Oct. 30, 1962 R. W. HERR 3,061,224

APPARATUS FOR COILING STRIP MATERIAL

Filed Jan. 18, 1960

Fig. 1

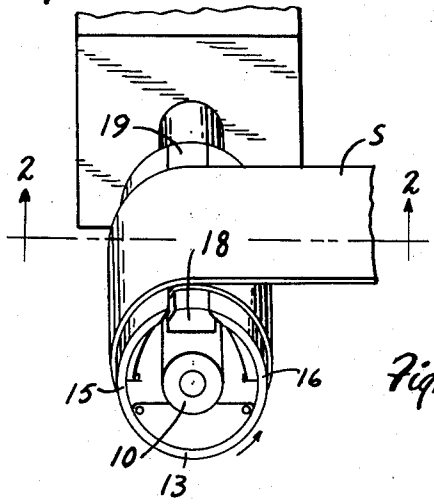


Fig. 2

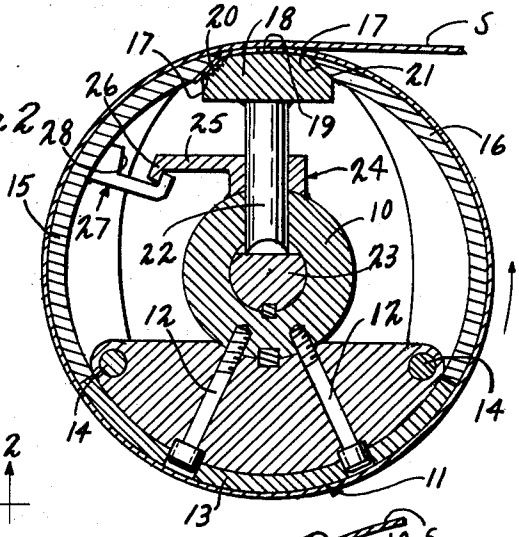


Fig. 3

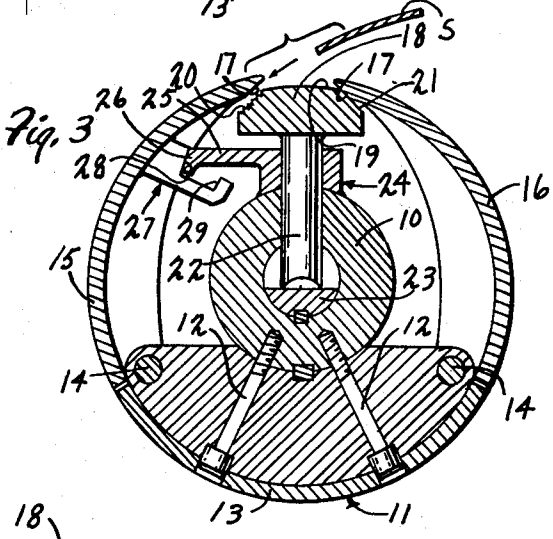
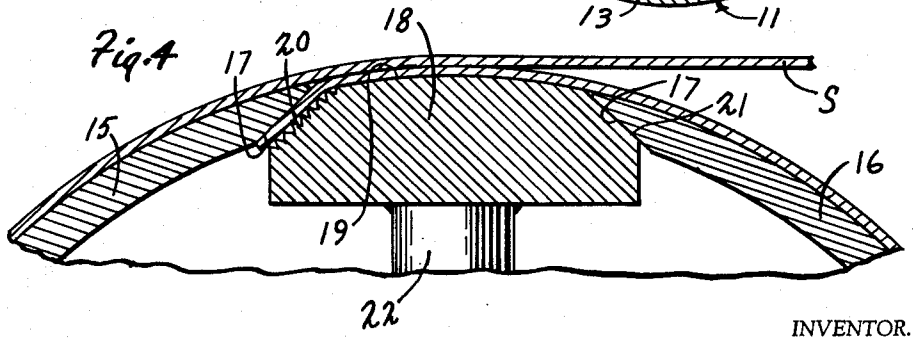


Fig. 4



INVENTOR.

Richard W. Herr

BY

Michael Williams

Attorney

United States Patent Office

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APPARATUS FOR COILING STRIP MATERIAL

Richard W. Herr, Cortland, Ohio, assignor to The Herr Equipment Corporation, Warren, Ohio

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The present invention relates to coiling strip material and the principal object of the invention is to provide a new and improved apparatus of such character.

The device in most common use at the present time for coiling strip material consists of an expansible-contractable, rotatably mounted drum which is first expanded, then rotated to wind a quantity of strip thereon to form a coil, and thereafter contracted, after stopping, so that the coiled strip may be removed therefrom.

As heretofore constructed and used, the above prior art devices have one serious drawback; regardless of the type of arrangement used to secure the leading end of the strip to the drum prior to coiling of the strip, a bump will inevitably be formed in the strip as each convolution of the coiled strip overlaps the beginning of the first coil convolution. Such bump results because the strip must abruptly change its direction as it overlaps the beginning of the first coil convolution.

While the bump aforesaid may not be particularly objectionable when thin, relatively resilient strip is being coiled, it becomes so when the strip is thick, especially if it is also rather ductile, since the bump then causes the strip to take a relatively severe set. In extreme cases, where the set in the strip caused by the bump is objectionable, it becomes necessary to rework the strip to eliminate the set prior to performing subsequent operations thereon and/or to even scrap some of the initial coil convolutions. Either expedient, of course, is costly and therefore undesirable.

In order to eliminate the foregoing disadvantages, it has been proposed to use a belt wrapping device which tightly wraps the leading end of the strip about the winding drum and thus obviates the necessity of otherwise attaching the free end of the strip to the drum. Such device, however, is initially expensive to purchase, cumbersome and troublesome to operate and maintain, is not usable with the heavier material, and it furthermore does not completely eliminate the aforesaid bump in the strip.

The present invention contemplates a novel method of using rotatably mounted, expansible-contractable coiling reels, or drums, and novel coiling reel apparatus whereby the above-mentioned disadvantages of prior art methods and apparatus are eliminated. Other advantages will become apparent from a study of the following description and from the appended drawing.

In the drawing accompanying this specification and forming a part of this application there is shown, for purpose of illustration, an embodiment which the invention may assume, and in this drawing:

FIGURE 1 is a perspective view of a coiling reel of the present invention in use in coiling strip material,

FIGURE 2 is an enlarged sectional view generally corresponding to the line 2—2 of FIGURE 1,

FIGURE 3 is a view similar to FIGURE 2 but showing certain parts in another position, and

FIGURE 4 is an enlarged, fragmentary sectional view of certain of the parts as they appear in FIGURE 2.

With reference to FIGURES 1, 2 and 3, the construction chosen to illustrate the present invention comprises a rotatably mounted arbor **10** which supports an expansible-contractable drum **11**. Although not shown since it forms no part of the present invention, arbor **10** will be selectively rotated by any suitable drive means.

Fixedly secured to the arbor **10**, as by means of cap-screws **12**, is an arcuate segment **13** forming a part of the drum periphery. Since this segment is not movable radially of the arbor axis during expansion and contraction of the drum, it will hereinafter be referred to as the fixed drum segment. Pivotally secured to opposite sides of the fixed drum segment, as by means of pivot pins **14**, are a pair of arcuate drum segments **15**, **16** which are pivotable about respective pivot pins toward and away from the arbor axis to respectively contact and expand the drum and which cooperate with the fixed drum segment **13** to provide the drum periphery. Segments **15**, **16** are disposed with their free ends in adjoining relation and each free end has an inwardly facing, inclined surface **17** for a purpose to appear.

Means are provided for urging the free ends of segments **15**, **16** radially outwardly to expand the drum, such means comprising a body, or wedge member **18** extending the length of the drum. Body **18** has an arcuate surface **19** providing a portion of the drum periphery and inclined surfaces **20**, **21** on opposite sides of such arcuate surface and respectively cooperable with an aforesaid inclined surface **17** of a respective adjoining movable segment as will appear. For reasons to be disclosed, body surface **20** is herein shown provided with a plurality of serrations or grooves.

Means are provided for guiding movement of body **18** in a rectilinear path toward and away from the arbor axis and as herein disclosed, a series of pins **22** (only only of which can be seen), are affixed to the body and project through transverse apertures in the arbor into the latter's hollow interior. In the present embodiment, the lower ends of the pins (in the position of parts seen) are inclined for complementary engagement with inclined surfaces formed in a rod **23** which is disposed within the hollow arbor and is shiftable longitudinally thereof. The arrangement of parts is such that when rod **23** is shifted in one direction, its inclined surfaces cause pins **22** to move radially outwardly to thus similarly shift body **18**. Movement of the rod **23** in the opposite direction will permit pins **22** and thus the body **18** to move radially inwardly.

In the event a more detailed description is desired of the manner in which pins **22** and rod **23** function, reference may be had to the application of Richard F. Herr, entitled, Reels for Tenuous Material, filed June 12, 1957, Serial No. 665,224, and assigned to the same assignee as the present case. It is to be understood, however, that other suitable means may be employed to control movement of the body **18**.

Means are provided for limiting radial movement of

the segment 15 and in the present embodiment, a bracket 24 having apertures for passing the pins 22, is secured to the arbor 10 by any suitable means. Bracket 24 has a leg 25 projecting toward the segment 15, such leg terminating in a transversely extending lug 26. Welded or otherwise secured to segment 15 are a plurality of stops 27 which may be suitably spaced longitudinally of the drum. Each stop is notched to provide spaced abutments 28, 29 alternately engageable (see FIGURES 2 and 3) with the lug 26 of the bracket leg 25.

The mode of operation and use of the herein disclosed reel construction is as follows: With the parts positioned as seen in FIGURE 3, it will be noted that body 18 is close to the arbor 10 thus permitting radial inward movement of the segments 15, 16 about their pivots to their drum-collapsed positions. While radial inward movement of segment 16 is limited by engagement of the latter's surface 17 with the body surface 21, it will be seen that radial inward movement of the segment 15 is limited by engagement of the stop abutment 28 with the bracket lug 26 to thus provide a space between the surface 17 of segment 15 and the surface 20 of the body 18.

The leading end of the strip S to be coiled will now be inserted in the space between the surfaces 17, 20 of the segment 15 and the body 18 respectively and the rod 23 then shifted, by any suitable means, in the direction to move the body 18 radially outwardly of the arbor. Radial outward movement of the body 18 will cause radial outward movement of the segments 15, 16 until the abutment 29 of the stop 27 engages the bracket lug 26 and arrests movement of segment 15 at its drum expanded position seen in FIGURE 2. Since the leading end of the strip is interposed between the surfaces aforesaid of the segment 15 and the body 18, the strip end will be tightly gripped, the previously mentioned serrations on body surface 20 insuring that the strip cannot slip from between said gripping surfaces.

It is to be noted that since the strip end is disposed between the aforesaid surfaces, radial outward movement of body 18 will be interrupted before its arcuate surface 19 coincides with the arcuate surface of the drum segment 15. There will thus be provided between the arcuate surfaces aforesaid a step which is substantially equal to the thickness of the strip being gripped. It will also be noted that since segment 16 is moved outwardly by radial outward movement of body 18, interruption of the movement of the body as above described will therefore interrupt movement of the segment 16 so that its arcuate surface generally coincides with the arcuate surface 19 of the body.

With the drum in the expanded position seen in FIGURE 2, it is to be understood that the drum does not have the usual circular periphery but one that is generally spiral. The step in the drum periphery is disposed intermediate the juncture of the arcuate surface of the segment 15 and the arcuate surface 19 of the body 18 and such step is of a depth substantially equal to the thickness of the strip being gripped.

If the drum is now rotated in the direction of the arrow to coil the strip thereon, the latter will first overlie the body 18, then segment 16, fixed segment 13 and finally segment 15. Note that as the first turn of the strip overlaps the strip end emerging from the drum (FIGURES 2 and 4), there is no abrupt change of direction, because of the spiral periphery of the drum, which could cause a bump in the strip.

Rotation of the drum in the direction of the arrow will be continued until a coil of the desired size has been formed. Rotation will then be stopped and the rod 23 shifted in the direction to permit radial inward movement of the body 18 and thus radial inward movement of the segments 15, 16 to the drum-collapsed positions seen in FIGURE 2. With the drum thus collapsed, the completed coil can readily be removed therefrom in

preparation for a repetition of the above described coiling operations.

It is an important feature of the present invention not only that a coil may be wound whose initial convolutions are not damaged by a permanent set caused by an abrupt change in direction of the lay of the strip, but also that the spiral drum periphery provided by the present construction is self-adjusting for various strip thicknesses.

In view of the foregoing it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention and it will also be apparent to those skilled in the art that the embodiment herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiment is illustrative only, and that my invention is not limited thereto.

I claim:

1. Apparatus for winding strip material, comprising a rotatably mounted drum upon whose periphery the strip is adapted to be wound in successive convolutions, said drum being split longitudinally to provide a pair of drum segments each forming a part of the drum periphery and each adapted to move outwardly in a direction away from the drum axis to a full outward position providing an expanded drum periphery of predetermined size, means for effecting outward movement of both of said segments toward drum-expanded position, a pair of strip gripping surfaces interposed between one of said segments and said moving means for gripping the leading end of the strip therebetween to provide the start of a convolution and through which surfaces movement of the moving means is transmitted to said one segment, and stop means for arresting outward movement of said one segment at its full outward position and through said strip gripping surfaces and the interposed strip, arresting movement of said moving means and consequent outward movement of the other of said segments short of its full outward position by an amount proportional to strip thickness, whereby said drum is formed with a radial step between said segments.

2. The construction of claim 1 wherein each of said segments is swingable about a longitudinal axis which is spaced from and parallel to the drum axis with longitudinal edges of said segments in facing relation, adjoining portions of said one segment and of said moving means providing said gripping surfaces.

3. The construction of claim 2 wherein said moving means is a member movable radially of said drum and has a portion interposed between said segments.

4. The construction of claim 1 wherein each of said segments is swingable about a longitudinal axis which is spaced from and parallel to the drum axis with longitudinal edges of said segments in facing relation, and wherein said moving means is a member movable radially of said drum and has a pair of spaced wedge surfaces engageable with respective longitudinal segment edges, the edge of said one segment and its respective wedge surface comprising said strip gripping surfaces.

5. The construction of claim 4 wherein a portion of said radially movable member between said wedge surfaces forms part of the drum periphery and wherein a fixed drum segment is interposed between said swingable segments and forms part of the drum periphery.

6. The construction of claim 1 wherein said drum includes a central support and wherein said moving means is slidably mounted in said central support, the latter and said one segment having interengaging surfaces which constitute said stop means for arresting outward movement of said one segment.

7. The construction of claim 1 wherein each of said segments is swingable about a longitudinal axis which is spaced from and parallel to the drum axis with longitudinal edges of said segments in facing relation, and

wherein said drum includes a central sleeve and an actuator reciprocable axially within said sleeve, wherein said moving means is a member slidably mounted in said sleeve and has cam engagement with said actuator to move outwardly through axial movement of said actuator, and wherein said member has a pair of wedge surfaces engageable with respective longitudinal segment edges, the edge of said one segment and the adjoining wedge surface of said member comprising said strip gripping surfaces and the edge of the said other segment being directly engageable with the other surface of said member.

8. The construction of claim 7 wherein said sleeve and said one segment have parts which interengage and constitute said stop means for arresting outward movement of the one segment at its full outward position.

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