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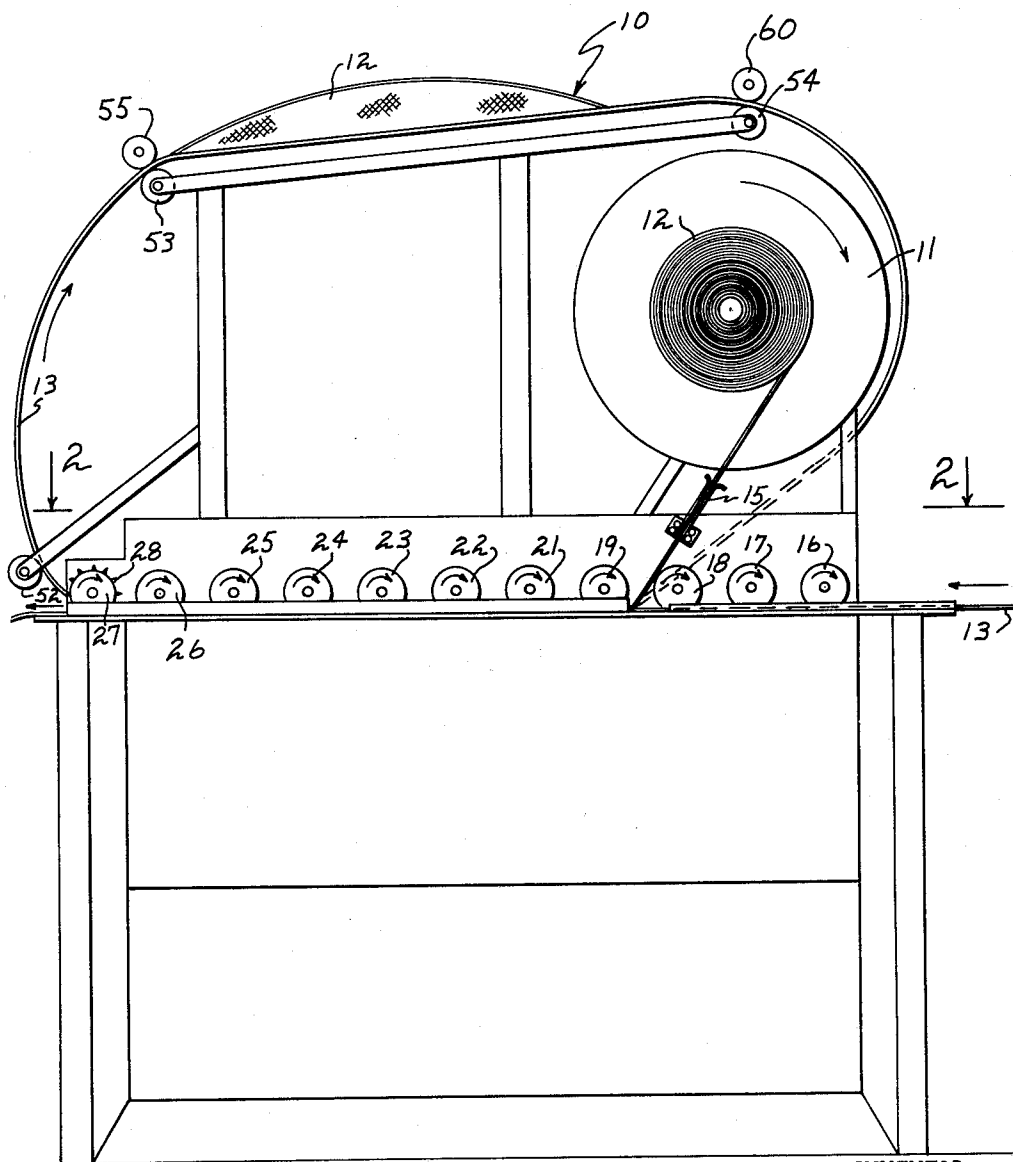
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3,183,701

METHOD FOR SECURING A FLEXIBLE STRIP TO METAL STRIPS

Filed March 1, 1961

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

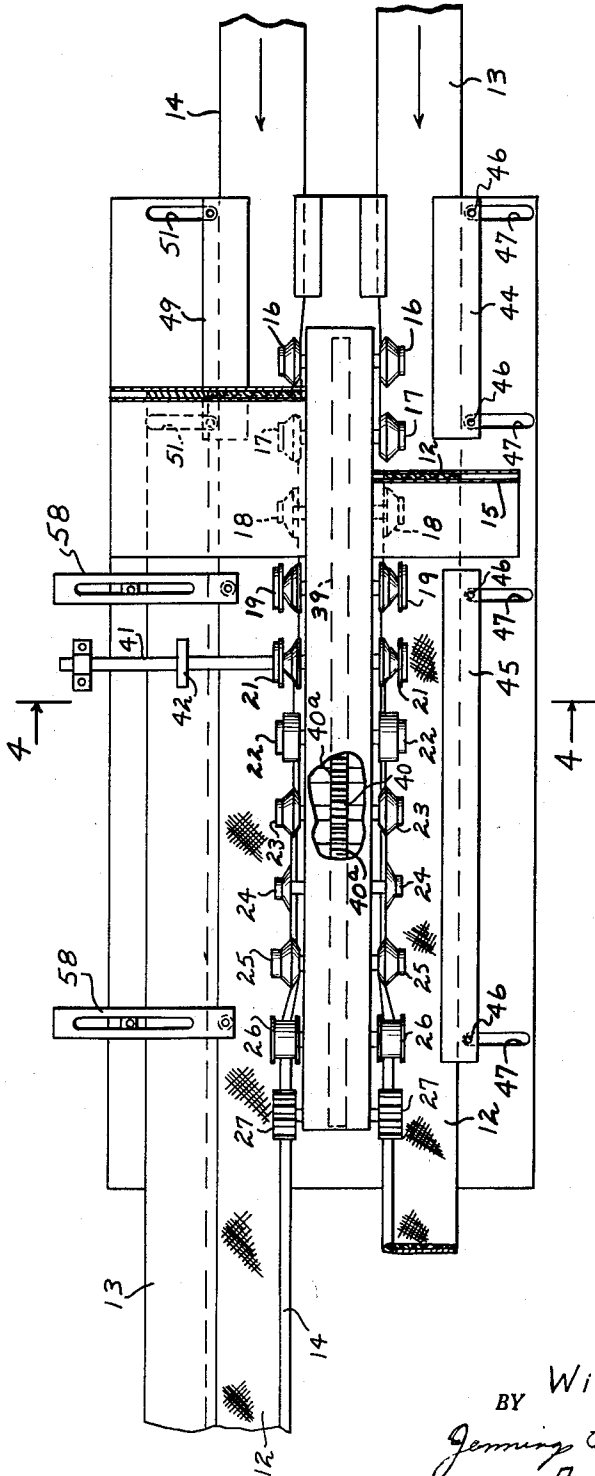


FIG. 2

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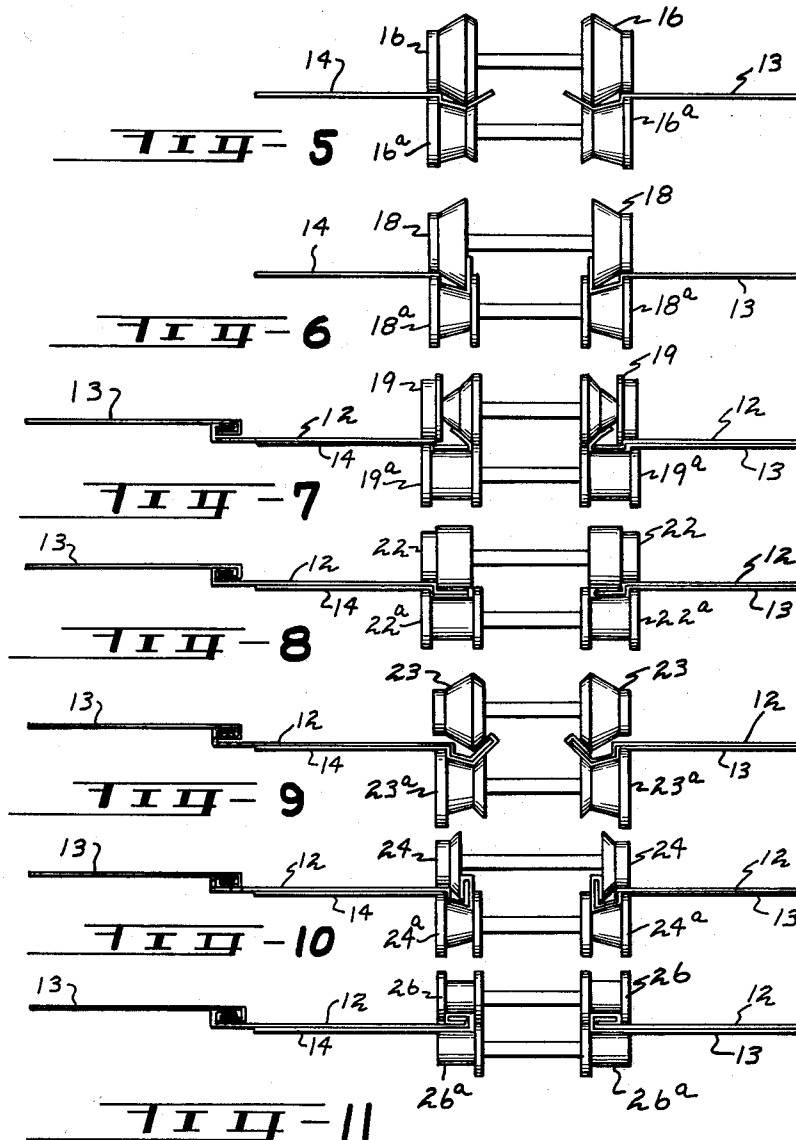
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METHOD FOR SECURING A FLEXIBLE STRIP TO METAL STRIPS

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4 Sheets-Sheet 4



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3,183,701

METHOD FOR SECURING A FLEXIBLE
STRIP TO METAL STRIPS

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6 Claims. (Cl. 72-181)

This invention relates to a method or process to secure strips of metal to opposite parallel edges of a moving strip of flexible material and more particularly, to secure the flexible material to a pair of non-overlapping continuously moving metal strips.

Heretofore, it has been common to secure a fabric strip simultaneously to a pair of overlapping metal strips. This has produced a relatively narrow finished product of two thicknesses of metal which has been difficult to coil at times and which produces a large diameter coil. Further, it has been difficult, heretofore, to adjust the securing apparatus for different widths of metal strips as the two series of forming or bending rolls have been used simultaneously on the outer edges of overlapping metal strips.

An object of the present invention is to provide a process to secure a flexible fabric strip to a pair of metal strips without the metal strips being overlapped at any time. This allows the finished product to be easily coiled as only a single thickness of metal is required to be flexed in the coil. By having the finished product coiled in flat non-overlapping relation the diameter of the coil is reduced which is desirable in the storing and handling of the coils.

A further object of my invention is to provide a process to secure a fabric strip to a pair of metal strips in which a side edge of a first metal strip is clamped by bending rolls to an edge of a fabric strip supported thereon, then the metal strip and fabric secured thereto are separated and a second metal strip is secured to the unattached free edge of the fabric strip by bending rolls.

Apparatus for performing a method or process embodying features of my invention is shown in the accompanying drawings, forming a part of this application, in which:

FIG. 1 is a side elevational view of the apparatus embodying the process to secure a flexible strip to a pair of metal strips;

FIG. 2 is a sectional view taken generally along the line 2-2 of FIG. 1;

FIG. 3 is a fragmentary side elevational view of the means to coil the secured strips after they leave the apparatus shown in FIGS. 1 and 2;

FIG. 4 is an enlarged sectional view taken generally along the line 4-4 of FIG. 2 and showing the drive means for the bending rolls;

FIG. 5 is a fragmentary view showing the first set of bending rolls with the first and second metal strips disposed therebetween;

FIG. 6 is a fragmentary view showing the metal strips in which the side edges of the metal strips are bent to 90° relative to the horizontal in position to receive the fabric strip thereat; and,

FIGS. 7-11 are fragmentary views showing successive pairs of bending rolls securing parallel side edges of the fabric strip to a pair of metal strips.

Referring now to the drawings for a better understanding of my invention, and more particularly to FIG. 1, I show apparatus embodying the process of my invention to secure parallel side edges of a flexible strip to a pair of metal strips with the metal strips being in non-overlapping relation and being coiled so that only a single thickness of metal is bent. The apparatus is indicated generally by the numeral 10 and comprises a reel 11 on which a roll of fabric 12 is mounted. Fabric 12 may be

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of any flexible sheet material, such as woven canvas. First and second flat metal strips 13 and 14, respectively, are fed continuously to apparatus 10 from suitable supply coils (not shown). Strips 13 and 14 are pulled or drawn into apparatus 10 by two sets of feed rolls 16 and 17. After metal strips 13 and 14 are fed to apparatus 10, upper rolls 16, 17, 18, 19, 21, 22, 23, 24, 25 and 26, and corresponding lower rolls 16^a, 18^a, 19^a, 22^a, 23^a, 24^a, and 26^a bend successively the side edges of strips 13 and 14 into secured relation with fabric 12.

Fabric 12 is fed in supported relation through vertical guides 15 onto metal strips 13 and 14 between sets of rolls 18 and 19 (see FIG. 1). After the side edges of metal strips 13 and 14 have been moved downwardly onto the edges of fabric strip 12 supported thereon, crimping rolls 27 having projections 28 crimp the side edges of the metal strips to hold fabric 12 tightly thereon.

The drive for rotating the several sets of rolls is shown in FIG. 4 and comprises a motor 31 having a drive shaft 32 thereon connected to a gear reducer 30. Drive sprocket 33 drives shaft 34 through sprocket 36 secured thereto and sprocket chain 37. Spur gear 38 mounted on shaft 34 drives gear 39 on upper shaft 41. Gear box 35 houses gears 38 and 39 and the remaining rolls are driven by power transmitting gears 40 and 40^a from gear 39 (see FIG. 2). Feed rolls 42 and 43 draw metal strip 13 through the apparatus after it has been looped.

Side guides 44 and 45 are positioned outwardly of the rolls and are adjustably mounted by bolts 46 slidably mounted in slots 47. Second metal strip 14 is fed outwardly of the feeding and bending rolls beneath guide 49 which is adjustably mounted for movement within slots 51.

Fabric 12 is fed downwardly through guides 15 onto first metal strip 13 and the side edge of strip 13 is bent downwardly and crimped thereon by the several bending rolls. As shown in FIG. 1, strip 13 and fabric 12 supported thereon is looped in a clockwise direction while supported by rollers 52, 53 and 54. Rollers 55 and 60 are mounted vertically over rollers 53 and 54 and strip 13 and fabric 12 are fed therebetween in a generally horizontal direction. Initially when the operation is commenced, strip 13 is unfolded from fabric 12 and turned 180° where it is threaded or fed between rollers 54 and 60. Thereafter the metal strip 13 and fabric strip 12 are separated between rolls 53 and 54 automatically without any manual control required. Thereafter, strip 13 and fabric 12 are fed downwardly with fabric 12 being positioned on and supported by second metal strip 14. Guides 58 are adjustably mounted to hold strips 13 and 14 accurately positioned. The bending rolls bend the marginal side edge of strip 14 onto the unsecured edge of fabric 12 and crimping rolls 27 crimp the edge of metal strip 14 tightly onto fabric 12. This also allows greater flexibility of the folded edge of metal strips 13 and 14 allowing the product to be easily withdrawn from the coil and flattened.

As the finished product leaves apparatus 10, strips 13 and 14 are in non-overlapping position and are fed to a coiler indicated generally by the numeral 61 in FIG. 3. Coiler 61 is driven by motor 62 connected to a reduction gear unit 63 and a variable speed reducing device 64. Belt 66 connects reducing device 64 to pulley 65, in turn connected to a coiling reel 67 by pulley belt 68. The finished product received from apparatus 10 comprises only a single thickness of metal and the coil may be easily formed of a minimum diameter by having a single thickness of material. Strips 13 and 14 are of identical lengths and there is a minimum of buckling of the material when withdrawn from the coil and flattened.

Referring now to FIGS. 5-11 in which the feeding and bending rolls are shown in detail, I show in FIG. 5 upper

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bending rolls 16 and lower rolls 16^a. Feed rolls 17 are similar to feed rolls 16 but bend the edges of strips 13 and 14 to a greater angle than rolls 16 and 16^a. Only rolls 16 are described and shown in detail. Rolls 16 and 16^a act both as feeding and forming or blending rolls. Metal strip 13 and metal strip 14 are in flat relation when fed to rolls 16. Rolls 16 and 16^a bend the marginal edges of strips 13 and 14 to an angle of 30° to the horizontal. Rolls 17 and 17^a bend the edges to an angle of 60° to the horizontal. Upper rolls 18 and lower rolls 18^a bend the side edges of strips 13 and 14 to a 90° relation with the horizontal.

FIG. 7 shows rolls 19 and lower rolls 19^a which are the first rolls to which fabric 12 is fed. Inner marginal side edges of metal strips 13 and 14 are bent to a position of 135° to the horizontal after fabric 12 has been positioned thereon. Rolls 22 and 22^a in FIG. 8 clamp the side edges of strips 13 and 14 downwardly onto fabric 12.

Rolls 23 and 23^a in FIG. 9 start the second overlapping of the inner marginal side edges of strips 13 and 14. Rolls 24 and 24^a in FIG. 10 bend the marginal side edges to a 90° relationship to the horizontal and rolls 25 to 135° relationship. Rolls 26 and 26^a in FIG. 11 complete the bending operation. Thereafter, crimping rolls 27 crimp the edges firmly to secure them on fabric 12 and to allow the coiled material to be easily withdrawn and flattened.

In operation, a first metal strip 13 is fed outwardly of one set of rolls 16 and the inner side edge of strip 13 is bent to an angle of 90° to the horizontal by rolls 16 and 18. Next, fabric 12 is fed downwardly onto the upper surface of metal strip 13 adjacent a side edge thereof with the edge of fabric 12 spaced from the edge of strip 13 and the bending rolls bend the side edge of strip 13 to secure firmly fabric 12 thereto. Thereafter, fabric 12 and strip 13 are looped in a clockwise direction as shown in FIG. 1 and rolls 54 and 60 separate or unfold fabric 12 from supporting relation on strip 13. Strip 13 with the unsupported fabric adjacent thereto is fed to the opposite side of the machine with the fabric being supported on a second metal strip 14. The bending or forming rolls bend the inner marginal edge of strip 14 in the same manner that the side edge of strip 13 was formed and the edge of fabric 12 opposite strip 13 is firmly clamped onto strip 14. Thereafter, the non-overlapping strips 13 and 14 with the clamped fabric are fed to coiler 61 where the product is coiled in a single thickness.

From the foregoing, it will be understood that I have provided a process to secure parallel edges of a fabric strip to a pair of continuously moving metal strips which are not overlapped at any time. This allows the finished product to be coiled easily since only a single thickness of metal is required to be bent in the coil.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. A method for producing an elongated strip-like product composed of a relatively flexible strip having a pair of opposite edge portions each securely engaged to a respective marginal portion of one of a pair of relatively rigid metal strips, said method comprising the steps of:

moving a first of said pair of metal strips along a path in a lengthwise direction;

positioning said flexible strip in a first disposition relative to said first metal strip with one edge portion of the flexible strip lying atop the first metal strip and located adjacent one marginal portion of

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the first metal strip and the remaining portion of the first metal strip extending widthwise underneath the flexible strip;

moving said positioned flexible strip along said path with said first metal strip;

deforming said one marginal portion of the first metal strip onto the adjacent edge portion of the flexible strip and securely engaging said portions of the two strips as they move along a first portion of said path;

looping said engaged strips through a second portion of said path and then moving them along a third path portion parallel to said first path portion;

changing the relative disposition of the first metal strip and the flexible strip, during movement thereof along the second path portion, to a second disposition in which the unengaged portions of the first metal strip and the flexible strip extend widthwise in respective non-overlapping directions from the engaged portions thereof;

moving a second of said pair of metal strips along a path parallel to said third portion of the path followed by said first metal strip and flexible strip;

positioning said flexible strip, moving along its third path portion, relative to the second metal strip with the other edge portion of the flexible strip lying atop the second metal strip and located adjacent one marginal portion of the second metal strip and the remaining portion of the second metal strip extending widthwise underneath the flexible strip;

and deforming said one marginal portion of the second metal strip onto the adjacent edge portion of the flexible strip and securely engaging said portions of the two strips as they move along their respective paths.

2. A method as recited in claim 1 wherein:

the other marginal portion of the second metal strip is in non-overlapping disposition relative to the engaged portions of the first metal and flexible strips and the remaining portion of the first metal strip when the flexible strip had undergone said positioning relative to the second metal strip and is wider than the second metal strip.

3. A method as recited in claim 1 wherein:

the unengaged portions of the first metal strip and the flexible strip lie in substantially parallel planes when said strips are in said second disposition, and the undeformed portion of the second metal strip is disposed parallel to the unengaged portion of the first metal strip which extends widthwise away from the second strip;

said method further comprising coiling said securely engaged strips, following the last recited deforming step, with the strips in their last recited relative dispositions.

4. A method as recited in claim 1 wherein:

the path of the second metal strip extends alongside the first and third portions of the path of the first metal strip, between said path portions;

the length of that part of the path of the second metal strip in which the second metal strip undergoes deformation being coextensive with the length of that part of the path of the first metal strip in which the first metal strip undergoes deformation.

5. A method as recited in claim 1 wherein:

the path of the second metal strip is spaced from and extends alongside the first portion of the path of the first metal strip, and said third path portion extends alongside at least a part of the path of the second metal strip;

said second metal strip being in non-overlapping disposition with respect to that part of the first metal strip in the first path portion;

said method comprising;

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moving advanced parts of the flexible strip and the first metal strip along said third path portion simultaneous with movement of intermediate parts of said strips along said second path portion and movement of trailing parts of said strips along said first path portion;

moving an advanced part of the second metal strip along its path simultaneous with movement of the trailing parts of the second metal strip and flexible strip along their first path portion;

said deforming of the advanced part of the second metal strip being simultaneous with the deforming of the trailing part of the first metal strip.

6. A method as recited in claim 5 wherein:

a leading part of the flexible strip is positioned on the leading part of the second metal strip simultaneous with positioning of a trailing part of the flexible strip on a trailing part of the first metal strip;

and said one marginal portion of each of said metal

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strips in partially deformed before the respective positioning of said flexible strip on the respective metal strips.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,183,701

May 18, 1965

William A. Cain, Jr.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 5, for "blending" read -- bending --;
line 7, for "blend" read -- bend --; column 4, line 42,
for "had" read -- has --; column 6, line 1, for "in" read --
is --.

Signed and sealed this 23rd day of November 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents