United States Patent [19]

Priester

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[54] **SPREADING TOOL FOR RESTORING THE SHAPE OF ANNULAR PRODUCTS**

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[52] **U.S. Cl.** **72/392,** 72/370, 72/393

[51] **Int. Cl.** **B21d 41/02**

[58] **Field of Search** 72/370, 392, 393

[56] **References Cited**

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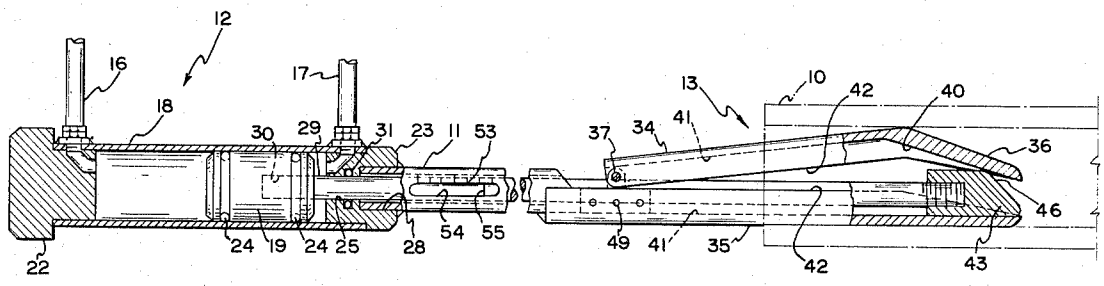
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[57] **ABSTRACT**

A tool for restoring a deformed or collapsed annular product having a hollow core. An elongate rigid staff carrying an expansible wedge section is forcibly inserted into the hollow core. A hydraulic cylinder located in the exposed end of the staff houses a piston which transmits force through the staff to a spreading cam contained in the wedge section so as to spread the wedge when pressure is introduced against the piston in the cylinder.

6 Claims, 4 Drawing Figures



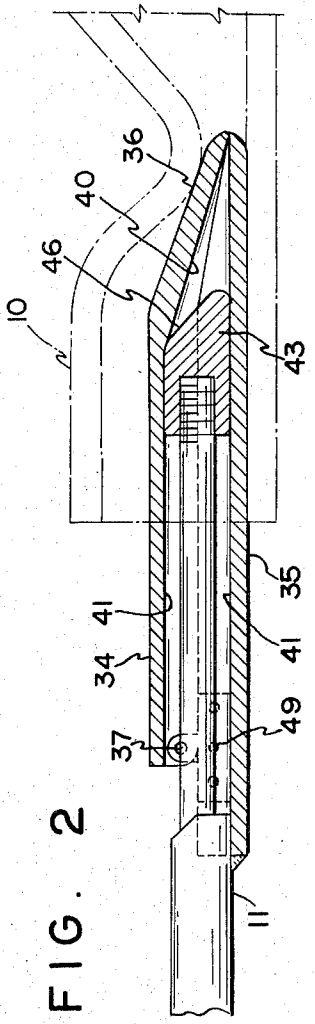


FIG. 2

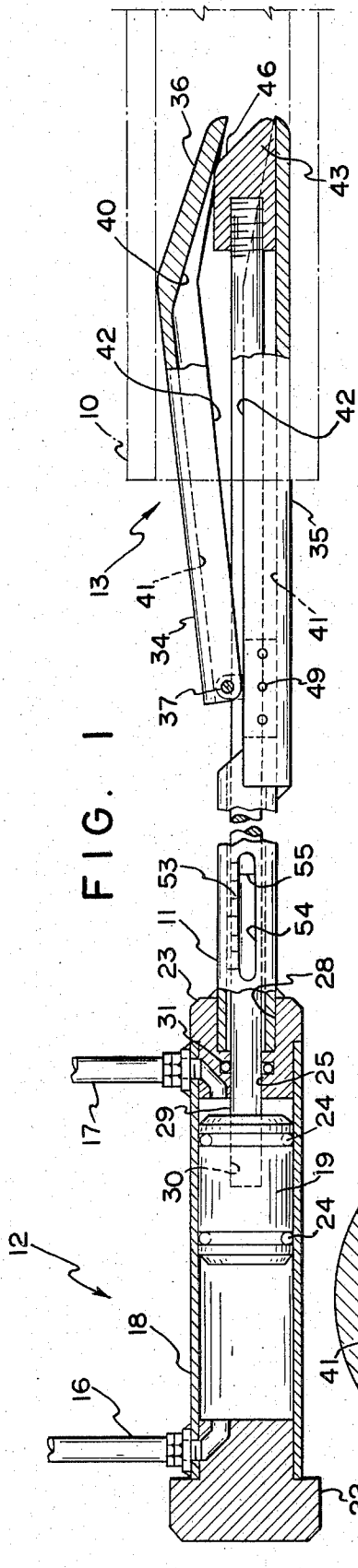


FIG. 1

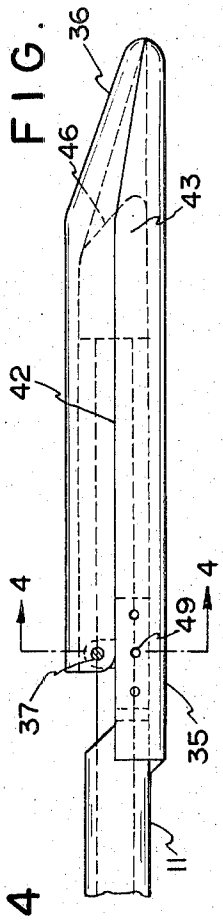


FIG. 3

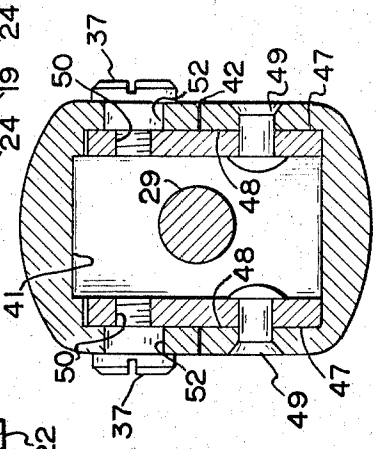


FIG. 4

SPREADING TOOL FOR RESTORING THE SHAPE OF ANNULAR PRODUCTS

BACKGROUND OF THE INVENTION

This invention pertains to a spreading tool and method for restoring deformed annular products and is particularly useful in restoring the cylindrical shape to collapsed rolls of paper, plastic film, tubing, metal foil or sheets, etc.

The aforementioned materials, among many others, are often rolled in coils on hollow cores for storage after completion of the manufacturing process while awaiting end use. Mishandling in shipment or storage may partially or fully collapse the cores and deform the rolls. Before normal use is possible the rolled material must be restored to its annular shape. Heretofore, restoring forces have been applied to the exterior of the roll, but these techniques serve to damage the material collected on the core and therefore have met with limited acceptance. To achieve the desired reforming and to circumvent possible damage to the stored material on the roll a device has been needed which will exert the required restoring forces radially outwardly from the interior of the hollow core.

SUMMARY OF THE INVENTION AND OBJECTS

The spreading tool described herein is utilized by inserting it within a collapsed hollow core of a normally cylindrical storage roll for the purpose of reforming the roll to its original configuration. The tool comprises an elongate rigid staff with an anvil cap on one end and an expansible split wedge assembly on the other end to be inserted into the core. Striking blows force the wedge end into the center of the collapsed core. Adjacent to the anvil cap and within the rigid staff is a hydraulic chamber serving as a cylinder having flow passages for introducing and exhausting fluid under pressure into and out of the chamber. A piston within the chamber mechanically transmits extending and retracting forces to a cam element disposed within the expansible wedge. Hydraulic pressure introduced through one of the flow passages forces the cam against an internal cam surface within the expansible wedge, causing it to enlarge radially and reform the core and the material stored thereon.

In general it is an object of the invention to provide an improved tool and method for restoring the shape to deformed annular products to render useful such products damaged through mishandling.

Another object of the invention is to provide a tool and method for restoring the shape of annular products without damaging the material of the roll.

Another object of the invention is to provide a tool and method for restoring the shape of annular products while also reforming the core upon which they are rolled to provide permanent restoration of their annular shape.

Additional objects and features of the tool and method for restoring the shape to annular products will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial cross sectional side elevation view of the spreading tool in its expanded condition, according to the invention.

FIG. 2 is a cross sectional side elevation view of an expansible wedge on the spreading tool in its collapsed condition.

FIG. 3 is a side elevation view of the expansible wedge of the spreading tool in its collapsed condition.

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The spreading tool disclosed herein reforms annular and cylindrical rolls of materials stored on hollow cores by reforming the cores through the application of internal pressure. Referring to FIG. 1 an assembly of the spreading tool is shown in place inside a hollow core **10** upon which material is rolled for storage. An elongate hollow rigid staff **11** carries a hydraulic cylinder assembly **12** on its rear end and a spreadable wedge assembly **13** on its forward end.

The hydraulic cylinder assembly **12** has flow passages **16** and **17** for admitting and exhausting fluid under pressure into and out of a cylinder **18.** A piston **19** is disposed within cylinder **18.** An anvil cap **22** is fixed in the rear end of the cylinder **18** and a guide cap **23** is fixed in the forward end of the cylinder **18.** The flow passages **16** and **17** can be seen to pass through a portion of the anvil cap **22** and guide cap **23** respectively in gaining communication with the cylinder **18.** Piston **19** has means for preventing fluid by-pass flow such as O-rings **24.**

Concentric bores **25** and **28** are formed in guide cap **23.** The larger bore **28** receives elongate rigid staff **11** for fixing the hydraulic cylinder assembly **12** to the staff. A piston rod **29** is fixedly engaged in a blind core **30** in piston **19.** A rod **29** passes through the smaller bore **25** and the center of hollow elongate staff **11** to the interior of the spreadable wedge assembly **13.** Means for preventing fluid leakage along the piston rod **29** through the smaller bore **25** is provided by O-ring **31.**

The spreadable wedge assembly **13** carried at the forward end of the spreading tool has a moveable top wedge element **34** and a fixed bottom wedge element **35.** A wedge ramp **36** is formed on the forward end of the top wedge element **34** and a pivot **37** is formed on the rear portion of wedge element **34.** An internal cam follower surface **40** is formed near the forward portion of wedge element **34.**

Both top and bottom wedge elements **34** and **35** have interior channels **41** and matching edge surfaces **42.** A cam member **43** is threadably attached to the forward end of piston rod **29** for slidable movement within the channels **41.** A cam surface **46** is formed on the top portion of cam member **43.**

Referring to FIG. **4** the pivot **37** and associated parts may more fully be described. Pivot plates **47** are shaped to fit in recesses **48** on each side of channel **41** in bottom wedge element **35.** Plates **47** are held in place in channel **42** by means such as rivets **49.** Threaded holes **50** are placed in the upper portion of pivot plates **47.** A clearance hole **52** is placed in each side of the chan-

nel **41** in top wedge element **34.** The pivot **37** is in the form of a shoulder pin in this embodiment.

A vernier scale **53** is provided on the outer surface of elongate hollow staff **11** in association with an opening **54** through which a reference mark **55** may be sighted on piston rod **29.**

As shown in FIG. **1,** fluid pressure applied through flow passage **17** in hydraulic cylinder assembly **12** causes piston **19** to move toward the rear of the cylinder **18** causing piston rod **29** to urge cam member **43** toward the rear of the spreadable wedge assembly **13** in the channels **41.** When cam member **43** is in such a position cam surface **46** is no longer in contact with cam follower surface **40,** the matching edge surfaces **42** of top and bottom wedge elements **34** and **35** are in contact and the spreadable wedge assembly **13** is in the collapsed condition as best seen in FIG. **2.** The spreading tool forward end, having spreadable wedge assembly **13** attached, is inserted in the collapsed condition into a hollow core **10** to be reformed. Striking blows are applied to the anvil cap **22** on the rear end of the spreading tool assembly to drive wedge assembly **13** deeper into the core **10** by means of the wedging action provided by wedge ramp **36.**

After the spreading tool assembly has been inserted to the desired depth and is in full engagement with the interior of the collapsed core **10,** pressure is directed through the flow passage **16** which forces the piston **19** toward the forward end of the cylinder **18.** Piston motion is transferred through piston rod **29** to cam member **43** within the spreadable wedge assembly **13.** Cam surface **46** is urged forward contacting internal cam follower surface **40** causing top wedge element **34** to pivot about pivot point **37** to assume the spread condition as seen in FIG. **1.** The spreading action of wedge assembly **13** exerts a radial force at the interior of the core **10** which reforms the core **10** to its normal annular or cylindrical condition.

One configuration of the spreading tool has a two and one half inch height when collapsed as seen in FIG. **3** which increases laterally with respect to the tool to a height of four and one eighth inches when spread as seen in FIG. **1.** The ramp angle formed on internal cam follower surface **40** provides an approximate three to one mechanical advantage when contacted by cam surface **46** when cam member **43** undergoes translational motion in channel **41.** Hydraulic cylinder assembly **12** is capable in this embodiment of transmitting a nine ton translational force to the cam member **43.** Thus a 27 ton radial spreading force can be exerted inside the core **10** for reforming the core and the materials carred thereon to their normal shape.

The vernier **53** in conjunction with the piston rod reference mark **55** as sighted through the opening **54** provides a gauge which indicates the measure of spread to which the top wedge member **34** has been moved.

From the foregoing it is readily apparent that an improved spreading tool for insertion within a collapsed or deformed hollow core serves to restore a normally annular or cylindrical shape to the core and also to the products carried thereon. No damage to the product occurs because no direct contact with the product is made. Thus, the spreading tool provides a useful device in reforming rolls of material which would not otherwise fit into manufacturing machinery in their deformed condition. The reforming is realized while carrying out the steps of inserting the expansible wedge carried on the spreading tool into the hollow core and driving the wedge into full engagement with the interior of the collapsed core. Finally, expanding the wedge radially relative to the core returns the core to its normally annular configuration.

I claim:

1. A spreading tool of a type for insertion within a collapsed or deformed hollow core of a normally annular product for expanding within the core to reform the annular configuration of the product comprising an elongate rigid hollow staff, wedging elements forming one end of said hollow staff for insertion into said core, one of said wedging elements being rigidly fixed to said one end, another of said elements being secured to said one end and movable between spaced and proximate positions relatively to the first named one of said wedging elements to provide an expanded and contracted wedging means at said one end, dual acting hydraulic means fixed within the other end of said hollow staff including a cylinder and a piston, a cam surface formed on one of said wedging elements, a rod attached at one end to said piston and extending through said hollow staff, a movable wedge member attached to the other end of said rod and disposed between said wedging elements for movement between advanced and retracted positions therebetween into and out of engagement with said cam surface, and an enlarged solid mass attached to the outer end of said cylinder forming an anvil for receiving striking blows for driving said wedging means into said core to a selected position therein, whereby upon activation said hydraulic means serves to force said elements apart at said position to reform said core and product from within.

2. A spreading tool as in claim **1** together with gauge means for indicating the measure of expansion of said wedge elements.

3. A spreading tool of a type for insertion within a collapsed or deformed hollow core of a normally annular product to be expanded within the core to reform the annular configuration of the product comprising an elongate rigid staff, laterally expansible rigid wedging means carried at one end of said staff for insertion into said core, an operating member movable to laterally expand said wedging means, hydraulic means attached to the other end of said rigid staff coupled to said operating member and including a cylinder and a piston selectively operable to expand said wedging means to reform said core and product from within, and an enlarged solid mass sealing the outer end of said cylinder and forming an anvil for receiving striking blows for driving said wedging means into said core to a selected position therein.

4. A spreading tool according to claim **3** wherein said wedging means comprises a pair of elongate wedging elements carried at said one end of said staff, one of said elements being pivotally coupled to move between closed and open positions, a cam surface formed on one of said elements, a movable wedge member attached to one end of said operating member disposed between said elements and movable between advanced and retracted positions therebetween said hydraulic piston being attached to the other end of said operating member for driving said wedge member, said hydraulic cylinder containing said piston and having pressure inlets at each end whereby said piston may selectively drive said wedge member into and out of engagement with said cam surface.

5. A tool for restoring the annular shape to a deformed roll of material collected on a hollow supporting core comprising an elongate rigid hollow shaft having a rear and a forward end, a chamber fixed to the rear end of said shaft, an anvil cap on the end of said chamber, a piston disposed in said chamber and movable in said chamber, a flow passage in each end of said chamber in fluid communication with said chamber on opposite sides of said piston, a fixed wedge segment attached to the forward end of said shaft adapted to enter said core, a movable wedge segment attached to said forward end and adapted to enter said core, said movable wedge segment having a portion disposed adjacent said fixed wedge segment, said anvil cap sealing the outer end of said chamber having sufficient mass and bulk to receive striking blows thereagainst to force said wedge segments into the supporting core, a cam follower surface formed internally in said movable wedge segment, a cam slideably disposed between said wedge segments for contacting said cam follower surface, and a piston rod joining said piston and said cam whereby hydraulic pressure admitted through one of said flow passages moves said piston and rod so as to force said cam into engagement with said cam follower surface for spreading said wedge segments and hydraulic pressure admitted through the other of said flow passages moves said piston to withdraw said cam out of engagement with said cam follower surface thereby allowing said wedge segments to collapse.

6. A tool for restoring the annular shape to a deformed roll of material collected on a hollow supporting core as in claim 5 wherein said hollow shaft has an opening extending through the hollow shaft wall, a vernier scale surrounding said opening, and a mark on said piston rod visible through said opening, whereby the relative position between said mark and said vernier scale provides a measure of the spreading of said wedge segments.

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