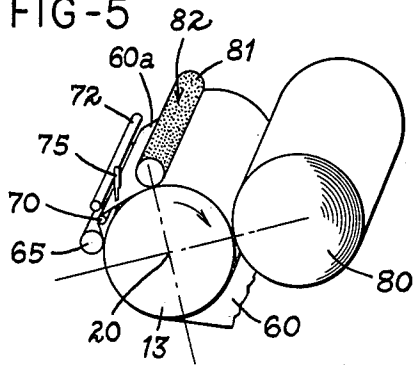


FIG-6

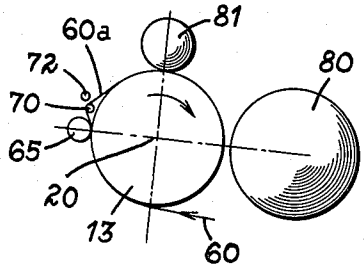


FIG-7

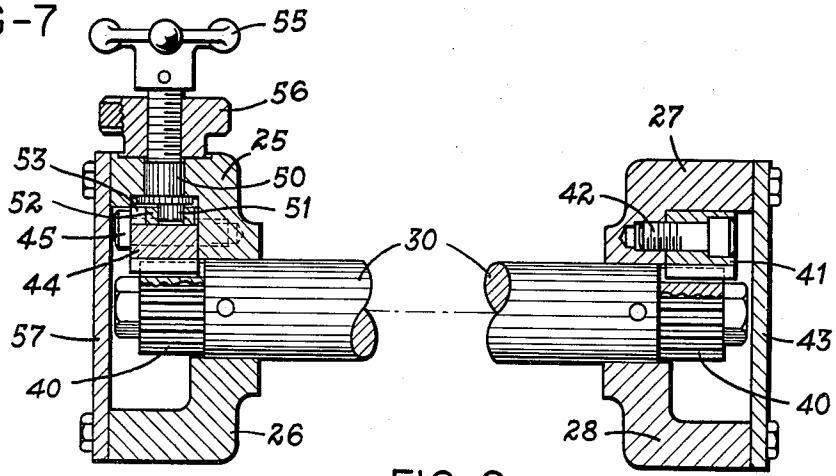


FIG-8

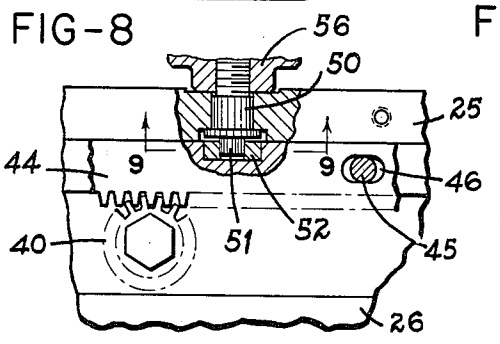
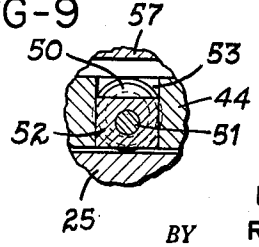


FIG-9



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2,728,532

WEB WINDING

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Application January 23, 1953, Serial No. 332,908

9 Claims. (Cl. 242—56)

This invention relates to apparatus for continuously winding paper and other web materials into rolls, and the invention has special application to apparatus for continuous winding operations in which a continuous web is wound into rolls on successive core shafts by successively severing the web upon completion of each roll and causing the severed end thereof to wind on a new core without interruption of the web travel.

One of the principal objects of the invention is to provide a winder of the drum type which is of simple and rugged construction adapted for economical production, which is operable to move each successively formed roll from its starting position on the drum to winding and discharging positions in properly timed relation to facilitate starting of the next roll on the drum, and which incorporates provisions for guiding the web at the drum and for guiding the winding roll with respect to the drum in such manner as to facilitate even winding and proper transfer of the web from each complete roll to the next core.

The invention accordingly provides a winder for web materials in which a driving drum is mounted within a reel for supporting the successively wound rolls. This reel includes a plurality of angularly spaced yoke arms for receiving the ends of the core shafts on which the rolls are wound, and these arms are arranged in such spaced relation that when a set of arms is in upwardly extending position to support the roll being wound, the next preceding set is extending downwardly for gravity discharge of a wound roll therefrom and the next following set of arms is also extending upwardly to receive the core shaft for the next roll to be wound. Accurate guiding and alignment of each core with respect to the drum in order to maintain desired parallelism of the winding roll with the drum for uniform winding is effected by means of racks in the yoke arms which operate with pinion teeth on the ends of the core shaft, and one rack in each pair of arms is also adjustable generally radially of the drum in order to raise or lower the adjacent end of the core shaft as required to maintain this desired parallelism of the core and drum.

Simple and smooth transfer of the web from a full roll to the next core is facilitated in the winder of the invention by guiding the web temporarily out of contact with the drum in such manner as to leave an unsupported web portion just ahead of the roll starting station for the new core on the drum. Thus a guide member is mounted adjacent but spaced from the drum and between the roll starting station for the new core and a pressure roll which forms a pressure nip with the drum ahead of the roll starting station, and this guide member guides the web temporarily out of contact with the drum. With the web thus unsupported and spaced from the drum as it approaches the roll starting station, it is readily severed by a knife drawn across its path, and the progressively cut end is then caused to wind on the new core by means of pressure sensitive adhesive on the core. With this arrangement, proper tension control over the

web is maintained continuously, while at the same time transfer of the web from a full roll to a new core is accurately and smoothly effected without loss of time and without retarding the web travel.

It is accordingly an object of the present invention to provide a winder of the reel and drum type for web materials in which each core shaft on which the new rolls are wound is supported in the reel for adjustment angularly with respect to the surface of the drum in such manner as to assure maintenance of proper parallelism between the winding core and the drum assuring uniformly tight winding.

Another object of the invention is to provide such a winder in which the web is guided temporarily away from the drum after its first engagement therewith and before it reaches a roll starting or winding station on the drum in such manner as to leave an unsupported web portion just in advance of the roll starting station on the drum to facilitate transfer of the web from a full roll to a new core while maintaining proper tension in the web at all times.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is an elevational view showing a winder constructed in accordance with the invention and looking from right to left in Fig. 2 with the web and the web roll omitted;

Fig. 2 is an end elevational view looking from left to right in Fig. 1;

Figs. 3 to 6 inclusive, are diagrammatic views illustrating successive stages in a continuous winding operation with the winder of Figs. 1 and 2;

Fig. 7 is an enlarged fragmentary sectional view taken approximately on the line 7—7 of Fig. 2;

Fig. 8 is a fragmentary view looking from left to right in Fig. 7 with the end cover removed and parts broken away and in section; and

Fig. 9 is a fragmentary section on the line 9—9 of Fig. 8.

Referring to the drawings, which illustrate a preferred embodiment of the invention, the winder includes a main frame comprising a pair of end stands **10** and **11** which may be provided with cross bracing as desired, and a driving drum **13** is mounted between the end stands for continuous rotation in the direction indicated by the arrow in Figs. 3–6. The drive for drum **13** is shown as including a sprocket **14** carried by one end of the drum and connected by chain **15** with a drive sprocket **16** on a shaft having a multiple V-pulley **17** adapted to be driven from a suitable motor or other external main power source (not shown). A tensioning idler for the sprocket chain is indicated at **18** on the end stand **11**.

The reel for supporting the winding rolls includes a pair of multi-armed end members **20** and **21** secured to the opposite ends of a central shaft **22** journaled in the end stands **10** and **11**. Each of the end members in turn includes a plurality of yoke arms (four being shown) identified as **25** and **26** on the end member **20** and as **27** and **28** on the end member **21**. These arms are arranged in aligned pairs on the two end members to receive the opposite ends of one of the core shafts **30** on which the rolls are wound, each core shaft being shown as provided with the usual pair of chucks **31**. Means are provided for rotating the reel to move the yoke arms around the drum, and such means are shown as including a worm wheel **33** secured to the shaft **22** and a worm **34** carried by the end stand **10** and having an operating hand wheel **35**.

The construction and arrangement of the reel arms and the core shaft are shown in detail in Figs. 7–9. A pinion

gear 40 is mounted for free rotation on each end of the core shaft 30, and at one end of the reel, shown as the right hand end in Fig. 1, this gear 40 meshes with a rack 41 bolted at 42 within a hollow portion along the outer surface of the arm 27. This portion of the yoke arms 27—28 is provided with a cover plate 43. At the opposite end of the reel, a similar rack 44 is mounted by bolts 45 within the arm 25, but the bolts 45 extend through slots 46 in the rack to permit limited movement of the rack generally radially of the drum 13 along arm 25.

In order to control this movement of the rack 44, a crank 50 is journaled in the arm 25 and includes an eccentric pin 51 rotatably received in a shoe 52 which is in turn slidable transversely of the rack in a slot 53 in the adjacent surface of the rack. A handwheel 55 is pinned to the outer end of crank 50, and the intermediate portion of the crank is threaded to receive a lock nut 56. Satisfactory results have been obtained with these parts proportioned to provide a total adjustment of about 3/16 inch for rack 44. The cover plate 57 on arms 25—26 corresponds to the cover plate 43, and this same arrangement of racks is repeated in each of the several pairs of yoke arms.

The path of the web to the winder is best seen in Figs. 2–4. The web 60 is shown as approaching the winder from the back and passes around an idler roll 61 mounted at the front of the winder on end stands 10 and 11. As desired, an automatic web guide of the usual type may be mounted adjacent the winder and ahead of the roll 61 as indicated at 62. The roll 61 is mounted at such height with respect to the drum 13 that the web passing from roll 61 contacts the drum at approximately the lowest point thereof, namely approximately below the vertical center of the drum. The web then travels around the drum to and through the nip of the drum with a pressure roll 65 carried by arms 66 pivoted in brackets 67 mounted on the end stands.

The brackets 67 also carry a guide bar 70, shown as a roller of small diameter, which is spaced from the adjacent surface of the drum and may be driven at web speed by a suitable driving connection from the drum as indicated at 71 in Fig. 3. The web leaving the nip of roll 65 and the drum is guided around bar 70 and then back into contact with the drum, and the bar 70 thus guides the web temporarily out of contact with the drum as shown in Figs. 3 and 4 in such manner as to leave a short unsupported portion of the web designated as 60*a*. It is in this unsupported portion that the web is severed during transfer from a full roll to a new core, and severing is facilitated by a knife bar 72 which is mounted on brackets 67 above bar 70 and serves as a guide for the knife 75 or the hand of the operator carrying the knife.

Figs. 2–6 illustrate several stages in a continuous winding operation with the winder of the invention. Fig. 3 shows a roll 80 supported in the normal winding position approximately above the vertical center of the drum 13, with the web 60 passing as described around the guide roll 61 to the drum, through the nip of pressure roll 65 and the drum, and then away from the drum over guide bar 70 and back to the drum. The nip pressure between the roll 80 and the drum may be varied as desired by rotating the reel to swing the roll away from its position of maximum nip pressure for a given weight shown in Fig. 3, and this movement of the reel will in any case be effected as winding of the roll approaches completion, in order to locate the next following set of yoke arms in proper position for starting the next roll. Also, during the winding operation, any variation of the roll 40 out of desired parallel relation with the surface of the drum can be corrected by shifting rack 44 as described to raise or lower the adjacent end of the core shaft with respect to the drum.

Figs. 2, 4 and 5 show the parts in position for starting a new roll, with the reel rotated to locate the set of arms following the roll 80 at the roll starting station, namely

the position of the arms in which a new core 81 will engage the drum at approximately the point above the horizontal center of the drum where the unsupported web portion 60*a* again contacts the surface of the drum. Pressure sensitive adhesive 82 is applied to the surface of this new core 81, as by wrapping a pressure sensitive adhesive tape thereon or by other suitable methods such as spraying adhesive or water thereon, but so long as the web remains unsevered, no transfer takes place and the new core simply comes up to speed.

The transfer of the web from the full roll to the new core is best seen in Fig. 5. When the roll 80 is completed and the new core 81 has come up to speed, the knife is inserted through the unsupported web portion 60*a* at a point close to the edge of the web, for example about one inch in from the edge, to cut a correspondingly narrow tail, and then the knife is drawn across the web to form a diagonal cut due to the continued forward travel of the web. If the knife is actuated manually, the knife bar 72 serves as a guide for the knife during the cut as described.

As soon as the web is thus cut, the adhesive on the new core picks up the cut end and causes this end to start winding on the new core, and since there is only a narrow tail then connecting the two portions of the web, this tail then breaks, or is cut completely by the knife, to complete the transfer and the start of the new core. As soon as the new roll is properly started, the reel is rotated as shown in Fig. 6 sufficiently to move the arms carrying the full roll 80 to a downwardly extending position to discharge the roll by gravity onto a truck or other carrier as desired. In the meantime, the core 81 is building up, and as soon as it approaches completion, the same procedure is followed.

It will accordingly be seen that this winder operates simply and effectively for continuous winding of successive rolls of paper or other web material with minimum requirements of personal attention by the operator. In particular, it should be noted that this winder provides simple and continuous control of the tension in the web during both winding and transferring of the web from a full roll to a new core, since the web is at all times held in pressure engagement with the drum both by the pressure roll 60 and by the roll being wound, with the full roll thus serving to hold the web properly tensioned against the drum until the transfer to the new core has been completed. Also the adjustable mounting of the core shaft in the reel arms as well as the cooperative arrangement of the pressure roll and guide bar 70 with the drum contribute to accurate control of winding for desired uniformly wound rolls as described. Further the device offers advantages in the simplicity of its construction as well as its compact form and cooperative lightness in weight, all of which contribute to its particular suitability in use for handling small rolls and in installations where space is a premium.

While the apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of yoked arms adapted to receive the ends of a core shaft, a core shaft adapted to be received in said yoke arms and having pinion teeth at each end thereof, racks within said yoke arms for meshing with said teeth to guide rotation of said core shaft in said arms, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll

discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, means for conducting said web to a drum engaging position below said roll starting station for travel around said drum to said roll starting and roll discharging stations, and guide means on said frame adjacent said drum for continuously guiding said web out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web adjacent said roll starting station facilitating severing of said web for transfer from a full roll to a new said core shaft.

2. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of arms adapted to receive the ends of a core shaft, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, means for conducting said web to a drum engaging position spaced below said roll starting station for travel around said drum to said roll starting and roll discharging stations, and guide means on said frame adjacent said drum and spaced between said drum engaging position and said roll starting station for engagement between said web and said drum to guide said web continuously out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web adjacent said roll starting station facilitating severing of said web for transfer from a full roll to a new core shaft.

3. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of yoked arms adapted to receive the ends of a core shaft, a core shaft adapted to be received in said yoke arms and having pinion teeth at each end thereof, racks within said yoke arms for meshing with said teeth to guide rotation of said core shaft in said arms, means on one said arm of each said pair for shifting said rack therein generally radially of said drum to adjust the adjacent end of said core shaft correspondingly radially of said drum with respect to the other end of said core shaft, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, means for conducting said web to a drum engaging position below said roll starting station for travel around said drum to said roll starting and roll discharging stations, and guide means on said frame adjacent said drum for continuously guiding said web out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web adjacent said roll starting station facilitating severing of said web for transfer from a full roll to a new said core shaft.

4. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of arms each adapted to receive the ends of a core shaft, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, a pressure roll engaging said drum below said roll starting station, means for conducting said web to the nip of said pressure roll and said drum for travel around said drum to said roll starting and roll discharging stations, and a guide bar located on said frame adjacent the path of said web from said pressure roll nip to said roll starting station and spaced from said drum for continuously guiding said web out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web between said guide bar and said roll starting station facilitating severing of said web for transfer from a full roll to a new core shaft.

5. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of arms adapted to receive the ends of a core shaft, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, means for conducting said web to a drum engaging position below said roll starting station for travel around said drum to said roll starting and roll discharging stations, guide means on said frame adjacent said drum for continuously guiding said web out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web adjacent said roll starting station facilitating severing of said web for transfer from a full roll to a new core shaft, and means on each said pair of arms for adjusting one end of the core shaft carried thereby towards and away from said drum during winding of said web thereon to maintain desired parallelism between said drum and the roll winding on said shaft.

6. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of arms each adapted to receive the ends of a core shaft, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, a pressure roll engaging said drum below said roll starting station, means for conducting said web to the nip of said pressure roll and said drum for travel around said drum to said roll starting and roll discharging stations, a guide bar located on said frame adjacent the path of said web from said pressure roll nip to said roll starting station and spaced from said drum for continuously guiding said web out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web between said guide bar and said roll starting station facilitating severing of said web for transfer from a full roll to a new core shaft, and a second guide bar on said frame extending adjacent and transversely of the path of said unsupported web portion to support and guide a knife for cutting movement across said unsupported web portion.

7. A device of the character described for winding a frame, a continuous traveling web into successive rolls, comprising a continuously rotatable driving drum sup-

ported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of yoked arms adapted to receive the ends of a core shaft, a core shaft adapted to be received in said yoke arms and having pinion teeth at each end thereof, racks within said yoke arms for meshing with said teeth to guide rotation of said core shaft in said arms, means on one said arm of each said pair for shifting said rack therein generally radially of said drum to adjust the adjacent end of said core shaft correspondingly radially of said drum with respect to the other end of said core shaft, and means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum.

8. A device of the character described for winding a continuous traveling web into successive rolls, comprising a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of yoked arms adapted to receive the ends of a core shaft, a core shaft adapted to be received in said yoke arms and having pinion teeth at each end thereof, racks within said yoke arms for meshing with said teeth to guide rotation of said core shaft in said arms, means on one said arm of each said pair for shifting said rack therein generally radially of said drum to adjust the adjacent end of said core shaft correspondingly radially of said drum with respect to the other end of said core shaft, means supporting one of said racks in each said pair of arms for sliding movement in said arms generally radially of said drum, a crank journaled in said arm adjacent said slidably supported rack and including a crank portion journaled in said rack, means for rotating said crank to cause said sliding movement of said rack for radial adjustment of the adjacent end of said core shaft with respect to the other end thereof, and means for locking said crank in a selected adjusted position thereof.

9. A device of the character described for winding a continuous traveling web into successive rolls, comprising

a frame, a continuously rotatable driving drum supported by said frame, a reel mounted on said frame for rotation at the ends of said drum and including a plurality of pairs of yoked arms adapted to receive the ends of a core shaft, a core shaft adapted to be received in said yoke arms and having pinion teeth at each end thereof, racks within said yoke arms for meshing with said teeth to guide rotation of said core shaft in said arms, means on one said arm of each said pair for shifting said rack therein generally radially of said drum to adjust the adjacent end of said core shaft correspondingly radially of said drum with respect to the other end of said core shaft, means for rotating said reel in the same direction as said drum to shift each successive pair of said arms from a new roll starting station above the horizontal center of said drum to a full roll discharging station at the opposite side of said drum while shifting the next following said pair of arms to said roll starting station, a pressure roll engaging said drum below said roll starting station, means for conducting said web to the nip of said pressure roll and said drum for travel around said drum to said roll starting and roll discharging stations, and a guide bar located on said frame adjacent the path of said web from said pressure roll nip to said roll starting station and spaced from said drum for continuously guiding said web out of contact with said drum over a limited portion of the travel thereof from said drum engaging position to said roll starting station to provide an unsupported portion of said web between said guide bar and said roll starting station facilitating severing of said web for transfer from a full roll to a new said core shaft.

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