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METHOD OF AND MACHINE FOR APPLYING WEB TO AN ARTICLE

Filed July 14, 1969

2 Sheets-Sheet 1

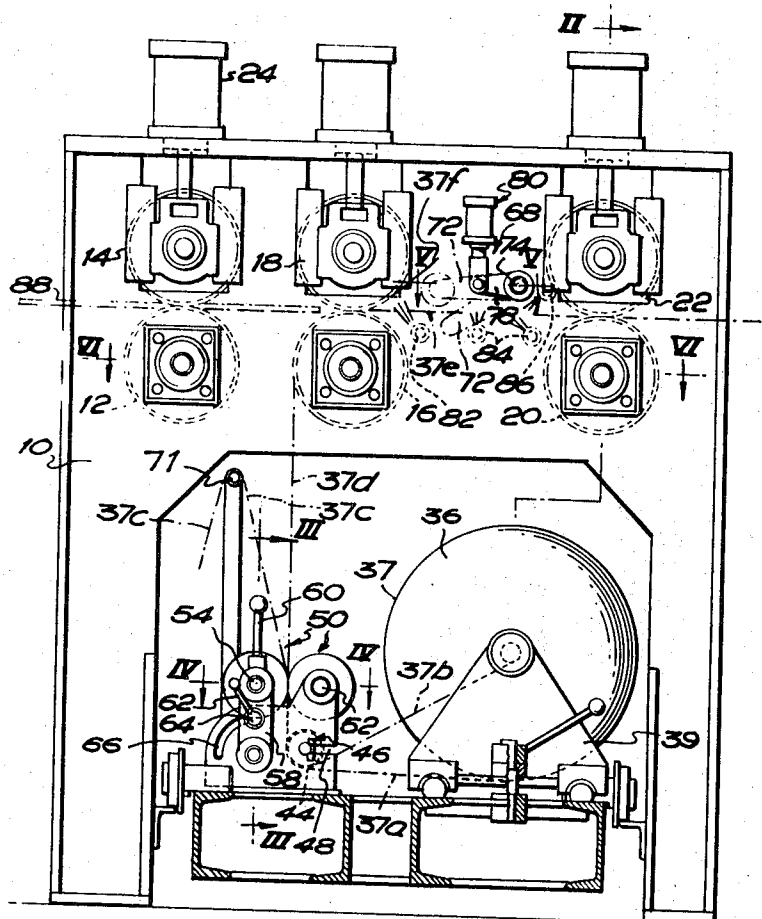


FIG. 1

II →

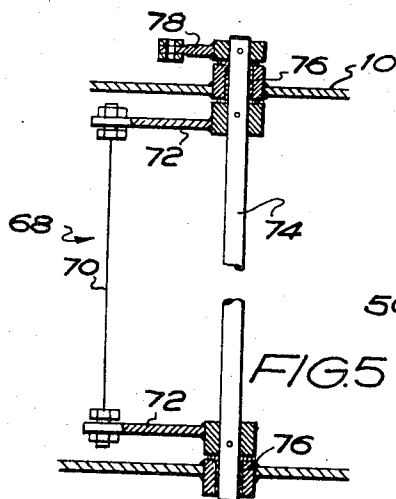


FIG. 5

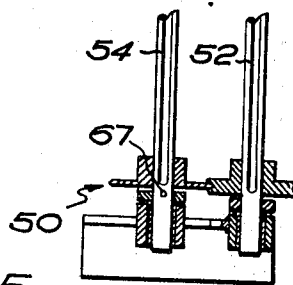


FIG. 4

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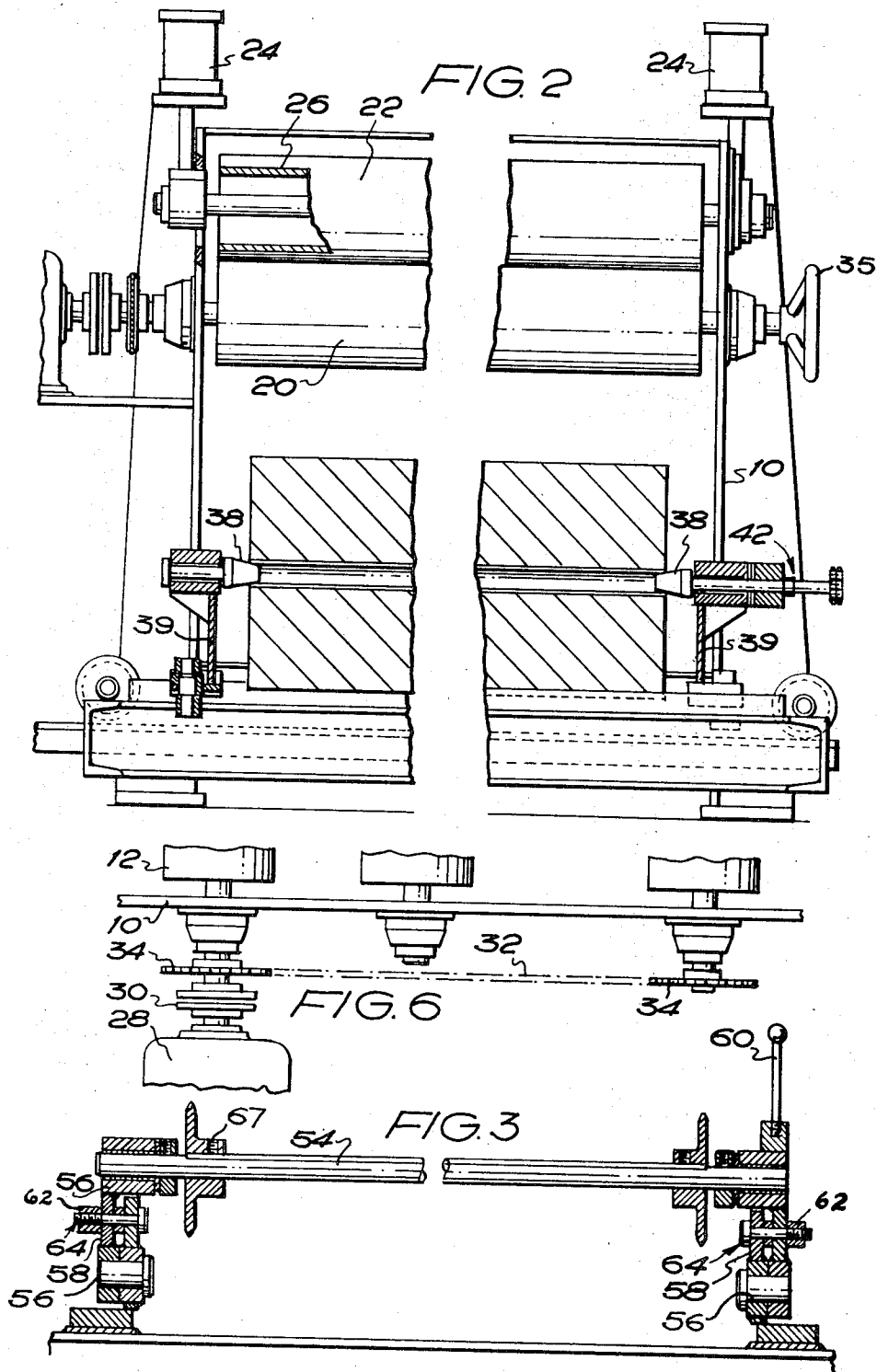
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METHOD OF AND MACHINE FOR APPLYING WEB TO AN ARTICLE

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2 Sheets-Sheet 2



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METHOD OF AND MACHINE FOR APPLYING WEB TO AN ARTICLE

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10 Claims

ABSTRACT OF THE DISCLOSURE

A method of, and machine for, applying a flexible paper web to a steel sheet in which, the forward movement of the sheet causes forward movement of the web, and the web is then severed rearwardly of a trailing edge of the sheet thereby causing the next section of web to project forwardly to be applied to the next sheet.

This invention relates to a method of and machine for applying a web to an article and has for its object to provide improvements therein.

According to one of its aspects, the invention provides a method of applying a flexible web to a flat surface of an article which includes the steps of interposing the web between the periphery of an applicator roll and the flat surface so that the web projects forwardly of a leading edge of the flat surface, causing the periphery of the applicator roll and the web and the flat surface to move at an equal speed to feed the flat surface and the web forwards, severing the web rearwardly of a trailing edge of the flat surface and maintaining the web taut forwardly of the applicator roll at least while the web is being severed. Preferably at least part of the feed of the web is caused by frictional forces between the web and the flat surface. Preferably also the applicator roll is rotated by the movement of the web tangential to its periphery transmitted to it by frictional forces. Desirably the web is drawn off a coil by tension in the web engendered by the feed of the web. Desirably the web is trimmed in width after being drawn off the coil and before it reaches the applicator roll. Preferably also the web is applied to the flat surface from below and is held to the flat surface by jets of air during at least part of the feed. Desirably the part of the web forwardly of the leading edge of the flat surface is wrapped over the leading edge also by jets of air.

According to a further aspect of the invention, there is provided a method of stacking successive lengths of steel strip so that the lengths of strip in the stack are interleaved with flexible web to protect their surfaces, the method including the steps of applying a flexible web to the flat surfaces of successive lengths of steel strip by interposing the web between the periphery of an applicator roll and the flat surface of a length of steel strip so that the web projects forwardly of a leading edge of the flat surface, causing the periphery of the applicator roll and the web and the length of steel strip to move at an equal speed to feed the strip and web forward, severing the web rearwardly of a trailing edge of the steel strip and maintaining the web taut forwardly of the applicator roll at least while the web is being severed, and feeding the steel strip and web forwardly for stacking.

According to another of its aspects, the invention provides a machine for applying a flexible web to a flat surface of an article, the machine including means for supporting a coil of web so that web may be drawn off

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the coil, an applicator roll for applying the web to the flat surface, severing means disposed forwardly of the applicator roll for severing the web, a feed roll for advancing the article relative to the applicator roll, the feed roll being disposed forwardly of the severing means, the arrangement being such that in use the web is interposed at least during part of the feed both between the applicator roll and the flat surface and between the feed roll and the flat surface so as to be gripped between the flat surface and the peripheries of the respective rolls. Preferably, air jet nozzles are provided for directing compressed air at the web to urge it against the flat surface. Air jet nozzles may also be provided for directing air at the web to fold it over a leading edge of the flat surface. Preferably the severing means is a taut wire shear. Desirably this is mounted for operation by a pneumatic piston and cylinder assembly. The arrangement can be such that the wire shear is able to sever the web on traversing the web position line from one side to the other side and again to sever the web on traversing the web position line back to the first mentioned side. Rotary trimming knives may be positioned intermediate the coil support means and the applicator roll for trimming the web to the required width. The arrangement of the parts is preferably such as to apply the web to the flat surface from below. In a machine for applying web to a flat surface of a sheet-like article, the applicator roll and the feed roll are preferably provided with back up rolls to grip the article between them. Preferably, also, an entry roll provided with a back up roll is disposed rearwardly of the applicator roll so that the nips of the three pairs of rolls are in line. Desirably the entry roll and the feed roll are driven but the applicator roll and its back up roll are idlers.

In this specification, the term web is used to include paper, corrugated paper, card, cloth, metal or plastic foil, whether homogeneous or woven or matted and whether perforate or imperforate, and all other kinds of flexible thin sheet material such as might be applied to a flat surface to protect it.

In order that the invention may be clearly understood and readily carried into effect, a preferred embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation partly in section of a machine for applying paper to cut lengths of stainless steel strip,

FIG. 2 is a vertical section as seen along the line II—II of FIG. 1,

FIGS. 3 and 4 are respectively a vertical section and a part horizontal section of trimming knife mechanism as seen along the lines III—III and IV—IV of FIG. 1,

FIG. 5 is a part sectional plan view of a taut wire shear as seen along the line V—V of FIG. 1 and

FIG. 6 shows in section part of the apparatus as seen along the line VI—VI of FIG. 1.

Referring to the drawings, there is shown a machine having a main frame 10 upon which are mounted transversely three pairs of rolls, namely: an entry roll 12 backed by a back up roll, 14; forwardly of the entry roll, an applicator roll 16 backed by a back up roll 18; and forwardly of the applicator roll, a feed roll 20 backed by a back up roll 22. The nips of the three pairs of rolls are in line. Each of the back up rolls is "loaded," i.e. urged downwardly under the action of a pair of pneumatic cylinders 24 upon the roll with which it is associated. The rolls are of tubular steel and are rubber covered as indicated at 26 (FIG. 2). The entry roll 12 is driven by a motor 28 through a coupling 30 (see FIG. 6) and the feed roll 20 is driven by a belt 32

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engaging pulleys 34 mounted on the respective shafts of those rolls. Additionally feed roll 20 is provided with a hand wheel 35. The applicator roll 16 is an idler and so are all the back up rolls.

A coil 36 of paper 37 is supported horizontally between a pair of transverse conical stub shafts 38 mounted between side plates 39 at a distance below the rolls. One of the stub shafts is associated with brake mechanism generally indicated 42 to provide limited back tension in the paper as it is unwound from the coil. Mechanism (not shown in detail) is provided for manual quick release of the coil from the stub shafts and to assist in positioning of the coil.

The paper, as it is unwound from the coil, passes under a tubular steel tension roller 44 carried by a tension controller generally indicated 46 guided in a slot 48, to tape up undesired slack in the paper. The direction followed by the paper on its way from the coil to the tension roller is indicated 37a when the coil is about to be started and 37b when the coil is nearly spent.

From the tension roller, the paper passes between two rotary trimming knife assemblies 50, one member of each assembly being carried on a fixed transverse shaft 52 and the other on a transverse shaft 54 movable to assist in threading the paper between the knife assemblies when setting up the machine ready for use. The movable shaft is pivotable about pivots 56 to which it is connected by swinging arms 58. Hand lever 60 is fast with one of the swinging arms for moving the movable shaft. Hand levers 62 rotate on respective screws 64 to secure the swinging arms in position (or to release them), the screws being guided in slots 66. The position of the trimming knife assemblies on the shafts 52 and 54 may be varied by sliding their respective members along the shafts to give the required width of paper. They can be secured in position lengthwise of the shafts by grub screws 67.

A horizontal rest bar 71 is provided to support the paper (if desired) in course of setting up. The position of the paper, as it lies over the rest bar, is shown at 37c.

From the tensioning roller (when the machine is set up for use), the paper passes over the applicator roll 16 as shown at 37d and thence intermittently (as later explained) between the feed roll 20 and its back up roll. The paper position line between the two pairs of rolls is designated 37e.

A taut wire shear is generally indicated 68 in FIG. 1 and more fully shown in FIG. 5. It includes a transverse wire 70 stretched taut between a pair of arms 72 fast with a shaft 74. The shaft is mounted in bearings 76 provided in side plates of the frame 10 and also has fast with it a stub arm 78. The stub arm at its end is acted upon by a high speed pneumatic piston and cylinder assembly 80. The length of the wire exceeds the width of the paper and thus when the piston "kicks" the wire down, the pair of arms 72 clear the sides of the paper.

Air jet nozzles 82, 84 and 86 are disposed in the region between the applicator roll 16 and the feed roll 20 and their positions, orientation and function will be explained later. It will be appreciated that each of the nozzles referred to is in the nature of a series of nozzle apertures extending transversely of the machine.

In operation, a cut length of stainless steel strip 88, by its leading edge, enters and is gripped in the nip between the entry roll 12 and its back up roll. The entry roll being driven, the steel strip is fed forwards to the nip between the applicator roll 16 and its back up roll. During this time the last mentioned two rolls, being idlers, are stationary and the paper is not fed forwards between those rollers. But a remnant of paper 37f from the previous operation projects from the nip of the rolls, being equal in length to the distance between the nip and the wire shear. A jet of compressed air is directed by the nozzle 82 to wrap the remnant of paper partially around the back up roll 18; for this purpose the nozzle 82 is dis-

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posed below the paper position line 37e and is oriented upwardly towards the lower part of the back up roll.

When the steel strip is fed by the action of the entry roll into and through the nip of the loaded applicator roll, the frictional forces acting between back up roll, steel strip, paper and applicator roll cause forward feed of the paper along with the steel strip and (incidentally) rotation of the applicator and back up rolls. The leading edge of the steel strip pushes the remnant of paper 37f away from the back up roll 18.

As the steel strip and the paper move forwards along the paper position line, air jets from the nozzles 82 and 84 are directed on the underside of the paper to urge it against the underside of the steel strip. The nozzles 84 are also disposed below the paper position line 37e and are oriented upwardly.

When the leading edge of the steel strip nears the nip of the feed roll 20, an air jet from the nozzle 86 is directed upon the remnant of paper 37f to fold it over the leading edge of the strip. For this purpose, the nozzle 86 is disposed above the paper position line 37e in the vicinity of the back up roll 22 and is oriented downwardly away from the back up roll.

Next, as the leading edge of the strip, with the remnant of paper folded over it, enters the nip of the loaded feed roll and its back up roll, the paper is creased over the leading edge and they are both gripped therebetween and by reason of the frictional forces are fed forwards at the same speed as is imparted to the steel strip by the entry roll since entry roll 12 and feed roll 20 are driven at the same peripheral speed.

When the strip has been fed forwards by a distance such that its trailing edge has left the nip of the entry roll, further feed of the strip and of the paper is assured by the feed roll. It will be appreciated that the length of the steel strip exceeds the distance between the entry roll and the feed roll.

Forward feed continues and, when the trailing edge of the strip has left the nip of the applicator roll, the paper rearwardly of it continues to be fed forwardly under tension. When the trailing edge of the strip has moved past the shear 68, the piston 80 is actuated to move the wire 70 to sever the paper, either from above the paper position line to below it or vice versa as the case may require; severing the paper of course relieves it of tension. A trailing remnant (not shown) protrudes from behind the trailing edge of the strip. Actuation of the piston may be by an operative or by automatic means which sense the position of the trailing edge of the steel strip such as electronic means or mechanical means.

When the paper has been severed, a remnant 37f is again left protruding from the nip of the applicator roll. Paper was drawn off the coil from the time the strip entered the nip of the applicator roll to the time the paper was severed. Thus, paper is effectively drawn off the coil intermittently, only when needed.

After further forward feed the length of steel strip leaves the machine with paper beneath it, a remnant of paper folded over its leading edge and with the trailing remnant of paper behind it. Successive lengths of strip are stacked, mechanically or manually, and the trailing remnant may be folded over the trailing edge of the strip if desired. The lengths of strip in the stack are effectively interleaved with paper which helps to protect their surfaces from damage.

If desired, the machine can form part of the run out table arrangement of a cut-to-length line.

The machine described above is extremely simple in design and devoid of complex control mechanism. It is adjustable to deal with different widths of strip in that the paper can readily be trimmed to width to suit, and it can deal with different lengths of strip without any adjustment at all, the paper feed being in effect self controlling.

Many modifications can be made in the machine described above without departing from the scope of the

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invention as claimed in the claims. Thus, just by way of example, it could readily be adapted to apply paper or other web to the underneath flat surface of articles that do not have a pair of parallel surfaces.

What I claim is:

1. A method of applying a flexible material to a flat surface of an article comprising:

passing a continuous web of said flexible material to the horizontal nip of a pair of rollers from a coil of said continuous web of material;

passing said article through said nip with said flat surface of said article overlying and adjacent to said web, and with the leading end of said article trailing the leading edge of said web;

applying jets of air to the bottom surface of the leading end of said web downstream from said nip to cause said leading end of said web to first wrap partially about the upper of said pair of rollers and then—as the leading edge of said article passes through said nip—about the leading edge of said article;

continuing to advance said article through said nip so that it causes said flexible web to be drawn from said coil and fed through said nip at the rate at which said article is being advanced therethrough; passing the trailing end of said article through said nip, and subsequently severing said web rearwardly of the trailing end of the article at a position sufficiently downstream from said nip to produce a new leading edge of said web downstream from said nip for wrapping about the leading end on the next article passing through said nip.

2. The method according to claim 1, further comprising trimming said web in width after it has drawn off said coil and before it reaches said nip.

3. A method of stacking successive lengths of steel strip so that the lengths of strip in the resultant stack are interleaved with flexible material sheets to protect their surfaces, comprising:

passing a continuous web of said flexible material to the horizontal nip of a pair of rollers from a coil of said continuous web of materials;

passing said steel strips in series through said nip and over and adjacent to said web, the leading end of each said steel strip trailing the leading edge of said web;

applying jets of air to the bottom surface of the leading end of said web downstream from said nip to cause said leading end of said web to first wrap partially about the upper of said pair of rollers and then—as the leading edge of said steel strip passes through said nip—about the leading edge of said steel strip; continuing to advance the length of strip through said nip so that it causes said web to be drawn from said coil and fed through said nip at the same rate of travel as said strip is advanced therethrough;

passing the trailing end of said steel strip through said nip and subsequently severing said web rearwardly of the trailing end of said steel strip at a position sufficiently downstream from said nip to produce a new leading edge of said web downstream from said nip for wrapping about the leading end of the next strip passing through said nip; and

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stacking successive lengths of steel strip having said flexible sheets thereon.

4. A machine for applying a flexible web to a flat surface of an article, comprising means for supporting a coil of web; a horizontally disposed applicator roll for applying said web to said flat surface; a horizontally disposed back-up roll associated with said applicator roll and defining a nip therebetween through which said article and said web pass; means for playing a jet of air beneath a free end of the web extending downstream from the nip of said rolls; means disposed downstream from said applicator roll for severing the web; and means disposed downstream from said severing means for advancing the article relative to said applicator roll.

5. A machine according to claim 4, wherein the severing means is a taut wire shear.

6. A machine according to claim 5, wherein the wire is mounted for operation by a pneumatic piston and cylinder assembly.

7. A machine according to claim 4, including rotary trimming knives positioned intermediate the coil support means and the applicator roll for trimming the web to the required width.

8. A machine in accordance with claim 4, wherein said means disposed downstream from said severing means for advancing the article relative to said applicator roll comprises a pair of driven feed rollers, the nip of which is aligned horizontally with said first mentioned nip; and further including a pair of driven entry rolls upstream from said applicator roll and having its nip aligned with the nip of said applicator roll, said entry rollers being driven and said applicator roll and its back-up roll being idlers.

9. The method according to claim 1, including the step of introducing the article into the nip between a driven entry roll and an associated back up roll so that the article is advanced thereby towards the applicator roll.

10. The method according to claim 1, including the step of causing the article to be introduced into the nip between a driven feed roll and an associated back up roll before the trailing edge of the article passes through the nip between the entry roll and its associated back up roll whereby the article and web are drawn through the nip between the applicator roll and its associated back up roll.

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