June 21, 1960 S. O. PERRINE 2,941,745

REEL FOR STRIP MATERIAL

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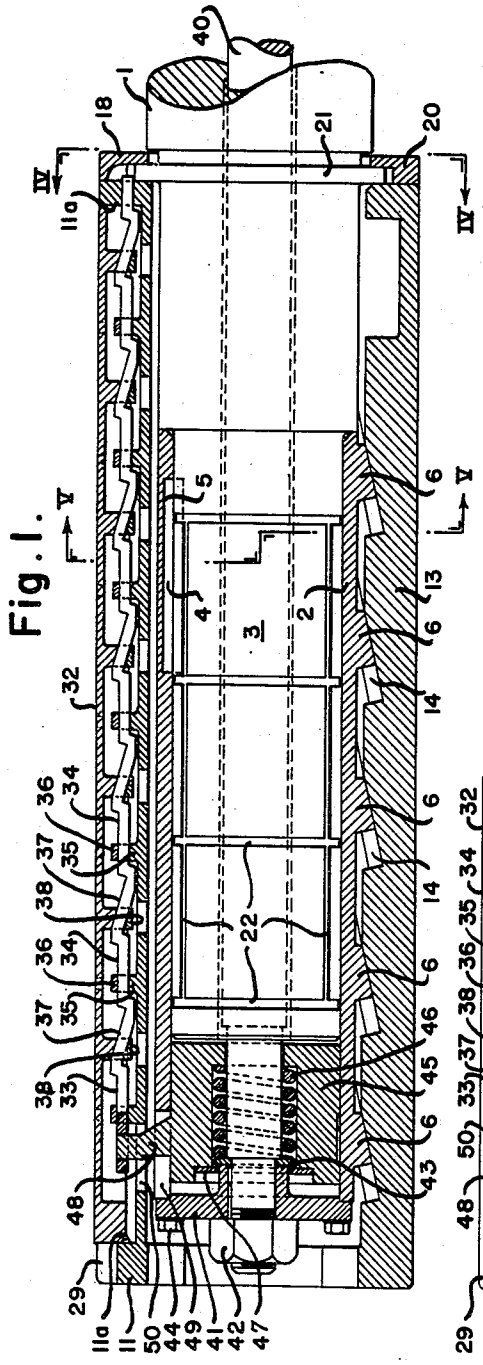


Fig. 1.

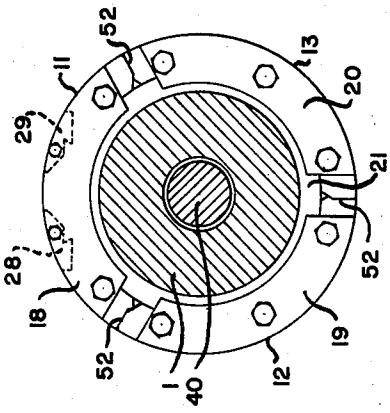


Fig. 4.

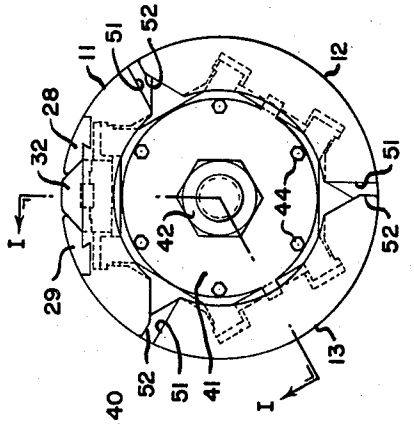


Fig. 3.

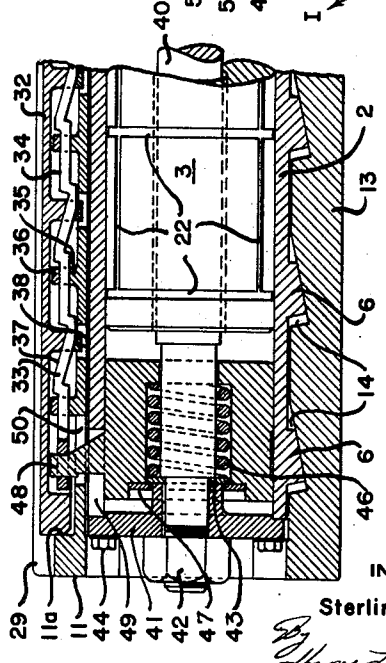


Fig. 2.

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REEL FOR STRIP MATERIAL

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Fig. 6.

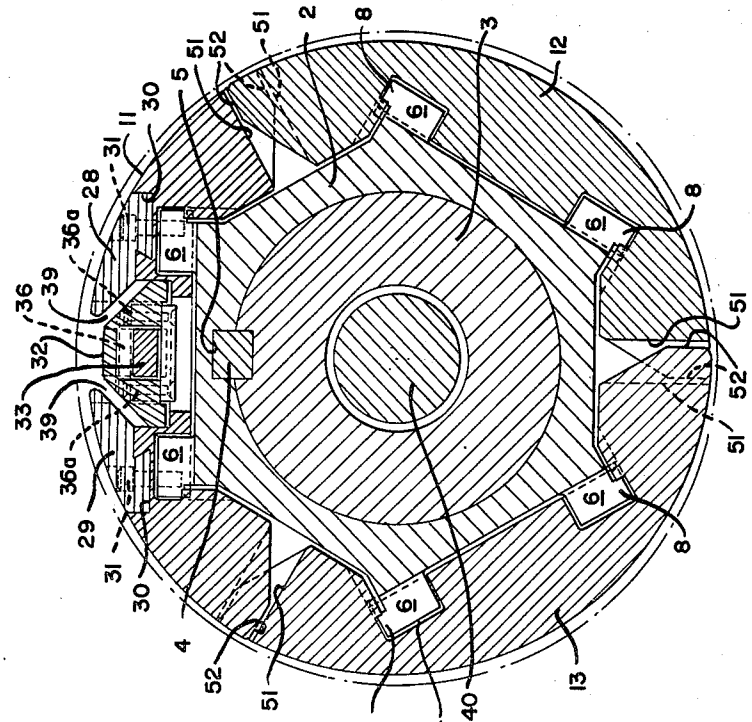
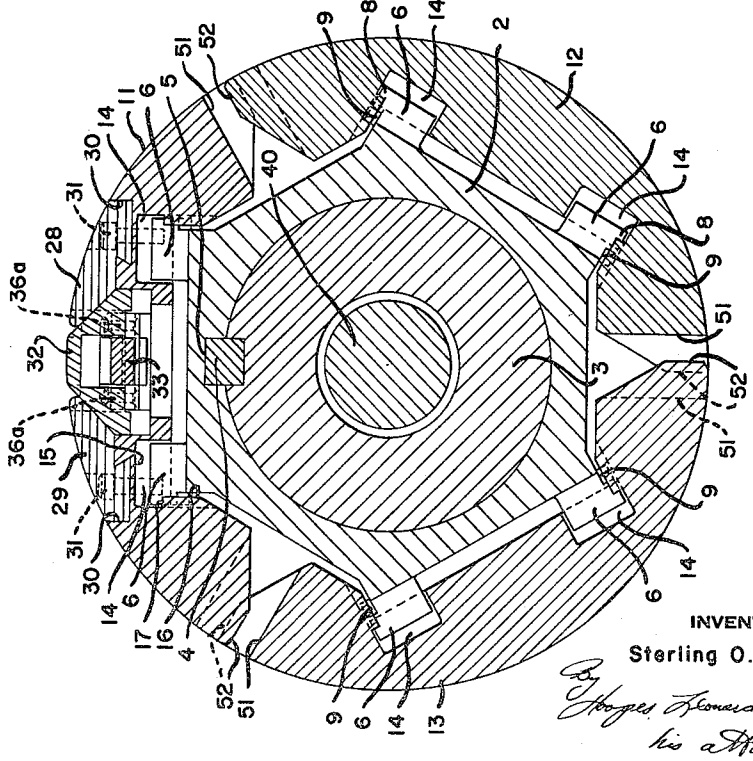


Fig. 5.



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REEL FOR STRIP MATERIAL

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Fig. 7.

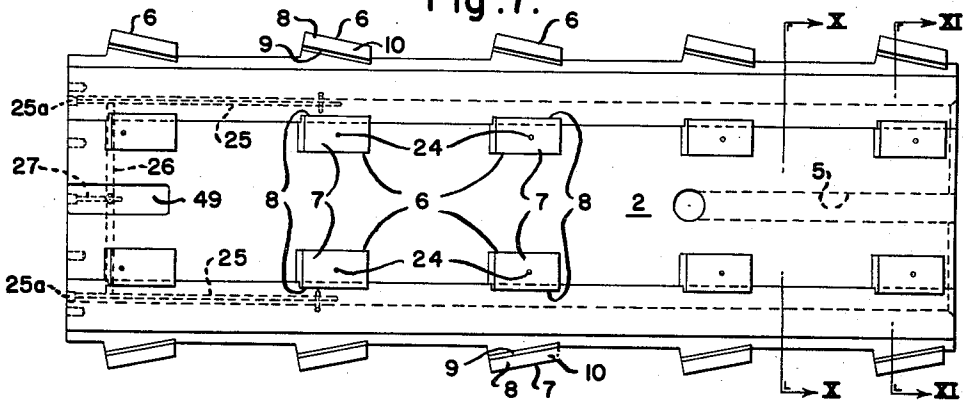


Fig. 8.

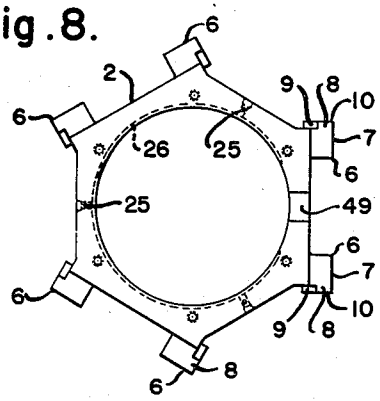


Fig. 9.

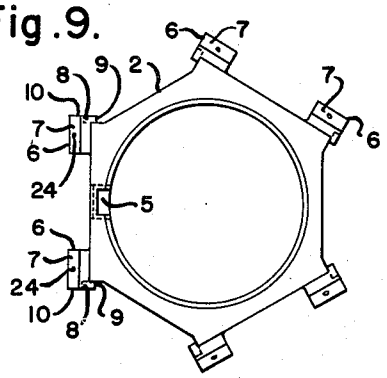


Fig. 10.

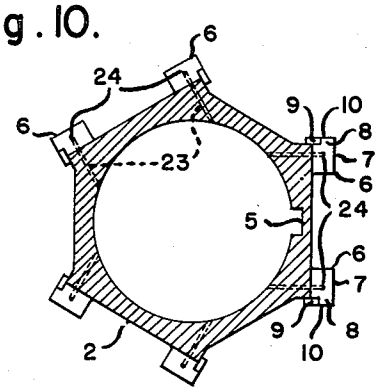
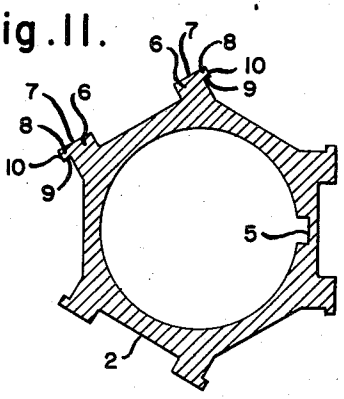


Fig. 11.



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Fig. 12.

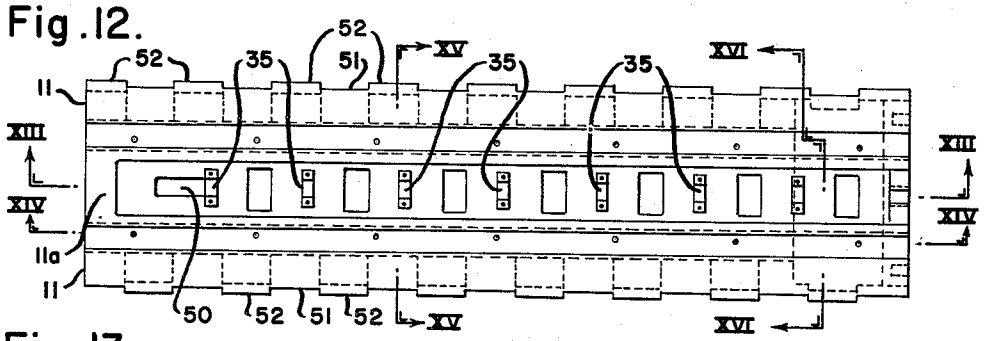


Fig. 13.

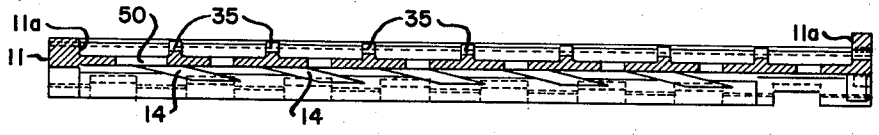


Fig. 14.

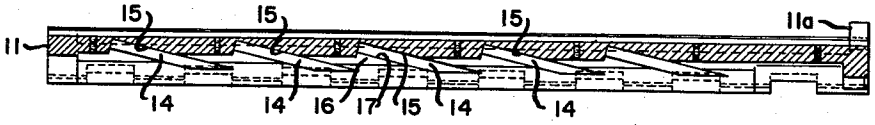


Fig. 15.

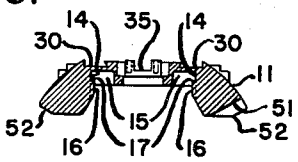


Fig. 16.

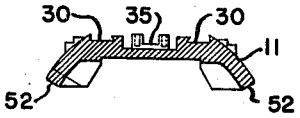
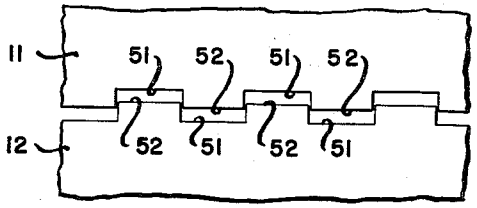


Fig. 17



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United States Patent Office 2,941,745 Patented June 21, 1960

2,941,745

REEL FOR STRIP MATERIAL

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Filed Oct. 10, 1956, Ser. No. 615,190

11 Claims. (Cl. 242—72.1)

This invention relates to reels for strip-like material and more particularly relates to reels having means for clamping the end of a length of strip preparatory to reeling it and means to decrease the diameter of the reel after a coil is wound in order to remove the coil readily from the reel.

I provide reel supporting means, a sleeve surrounding the reel supporting means, strip supporting means surrounding the sleeve and means to retract or expand the strip supporting means in operative connection between the sleeve and the strip supporting means. I further provide strip clamping means in clamping relationship with the strip supporting means and inclined means in operative connection with the strip clamping means for causing movement of the clamping means between operative and non-operative position. I preferably provide a plurality of wedges on the sleeve and mount a plurality of segments on the wedges, the segments being restrained against longitudinal motion but longitudinal motion of the sleeve being permitted. Preferably, I provide overhanging portions on the wedges and a plurality of machined portions on the inner side of the segments in positions corresponding to the positions of the wedges and forming similar overhanging portions which match and interlock with the overhanging portions on the wedges.

I prefer to provide means for shifting the wedges longitudinally whereby the segments which are restrained against longitudinal movement will expand and contract and their outer diameter or periphery be increased or reduced. I prefer to form a recess in one of the segments and to locate the strip clamping means therein. The segment is provided with one or more overhanging lips against which the strip clamping means may engage the strip in clamping engagement. Preferably, the strip clamping means are mounted on one of the segments and are radially movable, whereby when moved in one direction the strip clamping means will be urged toward the overhanging portion of the segment in strip clamping relationship therewith, and when urged in the other direction, will leave a slot into which the end of the strip may be freely inserted or from which it may be withdrawn. I provide clamp operating means comprising a plurality of inclined portions longitudinally slidable along the strip clamping means and effective when moved to cause radial movement of the strip clamping means. I prefer to employ hollow reel supporting means and place operating means therein. I connect the operating means to the sleeve, preferring a rigid connection, and to the clamp operating means, preferring a resilient connection.

Other details, objects and advantages of my invention will become apparent from the following description of a present preferred embodiment thereof.

In the accompanying drawings, I have illustrated a present preferred embodiment of my invention in which

Figure 1 is a side view of a reel embodying my invention, partially in cross section, showing the segments expanded and taken along line I—I of Figure 3;

Figure 2 is a view of part of Figure 1 showing the segments in collapsed position;

Figure 3 is an end view of the reel taken from the free end and showing the segments in expanded position;

Figure 4 is an end sectional view of the reel from the mounting end taken along line IV—IV of Figure 1 and showing the segments expanded;

Figure 5 is an enlarged cross-sectional view of the reel taken along line V—V of Figure 1 showing the segments expanded;

Figure 6 is an enlarged cross-sectional view of the reel taken along the same line as Figure 5 but showing the segments in collapsed position;

Figure 7 is a side elevation of the sleeve;

Figure 8 is an end view of Figure 7 taken from the free end of the sleeve;

Figure 9 is an end view of the sleeve in Figure 7 taken from the mounting end of the sleeve;

Figure 10 is a cross-sectional view of the sleeve taken on line X—X of Figure 7;

Figure 11 is a cross-sectional view of the sleeve taken along line XI—XI of Figure 7;

Figure 12 is a top plan view of the segment in which the clamping means are mounted;

Figure 13 is a cross-sectional view taken along line XIII—XIII of Figure 12;

Figure 14 is a cross-sectional view taken along line XIV—XIV of Figure 12;

Figure 15 is a cross-sectional view taken along line XV—XV of Figure 12;

Figure 16 is a cross-sectional view taken along line XVI—XVI of Figure 12; and

Figure 17 is a fragmentary view showing the edges of two of the segments when they are in expanded position.

Referring now to Figure 1 in which the reel is shown in cross section, a mandrel 1 is provided to support the reel. It will be understood that the mandrel is in horizontal position, is mounted on a base for rotation and is rotatably driven. Such construction is old and well-known in the art and will not be illustrated or further described here. A sleeve 2 is placed upon the mandrel and surrounds section 3 of the mandrel which has a reduced diameter. The sleeve is keyed to the mandrel by a key 4 fitting in a keyway 5 in the sleeve and a corresponding keyway in the mandrel. A plurality of wedges 6 are provided on the outer surface of sleeve 2. The wedges (Figures 7–11) have inclined surfaces 7 which also constitute the upper surfaces of overhanging portions 8. The inner surfaces 9 of the overhanging portions are likewise formed on the wedges and are parallel to inclined surfaces 7. The intersecting surfaces 10, as well as surfaces 7 and 9, are carefully machined and are preferably chrome-plated.

Three segments 11, 12 and 13 surround the sleeve. They have generally cylindrical outer surfaces and when mounted in position on sleeve 2, form a generally cylindrical strip winding surface.

Segment 11 (Figures 12–16) has a plurality of sloping portions 14 formed on its inner surface in positions corresponding to the positions of two rows of wedges 6 on sleeve 2. The sloping portions comprise a surface 15 which is inclined to the axis of segment 11 and an overhanging lip 16 having an upper surface 17 which is likewise inclined to the axis of segment 11 and is parallel to inclined surface 15. The degree of inclination of the wedges and of the sloping portions 14 are alike. Thus the sloping portions on the undersurface of segment 11 will match the corresponding wedges on sleeve 2. The overhanging portions 8 of wedges 6 and lips 16 will interlock permitting segment 11 to slide along the wedges

but not permitting it to be lifted bodily from the wedges. The faces of segments 12 and 13 adjacent to sleeve 2 are similar to the face of segment 11 which is adjacent to sleeve 2. Segments 12 and 13 each have sloping portions which correspond to the appropriate wedges 6 and which interlock therewith in the same manner as described for segment 11. Retainers 18, 19 and 20 are bolted to segments 11, 12 and 13 respectively. The retainers and the segments fit on opposite sides of collar 21 on mandrel 1 and restrain the segments against longitudinal movement on the mandrel.

A plurality of grooves 22 are provided on the reduced diameter section 3 of mandrel 1. Grease distributing passages 23 lead from the inner surfaces of sleeve 2 and terminate in holes 24 on inclined surfaces 7 of wedges 6. Grease injection passages 25 lead from a tapped hole in the end of the sleeve. A plug 25*a* is ordinarily screwed into the end of the hole but may be removed to receive a pressure grease fitting for lubrication. A further grease distributing passage 26 and grease injection passage 27 are provided for lubrication of the free end of sleeve 2.

Two insert members 28 and 29 are dovetailed in slots 30 on the upper surface of segment 11 and are held in position by mounting bolts 31. Their outer surfaces continue the curve formed by the outer surface of segment 11. Segment 11, of which insert members 28 and 29 form an integral part by attachment, thus has a recess or cavity formed along its length. A gripper bar 32 is placed in this recess. A gripper bar operating rod 33 is likewise mounted in the recess. It has a number of horizontal portions 34 which fit in U-shaped seats 35 formed on the flat section of segment 11. Caps 36 are fastened to the upstanding arms of seats 35 by bolts 36*a* and hold the gripper bar within the seats, permitting longitudinal movement of the gripper bar operating rod but restraining it from any other movement. Between seats 35, the gripper bar operating rod has a plurality of inclined portions 37. The lower surface of the gripper bar has bearing surfaces machined to the same angle of inclination as inclined portions 37, and caps 38 are provided to hold the gripper bar in sliding engagement with the gripper bar operating rod. The gripper bar is restrained against longitudinal movement by shoulders 11*a* (Figure 1) at either end of segment 11.

Mandrel 1 is hollow and a control rod 40 is placed within it. It will be understood that control rod 40 may be moved longitudinally by well-known external means but that it is free to rotate with mandrel 1. A cap 41 is secured on the end of control rod 40 by a nut 42 and is drawn snugly against a washer 43 which is in turn forced against a shoulder on the control rod. Sleeve 2 is bolted to cap 41 by bolts 44. A cup-shaped plunger 45 floats in the cavity formed by mandrel 1, sleeve 2 and cap 41. Spring 46, placed within the plunger, is under compression and exerts force on washer 43 and on the closed end of plunger 45. Retainer ring 47 is bolted to the open end of plunger 45 and has an opening smaller than the outer diameter of washer 43. Retainer ring 47 and washer 43 limit the longitudinal travel of plunger 45. Thus spring 46 is at its maximum extension (but is still in compression) when retainer ring 47 is bearing against washer 43 as is illustrated in Figure 2. Movement of plunger 45 toward cap 41 is permitted by compression of spring 46. In that case, retainer ring 47 will move away from washer 43. A lever 48 projecting from plunger 45 extends through slot 49 in sleeve 2 and slot 50 in segment 11. It fits through a slot in gripper bar control rod 33 preventing longitudinal movement but allowing radial movement of gripper bar control rod 33. When plunger 45 moves longitudinally relative to segment 11, it will cause like movement of gripper bar control rod 33 relative to segment 11, which in turn causes gripper bar 33 to move radially outward relative to segment 11. When gripper bar operating rod 33 is moved toward the supported end of the reel, as shown in Figure 1, the gripper bar will be in contact with inserts 28 and 29 as shown in Figure 5. When gripper bar control rod 33 is moved toward the unsupported end of the reel, as shown in Figure 2, gripper bar 33 will be withdrawn and will leave slots 39 open, as shown in Figure 6.

The segments 11, 12 and 13 have saw-toothed edges (Figure 17) comprising slots 51 and teeth 52. The slots and teeth in adjacent segments are staggered so that there is no continuous opening along the surface of the drum when the segments are in expanded or collapsed position.

In operation, control rod 40 is extended or moved to the position shown in Figure 2 by well-known external means. At this time, the segments will be in collapsed position (Figure 6) and gripper bar 32 will be withdrawn to form slots 39. The end of a strip of sheet material which is to be reeled or coiled is then placed in one of the slots 39 and control rod 40 withdrawn.

When control rod 40 is withdrawn it will move with it sleeve 2 and plunger 45. Segments 11, 12 and 13, which are restrained against horizontal movement by collar 31, will be forced to expand by action of wedges 6 which will slide along the segments. This will move gripper bar 32 and gripper bar control rod 33 radially but will not cause the relative position of gripper bar 32 and segment 11 to be changed. Simultaneously, however, plunger 45 will be carried along with control rod 40 by the pressure of spring 46 producing longitudinal movement of gripper bar control rod 33. Because gripper bar 32 is restrained against longitudinal movement, it will move radially on segment 11 until it meets resistance by clamping the strip in one of the slots 39 against one of the inserts 28 or 29. Further movement of control rod 40 will cause like movement of washer 43. Gripper bar 32, however, will not move further outward due to the end of the strip in slot 39. Gripper bar control rod 33 and plunger 45 will likewise remain fixed, and further movement of control rod 40 will cause compression of spring 46, thereby applying a clamping force to the strip end. After control rod 40 has been moved to its extreme position and the reel is in its fully expanded position, power is applied to mandrel 1, and strip is wound into a coil upon the reel. After a coil of proper size has been wound upon the reel, the strip is cut and the coil is restrained by banding around its circumference. Control rod 40 is then extended. This will cause the circumference of the segments to be reduced and will withdraw gripper bar 32, releasing the initial end of the coil. The coil is then drawn or pushed sidewardly from the reel to a point where it may be picked up by a crane or other conveying equipment and moved away. The leading end of the strip which is to form a new coil is then placed in slot 39 and the process is repeated.

By use of my invention, I am able to build a reel having far greater strength for a given external diameter than reels built heretofore. Mandrel 1 is of greater size than in conventional reels, and, therefore, possesses greater strength. Sleeve 2 adds structural strength to the reel. It will be apparent that larger coils can be formed on reels embodying my invention. The labor and expense of cutting the strip and removing the coil is, in this manner, reduced. The changeover time between coils aggregates less time and the productivity of a plant embodying my invention is thereby increased.

By way of example, a reel for steel strip built according to my invention, having an expanded diameter of twenty inches and winding a coil from strip sixty inches wide will, for the same design stresses, carry a load twice as great as other reels known to me. A conventional reel of these dimensions can wind a coil of not more than thirty thousand pounds without stresses in the reel exceeding a design stress, whereas a reel of the same dimensions embodying my invention can wind a

coil of sixty thousand pounds without exceeding the same stress.

While I have described and illustrated a present preferred embodiment of my invention, it is to be understood that I do not limit myself thereto and that my invention may be otherwise variously practiced within the scope of the following claims.

I claim:

1. A reel for strip material comprising reel supporting means, a sleeve surrounding the reel supporting means, strip supporting means surrounding the sleeve, retracting means for the strip supporting means on the sleeve and in positive engagement with the strip supporting means, strip clamping means in clamping engagement with the strip supporting means when in one position and not in clamping engagement with the strip supporting means when in another position, and inclined means in positive engagement with the strip clamping means effective to move the strip clamping means between clamping and non-clamping position.

2. A reel for strip material comprising reel supporting means, a sleeve surrounding the reel supporting means, strip supporting means surrounding the sleeve, retracting means for the strip supporting means on the sleeve and in positive connection with the strip supporting means, strip clamping means in clamping engagement with the strip supporting means when in one position and not in clamping engagement when in another position, means restraining the strip clamping means against longitudinal movement, inclined means in sliding positive engagement with the strip clamping means and positioned for longitudinal movement, the strip clamping means being effective when moved in one direction to move the strip clamping means to non-clamping position, and when moved in the other direction to move the strip clamping means to clamping position.

3. A reel for strip material comprising reel supporting means, a sleeve surrounding the reel supporting means, strip supporting means surrounding the sleeve, retracting means for the strip supporting means on the sleeve and in positive engagement with the strip supporting means, strip clamping means positioned inwardly of the periphery of the strip supporting means, cam means longitudinally disposed within the periphery of the strip supporting means in positive engagement with the strip clamping means, said cam means being shiftable between a strip clamping position and a strip non-clamping position.

4. A reel for strip material comprising reel supporting means, a sleeve surrounding the reel supporting means, strip supporting means surrounding the sleeve, retracting means on the sleeve and in positive connection with the strip supporting means, strip clamping means in clamping relationship to the strip supporting means, cam means within the periphery of the strip supporting means in positive connection with the strip clamping means and positioned for longitudinal movement, said cam means effective when moved in one direction to move the clamping means to clamping position and when moved in the other direction to move the clamping means to non-clamping position.

5. A reel for strip material comprising reel supporting means, a sleeve surrounding the reel supporting means, strip supporting means surrounding the sleeve, position shifting means on the sleeve and in positive engagement with the strip supporting means, means for operatively manipulating said strip supporting means and said position shifting means whereby the periphery of the strip supporting means may be varied, strip clamping means adjacent the strip supporting means, operating means for said strip clamping means comprising a plurality of inclined portions arranged with the strip clamping means for longitudinal movement thereagainst whereby the strip clamping means may be moved into or out of clamping position, and means for causing said longitudinal movement.

6. A reel for strip material comprising hollow reel supporting means, a sleeve surrounding the reel supporting means, a plurality of wedges on the sleeve, a plurality of segments surrounding the sleeve and in sliding engagement with the wedges and having a positive connection thereto, a recess in one of the segments, strip clamping means located in said recess, at least one strip clamping surface of said segment, means comprising a plurality of inclined portions in positive connection between the strip clamping means and the segment, means restraining said segment and said strip clamping means against longitudinal movement, operating means positioned within the hollow in the supporting means and operable to cause longitudinal movement of said inclined portions.

7. A reel for strip material comprising hollow reel supporting means, a sleeve surrounding the reel supporting means, a plurality of wedges on the sleeve, a plurality of segments positively positioned on the wedges for sliding movement, a recess within one of the segments, strip clamping means within said recess, strip clamping surfaces on said segment and forming sides to the recess, means comprising a plurality of inclined portions comprising a positive connection between the strip clamping means and said recessed segment, operating means positioned within the hollow reel supporting means and operable to cause longitudinal movement of the sleeve and of said inclined portions whereby the outer diameter of the segments may be varied and the strip clamping means may be moved into or out of strip clamping engagement with the strip clamping surfaces.

8. A reel for strip material comprising hollow reel supporting means, a sleeve surrounding the reel supporting means, a plurality of inclined surfaces on the sleeve, a plurality of segments positively mounted on the inclined surfaces for longitudinal movement relative thereto, strip clamping means in clamping relationship to at least one of the segments, means for positioning the strip clamping means comprising a plurality of inclined portions in positive engagement with the strip clamping means and arranged for longitudinal movement relative thereto, and operating means located within the reel supporting means, said operating means being effective when operated in one direction to cause the strip clamping means to move into clamping engagement with the segments and when operated in the other direction to move away from clamping engagement with the segments.

9. A reel for strip material comprising hollow reel supporting means, a sleeve surrounding the reel supporting means and arranged for longitudinal movement thereon, a plurality of inclined surfaces mounted on the sleeve, a plurality of segments in longitudinal sliding positive engagement with the inclined surfaces whereby longitudinal movement of the segments relative to the inclined surfaces will cause the periphery of the segments to expand or contract, strip clamping means arranged for radial movement and in clamping relationship to at least one of the segments, clamp operating means for causing radial movement of the strip clamping means comprising a plurality of inclined portions in sliding longitudinal engagement with the strip clamping means, operating means within the reel supporting means having rigid connection with the sleeve and resilient connection with the clamp operating means.

10. A reel for strip material comprising hollow reel supporting means, a sleeve mounted on the reel supporting means and longitudinally movable thereon, a plurality of wedges on the sleeve, a plurality of segments positively mounted on the wedges for sliding movement therealong and restrained against longitudinal movement, a recess in one of said segments having at least one overhanging lip, strip clamping means within said recess, clamp op-

erating means mounted on said segment for longitudinal movement and having inclined portions in sliding positive engagement with the strip clamping means, operating means within said reel supporting means, rigid means connecting said operating means and the segment, resilient means connecting said operating means and the clamp operating means.

11. A reel for strip material comprising hollow reel supporting means, a sleeve mounted on the reel supporting means and longitudinally movable therealong, a plurality of wedges on the sleeve, a plurality of segments surrounding the sleeve slidably mounted on the wedges in positive engagement therewith and restrained against longitudinal movement, a recess in one of said segments having at least one overhanging lip, strip clamping means located within said recess and radially movable therein,

clamp operating means on said segment mounted for longitudinal movement, a plurality of inclined portions on said clamp operating means in sliding positive engagement with the strip clamping means, operating means within the reel supporting means, rigid connecting means connecting said operating means and the sleeve, resilient connecting means connecting said operating means and the clamp operating means, said resilient means being stressed when said operating means is in extreme position urging the clamping means into clamping position.

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