Jan. 7, 1964 L. V. ANDERSON ETAL 3,116,891

SEGMENTED COIL DRUM

Filed May 12, 1961 4 Sheets-Sheet 1

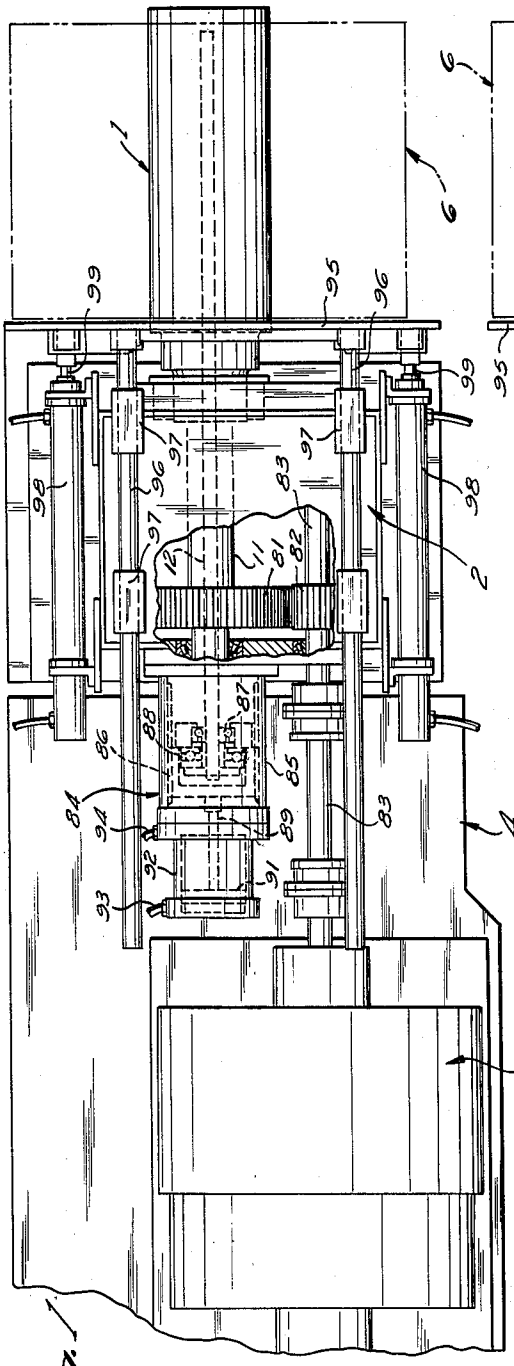


Fig. 1

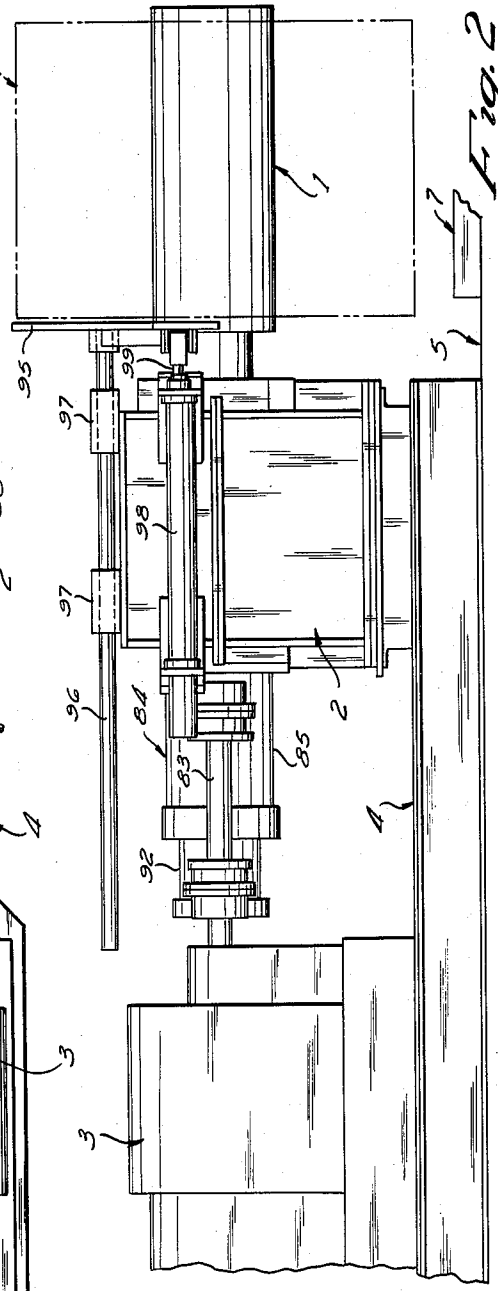


Fig. 2

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SEGMENTED COIL DRUM

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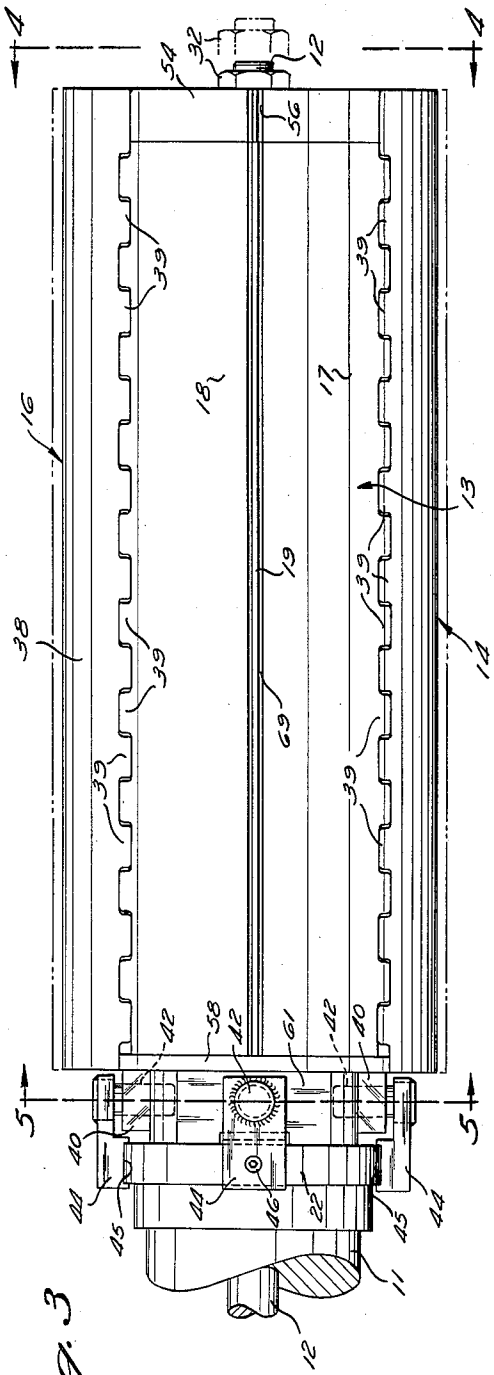


Fig. 3

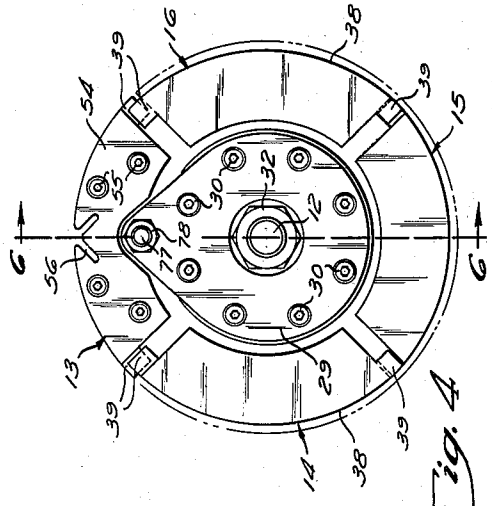


Fig. 4

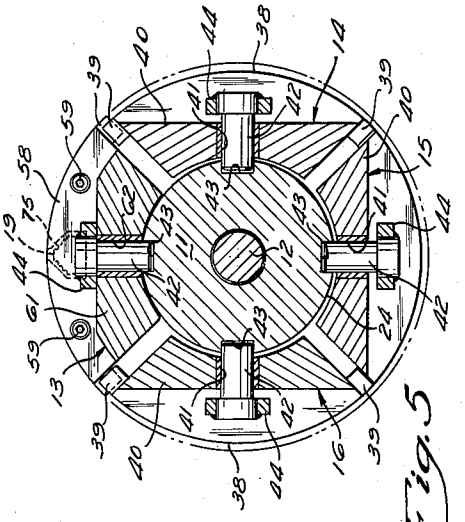


Fig. 5

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SEGMENTED COIL DRUM

Filed May 12, 1961 4 Sheets-Sheet 3

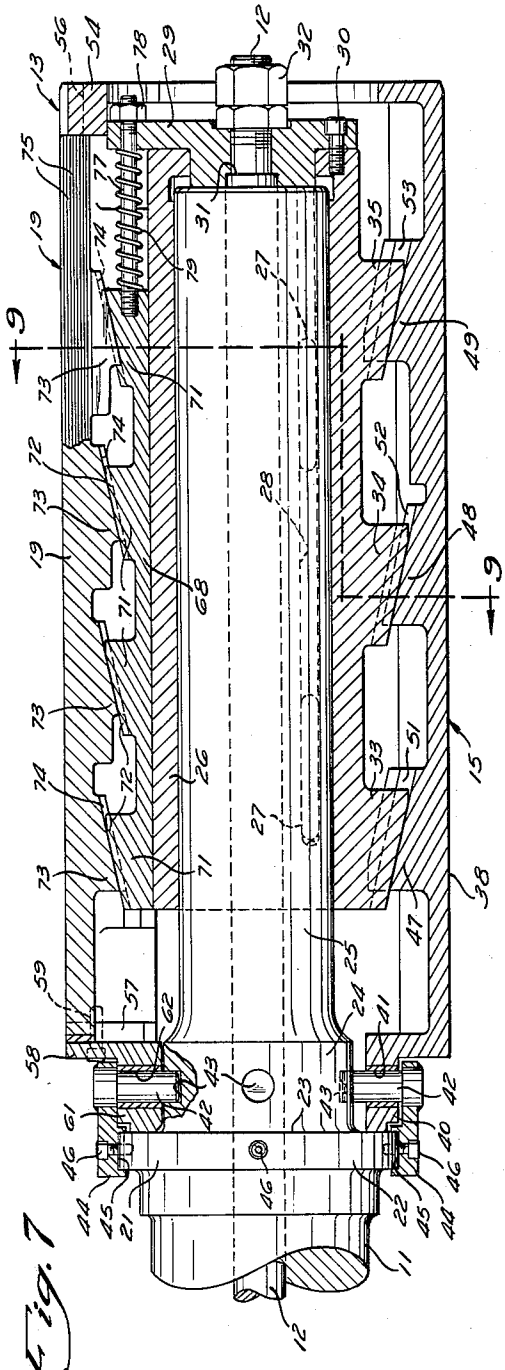


Fig. 7

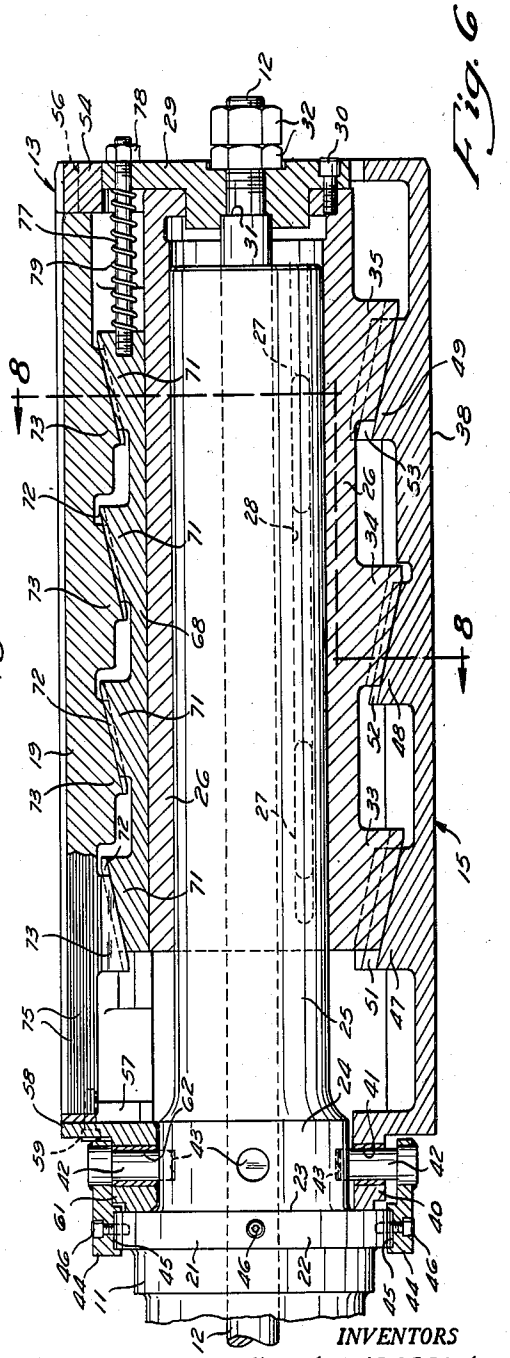


Fig. 6

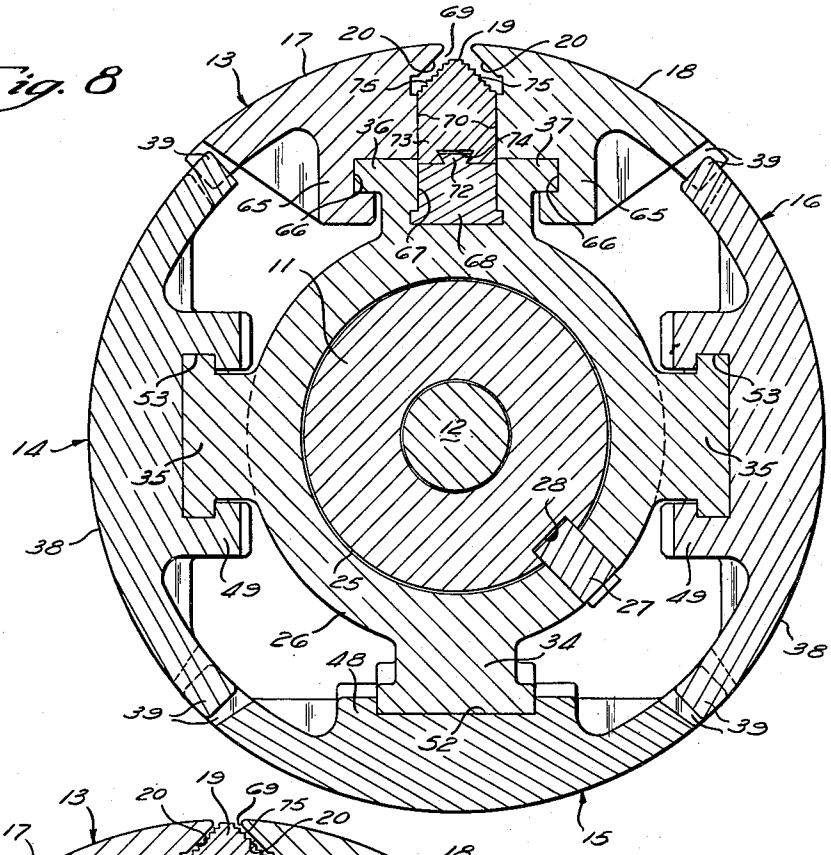
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Fig. 8



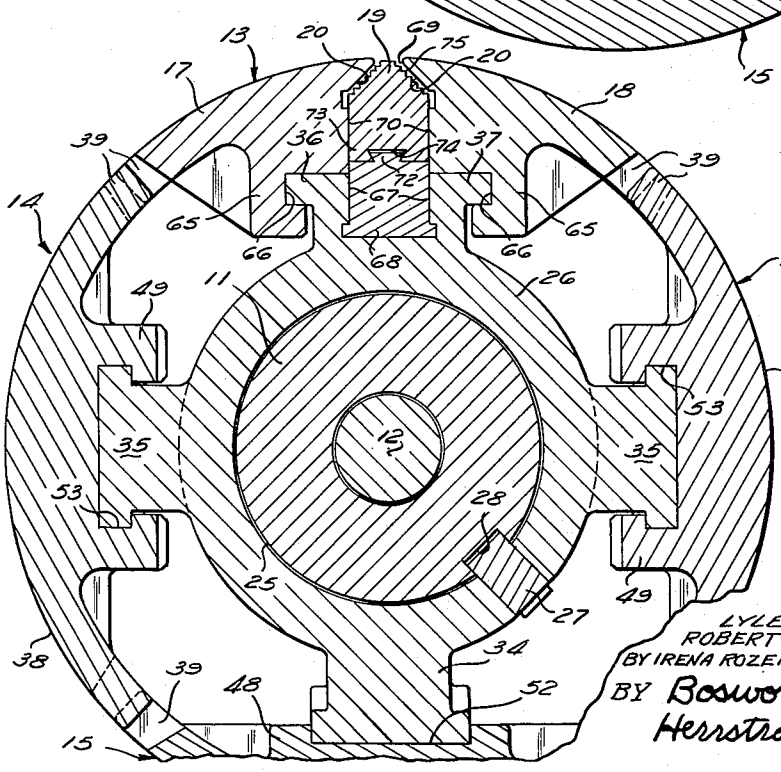


Fig. 9

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United States Patent Office 3,116,891 Patented Jan. 7, 1964

3,116,891

SEGMENTED COIL DRUM

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Filed May 12, 1961, Ser. No. 109,782
5 Claims. (Cl. 242—72.1)

This invention relates to pay-off and tension reels for coils of metal strip, and more particularly to reels in which the cross sectional size of the reel-carrying drums may be easily and rapidly changed so that the drums can carry coils having central openings of considerably different diameters.

While the invention may be employed to advantage for various purposes, it provides particular benefits when employed in pay-off and tension or take-up reels in processing lines for strip material such as steel. The processing line may be supplied from a coil of strip mounted on a pay-off reel. In other cases the strip from a processing line may be wound into a coil by a take-up or tension reel. In many cases, the metal is unwound from a coil mounted on a pay-off reel, passed through the processing line, and rewound into a coil mounted on a take-up reel. In both pay-off and take-up reels, it is often necessary to change the drum size in order to accommodate coils having central openings of different diameters. For example, the drums of pay-off reels often must be changed to accommodate coils having center openings of different sizes, while on take-up reels it is often necessary to wind coils having different sizes of inner openings.

The present practice is to provide for changes in drum size by making drums with several exterior replaceable drum segments, each of which is radially held on a hub member of the drum by several bolts which extend radially of the drum. The difficulties in the design and construction of the drums are increased by the requirement that the segments be radially movable so as to enable the drum to grip and release a coil. To satisfy the requirements for strength and rigidity, the segments must be quite heavy. Most if not all of the securing bolts pass through the segment surfaces which carry the coil. Usually there are four segments, each held in place by six or more bolts. Therefore, the changing of drum size has been a laborious and time-consuming operation involving the removal of the several bolts from each segment, removal of individual heavy segments, fitting the several individual heavy replacement segments, and replacing the bolts. The manual labor required for these operations is costly, but the production loss resulting from interruption of the operation for the lengthy periods required to effect the change in drum size is even more costly. Furthermore, the bolts holding the segments wear and often jam, adding to the difficulties and time required for replacement of segments. The efforts made to achieve higher processing speeds necessarily involve higher speeds of drum rotation and increased centrifugal forces on the heavy drum segments holding the segments to the hub member. If bolt failure results from stresses resulting from such forces, substantial safety hazards can result as well as damage to the material in the coil and to equipment.

An object of the invention is the provision of a reel drum the cross sectional size of which may be changed readily and rapidly, and which is free of these and other disadvantages. A further object is the provision of a reel drum in which the size of the drum can be changed by the removal and replacement of very few bolts and nuts and the removal of a single drum assembly embodying all drum segments and its replacement by another drum assembly embodying drum segments defining a drum of

different size. Another object is the provision of a reel drum in which the segments thereof are readily replaceable to change the cross sectional size of the drum, but in which such segments are radially held in place by means other than bolts. Another object is the provision of such a drum having segments which are radially movable in the assembled drum to expand and collapse the drum. The manner of attaining these and other objects of the invention will become apparent from the following description of a preferred form of the invention, reference being made to the accompanying drawings in which:

FIGURE 1 is a plan view, with parts broken away, of a power driven take-up reel having a drum embodying the present invention;

FIGURE 2 is a side elevation of the apparatus of FIGURE 1;

FIGURE 3 is a plan to an enlarged scale of the drum portion of the apparatus of FIGURES 1 and 2, the drum being positioned with its strip-gripping slot at the top, and being shown in contracted condition in full lines and expanded condition in broken lines;

FIGURE 4 is an end elevation taken as indicated by line 4—4 of FIGURE 3, the full lines depicting the drum in its contracted condition while the broken lines show it in its expanded condition;

FIGURE 5 is a sectional elevation along line 5—5 of FIGURE 3, the full and broken lines having the same significance;

FIGURE 6 is a longitudinal sectional elevation along line 6—6 of FIGURE 4 showing the parts of the drum structure in the positions they occupy when the drum structure is contracted;

FIGURE 7 is a longitudinal section corresponding generally to FIGURE 6, but showing the relationship of the parts when the drum is expanded;

FIGURE 8 is a cross sectional elevation along line 8—8 of FIGURE 6, but to a larger scale; and

FIGURE 9 is a cross sectional elevation along line 9—9 of FIGURE 7 but to a larger scale.

As shown in FIGURES 1 and 2 the illustrated take-up reel is adapted to coil steel strip emanating from a processing line. The apparatus comprises a drum embodying the invention and generally indicated by reference numeral 1, a transmission unit generally indicated by reference numeral 2, which rotatably supports the drum, and a power source such as a motor 3, which positively rotates the drum as required through transmission unit 2. The transmission unit 2 and motor 3 are rigidly mounted on a frame 4 fixed to floor 5. The drum 1 is adapted to carry a coil 6 shown in broken lines. Suitable coil hoist means, generally indicated by reference numeral 7, is located below the drum 1 in the conventional manner.

The drum 1 is of the cantilever type in that it is supported from one end only and has its other end free. The drum is mounted on and rotates with a shaft 11. One end of the shaft is unsupported and the other end is supported and driven by the transmission unit 2; the shaft can be rotated when desired by motor 3, as described below. An operating rod 12 is mounted coaxially of the shaft. Rod 12 is adapted to be moved axially of shaft 11, by means later described, to expand and collapse the drum 1. The drum is designed so that it can be collapsed to a smaller circumference to enable a coil to be placed on or removed from the drum over its free end, and to be expanded to a larger circumference so that it can firmly engage the inner surface of the coil to prevent relative rotation between the coil and the drum.

As shown in FIGURES 3 to 9, drum 1 preferably comprises a plurality of segments 13, 14, 15 and 16 having curved exterior surfaces which define a drum having a generally cylindrical exterior configuration. In the assembled drum, the segment 13 comprises two parts 17

and 18 rigidly connected to each other (see FIGURES 8 and 9). Segment 13 as a whole is both axially and radially immovable relatively to the drum; the segments 14, 15 and 16 are axially immovable but radially movable relatively to the drum as a whole to provide the above mentioned expanded and contracted circumferences of the drum. The assembled drum also includes a clamping bar 19 adapted to be moved radially outwardly toward and inwardly away from cooperating clamping edges 20 of the parts 17 and 18 of segment 13 as segments 14, 15 and 16 move radially outwardly and inwardly. In this manner the end of a strip can be clamped between the bar 19 and one of the cooperating clamping surfaces 20 of the segments 13 when the bar 19 is moved radially outward. Segments 14, 15, and 16 and clamping bar 19 are moved radially from axial movement of the operating rod 12 as described later.

In order to make it possible rapidly and readily to change the size of the drum, the segments 13 to 16 inclusive, and the clamping bar 19 are included in a subassembly which may be easily removed and replaced with another subassembly to provide a larger or smaller drum. The structure for accomplishing this result is shown in FIGURES 6 to 9 inclusive. Adjacent the transmission unit 2, the shaft 11 is provided with a radially extending flange 21 having an outer surface 22 and a radial shoulder 23. The shaft has a short cylindrical portion 24, providing a ledge portion which extends forwardly from the shoulder 23 and merges into a long cylindrical bearing portion 25, of slightly reduced diameter, which extends to the free end of the shaft.

In order to support and operate the segments and clamping bar, a hub member 26 is mounted on the cylindrical bearing portion 25 of shaft 11 so that it is incapable of rotational movement but is capable of axial movement relatively to the shaft. The inner bore of the hub member fits closely on portion 25 of the shaft. The hub member is driven with the shaft by two longitudinally extending keys 27 that are fixed to the hub member and are adapted to slide in a keyway 28 formed in and extending longitudinally of shaft 11 from its free end to a point near its supported end. The hub member can be moved axially of shaft 11 by a spider 29 which is fixed to the front end of the hub member as by bolts 30 and is clamped between shoulder 31 on rod 12 and locknuts 32 threaded on the end of the rod.

Hub member 26 is provided with inclined wedge portions 33, 34 and 35 arranged in a plurality of circumferentially spaced longitudinally extending rows. The wedge portions 33, 34 and 35 in each row slidably carry one of the radially movable segments 14, 15 and 16. Hub member 26 also is formed with two longitudinally extending slide members 36 and 37 which define a guide portion, parallel to the axis of shaft 11, slidably carrying the radially immovable parts 17 and 18 of segment 13.

Each of the radially movable segments 14, 15 and 16 comprises an outer peripheral portion 38 formed with a curved outer surface constituting part of a cylinder and longitudinal dentate edges having spaced tooth portions 39. The segments 14, 15 and 16 are identical except that the tooth portions 39 of the segment 15 are spaced to fit in between the tooth portions of segments 14 and 16, as shown in FIGURE 3. At its rear end, each segment 14, 15, 16 is formed with a rigid inwardly offset flange or arm portion 40 having a bushed opening 41 (see FIGURES 3 and 5). Each opening 41 carries a pin 42, the inner end of which closely fits into a recess 43 in the cylindrical portion 24 of shaft 11, and the outer end of which is rigidly fixed to a clamp member 44 as by welding.

In order to demountably secure the clamp member to the shaft 11, each clamp member 44 is provided with a groove 45 that fits over the outer periphery 22 of flange 21 of shaft 11, and is held in place by cap screw 46 threaded into the flange 21. Each clamp member 44 is thus firmly fixed on shaft 11 to resist the substantial

forces tending to move the segments axially, by the end of pin 42 in recess 43 and by groove 45 fitting over flange 21, as well as by cap screw 46. Each segment 14, 15 and 16 is thus firmly secured against movement longitudinally of the shaft 11, while being permitted to move radially of such shaft since the flange portion 40 is thinner than the space between clamp member 44 and shaft 11.

The inner surface of the peripheral portion 38 of each of these segments is formed with a longitudinal row of inclined wedge portions 47, 48, and 49 that cooperate with the inclined wedge portions 33, 34, and 35 of the corresponding row on hub member 26. Wedge portion 47 near one end of the segment is provided with a longitudinally extending, inclined, undercut T-shaped guide groove 51 which closely fits and is adapted to slide on the corresponding T-shaped inclined wedge portion 33, similarly, an underduct T-shaped guide groove 53 of wedge portion 49 at the other end of the segment is closely and slidably fits on the T-shaped portion of wedge 35. The central wedge portion 48 of the segment has an open guide groove 52 adapted to bear against the corresponding inclined central wedge portion 34 of hub member 26.

The inclined surfaces of wedge portions 33, 34 and 35 of the rows on hub member 26, and the mating inclined surfaces of wedge portions 47, 48, and 49 of segments 14, 15, and 16 all have the same angle of inclination, approximately 12° in the illustrated embodiment, and all incline outwardly toward the free or unsupported end of drum assembly 1. The angle and direction of inclination are such that when the hub member 26 is moved toward the unsupported end of the drum assembly 1, the radially movable segments 14, 15, and 16 are drawn radially inwardly toward the axis of the shaft 11 as is shown in FIGURES 6 and 8; whereas when hub member 26 is moved toward the supported end of the drum assembly, these segments are forced outwardly away from the axis of the shaft 11, as shown in FIGURES 7 and 9. Each of these radially movable segments 14, 15, and 16 is prevented from moving longitudinally of the drum by the radially extending pin 42 fixed on the shaft 11 by one of the clamps 44 as described above. The inclined T-shaped wedge portions 33 and 35 of hub member 26, closely fitting in the inclined T-shaped guide grooves 51 and 53 of the wedge portions 47 and 49 of each radially movable segment 14, 15, and 16, thus firmly support the segments on hub member 26.

To form the stationary segment 13, the front ends of the segment parts 17 and 18 are connected to a heavy cross member 54 (see FIGURES 3 and 4), as by bolts 55; member 54 is slotted as at 56 to receive the end of a strip. The rear ends of segment parts 17 and 18 are formed with integral lugs 57 which are fastened to a rear cross member 58, as by bolts 59 (see FIGURES 3, 5, 6, and 7). Cross member 58 has a rearwardly extending flange portion 61 provided with a bushed opening 62 through which another pin 42 extends. This pin is part of a clamp member 44 demountably secured to shaft 11 by engagement of groove 45 with flange 21, cap screw 46 threaded into flange 21, and a recess 43 in the shaft 11 receiving the inner end of the pin 42, as described above in connection with the clamping members 44 for the other segments. In this case, however, since the segment 13 is not radially movable, the flange portion 61 is thick enough to substantially fill the space between the clamping member 42 and the portion 24 of shaft 11, as shown in FIGURES 5, 6, and 7.

The segment 13 is held against movement radially or axially of the drum, by the parts just described. It is also supported by the axially movable hub member 26. For this purpose, parts 17 and 18 of segment 13 are each formed with a longitudinally extending guideway 65 having an undercut laterally extending groove portion 66, the guideways 65 and groove portions 66 being so formed that in the assembled segment 13 they define a substan-

tially T-shaped slot extending parallel to the axis of shaft 11. This slot makes slidable contact with the parallel slide members 36 and 37 of hub member 26, which define a guide portion of generally T-shaped outer configuration extending parallel to the axis of shaft 11 and hub member 26. These slide members 36 and 37 also define between them a longitudinally extending outwardly opening slot 67 of undercut T-shaped cross section. Slot 67 slidably supports and makes an interlocking connection with a closely fitting actuating bar 68 of T-shaped cross section, which bar is thus axially movable but radially immovable relatively to hub member 26. Bar 68 serves to move radially the clamping bar 19, which is slidably located in the slot 69 of segment 13 defined by the longitudinally extending facing surfaces 70 of segment parts 17 and 18, in such manner that the bar is radially movable but prevented from moving axially of the drum by the end cross members 54 and 58 of segment 13.

To move the clamping bar 19 radially, the upper portion of the actuating bar 68 is provided with several longitudinally inclined wedge portions 71 each having an outwardly extending undercut key-shaped slide portion 72, as shown in FIGURES 6 and 8. The inner portion of clamping bar 19 is formed with a corresponding number of inclined wedge portions 73 each having an undercut key-shaped guide slot 74 adapted to closely fit and slidably engage the corresponding key-shaped slide portion 72. The wedge portions are inclined outwardly toward the free end of the drum structure so that when the actuating bar 68 moves toward the free end of the drum structure with the hub member 26, it draws the clamping bar 19 radially inwardly; and when the actuating bar 68 moves away from the free end of the drum structure, it forces the bar 19 outwardly. Preferably, the outer longitudinal edge of the clamping bar 19 tapers to a longitudinal ridge as shown in FIGURES 8 and 9, and has closely spaced longitudinally extending serrations 75 which aid in firmly gripping the edge of the strip material against one of the cooperating inclined clamping surfaces 20 of the fixed segment 13.

The actuating bar 68 is moved longitudinally as described above by the operating rod 12. In the illustrated apparatus, a stud 77 threaded into the front end of actuating bar 68 slidably passes through a projecting lug of the spider member 29 fixed to the operating rod 12 and hub member 26. The end of the stud 77 projecting from member 29 has an adjustable stop nut 78; a compression spring 79 also surrounds the stud 77 between the facing surfaces of the actuating bar 68 and the spider 29. Therefore, when the operating rod 12 moves the hub member 26 toward the free end of the drum, the actuating bar 68 is positively drawn in the same direction with such members by stud 77, and the clamping bar is positively moved radially inwardly of the drum. However, when the operating rod 12 and hub member 26 are moved axially away from the free end of the drum, the actuating bar 68 is resiliently moved in the same direction through the compression spring 79, thus causing the clamping bar 19 to be resiliently forced outwardly in clamping relation; this resiliency facilitates gripping of the inner edge of the coil strip material between one of the clamping surfaces of the bar 19 and one of the surfaces 20 of segment 13.

In operation of the illustrated drum, movement of the operating rod 12 toward the free end of the drum to its extreme position illustrated in FIGURE 6 causes the spider member 29 fixed to the end of the rod 12 to move the hub member 26 simultaneously with the rod. Such movement of the hub member 26 causes the wedge portions 33, 34, and 35 of the hub member 26 to slide relatively to the wedge portions 47, 48, and 49 of the radially movable segments 14, 15, and 16, causing these segments to be drawn radially inwardly by the cooperating interlocked wedge portions 33 and 47, and 35 and 49; these segments 14, 15, and 16 are prevented from movement axially or longitudinally of the drum by the pins 42 of clamping members 44 rigidly secured to the shaft 11. The actuating bar 68 is moved simultaneously with hub member 26 by the stud 77 which is in tension; this longitudinal movement of the actuating bar 68 relatively to the clamping bar 19 causes the clamping bar to be drawn inwardly toward the axis of the drum structure. The drum structure now has its smallest external circumference and the clamping bar 19 is located at its innermost position, as shown in FIGURES 6 and 8, so that the drum structure is ready to have the end of a length of strip material positioned in the slot 69 between the clamping bar 19 and a clamping surface 20 of segment 13.

When the operating rod 12 is moved axially within shaft 11 away from the free end of the drum toward its supported end, the spider member 29 and hub portion 26 move simultaneously with rod 12. Such axial movement of the hub portion 26 causes the inclined surfaces of the wedge portions 33, 34 and 35 of the hub member 26 to slide relatively to the inclined surfaces of wedge portions 47, 48, and 49 of the segments 14, 15, and 16, thus forcing the segments radially outwardly. Pressure of the spider member 29 against the spring 79, and pressure of the spring 79 against the end of actuating bar 68 causes the bar to move axially relatively to the hub member 26, thus causing the bar to be forced radially outwardly so that its outer edge resiliently clamps the end of the strip against an edge 20 of segment 13. FIGURES 7 and 9 show the relative positions of the parts when the operating rod 12 is moved to its extreme position relatively to the supported end of the drum structure. When in this condition, the drum has its maximum circumference and the clamping bar 19 is located in its extreme outward position, so that the drum can firmly support and grip a coil.

Preferably, the drum is supported in such manner so that it can be rotated in either direction when desired, and so that the operating rod 12 can be axially moved in either direction to expand or collapse the drum while it is stationary or while it is being rotated. The shaft 11, which is rotatably supported and secured against axial movement by transmission unit 2, is positively rotated when desired by a gear 81, fixed to the shaft, meshing with a pinion 82 fixed to a shaft 83 driven by the motor 3.

The operating rod 12 has a rear portion extending from the rear end of shaft 11. This projecting end of rod 12 is connected to means, generally indicated by reference character 84, which rotatably supports the end of the rod while moving it axially as required. This means comprises a housing 85 rigidly fixed to the transmission unit 2 and containing a saddle member 86 slidably but non-rotatably mounted in housing 85. The end of rod 12 is supported in saddle member 86 by a bearing 87 and is adapted to be moved axially through a thrust bearing 88, one race of which is connected to the end of the rod 12 and the other race of which is supported in the saddle member 86. The saddle member 86 is moved axially as required by the piston rod 89 actuated by the piston 91 of a hydraulic cylinder 92. The hydraulic cylinder is connected through conduits 93 and 94 to a suitable source of hydraulic fluid under pressure.

The illustrated apparatus also includes a stripper plate 95 for pushing the coil 6 off the drum 1 when the drum is in its contracted or collapsed condition. This stripper plate is fixed to two bars 96 slidably mounted in guides 97 fixed to transmission unit 2, and is moved axially of drum 1 as required by two hydraulic cylinders 98 fixed to unit 2 and having piston rods 99 connected to the stripper plate. When a coil is stripped from the drum, the end of the strip that was clamped by bar 19 passes through the slot 56 in cross member 54.

The size of the drum 1 can be readily changed within wide limits to accommodate coils having different size inner openings. This can be accomplished merely by

removing the four cap screws 46 and the four clamping members 44 with their affixed pins 42, removing locknuts 32 from the outer end of operating rod 12, and removing from the main shaft 11 the entire drum assembly comprising hub member 26, and segments 13, 14, 15, and 16 and associated parts mounted on such hub member. A replacement drum assembly of different cross sectional size but of corresponding parts then may be easily installed on the projecting shaft 11 by sliding it over the free end of shaft 11 with its keys 27 in keyway 28 of the shaft, mounting four clamping members 44 in place with their pins 42 extending through the bushed openings 41 of segments 13, 14, 15, and 16 into the recesses 43 in the shaft and with their grooves 45 fitting over the radially extending flange 21 of the shaft 11, threading the four cap screws 46 into place to hold the clamping member securely, and then threading the locknuts 32 on the end of operating rod 12.

The operation just described requires much less time to change drum sizes than is required by conventional practices involving bolting on of segments of different sizes. Substantial savings in labor costs are effected in the operation of changing the drum; and even greater savings result from the reduction in loss of production. Furthermore, the design is such that the clamping members, bolts and nuts are always readily removable since they are not subjected to impact or to contact within the coil so that prior difficulties arising from jamming of bolts or nuts are avoided. Moreover, the simple and rugged construction of the parts, and the firm holding of the segments in place on the hub member by slides and guideways of interlocking cross section provide the rigidity and strength required to support the coil, and make possible safety in operation even at high rotational speeds.

Those skilled in the art will appreciate that various changes and modifications can be made in the illustrated embodiment of the invention without departing from the spirit and scope thereof, and that the invention may be employed for purposes other than that in connection with which it was specifically discussed. The essential characteristics of the invention are defined in the appended claims.

We claim:

1. An expandable drum for coiling strip material comprising

a supporting and driving shaft rotatably supported from one end about an axis and having an unobstructed free end, said shaft having near its supported end a generally axially extending segment connecting portion;

a drum assembly demountably supported on said shaft and comprising

a hub member mounted on said shaft to move non-rotatably but axially relatively to said shaft, and to be axially moved on or off said shaft over its free end after the drum assembly is disconnected from said shaft, and

a plurality of elongated drum segments circumferentially arranged around and supported by said hub member for rotation therewith, at least some of said segments being movable on said hub member radially toward and away from said shaft upon movement of said hub member axially of said shaft, each of said radially movable segments having at its end near the supported end of said shaft an opening radially extending therethrough;

clamp means demountably fixed on said connecting portion of said shaft and rigidly carrying a pin extending through and slidably engaging the opening of each radially movable segment, whereby each of said radially movable segments is permitted to move radially relatively to said shaft but is prevented from moving longitudinally of said shaft when said hub member moves axially thereof; and

means for moving said hub member axially of said shaft, said means being demountably connected to said hub member at the free end of said shaft.

2. An expandable drum for coiling strip material comprising

a supporting and driving shaft rotatably supported from one end about an axis and having an unobstructed free end, said shaft having near its supported end means providing a generally axially extending segment connecting portion, said shaft having a plurality of openings extending radially inwardly of said shaft from said connecting portion;

a drum assembly demountably supported on said shaft and comprising

a hub member which is mounted on said shaft so that it can move non-rotatably but axially relatively to said shaft and be axially moved on or off said shaft over its free end after the drum assembly is disconnected from said shaft, and

a plurality of elongated drum segments circumferentially arranged around and supported by hub member for rotation therewith, at least some of said segments being movable on said hub member radially toward and away from said shaft upon movement of said hub member axially of said shaft, each of said radially movable segments having at its end near the supported end of said shaft a radially extending opening therethrough which is in alignment with one of said radial openings in said shaft;

clamp means demountably fixed on said flange means of said shaft and rigidly carrying a pin which extends through and makes sliding engagement with said opening of each radially movable segment and which is seated in one of said radial openings in said shaft, whereby each of said radially movable segments is permitted to move radially relatively to said shaft but is prevented from moving longitudinally of said shaft when said hub member moves axially thereof; and

means for moving said hub member axially of said shaft, said means being demountably connected to said hub member at the free end of said shaft.

3. An expandable drum for coiling strip material comprising

a supporting and driving shaft rotatably supported from one end about an axis and having an unobstructed free end, said shaft having near its supported end means providing a generally axially extending segment connecting portion;

a drum assembly demountably supported on said shaft and comprising

a hub member which is mounted on said shaft so that it can move non-rotatably but axially relatively to said shaft and be axially moved on or off said shaft over its free end after the drum assembly is disconnected from said shaft, and

a plurality of elongated drum segments circumferentially arranged around and supported by said hub member for rotation therewith, at least some of said segments being movable on said hub member radially toward and away from said shaft upon movement of said hub member axially of said shaft, each of said radially movable segments having an outer coil supporting surface the portion of which adjacent said connecting portion of said shaft is at all times a greater distance from said shaft axis than said connecting portion, each of said segments having at its end near the supported end of said shaft an arm portion extending over said connecting portion and located substantially closer to said shaft than the outer coil supporting surface portion of said segment adjacent said connecting portion,

said arm portion having an opening radially extending therethrough;

clamp means demountably fixed on said connecting portion of said shaft and rigidly carrying a pin which extends through said opening in each segment and makes sliding engagement with said opening of each radially movable segment, whereby each of said segments is permitted to move radially relatively to said shaft but is prevented from moving longitudinally of said shaft when said hub member moves axially thereof, all portions of said clamp means being closer to said shaft axis than said outer coil supporting surface portion of the adjacent segment;

and means for moving said hub member axially of said shaft, said means being demountably connected to said hub member at the free end of said shaft.

4. An expandable drum for coiling strip material comprising

a supporting and driving shaft rotatably supported from one end about an axis and having an unobstructed free end, said shaft having fixed near its supported end generally transversely extending radially projecting flange means with a generally axially extending outer edge and a ledge portion adjacent said flange means extending generally axially toward the free end of said shaft, said shaft having a plurality of openings extending radially inwardly of said shaft from said ledge portion;

an operating rod mounted in said shaft for axial movement toward and away from the free end of said shaft, said rod projecting from the free end of said shaft;

a drum assembly supported on said shaft and comprising

a hub member mounted on said shaft to move nonrotatably but axially relatively to said shaft and to be axially moved on or off said shaft over its free end after the drum assembly is disconnected from said shaft, and

a plurality of elongated drum segments circumferentially arranged around and supported by said hub member, at least some of said segments being movable on said hub member radially toward and away from said shaft upon movement of said hub member axially of said shaft, each of said radially movable segments having an outer coil supporting surface the portion of which adjacent said flange means on said shaft is at all times a greater distance from said shaft axis than said flange means, each of said segments having at its end adjacent said flange means an arm portion extending over said ledge portion of said shaft and being substantially closer to said shaft than the outer coil supporting surface of said segment, said arm portion having therethrough a radially extending opening which is in alignment with one of said radial openings in said shaft;

a plurality of clamp members, one for each of said segments, each clamp member comprising

a portion extending longitudinally of said shaft and having a groove which engages the edge of said flange means on said shaft,

a pin fixed to said portion and having a lower end seated in one of the radial openings in said shaft, said pin passing through and slidably engaging the opening through the arm portion of one of said radially movable segments, and

demountable radially extending means rigidly connecting said longitudinally extending clamp portion to said flange portion of said shaft, all portions of said clamp members being closer to said shaft axis than said outer coil supporting surface portion of the associated segment;

and demountable means located at and accessible from the free end of said shaft for connecting said hub member to said operating rod.

5. An expandable drum for coiling strip material comprising

a supporting and driving shaft which is rotatably supported from one end about an axis and has an unobstructed free end, said shaft having near its supported end a generally axially extending segment connecting portion;

a drum assembly demountably supported on said shaft and comprising

a hub member mounted on said shaft to move nonrotatably but axially relatively to said shaft, and to be axially moved on or off said shaft over its free end after the drum assembly is disconnected from said shaft, and

a plurality of elongated drum segments circumferentially arranged around and supported by said hub member for rotation therewith, at least some of said segments being movable on said hub member radially toward and away from said shaft upon movement of said hub member axially of said shaft, said segments having outer coil carrying surfaces which if projected toward the supported end of said shaft define a generally cylindrical projected surface, each of said radially movable segments having at its end near the supported end of said shaft radially extending slide means located wholly within said generally cylindrical surface;

holding means demountably fixed to said connecting portion of said shaft and located wholly within said generally cylindrical projected surface, said holding means having radially extending slide means for engaging said slide means on each of said radially movable segments and permitting each of said radially movable segments to move radially but not longitudinally relatively to said shaft, all parts of said holding means being radially removable from said shaft; and

means for moving said hub member axially of said shaft, said means being demountably connected to said hub member.

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