

United States Patent

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[54] **PLASTIC STRAPPING MACHINE**
11 Claims, 14 Drawing Figs.

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 100/33, 156/483, 156/497

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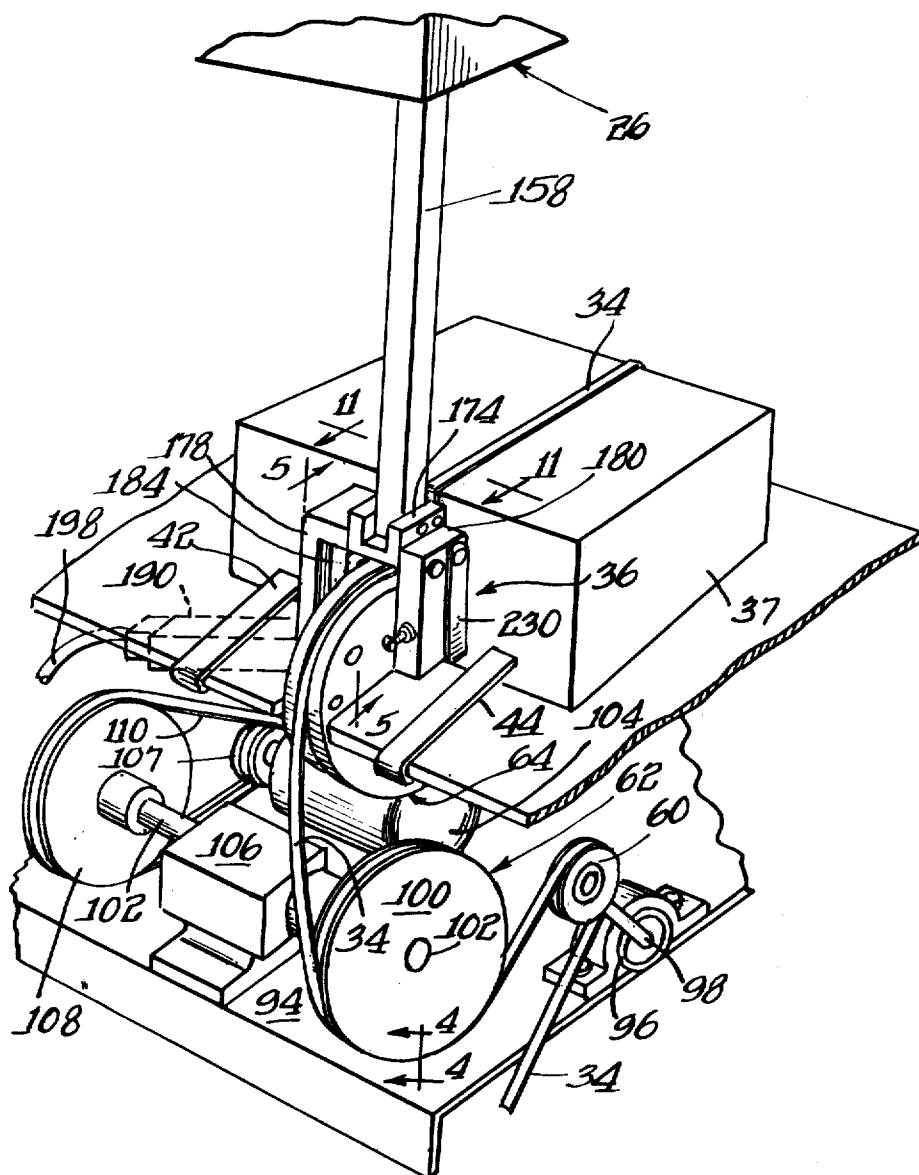
[50] Field of Search 156/483,
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 53/198

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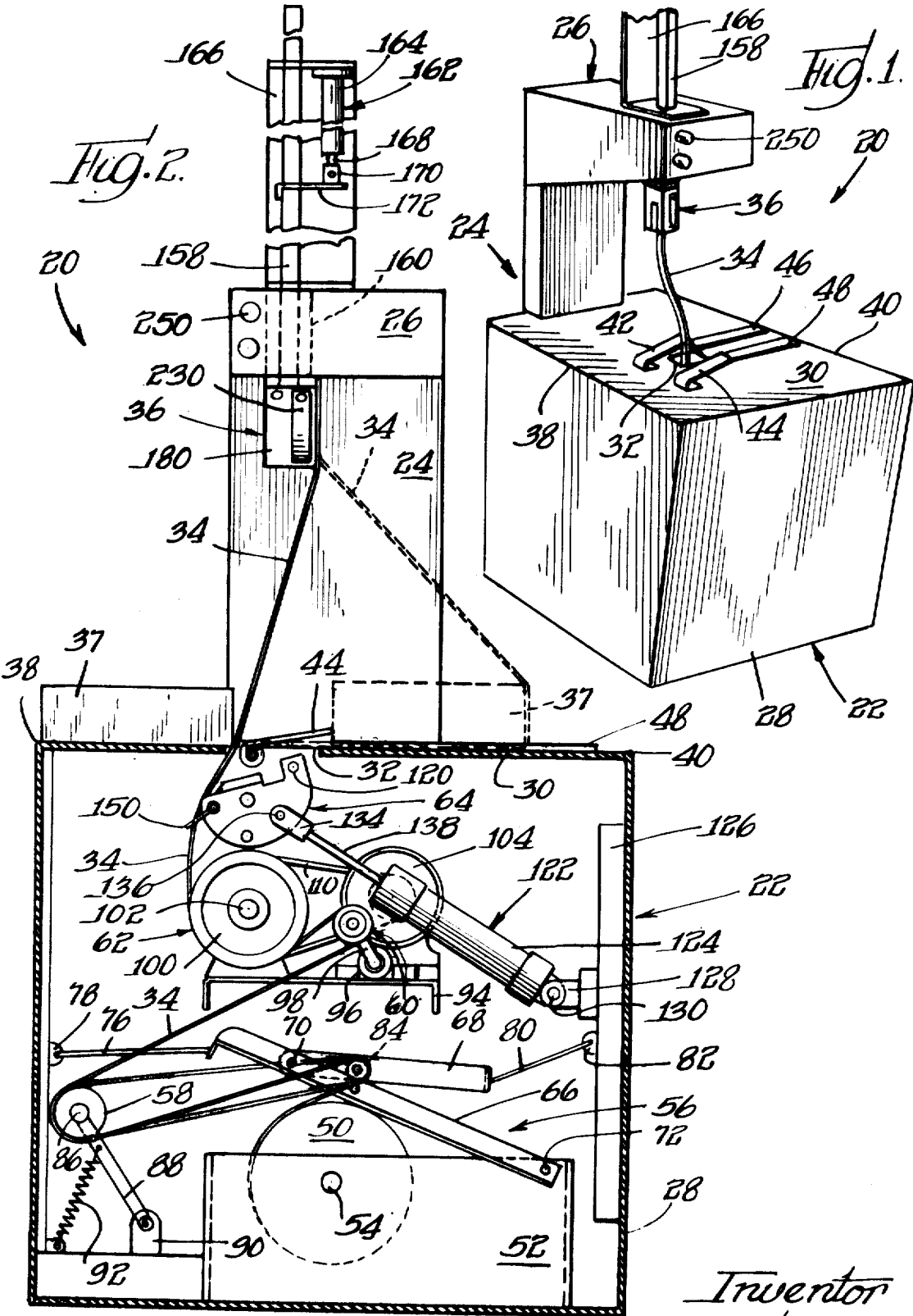
ABSTRACT: Apparatus for applying plastic strapping comprises a base which defines a work platform and a joint-forming station. A complementary strap supply includes a source of strapping and a strap-feeding arrangement mounted in the base for controllably advancing strapping material toward the joint-forming station. Cooperative joint-forming heads are mounted for converging movement toward the work station, one of the heads including a strap-gripping arrangement and the other head including guide means for controllably feeding the strapping material. In addition, joint-forming means are provided and include a transfer member mounted in the base and an outlet member mounted in one of the heads to cooperate in forming joints in the strapping.



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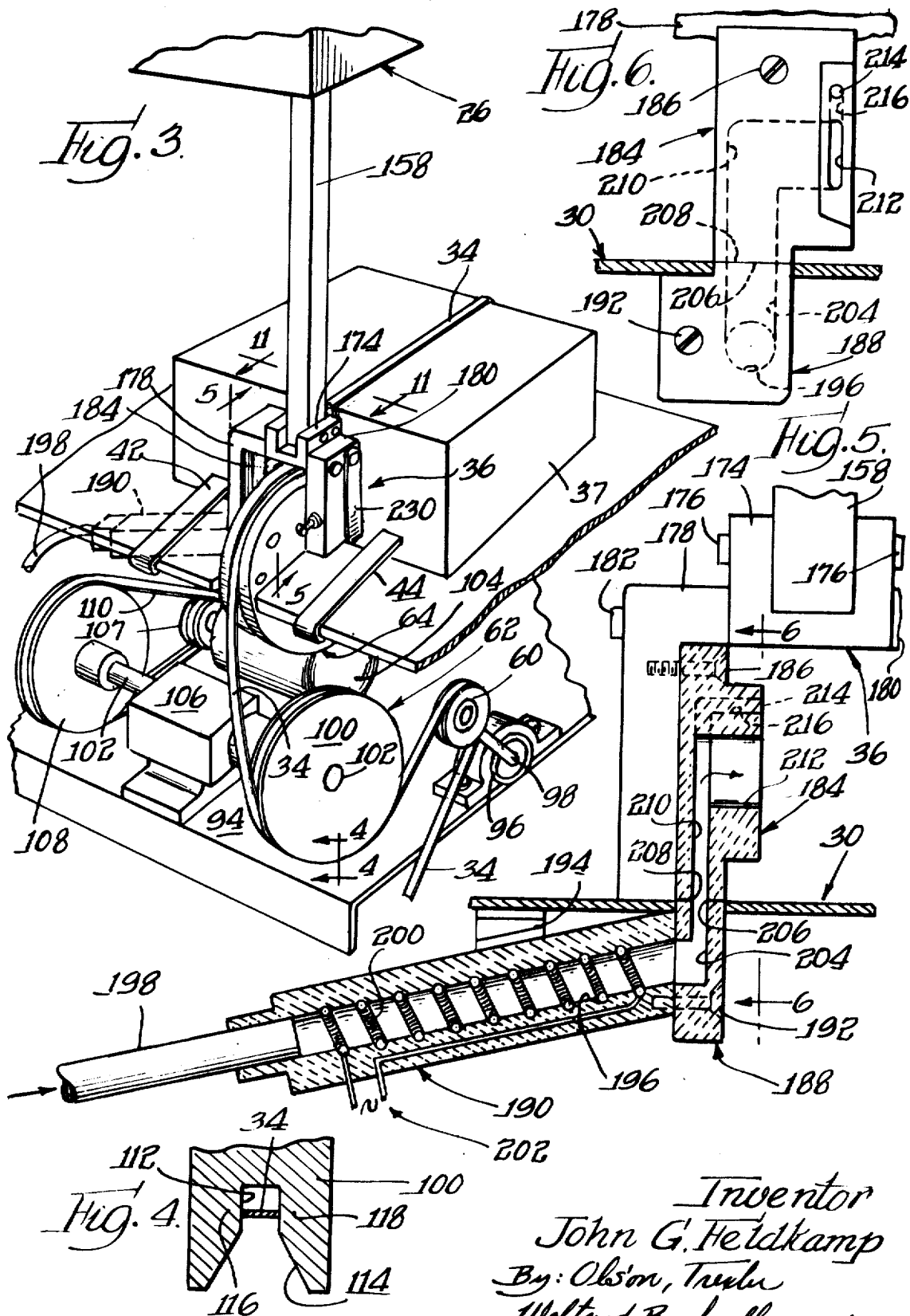


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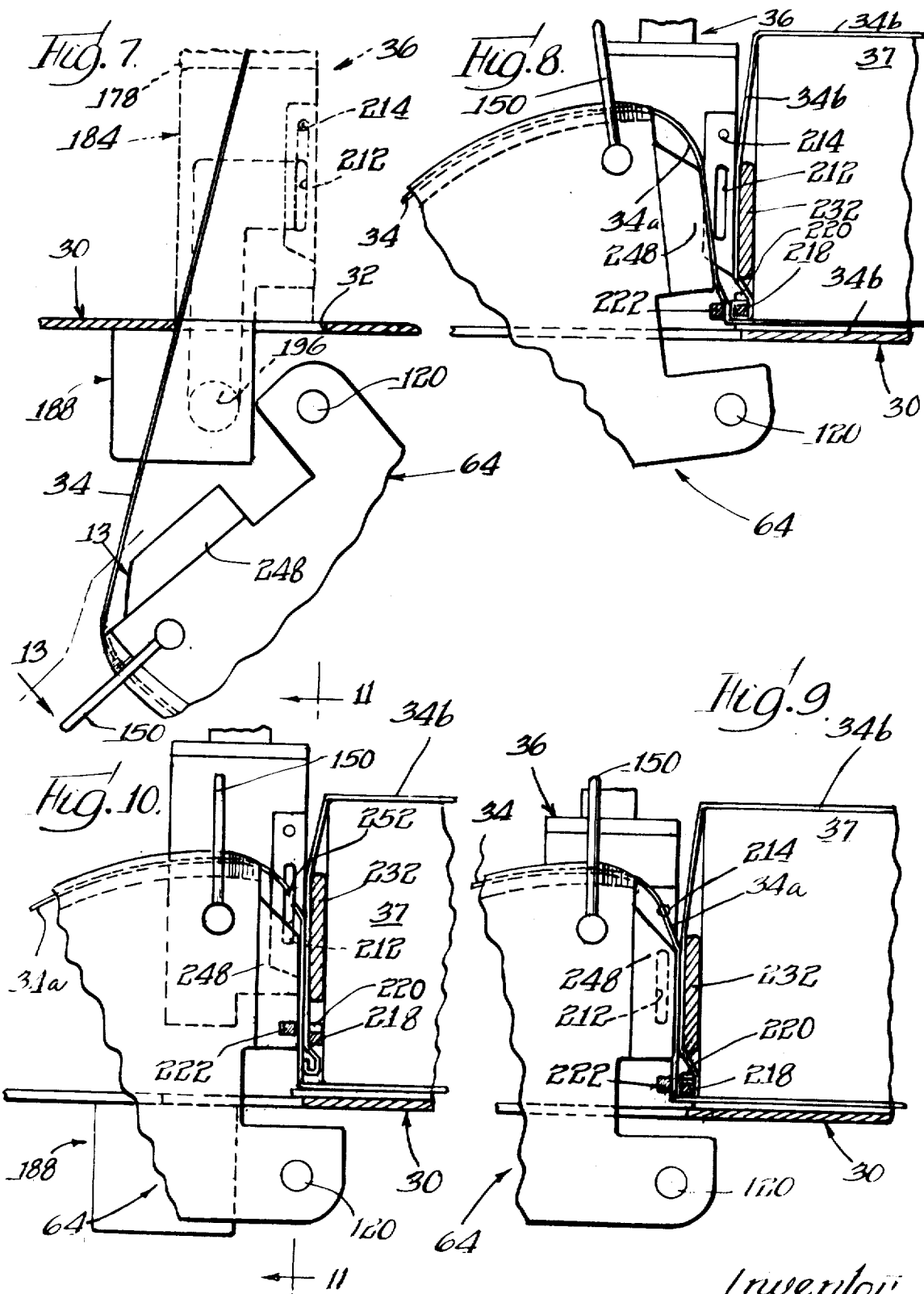


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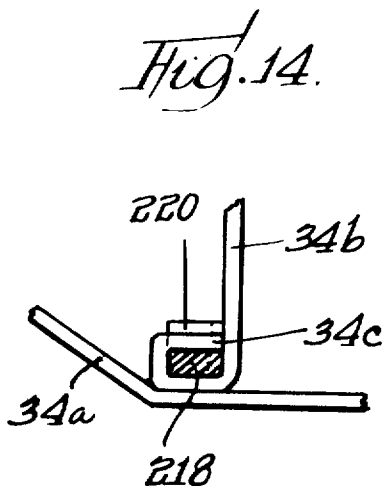
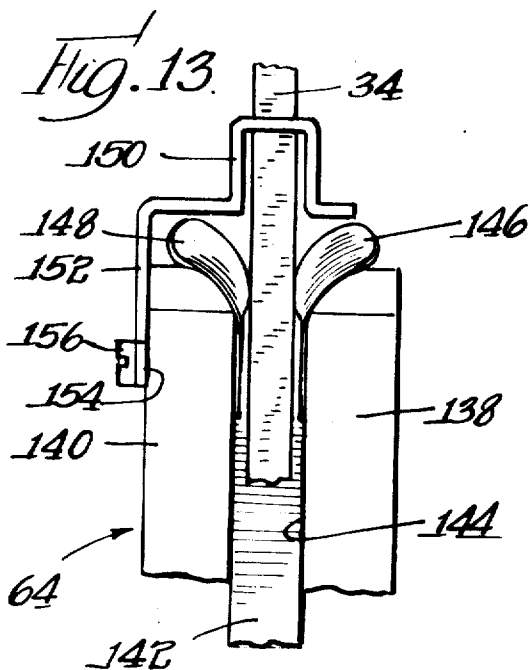
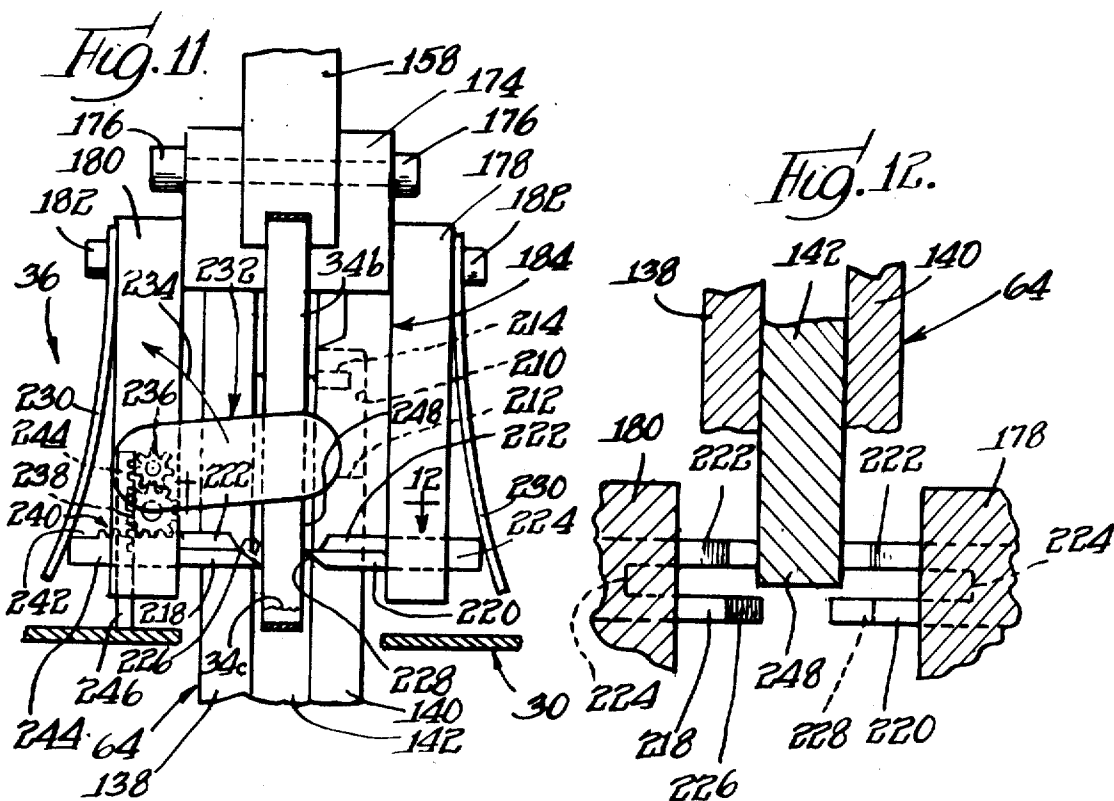


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PLASTIC STRAPPING MACHINE

BACKGROUND OF THE INVENTION

This invention relates generally to the packaging art and more particularly to banding or strapping machinery.

Cartons are commonly bound together to prevent spillage and pilferage; loose items are frequently bundled to facilitate their handling in lots; and such materials as gummed paper tape, twine, fiber-reinforced pressure-sensitive tape and light gauge steel strapping have heretofore been employed as wrapping material for these purposes. More recently, plastic strapping has been introduced; and both nylon and polypropylene resins have been used in making up this latter product.

Of the materials employed for light-duty wrapping, twine is unsuited for use in high-speed machinery because of its lack of uniformity and resultant tendency to break at weak spots with consequent fouling of automatic equipment. Gummed tape must be wet and is thus both messy and slow to apply. On the other hand, reinforced pressure-sensitive tape is limited to specialty applications because of its high cost. Steel strapping is relatively inexpensive and a uniformly high quality product. However, it can present undesirably sharp edges, especially in the lighter gauges, and requires special shears for its removal. Of all the available products, only plastic strapping combines low cost, uniform strength, easy removal, safety, and an amenability to high-speed wrapping. Nevertheless, this premier product has not enjoyed widespread popularity because of limitations in the machinery that has been available in the past for applying it.

Prior art plastic strapping machines have exhibited a number of serious deficiencies. In some, the work platform has been obstructed on two or more sides making automatic package feeding and removal both difficult and expensive. Others have secured the strapping by means of expensive metal joints that present a cutting hazard; and those that have employed fusion joints have inherently produced weak connections. In addition, there has been a need for cumbersome auxiliary devices to hold the package being banded during the wrapping portion of the cycle.

It is therefore a general object of the present invention to provide a plastic strapping machine that overcomes the aforesaid limitations of the prior art and fully utilizes all of the inherent advantages of plastic strapping material.

Another object of the invention is to provide plastic strapping apparatus which incorporates a work platform that is open and accessible from three sides.

Still another object of the invention is to provide plastic strapping apparatus which forms a fusion joint that penetrates deeply into the thicknesses of the strapping material.

And still another object of the invention is to provide plastic strapping apparatus which is arranged for handling the strapping so as to preserve its strength and continuity.

A further object of the invention is to provide plastic strapping apparatus which incorporates means for gripping the free end of the strapping in a highly secure manner.

A still further object of the invention is to provide plastic strapping apparatus that is of simple construction and is characterized by ease of maintenance.

And a still further object of the invention is to provide plastic strapping apparatus which is capable of high-speed cycling.

These and other objects and features of the invention will become more apparent from a consideration of the following descriptions.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a perspective view of plastic strapping apparatus constructed in compliance with the present invention;

FIG. 2 is an enlarged front elevational view of the apparatus of FIG. 1 with the front panel of the base cabinet removed to reveal details of the equipment contained therein;

FIG. 3 is a further enlarged perspective view of the apparatus of FIG. 1 with a portion of the base cabinet broken away to show elements of the strapping supply arrangement and illustrating the upper and lower joint-forming heads substantially converged, as in the completion of the banding of a package;

FIG. 4 is an enlarged radial sectional view taken substantially along the line 4-4 of FIG. 3;

FIG. 5 is an enlarged view in partial cross section taken substantially along the line 5-5 of FIG. 3;

FIG. 6 is a side elevational view taken substantially along the line 6-6 of FIG. 5;

FIG. 7 is a view similar to the showing of FIG. 6 but additionally showing the lower joint-forming head in its ready-to-operate condition;

FIG. 8 is a view similar to the showing of FIG. 7 but showing the lower head rotated upwardly into its intermediate position for softening confronting faces of the strapping material preparatory to the formation of a joint therein;

FIG. 9 is a view similar to the showing of FIG. 8 but illustrating rotation of the lower head into its final, uppermost position where the previously softened portions of the strapping material are clamped into confluent contact for forming a fusion joint and heated air is redirected to the cutoff aperture for use in severing the trailing section of the strapping material;

FIG. 10 is a view similar to the showing of FIG. 9 but illustrating the initial raising movements of the upper traveling head;

FIG. 11 is an enlarged view taken substantially along the line 11-11 of FIG. 3 (alternatively, taken along the line 11-11 of FIG. 10);

FIG. 12 is a top plan view in cross section taken substantially along the line 12-12 of FIG. 11;

FIG. 13 is an enlarged view taken substantially along the line 13-13 of FIG. 7 and illustrating the action of the spring guides in the lower head; and

FIG. 14 is an enlarged side elevational view showing the action of the gripping fingers and the manner in which they hold the severed end of the strapping material.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now in detail to the drawings, specifically to FIG.

1, apparatus for applying plastic strapping in compliance with the invention is identified generally by the reference numeral 20. The apparatus 20 includes a base section 22, a vertical arm 24 upstandingly disposed adjacent the rear of base section 22, and an upper support block 26 cantilevered from the vertical arm 24 over the base section 22. The base section 22 comprises a housing or cabinet 28 having a horizontal upper panel 30 which defines a work platform, panel 30 being perforated with a strap-feeding opening 32 which locates and generally defines the joint-forming station in the strapping apparatus 20. A continuous length of strapping 34 emerges from the opening 32 to have its one end gripped by a vertically traveling upper head 36 which is guided and directed from the support block 26. Cantilevering the upper support block and the traveling upper head clears and leaves open three sides of the work platform defined by panel 30 whereby to ease the handling of articles being strapped and whereby to facilitate the use of automatic feeding and conveying equipment.

Referring to FIG. 2, a package or like article 37, in the course of being banded, moves generally from a leading edge 38 of panel 30 and over the strap-feeding opening 32, where the strapping 34 is engaged, to exit generally from a trailing edge 40 of the panel 30. In the course of this movement, the package or like article engages and depresses a pair of vertically swingable switch arms 42 and 44 which laterally straddle the opening 32, the switch arms 42 and 44 actuating strap-feeding means in a manner to be described more fully hereinafter; and upon approaching the trailing edge 40 of the panel 30, as is suggested in broken outline in FIG. 2, the package or like article 37 clears the arms 42 and 44 releasing

them to spring-biased upward movement into their normal switch-closing position. In accordance with a feature of the present invention, the package or article being banded thereupon rests upon two shallow, package-elevating bars 46 and 48. Bars 46 and 48 are secured to the panel 30 and extend in parallel relationship from a position generally adjacent the opening 32 to a position generally adjacent the edge 40. In addition, the bars 46 and 48 are spaced closely apart generally interjacent the switch arms 42 and 44 to define therebetween a channel which receives the strapping material that is draped about the item or items being banded. Thus, the bars 46 and 48 relieve the strapping 34 of the weight of the item or items being banded whereby to avoid friction-retention of the strapping between the package or items being banded and the panel 30. Such restraint on the strapping would impede its drawback as the package or like item being banded is positioned to clear the opening 32 so as to permit forming of a joint in the draped strapping. Since the package or like item is pushed through a vertical length of selectively fed strapping in the apparatus of the present invention, the strapping itself is draped about the package instead of being pulled around the package as in prior art machines. Consequently, there is no need for auxiliary package holddown devices in the apparatus of the invention.

Plastic strapping, by virtue of its manner of manufacture is molecularly oriented in the longitudinal direction, the strapping material being therefore relatively strong tensilely in the longitudinal direction and relatively weak in the lateral direction. As a consequence, the application of rubbing force on the faces of the strapping, as for example might occur in imperfectly gripping the band to pull it from a supply roll, tends to disorient the material and fibrillate it resulting in its weakening. In compliance with an important feature of the present invention, the apparatus 20 incorporates dragless strap-feeding arrangements.

Continuing with the consideration of FIG. 2, the cabinet 28 of the base section 22 houses a supply drum 50 upon which is coiled a substantial length of the plastic strapping 34. The drum 50 is rotatably mounted in a topless bin 52 by means of a horizontal axle 54. The plastic strapping material from the drum 50 is threaded between a conventional accumulator device 56 and a spring-loaded, multiple-pulley roller 58 from whence it passes first to a single spring-loaded guide pulley 60, then to a strap-feeding endless drive member 62 and over a lower joint-forming head 64 to be gripped at its terminus in the upper head 36.

The accumulator device 56 comprises a lower U-shaped frame 66 and an upper U-shaped frame 68 which is swingably mounted to the lower frame 66 by means of a horizontal pivot rod 70. The lower frame 66 is swingably mounted at its lower end to the bin 52 by means of a pivot rod 72 and is restrained at its upper end by means of a wire link 76 which is fastened to the inner sidewall of cabinet 28 by means of a mounting ear 78. The free end of the upper frame 68 is similarly restrained by means of a wire link 80 which is secured to the opposite inner sidewall of cabinet 28 by means of a mounting ear 82. A horizontal cylinder 84 is rotatably mounted between the fixed and pivoted ends of the upper frame 68 and is selected to be of a length at least about equal to the length of drum 50 so that plastic strapping material being fed from the drum may pass freely over its surface and through the multiple pulleys of roller 58. In compliance with the illustrated embodiment, the pulleys of roller 58 are mounted on a common shaft 86. The shaft 86 is in turn supported on an arm 88 which pivots about a fixture 90 and which is biased generally away from the accumulator device 56 by means of a tension spring 92.

The spring-biased roller 60 is mounted on a horizontal interior platform 94 by means of a fixture 96 and a swingable connecting arm 98, a torsion spring (not shown) contained in the fixture 96 being arranged to rotate the arm 98 in a direction generally away from roller 58 whereby to preserve mild tension in the plastic strapping material being delivered from drum 50. The endless drive member 62 comprises a pul-

ley 100 which is mounted on a shaft 102; and turning to FIG. 3, the pulley 100 is seen to be powered from an electric drive motor 104 through a magnetic clutch unit 106. More specifically, the motor 104 is drivingly coupled to shaft 102 by means of a drive pulley 107, a driven pulley 108 and an endless drive belt 110, motor 104 and clutch 106 being suitably secured to the upper surface of the interior platform 94.

The motor 104 is selectively energized by the action of switch arms 42 and 44 closing parallel electric circuits to the field coil and brushes of the motor; and the amount of tension or resistance to unwinding which is achieved at the pulley 100 is adjusted by regulating the drag produced by the magnetic clutch 106. As the package or other item to be banded passes depressingly over the switch arms 42 and 44, the motor 104 is energized to drive the pulley 100 and feed the strapping material out of the supply drum in a power-assisted manner. Dragless strap feeding is specifically accomplished by the construction of the pulley 100. Considering FIG. 4, the pulley 100 is provided with a deep rectangular-shaped peripheral groove 112 disposed at the root of a V-shaped groove 114. By this construction, the pulley 100 defines spaced, circular drive elements 116 and 118 which engage the strapping material 34 exclusively at the lateral edges thereof; and in compliance with specific embodiments of the invention, the width of the groove 112 is selected to be a few thousandths of an inch less than the width of the strapping material 34 in order to insure firm gripping of the edges of the strapping material.

Returning to FIG. 2, the lower joint-forming head 64 is mounted on a horizontal pivot shaft 120 to be rotated in a vertical arc by the driving action of a double-acting pneumatic jack 122. The jack 122 comprises a cylinder 124 which is vertically swingably mounted to the inner sidewall of cabinet 28 by means of a mounting plate 126, a mounting fixture 128 and a pivot pin 130. The jack 122 also includes an extensible and retractable piston rod 138 which is connected to the lower head 64 by means of a bifurcated coupling 134 and a pivot pin 136. Dragless feeding of the plastic strapping material 34 is further promoted by the provision of guide means in the head 64 for controllably feeding strapping material from the supply drum generally toward the joint-forming station defined by the opening 32 at the top panel of the base cabinet. Specifically and with reference to FIG. 13, the lower joint-forming head 64 comprises three sandwiched plates, laterally outwardly disposed plates 138 and 140 and an interjacent disposed plate 142, plate 142 being of generally lesser radial extent than the plates 138 and 140 in order to define a strap-guiding peripheral groove 144. The groove 144 is specifically arranged to be wider than the strapping material 34, as is illustrated in the drawing; and the guide means for the strapping material, in the illustrated embodiment, comprises spaced opposed spring plates 146 and 148, plates 146 and 148 being fabricated from comparatively thin, soft spring material. The base portions of the spring plates 146 and 148 are clamped between plate 142 and plates 138 and 140 respectively for securing the spring plates in position. The tip portions of the spring plates curve outwardly, as illustrated in the drawing, to engage the lateral edges of the strapping material 34 in a gently resilient manner whereby to provide a mild resistance to strap transit while avoiding rubbing engagement with the faces of the strapping material. Advantageously, a U-shaped strapping guide 150 is inverted over the groove 144 adjacent a forward portion of the head 64 to prevent total escape and resultant misalignment of the strapping material. The strapping guide 150 is provided with an extension arm 152 which terminates in an eye 154, eye 154 being sized to receive a mounting screw 156 that is used in affixing the strapping guide 150 to one side of the head 64.

Returning once again to FIG. 2, the upper traveling head 36 is mounted on a vertical shaft 158 which is fashioned with a square or rectangular cross section in order to facilitate the preservation of its proper angular alignment. A cooperatively shaped guide bushing 160 is secured in the support block 26 to receive the shaft 158 and to direct converging and retracting

movements of the upper head 36. Movements of the head 36 are powered by a double-acting pneumatic jack 162; and specifically, the jack 162 includes a cylinder 164 which is mounted to the upper horizontal panel of an elongated C-shaped bracket 166, the upper and lower horizontal panels of bracket 166 being appropriately perforated to pass the shaft 158. The jack 162 also includes an extensible and retractable piston rod 168 which is secured to the shaft 158 intermediate the ends thereof by means of a coupling 170 and a laterally extending, L-shaped mounting plate 172. The pneumatic jack 162 like the pneumatic jack 122, is supplied with pressurized air from a suitable source (not shown) and is appropriately actuated by means of conventional pneumatic circuitry in a manner well known in the art.

Advantageously, the upper traveling head carries a portion of the joint-forming unit; and giving consideration to FIGS. 5 and 6, the upper traveling head 36 comprises a U-shaped coupling 174 which is secured to the lower end of shaft 158 by machine screws 176. A pair of side members 178 and 180 are fastened in turn to the coupling 174 by means of machine screws 182; and as is particularly well shown in FIG. 5, a first joint-forming agent transfer member 184 is fastened to a side member 178 by means of screws 186 or other suitable means. A second joint-forming agent transfer member 188 is cooperatively secured to the base panel 30 in alignment beneath the first transfer member 184. Conveniently, the member 188 is attached to a processing chamber element 190 by means of a screw 192, processing chamber element 190 being mounted beneath panel 30 by means including a bracket 194.

In compliance with an important feature of the present invention, use is made of a separate joint-forming agent, in particular a heated fluid. Thus, the present invention contemplates the formation of a fusion joint in the thermoplastic strapping material for completing the banding of packages or like articles. Thermal cutoff of the strapping material between the completed joint and the supply drum is also contemplated since severing the strapping material with heat fuses the cut ends of the strapping and keeps them from dividing. Specifically, heated air is used as the joint-forming agent; and hence, the cooperating members 184 and 188 and the chamber element 190 are advantageously fabricated from a refractory material such as magnesia or cemented mica. In addition, the members 184 and 188 and the chamber element 190 are fashioned with confluent passageways which conduct and direct the heated air.

Continuing now with reference to FIGS. 5 and 6, the chamber element 190 is fashioned with a longitudinally extending bore 196 which receives the open end of an air pipe 198, pipe 198 communicating with a pump or other source of pressurized air (not shown). In order to heat the air passing through the chamber element 190, an electric heating element 200 is coiled about the surface of bore 196 to be connected to a suitably regulated electrical power source suggested by the reference numeral 202. The bore 196 opens into a vertically upwardly opening channel 204 that is fashioned in the stationary, joint-forming agent transfer member 188. The channel 204 exits through the upper surface of member 188 through an aperture 206, and the traveling transfer member 184 is provided with a cooperating aperture 208 which opens into an inverted L-shaped chamber 210, apertures 206 and 208 being disposed in registry when the traveling head 36 is lowered into contact with the base panel 30.

The channel 120 terminates in a narrow vertically elongated, laterally opening slot 212 which defines a nozzle for the exiting air. The relatively large orifice defined by the slot 212 preferentially exhausts the heated air which form joints in the strapping material as will be described more fully hereinafter; and additionally, the traveling transfer member 184 is fashioned with relatively small, circular, superposed orifice 214 which communicates with the slot 212 by means of a narrow channel or conduit 216. Thus, when the slot 212 is selectively obstructed, the relatively large orifice thereof will be closed whereby the heated air will be directed through the

conduit 216 to be exhausted through the orifice 214 as a relatively intense, hot air blast. This intense, hot air blast is used in severing the strapping material in a manner to be described more fully hereinafter.

It will be appreciated that the pipe 198, bore 196, the channels 204 and 210, the slot 212, the conduit 216 and orifice 214 form a continuous duct for directing, heating and utilizing air as the joint-forming and strap-severing agent. The flow rate of air through this duct is regulated in conjunction with the thermal output of the heating element 200 to achieve temperatures of approximately 600°—700° F. in the air exiting from the nozzle orifices.

Turning to a consideration of FIGS. 11 and 12 for further descriptions of the upper traveling head 36, the side members 178 and 180 are horizontally chambered to receive slidably a pair of gripping fingers 218 and 220, each of the gripping fingers having a companion cam finger 222 affixed thereto by means of a common shank portion 224. The gripping finger 218 has an upwardly facing beveled tip 226 and the gripping finger 220 has a cooperating, downwardly facing beveled tip 228. Thus, when the gripping fingers are converged, they are capable of gripping an end portion of the strapping material therebetween as is suggested in FIG. 14. Returning to FIG. 11, a spring plate 230 is secured laterally of each of the side members 178 and 180 by means of the machine screws 182 to bias the gripping fingers and companion cam fingers into generally converged relationship.

While the strapping material cutoff afforded by the hot air blast through nozzle 214 is ordinarily efficient in severing the strapping material after fusion joint formation, the apparatus 20 includes means for insuring severance of the strapping material after a package or like item has been banded. In particular, the upper traveling head 36 includes a backup plate 232 for use in forming the fusion joint as will be described more fully hereinafter; and in order to insure severing the strap material after fusion joint formation, the backup plate 232 is arranged to be rotated first in the direction of arrow 234 and then in the reverse arcuate direction so as to strike a blow across the strapping material in order to make its severance certain. More specifically, the backup plate 232 is connected to a pinion gear 236 that is journaled about a horizontal axis within the chamber fashioned in the side member 180. The gear 236 meshes with a companion gear 238, and the gear 238 in turn meshes with a horizontal rack 240 which is provided on the upper surface of the shank portion 224 associated with gripping finger 218. Thus, horizontal traveling motion of the gripping finger is translated into rotary motion of the backup plate 232.

In order to lift the backup plate 232 from its normal rest position pendent from its axis of rotation defined by gear 236 and into its backup position where it is disposed substantially horizontally, the rack 240 includes a toothless heel portion 242 which allows free wheeling of the gears 236 and 238 when the gripping fingers are in engagement with each other. In addition, a vertically slidable rack bar 244 meshes with the gear 238 and has a pendent stem portion 246 which engages the base panel 30 to rotate the backup plate 232 in the direction of arrow 234 through the gears 236 and 238 upon downward movement of the upper traveling head 36.

The cam fingers 222 are arranged to be forcibly spread apart against the bias of spring plates 230 by means of engagement with the sides of an anvil portion 248 raised radially from the medial plate 142 of lower head 64, as will be described more fully hereinafter.

OPERATION

For purposes of affording a more complete understanding of the invention, it is advantageous now to provide a functional description of the mode in which the component parts cooperate.

Considering FIGS. 7—10 and giving first consideration to FIG. 7, the illustrated parts are there shown disposed in their

rest position wherein the apparatus is ready to receive a package or like article for banding. With reference temporarily to FIG. 2, a package 37 to be banded is passed generally across the top panel 40 of the machine base section and over the strap-feeding opening 32 that cooperates in defining the work station. As the package 37 engages and depresses the switch arms 42 and 44, the strapping material 34 is fed from the supply drum 50 in a power-assisted manner until the package 37 has passed to the position shown in FIG. 2 in broken outline where it has cleared the switch arms 42 and 44 releasing them to the switch-closing position and terminating strap feed. Thereupon, the remainder of the machine cycle will be initiated as for example by the operator manually engaging a starter button 250 located conveniently on upper support block 26. The next stage in the machine cycle comprises energizing the jack 162 to situate the traveling head 36 into the position shown in FIG. 8, resulting in the strapping material 34 being draped about the package 37.

As shown in FIGS. 7-11 and 14, that portion of the strapping which is nearest the lower head 64 is designated 34a, that passing around the package 37 is designated 34b and that gripped by the fingers 218 and 220 is indicated by the numeral 34c.

A position-responsive switch associated for example with the slidable stem portion 246 will be employed to sense completion of the lowering of the head 36 whereby to terminate further powered downward movement thereof and whereby to actuate the jack 122 for swinging the lower head from the position shown in FIG. 7 to that shown in FIG. 8. The rotary motion of the lower head 64 trips a switch (not shown) to stop the lower head at the position shown in FIG. 8 and, at the same time, cause air to flow through the pipe 198 and out through the nozzle defined by slot 212. The heated air blast emanating from the slot 212 heats and softens the confronting faces of the thermoplastic strapping material in preparation to the formation of a fusion joint.

A timing mechanism triggered by the initial movement of head 64 may be conveniently used to select the period for softening of the plastic strapping material; and when such timer completes its cycle, it will close the switch to reenergize the jack 122 for delivering the head 64 into the position shown in FIG. 9 where the anvil 248 presses the softened surfaces of the strapping material firmly against each other, the backup plate 232 supporting the strapping material against the advance of the anvil 248.

It will also be noted in FIG. 9 that the anvil 248 obstructs the slot 212 whereby to redirect the heated air to the orifice 214. Since the final, closing movement of the lower head 64 has brought the strapping material into general lateral alignment with the orifice 214, this secondary flow of heated air produces a molten severance of the strapping material at this point.

A second timer may be conveniently used to regulate the length of the severing operation, and this second timer may be triggered by the final positioning of the head 64. At the end of its cycle, this second timer terminates the flow of air through the pipe 198 and energizes the jack 162 to begin raising motion of the upper traveling head 36. The cam fingers 222 will thus lift into engagement with the lower end of anvil 248; and because the anvil is wider than the normal gap between these cam fingers, these fingers will be forced laterally outwardly as is shown in FIG. 11, causing the gripping fingers 218 and 220 to release the strapping. When the cam fingers pass beyond the upper end of the anvil 248, the spring plates 230 will act to reengage the gripping fingers so that they capture the most recently severed end 252 of the strapping material; and with this release of the cam fingers from engagement with the anvil 248, the backup plate 232 will be rotated generally downwardly, as by spring bias acting on the rack bar 244, to strike a blow across the strapping material beyond the now-gripped end 252 to break any residual strands. Continued lifting of the shaft 158 and its connected traveling head 36 produces an actuation of a position-responsive switch located,

for example on the frame 166, this latter switch energizing the strap feed motor 104 and the jack 122 whereby to feed out the strapping material and cause a rotatable return of the lower head 64 to the position shown in FIG. 7.

A final position-responsive switch located conveniently in the frame 166 detects the presence of upper head 36 in the position selected for the particular packages being banded and energizes a suitable circuit to cease further powered movements, thus restoring the apparatus for the banding of a subsequent package.

From the foregoing description, it will be apparent that the present invention provides new and improved apparatus for applying plastic strapping which apparatus is of simple construction and characterized by a work platform that is open and accessible from three sides by virtue of the upper strapping head 36 being operated from the cantilevered support block 26. It will also be apparent that the apparatus of the invention develops a fusion joint penetrating well into the thickness of the strapping material because the hot air blast emanating from the slot 212 softens both of the confronting faces of the strapping material and because the thus incipiently molten surfaces are pressed forcibly into contact with each other between the anvil 248 and the backup plate 232. Furthermore, the apparatus of the invention is specifically arranged to avoid thermal disorientation or fibrillation of the strapping material. These latter problems are specifically avoided by draping the strapping around the package or other article to be wrapped rather than by gripping and pulling the strapping material about such item, by the power-assisted feeding of the strapping material from the supply drum, by use of edge gripping in the feed pulley 100 and the lower head 64, and by relieving the strapping material from the weight of the item being wrapped through the use of the support bars 46 and 48. In addition, use of a fusion cutoff seals the strapping material transversely and provides a convenient grip for holding the free end of the strapping material in the upper traveling head 36, finally it will be appreciated that the simple construction of the instant apparatus promotes high-speed cycling.

The drawings and the foregoing descriptions are not intended to represent the only forms of the invention in regard to details of its construction and manner of operation. Changes in form and in the proportion of parts, as well as the substitution of equivalents, are contemplated as circumstances may suggest or render expedient; and although specific terms have been employed, they are intended in a generic and descriptive sense only and not for the purposes of limitation, the scope of the invention being delineated in the following claims.

I claim:

1. Plastic strapping apparatus comprising: base means including work platform means for supporting articles to be strapped and defining a joint-forming station; supply means for strapping material; first and second joint-forming heads mounted for convergible movement toward said station, said first head including strap-gripping means and said second head including guide means for controllably feeding strapping material from said supply means generally toward said station, one of said heads including nozzle means for directing a joint-forming agent against regions of the strapping material selected to form a joint; and passageway means mounted for connection with said nozzle means for transferring quantities of said joint-forming agent to said nozzle means.
2. Plastic strapping apparatus according to claim 1 wherein said passageway means and said nozzle means have complementary portions engageable upon convergence of said heads to form a continuous duct.
3. Plastic strapping apparatus according to claim 1 wherein said strapping is a thermoplastic material, said agent is a heated fluid and said passageway means and said nozzle means are of refractory material.
4. Plastic strapping apparatus according to claim 3 wherein said apparatus further includes heating element means in said passageway means.

5. Plastic strapping apparatus according to claim 1 wherein one of said heads includes pressure foot means and the other of said heads includes a backup member cooperatively opposing said pressure foot means to form a joint-forming assembly for compressibly confining therebetween regions of strapping material treated with said agent.

6. Plastic strapping apparatus according to claim 1 wherein said nozzle means includes a relatively large orifice preferentially exhausting said joint-forming agent for use in forming joints in said strapping material, a relatively small orifice and a conduit connecting said orifices; and wherein the other of said heads includes valve member means selectively positionable with respect to said relatively large orifice for closing the same and directing said agent to said relatively small orifice for use in severing said strapping material.

7. Plastic strapping apparatus according to claim 1 wherein said supply means includes a source of strapping material and strap-feeding means mounted in said base means for controllably advancing strapping material from said source toward said joint-forming station, said strap-feeding means including selectively operable means having spaced drive elements for engaging said strapping material at the lateral edges thereof.

8. Plastic strapping apparatus comprising: base means including work platform means for supporting articles to be strapped and defining a joint-forming station; strap supply means including a source of strapping material and strap-feeding means mounted in said base means for controllably advancing strapping material from said source toward said joint-

forming station, said strap-feeding means including selectively operable feeding means having spaced drive elements for engaging said strapping material at the lateral edges thereof; first and second joint-forming heads mounted for convergible movement toward said station, said first head including strap-gripping means and said second head including guide means for controllably feeding strapping material from said strap supply means toward said joint-forming station; and joint-forming means including a first member mounted in said base means and a second member mounted on one of said heads to cooperate with said first member in forming strapping joints.

9. Plastic strapping apparatus according to claim 8 wherein said selectively operable feeding means comprises an endless member defining said drive elements and wherein said strap-feeding means further includes a selectively energizable clutch drivingly coupled to said endless member.

10. Plastic strapping apparatus according to claim 8 wherein said guide means includes spaced opposed spring blades grippingly engageable with said strapping material at the lateral edges thereof.

11. Plastic strapping apparatus according to claim 8 wherein said base means further includes spaced-apart package-elevating members mounted on said work platform means to define therebetween a channel for receiving strapping material draped about an item to be strapped whereby to relieve said strapping material of the weight of said item.

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