United States Patent

[11] **3,587,274**

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[73] Assignee **Siegener Maschinenbau, G.m.b.H.**
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[33] **Germany**
[31] **P 16 02 349.7**

[54] **STRIP COILER**
5 Claims, 1 Drawing Fig.

[52] **U.S. Cl.** **72/148,** 72/151, 72/171
[51] **Int. Cl.** **B21c 47/00,** B21d 7/04, B21d 5/14
[50] **Field of Search** 72/148, 151, 171

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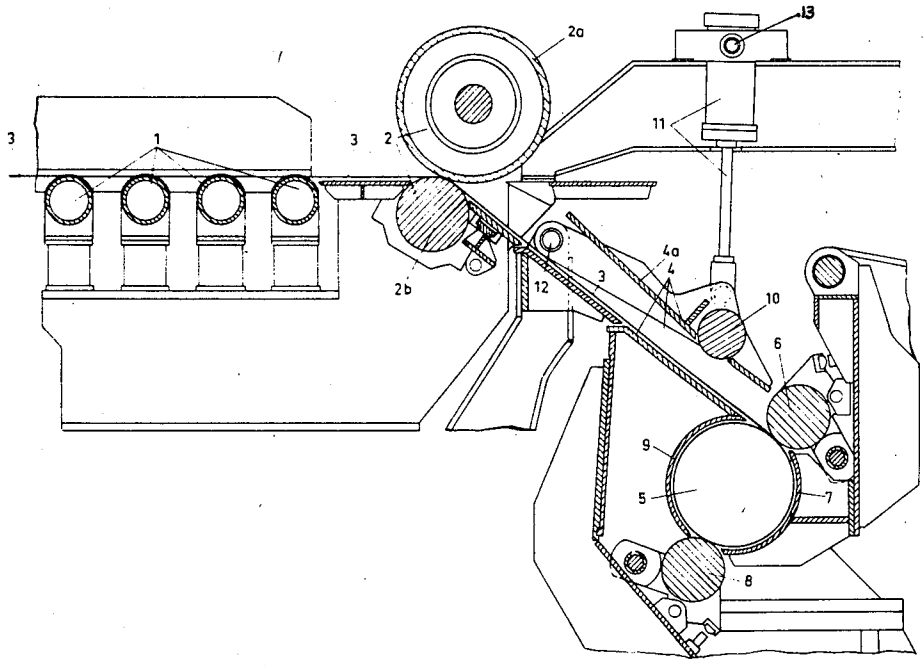
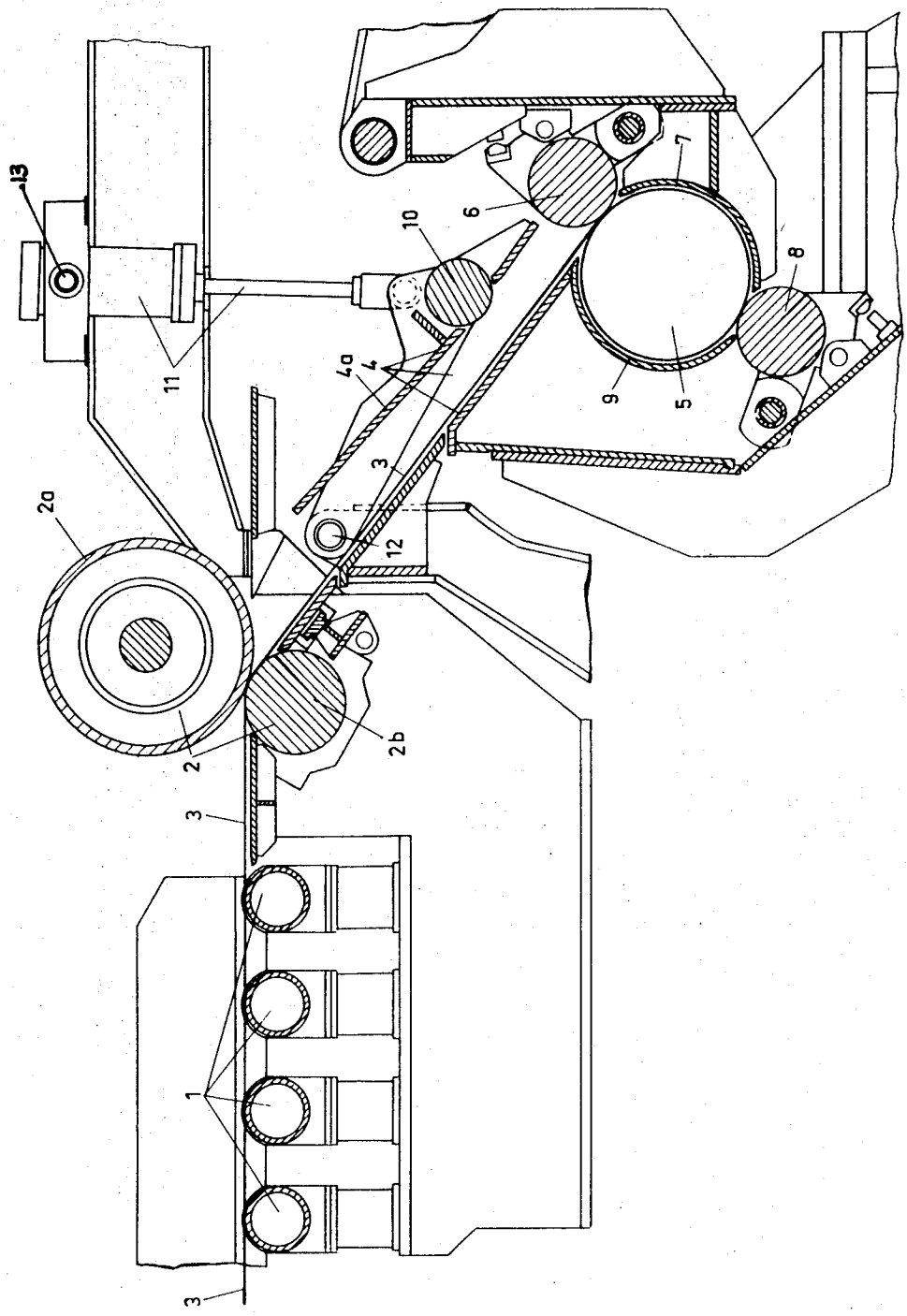
ABSTRACT: The disclosure relates to a hot strip downcoiler in which, in addition to the wrapper roller assembly arranged around the mandrel, an adjustable bending roller is arranged adjacent to the first wrapper roller in the throat of the coiler.





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STRIP COILER

Stripe coilers of this type are very common in the steel industry. They serve the purpose of winding rolled strip issuing from a finishing stand of a hot rolling mill.

In one form the coiler can include a pinch roll having a driven upper and lower roller, each, on the one hand, has the task of seizing the strip issuing from the runout roller table and deflecting it at a predetermined angle downwardly into the throat of the coiler. The pinch roll also has the task of applying a tension of the strip with respect to the mandrel at the end of the winding process, i.e., at the instant when the end of the strip has left the last stand of the finishing mill in which the pinch rolls are driven by frictional contact with the strip and the motors are operated as generators.

The coiler may also include a number of driven wrapper rollers which transport the leading end of the strip forward, wherein the rolled strip is guided along deflection guides surrounding the mandrel and thereby is bent about the mandrel so that the leading end is forced to assume the cylindrical contour of the mandrel.

As is well known, the deformation stiffness, i.e. the resistance against bending, or rolled strip is determined by the strip width, the strip thickness, the quality of the material and by the particular treatment temperature; in this case, the mandrel temperature. Rolled strip which, with respect to its deformation stiffness, is relatively soft can be wound by means of the well-known strip coilers described above to very consistent and acceptable coils. However, more and more frequently, the strip being delivered by the mill to the coiler has a thickness and high material quality with a temperature below the feasible plastic range to form a good coil. This problem becomes greater which may reach 30 and 33 tons, while the diameter of the mandrel and the outer dimensions of the coils are to be kept the same.

Although it is possible to construct the reel drive sufficiently rugged, considerable difficulties arise in attempting to coordinate a sufficiently strong force opposing the peripheral force of the mandrel which, on one hand, causes deflection, i.e., the bending of the strip, and, on the other hand, the tight winding of the individual convolution. Acting as opposing forces are the pinch rolls when they are braked, the friction force on the part of the strip on the roller table and the roll stand when the strip is still in the finishing mill. When the strip leaves the finishing mill, only the friction on the roller table and the pinch rolls become active as retaining forces. In rolling heavy and wide strip the total length of the strip is relatively short and the length of the strip between the mill and coiler represents a substantial part of the total coil. The retaining forces acting on the strip after the end leaves the finishing mill do not suffice in the case of rolled strip with high deformation stiffness to induce both the bending of the strip around the reel mandrel and the tight winding of the individual windings. The consequence is that strip coils of this stiff material cannot be wound with aligned edges or tightly.

The object of this invention is to provide a strip coiler, in particular, a wide strip downcoiler of the type described in the introduction, by which rolled strip of high deformation stiffness can be would into acceptable coils.

More particularly, the object of this invention is to provide a strip coiler including a simple means that will augment the retaining forces developed by the roller table and the pinch roll and allow these forces to be utilized to both effect the proper bending of the strip around the mandrel and assure the winding of individual convolutions of the coil, particularly the last portion of the strip.

A specific employment of the invention is characterized by providing a bending roller which is adjustable toward the mandrel transversely to the strip path of travel and engageable with the strip between the pinch roll and the first wrapper of the coiler. The wrapper roller is pressed against the strip and thus, an opposing moment to the reel moment is created by the wrapper roller force times the lever arm which leads to a bending of the rolled strip.

The invention is further characterized in that the bending roller forms the terminal point of a chord starting from the wrapper roller and intersecting the periphery of the coil. In this manner the bending roller together with the first wrapper roller and the mandrel exercises a bending effect on the rolled strip which is similar to that of a three roller bending machine.

According to a further characteristic of the invention, the bending roller is supported at or near the lower end of the throat of the coiler and as close as possible to the first wrapper roller and is suspended at its upper end in a manner that it can be swung towards and away from the strip.

According to the invention, the adjusting device for the bending roller can be a piston cylinder assembly in which the applicable force of the adjusting device can be controlled by an adjustable overpressure valve or a similar device.

These objects and advantages as well as others can be better understood when the following description is read along with the accompanying drawing which is a sectional view of one employment of the present invention.

At the tail end of a hot mill runout roller table **1** of a rolling mill (not shown), there is a pinch roll **2** having a driven upper roller **2***a* and a lower roller **2***b* which is likewise driven. The driven roller **2***a* is considerably greater in diameter than the roller **2***b* and the two rollers are arranged with respect to each other in such a way that they deflect the strip **3** running over the roller table **1** from the horizontal plane of the roller table downward under a definite slanting angle. The strip **3** passes into an inclined throat **4** located between the periphery of a driven mandrel **5** and the periphery of a driven wrapper roller **6** of the coiler. In the usual manner the mandrel **5** and the roller **6** pinch the strip to urge its leading end forward. Upon leaving the strip wrapper roller **6**, the strip **3** encounters a deflection guide **7** which surrounds the mandrel **5** so that the strip **3** is guided between the mandrel and the deflection guide **7** while it is simultaneously being bent around the mandrel under the influence of the roller **6** and guide **7**. Following the guide **7**, the strip **3** reaches another wrapper driven roller **8** which approximately faces the first strip wrapper roller **6** at the periphery of the mandrel **5**. The strip is further driven around the mandrel **5** to another deflection guide **9** which guides the leading end of the strip between the mandrel and oncoming strip which receives the same treatment.

So that the individual convolutions of the strip coil will all be wound with the edges as much aligned as possible and tightly lying on top of each other, it is necessary to furnish a large retaining force sufficient to oppose the peripheral force of the mandrel **5**. This retaining force is produced on the one hand by the last mill as long as the strip is still on the finishing line and on the other hand after the strip leaves the mill by the friction force of the portion of the strip lying on the roller table **1** as well as by the pinch roll **2** since, as noted previously, it furnishes a drag on the strip.

While the retaining forces that are imposed on the strip once it has left the finishing mills are not sufficient to effect a proper bending and tight uniform winding of the strip around the mandrel, the utilization of the additional bending roller, according to the present invention, augments these forces to obtain acceptably formed coils. This bending device consists of a bending roller **10** located into the throat **4** of the coiler between the pinch roll **2** and the first wrapper roller **6** which can be adjusted toward the mandrel **5** transversely to the direction of the strip's path of travel by means of an adjusting device **11**, e.g. a piston cylinder assembly.

The bending roller **10** is rotatably mounted at the lower end of a portion of the wall of the throat **4** and is pivotally supported at its upper end at **12**, that is to say, in such a manner that it forms the terminal point of a chord starting from the first upper roller **6** and intersecting the periphery of the coil. This construction allows the bending roller **10** to be adjusted in such a way that it exerts on the strip together with the first strip wrapper roller **6** and the mandrel **5** a bending action which corresponds to the action of a so-called three roller bending machine and properly formed coil is assured.

In order to set the holding force of the piston cylinder assembly 11 according to the requirements existing for a given condition, the cylinder may be controlled by an adjustable overpressure valve 13 or the like which will maintain the holding force within set limits.

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. In a coiler for coiling striplike material having a mandrel, at least one adjustable wrapper roller arranged adjacent to the periphery of the mandrel where the material first contacts the mandrel, a pinch roll assembly spaced from said mandrel and wrapper roller which space defined a throat through which the material is urged by the pinch roll assembly to the mandrel, the improvement comprising:

a material bending roller arranged in said throat adjacent to said mandrel and wrapper roller and transversely of the path of the material,

means for rotatably supporting said bending roller, and

means for moving independent of said one wrapper roll said supporting means and hence said bending roller towards the material passing through said throat to impose a retaining force on the strip.

2. In a coiler according to claim 1 wherein said bending roller is located in said throat in a manner that it forms the terminal point of a chord which commences at the wrapper roller and intersects the perimeter of a coil partially formed on the mandrel.

3. In a coiler according to claim 1 wherein said throat includes a separate lower guide and a separate upper guide,

said means rotatably supporting said roller being mounted in the lower end of said upper guide, and

means for pivotally supporting the upper end of said upper guide.

4. In a coiler according to claim 1 wherein said means for moving said roller comprises a piston cylinder assembly.

5. In a coiler according to claim 4 including a pressure valve for adjusting the pressure of the piston cylinder assembly.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,587,274 Dated June 28, 1971

Inventor(s) Friedrich Rotter

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 1, "Stripe" should read -- Strip --; line 22, "or" should read -- of --; line 33, after "becomes" insert -- more acute when the weight of the coils becomes --; line 60, "would" should read -- wound --.

Signed and sealed this 30th day of May 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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