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METHOD FOR THE WIPING TRANSFER OF BONDING AGENT ONTO A LONGITUDINAL MEMBER AND AN UNDERLAPPING MARGIN OF A TAPE ON THE LONGITUDINAL MEMBER

Original Filed Feb. 26, 1970 7 Sheets-Sheet 1

FIG. 1.

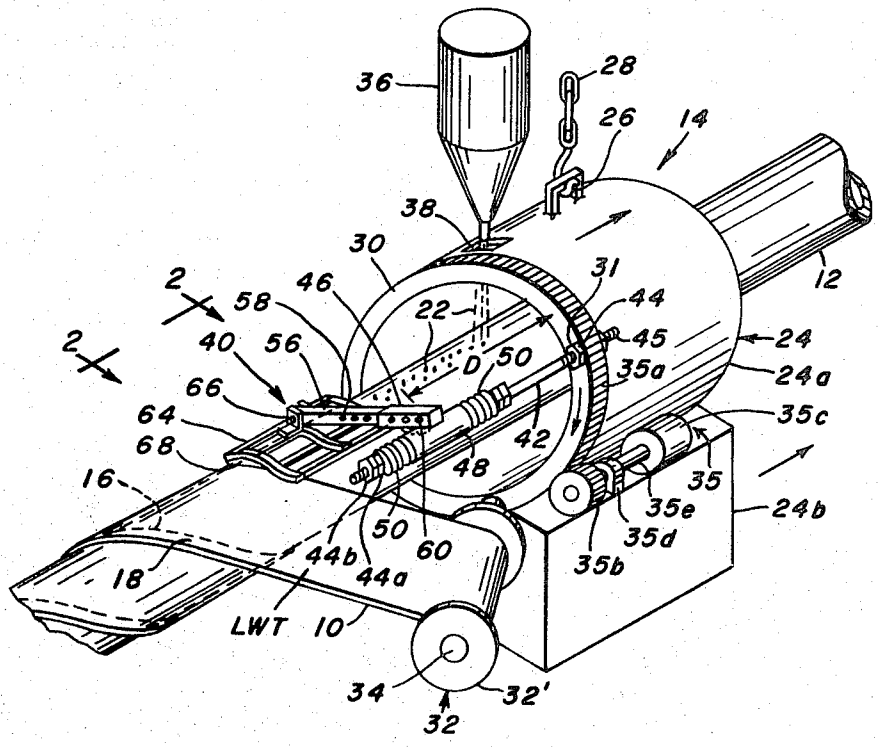


FIG. 2.

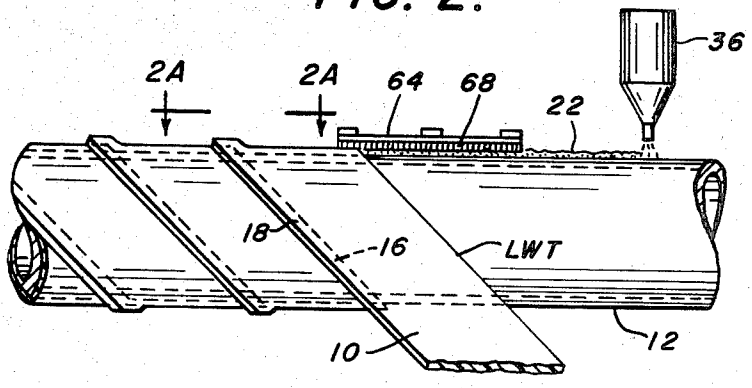
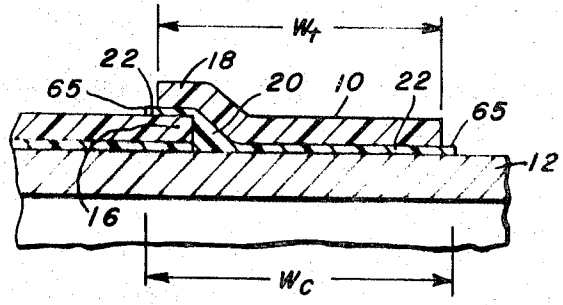


FIG. 2A.



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FIG. 3A.

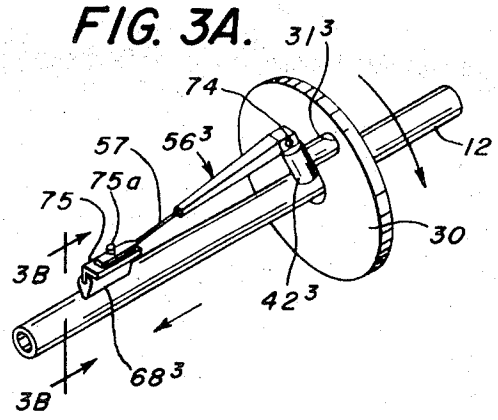


FIG. 3B.

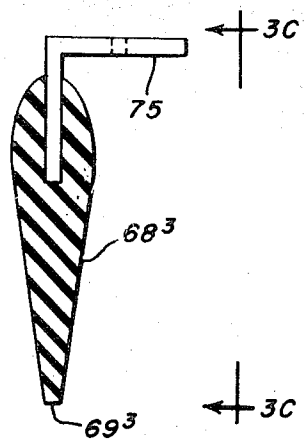


FIG. 3C.

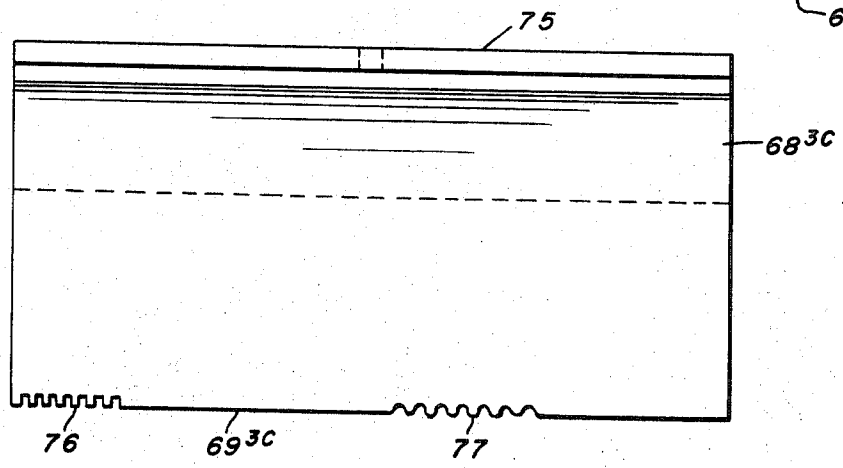
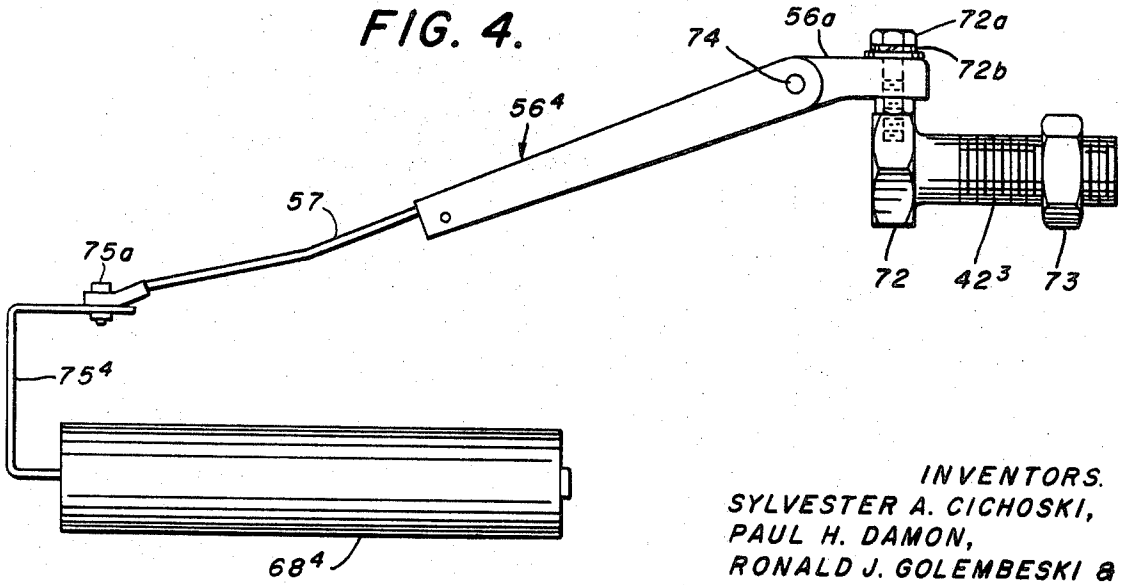


FIG. 4.



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FIG. 5.

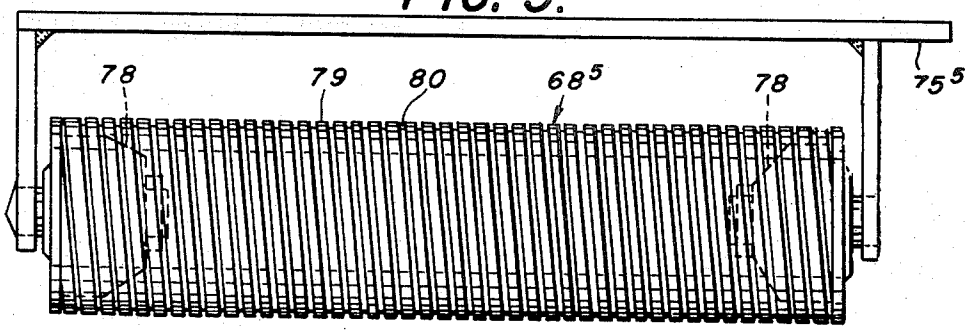


FIG. 6.

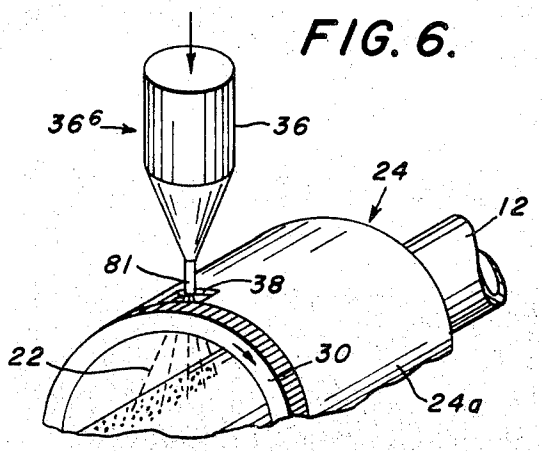


FIG. 8.

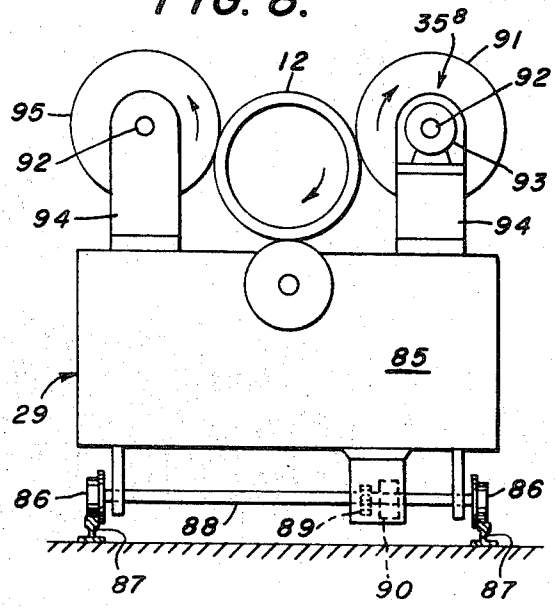
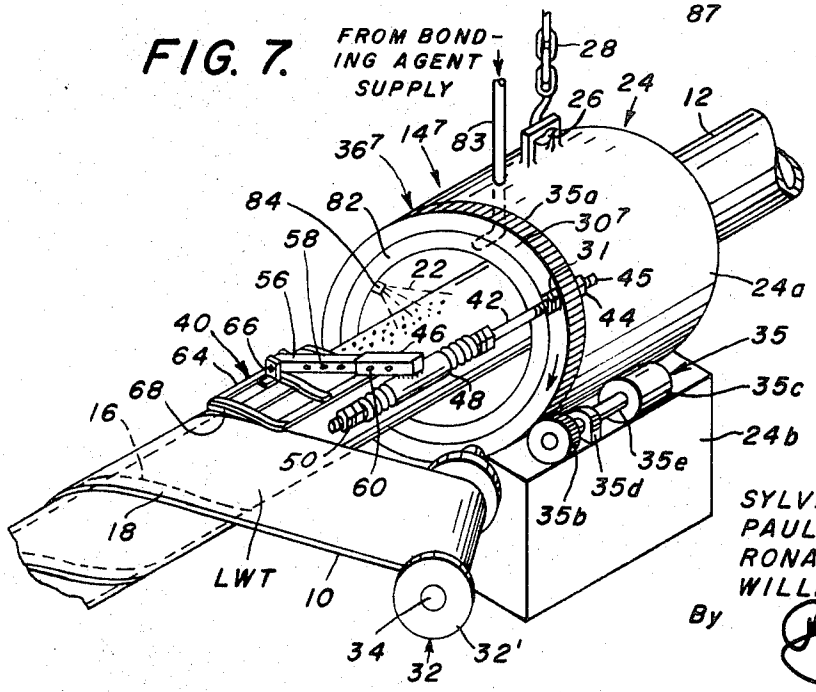


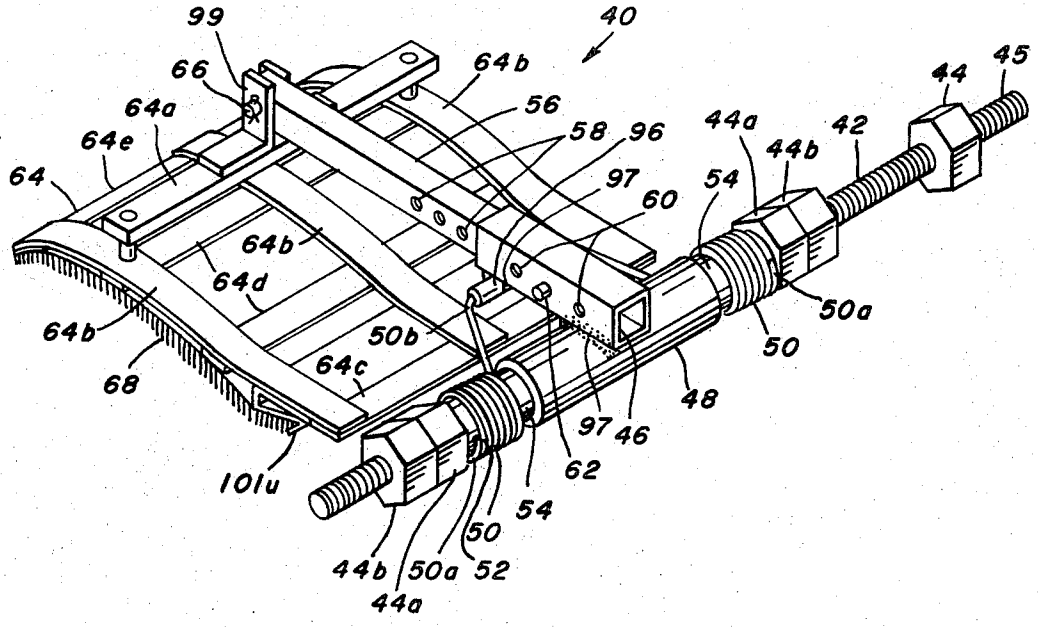
FIG. 7.



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FIG. 9.



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FIG. 10.

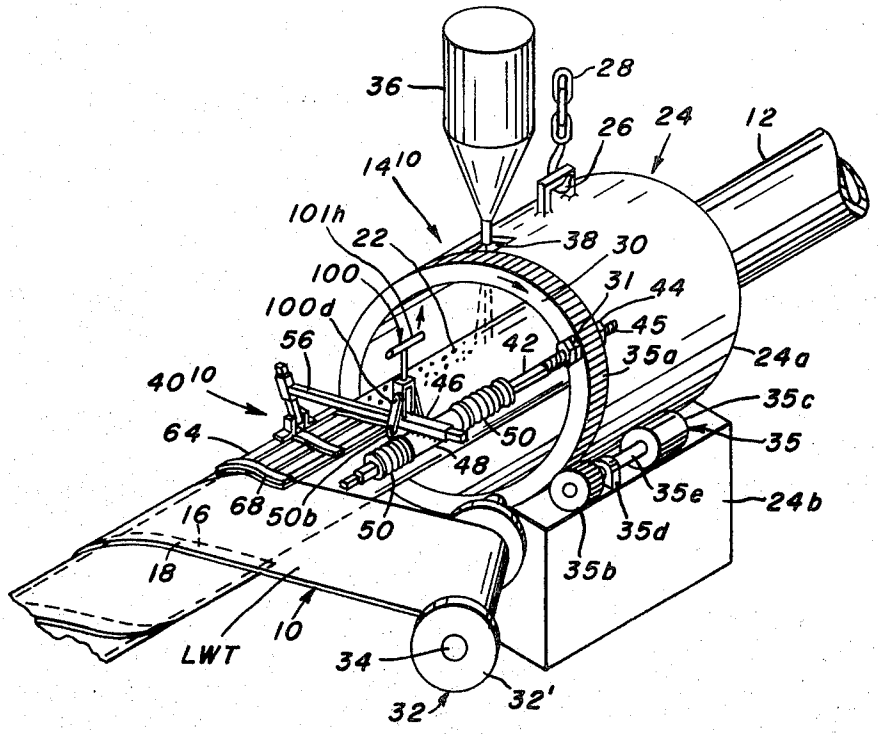
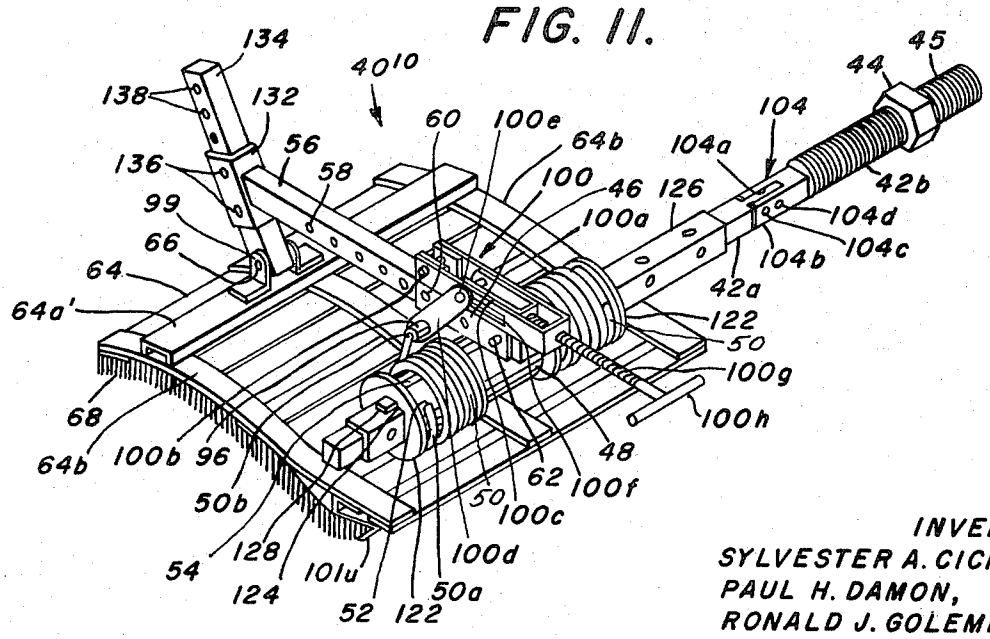


FIG. 11.



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METHOD FOR THE WIPING TRANSFER OF BONDING AGENT ONTO A LONGITUDINAL MEMBER AND AN UNDERLAPPING MARGIN OF A TAPE ON THE LONGITUDINAL MEMBER

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FIG. 12.

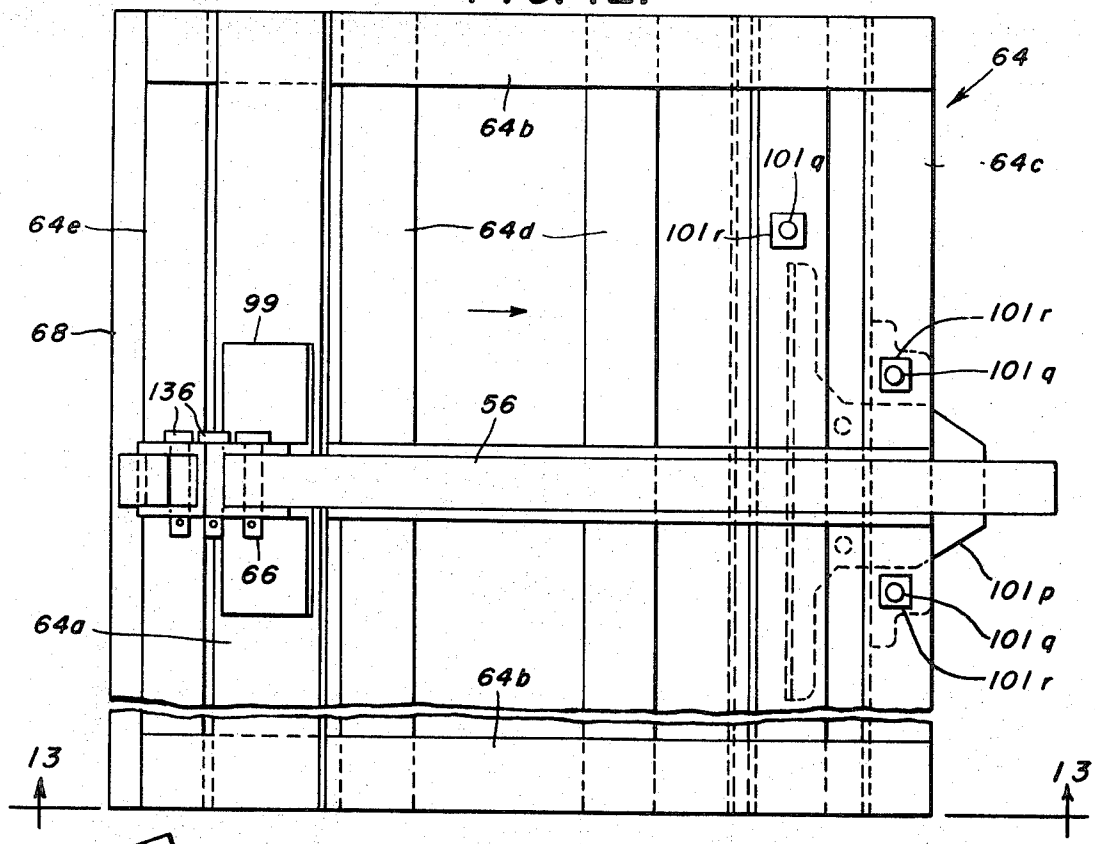
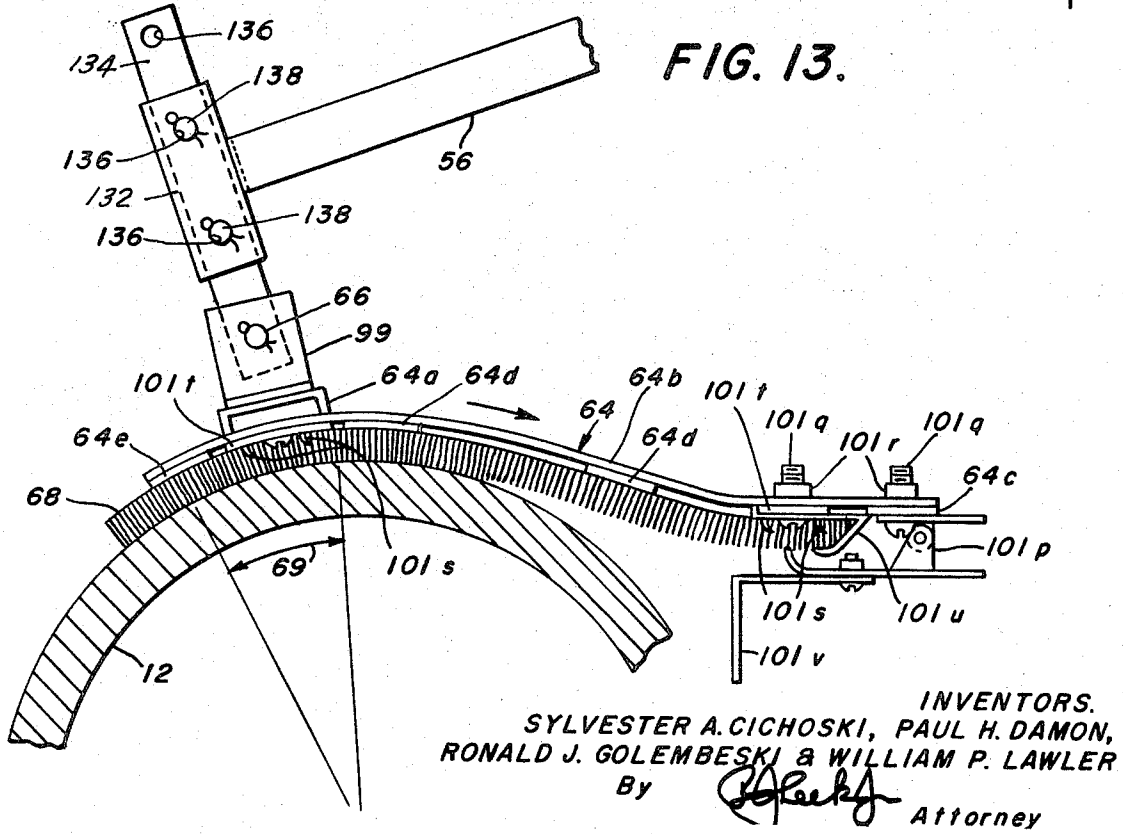


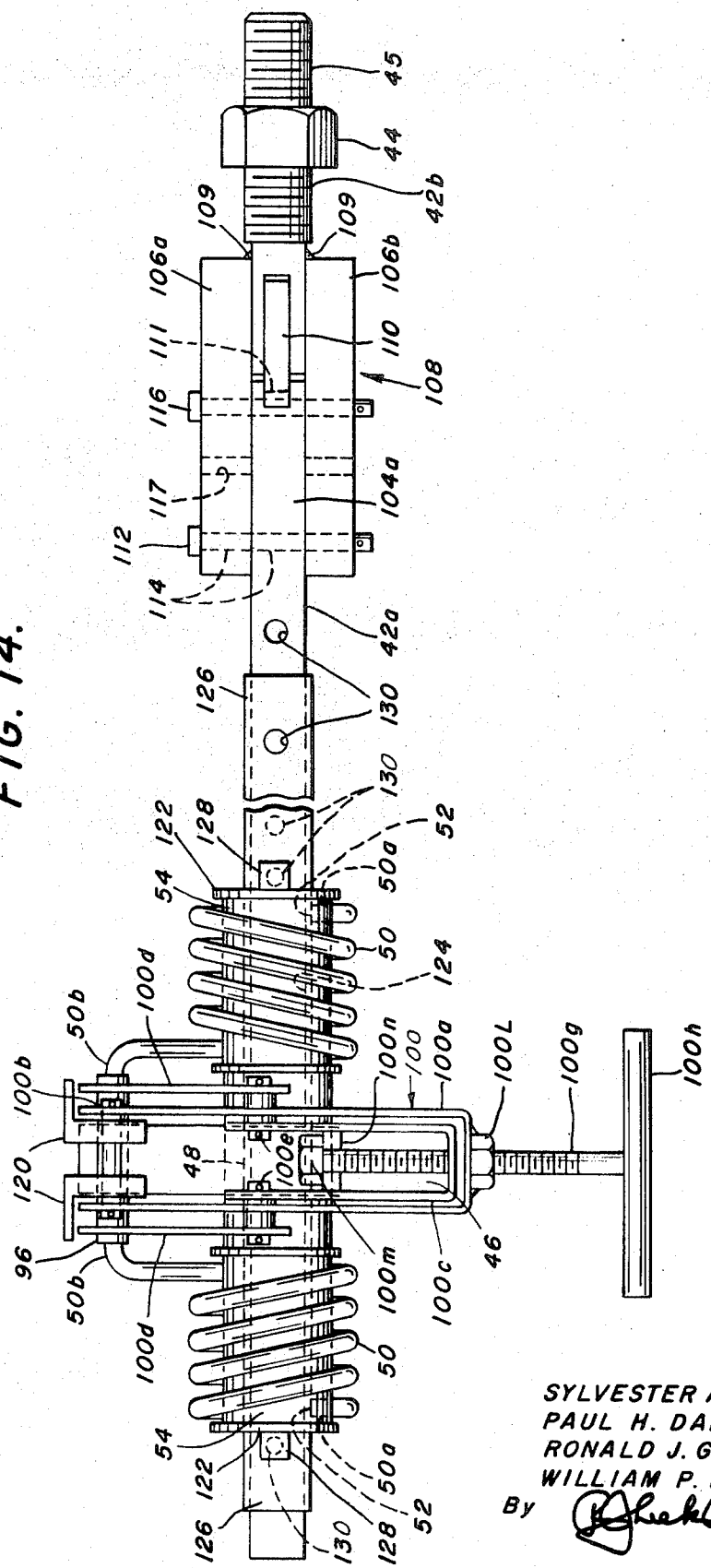
FIG. 13.



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FIG. 14.



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United States Patent Office

3,761,335

Patented Sept. 25, 1973

3,761,335

METHOD FOR THE WIPING TRANSFER OF BONDING AGENT ONTO A LONGITUDINAL MEMBER AND AN UNDERLAPPING MARGIN OF A TAPE ON THE LONGITUDINAL MEMBER

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Original application Feb. 26, 1970, Ser. No. 14,284, now Patent No. 3,687,778. Divided and this application Aug. 12, 1971, Ser. No. 171,051

Int. Cl. B31c *1/00*

U.S. Cl. 156—187 20 Claims

ABSTRACT OF THE DISCLOSURE

A method for the wiping transfer of a bonding agent onto a longitudinal member and onto the underlapping portions of a protective tape wrapped onto the longitudinal member is disclosed. The tape has an underlapping margin and an overlapping margin during the wrapping operation. The underlapping margin defines with the longitudinal member a transitional cavity. The tape is wrapped on the longitudinal member with a bonding agent therebetween. The overlapping margin is wrapped onto the underlapping margin with the bonding agent between and the transitional cavity is substantially filled with the bonding agent and is then covered by the overlapping margin. The tape has a last wrapped turn on the longitudinal member during the wrapping operation.

The method includes the steps of:

(a) Causing relative longitudinal movement between the longitudinal member and the tape along a path of wrapping movement;

(b) Connecting a free end of the tape to the longitudinal member;

(c) Causing relative rotary movement between the longitudinal member and the tape to wrap the tape about a longitudinal member;

(d) Feeding the bonding agent to the longitudinal member ahead of the last wrapped turn of the tape on the longitudinal member; and

(e) Picking up the bonding agent on the longitudinal member, transferring the bonding agent on the longitudinal member around the longitudinal member adjacent the last wrapped turn of the tape on the longitudinal member preparatory for the application of the next wrapped turn of the tape, transferring the bonding agent from the longitudinal member onto the underlapping margin preparatory for the wrapping of the overlapping margin of the next wrapped turn of the tape thereon, and substantially filling said transitional cavity with the bonding agent.

This application is a divisional application of U.S. patent application Ser. No. 14,284 filed Feb. 26, 1970 now U.S. Pat. No. 3,687,778, by applicants and assigned to the assignee of the present invention.

BACKGROUND OF THE INVENTION

Heretofore conventional methods of and apparatus for applying a bonding agent, tape and the like, to the longitudinal member have been of the type shown in the following U.S. patents.

We are aware of the following prior art:

U.S. Pat No.	Inventor	Class	Issued
1,299,037	Reynolds	36/59	4/1/19
1,319,455	Barlett	93/94	10/21/19
1,821,352	McManis	29/81	9/1/31
1,985,979	Keeran	126/39	1/1/35
1,988,628	McDonald et al	25/38	1/22/35
2,291,823	Mickelsen et al	242/11	8/4/42
2,371,224	Cumfer	242/11	3/13/45
2,377,608	Bronson	242/11	6/5/45
2,405,909	Smith et al	93/94	8/13/46
2,716,315	Jacoby	53/98	8/30/55
2,877,150	Wilson	154/83	3/10/59
2,900,881	Barnes et al	93/80	8/25/59
2,944,586	Yanulis	154/1	7/12/60
2,948,200	Westerbarkey	93/80	8/9/60
3,018,212	Chinn	156/195	1/23/62
3,099,190	Allen et al	93/80	7/30/63
3,163,182	Sandow	138/144	12/29/64
3,170,489	Cunningham	138/145	2/23/65
3,194,275	Biggs et al	138/144	7/13/65
3,230,123	Christensen	156/195	1/18/66
3,234,970	Baker et al	138/125	2/15/66
3,247,869	Boegershausen et al	138/144	4/26/66
3,315,864	Martin et al	299/4.5	4/25/67
3,338,270	Renenberg	138/144	8/29/67
3,379,171	Cordingly et al	118/261	4/23/68
3,389,009	McNulty et al	117/18	6/18/68
3,402,742	O'Brien	138/143	9/24/68
3,404,050	Gill	156/53	10/1/68

In the wrapping of fluid pipe lines with a protective tape, conventional primer rugs or sleeves are employed. These primer rugs wipe the primer around the pipe after such primer has been dripped onto the top of the pipe. Alternatively, extrusion type boot sleeves are employed, which extrusion type boot sleeves extruder primer around the pipe through the extrusion end of the extrusion type boot sleeves. Such conventional devices fail to give complete pipe line protection since the spirally wound tape leaves the overlapped margin unfilled and therefore produces a discontinuous envelope about the pipe.

OBJECTS OF THE INVENTION

It is the general object of this invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by the provision of a novel method for the wiping transfer of a bonding agent onto a longitudinal member and onto the underlapping portions of a protective tape being wrapped onto the longitudinal member. The improved method:

(a) Utilizes direct contact between the wiping applicator and the surface of the longitudinal member where the coating is picked up and the surface to which it is transferred to and redeposited;

(b) Provides a sealed overlapping margin and effect a continuous wrapped envelope about the longitudinal member;

(c) Completely seals the transitional area (defined by the underlapping margin and the longitudinal member) with the bonding agent and covers such filled transitional cavity with the overlapping margin of the tape;

(d) Is universally adapted to use a wide range of bonding agent materials including those with abnormally low or high viscosities; and

(e) Seals the underlapping margin and overlapping margin with an internal source of bonding agent deposited on the longitudinal member ahead of the last wrapped turn of the tape on the longitudinal member.

BRIEF SUMMARY OF THE INVENTION

The aforesaid objects of this invention and other objects which will become apparent as the description proceeds are achieved by providing an improved method for

the wiping transfer of a bonding agent onto a longitudinal member and onto the underlapping portions of a protective tape being wrapped onto the longitudinal member. The tape has an underlapping margin and an overlapping margin during the wrapping operation. The underlapping margin defines with the longitudinal member a transitional cavity. The tape is wrapped on the longitudinal member with a bonding agent therebetween. The overlapping margin is wrapped onto the underlapping margin with the bonding agent between and the transitional cavity is substantially filled with the bonding agent and is then covered by the overlapping margin. The tape has a last wrapped turn on the longitudinal member during the wrapping operation.

The method includes the steps of:

(a) Causing relative longitudinal movement between the longitudinal member and the tape along a path of wrapping movement;

(b) Connecting a free end of the tape to the longitudinal member;

(c) Causing relative rotary movement between the longitudinal member and the tape to wrap the tape about the longitudinal member;

(d) Feeding the bonding agent to the longitudinal member ahead of the last wrapped turn of the tape on the longitudinal member; and

(e) Picking up the bonding agent on the longitudinal member, transferring the bonding agent on the longitudinal member around the longitudinal member adjacent the last wrapped turn of the tape on the longitudinal member preparatory for the application of the next wrapped turn of the tape, transferring the bonding agent from the longitudinal member onto the underlapping margin preparatory for the wrapping of the overlapping margin of the next wrapped turn of the tape thereon, and substantially filling the transitional cavity with the bonding agent.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

For a better understanding of this invention, reference should be had to the accompanying drawings wherein like numerals of reference indicate similar parts throughout the several views and wherein:

FIG. 1 is a perspective view of a preferred embodiment of the apparatus for spirally wrapping the protective tape in overlapping engagement on a longitudinal member, such as a pipe or the like, and showing a non-rotatable housing, a rotatable shuttle mounted on the housing, a pipe wrapping means secured to the shuttle and one embodiment of a wiping transfer device secured to the rotatable shuttle;

FIG. 2 is a fragmentary enlarged side elevational view taken along the line **2—2** of FIG. 1 in the direction of the arrows and having the wiper member support structure, the shuttle and the housing removed for clarity;

FIG. 2A is a fragmentary enlarged side elevational view taken along the line **2A—2A** of FIG. 2 in the direction of the arrows and showing the underlapping margin, the overlapping margin, the transitional cavity, the bonding agent and the pipe.

FIG. 3A is a perspective view of an alternative embodiment of the bonding agent wiping means showing a blade-type wiper member mounted on a wiper blade assembly which assembly is pivoted on the shuttle member;

FIG. 3B is an end view taken along the line **3B—3B** of FIG. 3A in the direction of the arrows and showing the blade-type wiper member and its mounting plate affixed thereto;

FIG. 3C is a view similar to one taken along the line **3C—3C** of FIG. 3B in the direction of the arrows and showing a side elevational view of an alternative embodiment of the blade-type wiper member having either serrations or corrugations on its contact wiping surface;

FIG. 4 is a fragmentary side elevational view of another alternative embodiment of the wiper member and showing a roller type member mounted on the wiper blade assembly;

FIG. 5 is a fragmentary side elevational view of an alternative embodiment of a wiper member and showing a rotary-type wiping member having a square wire provided with a chamfer slot and wound around the periphery of the pivotable roller;

FIG. 6 is a fragmentary perspective view similar to the upper portion of FIG. 1 and showing an alternative embodiment of the bonding agent supply means utilizing a spray type feed of the bonding agent from a pressurized bonding agent spray;

FIG. 7 is a perspective view similar to FIGS. 1 and 6 and showing another embodiment of the bonding agent supply means utilizing centrifugal type feed and including a stationary circular storage tank for the bonding agent and a rotating shuttle rotatable within the stationary circular storage tank, such shuttle having an outlet for centrifugally depositing the bonding agent around the pipe;

FIG. 8 is an end elevational view of an alternative embodiment of the longitudinal drive means and the rotary drive means and showing the longitudinal member or pipe supported on a movable carriage reciprocable on tracks and further showing the longitudinal member or pipe rotatable by a drive roller and a driven roller;

FIG. 9 is an enlarged perspective view of the bonding agent wiping means shown in FIGS. 1, 7;

FIG. 10 is a perspective view of an alternative embodiment of the apparatus and showing a tensioning means connected to the biasing means on the bonding agent wiping means, which tensioning means is utilized for controlling the biasing of the bonding agent wiping means against the longitudinal member and is shown in the loaded or tensioning position;

FIG. 11 is an enlarged perspective view of the bonding agent wiping means and the tensioning means and showing the tensioning means in the released or unloaded position;

FIG. 12 is an enlarged plan view of the wiper member frame shown in FIGS. 10 and 11 and including the vertical positioning means and the horizontal positioning arm;

FIG. 13 is a view similar to a side elevational view taken along the line **13—13** of FIG. 12 in the direction of the arrows and showing also the wiper member affixed to the wiper member frame and in engagement with the longitudinal member or pipe along the contact surface of the wiper member; and

FIG. 14 is an enlarged side elevational view of the mounting member, the biasing means and the tensioning means and showing the tensioning means in the released or unloaded position.

Although the principles of this invention are broadly applicable to the application of a liquid to a longitudinal member adjacent the last wrapped turn of a tape on the longitudinal member and onto the underlapping margin of such last wrapped turn, this invention is particularly adapted for use in connection with the application of a bonding agent to the portion of the longitudinal member adjacent the last wrapped turn of a protective tape on the longitudinal member and onto the underlapping margin of such last wrapped turn of the protective tape and hence it has been so illustrated and will be so described.

DETAILED DESCRIPTION

With specific reference to the form of this invention illustrated in the drawings and referring particularly to FIG. 1, an apparatus for wrapping a protective tape **10** (FIGS. 1, 2, 2A, 7, 10) in overlapping spiral engagement on a longitudinal member, such as a hollow pipe **12** (FIGS. 1, 2, 2A, 6, 7, 10, 13) or the like, is indicated generally by the reference numeral **14** (FIG. 1).

The protective tape **10** may be, for example, a laminate

composed of an inner coal tar rubber based sheet laminated to an outer polyvinyl chloride (PVC) sheet.

The protective tape **10** may also be any of the following blends, laminates or other material:

Blends

(1) Polyvinyl chloride and coal tar;
(2) Polyethylene and asphalt;
(3) Polyvinyl chloride and butyl rubber;
(4) Copolymers of vinylchloride and vinylacetate and coal tar pitch; or
(5) Ethylene vinylacetate copolymer and coal tar.

Laminates

(1) Polyvinyl chloride backed coal tar rubber blend;
(2) Polyethylene backed coal tar rubber blend; or
(3) Polypropylene backed coal tar rubber blend.

Other material

(1) Polyethylene;
(2) Polypropylene; or
(3) Coal tar rubber blends reinforced or laminated with glass, nylon, or felt.

The tape **10** has during the wrapping operation an underlapping margin **16** (FIGS. 1, 2, 2A, 7, 10) and an overlapping margin **18** (FIGS. 1, 2, 2A, 7, 10). The underlapping margin **16** defines with the pipe **12** a transitional cavity **20** (FIG. 2A). The tape **10** is wrapped on the pipe **12** with a bonding agent **22** (FIGS. 1, 2, 2A, 6, 7, 10) therebetween.

The bonding agent **22** may be either an adhesive, a primer, sealing, coating or the like, for example, a primer of the type known as "Quick Dry." "Quick Dry" is a trade name of the assignee of the present invention for a primer of the type disclosed in U.S. Pat. No. 2,752,267, issued June 26, 1956, to Norman T. Shideler. Other bonding agents **22** may be:

(1) butyl rubber in a solvent;
(2) vinyl copolymers blended coal tar pitch in a solvent;
(3) epoxy primers;
(4) bitumin, petroleum wax or the like; and
(5) chlorinated rubber and creosote oil.

The overlapping margin **18** is wrapped on the underlapping margin **16** with the bonding agent **22** therebetween and the transitional cavity **20** is substantially filled with the bonding agent **22** and covered by the overlapping margin **18** during the wrapping operation.

The tape **10** has a last wrapped turn LWT (FIGS. 1, 2, 7, 10) on the pipe **12** during such wrapping operation.

Apparatus **14**.—The apparatus **14** has a housing **24** (FIGS. 1, 6, 7, 10) disposed about the pipe **12**. The housing **24** has an upper hollow generally cylindrical portion **24***a* (FIGS. 1, 6, 7, 10) which is disposed around the pipe **12** and is connected to a bottom or base portion **24***b* (FIGS. 1, 7, 10). The apparatus **14**, in the embodiment of FIG. 1, is supported by means of a hook **26** (FIGS. 1, 7, 10) extending from the cylindrical portion **24***a* and, for example, a chain **28** (FIGS. 1, 7, 10) from a boom (not shown) of a supporting or a slave side boom type tractor or the like (not shown). A longitudinal drive means (not shown) may be of the type utilized in the U.S. Pat. No. 2,583,819, issued Jan. 29, 1952, to J. D. Cummings. This longitudinal drive means (not shown) is connected to one member of the pipe **12** and the housing **24** for causing relative longitudinal movement between the pipe **12** and the housing **24** along a path of wrapping movement indicated by the arrow in FIG. 1. In this case (FIG. 1), the longitudinal drive means (not shown) is carried by the housing **24** and in driving contact with the pipe **12**.

Disposed on the left-hand end, as viewed in FIG. 1, of the housing **24** is a rotatable shuttle **30** (FIGS. 1, 3A, 6, 10). Wrapping means **32** (FIGS. 1, 7, 10) has a supply reel **32**[1] (FIGS. 1, 7, 10) or the like, is mounted on a

tape arm **34** (FIGS. 1, 7, 10) on the rotatable shuttle **30** and is employed for storing the tape **10** and for feeding the tape **10** to the pipe **12**. Rotary drive means **35** (FIGS. 1, 7, 10) may be of the type disclosed in such U.S. Pat. No. 2,583,819, or, as shown in FIGS. 1, 7, 10, have gear teeth **35***a* (FIGS. 1, 7, 10) on the rotatable shuttle **30** engage a drive gear **35***b* driven by a motor **35***c* mounted on the base **24***b*. The drive gear **35***b* rotates in a bearing **35***d* (FIGS. 1, 7, 10) upstanding from the base **24***b* and is connected to the motor **35***c* by a shaft **35***e*. The rotary drive means **35** is connected to one means of the wrapping means **32** and the pipe **12** for causing relative rotary movement therebetween and thus wrapping the tape **10** about the pipe **12**. In the embodiment of FIG. 1, the rotary drive means **35** is connected to the rotatable shuttle **30** for the purpose of rotating such rotatable shuttle **30** and the wrapping means **32** in the direction of the arcuate arrow shown in FIGS. 1, 3A, 6, 7, 10.

Bonding agent supply means, such as a bonding agent supply tank **36** (FIGS. 1, 2, 6, 10) or the like, is disposed adjacent the housing **24** and the pipe **12** and is utilized for feeding the bonding agent **22** (through a hole **38**, FIGS. 1, 6, 10, in the cylindrical portion **24***a* of the stationary housing **24**) to the pipe **12** ahead of the last wrapped turn LWT of the tape **10** on the pipe **12**.

Bonding agent wiping means **40** (FIGS. 1, 7, 9) are mounted on the rotatable shuttle **30** at **31** (FIGS. 1, 7, 10) and are utilized for picking up the deposited bonding agent **22** on the pipe **12**, for transferring the bonding agent **22** on the pipe **12** around the pipe **12** adjacent the last wrapped turn LWT of the tape **10** on the pipe **12** preparatory for the application of the next wrapped turn of the tape **10** by the wrapping means **32**, for transferring the bonding agent **22** on the pipe **12** into the underlapping margin **16** preparatory for the wrapping of the overlapping margin **18** of the next wrapped turn of the tape **10** thereon, and for substantially filling the transitional cavity **20** with the bonding agent **22**.

Bonding agent wiping means **40**.—As shown particularly in FIGS. 1, 7, 9, the bonding agent wiping means **40** has a mounting rod **42** (FIGS. 1, 7, 9, 10) projecting from the shuttle **30** at **31** and secured thereto as by means of nuts **44** (FIGS. 1, 7, 9, 11, 14) on the threaded end **45** (FIGS. 1, 7, 9, 11, 14) of the mounting rod **42**. For the purpose of permitting pivotable movement of the bonding agent wiping means **40** on the mounting rod **42**, a horizontal positioning sleeve **46** (FIGS. 1, 7, 9, 10, 11, 14) is secured to a rotatable sleeve **48** (FIGS. 1, 7, 9, 10, 11, 14) as by welding or the like, which rotatable sleeve **48** is rotatable on the central portion of the mounting rod **42** (FIGS. 1, 7, 9, 10). The means utilized to bias the horizontal positioning sleeve **46** in a downward direction toward the pipe **12** are a pair of tensioning springs **50** (FIGS. 1, 7, 9, 10, 11, 14), each tensioning spring **50** having an outer free end **50***a* (FIGS. 9, 11, 14) secured in a hole **52** (FIGS. 9, 11, 14) in a positioning sleeve **54** (FIGS. 9, 11, 14). The inner free end **50***b* (FIGS. 9, 11, 14) of each of the tensioning springs **50** is inserted into spring retainer **96** (FIGS. 9, 11, 14) which spring retainer **96** is secured, as by welding or the like, to the horizontal positioning sleeve **46**. The tensioning springs **50** are a right-hand spring and a left-hand spring to provide tension or pressure in the same direction.

A horizontal positioning arm **56** (FIGS. 1, 7, 9, 10, 11, 13) is provided with a plurality of spaced holes **58** (FIGS. 1, 7, 9, 11). The spaced holes **58** are aligned with one of the plurality of holes **60** (FIGS. 1, 7, 9, 11) in the horizontal positioning sleeve **46** for the desired location of the free end of the horizontal positioning arm **56**. Suitable means, such as a pin **62** (FIGS. 9, 11), extend through a spaced hole **58** in the horizontal positioning arm **56** and the aligned hole **60** in the horizontal positioning sleeve **46** to secure the horizontal positioning assembly in the desired position. The left-hand or outer end (as viewed

in FIG. 1) of the horiozntal positioning arm **56** has a wiper frame **64** (FIGS. 1, 2, 7, 9, 10, 11, 12, 13) pivotably connected at **66** (FIGS. 1, 7, 9, 10, 11, 12, 13) to such free or left-hand end of the horizontal positioning arm **56**. The wiper frame **64** carries a wiper member, such as a rug **68** (FIGS. 1, 2, 7, 9, 10, 11, 12, 13) or the like, which rug **68** is suitably clamped along the hook member **101***u* (FIGS. 9, 11, 13) of the wiper frame **64** to such wiper frame **64** as by a clamp **101***p* (FIGS. 12, 13) or the like. The rug **68** contacts the pipe **12** and underlapping margin **16** along its contact surface **69** (FIG. 13).

The fabric type rug **68** may be, for example, a dense weave nylon, tufted carpeting or the like having a pile height of about twice the height of a bead (not shown) between welded pipe **12**. Bonding agent **22** on the pipe **12** is absorbed by the rug **68**, is wiped around the pipe **12**, migrates or transfers laterally over the untaped portion of the pipe **12** adjacent the last wrapped turn LWT and over the underlapping margin **16** and deposits thereon. It will be noted from FIG. 2A that the width W_c of the coated primer **22** applied to the uncoated portion of the pipe **12** and on the last wrapped turn LWT is greater than the width W_t of the tape **10** thereby providing an inspection edge **65** (FIG. 2A) on the applied bonding agent **22** for quality control purposes.

Alternative embodiments.—It will be understood by those skilled in the art that alternatively the above described apparatus may be modified as shown in FIGS. 3A–8.

In FIGS. 3A, 4, a mounting bracket 42^3 is secured at 31^3 (FIG. 3A) on the shuttle **30**. The mounting bracket 42^3 (shown in enlarged detail in FIG. 4) comprises a threaded shaft **72** (FIG. 4) secured at 31^3 (FIG. 3A) on the rotatable shuttle **30** by a nut **73** (FIG. 4). For the purpose of mounting a windshield wiper type blade mounting assembly 56^3 (FIG. 3A) on the nut **73**, the upper end **56***a* (FIG. 4) of the assembly 56^3 is fixably secured by a bolt **72***a* (FIG. 4) and a lock washer **72***b* (FIG. 4) to the threaded shaft **72**. The bolt **72***a* extends through the upper end **56***a* of the blade assembly 56^3 and into a threaded portion of the head of the threaded shaft **72**. As shown in FIGS. 3A and 4, a blade arm **57** of the blade assembly 56^3 is pivoted at **74** (FIGS. 3A, 4) in an up and down direction on the fixed upper portion **56***a* of the blade assembly 56^3. The lower portion of the blade assembly 56^3 (as viewed in FIG. 3A) is connected by means of a bolt, screw, or the like **75***a* (FIGS. 3A, 4) to a mounting plate **75** (FIGS. 3A, 3B) which mounting plate **75** carries a wiper member 68^3 (FIGS. 3A, 3B) having a contact surface 69^3 (FIG. 3B). As shown in FIG. 3B, the wiper member 68^3 may be formed of rubber or the like.

In FIG. 3C, the contact surface 69^{3C} of the wiper member 68^{3C} may be formed with serrations **76**, corrugations **77**, or the like.

In FIG. 4, the wiper member is shown in the form of a paint type roller 68^4 rotatable in a mounting plate 75^4, which mounting plate 75^4 is secured at **75***a* to the lower end of the blade arm **57**.

The roller type wiper member 68^5 (FIG. 5) is rotatable in end bearings **78** mounted on the mounting plate 75^5. In addition, a square cross sectioned wire or strip **79** provided with a chamfer slot **80** is wound in side-to-side-turn relationship about the periphery of the roller 68^5 to provide an irregular surface thereon similar to the serrations **76** and the corrugations **77** shown in FIG. 3C. Alternatively, the wire or the strip **79** may be replaced by either rounded wire (not shown), or grooves (not shown) machined into the member 68^5, or the like.

Referring now to FIG. 6, the bonding agent supply means 36^6 has a pressurized tank **36** which receives bonding agent from a bonding agent supply indicated by the legend "From bonding agent supply" in FIG. 6. The tank **36** feeds the pressurized bonding agent **22** through a spray nozzle **81** and through the hole **38** in the cylindrical portion **24***a* of the housing **24** onto the untaped surface of the pipe **12**.

A centrifugal-type bonding agent supply means 36^7 is shown in FIG. 7. In this embodiment, the rotatable shuttle 30^7 rotates in a substantially hermetic sealing engagement within a stationary circular tank **82** on the cylindrical portion **24***a* of the housing **24**, and the tank **82** is connected by means of a pipe **83** to the bonding agent supply. The bonding agent **22** is centrifugally exuded from an outlet **84** in the rotatable shuttle 30^7 onto the untaped portions of pipe **12**.

In FIG. 8, a longitudinal drive means **29** comprises a carriage **85** mounted on wheels **86**. The wheels **86** ride on tracks **87** and are powered by means of a shaft **88** driven through gears **89** by a motor **90**. The pipe **12** is supported on the carriage **85**. The rotary drive means 35^8 comprises a drive roller **91** on a shaft **92** powered by a motor **93**. The motor **93** is mounted on, and the shaft **92** is journaled in, a bracket **94** upstanding from the carriage **85**. A driven roller **95**, similarly mounted on a shaft **92** and bracket **94**, engages the other side of the pipe **12** to provide the desired rotary motion to the pipe **12**.

Referring to FIG. 9 which is an enlargement of the bonding agent wiping means **40** shown in FIGS. 1, 7, such bonding agent wiping means **40** has a mounting member, such as the threaded monuting rod **42**. The right-hand threaded end **45** of the mounting rod **42** carries a nut **44** which secures or locks the mounting rod **42** to the rotatable shuttle **30** (not shown in FIG. 9). The tensioning springs **50** (FIG. 9) are disposed about the positioning sleeves **54** on the mounting rod **42** and have their outer free ends **50***a* secured in a suitable hole **52** in the positioning sleeve **54**. The inner free end **50**b (FIG. 9) of each tensioning spring **50** is inserted into a spring retainer **96** (suitably a pipe or the like). The spring retainer **96** is secured to the underside of the horizontal positioning sleeve **46**, as by welds **97** or the like.

The wiper frame **64** (FIG. 9) is pivotably secured at **66** by a pin **98** extending through brackets **99** (FIGS. 9, 11, 12, 13 upstanding from a back mounting plate **64***a* of the wiper frame **64**) and through the outer end of the horizontal positioning arm **56**. The wiper frame **64** has longitudinal members **46***b* (FIG. 9), which longitudinal members **64***b* are integrated, as by welding or the like, to a front member **64***c*, cross members **64***d*, and a back member **64**e. The above described positioning sleeves **54** (FIG. 9) are secured or positioned on the mounting rod **42** against the rotatable sleeve **48** by a pair of lock nuts **44***a*, **44***b* rotatable on the threaded mounting rod **42** on the outer sides of each of the tensioning springs **50**. Each positioning sleeve **54** (FIG. 9) is secured, as by welding or the like, to a lock nut **44***a*. In order to control the tension in tensioning springs **50**, the lock nuts **44***a* are rotated on the threaded rod **42** until the desired tension is achieved and are then locked in position by lock nuts **44***b*. The nuts **44***a* are also used to position the bonding agent wiping means **40** the desired distance D (FIG. 1) from the rotatable shuttle **30** to accommodate varying helix angles of application of the tape **10** and varying widths of the tape **10**.

Tensioning means **100**.—The further alternative embodiment of the apparatus 14^{10} (FIG. 10) shown in detail in FIGS. 10–14 utilizes a tensioning means **100** (FIGS. 10, 11, 14) connected to the tensioning springs **50** for controlling the biasing of the bonding agent wiping means 40^{10} (FIGS. 10, 11) against the pipe **12**. The tensioning means **100** has, for example and not by way of limitation, a first yoke member **100***a* (FIGS. 11, 14) pivoted at pin **100***b* (FIGS. 11, 14) on the horizontal positioning sleeve **46**. A second yoke member **100***c* (FIGS. 11, 14) is reciprocable with respect to the first yoke member **100***a*. The link members **100***d* (FIGS. 10, 11, 14) are pivotably connected to the inner free ends **50***b* of the tensioning springs **50** at one end and are pivotably connected at the other end by a pin **100***e*

(FIGS. 11, 14) extending through the other end of the link members **100***d*, a slot **100***f* (FIG. 11) in the first yoke member **100***a* and the second yoke member **100***c*. The first yoke member **100***a* and the second yoke member **100***c* are rotatable on the pin **100***b* from a release or unloaded position (shown in FIGS. 11 and 14) to a tensioning or loaded position (shown in FIG. 10) to bias or pressure the wiper member **68** against the pipe **12**.

Yoke positioning means.—Yoke positioning means (FIGS. 11, 14) are connected to the first yoke member **100***a* and the second yoke member **100***c* for varying the biasing on the tensioning springs **50**. As shown particularly in FIGS. 11, 14, a threaded handle **100***h* is threaded in a fixed nut **100**L (FIG. 14) mounted, as by welding or the like, on the first yoke member **100***a*. The threaded handle **100***h* extends through a suitable hole in the first yoke member **100***a*, the second yoke member **100***c*, and a bridge member **100***n* (FIG. 14) extending across the second yoke member **100***c*. The threaded handle **100***h* carries a stop **100***m* (FIG. 14) on its outer end. The stop **100***m*, as shown in FIG. 14, is a nut secured, as by welding or the like, to the end of the handle **100***h* and bears against the bridge member **100***n* of the second yoke member **100***b*.

Operation of tensioning means **100**.—In order to increase the tension on the tensioning springs **50** while the threaded handle **100***h* is in the tensioning position (FIG. 10), the threaded handle **100***h* is threaded in the direction of the arrow shown in FIG. 10 to move the second yoke member **100***c* (FIG. 14), the link members **100***d* (FIGS. 10, 14) and the inner free ends **50***b* (FIGS. 10, 14) of the tensioning springs **50** in the same direction as the above described movement of the threaded handle **100***h* thereby increasing the tension of the tensioning spring **50**.

Pivotable movement of the threaded handle **100***h* about its pivot pin **100***b* from the released or unloaded position shown in FIGS. 11 and 14 to the loaded or tensioning position shown in FIG. 10 then biases the wiper frame **64** and the wiper member **68** against the pipe **12** with the desired amount of tension thereon.

Alternatively, the threads **100***g* (FIGS. 11, 14) of the threaded handle **100***h* can thread into the first yoke member **100***a* (FIGS. 11, 14) and the nut **100**L (FIG. 14) can be eliminated.

Yoke stop assembly.—In order to prevent release of the tension on the bonding agent wiping means **40**[10] when the threaded handle **100***h* is in the loaded position shown in FIG. 10, stops **120** (FIG. 14) are mounted on the pin **100***b* so that when the threaded handle **100***h* is moved to the position shown in FIG. 10 (forwardly off center), the first yoke member **100***a* contacts the stops **120** to prevent release of the tension in the forward direction. When the first yoke member **100***a* is in contact with the stops **120** and the threaded handle **100***h* is in the (forwardly off center) position shown in FIG. 10, the bias, tension or pressure exerted by the bonding agent wiping means **40**[10] on the pipe **12** may be quickly released by striking the threaded handle **100***h* to cause it to rotate in clockwise direction, as viewed in FIG. 10, to the position shown in FIG. 11.

Slide-on mounting assembly.—The positioning nuts **44***a*, **44***b* (FIG. 9) may be replaced by the slide-on type mounting shown in FIGS. 11, 14. In this case, an end plate **122** (FIGS. 11, 14) is secured, as by welding or the like, to the positioning sleeves **54**. The positioning sleeves **54** and end plates **122** are provided with a non-round mounting hole **124** (FIGS. 11, 14) which receives a mating mounting sleeve **126** (FIGS. 11, 14), which mounting sleeve **126** is slidably mounted on non-round mounting rod **42***a*. In order to position the bonding agent wiping means **40**[10] in the desired location on the mounting rod **42***a* (FIGS. 11, 14) headed pins **128** (FIGS. 11, 14) extend through a selected pair of registering holes **130** (FIG. 14) extending through the mounting sleeve **126** and the mounting rod **42***a*. It will be understood that there are a plurality of such spaced registering holes **130** in the mounting sleeve **126** and in the mounting rod **42***a*.

Three dimensional positioning device.—It will be understood that the nuts **44***a*, **44***b* (FIG. 9) and the slide-on-type mounting described above and shown in FIG. 11 form the embodiments of a Z-plane positioning means of a three dimensional positioning device.

In order to accommodate varying sizes of the pipe **12**, a horizontal or X-plane positioning means of the three dimensional positioning device and a vertical or Y-plane positioning means of the three dimensional positioning device are provided on the bonding agent wiping means **40**[10].

Horizontal positioning means.—The horizontal positioning means shown in FIGS. 1, 7, 9, 11 is shown particularly in detail in FIG. 11. The horizontal positioning arm **56** is positionable with respect to the horizontal positioning sleeve **46** by insertion of a pin **62** in one registering pair of holes **58** (in the horizontal positioning arm **56**) and holes **60** (in the horizontal positioning sleeve **46**). There are a plurality of such spaced registerable holes **58**, **60**.

Vertical positioning means.—The vertical positioning means (FIGS. 10, 11, 13) and shown particularly in FIG. 11, has a vertical positioning sleeve **132** secured angularly (as by welding or the like) to the outer end of the horizontal positioning arm **56** to receive a vertical positioning arm **134**, which vertical positioning arm **134** is pivotably connected at **66** to bracket **99** upstanding from the back mounting plate **64***a'*. A pin or pins **136** (FIGS. 11, 13) extend through selected registering holes **138** (FIGS. 11, 13) in both the vertical positioning sleeve **132** and the vertical positioning arm **134** to position the wiper frame **64** against the pipe **12**.

Coupling assembly for locking the repositioning the assembly **40**.—Referring to FIG. 11, a coupling assembly **104** for locking the assembly **40**[10] in the position shown in FIGS. 11, 14 and for permitting the repositioning of such assembly **40**[10] in an elevated or rest position (not shown) away from the pipe **12** as hereinafter described below is employed. In this assembly **104**, the rod **42***a* has a male portion **104***a* (FIGS. 11, 14) inserted in a female portion **104***a* (FIG. 11) of the threaded rod **42***b*. The male portion **104***a* is secured to the female portion **104***b* by pins **104***c* or the like extending through registering holes **104***d* in the male portion **104***a* and in the female portion **104***b*.

Alternatively in FIG. 14 the male portion **104***a* of the rod **42***a* is inserted between side pieces **106***a*, **106***b* of a yoke **108** and are secured, as by welding or the like, at **109** to the threaded rod **42***b*. For the purpose of limiting the pivotable movement of the rod **42***a* with respect to the threaded rod **42***b*, a stop **110** having a downwardly front taper **111** is secured to the threaded rod **42***b*. When it is necessary to pivot the rod **42***a* and the bonding agent wiping means **40**[10] (not shown in FIG. 14) with respect to the threaded rod **42***b*, a retaining pin **112** is removed from registering holes **114** in the side pieces **106***a*, **106***b* and the male portion **104***a*, and the rod **42***a* and assembly **40**[10] are pivoted on a pivot pin **116** until the male portion **104***a* engages the taper **111**. The rataining pin **112** (FIG. 14) is then inserted in registering holes **117** in the side pieces **106***a*, **106***b*.

Wiper member **68**.—For the purpose of securing the wiper member **68** (a rug as shown in FIGS. 10–13) on the wiper frame **64**, clamp means, such as the spring clamp **101***p* or the like (FIGS. 12, 13), is mounted by means of bolts **101***q* and nuts **101***r* or the like (FIGS. 12, 13) on the front member **64***c* of the wiper frame **64** and secures the rug **68** to the wiper frame **64**. Since the wiper frame **64** moves in the direction of rotary movement indicated by the arrows in FIGS, 12 and 13, it is not essential that the rearward portions of the rug **68** be otherwise secured to the wiper frame **64**. However, alterna-

tively or in addition to the spring clamp **101***p*, barb means, such as the barbs **101***s* or the like (FIG. 13), may project from a plate **101***t* mounted on the forward cross member **64***d*, as viewed in FIGS. 12 and 13, as by, for example, the bolts **101***q* and nuts **101***r* or the like. As shown in FIG. 13, the barbs **101***s* and the plate **101***t* may be similarly mounted on the rearward portions of the wiper frame **64** as, for example, adjacent the back mounting plate **64***a* (FIG. 13). The wiper positioning means utilized to position the front edge of the rug **68** on the wiper frame **64** may comprise a hook-like edging bar member **101***u* projecting from the forward portions of the plate **101***t*.

In order to deflect the bonding agent **22** (which is moved away from the pipe **12** due to centrifugal action due to either rotation of the pipe **12** or the rotatable shuttle **30**) backwardly toward the pipe **12** during rotation of either the pipe **12** or rotatable shutter **30**, bonding agent guard means, such as the guard plate **101***v*, or the like (FIG. 13), may be mounted on the wiper frame **64** as, for example, adjacent the rearward portions of the front cross member **64***d*, as by welding or the like.

It will be understood that the longitudinal member referred to above may be a pole, post, piling, cable, conduit bars or the like, hollow or solid, and not necessarily round in shape.

METHOD

It will be recognized by those skilled in the art from the above description of the improved apparatuses **14** (FIGS. 1–9) and **14**[10] (FIGS. 10–14) that an improved method is contemplated by this invention, which method may be performed by the above described forms of the apparatuses **14**, **14**[10], or by hand.

The novel method for the wiping transfer of the bonding agent **22** onto the pipe **12** and onto the underlapping margin **16** (FIG. 2A) of the protective tape **10** being wrapped in spiral lapping engagement on the longitudinal member or pipe **12** has during the wrapping operation the underlapping margin **16** and an overlapping margin **18**. The underlapping margin **16** (FIG. 2A) defines with the pipe **12** a transitional cavity **20**. The tape **10** is wrapped on the pipe **12**, as shown in FIGS. 1, 7, 10, with the bonding agent **22** therebetween. The overlapping margin **18** is wrapped on the underlapping margin **16** (FIG. 2A) with the bonding agent **22** therebetween and the transitional cavity **20** is substantially filled with the bonding agent **22** and covered by the overlapping margin **18**. The tape **10** has a last wrapped turn LWT (FIGS. 1, 2, 7, 10) on the pipe **12** during the wrapping operation.

The novel method includes the steps of:

(a) Causing relative longitudinal movement between the pipe **12** and the tape **10** along a path of wrapping movement (FIGS. 1, 7, 8, 10);

(b) Connecting a free end of the tape **10** to the pipe **12**;

(c) Causing relative rotary movement between the pipe **12** and the tape **10** to wrap the tape **10** about the pipe **12** (FIGS. 1, 7, 8, 10);

(d) Feeding the bonding agent **22** to the pipe **12** ahead of the last wrapped turn LWT of the tape **10** on the pipe **12** (FIGS. 1, 7, 10); and

(e) Picking up the bonding agent **22** on the pipe **12**, transferring the bonding agent **22** on the pipe **12** around the pipe **12** adjacent the last wrapped turn LWT of the tape **10** on the pipe **12** preparatory for the application of the next wrapped turn of the tape **10**, transferring the bonding agent **22** on the pipe **12** onto the underlapping margin **16** preparatory for the wrapping of the overlapping margin **18** of the next wrapped turn of the tape **10** thereon, and substantially filling the transitional cavity **20** with the bonding agent **22**.

SUMMARY OF THE ACHIEVEMENTS OF THE OBJECTS OF THE INVENTION

It will be recognized by those skilled in the art that the objects of this invention have been achieved by provindg a novel method for the wiping transfer of the bonding agent **22** onto the pipe **12** and onto the underlapping margin **16** of the protective tape **10** in overlapping engagement on a longitudinal member, such as a pipe **12** or the like.

The novel method:

(a) Utilizes direct contact between the bonding agent wiping means **40** (FIGS. 1–9) and **40**[10] (FIGS. 10–14) with the pipe **12** where the bonding agent **22** is picked up on the pipe **12** adjacent the bonding agent tanks **36** (FIGS. 1, 2, 6, 10) and **36**[7] (FIG. 7) and the contact surface **69** (FIG. 13), **69**[3] (FIG. 3B), **69**[3] (FIG. 3C) to where it is transferred and redeposited;

(b) Provides a bonding agent inspection edge **65** (FIG. 2A) and a bonded joint between overlapping margin **18** and underlapping margin **16** thereby providing a continuous wrapped tape envelope about the pipe **12**;

(c) Substantially fills the transitional cavity **20** with the bonding agent **22** and covers the transitional cavity **20** with the overlapping margin **18** of the tape **10**;

(d) Is universally adapted to use a wide range of bonding agent materials **22** including those with abnormally low or high viscosities;

(e) Bonds the underlapping margin **16** of the tape **10** and the overlapping margin **18** of the tape **10** with an internal source of bonding agent **22** deposited on the pipe **12** ahead of the last wrapped turn LWT of the tape **10** on the pipe **12**; and

(f) Is adapted for use with any and all conventional types of tape wrapping machines and sizes of pipe **12**.

While in accordance with the patent statutes, preferred and alternative embodiments of this invention have been illustrated and described in detail, it is to be particularly understood that this invention is not limited thereto or thereby.

We claim:

1. A method for the wiping transfer of a bonding agent onto a longitudinal member and onto the underlapping portions of a protective tape being wrapped onto said longitudinal member, said tape having during the wrapping operation an underlapping margin and an overlapping margin, said underlapping margin defining with said longitudinal member a transitional cavity, said tape being wrapped on said longitudinal member with a bonding agent therebetween, said overlapping margin being wrapped on said underlapping margin with said bonding agent therebetween and said transitional cavity being substantially filled with said bonding agent and covered by said overlapping margin, said tape having a last wrapped turn on said longitudinal member during said wrapping operation, said method including the steps of;

(a) causing relative longitudinal movement between said longitudinal member and said tape along a path of wrapping movement;

(b) connecting a free end of said tape to said longitudinal member;

(c) causing relative rotary movement between said longitudinal member and said tape to wrap said tape about said longitudinal member;

(d) feeding said bonding agent to said longitudinal member ahead of said last wrapped turn of said tape on said longitudinal member;

(e) picking up said bonding agent on said longitudinal member, transferring said bonding agent on said longitudinal member around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member preparatory for the application of the next wrapped turn of said tape, transferring said bonding agent on said longitudinal member onto said underlapping margin preparatory for the wrapping of the overlapping margin of said next wrapped turn of said tape thereon, and substantially

filling said transitional cavity with said bonding agent; and

(f) picking up said bonding agent on said longitudinal member with a wiper member, transferring said bonding agent on said longitudinal member around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member by said wiper member, transferring said bonding agent on said longitudinal member onto said underlapping margin by said wiper member, and substantially filling said transitional cavity with said bonding agent by said wiper member.

2. The method recited in claim 1 including the step of biasing said wiper member into engagement with said longitudinal member.

3. The method recited in claim 1 including the step of positioning said wiper member with respect to said housing.

4. The method recited in claim 1 including the step of picking up said bonding agent from said longitudinal member with a wiper member of the rug type to migrate said bonding agent around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member and onto said underlapping margin.

5. The method recited in claim 1 including the step of spreading said bonding agent around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member and onto said underlapping margin by a blade-type wiper member.

6. The method recited in claim 5 including the step of raking said bonding agent around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member and onto said underlapping margin by a wiper member having one surface of a corrugated surface and a serrated surface.

7. The method recited in claim 1 including the step of rolling said bonding agent around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member and onto said underlapping margin.

8. The method recited in claim 7 including the step of rolling said bonding agent around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member and onto said underlapping margin by a wiper member having a grooved peripheral surface.

9. The method recited in claim 8 including the step of rolling said bonding agent around said longitudinal member adjacent said last wrapped turn of said tape on said longitudinal member and onto said underlapping margin by means of a roller-type wiper member having a grooved strip wound around the peripheral surface of said roller-type wiper member.

10. The method recited in claim 1 and including the step of positioning said wiper member in a Z-plane.

11. The method recited in claim 1 and including the step of positioning said wiper member in a Y-plane.

12. The method recited in claim 1 and including the step of positioning said wiper member in an X-plane.

13. The method recited in claim 1 including the step of gravity feeding said bonding agent to said longitudinal member ahead of said last wrapped turn of said tape on said longitudinal member.

14. The method recited in claim 1 including the step of spray feeding said bonding agent to said longitudinal member ahead of said last wrapped turn of said tape on said longitudinal member.

15. The method recited in claim 1 including the step of pressure feeding said bonding agent to said longitudinal member ahead of said last wrapped turn of said tape on said longitudinal member.

16. The method recited in claim 1 including the step of centrifugal feeding said bonding agent to said longitudinal member ahead of said last wrapped turn of said tape on said longitudinal member.

17. The method recited in claim 1 including the step of moving said tape longitudinally with respect to said longitudinal member.

18. The method recited in claim 1 including the step of moving said longitudinal member longitudinally.

19. The method recited in claim 1 including the step of rotating said tape about said longitudinal member.

20. The method recited in claim 1 including the step of rotating said longitudinal member.

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