May 5, 1964 C. W. MILLER ETAL 3,131,880

WEB ROLL WINDER SHAFT STRIPPER

Filed June 11, 1962 4 Sheets-Sheet 1

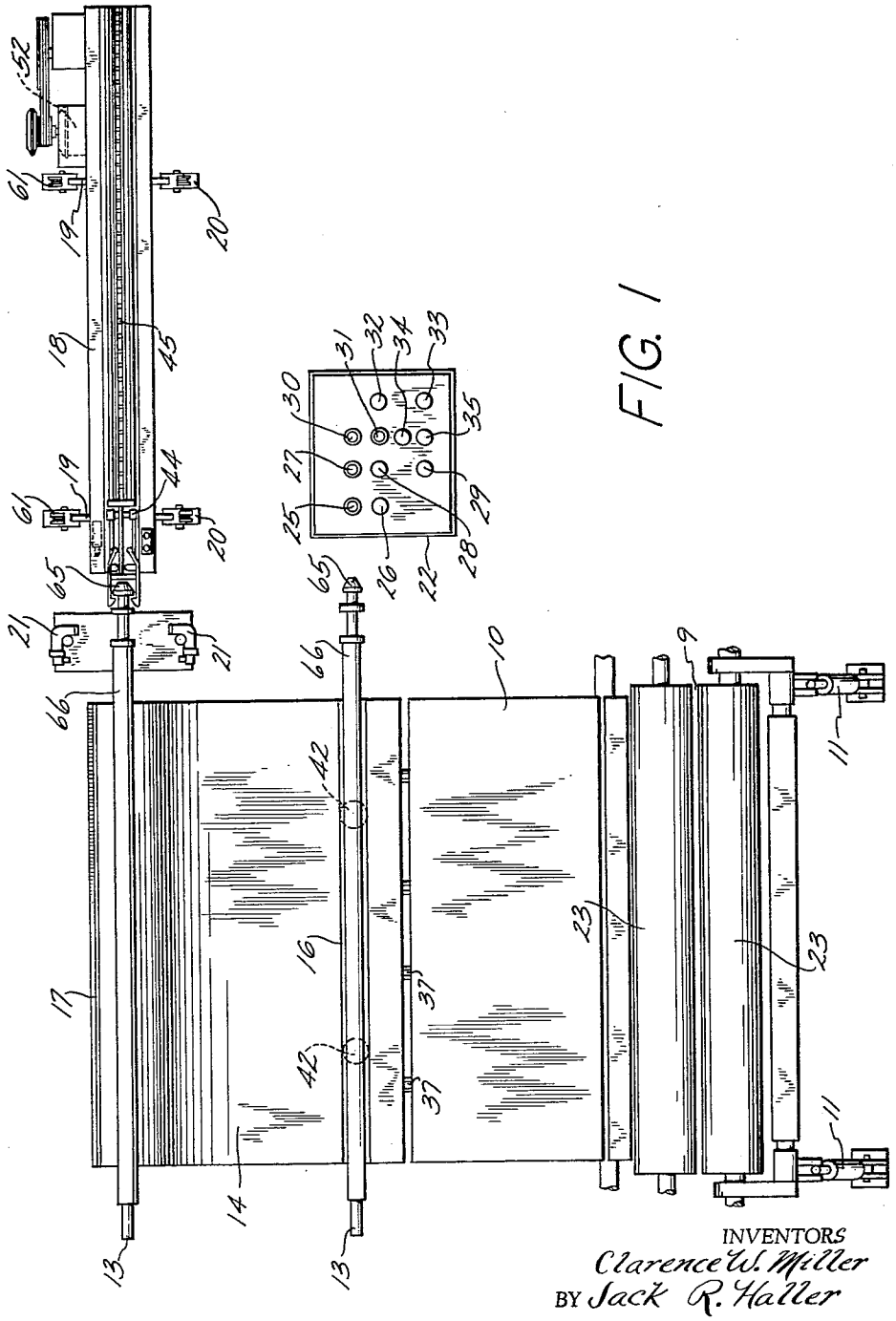


FIG. 1

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Filed June 11, 1962 4 Sheets-Sheet 2

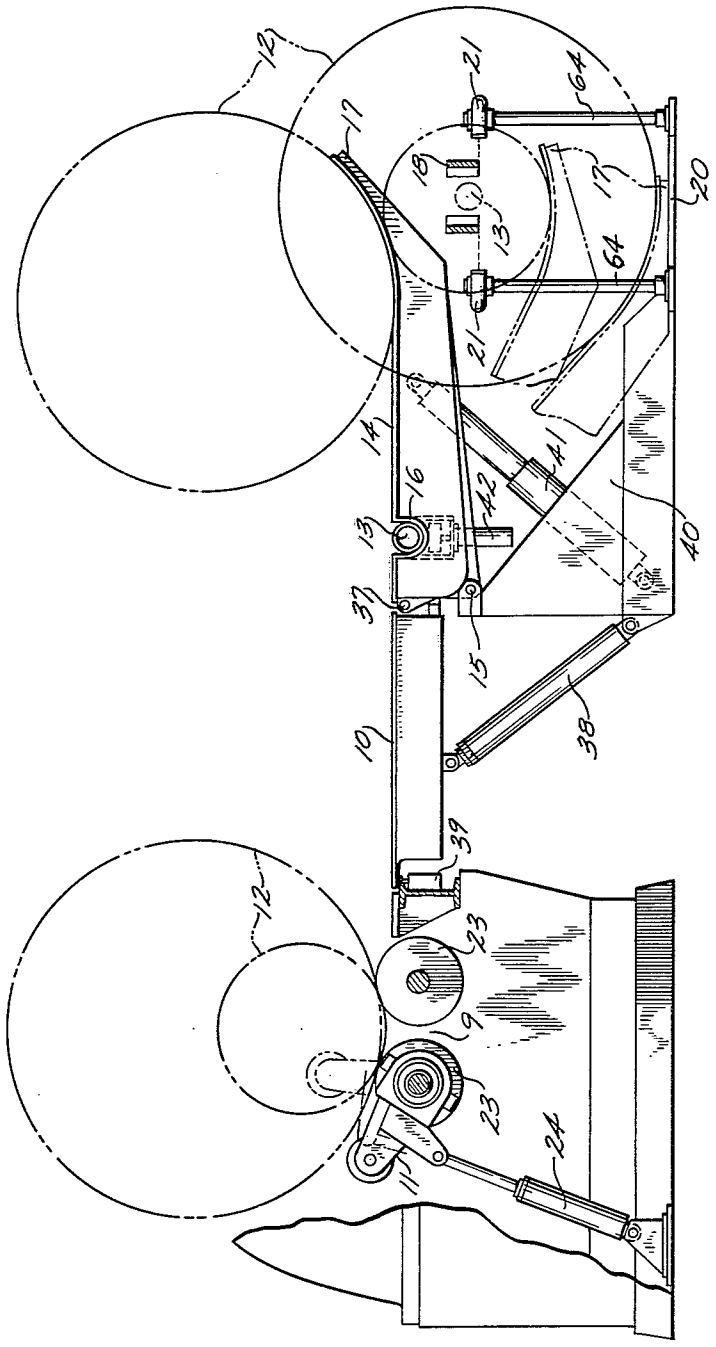


FIG. 2

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Filed June 11, 1962 4 Sheets-Sheet 3

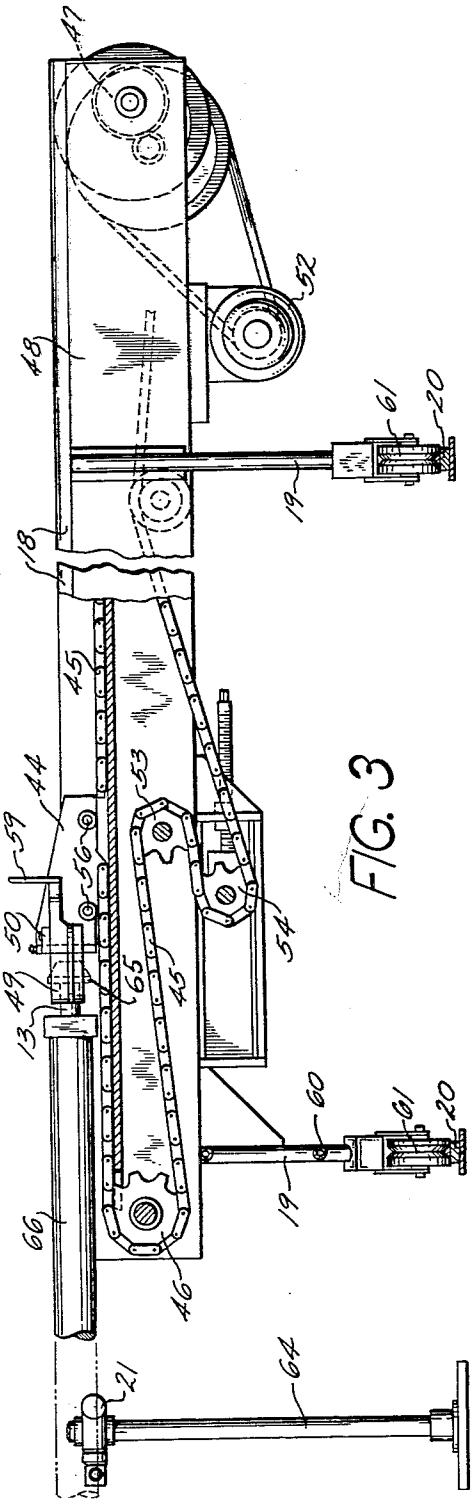


FIG. 3

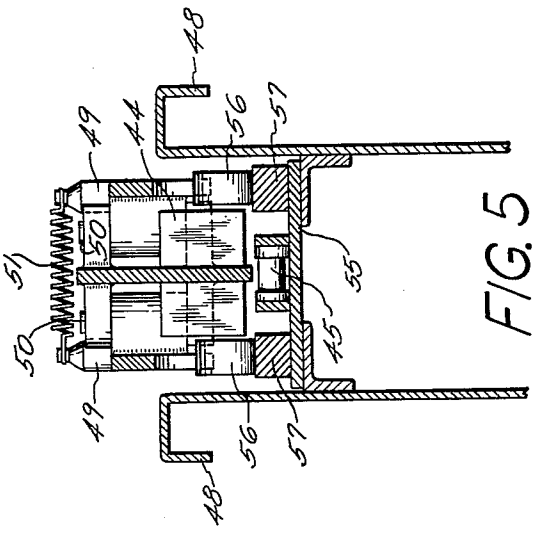


FIG. 5

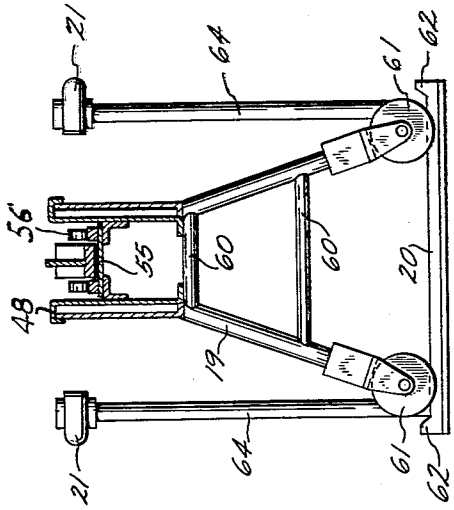


FIG. 4

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WEB ROLL WINDER SHAFT STRIPPER

Filed June 11, 1962 4 Sheets-Sheet 4

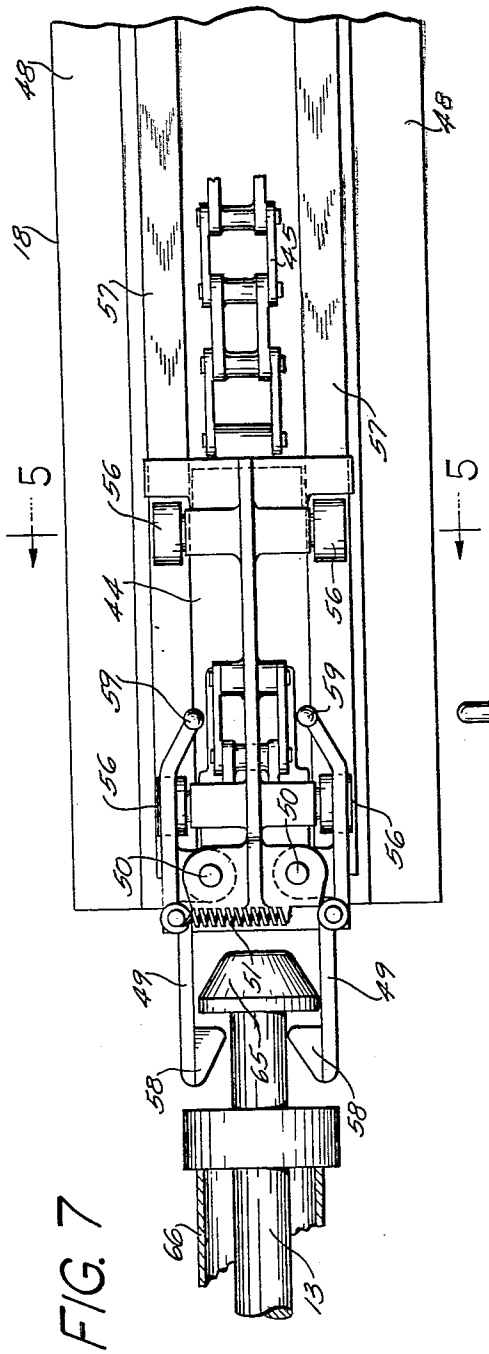


FIG. 7

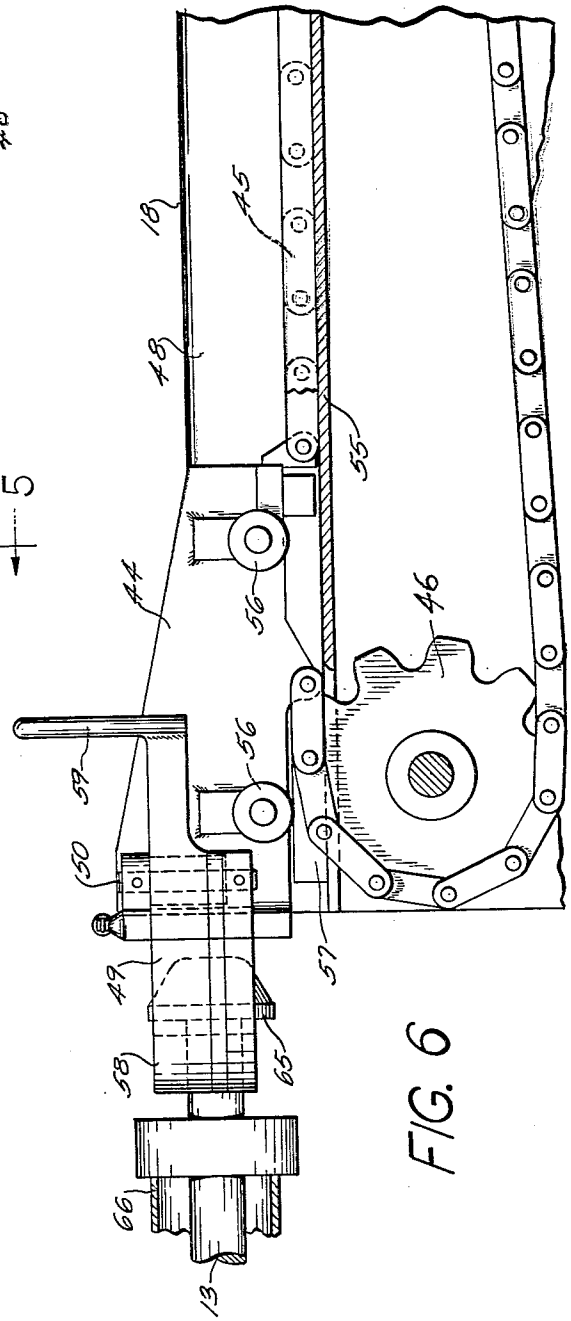


FIG. 6

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United States Patent Office 3,131,880 Patented May 5, 1964

3,131,880

WEB ROLL WINDER SHAFT STRIPPER

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8 Claims. (Cl. 242—55)

This invention relates generally to improvements in the art of removing winding cores from web rolls wound thereabout, and it relates more specifically to an improved web roll winder shaft stripper.

The primary object of the present invention is to provide an improved system for facilitating the removal of winder shafts from web rolls of various diameters which have been wound into formation about the shafts.

In the paper industry, it is necessary to wind the finished webs into roll formation, and such winding is effected about a core comprising a shaft which is firmly confined within the center of the final roll but must be removed for reuse in winding subsequent webs. Depending upon the length of the web, the diameter of the wound rolls will naturally vary considerably, and because the winder shafts are tightly embraced by the web, it is a tedious job to manually release and remove these shafts for subsequent use. While several types of mechanisms for facilitating removal of winder shafts from web rolls have heretofore been proposed, none have proven entirely satisfactory either because they were too complicated and difficult to operate and to maintain in operating condition, or they were not adapted to accurately position web rolls of different diameters relative to the shaft stripper, or they required withdrawal of the heavy web rolls endwise from the lighter winder shafts while the latter were held fixed.

It is therefore an important object of this invention to provide an improved winder shaft stripper which is relatively simple but highly dependable and conveniently controllable to quickly remove the shafts from the web rolls.

Another important object of the invention is to provide an automatically functioning web roll winder shaft remover which is effectively cooperable with web rolls of various diameters to insure rectilinear axial withdrawal of the winder shafts.

A further important object of the present invention is to provide an improved mechanism for quickly and safely withdrawing winder shafts from paper rolls, which is controllable by a single attendant from a common vantage point or station to transfer the successive roll and shaft assemblages from place to place.

Still another important object of our invention is to provide improved equipment for handling heavy web rolls in order to transfer them from a winding machine to a shaft removal zone and for pulling the shafts and returning them to the winding machine for rewinding, with minimum physical effort.

These and other more specific objects and advantages of the invention will be apparent from the following description.

A clear conception of the several features constituting the present improvement, and of the construction and operation of a commercial system embodying the invention, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

FIG. 1 is a top view of the equipment constituting a complete winder shaft stripping system embodying the invention showing only part of a push-button control panel or station, but not the electrical system for activating the various parts of the apparatus;

FIG. 2 is a part sectional end elevation of the system

showing the manner in which web rolls of various diameters can be transferred from place to place during removal of the winder shaft assemblages and after such removal has been effected;

FIG. 3 is a fragmentary enlarged side view of the winder shaft stripping or pulling apparatus of the system, portions of the shaft carriage frame having been broken away in order to reveal the carriage driving mechanism;

FIG. 4 is a similarly enlarged end view of the shaft puller carriage support for positioning the carriage in axial alignment with web rolls of various diameters;

FIG. 5 is a further enlarged transverse vertical section through the shaft stripping carriage alone, taken along the line 5—5 of FIG. 7;

FIG. 6 is a similarly enlarged fragmentary longitudinal section through the pulling jaw carriage taken inside of the carriage frame adjacent to the jaw transporting conveyor chain; and

FIG. 7 is a likewise enlarged and fragmentary top view of the jaw pulling carriage showing the jaws coacting with the end head of a winder shaft assembly.

While the improvement has been shown and described herein as having been embodied in a system having various parts operable by hydraulic electrically controlled servo-motors, it is not intended to restrict the invention to such a specific assemblage; and it is also contemplated that specific descriptive terms employed herein be given the broadest possible interpretation consistent with the actual disclosure.

Referring to FIGS. 1 and 2 of the drawings, the improved winder shaft stripping system shown therein comprises, in general, a web roll winding unit **9**; a tiltable table **10** having one edge adjoining the unit **9**; a pair of devices **11** for ejecting completed web rolls **12** each having a winder shaft **13** confined centrally therein from the unit **9** onto the table **10**; a tiltable deck **14** swingably suspended from a pivot **15** at the opposite edge of the table **10**, and having a transverse recess **16** therein near the pivot **15** and an arcuate elevated nose at its free swinging end **17**; a winder shaft pulling carriage assemblage **18** mounted upon a pair of spaced supports **19** near the swinging end **17** of the deck **14** and which are adjustable along rails **20** to move the assemblage **18** toward and away from the deck **14**; a photoelectric beam accessory **21** for effecting alignment of the assemblage **18** with the shafts **13** of web rolls **12** having diverse diameters; and an electrical system not shown but which is controllable by push-buttons located at a station **22** for the attendant.

The web winding unit **9** and the completed roll ejecting devices **11** are of well-known construction and operation, being capable of producing and delivering rolls of diverse lengths and diameters dependent upon the length of the webs and having the winder shafts **13** confined therein onto the adjacent edge of the transfer table **10**. During the winding operation, the rolls **12** are revolved upon rollers **23**, and whenever a web roll **12** has been completed, the ejecting devices **11** may be actuated by hydraulic servo-motors **24** to lift the roll off of the rollers **23** and to deposit it upon the table **10**. The operation of these ejector actuating hydraulic motors **24** is controllable through an electrical system not shown, with the aid of push-buttons located at the station **22** from which the functioning of all parts of the equipment is plainly visible at all times. Since the specific construction of the electrical apparatus controlled by the actuators and push-buttons at the station **22** is clearly apparent to any electrician, it has been omitted for the sake of clearness, but the several actuators and push-buttons will hereinafter be specifically identified in connection with the apparatus which they control.

The switch actuator **25** merely controls the lighting for most of the installation, while the actuator **26** controls

the electric current admitted to the panel and the web winding unit has its own control panel not shown. The push-button 27 controls the illumination of the hydraulic pump for supplying the hydraulic pressure required to actuate the various servo-motors, and the push-buttons 28, 29 control the starting and stopping respectively of this pump. The push-buttons 30, 31 control the raising and lowering respectively of the ejecting devices 11, while the push-buttons 32, 33 control the raising and lowering respectively of the table 10, and the push-buttons 34, 35 control the raising and lowering respectively of the winder shaft assemblies. The motor for actuating the shaft puller is also controllable by a switch near the operator's station.

The bridge table 10 is tiltable about pivots 37 by means of a hydraulic lift 38 and the swinging end of this table coacts with a limit switch 39 which stops the table 10 in an approximately horizontal position, see FIG. 2. The deck 14 has the table pivots 37 mounted thereon and is swingable about the pivot 15 carried by a frame 40 by a hydraulic hoist 41 from substantially horizontal position as shown in solid lines into selected inclined positions as shown in dot-and-dash lines in FIG. 2. A hydraulic jack 42 is also mounted upon the deck 14 beneath the recess 16, and when the roll ejectors 11 are actuated by the servo-motors 24 to eject a completed web roll 12 from the rollers 23, this roll will be deposited upon the swinging end of the table 10 which may thereafter be elevated by the hydraulic lift 38 to cause the roll 12 with the winder shaft 13 therein to travel onto the horizontal deck 14 until its motion is arrested by the elevated deck end 17. When a roll 12 has thus been delivered onto the deck 14, a new shaft assembly 13 placed in the recess 16 may be lifted out of this recess and rolled into position within the web winder 9 preparatory to formation of a subsequent web roll 12.

The winder shaft carriage assemblage 18 with its supports 19 and photoelectric beam accessory 21 constitute an important part of the present invention, and is shown in detail in FIGS. 3 to 7 inclusive. The assemblage 18 comprises a carriage 44 secured to the upper rectilinear horizontal stretch of an endless chain conveyor 45 which coacts with end sprockets 46, 47 journalled in horizontally elongated frame beams 48 mounted upon the spaced supports 19; a pair of gripping jaws 49 swingable about upright pivots 50 secured to the carriage 44 and which are biased toward each other by a tension spring 51; and a reversible electric motor 52 suspended from the beams 48 and drivingly connected with the conveyor end sprocket 47. The lower run of the conveyor chain 45 is provided with a chain tensioning device consisting primarily of an idler sprocket 53 mounted upon a fixed shaft, and another idler sprocket 54 adjustable horizontally relative to the sprocket 53 so as to eliminate excessive slack in the chain, see FIG. 3.

The spaced frame beams 48 are firmly connected by an elongated plate 55 and angle irons as depicted in FIG. 5, and the carriage 44 may be connected to selected links of the chain 45 and is provided with four rollers 56 which ride upon elongated rectilinear guide bars 57 mounted upon the frame plate 55. With this assemblage of elements, the jaws 49 will be moved along a rectilinear line whenever the upper stretch of the chain 45 is moved in either direction along and between the frame beams 48; and while the spring 51 constantly urges the tapered ends 58 of the jaws 49 toward each other as in FIGS. 6 and 7, these jaws may be manually separated or spread apart with the aid of handles 59. The frame of the shaft pulling assemblage is also provided with limit switches for limiting the travel of the carriage 44 in either direction.

Each of the supports 19 for the carriage assembly comprises a pair of legs spread apart and rigidly united by the plate 55 and by braces 60 as shown in FIG. 4, and the lower extremity of each of these legs is provided with a roller 61 adapted to ride upon an adjacent guide rail 20. These rails 20 are parallel to each other and are disposed transversely of the jaw carrier frame 48, and the rails are provided with end stops 62 for limiting movement of the jaw carrier therealong. At least one of the rails 20 is provided with a central ridge, while the adjacent rollers 61 have peripheral V-grooves coacting with the ridge in order to insure proper guiding of the supports 19 and to prevent displacement thereof laterally while the shafts 13 are being stripped from the successive rolls 12, and the adjustability of the supports 19 transversely of the line of movement of the carriage 44 provides means for aligning the travel of the jaws 49 with the axes of the shafts 13 being pulled.

The photoelectric beam accessory 21 which is located between the elevated end 17 of the web roll supporting deck 14 and the jaw carriage assemblage 18 comprises a pair of spaced and aligned beam projecting elements mounted upon stationary posts 64. Each winder shaft assembly comprises a shaft 13 having an integral tapered head 65 at one end, and which is provided with a pneumatic collapsible core 66 adapted to be expanded and to firmly engage the interior of the web roll 12 wound thereon. These cores are removable longitudinally of the rolls by collapsing the jackets or cores 66 and by pulling the released shaft assemblies endwise from within the rolls 12 with the aid of the carriage 44 and jaws 49, but due to the variation in the diameter of the successive rolls 12, the shafts 13 of the successive wound webs must be perfectly aligned with the line of travel of the jaws 49 before a shaft stripping operation is begun, and the beam produced by the photoelectric accessory 21 is utilized to effect such perfect alignment.

When the accessory 21 is active to produce a beam spanning the path of the winder shaft 13 of a completed web roll 12 of any diameter that has been deposited upon the tiltable deck 14 against the elevated end 17 thereof, the deck may be tilted with the aid of the hydraulic hoist 41 to bring the shaft axis into the horizontal plane of the beam being transmitted, and the entire carriage assembly 18 may be shifted laterally upon the rails 20 to also bring the line of travel of the jaws 49 into accurate alignment with this photoelectric beam, whereupon the shaft stripping operation may proceed. Such alignment may be readily effected by the operator located at the station 22 with the aid of the various buttons located at this station.

The electric motor 52 may thereafter be operated to cause the conveyor chain 45 to move the carriage 44 toward the head 65 of the shaft 13 after the pneumatic jacket 66 has been colapsed, and as the tapered ends 58 of the jaws 49 approach and engage the aligned and tapered shaft end head 65, they are spread apart against the action of the tension spring 51 and eventually snap over this head into shaft stripping position. The direction of travel of the conveyor chain 45 may then be reversed by reversing the rotation of the motor 52, whereupon the shaft assembly 13 will be withdrawn longitudinally from the web roll 12 while the latter remains stationary. The removed shaft 13 may then be removed from the carriage assembly 18 and re-cored for use in producing a subsequent roll 12, and deposited within the deck recess 16, whereupon the deck 14 may be lowered into its lowermost position so as to permit the web roll 12 to be freely removed from the apparatus. The empty deck 14 may thereafter be raised into horizontal postion, and the re-cored shaft assembly may be removed from the recess 16 with the aid of the jack 42 and positioned within the winder unit 9 preparatory to production of a subsequent web roll 12.

With a properly installed electrical system, all of these operations may be performed by a single attendant with the aid of the push-buttons 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 cooperating with limit switches and located at the station 22, and with the aid of the hydraulic servo-motors 24, 38, 41, 42 and the photoelectric appli-

ance 21. The various operations may be quickly and safely performed without damaging the rolls 12 or the shafts 13. The forward and rearward motion of the jaw carriage 44 is arrested by limit switches mounted at the opposite ends of the frame 48, and the side play of this carriage is restricted by bearings which insure accurate movement of the jaws 49 along the rectilinear path.

Before the winder shaft ejecting system can be operated, both the table 10 and the deck 14 must be in horizontally aligned positions as in FIG. 2, and the limit switch 39 at the swinging end of the table 10 will then permit the push-button 31 to be actuated to cause the ejectors 11 to rise and remove the completed web roll 12 from the winder rolls 23. The roll 12 will then roll against the curved end 17 of the deck 14 whereupon the ejectors may be lowered by pressing the button 30. The hydraulic hoist 42 may then be actuated by pressing the button 34 to lift the re-cored shaft assembly out of the recess 16, whereupon this reconditioned shaft assemblage may be installed in the web winder, and the jack 42 may be lowered with the aid of the button 35. The deck 14 may then be lowered with the aid of the push-button 33 to bring the shaft axis in alignment with the photoelectric beam of the accessory 21, and when this alignment is effected, the deck 14 automatically comes to rest. The reversible electric motor 52 may then be actuated to cause the jaws 49 to strip the shaft assemblages from within the web rolls 12 in an obvious manner, and the removed shaft assemblages may then be released by pressing the jaw separating handles 59 and reconditioned and deposited within the deck recess 16 for reuse. After a shaft 13 has been withdrawn from a roll 12 resting on the deck 14, this deck may be lowered to allow the shaft free web roll to escape by gravity, thus completing the cycle.

The improved assemblage is thus operable to quickly remove the winder shaft assemblies from the successive web rolls 12 and to deliver the de-shafted rolls from the shaft pulling equipment, and the push-button 32 may be actuated to bring the deck 14 back to horizontal position in alignment with the deck 10. The improved apparatus is operable systematically to remove the winder shafts from successive web rolls 12 of diverse diameters safely and with minimum effort on the part of the attendant and has proven highly satisfactory and successful in actual use.

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

1. In a system for stripping winder shafts each provided with a tapered end head from within successive web rolls of diverse diameters, means for positioning and holding each web roll with its axis located in alignment with a fixed center line, a carriage movable toward and away from the headed shaft end of each web roll while thus positioned and held, radially expandable and contractable gripping jaws movable with said carriage and resiliently urged to contracted condition, means for moving said carriage toward each pre-positioned and held web roll and shaft assemblage with said jaws moving axially along said fixed center line to cause the tapered shaft head thereof to expand and thereby automatically actuate said jaws into clamping engagement with said shaft head, and means for subsequently moving said carriage away from the web roll to cause said jaws to strip the shaft from the fixed web roll in axial alignment with said center line.

2. In a system for stripping winder shafts each provided with a tapered end head from within successive web rolls of diverse diameters, means for fixedly positioning each web roll with its axis located in alignment with a fixed horizontal center line, a carriage movable toward and away from the headed shaft end of each web roll while thus positioned and held, radially expandable and contractable spring pressed gripping jaws movable with said carriage, means for moving said carriage parallel to said center line toward each pre-positioned web roll and shaft assemblage to cause the tapered shaft head thereof to expand said jaws and permit the same to move into clamping engagement with said head, and means for subsequently moving said carriage away from the web roll to cause said jaws to strip the shaft from the fixed web roll in axial alignment with said center line.

3. In a system for stripping winder shafts each provided with a tapered end head from within successive web rolls of diverse diameters, means for positioning and holding each web roll with its axis located in alignment with a fixed center line, a carriage movable toward and away from the headed shaft end of each web roll while thus positioned and held, radially expandable and contractable gripping jaws hingedly mounted upon and movable with said carriage, said jaws being normally resiliently urged to contracted condition, means for laterally displacing said carriage to bring said jaws into axial alignment with said center line, means for moving said carriage toward each pre-positioned and fixed web roll and shaft assemblage to move said jaws axially along said center line and cause said jaws to expand and automatically clampingly engage the tapered shaft head, and means for subsequently moving said carriage away from the web roll to cause said jaws to strip the shaft from the fixed web roll along said center line.

4. In a web roll winder shaft stripper, a web roll transfer table, means for ejecting successive web rolls with the winder shafts therein from a roll winding device onto one end of said table, said winder shafts having at least one enlarged end head, a tiltable deck associated with the opposite end of said table, means for moving said table to cause the successive web rolls deposited thereon by said ejecting means to roll onto said deck, means for thereafter tilting said deck to dispose the axes of the winder shafts of the successive web rolls deposited thereon in a definite fixed position, a carriage having thereon automatically operable spring pressed gripping jaws movable toward and away from the successive web rolls in alignment with said shaft axes, and means for moving said carriage toward the successive web rolls on said deck to cause said jaws to contact said enlarged head and thereby expand and automatically actuate and grip the winder shafts of said rolls and for subsequently moving the carriage in the opposite direction to strip said shafts from within the web rolls.

5. In a web roll winder shaft stripper, a web roll transfer table, means for ejecting successive web rolls with the winder shafts therein from a roll winding device onto one end of said table, said winder shafts having at least one enlarged end head, a tiltable deck associated with the opposite end of said table, means for moving said table to cause the successive web rolls deposited thereon by said ejecting means to roll onto said deck, means for thereafter tilting said deck to dispose the axes of the winder shafts of the successive web rolls deposited thereon in a definite fixed position, a carriage having thereon automatically operable gripping jaws movable toward and away from the successive web rolls in alignment with said shaft axes, said jaws being normally resiliently urged toward each other, means for moving said carriage toward the successive web rolls on said deck to cause said jaws to contact said enlarged head and thereby spread said jaws whereby they engage and automatically grip the winder shafts of said rolls and for subsequently moving the carriage in the opposite direction to strip said shafts from within the web rolls, and means for finally further tilting said deck to eject the successive de-shafted web rolls therefrom.

6. In a web roll winder shaft stripper, a web roll transfer table, means for ejecting successive web rolls with the winder shafts therein from a roll winding device onto one end of said table, a deck alignable with the opposite end of said table, means for moving said table to cause the successive web rolls deposited thereon by said ejecting means to advance onto said deck, means for thereafter

moving said deck to dispose the axes of the winder shafts of the successive web rolls deposited thereon in a definite fixed axial position, a carriage having thereon radially expandable and contractable gripping jaws movable toward and away from the successive web rolls in alignment with said shaft axes, and means for moving said carriage toward the successive web rolls on said deck to cause said jaws to expand and clampingly grip the winder shafts of said rolls and for subsequently moving the carriage in the opposite direction to strip said shafts from within the web rolls.

7. In a web roll winder shaft stripper, an approximately horizontal web roll transfer table, means for ejecting successive web rolls with the winder shafts therein from a web roll winding device onto one end of said table, a tiltable deck associated with the opposite end of said table, means for moving said table to cause the successive web rolls deposited thereon by said ejecting means to roll onto said deck when the latter is in approximately horizontal position, means for thereafter tilting said deck to lower the axes of the winder shafts of the successive web rolls deposited thereon into a fixed horizontal position, a carriage having thereon radially expandable and contractable gripping jaws movable horizontally toward and away from the successive web rolls in alignment with said shaft axes, and means for moving said carriage toward the successive web rolls on said deck to cause said jaws to expand and automatically grip the winder shafts of said rolls upon contact therewith and for subsequently moving the carriage in the opposite direction to strip said shafts axially from within the stationary web rolls.

8. In a web roll winder shaft stripper, a web roll transfer table, means for ejecting successive web rolls with the winder shafts therein from a roll winding device onto one end of said table, a tiltable deck associated with the opposite end of said table, means for moving said table to cause the successive web rolls deposited thereon by said ejecting means to travel onto said deck, means for thereafter tilting said deck downwardly from a horizontal position to dispose the axes of the winder shafts of the successive web rolls deposited thereon in a horizontal fixed position, a carriage having thereon radially expandable and contractable gripping jaws movable toward and away from the successive web rolls in alignment with said shaft axes, means for moving said carriage horizontally toward the successive web rolls on said deck to cause said jaws to expand and grip the winder shafts of said rolls upon contact therewith, means for subsequently moving the carriage in the opposite direction to strip said shafts from within the web rolls, and means for finally further tilting said deck to eject the successive de-shafted web rolls therefrom by gravity.

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