June 11, 1963 G. E. TRAPP 3,093,338

REEL FOR COILING STRIP MATERIAL

Filed Sept. 29, 1959 3 Sheets-Sheet 1

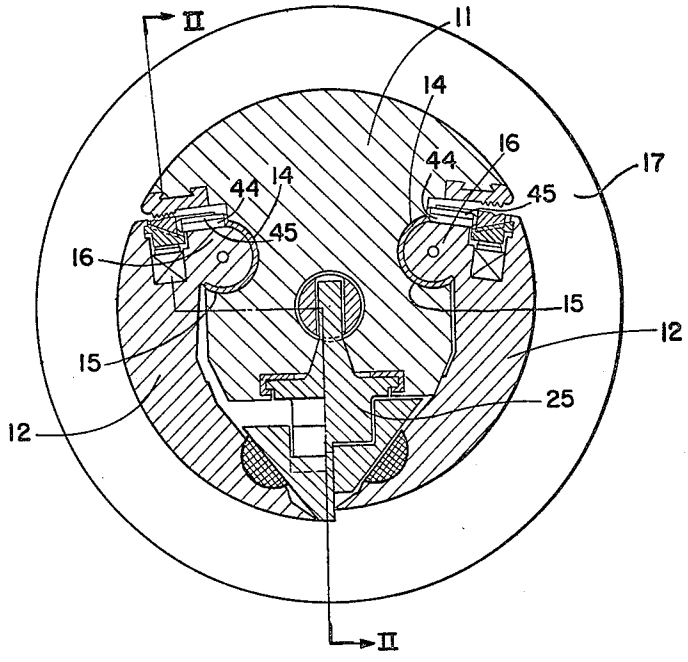


FIG. 1

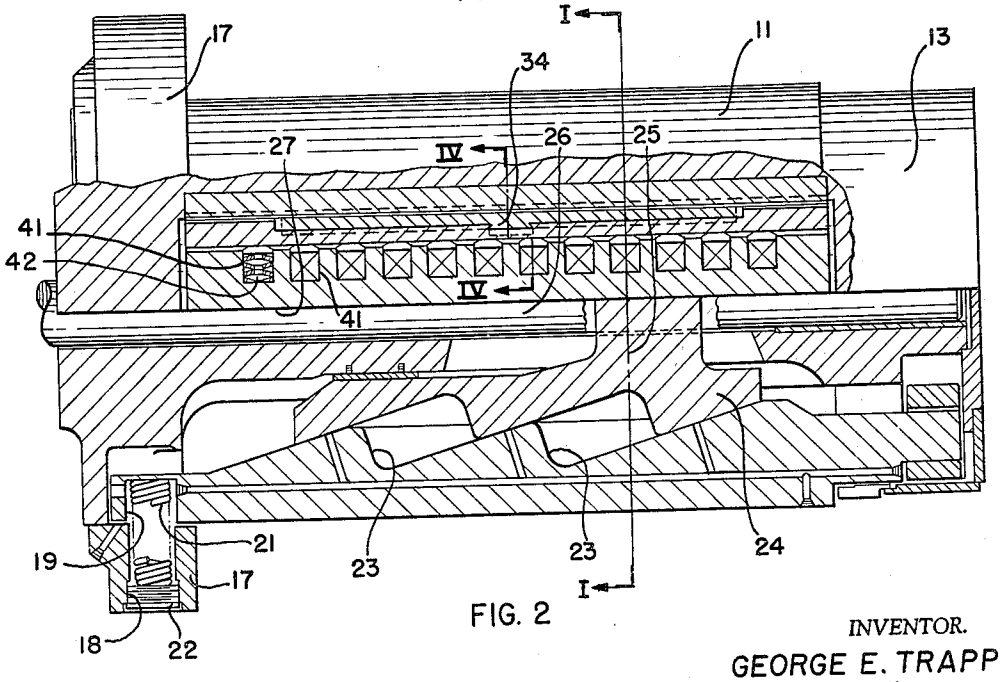


FIG. 2

INVENTOR.
GEORGE E. TRAPP
BY Joseph E. Nickerson
HIS ATTORNEY

June 11, 1963 G. E. TRAPP 3,093,338

REEL FOR COILING STRIP MATERIAL

Filed Sept. 29, 1959 3 Sheets-Sheet 2

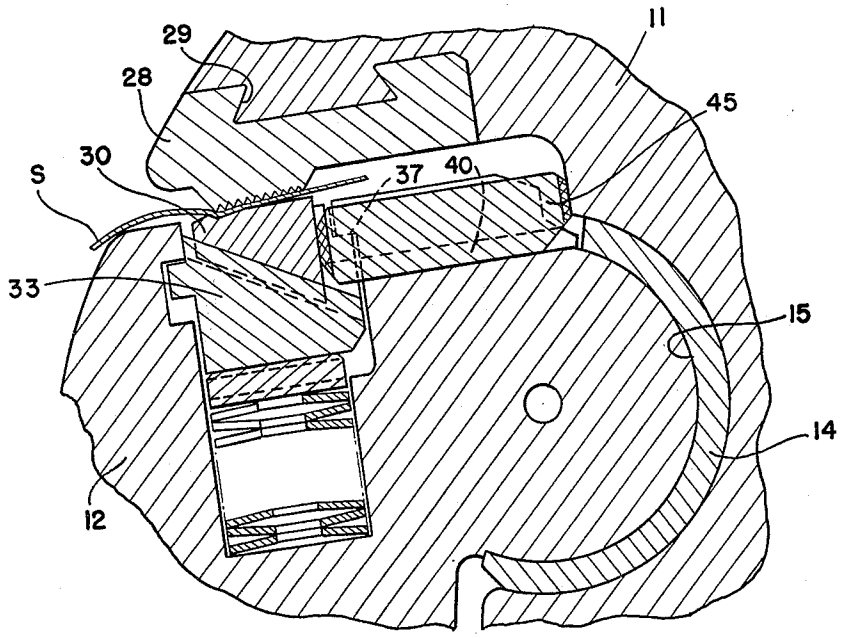


FIG. 3

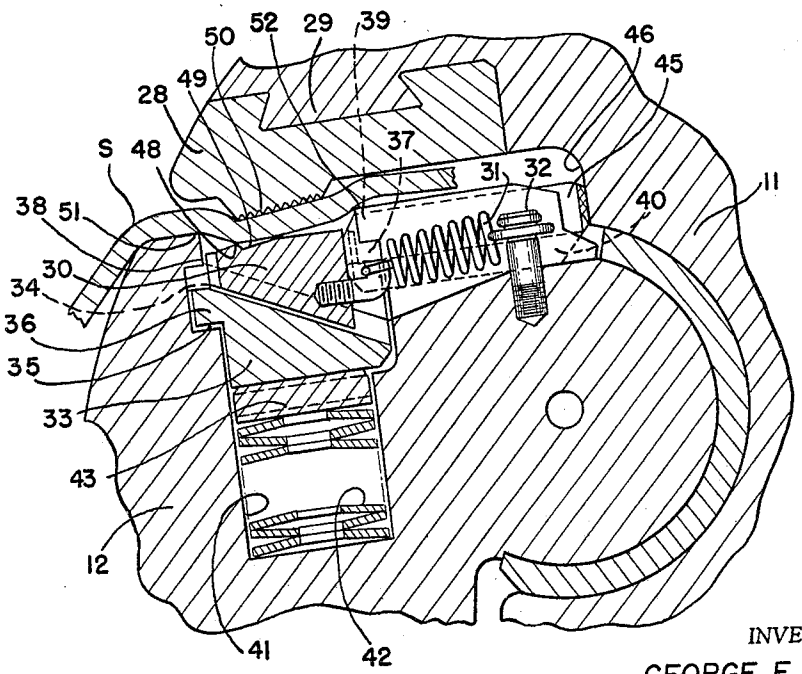


FIG. 4

INVENTOR.
GEORGE E. TRAPP
BY Joseph E. Mackenzie
HIS ATTORNEY

June 11, 1963 G. E. TRAPP 3,093,338

REEL FOR COILING STRIP MATERIAL

Filed Sept. 29, 1959 3 Sheets-Sheet 3

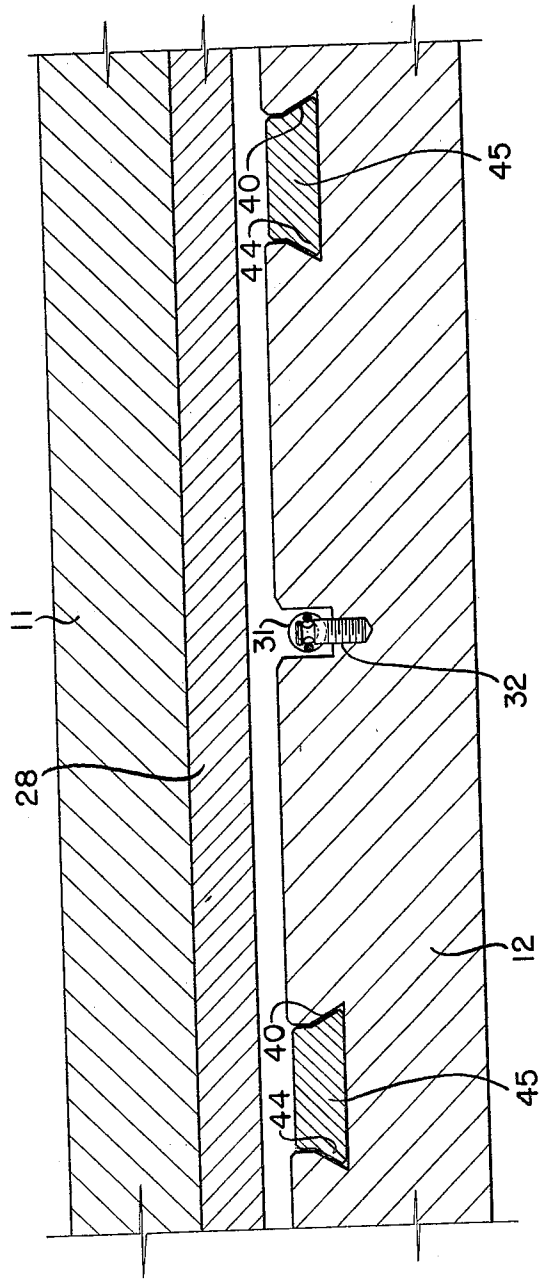


FIG. 5

INVENTOR.
GEORGE E. TRAPP

BY
Henry C. Westin
HIS ATTORNEY

United States Patent Office 3,093,338 Patented June 11, 1963

3,093,338

REEL FOR COILING STRIP MATERIAL

George E. Trapp, Pittsburgh, Pa., assignor to United Engineering and Foundry Company, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Sept. 29, 1959, Ser. No. 843,242
7 Claims. (Cl. 242—72.1)

This invention relates to an expansible reel for coiling metal strip issuing from a rolling mill or the like, and, in particular, to a reel in which there is incorporated a strip end gripping mechanism which is adapted to secure the leading end of strip material to be coiled on the reel irrespective of the gage of the material and without interfering with complete expansion of the reel.

It is customary in the design of presently employed reels which incorporate a strip gripper mechanism to coordinate the gripper with the means employed for expanding and collapsing the reel segments, whereby, on expansion of the reel, the strip which has been previously inserted into the gripping mechanism will be automatically gripped after which the coiling operation may commence. This cooperative relationship, however, has been found to have its inherent disadvantages and limitations, particularly, when it is necessary for the reel to handle a wide range of strip gauges. When coiling strip which varies widely in gage, the principal difficulties that have been experienced are the inability to fully expand the reel when coiling the heavy gages or; if the gripper mechanism is constructed to permit full expansion when coiling the maximum thickness of strip, then, in order to effectively grip the thinner gage strip, filler plates must be employed to grip the strip securely.

In addition to a reel design that would obviate these deficiencies, it is also a requirement that the gripper mechanism be able to increase its gripping pressure whenever the strip moves or tends to move out of the gripper as may be the case when high tensions are imposed upon the strip between the reel and the mill.

One of the objects, therefore, of the invention herein disclosed is to provide a gripper and a reel which are so interrelated that both the gripper and the reel will readily adapt themselves to the gripping and coiling of strips of different gages to form a cylindrically shaped coil.

Another object of this invention is to provide a reel having strip end gripping means associated therewith which will readily adapt itself to strips of various gages while, at the same time, permitting the reel to be expanded to the fullest extent.

Still another object of this invention is to provide a reel in which the strip end gripping mechanism thereof will impose an increasing gripping force both when there is an increase in the gages of the strips to be coiled and when the tension on the strip would tend to pull the strip out of the gripper, thereby to assure that the strip end will be prevented from slipping out of the mechanism as the coil is formed on the reel.

A further object of this invention is to provide a strip end gripper mechanism that will automatically engage and disengage the strip on expansion and collapse of the reel respectively.

These objects as well as the various other novel features and advantages of the invention herein disclosed will be apparent from the following description when read in

connection with the accompanying drawings, of which:

FIG. 1 is a transverse sectional view of a reel embodying the invention herein disclosed taken at lines I—I of FIG. 2 and showing one portion of the reel in its expanded position and the other portion thereof in its collapsed position;

FIG. 2 is a longitudinal sectional view taken at lines II—II of FIG. 1;

FIG. 3 is an enlarged view of the gripping mechanism of the reel in its fully expanded position as shown in FIG. 1 with relatively light gage material engaged by the gripper,

FIG. 4 is an enlarged view similar to FIG. 3 but taken at lines IV—IV of FIG. 2 in which relatively heavy gage material is engaged by the gripper, and FIG. 5 is a vertical sectional view of a portion of the gripper herein disclosed.

With reference to FIGS. 1 and 2 of the drawings, the reel consists of a solid arbor or shaft portion **11** having two arcuate shaped segments **12** being of a length substantially equal to that of the arbor portion and which are secured at their outer ends to the reel shaft **11** by means of a ring **13** fitted on the outer end of the reel. By this arrangement, the segments are permitted to oscillate to a limited extent in bearings **14** provided in recesses **15** machined in the main arbor **11** and which engage circular projections **16** formed on the upper portions of the segments **12**. The inner ends of the segments **12** are received in a ring **17** secured to the inboard portion of the main arbor **11**. Suitable openings **18** formed in the ring **17** are aligned with similar openings **19** formed in a radially displaceable keystone element in which compression springs **21** are inserted and held in place by threaded caps **22**, springs **21** serving to urge the keystone element into the collapsed position as indicated in the right hand portion of FIG. 1. Additional springs, not shown, are arranged at the outboard end of the reel for urging the segments **12** into their reel collapsed position.

The keystone element has a series of wedge shaped projections **23** on the inner surface thereof which engage with a similar series of wedge shaped projections **24** formed on an axially slidable reel expanding element **25** secured to an actuating rod **26** which passes through an opening **27** extending axially through the arbor **11**. Suitable mechanism, not shown, is secured to the outer end of the rod **26** to the left, outward of the reel, for moving the rod and the element **25** to the right for exapnding the reel and to the left for effecting the collapse thereof.

In order that the reel may be used on either side of a reversing mill, two similar strip end gripping mechanisms are employed. Each mechanism, also shown on FIGS. 3 and 4, consists of a stationary gripper jaw **28** secured by means of a suitable dove tail connection **29** to the main reel arbor **11** and a movable gripper jaw **30** secured at its center to a tension spring **31**, which spring is fastened to a pin **32** threadably secured to the reel segment **12**. The primary purpose of the spring **31** is to constantly urge the movable gripper jaw to the right. Beneath the jaw **30** there is a cam **33** having an inclined surface which corresponds to an inclined under surface of the jaw **30**. The cam **33** and the jaw **30** are secured together by means of a dove tail connection **34** which has sufficient clearance to permit the jaw **30** to slide freely along the cam **33** as the reel is expanded and collapsed. The cam **33** is posi-

tioned for vertical movement within a slotted opening 35 extending along the length of the segment 12, the extent of the vertical movement being limited by projections 36 and 37 machined along the cam 33 which strike against projections 38 and 39 formed on the segment 12 at the top of the slot 35. At spaced intervals at the bottom of the slot 35, there is a series of openings 41 bored in the segment 12 and into which there are inserted disk or ring springs 42. At the upper end of each of the springs 42, there is a loosely fitted circular slug 43 which bears against the underside of the cam 33 and the tops of the springs 42 thereby urging the cam 33 to its uppermost position in the slot 35.

As best shown in FIG. 5, at a spaced distance on either side of the tension spring 31, the segment 12 is provided with a dove tail slot 40 into which there is loosely received a dove tail 44 formed on pusher members 45. As noted in FIGS. 1, 3 and 4, the front end of each pusher member is always in engagement with the movable gripper jaw 30 and with an abutment 46 formed on the main shaft.

When, as shown in the right hand portion of FIG. 1 the reel is in the collapsed position, the segments 12 are pivoted inward thereby causing the movable jaw 30 to take its full open position. However, when the reel is fully expanded, the movable jaw 30 is forced up the inclined surface of the member 33 and takes the position shown in the expanded section of FIG. 1 as well as shown in FIGS. 3 and 4. The reason the movable jaw 30 takes the position shown in FIGS. 1, 3 and 4 is that the construction is such that the distance between the outer edge of the jaw 30 and the inner end of the pusher members 45 always remains constant irrespective as to whether the reel is expanded or collapsed. When the reel is collapsed, the spring 31 draws the movable jaw 30 back along the inclined surface of the cam 33.

On expansion of the reel, the jaw 30 will take the position shown in FIGS. 3 and 4, which are the respective positions assumed when light gage and heavy gage strip material is engaged between the gripper jaws. As will be noted, the jaw 30 is as far forward in FIG. 3 as it is in FIG. 4 but, depending upon the thickness of the strip, the springs 42 will be compressed thereby to permit the movable jaw 30 and the cam 33 to move downward as a unit to the extent necessary to permit the reel to be fully expanded. Thus, irrespective of the thickness of the strip to be coiled, the reel always attains its fully expanded condition. Furthermore, as the thickness of the strip is increased, the pressure between the gripper jaws will also increase to an extent dependent upon the increase in resistance offered by the springs 42 when they are being compressed.

Also as illustrated in FIGS. 3 and 4, if after the strip is gripped, it should tend to move out of this gripper by reason of the tension imposed thereon, the jaw 30 will be pulled closer to the jaw 28 and, hence, there will be an increase in the gripping force.

As mentioned above and to which more particular attention is directed, it is a feature of the gripper mechanism to reversely bend an area of the gripped strip thereby to assure a positive grip and to reduce the tendency of the strip to be pulled out of the gripper. One of the unique features of the present gripper mechanism is that this reverse bending action is provided for all strip thicknesses. In order to obtain this effect for the thinner gauges, the upper forward surface of the movable gripper 30 is provided with a tooth 48 which extends across the entire length of the jaw. Immediately behind the tooth 48, the jaw is provided with a recess 49, which is to disposed that when the jaw is in its gripping position the recess will be substantially directly opposite the first serration of spaced serrations 50 provided on the lower surface of the stationary jaw 28. By this construction, the strip is forced into the recess 49 during the gripping action thereby to firmly secure the strip end.

The tooth 48 and recess 49 become less and less effective as the thickness of strip to be coiled is increased as can be seen by comparing FIG. 3 and FIG. 4. Nevertheless the gripper construction provides for the reverse bending of heavy gage strip in an area between a corner 51 of the reel segment 12 and the most forward serration 50 of the stationary gripper 28. Immediately to the left of the corner 51, there will be a space due to the fact that the jaw 30 will be depressed when heavy gage materials are being coiled, hence the heavy gage strip will be bent about the corner 51 and the front corner of the stationary gripper jaw 28 and as well as at a point inward around a corner 52 of the segment 12.

It is to be observed that notwithstanding the firmness with which the strip is gripped by the mechanism herein disclosed, release of the strip therefrom is automatically accomplished. This result is obtained by the action that takes place when the reel is collapsed inasmuch as the jaw 30 is lowered away from the jaw 28 while at the same time being pulled down the inclined slope and away from the strip. Thus the strip end is automatically freed from the gripper and the coil can be readily stripped from the reel.

In accordance with the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I consider to represent the best embodiment thereof. However, I desire to have it understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An expansible reel upon which strip materials of various gages are to be coiled comprising a stationary element, a segment operatively engaged with said element, means in engagement with said element and said segment operable in one direction to cause said segment to be placed into the reel expanded position, and means for securing the end of a strip material to be coiled upon said reel comprising a stationary gripper jaw secured to said element, a movable gripper jaw operatively engaged with said segment and caused to move toward said stationary gripper jaw on said movement of said segment in said one direction, a member extending between said element and said movable jaw operatively engageable with said movable jaw and effective to urge said movable gripper jaw toward said stationary jaw on the movement of said segment in said one direction, and resilient means interposed between said movable jaw and said segment for maintaining said movable jaw in engagement with said member.

2. An expansible reel according to claim 1 in which a second resilient means is provided, and a cam interposed between said movable jaw and said second resilient means.

3. An expansible reel according to claim 2 in which projections are provided on said cam, said segment being recessed for receiving said projections and for defining the extent of the movement of said cam.

4. An expansible reel according to claim 3 in which said member is slidably connected to said segment, and said movable jaw slidably connected to said cam.

5. An expansible reel according to claim 1 in which said movable jaw is provided at its front end with a tooth, said movable jaw being recessed at a point adjacent to said tooth, said tooth assuming a position closely adjacent to the front portion of said stationary gripper jaw on expansion of said reel whereby said strip is crimped to occupy the space provided by the recess in said movable jaw.

6. A strip end gripping mechanism capable of automatically adjusting itself to grip strips of various thicknesses comprising a stationary jaw, a jaw movable toward said stationary jaw under the influence of two forces applied substantially perpendicular to each other against said movable jaw, a tapered cam slidably engageable with

and restricting movement of said movable jaw in an oblique direction toward said stationary jaw, resilient means continually exerting one of said forces upon said movable jaw, a rigid member in continuous direct engagement with and arranged in juxtapositional relationship relative to said movable jaw, and means for exerting the other of said forces upon and through said rigid member to said movable jaw.

7. A strip gripping mechanism according to claim 6 including a second resilient means connected to and for urging said movable jaw away from said stationary jaw.

References Cited in the file of this patent

UNITED STATES PATENTS

2,483,144	McConnell et al.	Sept. 27, 1949
2,755,031	Russell	July 17, 1956

OTHER REFERENCES

Germany, 1,007,279, printed May 2, 1957 (KL. 7b 5/30).