United States Patent

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[54] APPARATUS AND METHOD FOR WRAPPING TAPE ON MULTISIDED ARTICLES
3 Claims, 8 Drawing Figs.

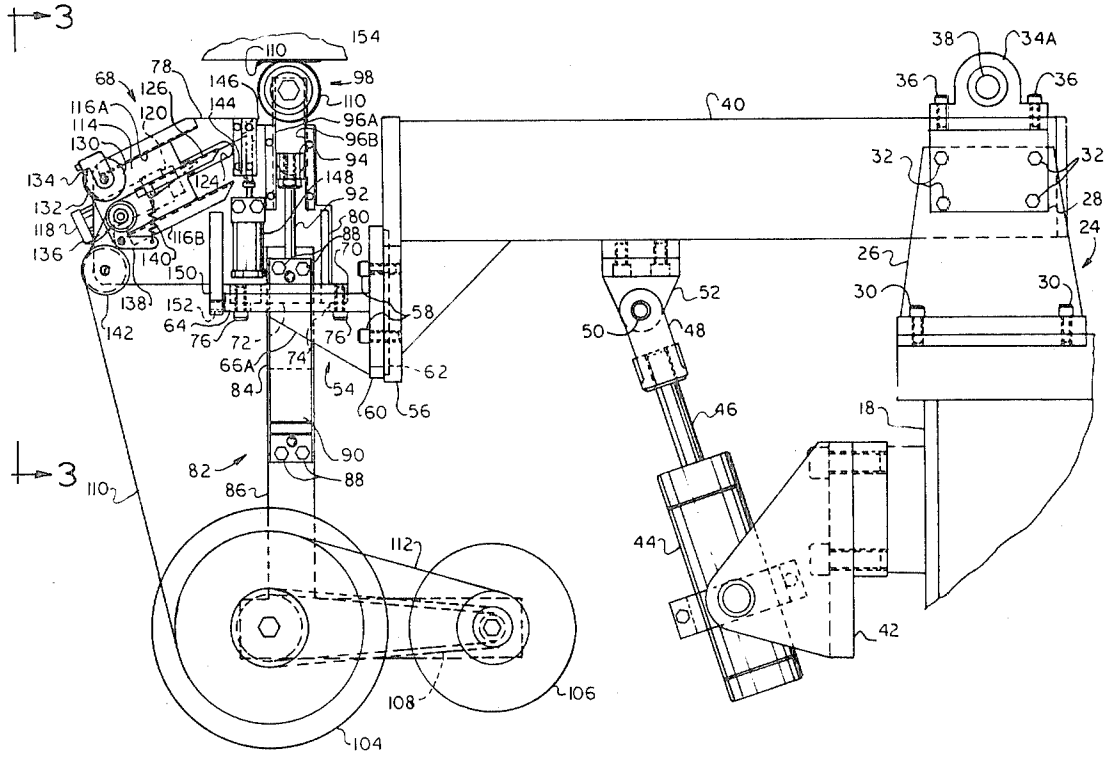
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[51] Int. Cl. B65c 3/12, B65c 9/02
[50] Field of Search 156/475, 486, 489, 492, 542, 351, 446, 447, 450; 242/7.08, 7.21, 7.23

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ABSTRACT: Apparatus for, and method of, wrapping tape around a multisided article, employing a yieldably supported roller and a mechanism which feeds said tape between the surfaces of the article and said roller as the latter is moved over said surfaces. After the roller has traveled diagonally across one side of the article and pressed tape thereon, the article is rotated to bring the next adjacent side into position for taping, while the roller is held against the surface of the article by the yieldable action of the means provided for supporting the roller and by the programmed movement of the roller at a predetermined rate in the direction of rotation of said article. Through repetition of the aforesaid steps, tape is wrapped around the article at a selected angle relative to its longitudinal axis.



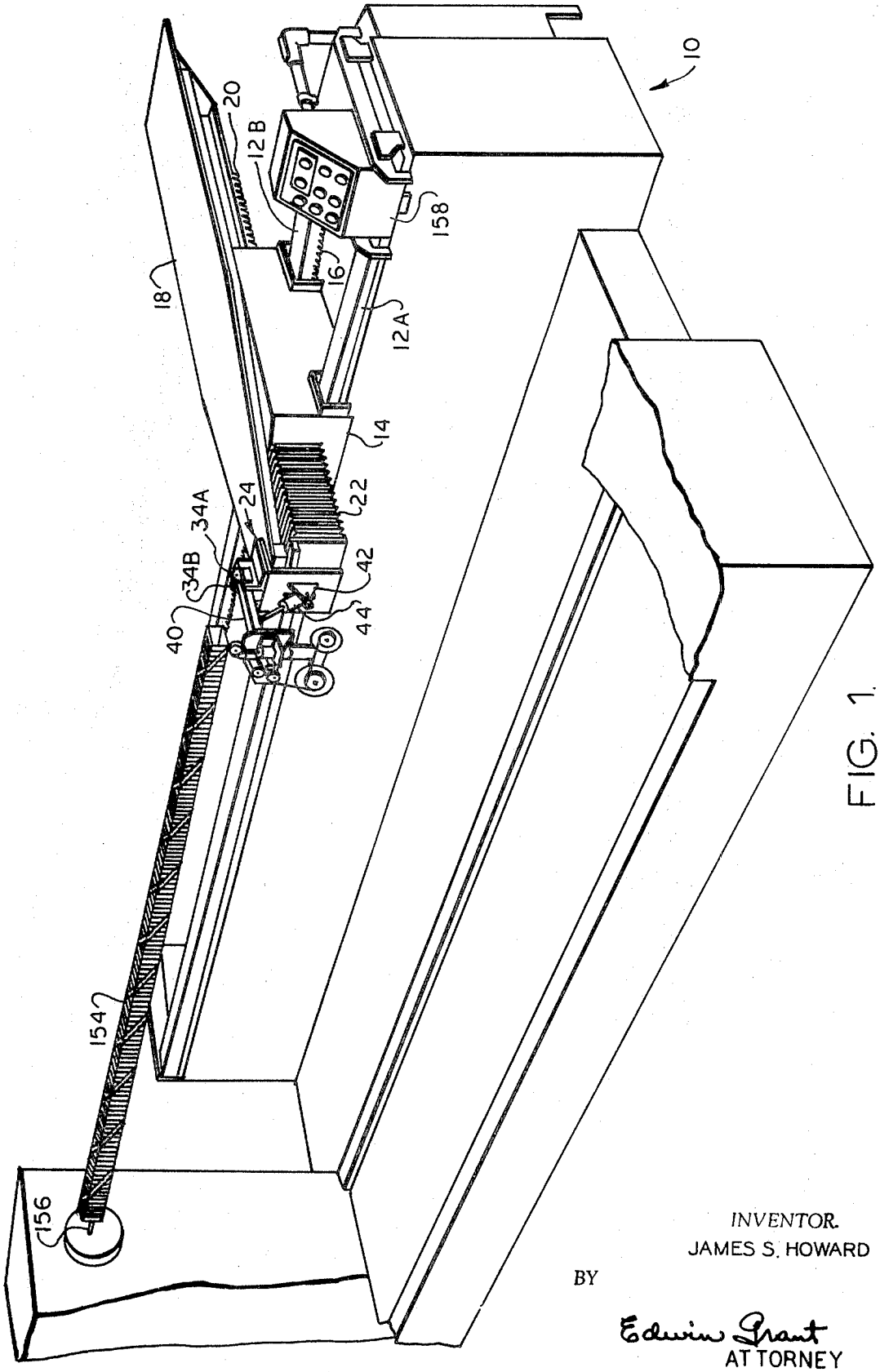


FIG. 1.

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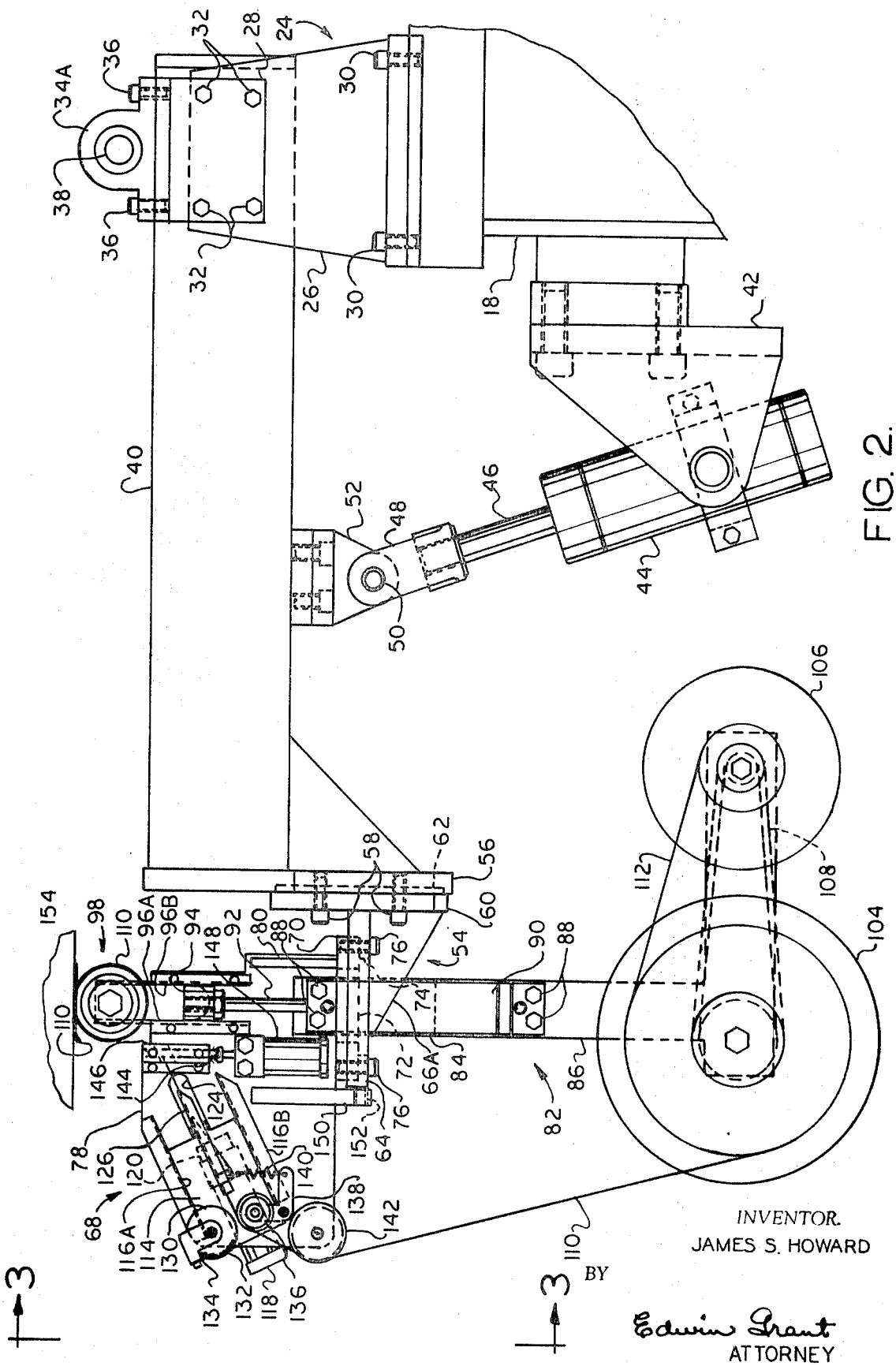


FIG. 2.

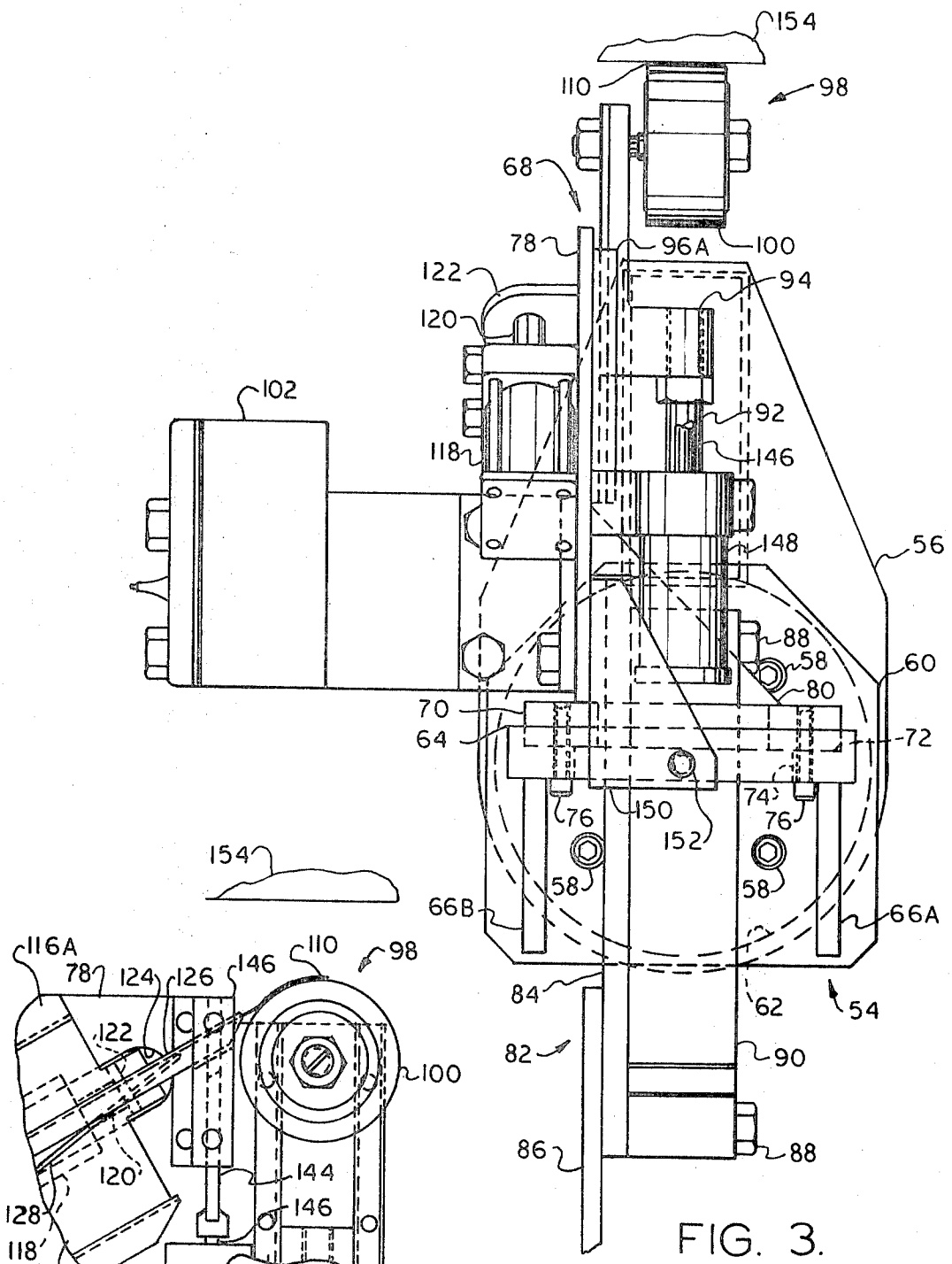


FIG. 3.

FIG. 4

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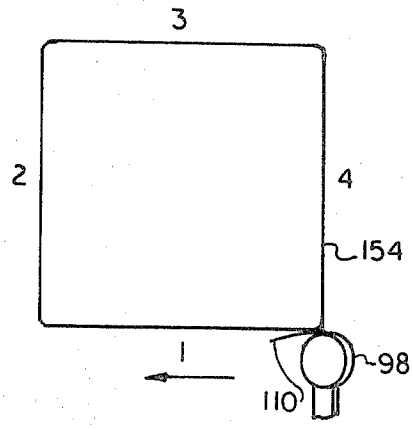


FIG. 5.

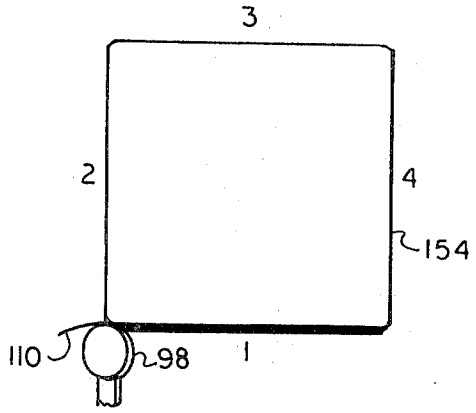


FIG. 6.

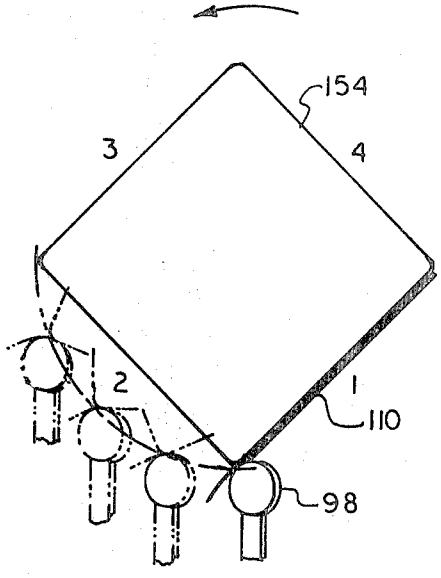


FIG. 7.

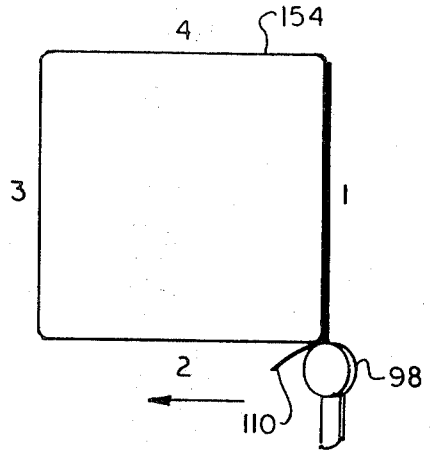


FIG. 8.

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APPARATUS AND METHOD FOR WRAPPING TAPE ON MULTISIDED ARTICLES

BACKGROUND OF THE INVENTION

This invention relates to both an apparatus and a method for wrapping tape around a multisided article, and more particularly to an apparatus and a method which are adapted for automatically wrapping tape around a laminated structural member in precisely spaced, adjacently disposed strips.

Laminated structural members have recently found increased use in the construction of various articles which must have a high strength-to-weight ratio, such as spars used in aircraft. In the fabrication of such components, it is often clarity to wrap strips of resin-impregnated fiberglass tape diagonally around the periphery of a structural member having a square or rectangular cross section. This operation has heretofore generally been performed manually, which method is unsatisfactory because of the excessive amount of time and cost involved and also because of the lack of uniformity in the products produced thereby. Hence the invention disclosed herein, which as has been mentioned pertains to both an apparatus and a method for automatically wrapping laminated structural members, has particular utility in the fabrication of lightweight beams and the like, although the invention is not limited thereto.

SUMMARY OF THE INVENTION

As described in detail hereinafter, apparatus constructed in accordance with the principles of this invention comprises means for yielding supporting and moving a pressure roller over the surface of an object about which tape is to be wrapped, the words "resiliently supporting" referring 45° arrangement pressure roller being maintained against the surface of said object as the latter is rotated during the tape-wrapping method associated with the apparatus. More particularly, a preferred apparatus embodiment of being invention is provided with an elongated bed consisting of a pair of horizontally disposed ways, and a carriage slidably mounted on said ways and movable in opposite directions therealong by means of a rack and pinion arrangement. A horizontally disposed beam is slidably mounted on the aforesaid carriage for movement along its own longitudinal axis in a direction perpendicular to the ways of said bed, said beam also being driven by a rack and pinion mechanism. One end of a support arm is pivotally mounted on the aforesaid beam for rotation about a horizontal axis, and means are provided for yieldably biasing this support arm to rotate in one direction about said axis of rotation thereof. Pivotally mounted on the free end of the support arm for rotation about an axis perpendicular thereto is a support member which carries a pressure cylinder, the longitudinal axis of this cylinder illustrated coincident with said axis of rotation of said support member and pressure roller having a resilient rim being mounted on the end of the extensible shaft of the cylinder. The support member also carries a tape-feeding assembly which is adapted to feed tape between the pressure roller and the surfaces of the object around which said tape is to be wrapped, as well as a tape-cutting assembly arranged for cutting the tape fed to said pressure roller.

To wrap tape around a multisided article by means of the above-described apparatus, the article is first mounted between centers and the aforesaid carriage and beam are positioned so that pressure roller carried by in beam is adjacent the surface of said article at one end thereof. Tape is fed under the pressure roller as the latter moved obliquely across the surface of a first side article by the simultaneous movement of said carriage and beam. When the pressure roller reaches an edge of the article it is stopped and the article is rotated to bring a second side thereof into position for taping, said beam being simultaneously moved in the direction opposite its direction of motion during the aforesaid oblique movement of the pressure roller across the first side of the article. As mentioned hereinbefore, the support arm which carries the pressure roller is yieldably biased to rotate in one direction about its point of attachment. This arrangement, together with the programmed movement of pressure roller during the rotation of the article being wrapped, maintains the pressure roller in contact with said article throughout its rotation. When the article has reached a predetermined position its rotation is stopped, and tape is again fed under the pressure roller as the latter is moved obliquely across the surface of the next adjacent side of the article by the simultaneous movement of the carriage and beam mounted on the latter. By repeating the steps which have been briefly described, tape is wrapped around the article at a selected angle relative to its axis of rotation on the aforementioned centers.

OF THE INVENTION

Accordingly, it is an object of this invention to provide an effective means and an efficient method for wrapping tape around an article of manufacture.

Another object of the invention is to provide apparatus capable of wrapping tape around an object in precisely spaced, adjacently disposed strips.

Still another object of the invention multisided to provide a method of wrapping tape upon a multisided workpiece, which method is adapted for automation.

A further object of the invention is to provide apparatus which can wrap layers of adjacently disposed strips around a laminated structural member at different angles relative to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG 1 is a pictorial view illustrating a preferred embodiment of the invention:

FIG. 2 is a side elevation of certain components of the apparatus depicted in FIG. 1;

FIG. 3 is a front elevation of the same components, taken along the plane represented by the line designated 3—3 in FIG. 2 and in the direction indicated therein, certain components being removed from the apparatus for clarity;

FIG. 4 is a detail view of certain components, illustrating them in a position different from that shown in FIG. 2; and

FIGS. 5 through 8 are diagrammatic representations of a pressure roller of the apparatus as illustrated in FIGS. 1–4 and the cross section of a box beam wrapped by said apparatus, different positions assumed by said roller and box beam during the steps of the disclosed wrapping method being illustrated therein.

Throughout the drawings and the following specification like numbers designate like parts.

DETAILED DESCRIPTION

As illustrated in FIG. 1, a preferred apparatus embodiment of this invention comprises an elongated bed which is generally designated in the drawing by the number **10** and which is provided with a pair of parallel ways **12A**, **12B** on which a carriage **14** is slidably supported. Carriage **14** is driven in opposite directions along bed **10** by means of a pinion (not shown) carried by said carriage and engaged with a rack **16** attached to said bed. Slidably mounted on carriage **14** for movement along its own longitudinal axis is a beam **18**, a second pinion (not shown) being carried by said carriage and engaged with a rack **20** attached to said beam to move the latter in opposite directions along said longitudinal axis thereof. The front, lower portions of beam **18** and rack **20** are covered with an extensible bellows **22**.

Mounted on the upper surface of beam **18** at the forward end thereof are two supports (only one of which is seen in FIGS. 1 and 2 and which is generally designated therein by the number **24**). More particularly, the two supports **24** are disposed in spaced, parallel relations and each comprises two L-shaped sections **26**, **28**, one arm of each lower section **26** being secured by means of machine screws **30** to beam **18** and

one arm of each upper section **28** being joined by means of machine screws **32** to a respective one of said lower sections. Pillow blocks **34A, 34B** are respectively secured by means of machine screws **36** to the horizontally extending arms of the aforesaid sections **28**, and a shaft **38** is journaled in said pillow blocks for rotation about an axis disposed perpendicular to the longitudinal axis of beam **18**. One end of a support arm **40** is positioned between the two supports **24** and fixedly attached to shaft **38** by conventional means which are not shown for the sake of simplicity. The longitudinal axes of beam **18** and support arm **40** are coplanar in a vertical plane.

As can best be seen in FIG. **2**, a U-shaped support member **42** is fixedly mounted on the forward end of beam **18** and pivotally supports a pressure cylinder **44** for rotation about an axis disposed perpendicular to the longitudinal axis of said beam and support arm **40**. Projecting from one end of pressure cylinder **44** and fixedly secured to the piston (not shown) therein is a drive shaft **46** the free end of which has a U-shaped connector **48** threadedly attached thereto, which connector is in turn pivotally connected by means of a pin **50** to a lug **52** fixedly joined to the lower side support arm **40**. To bias support arm **40** so that it tends to rotate in the clockwise direction as viewed in FIG. **2**, the interior of pressure cylinder **44** is pressurized by conventional pnuematic or hydraulic pressurizing means (not shown).

FIGS. **2** and **3** most clearly show the structure of a support bracket (generally designated in said drawings by the number **54**) which is fixedly secured to a forward end plate **56** of arm **40** by means of a plurality of machine screws **58**. More specifically, support bracket **54** comprises a first section **60** a projecting portion of which rotatably fits within a bore **62** formed in forward end plate **56** (said machine screws **58** locking said first section in a selected position relative to said forward end plate), a second section **64** disposed parallel to the longitudinal axis of support arm **40**, and a pair of braces **66A, 66B** welded to said first and second sections. Generally designated in the drawings by the number **68** is a support member comprising an annular member **70** the lower edge of which rotatably fits within a counterbore **72** of a hole **74** which extends through the aforesaid second section **64** of support bracket **54**. Machine screws **76** extend through holes in said second section **64** and are threadedly engaged within selected ones of a plurality of holes in member **70** to thereby lock support member **68** at s selected angular position relative to support arm **40**. Support member **68** also includes a plate **78** which is disposed perpendicular to member **70** and fixedly attached thereto by suitable means such as welding (a brace **80** being fixedly attached to said plate and disk to impart increased rigidity to the assembly). An elongate arm generally designates in the drawings by the number **82** is comprised of a first section **84** which passes through the hole **74** in the second section **64** of support bracket **54** and the hole in member **70** and which is fixedly attached by suitable means to said plate **78**, and a second generally L-shaped section **86** one arm of which is integrally joined to said first section **84** and depends therefrom. Attached to arm **82** by means of machine screws **88** is a pressure cylinder **90** the longitudinal axis of which coincides with the axis of rotation of member **70**. The centrally disposed drive shaft **92** of pressure cylinder **90** is threadedly connected at the outer end thereof to a generally L-shaped member **94**, the opposite sides of which slidably abut a pair of guide bars **96A, 96B** mounted on plate **78**. Member **94** carries at its upper end a pressure roller, generally designated by the number **98**, which has a resilient rim **100** and which rotates about an axis perpendicular to the longitudinal axis of support arm **40**. Conventional pressurizing means (a portion of which is designated in FIG. **3** by the number **102**) are connected to pressure cylinder **90** to selectively extend and retract drive shaft **92** and thereby move pressure roller **98** between a first position thereof which is illustrated in FIG. **4** and a second position thereof which is illustrated in FIG. **2**.

The embodiment of the invention which is herein described also includes a tape feeding assembly comprising a tape supply drum **104** rotatably mounted on arm **86** and a spool **106** which is also rotatably mounted on said arm and the rotation of which is synchronized with the motion of said tape supply drum by means of a belt **108** engaged with pulleys attached to said drum and spool. One surface of the tape **110** wound on drum **104** is coated with an adhesive and covered by a tape **112** which is peeled from said surface and wound on spool **106** as tape **110** is unwound from the drum **104**. The tape-feeding assembly also includes a flat slide member **114** which is slidably mounted between two parallel slide plates **116A, 116B** fixedly attached to the side of plate **78** adjacent pressure cylinder **90**, said slide member being movable between a first position thereof which is illustrated in FIG. **2** and a second position thereof which is illustrated in FIG. **4**. To drive slide member **114** between said first and second positions thereof, the apparatus is provided with a pressure pressure **118** which is attached by suitable means to the side of plate **78** facing away from pressure cylinder **90** and the drive shaft of which is connected by means of a lug **122** to said slide member through a slot **124** formed in plate **78**. The slide member actuation system also comprises conventional pressurizing means (a portion of which is designated in FIG. **3** by the number **102**) connected to pressure cylinder **118** and adapted to drive the piston (not shown) to which shaft **120** is attached in opposite directions within said cylinder. Slide member **114** carries an elongate tape guide member **126** in the form of a trough the width of which is substantially equal to the width of tape **110** and one end of which is positioned adjacent the upper periphery of pressure roller **98** when the latter is positioned in the aforesaid first position thereof illustrated in FIG. **4**, and said slide member is positioned in the aforesaid second position thereof illustrated in the same drawing. A spring-biased arm **128** hold tape **110** against tape guide member **126**.

The tape-feeding assembly also comprises a tape feed control mechanism formed of a first feed roller **130** rotatable mounted end slide member **114**, a ratchet wheel **132** fixedly attached to said first feed roller, a pawl **134** which engages said ratchet wheel and allows said first feed roller to turn in a counterclockwise direction only as viewed in FIG. **2**, and a second feed roller **136** rotatably mounted on one end of an L-shaped arm **138** which is in turn pivotally mounted on slide member **114** and biased by means of a spring **140** so as to move said second feed roller toward said first feed roller. An idler roller **142** is rotatably mounted on plate **78** adjacent the aforedescribed tape feeding assembly to align tape **110** with tape guide member **126**. During the operation of the apparatus, tape **110** extends from drum **104** to idler roller **142** and thence between rollers **130, 136** ro tape guide member **126**.

Also illustrated in FIG. **2** is a tape-cutting assembly mounted on plate **78** between pressure roller **98** and slide member **114**. More particularly, the aforesaid tape-cutting assembly comprises a vertically disposed bar **144** which has a cutting edge at the upper end thereof and which is slidably engaged within a hole in a guide member **146**, and a pressure cylinder **148** which is mounted on plate **78** and which contains a piston (not shown) to which bar **144** is connected. Conventional pressurizing means (a portion of which is designated in FIG. **3** by the number **102**) are connected to pressure cylinder **149** to drive bar **144** between a first position thereof illustrated in FIG. **4** and a second position thereof illustrated in FIG. **2**, the line of travel of said bar intersecting the line of travel of tape **110** to pressurize roller **98** so that the tape is cut when the bar moves to said second position thereof.

During the wrapping of multiple layers of tape around a workpiece by means of the disclosed apparatus, it may be necessary to remove screws **76** from support member **68** and support bracket **54** so that said support member can be rotated to a new position relative to said support bracket. Hence there is provided a plate **150** which is fixedly mounted on plate **78** of support member **68** and which depends therefrom to a point contiguous to the edge of the section **64** of support bracket **54**. A spring-biased plunger **152** extends

through a hole formed in plate 150 adjacent the lower edge thereof, the inner end of said plunger entering one of a number of dimples formed in the edge of said section 64 when support member 68 has been turned to register the plunger with a selected dimple, which arrangement facilitates the proper positioning of said support member at different positions relative to support arm 40. Screws 76 are of course employed to lock support member 68 to support bracket 54 when the apparatus is in use.

In FIG. 1 is illustrated a box beam, hereinafter referred to as workpiece 154, which for clarity is cut away in the drawing at the point where pressure roller 98 makes contact therewith. Workpiece 154 is mounted between two centers (only one of which is illustrated in FIG 1 and which is designated therein by number 156) for rotation about its longitudinal axis. Also illustrated in the same drawing is a control console 158 constituting a portion of a numerical control system which is programmed to move carriage 14, beam 18, and other moving parts of the apparatus during process steps in accordance with the invention, as disclosed hereinafter. Since the principles of numerical control are well known in the art and do not constitute a part of the present invention, details of the electrical equipment used to control the disclosed apparatus are omitted.

OPERATION

By means of the illustrated apparatus adhesive-coated tape can be wrapped around workpiece 154 in precisely spaced, parallel strips disposed at any desired angle relative to the longitudinal axis of said workpiece. FOr example, to wrap strips on workpiece 154 at an angle of 45° relative to the longitudinal axis thereof, carriage 14 and beam 18 can be moved to position pressure roller 98 adjacent one edge of a first side thereof, with said pressure roller being under workpiece as illustrated in FIG. 1 and in the aforesaid first position thereof illustrated in FIG. 4, and with support member 68 locked at an angle of 45° with respect to the longitudinal axis of support arm 40. (For the purpose of illustration, it will be assumed that pressure roller 98 is initially positioned below the edge of workpiece 154 which is rearmost in FIG. 1 and that tape 110 is to be wrapped around the workpiece starting from a point adjacent the end thereof which is on the right in the same drawing.) Tape 110 is fed over pressure roller 98 by actuating cylinder 118 so as to drive slide member 114 toward said pressure roller and bring the end of tape guide member 126 close to the upper periphery thereof as illustrated in FIG. 4. It should be noted at this point that tape 110, being held against guide member 126 by means of arm 128, is unwound from drum 104 as slide member 114 is moved toward pressure roller 98, and also tape 110 is initially extended beyond the end of said guide member so that it lies over the pressure roller when the slide member is in the aforesaid second position thereof adjacent pressure roller 98. As previously mentioned, tape 112 is peeled from tape 110 and wound on spool 106 as tape 110 is unwound from the drum 104. Cylinder 90 is next actuated to move pressure roller 98 upward, thereby pressing the adhesive-coated side of tape 110 against the lower surface of workpiece 154 as illustrated in FIG. 5. Selected pressures are maintained in cylinder 90 and cylinder 44 when pressure roller 98 is in contact with tape 110 and the latter is thereby pressed against workpiece 154. Carriage 14 is then moved toward the end of the bed 10 which is on the left in FIG. 1 as beam 18 is moved at the same rate in a forward direction on said carriage (i.e., to the left in FIG. 1), thereby moving pressure roller 98 in a first direction across workpiece 154 at an angle of 45° with respect to the longitudinal axis thereof. The motion of pressure roller 98 is lengthwise of tape 110, which is pulled from the drum 104 as said pressure roller rolls toward the forward edge of workpiece 154 and presses the tape against the lower surface of said workpiece.

When pressure roller 98 reaches the end of the planar portion of the side of workpiece 154 which is designated by the number 1 in FIG. 5, the aforesaid motions of carriage 14 and beam 18 are stopped, at which time the pressure roller and workpiece are in the configuration illustrated in FIG. 6 Workpiece 154 is then rotated 90° in the direction counter to the first direction of motion of pressure roller 98 across side one of said workpiece, that is, the rotation of the workpiece is counterclockwise as viewed from a point located to the right of the point at which said workpiece is broken away in FIG. 1, whereas the motion of the pressure roller in said first direction thereof is clockwise of the workpiece when viewed from the same point (the motion of said pressure roller longitudinally of the workpiece when it moved in said first direction being disregarded in defining the direction of rotation of workpiece 154 as "counter" to that of pressure roller 98 in the first direction of motion thereof. As workpiece 154 is rotated through an angle of 45° to bring it into the position illustrated in FIG. 7, beam 18 is moved at a predetermined rate rearwardly on carriage 14 and simultaneously support arm 40 is rotated in a counterclockwise direction as viewed from a point located on the right side thereof in FIG. 1, the rotation of said support arm being effected by the pressure exerted against pressure roller 98 as the edge of side one of workpiece 154 which is on the left in FIGS. 5 and 6 moves along the path indicated in phantom in FIG. 7. The piston of pressure cylinder 44 is of course pushed inwardly of said cylinder as support arm 40 is rotated as described. Hence fluid (air or liquid, depending upon the type of pressurizing system which is employed) is bled from cylinder 44 as arm 40 is depressed; then as workpiece 154 continues to rotate counterclockwise from the position illustrated in FIG. 7, fluid is injected into the cylinder in order to move arm upward, beam 18 meanwhile continuing to move at the aforesaid predetermined rate rearwardly on carriage 14. The aforementioned rearward motion of beam 18 and the yieldable action or arm 40 keep pressure roller 98 pressed against the surface of workpiece 154 as it rotates. Furthermore, the rate at which beam 18 is moved rearwardly on carriage 14 is such that the pressure roller 98 has rolled around the edge between side one and side two of workpiece 154 and reached the planar portion of side two of workpiece 154 when the latter has rotated 90°, as illustrated in FIG. 8. By again moving carriage 14 toward the left end of bed 10 and beam 18 in a forward direction at the same rate as has been described in connection with the motion of pressure roller 98 in the aforesaid first direction thereof, the pressure roller is moved in a third direction across side two of workpiece 154, which third direction is parallel to said first direction (i.e., disposed at an angle of 45° with respect to the longitudinal axis of the workpiece). By repeating the foregoing steps, tape 110 is wrapped around all sides of workpiece 154 along the length thereof. Just before pressure roller 98 reached the point on the workpiece where wrapping is to be terminated, cylinder 118 is actuated so as to drive slide member 114 to the aforesaid first position thereof which is illustrated in FIG. 2. Cylinder 148 is immediately thereafter actuated to drive bar 144 from the aforesaid first position thereof illustrated in FIG. 4 (in which first position said bar is of course maintained during the time tape 110 is fed to pressure roller 98) to the aforesaid second position thereof illustrated in FIG. 2, thus cutting tape 110. The motion of pressure roller 98 across workpiece 154 continues until the end of the tape 110 being wrapped on said workpiece has been pressed against the workpiece. After one strip of tape 110 has been wrapped around workpiece 154 along the length thereof, pressure roller 98 is moved away from the surface of said workpiece by actuating cylinder 90 and carriage 14 is then returned to the right end of the workpiece and positioned so that a second strip of tape can be wrapped around the workpiece adjacent the first strip. SInce the motions of carriage 14, beam 18, and other moving parts of the apparatus are controlled by numerical tape, the wrapping of workpiece 154 is achieved automatically.

As mentioned hereinbefore, support member 68 can be rotated to different angular positions relative to the longitudinal axis of arm 40. Hence the support member 68 can be

rotated 90° with respect to its position during the wrapping of tape **110** on workpiece as described hereinbelow, and by proper programming of the motions of carriage **14** and beam **19** a second layer of tape can be wrapped around the workpiece in adjacent strips which are also disposed at an angle of 45° with respect to the longitudinal axis of said workpiece but which run in the direction opposite to that of the strips in the first layer of tape. Other angular orientations of tape **110** are of course readily attainable by means of the disclosed apparatus and method. It should be understood that the utility of the invention is not limited to the wrapping of workpieces having a square cross section or only four planar sides, the shape of the workpiece **154** illustrated in the drawings being chosen for the purpose of example only.

When tape is being wrapped around a workpiece of relatively large cross section at a relatively large angle with respect to the longitudinal axis thereof, the rim **100** of pressure roller **98** will not remain in contact with the surface of the workpiece across the entire width of said rim during the movement of said pressure roller which is shown in FIG. **7** (i.e., during the rotation of workpiece **154**), unless the aforesaid rim is of a certain thickness and hardness. More specifically, for a workpiece having a transverse measurement in the range of 12 to 15 inches and for the wrapping of tape **110** at an angle of 45° with respect to the longitudinal axis of the workpiece, it has been found that the thickness of the rim **100** should be at least one-fourth inch and that said rim should be formed of a rubber having a Shore hardness not greater than **50**.

The present embodiment of this invention is to be considered in all respect as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and all changes coming within the meaning and range of equivalency of the claims are intended to be embraced therein.

Having thus described the invention, what is claimed as new and useful and desired to be secured by Letters Patent is:

1. Apparatus for wrapping tape on the surface of a workpiece, comprising:

means for supporting and turning said workpiece about an axis of rotation extending therethrough;

a carriage;

means for supporting and moving said carriage in opposite directions along a longitudinal axis extending parallel to said axis of rotation of the workpiece;

a beam;

means for supporting and moving said beam on the carriage in opposite directions along an axis perpendicular to said longitudinal axis of the carriage;

a support arm;

means pivotally connecting one end of said support arm to the end of said beam nearest the axis of rotation of the workpiece for swinging movement about an axis parallel to said axis of rotation of the workpiece;

a pressure roller;

means supporting said pressure roller on the free end of said support arm for rotation about an axis perpendicular to the longitudinal axis of the arm;

a pressure cylinder operatively attached pivotally at one end thereof to said beam and pivotally attached at the other end thereof to said arm so that the cylinder when pressurized causes swinging movement of the arm to bring the pressure roller into pressurized engagement with a surface of the workpiece and reverse swinging movement of the arm caused by rotation of the workpiece against the roller is permitted by release of pressure in the cylinder;

and means for feeding said tape between said pressure roller and said surface of the workpiece.

2. Apparatus as defined in claim **1** including: said pressure roller supporting means comprising

a support member mounted on said support arm for rotation about an axis disposed perpendicular to the axis of rotation thereof;

means for locking said support member at different angular positions relative to said support arm;

a pressure cylinder mounted on said support member so that its longitudinal axis is disposed perpendicular to the longitudinal axis of said support arm;

a piston slidably disposed within said cylinder;

a shaft one end of which is connected to said piston and the other end of which projects from said cylinder, said pressure roller being mounted on the free end of said shaft;

means for maintaining the axis of rotation of said pressure roller in fixed position relative to said support member; and

means for pressuring said cylinder to thereby drive said piston in opposite directions therein.

3. Apparatus as defined in claim **1** wherein said pressure roller has a resilient rim the Shore hardness of which is not greater than 50 and the thickness of which is at least one-fourth inch.

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