Aug. 24, 1943. J. E. KIEFER 2,327,906

STIP COIL HANDLING

Filed April 2, 1941 2 Sheets-Sheet 1

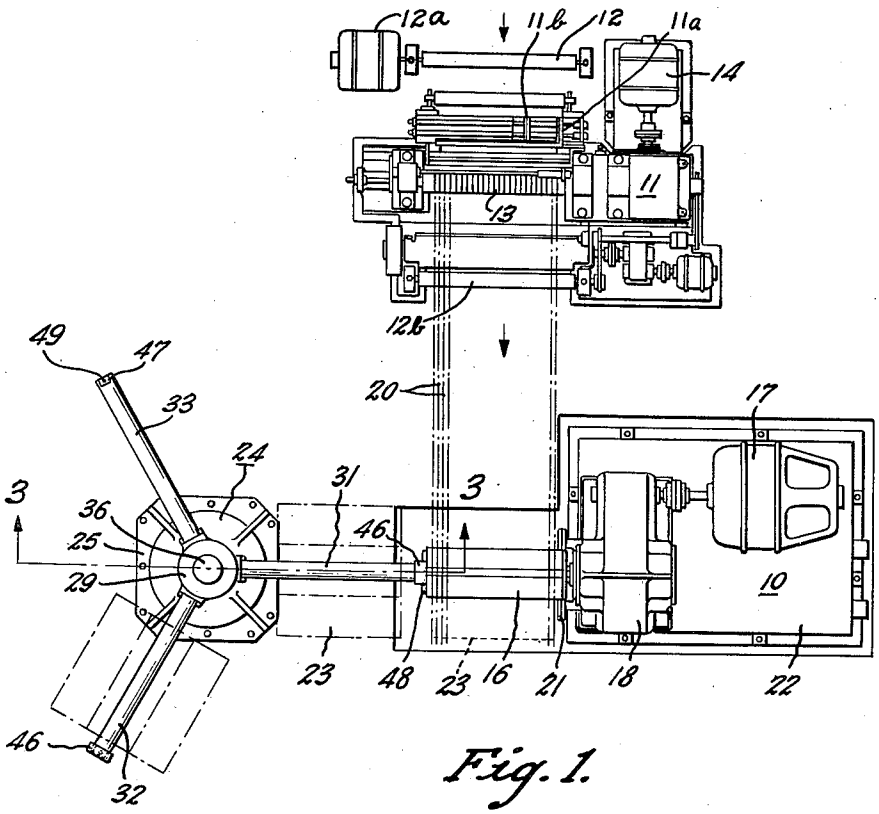


Fig. 1.

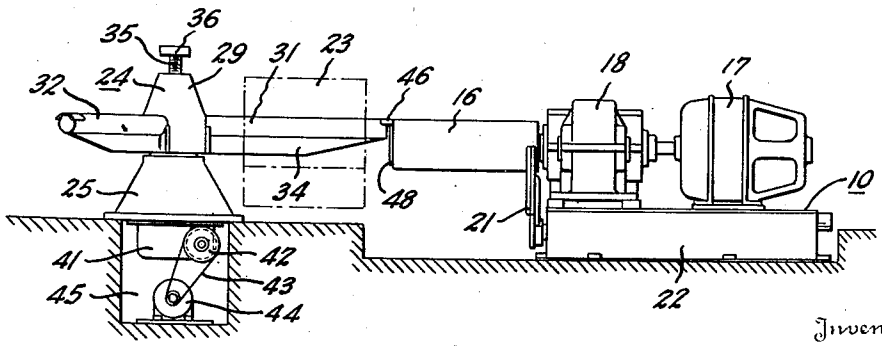


Fig. 2.

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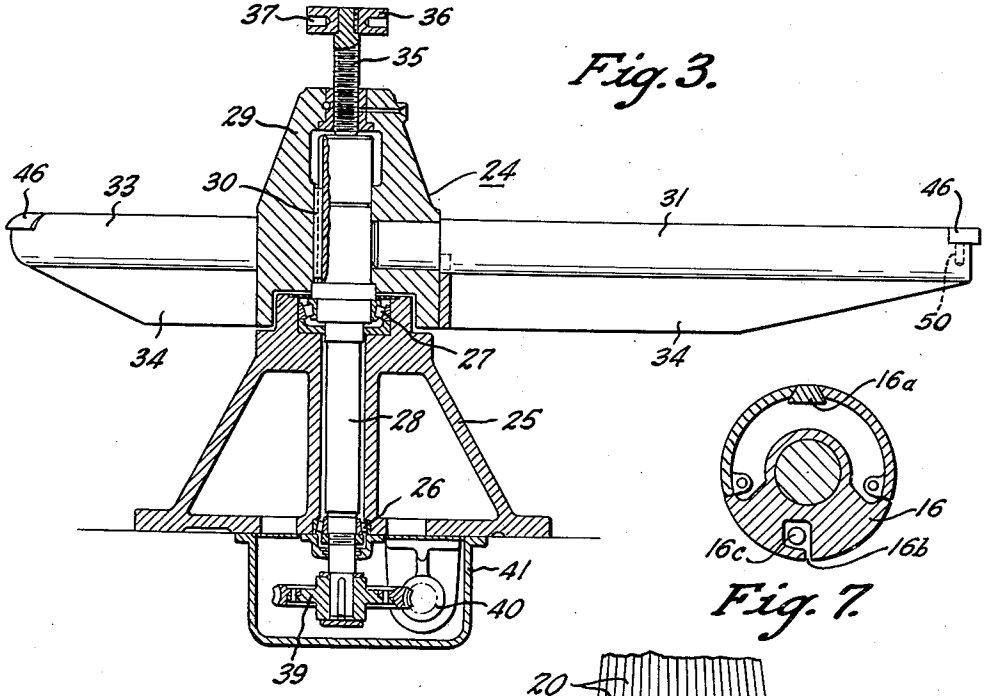


Fig. 3.

Fig. 7.

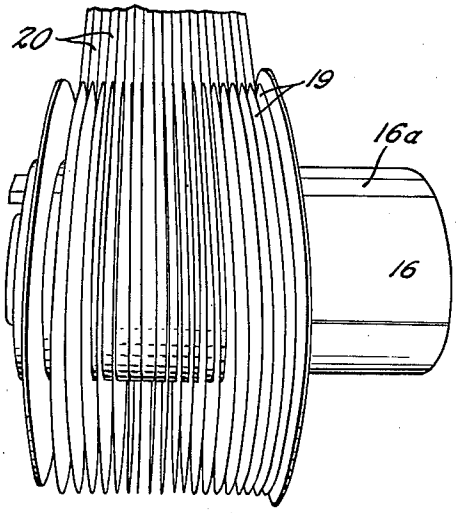
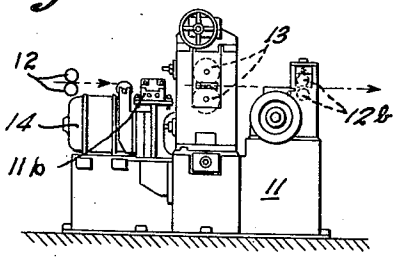


Fig. 6.

Fig. 4.



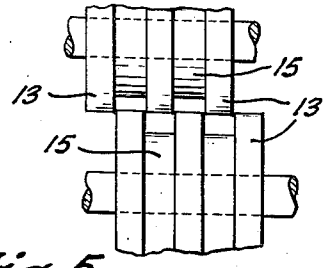


Fig. 5.

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UNITED STATES PATENT OFFICE

2,327,906

STRIP COIL HANDLING

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Application April 2, 1941, Serial No. 386,491

13 Claims. (Cl. 164—65)

This invention relates to the manufacture of strip coils of sheet material, and more particularly to the manufacture and handling of strip coils wound in a sheet slitting and coiling line.

One object of the invention is the provision of a carrier adapted to receive strip coils made at the winding zone of a slitting and coiling line, so arranged that a group of strip coils may be transferred from the winding zone and then conveniently taken off and bundled during the winding and similar transfer of another group of coils.

Another object is the provision of a strip coil carrier having a plurality of coil receiving and carrying arms adapted to be successively moved to receive successive groups of coils made at the winding zone of a slitting and coiling line, and to move such groups to an unloading and bundling station or stations where the coils are bundled during the time another group of strip coils is being made at the winding zone.

Another object is the provision of a winding reel and an associated carrier adapted to receive strip coils from the winding reel, the carrier having a coil receiving arm which is rotatably mounted for swinging movement in an arcuate path from a loading position in alignment with the winding reel to an unloading position in which the coils can be conveniently bundled and removed from the carrier.

Another object is the provision of apparatus for receiving coils from a rewind reel, and including a plurality of radial arms mounted for rotation about a fixed vertical axis so that one arm may be swung to a loading position substantially in alignment with the reel while another arm previously loaded from the reel is moved to a bundling location.

Another object resides in the method, in the manufacture of strip coils, in which a sheet of metal is rapidly slit into strips and the strips are then coiled at a winding zone of a slitting and coiling line, the coils then being transferred as a group from the winding zone, and then removed and bundled at a bundling station or stations during the time another group of strip coils formed at the winding zone is removed from the winding zone.

Another object resides in the method of removing strip coils from a rewind reel of a slitting and coiling line, in which a plurality of arms are successively moved into alignment with the reel to receive strip coils from the reel and then moved to carry the strip coils to an unloading position in which the strip coils can be conveniently bundled.

Other objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawings, in which

Fig. 1 is a plan view of a portion of a slitting and coiling line of machinery, showing the strip coil carrier in cooperative association with the rewind reel;

Fig. 2 is a view shown in end elevation and corresponding to Fig. 1;

Fig. 3 is a vertical section on the line 3—3 of Fig. 1;

Fig. 4 is an end elevation showing the slitting machine;

Fig. 5 is a fragmentary view of some of the slitting knives;

Fig. 6 is a perspective view of the rewind reel with some partially wound strip coils; and

Fig. 7 is a sectional view of the winding reel.

In the drawings the preferred embodiment of the invention is shown in its association with a slitting and coiling line in which a sheet of metal is slit to form a number of strips and the strips are coiled on a winding reel. The strip coils are then removed from the winding reel and bundled. Referring more particularly to the drawings, in which the same reference numerals have been used to designate like parts in the different views, 10 generally designates the winding apparatus and 11 designates a slitting machine of a slitting and coiling line. In the manufacture of strip coils from a coil of sheet metal, the sheet metal coil is mounted on a pay-off reel, which has not been illustrated, but which is arranged at the left side of the slitter 11 as viewed in Fig. 4 so that a continuous sheet is payed off of the sheet metal coil and is pushed to the slitter where it passes between upper and lower rotatable shearing knives 13 which are driven by a suitable motor 14, and which shear or slit the sheet into strips. A series of leveling rolls, or pairs of pinch rolls 12 of any suitable number, driven by a motor 12a, may be used to push the entering end of the metal sheet up to and through the slitting or shearing zone. Pinch rolls 12b, driven by motor 14 cooperate with the knives to pull the strips through the slitting zone after the strips advance far enough to engage with these rolls 12b.

Ahead of the knives 13, the slitter is provided with a stationary guide plate 11a to maintain one edge of the continuous sheet in its proper relation to the end of the series of knives. A laterally adjustable guide plate 11b is positioned a

proper distance from the guide plate 11a to permit the sheet to run freely to the knives but holding the sheet against lateral movement. As will be understood, the axis of the pay-off reel is parallel with the axis of the shearing knives and the sheet is advanced to the slitter in a line which is transverse to the axes of the knives and as indicated by the arrows in Figs. 1 and 4. The upper slitting or shearing knives are axially spaced apart by means of spacer collars or disks 15 of smaller diameter than the knives and arranged vertically opposite the knives of the lower series, similarly spaced apart by spacer collars, with the upper and lower knives overlapping one another vertically to insure complete severing or shearing of the sheet as the sheet is pulled between the knives. In practice this vertical overlap may be about six thousandths of an inch, and the radial planes of a cooperating pair of shearing edges of an upper and a lower knife may have an axial clearance spacing of about three thousandths of an inch. The width of the knives or the axial distance between successive shearing bites determines the width of the strips cut from the continuous sheet.

The continuous strips 20 coming from the slitter are supplied to a rewind reel 16 and are wound up on that reel to form a series of strip coils. The winding reel 16 is rotated by means of a variable speed motor 17 through suitable gearing arranged in the gear transmission housing 18. The motor 17 is preferably of sufficient size so that it can pull the strips through the slitter, and operates the rewind reel at such speed that the strips will be pulled through the slitter independently of any power coming from the motor 14, which is provided with an overrunning clutch in its driving connection to the slitting knives 13 and the pinch rolls 12b. Motor 14 however is used to drive the slitter and feed the strips toward the rewind reel until the ends of the strip are fastened to and pulled by the reel.

The rewind reel 16 is provided with pivotal segmental sections and with suitable expanding means 16a which can be moved inwardly or outwardly by the operator. A longitudinally extending slot 16b receives the ends of the strips, the construction being such that after the strip ends are inserted into the reel, the latter is expanded and the ends of the strips gripped by a gripping device 16c. The strips are applied to the reel between a series of flat thin spacing disks, shown at 19, to provide orderly and even sides to the coils. The strips are wound on the reel 16, driven by motor 17, until the coiled sheet which supplies the slitter is entirely unwound, and the motor 17 is then stopped, the reel 16 contracted and the strip ends released. The series of strip coils together with the spacing disks 19 may then be pushed off of the reel by a pusher plate 21 which is movable to the left as viewed in Figs. 1 and 2 by means of a suitable fluid pressure operated piston contained in the housing 22 on which the motor 17 and the transmission housing 18 are supported.

In accordance with the present invention the coiled strips are pushed off of the rewind reel 16 as a group 23 onto a coil carrier 24, from whence the strips are bundled ready for distribution. The coil carrier comprises a support 25 which is mounted in fixed position at some distance from the rewind reel 16 and in line with the reel. Suitable antifriction bearings 26 and 27 in the support 25 provide a rotatable mounting for a frame which comprises a vertical shaft 28 carrying a head 29 for rotational movements therewith. As shown, there is a key connection 30 between the shaft and the head permitting relative axial movement of those parts for a purpose as will be presently described. Projecting horizontally from and fixed to the head 29 are rigid arms 31, 32, and 33 extending radially and of such length that the outer end of an arm will reach almost to the outer end of the reel 16, when such arm is in axial alignment with the reel. There is preferably a small clearance space between the adjacent ends of the aligned arm and reel so that the arms can be swung about their vertical axis of rotation without striking against the end of the reel. As will be apparent, the arms are rotatable so that any one of them may be selectively brought into alignment with the reel 16 while another arm is moved out of alignment to a more remote position such as that assumed by the arm 32 in Fig. 1. The arms of the carrier may be constructed from rigid thick bars somewhat smaller in diameter than the reel 16 and having depending vertical reenforcing plates or walls 34 connected to the sides of the head 29 and bracing the bars to the head. The upper surface of these arms is substantially level with the upper surface of the reel 16 so that the strip coils can be readily pushed along from the reel 16 onto an arm that has been brought into alignment with the reel.

To enable the arms to be brought exactly into a desired level relation with the reel, the head 29 is provided with adjusting means for adjusting the height of the head with respect to the frame 25. This adjustment, as shown, comprises a stud 35 threaded in the top of the head 29 and abutting against the top of the shaft 28. An operating plate 36 fixed on the top of the stud may be rotated by means of a lever bar or bars engaged in sockets 37 so that the head 29, and consequently the arms 31, 32 and 33 carried by the head can be vertically moved either upwardly or downwardly with respect to the support.

Since the weight of strip coils applied to an arm of the carrier is not lifted as the carrier is rotated about its vertical axis, the carrier may be readily moved by hand in order to bring one of its arms into loading position adjacent the reel 16 and to move an arm to which a series of strip coils have been applied from the carrier to an unloading and bundling position. As shown, however, the shaft 28 is provided with power actuated means, under the control of the operator, for rotating it upon its own axis. For this purpose the lower end of the shaft is provided with a worm gear 39, keyed to the shaft, and engaging a worm 40 which is rotatably supported in the casing 41. The worm shaft extends through the casing wall and is provided exteriorly of the casing with a pulley 42 driven by a belt 43 from an adjusting motor 44 which may be arranged in a pit 45 above which the carrier is positioned. The adjusting motor may be started and stopped by the operator in order to bring the carrier arms successively to their loading position and their unloading positions.

To bridge the small space between the end of an arm of the carrier and the end of the reel 16, a small curved bridge plate 46 is preferably used, the upper portions of each arm adjacent its free end being recessed as indicated at 47 and having a dowel socket 49 for the removable support of the bridge member 46 and its dowel pin 50. Member 46 has a radius of curvature greater than the radial dimension of the arm and less than

that of the reel, and its upper surface is substantially flush with the upper part of the arm on which it is mounted. The outer end of the plate, which projects beyond the arm, will be received on a short shoulder 48 at the end of the reel 16, and its upper surface is flush with the upper surface of the reel. The bridge member 46 permits the strip coils to be more conveniently shoved onto the arm of the carrier, and may be instantly removed before rotating the carrying arm out of alignment with the reel.

The strips coming from the slitter move at comparatively high speed, of the order of several hundred feet per minute, and the strips are therefore coiled quite rapidly. The time required to remove the coiled strips and bundle these strips so that the loose ends will be fastened down ready for distribution is quite substantial, but the carrier permits the strip coils to be removed and bundled at a point remote from the end of the reel 16 at one or a plurality of unloading stations while another series of strip coils is being formed on the reel and removed from the reel to another arm of the carrier. A series of strip coils may thus be formed and removed from the winding zone before the completion of the bundling and removal of all the strip coils of a previously formed series. The slitting and coiling line may therefore operate rapidly and at its full capacity while affording the bundlers an opportunity to perform that operation. And with a plurality of unloading stations to which the strip coils are successively moved by the carrier for the bundling operation, and where the bundling may take place simultaneously it will be quite apparent that the production capacity of the line may be very high and the cost of production lowered accordingly.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A carrier adapted to receive a series of separate axially spaced strip coils from a rewind reel of a slitting and coiling line, comprising a stationary support, a frame operably mounted on said support, said frame having a projecting arm adapted in one position of the frame to extend in alignment and direct transferring relation with the reel so that a series of said strip coils can be pushed from the reel onto the arm, the uppermost portions of the arms having a smooth curvature along which the coils are readily slidable, and means for rotatably mounting the frame on the support for movement of the arm from its position of alignment with the reel to a remote position in which coils on the arm can be conveniently taken therefrom.

2. A carrier adapted to receive a series of separate axially spaced strip coils from a winding reel of a slitting and coiling line comprising a support, a frame operably mounted on said support and having a plurality of radially extending arms adapted to be successively positioned in alignment and direct transferring relation with the reel so that said strip coils can be pushed from the reel onto the aligned arm, the uppermost portions of the arms having a smooth curvature along which the coils are readily slidable, and means for rotatably mounting the frame on the support for swinging movement of the arms about an axis extending substantially at right angles to the axis of the reel.

3. A carrier adapted to receive a series of separate axially spaced strip coils from a winding reel of a slitting and coiling line, comprising a stationary support, a frame operably mounted on said support and having a plurality of horizontal arms adapted for successive positioning in a coil receiving position, the uppermost portions of said arms lying at the level of the top of said reel providing for direct transfer of said series of coils therebetween and means for rotatably mounting the frame on the support for movement about a vertical axis for simultaneously swinging one arm to an unloading position and swinging another arm into a coil receiving position.

4. A carrier adapted to receive a series of strip coils from a winding reel of a slitting and coiling line, comprising a support, a frame rotatably mounted on said support for movement about a vertical axis and having a plurality of radially extending horizontal arms adapted to be successively brought into alignment and direct transferring relation with the reel to receive strip coils from the reel, and adjusting means for vertically adjusting the height of the frame with respect to the support to position the top of an arm level with the top of the reel and to maintain said frame at said height during operation of the carrier.

5. A carrier adapted to receive a series of strip coils from a winding reel of a slitting and coiling line, comprising a stationary support, a frame rotatably mounted on said support for movement about a vertical axis and having a plurality of horizontally projecting arms adapted to be brought one at a time to a position to receive strip coils from the reel and then moved to a remote position, and bridge means movably connected to an outer end of an arm and flush with the top of the arm and extending out from the end of the arm substantially to the winding reel and flush with the upper surface thereof.

6. A carrier adapted to receive a series of strip coils from a winding reel of a slitting and coiling line, comprising a stationary support, a shaft rotatably mounted in said support for movement about a vertical axis, a carrying head keyed to said shaft and having a plurality of radially extending arms adapted to be successively brought adjacent to and in alignment with the winding reel with a small axial spacing between the end of an arm and the end of the winding reel, adjusting means between said shaft and said head for adjusting the height of said head on said support to bring the top of an arm level with the top of the winding reel, and bridge means movably connected to the outer end of an arm and flush with the top of the arm and extending to the winding reel substantially flush with the upper surface thereof.

7. In combination, a winding reel on which strips of sheet material are wound to form an axially extending series of strip coils, and a coil carrier having a series of radially extending rotatably supported arms and a fixed support rotatably mounting said arms for movement about a vertical axis, said support being so spaced from the end of the winding reel that the arms can be simultaneously swung to position one arm in alignment with the reel and close to the end of the reel while bringing another arm to a position remote from the reel.

8. In combination, a winding reel of a slitting and coiling line, and a carrier comprising a stationary support, a frame on said support and having projecting arms adapted to be brought successively into alignment with the reel with the top of an arm level with the top of the reel so that strip coils can be pushed from the reel onto the aligned arm, and means movably mounting the frame on the support.

9. In combination, slitting and coiling apparatus including a slitting device and a coiling reel which pulls the strips from the slitting device and coils the strips into an axially extending series of strip coils, and a coil carrier having a series of radially extending horizontal arms, a fixed support rotatably mounting said arms for movement about a vertical axis while maintaining the top surfaces of the arms substantially level with the top of the reel, said support being axially spaced from the end of the reel to provide for swinging movement of one arm into alignment with the reel and close to the end of the reel while swinging another arm to a position remote from the reel.

10. The method, in the manufacture of strip coils, comprising passing sheet material through a slitting zone to divide a sheet into strips and to a winding zone in which the strips are wound to provide a series of strip coils, simultaneously removing all the wound strip coils from the winding zone and transferring them simultaneously to a bundling station, and removing and bundling the strip coils at the bundling station during the time another series of strip coils formed at the winding zone is removed from the winding zone.

11. The method, in the manufacture of strip coils, comprising passing sheet material in a line of travel first through a slitting zone in which the sheet is slit into strips and then to a winding zone in which the strips are wound into strip coils, transferring the wound strip coils as a group from the winding zone to a carrier, moving the carrier to carry the wound strip coils to successive positions remote from the winding zone, and removing and bundling the strip coils at such remote positions while transferring another group of strip coils from the winding zone.

12. The method of handling strip coils wound on a rewind reel of a slitting and coiling line comprising pushing the coils from the rewind reel onto a carrier arm aligned with the reel and level with the top of the reel, and moving the loaded arm out of alignment with the reel and to an unloading position remote from the reel while concomitantly moving another arm into alignment with the reel to receive other strip coils from the reel.

13. The method of handling strip coils wound on a rewind reel of a slitting and coiling line comprising pushing a series of strip coils from the reel onto a carrying arm which has been swung into alignment with the reel, and then swinging the arm horizontally in an arcuate path out of alignment with the reel and to an unloading and bundling position in which the strip coils are removed and bundled, and swinging another arm into alignment with the rewind reel and pushing another series of strip coils thereon from the reel while the first mentioned series is being unloaded and bundled.

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