Jan. 12, 1960 C. H. PRIESTLEY 2,920,838

STRIP COILING APPARATUS

Filed Nov. 1, 1956

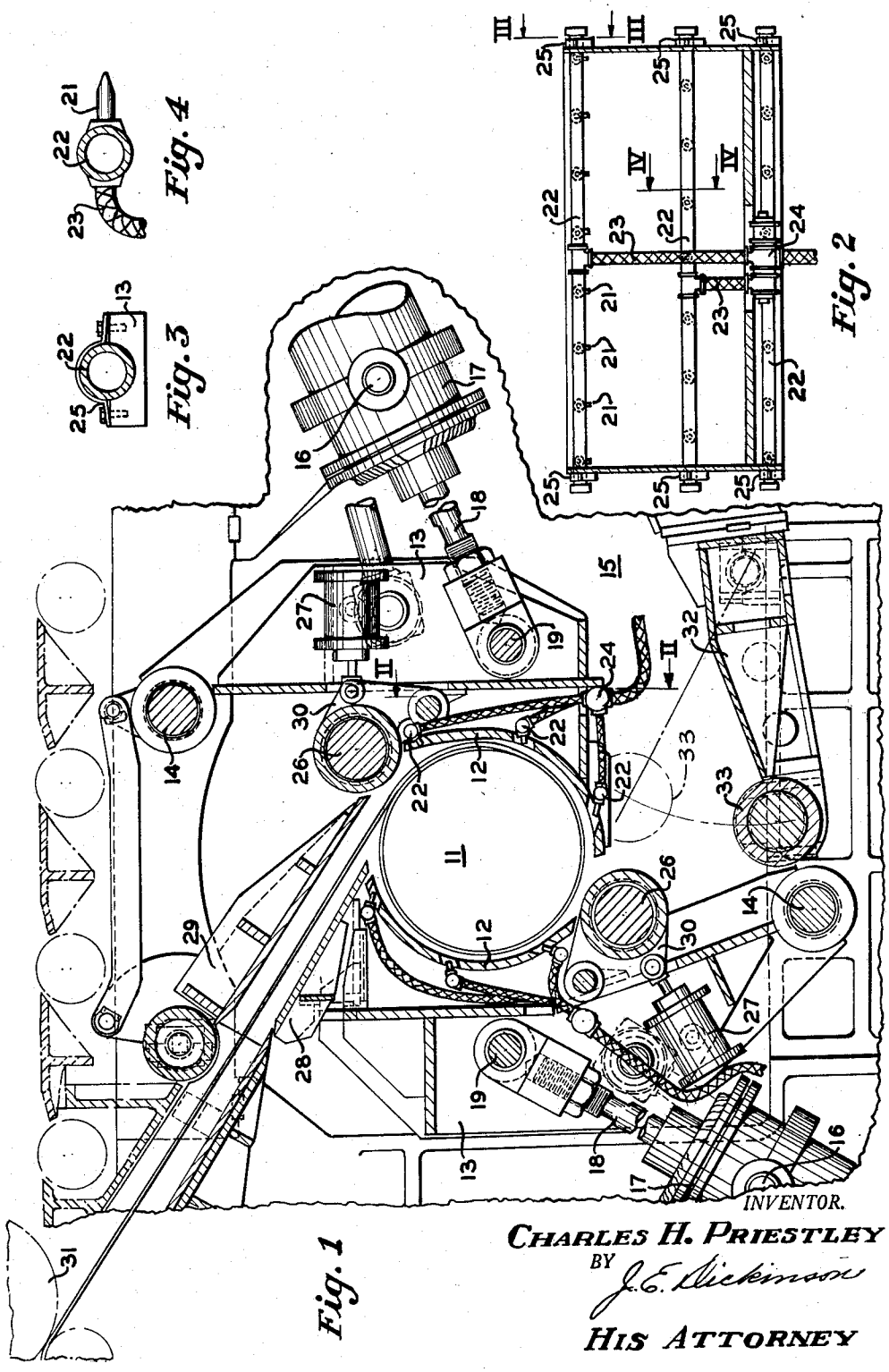


Fig. 1

Fig. 2

Fig. 3

Fig. 4

INVENTOR.

CHARLES H. PRIESTLEY

BY J. E. Hickman

HIS ATTORNEY

United States Patent Office 2,920,838 Patented Jan. 12, 1960

2,920,838

STRIP COILING APPARATUS

Charles H. Priestley, Bethel, Pa., assignor to United Engineering and Foundry Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application November 1, 1956, Serial No. 619,765

11 Claims. (Cl. 242—78.4)

This invention relates to strip coiling apparatus and in particular is related to apparatus for coiling continuous strip of a relatively heavy gauge.

Where apparatus such as that which is commonly employed for the coiling of light gauge metallic strip material is employed for coiling relatively heavy gauge strip objectionable marking of the strip takes place at the point of overlap, caused by the pressure set up when the coiler rolls strike the strip at the overlap or point of increased coil diameter. Such an action takes place at each coiler roll and until the coiler rolls and the guides are withdrawn from their coiling position the scoring or marking of a considerable length of strip takes place due to the incessant pounding each time the point of overlap strikes one of the rolls. These rolls are considered to be essential to successful operation of the present day coilers inasmuch as they are necessary to assure the operator that the leading end of the strip will be maintained in close contact with the reel so that the initial or first wrap will be tightly formed thereon. Notwithstanding this, it is also common experience that the rolls are a source of many operational difficulties and a major factor affecting the economy of the present day coilers. When coil forming rolls are employed, as each point of strip overlap of the coil strikes one of the rolls, exceptionally severe pounding takes place, this pounding action being one of the inherent characteristics of such coilers. It is apparent, then, that the maintenance problem resulting from this factor alone, as well as marking of the strip resulting in excessive scrap material, is significant inasmuch as it represents a substantial portion of the total cost for maintaining the coiler in working condition.

The invention disclosed herein alleviates this objectionable condition inherent in coilers employing strip engaging coiler rolls by providing a coiler having simple guides spaced around the periphery and in combination therewith spray means so spaced around the guides as to cause fluid under high pressure to impinge upon the leading end of the strip thus to cause the strip as it enters the coiler to be bent toward and forced against the peripheral surface of the rotating reel.

Moreover, when coiling rolls are employed the rolls are sometimes maintained at a slight distance away from the reel surface so as to reduce or eliminate surface marking of the strip. This, of course, permits the strip to become somewhat slack between the rolls and the reel and it will be necessary for the operator to see that all slack is taken up in order that the leading end of the strip and the first few wraps of the coil will be firmly cinched or gripped upon the reel. In present day coilers at least several wraps of strip must be placed upon the mandrel before the guides and coiler rolls are withdrawn to their inoperative positions. By applying fluid under controlled high pressure at the point of coiling as provided for by this invention, the strip surface will be firmly forced or pressed against the surface of the coil thereby assuring the operator that there will be no slack in the strip and that the first

wrap will be firmly cinched upon the reel. It is evident, therefore, that after only as few as one and one-half wraps of material have been placed upon the reel the guide portions of the coiling apparatus can be withdrawn to their inoperative positions. As a result, the entire coiling assembly will be subject to less wear and abuse in operation than is the case of the coilers presently in use.

One of the objects of this invention, therefore, is to provide apparatus for coiling heavy gauge strip material expeditiously and without marking of the strip at its points of coil overlap.

A further object of this invention is to provide a strip coiling apparatus in which coiling rolls as well as fluid jets are employed for coiling strip material upon a reel, the coiling rolls being provided with yieldable elements for permitting their removal from the coiling position independently of the jets.

Another object of this invention is to provide strip coiling apparatus which is simple of construction and relatively economical to service and maintain.

Still another object of this invention is to provide strip coiling apparatus for coiling relatively heavy gauge strip material continuously, adapted to controllably bend the leading end of the strip around the reel upon which a coil is to be formed.

A further object of this invention is to provide in strip coiling apparatus curved guides, positioned adjacent to the periphery of the surface of a reel, having a series of spaced high pressure nozzles with their axes so directed with respect to the reel as to deliver streams of liquid under high pressure at such an angle as to have a component of flow in the direction of travel of the strip in order to expedite coiling of the strip.

These objects, as well as the various other novel features and advantages of this invention, will be apparent from the following description and accompanying drawings of which:

Fig. 1 is a sectional side elevation view of strip coiling apparatus embodying the features of the invention;

Fig. 2 is a sectional view taken on lines II—II of Fig. 1;

Fig. 3 is a sectional view taken at III—III of Fig. 2, and

Fig. 4 is a sectional view taken at IV—IV of Fig. 2.

With reference to the drawings, Figs. 1 and 2, the coiling apparatus embodying the preferred form of invention herein disclosed comprises a driven reel **11**, a pair of curved guides **12** with their faces arranged closely adjacent to the peripheral surface of the reel and encompassing a substantial portion thereof and a pair of frames **13** pivotally mounted upon shafts **14** secured to a main frame **15** which frame also pivotally supports by trunnions **16** a pair of cylinders **17** having piston rods **18** extending therefrom and pivotally connected at their outer ends by pins **19** to the frames **13**.

Around the guides **12** and secured thereto, as shown in detail in Figs. 3 and 4, there are spaced nozzles **21** which communicate with headers **22** having connected thereto flexible hoses **23** through which fluid under high pressure is conducted to the nozzles **21** from a source not shown by means of a master header **24**. In the drawings, it is to be noted that the axes of the nozzles are positioned at such an angle with respect to the reel that the streams delivered thereby have components in the direction of travel of the reel and the strip to be coiled thereon. Separate brackets **25** for each of the headers **22** are provided at their ends and secured to the frames **13** so that the headers may be individually rotated to provide the proper angle of flow required with respect to the reel and strip to give the best results under particular conditions dependent upon gauge and type of material as well as upon speed of the reel and strip. In some cases the axes of the noz-

zles may even be so positioned as to direct their streams radially with respect to the axis of the reel.

In addition to the guides **12**, there are also secured to the frames **13** rolls **26** which are, during a coiling operation, normally positioned at spaced points away from the reel so that they do not contact the strip as the leading end is conducted around the reel **11** by the guides **12**. The rolls **26** may have positive drives connected thereto or they may be idler rolls and depend for their rotation upon the reel and strip when used for coiling. In the event the strip becomes cobbled, then the rolls **26** can be quickly brought into contact with the strip by means of suitable individual piston-cylinder assemblies **27** connected thereto and to the frame by means of a member **30** thereby forcibly to pinch the strip against the reel and cause it to be drawn around the reel and hence eliminate the effects of the cobble.

Between the coiling apparatus and the mill or other strip processing apparatus from which the strip is delivered to the reel, there is a plate **28** secured to one of the frames **13** and a plate **29**, pivotally connected to and movable with the other frame **13**, which together with plate **28** form a throat for directing the strip leading end from a pinch roll unit **31** to the coiling apparatus.

Where special steels are to be coiled as they are delivered by a hot mill, for example, and where the application of a cooling medium to the metal would be detrimental, it is simply necessary to interrupt the flow of the high pressure fluid from the nozzles and position the rolls **26** adjacent to the reel as the guides **12** are moved forward into their strip coiling positions. Metal of this type, however, may represent only a very small percentage of the total tonnage to be coiled but nevertheless there will be a danger of marking of the surface of the strip by the rolls **26** at each point of strip overlap. Marking due to the rolls **26** can be kept to a minimum, if not entirely eliminated, by so adjusting the pressure in the cylinders **27** thereby permitting the rolls when they reach the point at which the coil increases in diameter to move away quickly inasmuch as the pressure within the cylinders **27** is momentarily overcome by the force imposed upon the roll as it makes contact with the coil at each point of overlap. The force resisting the instantaneous outward movement of the roll **26** can thus be very finely controlled so that no marking of the strip will take place at the point of overlap.

Beneath the coiler and pivotally secured to the frame **15** there is an arm **32** having at its inner end an idler roll **33** which, on withdrawal of the guides **12** to their inoperative position, is adapted to be swung upward, by means of a piston-cylinder assembly or other actuating means connected thereto, to the dotted line position shown in Fig. 1, for engaging with the coil as it builds up to its final size. The roll **33** not only assists in maintaining a tight coil but it prevents the tail end of the coil from flopping downward especially when the finished coil is being stripped from the reel.

The coiling apparatus herein disclosed functions in the following manner:

The operator ascertains that the guides **12** and nozzles **21** are positioned adjacent to the reel, the two rolls **26** withdrawn to their strip non-engaging position and the reel **11** rotated as high pressure fluid is introduced into the nozzles **21** for expulsion against the reel. The strip leading end on delivery from the processing apparatus and pinch rolls **31** is passed down through the throat formed by the plates **28** and **29** and between the reel and the first guide **12**. As the leading end of the strip arrives at a point adjacent to the nozzles **21**, the high pressure fluid expelled from the nozzles strikes the moving strip and causes it to be forced away from the guides and against the reel so that as the reel continues to rotate the strip will hug the reel by reason of the forces set up by the streams striking against it thereby to form a tight first wrap upon the coil. This is accomplished without the necessity of contacting the strip with the spaced rolls **26** either during the time the first wrap is made or as additional convolutions are added to the coil. The guides **12** and nozzles **21** are maintained closely adjacent to the reel until sufficient strip has been wrapped upon the reel to assure a tight grip on the coil and then are quickly withdrawn to an inoperative position simply by admitting fluid under pressure through suitable valves, not shown, to the cylinders **17**. If such should be deemed desirable for cooling purposes or otherwise, fluid may continue to be expelled through the nozzles to the coil until completion but under ordinary conditions the flow of fluid would be interrupted when the nozzles are withdrawn from their strip coiling positions.

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. Apparatus for coiling strip material comprising a driven reel, a plurality of guides having a curvature corresponding to that of the peripheral surface of said reel and forming a channel adjacent to said reel through which strip material is directed to pass for coiling upon said reel, a plurality of nozzles spaced around the periphery of said reel and secured to each of said guides having their axes directed toward said reel, means connected to and for supplying fluid to said nozzles, and fluid operable means connected to and for moving said guides and nozzles toward and away from said reel.

2. Apparatus for coiling strip material comprising a driven reel, a frame, a plurality of guides having a curvature corresponding to that of the peripheral surface of said reel and forming a channel adjacent to said reel through which strip material is directed to pass for coiling upon said reel, a plurality of nozzles spaced around the periphery of said reel and secured to each of said guides having their axes directed toward said reel, means connected to and for supplying fluid to said nozzles, fluid operable means connected to and for moving said guides and nozzles toward and away from said reel, a driven roll pivotally connected to said frame and means connected to said roll adapted to move said roll in a direction toward and away from said reel independently of the movement of said guides.

3. Apparatus for coiling strip material according to claim 1 in which there are two guides positioned substantially diametrically opposite each other with respect to the axes of said reel.

4. Apparatus for coiling strip material according to claim 1 in which adjustable means are operatively connected to said nozzles for varying the angle of the axes of said nozzles with respect to said reel.

5. Apparatus for coiling strip material according to claim 1 in which there is included a header communicating with said nozzles of each guide and adjustable means secured to said header and to said guides for varying the angle between the axes of said nozzles and the surface of said reel.

6. Apparatus for coiling strip material according to claim 1 in which a roll is positioned adjacent to each of said guides and means connected thereto adapted to position said rolls adjacent to and remotely of said reel independently of and while said guides are in their strip coiling positions.

7. Apparatus for coiling strip material comprising a driven reel, a pair of frames, a pair of guides having a curvature corresponding to that of the peripheral surface of said reel and which during the initial stages of a coiling operation form a channel adjacent to said reel through which strip material is directed to pass for coiling upon

said reel, means operatively connected to said guides for positioning said guides into and out of their coiling positions, a roll connected to each of said frames, means operatively connected to each of said rolls and to said frames adapted to move said rolls into and out of their coiling position relative to said guides during the interval said guides are in their strip coiling positions, fluid conductor means connected to each of said guides and a plurality of nozzles with the axes thereof extending toward the surface of said reel and spaced there-around connected to each of said conductor means.

8. Apparatus for coiling strip material according to claim 7 in which means are operatively connected to said nozzles adapted to vary the angle of the axes thereof with respect to the surface of said reel.

9. Apparatus for coiling strip material comprising a driven reel, a plurality of guide members forming a spaced channel around and adjacent to the peripheral surface of said reel through which strip material is directed to pass for coiling thereon, a plurality of fluid discharge members in groups of two spaced around said reel periphery adapted to direct fluid under pressure against the strip passing adjacent thereto through said channel to force the strip into contact with said reel and means connected to and for supplying fluid to said fluid discharge members.

10. Apparatus for coiling strip according to claim 9 in which said fluid discharge members are arranged radially of and parallel to said reel axis and comprise

a series of orifices extending substantially across the width of the strip.

11. Apparatus for coiling strip material comprising a driven reel, a plurality of spaced curved guides encircling said reel and having a curvature corresponding substantially to that of the peripheral surface thereof forming a channel having an entry and exit end and into the entry end of which the leading end of strip material may be introduced and directed therethrough for coiling upon said reel, an additional guide adjacent to and for directing material into the entry end of said channel, a nozzle secured to the curved guide at the entry end of said channel, a second nozzle secured to the curved guide at the exit end of said channel, a plurality of nozzles secured to said curved guides at spaced points intermediate said first and second mentioned nozzles, adjusting means secured to each of said nozzles for varying the angle of the axis of each nozzle with respect to said reel, and means connected to and for supplying fluid under pressure to said nozzles.

References Cited in the file of this patent

UNITED STATES PATENTS

1,141,771	Carpenter	June 1, 1915
1,654,651	Johnson	Jan. 3, 1928
2,537,588	Husson	Jan. 9, 1951
2,693,919	Wutscher	Nov. 9, 1954