

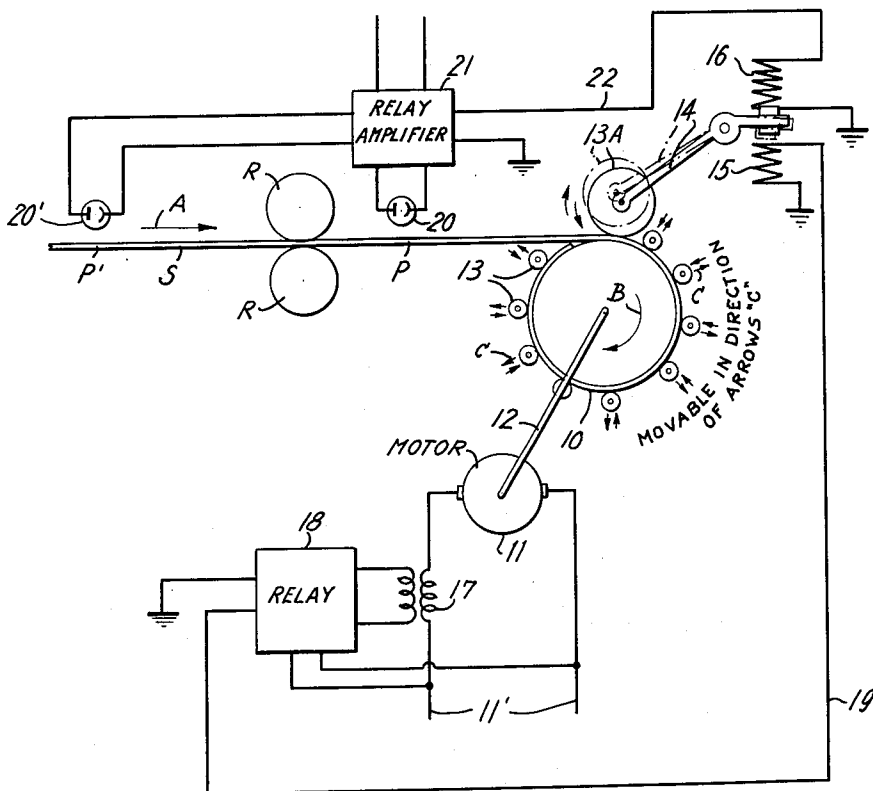
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ARRANGEMENT FOR COILING METAL STRIP MATERIAL

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1

2

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**ARRANGEMENT FOR COILING METAL
 STRIP MATERIAL**

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The present invention concerns arrangements and methods for coiling metal strip material delivered from a rolling mill.

In rolling mills producing metal strip material it is customary to coil the strip material delivered by the rolling mill, on a rotary coiling drum or mandrel which is located in the path of the moving metal strip material and is power driven by some motor means. In order to assure that the strip material is properly wound and coiled around the coiling means it is customary to provide one or more counter pressure means, usually counter rollers which are arranged parallel with the axis of the coiling drum or mandrel and adjacent thereto in suitable positions. These counter pressure means are movable in direction toward and from the coiling means i.e., between an operative position in which the strip material is engaged between them and the coiling means, and an idle position in which the counter pressure means are disengaged from the strip material.

When the coiling operation starts the counter pressure means should be in operative position in order to guide the metal strip material around the coiling means, but after the coiling operation has been properly initiated the counter pressure means should be disengaged in order not to interfere with the coiling and in order to reduce power consumption. On the other hand, shortly before a certain length of strip material is completely coiled the counter pressure means should be re-applied in order to prevent the tail end of the strip material from carrying out uncontrolled movements which might endanger the operators.

Conventionally, the counter pressure means or counter rollers are controlled by hand i.e., an operator has to cause movement of the counter pressure means from idle position to operative position and from operative position to inoperative or idle position. It is evident that in most of these cases the manual operation involves great dangers.

It is therefore a main object of the present invention to provide for means whereby the movement of the counter pressure means between idle and operative positions is carried out entirely automatically thus eliminating the human factor in the operation.

It is a further object of this invention to provide for a method and means of the type set forth which are entirely reliable yet comparatively simple.

With above objects in view, an apparatus or arrangement for coiling metal strip material delivered from a rolling mill comprises, according to the invention, rotary coiling means located in the direction of movement of the strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which strip material is engaged between said counter pressure means and said coiling means for being wound around the latter, and an idle position in which said counter pressure means is disengaged from said strip material while the latter is being wound around said coiling means; and electrically actuatable control means including electric actuating means and moving means actuatable thereby for moving, upon being actuated, said counter pressure means from their operative position to their idle position, said electric actuating means being in circuit

with the power supply to said electromotor means and being responsive to pulses in said power supply occurring due to the increase in power demand of said electromotor means at the moment of engagement of the strip material between said coiling means and said counter pressure means, whereby said counter pressure means are disengaged from said strip material after the coiling operation has been initiated.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing. A preferred embodiment of the invention is diagrammatically illustrated in the drawing.

Referring to the drawing, it may be assumed that metal strip material S is delivered from the last set of rollers R of the rolling mill so as to move in the direction of the arrow A toward the coiling means. The coiling means is diagrammatically represented by a drum or mandrel 10 connected by a shaft 12 with a drive motor 11 for rotation in the direction of the arrow B. The motor 11 is furnished with electrical energy through circuit means 11'. The coiling means 10 is supplemented by counter pressure means 13, 13A. These counter pressure means may be rollers turnable about respective axes parallel with the axis of the drum 10. The counter pressure rollers are movable between idle positions in which they are disengaged from the metal strip S being coiled around the drum 10, and an operative position in which they are applied with pressure against the metal strip S in order to guide it around the drum 10 and to cause proper coiling. For the sake of simplicity of the drawing the one roller 13A of the counter pressure means is shown at a larger scale than the other rollers 13. However, it should be understood that the principle of the invention applies equally no matter how many counter pressure rollers are to be used in the manner above described.

The counter pressure roller 13A is carried by a rockable lever 14 between the operative position shown in full lines and its idle position shown in dotted lines. In order to move the roller 13A with the rocker lever 14 between these positions electromagnetic means 15, 16 are provided. When the solenoid 15 is energized the roller 13A will be moved into its idle position, and when the solenoid 16 is energized the roller 13A will be moved into its operative position.

The primary circuit means 11' connected with the motor 11 comprise induction means 17 by which the primary circuit means are coupled with secondary circuit means. The latter comprise relay means 18 which may contain an electronically controlled gas discharge tube which would be ignited by an impulse furnished by the induction means 17 in such a manner that the relay 18 furnishes an electrical impulse which is transmitted through the secondary circuit means 19 to the solenoid 15. An impulse will be furnished by the induction means 17 to the relay 18 whenever the power demands of the motor 11 suddenly increases at the moment when the strip material S reaches the coiling means and is engaged between the pressure roller 13A and the drum 10 because under these circumstances more driving power is required for operating the coiling means than was the case before said engagement. Consequently, after the strip S is properly engaged between the counter pressure means and the coiling means and the coiling operation has been properly initiated the impulse transmitted from the relay 18 to the solenoid 15 will result in moving

the pressure roller 13A from its operative position into its idle position so that thereafter the coiling operation is in no way interfered with by the counter pressure means. It may be of advantage to provide in the relay 18 delay means of known type so that the disengagement of the roller 13A from the strip S takes place after a predetermined period of time after the moment when the front end of the strip S has reached the coiling means.

Adjacent to the path of the strip S are arranged two photoelectric cells 20, 20', preferably of a type which is particularly sensitive to the radiation emanating from the strip S which is usually in red hot condition. The cells 20, 20' are located a predetermined distance from the coiling means in direction opposite to the movement of the strip S so that these cells will scan the passage of the strip material S during its movement toward the coiling means, and will particularly respond to the radiation from the strip S when the front end or the rear end, respectively, of the strip S moves past the cells 20, 20', respectively. Whenever the cells 20, 20' react to the start or termination, respectively, of radiation emanating from the strip S, an electrical impulse will be caused through the amplifier 21 with which the cells 20, 20' are connected. By this impulse a relay comprised in the amplifier 21 will be actuated and will furnish an impulse through the circuit means 22 to the second solenoid 16. Consequently, whenever one of the cells 20, 20' responds to the passage of the forward or rearward end, respectively, of the strip S past the corresponding points P, P', respectively, the roller 13A will be moved from its idle position into its operative position so as to engage the strip material S being coiled around the drum 10.

By suitably selecting the location of the points P and P' the engagement of the roller 13A with the strip S will be caused at the beginning of the coiling operation, at a predetermined moment substantially coinciding with the arrival of the front end of the strip S at the coiling means. On the other hand, when the tail end of the strip S approaches the coiling means, the reaction of one of the cells 20, 20' will cause the roller 13A to re-engage the strip S being coiled around the drum 10 in such a manner that the coiling operation is properly completed.

While in the drawing two different cells 20, 20' located at points P and P', respectively, are shown, it will be understood that under certain conditions one cell alone can be located in such a position relative to the coiling means that the first and the second impulse required for causing engagement between the roller 13A and the strip S are caused thereby.

It may be desirable, to supplement the means for moving the roller 13A between its idle and operative positions with further means for maintaining the rollers 13A in either one of these positions for a certain period of time after the impulses furnished by the relay 18 or the amplifier relay 21 have subsided. These means would operate in such a manner that they would not interfere with a counteracting impulse following later.

It can be seen that the arrangements illustrated by the drawing fully meet the requirements stated at the outset for a safe and automatic operation of coiling means arranged for coiling strip material furnished from a rolling mill.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of an arrangement for coiling metal strip material delivered from a rolling mill, differing from the types described above.

While the invention has been illustrated and described as embodied in an arrangement for coiling, by power driven coiling means, metal strip material delivered from a rolling mill, it is not intended to be limited to the details shown, since various modifications and structural

changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An arrangement for coiling metal strip material delivered from a rolling mill, comprising, in combination, rotary coiling means located in the direction of movement of the strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which the strip material is engaged between said counter pressure means and said coiling means for being wound around the latter, and an idle position in which said counter pressure means are disengaged from the strip material while the latter is being wound around said coiling means; and electrically actuable control means including electric actuating means and moving means actuable thereby and capable upon being actuated, of moving said counter pressure means from their operative position to their idle position, said electric actuating means being in circuit with the power supply to said electromotor means and responsive to an electrical pulse occurring in said power supply due to the increase in power demand of said electromotor means at the moment of engagement of the strip material between said coiling means and said counter pressure means, whereby said counter pressure means are disengaged from said strip material after the coiling operation has been initiated.

2. An arrangement for coiling metal strip material delivered from a rolling mill, comprising, in combination, rotary coiling means located in the direction of movement of strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which the strip material is engaged between said counter pressure means and said coiling means for being wound around the latter, and an idle position in which said counter pressure means is disengaged from said strip material while the latter is being wound around said coiling means; electromagnetic means for moving said counter pressure means between said operative and idle positions; primary circuit means connected to said electromotor means for supplying the latter with power; secondary circuit means operatively connected between said primary circuit means and said electromagnetic means for actuating the latter, said secondary circuit means including control means responding to the increase in power demand of said electromotor means at the moment of engagement of the strip material between said coiling means and said counter pressure means by furnishing an electrical impulse to said electromagnetic means for causing the latter to move said counter pressure means into its idle position after the coiling operation has been initiated through said strip material being engaged between said counter pressure means and said coiling means.

3. An arrangement as claimed in claim 2, wherein said control means comprise induction means inductively coupled with said primary circuit means, and capable of furnishing an electrical impulse in response to said increase in power demand, and relay means in circuit with said induction means and having contact means in circuit upon application of said impulse.

4. An arrangement for coiling metal strip material de-

5

livered from a rolling mill, comprising, in combination, rotary coiling means located in the direction of movement of strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which the strip material is engaged between said counter pressure means and said coiling means for being wound around the latter, and an idle position in which said counter pressure means is disengaged from said strip material while the latter is being wound around said coiling means; electromagnetic means for moving said counter pressure means between said operative and idle positions; primary circuit means connected to said electromotor means for supplying the latter with power; scanning means located along the path of the strip material at a point spaced a predetermined distance from said coiling means in direction opposite to the direction of movement of the strip material for scanning the passage of the forward end of the strip material moving toward said coiling means and for furnishing an electrical impulse at a predetermined moment related to said passage of said forward end past said point; circuit means connecting said scanning means with said electromagnetic means for transmitting said impulse to the latter and for actuating the same so as to move said counter pressure means from its idle position into its operative position causing engagement of the forward end portion of the strip material between said counter pressure means and said coiling means after said forward end reaches the latter; secondary circuit means operatively connected between said primary circuit means and said electromagnetic means for actuating the latter, said secondary circuit means including control means responding to the increase in power demand of said electromotor means at the moment of engagement of the strip material between said coiling means and said counter pressure means by furnishing an electrical impulse to said electromagnetic means for causing the latter to move said counter pressure means into its idle position after the coiling operation has been initiated through said strip material being engaged between said counter pressure means and said coiling means.

5. An arrangement as claimed in claim 4, wherein said scanning means are photoelectric means.

6. An arrangement as claimed in claim 4, wherein said control means comprise induction means inductively coupled with said primary circuit means, and capable of furnishing a second electrical impulse in response to said increase in power demand, and relay means in circuit with said induction means and having contact means in circuit with said electromagnetic means for actuating the latter upon application of said second impulse.

7. An arrangement as claimed in claim 6, wherein said scanning means are photoelectric means.

8. An arrangement for coiling metal strip material delivered from a rolling mill, comprising, in combination, rotary coiling means located in the direction of movement of strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which the strip material is engaged between said counter pressure means and said coiling means for being wound around the latter, and an idle position in which said counter pressure means is disengaged from said strip material while the latter is being wound around said coiling means; electromagnetic means for moving said counter pressure means between said operative and idle positions; primary circuit means connected to said electromotor means for supplying the latter with power; scanning means located along the path of the strip material at a point spaced a predetermined distance from said coiling means in direction opposite to the direction of movement of the strip material for scanning the passage of the rearward end of the strip material moving toward said coiling means and for furnishing an electrical impulse at a predetermined mo-

6

ment related to the passage of the rearward end of the strip material past said point; circuit means connecting said scanning means with said electromagnetic means for transmitting said impulse to the latter and for actuating the same so as to move said counter pressure means from its idle position to its operative position before said rearward end of the strip material reaches the same so as to cause re-engagement of the strip material between said counter pressure means and said coiling means; secondary circuit means operatively connected between said primary circuit means and said electromagnetic means for actuating the latter, said secondary circuit means including control means responding to the increase in power demand of said electromotor means at the moment of engagement of the strip material between said coiling means and said counter pressure means by furnishing an electrical impulse to said electromagnetic means for causing the latter to move said counter pressure means into its idle position after the coiling operation has been initiated through said strip material being engaged between said counter pressure means and said coiling means.

9. An arrangement as claimed in claim 8, wherein said scanning means are photoelectric means.

10. An arrangement for coiling metal strip material delivered from a rolling mill, comprising, in combination, rotary coiling means located in the direction of movement of strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which the strip material is engaged between said counter pressure means and said coiling means for being wound around the latter, and an idle position in which said counter pressure means is disengaged from said strip material while the latter is being wound around said coiling means; electromagnetic means for moving said counter pressure means between said operative and idle positions; primary circuit means connected to said electromotor means for supplying the latter with power; first scanning means located along the path of the strip material at a point spaced a predetermined distance from said coiling means in direction opposite to the direction of movement of the strip material for scanning the passage of the forward end of the strip material moving toward said coiling means and for furnishing a first electrical impulse at a predetermined moment related to said passage of said forward end past said point; first circuit means connecting said first scanning means with said electromagnetic means for transmitting said impulse to the latter and for actuating the same so as to move said counter pressure means from its idle position into its operative position causing engagement of the forward end portion of the strip material between said counter pressure means and said coiling means after said forward end reaches the latter; second scanning means located along the path of the strip material at a second point spaced a predetermined distance from said coiling means in direction opposite to the direction of movement of the strip material for scanning the passage of the rearward end of the strip material moving toward said coiling means and for furnishing a second electrical impulse at a predetermined moment related to the passage of the rearward end of the strip material past said second point; second circuit means connecting said scanning means with said electromagnetic means for transmitting said second impulse to the latter and for actuating the same so as to move said counter pressure means from its idle position to its operative position before said rearward end of the strip material reaches the same so as to cause re-engagement of the strip material between said counter pressure means and said coiling means; secondary circuit means operatively connected between said primary circuit means and said electromagnetic means for actuating the latter, said secondary circuit means including control means responding to the increase in power demand of said electromotor means at the moment of engage-

ment of the strip material between said coiling means and said counter pressure means by furnishing a third electrical impulse to said electromagnetic means for causing the latter to move said counter pressure means into its idle position after the coiling operation has been initiated through said strip material being engaged between said counter pressure means and said coiling means.

11. An arrangement as claimed in claim 10, wherein said control means comprise induction means inductively coupled with said primary circuit means, and capable of furnishing a third electrical impulse in response to said increase in power demand, and relay means in circuit with said induction means and having contact means in circuit with said electromagnetic means for actuating the latter upon application of said third impulse.

12. An arrangement as claimed in claim 10 wherein said first and second scanning means are photoelectric means.

13. An arrangement as claimed in claim 11, wherein said first and second scanning means are photoelectric means.

14. An arrangement for coiling metal strip material delivered from a rolling mill, comprising, in combination, rotary coiling means located in the direction of movement of strip material delivered from the rolling mill; electromotor means for driving said coiling means; counter pressure means mounted adjacent to said coiling means and movable between an operative position in which the strip material is engaged between said counter pressure means and said coiling means for being said counter pressure means is disengaged from said strip material while the latter is being wound around said coiling means; electromagnetic means for moving said counter pressure means between said operative and idle positions; primary circuit means connected to said electromotor means for supplying the latter with power; scanning means located along the path of the strip material at a point spaced a predetermined distance from said coiling means in direction opposite to the direction of movement of the strip material for scanning the passage of the strip material past said point for furnishing an electrical impulse when the forward end of the strip material passes said point and for furnishing another impulse when the

rearward end of the strip material passes said point; circuit means connecting said scanning means with said electromagnetic means for transmitting either one of said impulses to said electromagnetic means and for actuating the latter so as to move said counter pressure means from its idle position to its operative position causing engagement of said strip material between said counter pressure means and said coiling means first at a moment depending upon the passing of the forward end of the strip material past said point, and secondly at a moment depending upon the passing of the rearward end of the strip material past said point; secondary circuit means operatively connected between said primary circuit means and said electromagnetic means for actuating the latter, said secondary circuit means including control means responding to the increase in power demand of said electromotor means at the moment of engagement of the strip material between said coiling means and said counter pressure means by furnishing a third impulse to said electromagnetic means for causing the latter to move said counter pressure means into its idle position after the coiling operation has been initiated through said strip material being engaged between said counter pressure means and said coiling means.

15. An arrangement as claimed in claim 14, wherein said scanning means are photoelectric means.

16. An arrangement as claimed in claim 15, wherein said control means comprise induction means inductively coupled with said primary circuit means, and capable of furnishing a third electrical impulse in response to said increase in power demand, and relay means in circuit with said induction means and having contact means in circuit with said electromagnetic means for actuating the latter upon application of said third impulse.

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