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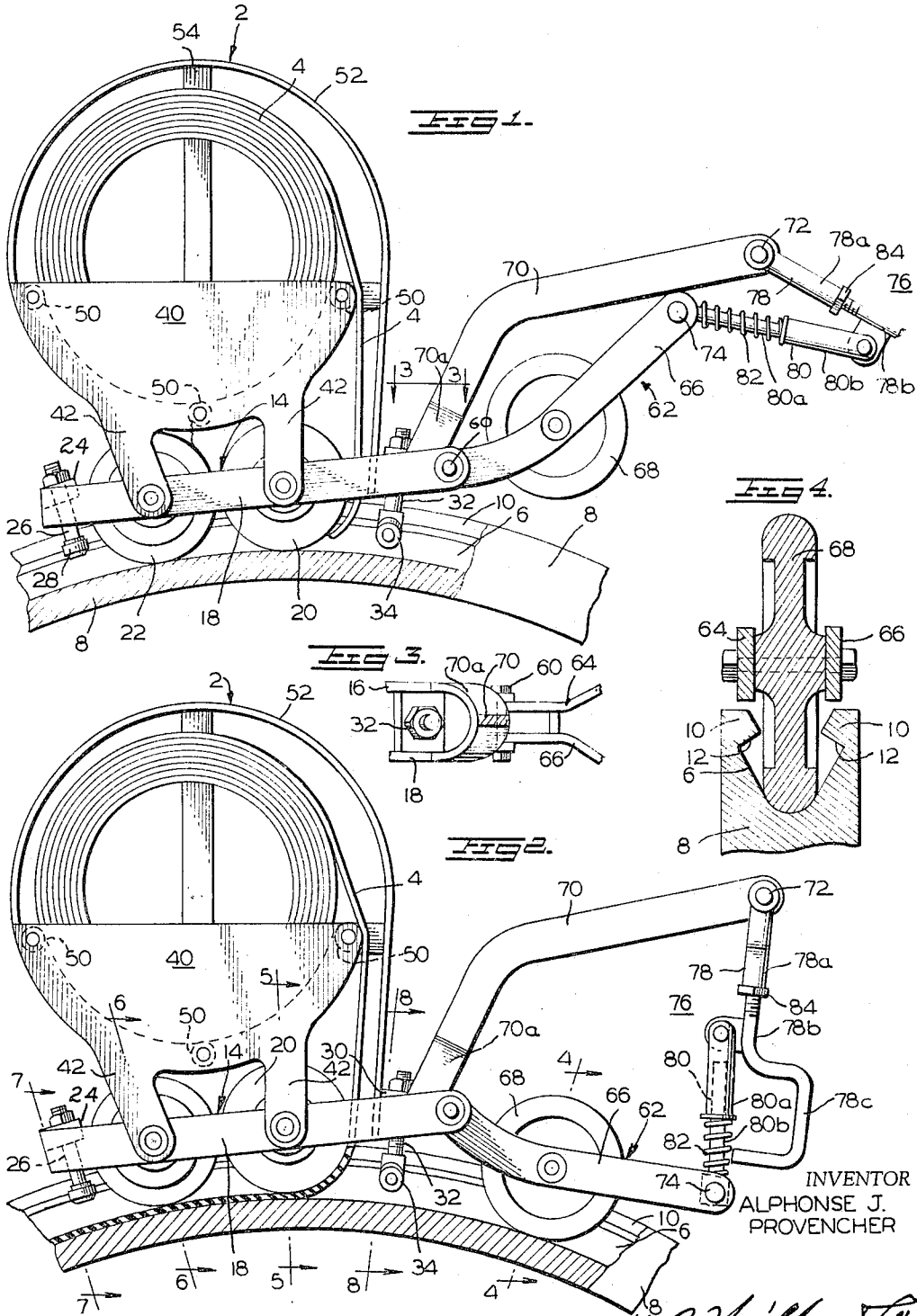
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3,284,886

TOOL FOR INSTALLING GROOVE LINERS

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2 Sheets-Sheet 1



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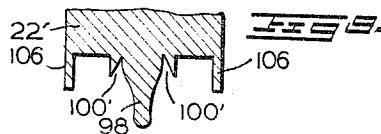
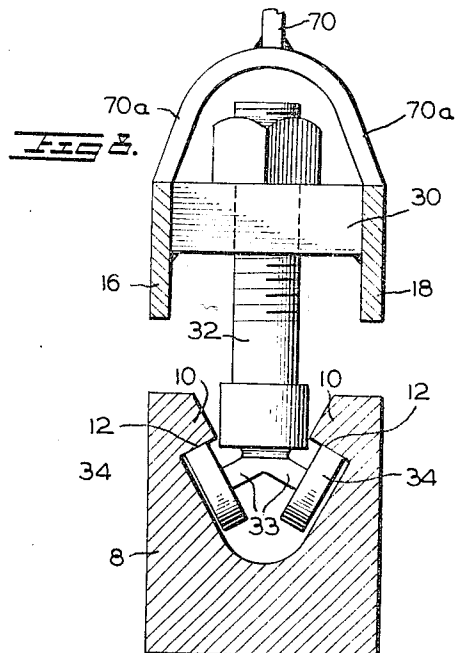
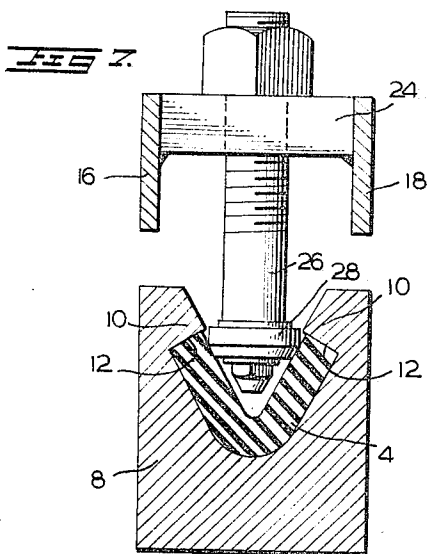
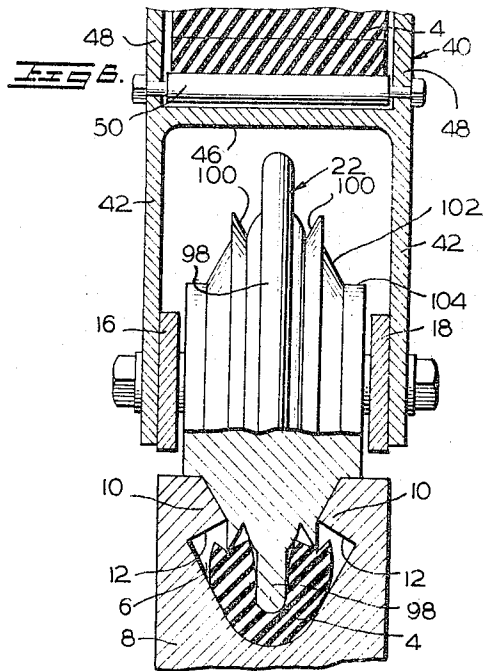
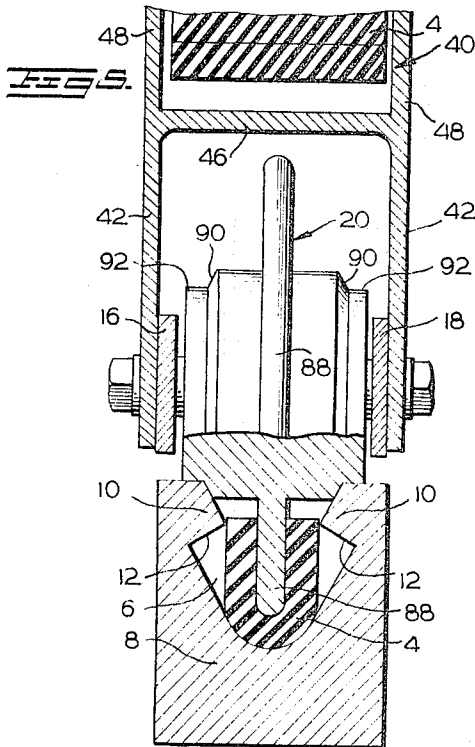
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TOOL FOR INSTALLING GROOVE LINERS
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 12 Claims. (Cl. 29—235)

This invention relates generally to apparatus for installing flexible liners in grooves, and more particularly to a tool adapted for circumferential travel about a wheel to install a flexible liner in a continuous groove contained in the outer periphery of the wheel.

In the stone working industry, sawing machines of the endless wire type are commonly used in the sawing of blocks of granite or the like into slabs. In such machines the endless steel wire is mounted for travel between a plurality of peripherally-grooved wheels of relatively large size (on the order of four or five feet in diameter). To protect the grooves against wear by the emery and water impregnated steel saw wire, it is conventional in the art to line the grooves with a replaceable liner of a flexible material, such as rubber. In the past, it has been found that it has taken a workman on the order of twenty-five to thirty minutes to install such a liner with the use of conventional hand tools, such as screwdrivers or the like. Furthermore, it has proven difficult for the workman using hand tools to apply the liner with uniform tension so that the liner is properly fitted in the groove without buckling or gaps between the liner ends. To alleviate the above problem, the liner-applying tool of the present invention was developed to automatically and accurately apply a flexible liner within a circumferential groove in the outer periphery of the wheel during travel of the tool along the groove. In one working embodiment of the invention, the time for installing the liner was reduced to approximately three minutes, thus resulting in appreciable savings in maintenance costs and in the plant shut-down time required for liner replacement.

A primary object of the present invention is to provide a liner-applying tool adapted for connection with an object for travel along a groove contained therein to automatically install a resilient liner in the groove. The apparatus includes pressing roller means for inserting the liner within the groove, supply means for supplying the liner rearwardly between the pressing roller means and the bottom of the groove, and roller means connecting the tool with the object for relative movement along the groove.

A more specific object of the invention is to provide a tool for applying a flexible liner in a continuous circumferential groove contained in the outer periphery of a wheel. The invention is specifically designed to install the liner in a groove the side walls of which are provided with opposed shoulders. The means for connecting the tool with the wheel include mounting roller means adapted for insertion in the groove beneath the shoulders, and means for biasing the pressing rollers means downwardly toward the bottom of the groove and for biasing the mounting roller means upwardly against the shoulders, whereby the tool is connected with the wheel for longitudinal travel along the groove.

Another object of the invention is to provide a liner-installing tool including a frame adaptable for coplanar arrangement relative to the outer periphery of a grooved wheel, pressing roller means connected with the frame for pressing the liner in the groove, mounting roller means connected with said frame forwardly of the pressing roller means and adapted for insertion in the groove

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beneath shoulders on the side walls thereof, and means connected with the frame for engagement with the wheel and operable to maintain said frame in a position in which the mounting rollers are urged upwardly against said shoulders and said pressing roller means are urged downwardly toward the groove bottom. According to a specific feature of the invention, the frame biasing means includes guide roller means pivotally connected with the frame forwardly of the mounting roller means. The guide roller means are adapted for insertion within, and for rolling engagement with the bottom surface of the groove. Spring means connected with the frame pivotally bias the guide roller means downwardly toward the groove bottom, with the result that forward end of the frame is elevated and, owing to the engagement between the mounting rollers and the groove shoulders, the rearward end of the frame and the pressing roller means are biased downwardly toward the groove bottom.

According to a further object of the invention, the aforementioned pressing roller means comprise a plurality of rollers successively arranged in the groove. The flexible liner, in strip form, is fed rearwardly between the pressing rollers and the groove bottom. A first pressing roller serves to urge the longitudinal central portion of the liner downwardly into engagement with the groove bottom. A second pressing roller, that is arranged rearwardly of the first, serves to compress the lateral edges of the liner downwardly in the groove below the groove shoulders. A third pressing roller, that is arranged transversely in the groove, rearwardly of the second pressing roller, urges the liner edges outwardly beneath the shoulders, whereby the liner is retained in the groove by the shoulders.

According to a further object of the invention, the means for pivoting the guide roller means downwardly in the groove comprises toggle linkage means connected between a rigid extension on the forward end of the frame and the pivot arm upon which the guide roller means are mounted. One link of said toggle linkage means includes a pair of telescopic sections that are normally biased in opposite directions by said spring biasing means.

Other objects and advantages of the invention will become apparent from a study of the following specification when considered in conjunction with the accompanying drawing, in which:

FIGURE 1 is a partially-sectioned elevational view of the liner-applying tool arranged on the grooved wheel, the toggle means being in the collapsed condition to retract the guide roller from the groove;

FIGURE 2 is a partially-sectioned elevational view of the apparatus of FIGURE 1 mounted on the wheel in the liner-applying condition;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 1;

FIGURES 4—8 are sectional views taken along lines 4—4, 5—5, 6—6, 7—7 and 8—8 of FIGURE 2, respectively; and

FIGURE 9 is a detailed sectional view of a second embodiment of the compression roller of FIGURE 6.

Referring first more particularly to FIGURES 1 and 2, the tool 2 is operable to insert a flexible liner 4 (preferably a strip of rubber or a resilient synthetic plastic material) in a continuous groove 6 contained in the outer periphery of the wire saw wheel 8. As shown in FIGURE 4, the side walls of the groove 6 include opposed shoulders 10 defining a pair of radially-inwardly directed, angularly-arranged, continuous surfaces 12.

The tool 2 includes a rigid metal frame 14 having a pair

of side plates 16 and 18 between which are journaled a pair of coplanar vertically-arranged liner pressing rollers 20 and 22. Welded between the rear ends of side plates 16 and 18 is a horizontal plate 24 that is bored to receive a vertical bolt 26 upon the lower end of which is journaled a horizontally-arranged liner pressing roller 28. Welded between the side plates 16 and 18 adjacent the forward end of the frame 2 is a second horizontal plate 30 that is bored to receive a vertical bolt 32. As shown in FIGURE 8, at its lower end the bolt 32 carries a pair of laterally-extending angularly-arranged shafts 33 upon which are journaled a pair of mounting rollers 34. The shafts 33 are parallel with the shoulder surfaces 12 and are so arranged that the peripheries of rollers 34 are in rolling engagement with the surfaces 12.

A coiled roll of the liner strip 4 is contained within a supply housing 40 connected with the frame 14 by depending legs 42. The housing 40 includes a bottom wall 46 and a pair of side walls 48 between which are journaled a plurality of rollers 50 that support the liner roll. The housing 42 also includes a curved top strap 52 the ends of which are secured to the bottom wall 46 and the frame 14, respectively. The intermediate portion of the strap 52 is supported by a vertical brace 54 the lower end of which is secured to one of the side walls 48.

Pivotally connected at one end with the forward end of frame 14 by the pivot pin 60 is a rigid arm 62 including a pair of side members 64 and 66 between which is journaled a guide roller 68. Rigidly secured to the forward end of the frame 14 is a rigid extension 70 the bifurcated lower portion 70a of which is welded to the side plates 16 and 18. Pivotally connected between the free ends of extension 70 and arm 62 by pivots 72 and 74, respectively, is a toggle linkage 76 including a pair of pivotally connected arms 78 and 80. Arm 80 consists of a pair of telescopic sections 80a and 80b that are normally biased axially apart by the coil spring 82. Arm 78 comprises a pair of axially displaceable sections 78a and 78b the relative positions of which are adjusted by the adjusting nut 84. At one end the section 78b is extended and formed to define a handle portion 78c as shown in FIGURE 2.

As shown in FIGURES 1 and 2, the arm 62 is pivotable (by the collapsing and expanding of the toggle means 76) between positions in which the guide roller 68 is withdrawn from and is inserted within the wheel groove 6, respectively. As shown in FIGURE 4, when the toggle means 76 is in the expanded (FIGURE 2) condition, the periphery of guide roller 68 engages the bottom surface of groove 6.

Referring now to FIGURE 5, the longitudinal central portion of the liner 4 is initially pressed into groove 6 by a relatively thin central rim portion 88 of the leading pressing roller 20. The roller 20 includes pairs of chamfered surfaces 90 and cylindrical surfaces 92 that cooperate with the upper shoulder surfaces and the outer periphery of the wheel, respectively, to accurately guide the roller 20 relative to the groove 6.

Referring now to FIGURE 6, the liner compressing roller 22 also includes a central rim portion 98 adapted to press the central portion of the liner 4 against the groove bottom. Furthermore the compressing roller 22 contains a pair of grooves 100 that define annular projections on opposite sides of the rim 98 which press the upper free ends of the liner downwardly beneath the groove shoulders 10. Chamfered surfaces 102 and cylindrical surfaces 104 engage the wheel 8 to accurately guide the roller 22 relative to the groove 6.

As shown in FIGURE 7, the horizontal roller 28 is arranged adjacent and slightly lower than the shoulders 10, said roller being of a size and configuration to force the compressed liner edge portions of FIGURE 6 outwardly into engagement with the radially inwardly-directed shoulder surfaces 12, whereby owing to its resiliency, the liner 4 is retained in the groove 6.

Operation

Assume that a resilient liner 4 is to be installed in the groove 6 of a saw wheel 8 that is maintained stationary (by clamping means or the like, not shown). With the toggle means 76 in the collapsed condition, the tool 2 is initially arranged normal to the plane containing the wheel 8, and the mounting rollers 34 are inserted downwardly within the groove 6. The tool 2 is then rotated 90 degrees about the axis of bolt 32 so that the rollers 34 extend laterally beneath the shoulders 10 (and into rolling engagement with the shoulder surfaces 12) and the free end of the liner strip 4 is brought beneath the pressing roller 20, whereupon the frame 14 is pivotally lowered about the effective pivot axis defined by the cooperation between rollers 34 and shoulders 10 to effect insertion of the pressing rollers 20, 22 and 28 and the end of the liner 4 into groove 6. The apparatus is now in the condition illustrated in FIGURE 1.

The operator now grasps the rear end of the housing 40 with one hand and the handle 78c with the other, whereupon the handle 78c is moved rearwardly relative to the frame to effect expansion of the toggle linkage 76, with the result that arm 62 is pivoted downwardly to insert guide roller 68 within groove 6. It is important to note that as the toggle means snap overcenter to the FIGURE 2 condition, guide wheel 68 engages the bottom of the groove and the spring 82 biases arm 62 in the clockwise direction about guide wheel 68. Owing to the pivotal connection 60 between arm 62 and the forward end of frame 14, the forward end of the frame is pivoted upwardly, so that rollers 34 are biased against shoulder surfaces 12, and frame 14 is pivotally biased in the counterclockwise direction relative to rollers 34 to urge the pressing rollers 20, 22 and 28 downwardly toward the bottom of the groove.

The operator now grasps section 80a and handle 78c with one hand and the rear end of the housing 40 with the other, and displaces the tool in the clockwise direction relative to the wheel. During this relative circumferential travel of the tool about the wheel, the liner 4 is withdrawn from the roll (over the right hand roller 50) and is pressed in the groove by the pressing rollers. As described previously with regard to FIGURES 5-7, the rim 88 of roller 20 urges the central portion of the rubber liner against the bottom of the groove. The compression roller 22 similarly maintains the central portion of the liner against the groove bottom and also compresses the lateral edges of the liner downwardly toward the groove bottom. Finally, the horizontally-arranged finishing roller 28 urges the edge portions of the liner laterally apart toward the side walls of the groove, whereupon the edge surfaces of the liner engage the shoulder surfaces 12 to retain the liner in the groove.

Assuming that the length of the liner on the roll is so selected that cutting of the liner is not required, as the tool 2 nears its completion of its travel about the wheel (i.e., as guide roller 68 approaches the initially inserted end of the liner), toggle linkage 76 is collapsed to the FIGURE 1 condition to raise guide roller 68 from the groove, whereupon the tool is further drawn to the right to effect the insertion of the remaining portion of the liner in the groove by the pressing rollers. During this final movement of the tool in the FIGURE 1 condition, the rear end of the frame 14 is manually pressed downwardly by the operator.

In the event that the length of the rolled liner strip is greater than the circumference of the wheel, upon travel of the tool to the position where roller 68 engages the initially inserted liner end, the operator may cut the liner 4 at a point opposite a corresponding mark on the housing strap 52.

It is important to note that the tension of the biasing force applied to the free end of arm 62 by the toggle

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linkage 76 may be adjusted by the adjusting nut 84. As a consequence of these means for adjusting biasing tension (which may be on the order of 25 or 30 pounds) the force required to displace the tool around the wheel and the relative positions of the guide and pressing rollers may be accurately controlled. Furthermore, by adjustment of the nut means associated with bolts 26 and 32 and by adjustment of nut 84, the elements of the tool may be varied for the installation of a strip of liner material in a grooved wheel of a different size.

Furthermore, various modifications in the configurations of the guide, mounting and pressing rollers may be made without deviating from the invention. For example, in the compression roller modification of FIGURE 9, laterally-spaced peripheral flanges 106 are provided for engagement with the sides of the wheel to center the rim 98' within the groove. If desired, one of the side walls of the housing 40 may be mounted for removal or pivotal movement to simplify insertion of the roll within the housing.

It will be apparent to those skilled in the art that other changes and modifications may be made in the apparatus illustrated and described without deviating from the invention set forth in the following claims.

What is claimed is:

1. Apparatus for inserting a flexible liner within a groove contained in a body, the side walls of said groove including laterally-inwardly directed opposed shoulders, comprising

a frame;

pressing roller means connected with said frame for pressing the liner downwardly into the groove; and means for connecting said frame with said body for relative movement longitudinally of said groove, said frame connecting means including mounting roller means connected with said frame and adapted for insertion in the groove beneath and in rolling contact with the shoulders, whereby when said liner is supplied rearwardly between said pressing roller means and the bottom surface of the groove, forward movement of said frame longitudinally of the groove causes progressive insertion of said liner in said groove.

2. Apparatus for inserting a flexible liner within a continuous circumferential groove contained in the outer peripheral surface of a cylindrical body, the side walls of said groove including laterally inwardly directed opposed shoulders, comprising

a frame;

pressing roller means connected with the frame for pressing the liner downwardly in the groove;

mounting roller means connected with said frame and adapted for insertion in the groove beneath the shoulders; and

means connected with said frame for biasing said pressing roller means downwardly toward the bottom of the groove and the mounting roller means upwardly into rolling engagement with the groove shoulders, whereby when said liner is supplied rearwardly between said pressing roller means and the bottom of the groove, forward circumferential displacement of said frame relative to the body effects progressive insertion of the liner in the groove by said pressing roller means.

3. Apparatus for inserting a flexible liner in a continuous groove contained in the outer periphery of a wheel, the side walls of said groove including laterally-inwardly directed shoulders, comprising

a frame;

pressing roller means connected with said frame adjacent the rear end thereof for insertion in the groove; means connected with said frame for supplying the liner rearwardly between said pressing roller means and the bottom of the groove;

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mounting roller means connected with said frame forwardly of said pressing roller means, said mounting roller means being adapted for insertion in said groove beneath and in rolling contact with said shoulders;

guide roller means pivotally connected with said frame forwardly of said mounting roller means, said guide roller means being adapted for engagement with a radially outwardly directed circumferential surface of the wheel; and

means connected with the frame for pivoting said guide roller means in the direction of said wheel, whereby a force is applied to said frame to urge said pressing and mounting roller means against the groove bottom and shoulder surfaces, respectively.

4. Apparatus as defined in claim 3 wherein said guide roller means comprises an arm pivotally connected with said frame forwardly of said mounting roller means for pivotal movement in the plane containing said pressing and mounting roller means, and a guide roller rotatably connected with said arm, said guide roller being adapted for insertion into the groove for rolling contact with the bottom surface thereof.

5. Apparatus as defined in claim 4 wherein said means for pivoting said guide roller means in the direction of said wheel comprises spring means connected intermediate said arm and said frame.

6. Apparatus as defined in claim 4 wherein said guide roller is connected intermediate the ends of said arm, and further wherein said means for pivoting said guide roller means comprises toggle linkage means connected at one end with the free end of said arm and at the other end with said frame at a point forwardly of the pivotal connection between said arm and said frame, said toggle means being expandable and collapsible to insert and withdraw said guide roller from the groove.

7. Apparatus as defined in claim 6 wherein said toggle means includes a pair of pivotally connected links at least one of which comprises a pair of axially displaceable sections, and spring means for biasing said sections in opposite directions.

8. Apparatus as defined in claim 7 wherein the other of said links comprises a pair of relatively axially adjustable sections, and adjusting means for axially displacing said sections relative to each other.

9. Apparatus as defined in claim 3 wherein said pressing roller means comprises a plurality of rollers arranged longitudinally of said groove, the forwardmost one of said pressing rollers having a configuration to press the longitudinal central portion of said liner against the bottom of the groove.

10. Apparatus as defined in claim 9 wherein a second one of said pressing rollers has a configuration to press the lateral edges of said liner downwardly below the shoulders of the groove.

11. Apparatus as defined in claim 10 wherein said pressing roller means includes a third roller arranged rearwardly of said second pressing roller and having a configuration to press the edge portions of the liner laterally outwardly beneath the groove shoulders.

12. Apparatus for inserting a flexible liner in a groove contained in a body, said groove having an upwardly directed bottom surface and said body having a downwardly directed surface parallel with said groove bottom surface, comprising

a frame;

a first pair of longitudinally-spaced roller means connected with said frame for insertion within said groove;

liner supply means on said frame for supplying the liner downwardly between said first pair of roller means and between one of the roller means and the groove bottom surface;

mounting roller means connected with said frame inter-

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mediate said first pair of roller means and adapted for engagement with said downwardly directed body surface; and
spring means connected between said frame and at least one of said roller means for biasing said first pair of roller means downwardly toward said groove bottom surface and for biasing said mounting roller means upwardly against said downwardly directed body surface.

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References Cited by the Examiner
UNITED STATES PATENTS

227,106	5/1880	Henry	-----	157—1.1
754,175	3/1904	Tynan et al.	-----	114—224
1,326,660	12/1919	Hainer	-----	114—224

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