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Makinen

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[54] **CENTER HOISTING DEVICE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 331,258, Feb. 9, 1973, abandoned.

[52] **U.S. Cl.** **294/93;** 188/286; 188/287; 188/322

[51] **Int. Cl.** **B66c 1/54**

[58] **Field of Search** ..... 294/86.24, 93, 99 R, 86 R, 294/88, 64 R; 188/322, 286, 287

[56] **References Cited**

UNITED STATES PATENTS

2,826,445	3/1958	Tidland	294/93
3,052,494	9/1962	Williamson	294/93
3,367,098	2/1968	Schultz	57/52
3,396,980	8/1968	Muller	294/88
3,462,934	8/1969	Schultz et al.	294/93
3,605,960	9/1971	Singer	188/287
3,621,952	12/1971	Long et al.	188/322
3,750,856	8/1973	Kenworthy	188/287

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[57] **ABSTRACT**

A center hoisting device for rolls and the like is disclosed which comprises a hoisting piece that can be fitted inside the center of a roll of paper or the like and which can be expanded so that its circumference presses against the wall of the roll center to create a frictional contact between the hoisting piece and the roll; the hoisting piece being a hydraulic cylinder hoisted by its piston rod, wherein the upper part of the peripheral wall of the cylinder has at least one aperture, and the peripheral wall is at least partly covered with a resilient material secured thereto in liquid tight relation to create at the periphery of the cylinder an expandable space which is in hydraulic communication with the cylinder through the aperture, so that the resilient material will be expanded upon contraction of the piston rod, by fluid supplied to said expandable space through the aperture, thereby to engage the wall of the roll center.

4 Claims, 3 Drawing Figures

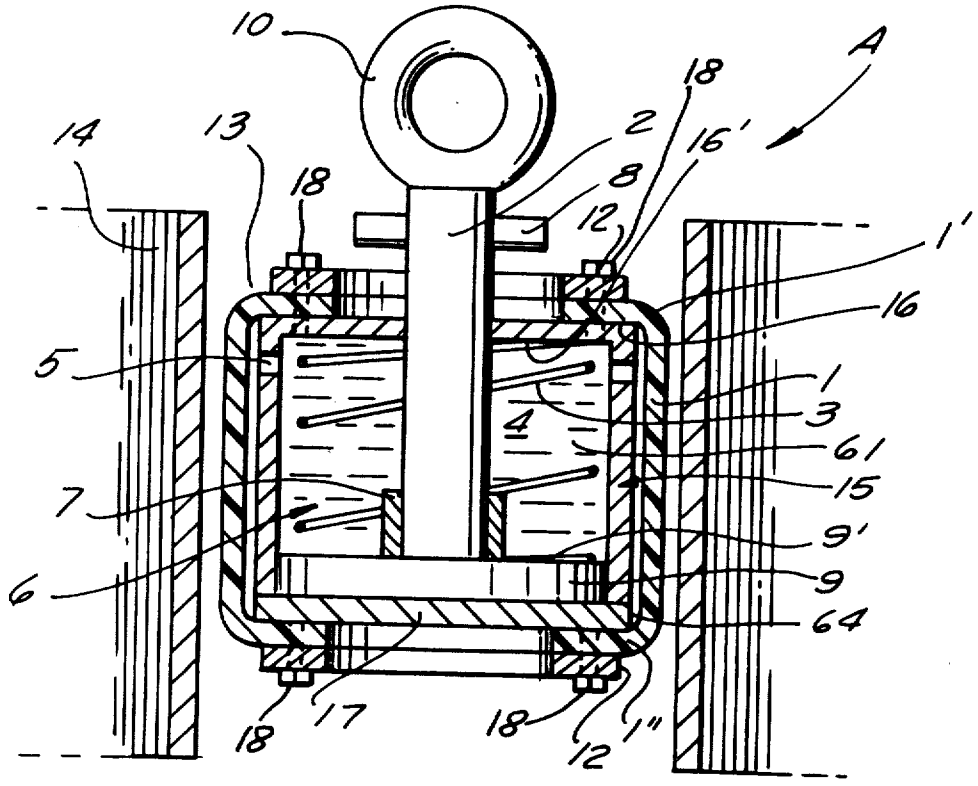
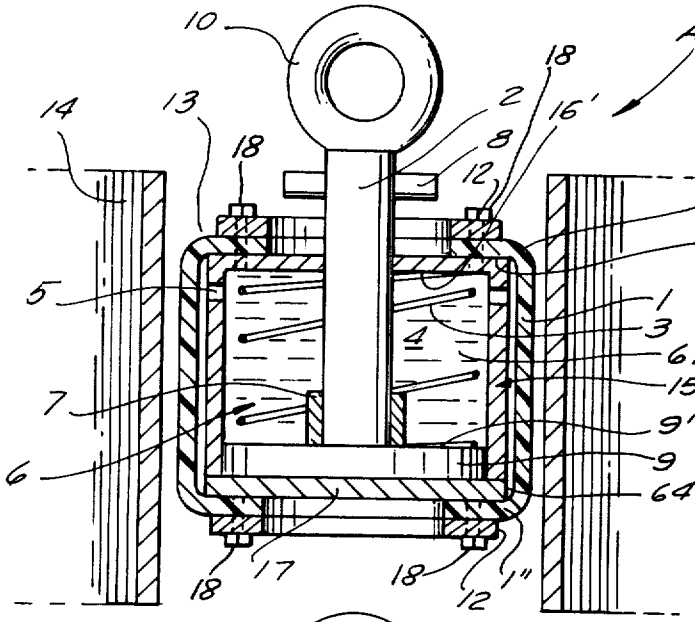


FIG. 1



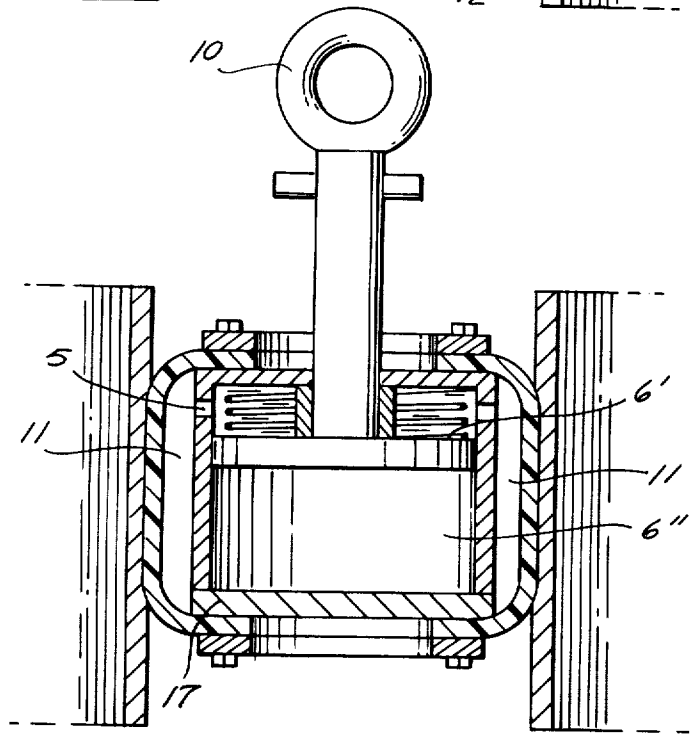
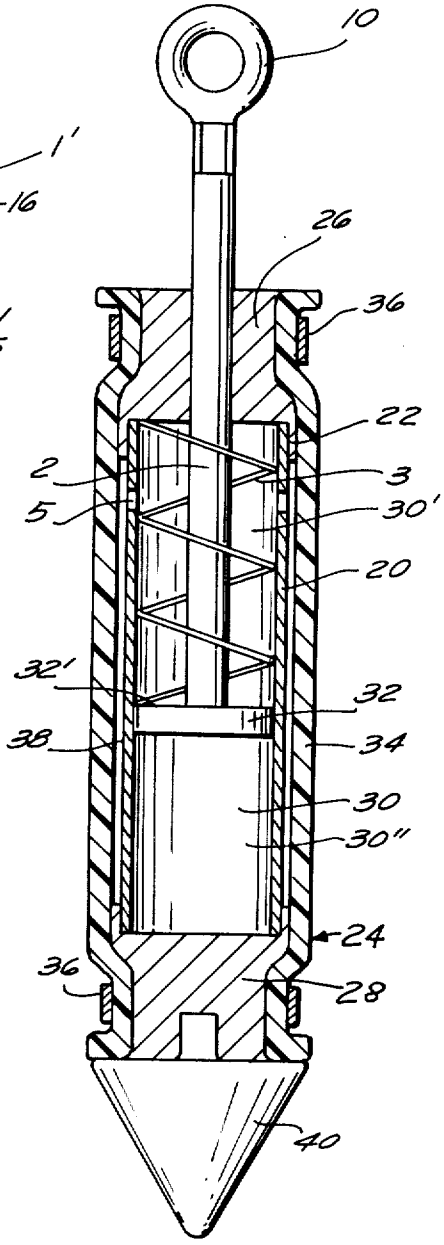


FIG. 2

FIG. 3



CENTER HOISTING DEVICE

This application is a continuation-in-part of U.S. Pat. Application Ser. No. 331,258, filed Feb. 9, 1973, now abandoned, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to center hoisting devices for rolls and the like.

2. Description of the Prior Art

Center hoisting devices are used for hoisting rolls and the like, especially big and heavy rolls of paper, carton, board, foil, plastic or the like, and other hollow items by creating a frictional contact between the hoisting device and the inner wall of the roll core or center. Since heavy rolls of this type easily become deformed because of their weight if they are kept in a horizontal position, they typically are stored in a vertical position, so that they stay in place with more certainty and can be stacked one on top of the other without deformation of the lowest rolls. Thus center hoisting devices which can be inserted in the vertically extending hollow core or center of the rolls are used to transport or move the rolls.

Different types of mechanical center hoisting devices have been previously proposed. One known center hoisting device includes an inner piece and an outer mantle concentrically on top of the inner piece. The outer mantle can be moved axially in relation to the inner piece, so that several sharp attaching protuberances are pushed by springs from the inner piece through openings in the outer mantle. When the outer mantle is pushed, the openings move in front of the attaching protuberances. They stick to the center of the roll and make hoisting possible.

In another known solution the center hoisting piece is a socket made from a resilient material and provided with a centered opening that narrows upwards conically. An axle having a lower end which is thicker than the upper end, and which narrows conically upwards, includes a hoisting loop at its upper end which fits through the opening. When the axle is hoisted, its thicker lower end presses against the conical inner wall of the socket, so that the socket expands and thus presses against the inner wall of the roll center to provide a frictional contact between the expanded socket and the roll center. Thus the socket is pressed between the thick part of the hoisting axle and the roll center and transmits the hoisting force of the axle to the roll center.

Mechanical center hoisting devices such as this are, however, relatively complicated and therefore accident prone. They have many moving and wearing parts which have to be checked and renewed at regular intervals.

Another known solution is a hydraulically operated center hoisting device having facing sides on its lower part that are provided with arms which are attached to the hoisting device so that they can turn. The free ends of the arms are provided with gripping organs which press against the wall of the roll center when the arms are turned outwards and away from each other by means of hydraulic cylinders fitted between the hoisting device and the arms. The center hoisting device is, however, not self-locking, and if the hydraulics fail during the hoisting process the hoisting device becomes detached from the roll, with serious consequences.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to create a hydraulically operated, self-locking center hoisting device which can be lowered into the center or core of a roll from above and pressed against the center wall of the roll by the weight of the roll during the hoisting procedure.

This object is achieved by a resilient cover attached to and surrounding the peripheral wall of a hydraulic cylinder facing the roll and covering at least part of the wall to create an expandable space between the cover and the cylinder wall. This space communicates with the interior of the cylinder, above the piston therein, through at least one aperture in the wall.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional, elevational view of a center hoisting device according to one embodiment of the present invention, fitted in a roll core or center;

FIG. 2 is a sectional view similar to FIG. 1 and showing the configuration of the center hoisting device during the hoisting procedure; and

FIG. 3 is an elevational view similar to FIG. 1 of another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing in detail, and initially to FIG. 1 thereof, it will be seen that the center hoisting device A of the present invention is adapted to be inserted in the central hollow core **13** of a paper roll **14** or the like and includes a hydraulic cylinder or ram **15** having a hollow cylindrical chamber **6** containing a piston **9**. The latter is movable in chamber **6**, but fits tightly therein in a conventional manner, to divide the chamber into two separate chamber sections **6'** and **6''**, with the chamber section **6'** containing a supply of hydraulic fluid **4**. Piston **9** includes a piston rod **2** which extends through a fluid tight seal (not shown) in the top wall **16** of the cylinder, in the conventional manner, and its upper end is provided with a hoisting loop **10** and guiding lobes **8**.

The upper part of the side wall of cylinder **15** has a plurality of apertures **5** formed therein which provide communication between the upper chamber section **6'** (i.e. above piston **9**) and the exterior of the cylinder. The peripheral wall of cylinder **15** also is covered, or surrounded, on its outside with a continuous fluid impervious flexible teflon mantle **1** which is in the general shape of a cylindrical sleeve. The upper and lower edges **1'** and **1''** respectively, of the mantle **1** are respectively tightly attached, in fluid tight relation, to the cover or top wall **16** and the bottom wall **17** of cylinder **15** by means of flanges or o-rings **12** which serve to clamp the ends of the mantle to the end walls of the cylinder. The o-rings clamp the mantle with the aid of a plurality of bolts, screws, or the like **18** to form a fluid tight seal. In this manner a fluid tight surrounding space **11** is formed about the periphery of the cylinder **15** between the flexible teflon mantle **1** and the circumference of cylinder **15**.

As will be apparent, the space **11** is in hydraulic communication with the chamber section **6'** above piston **9** of cylinder **15** to receive hydraulic fluid **4** from the

cylinder. In addition, a spring 3 is fitted in the liquid chamber section 6' of cylinder 15, between the upper surface 9' of piston 9 and the lower surface 16' of cylinder 15. This spring normally biases piston 9 downwardly when the center hoisting device is not hoisted or lifted by piston rod 2. An annular limiting collar 7 is fitted or secured, in any convenient manner, to the top surface 9' of piston 9, around piston rod 2 and its height is selected so that the movement of piston 9 in the upward direction is limited to the position shown in FIG. 2. As a result, the piston 9 can never cover or close the apertures 5 even in its extreme upward position.

When the center hoisting device is not loaded, i.e. before it is used to lift a roll 14, the piston 9 is in its lowermost position shown in FIG. 1, with the upper chamber section 6' containing substantially all of the fluid 4, so that the outer diameter of the device (i.e. the outer diameter of mantle 1) is slightly smaller than the inner diameter of the center or core 13 of roll 14. Thus the center hoisting device can be readily lowered or inserted into the center or core 13 of the roll 14 from above. The guiding lobes 8 make possible an operational and empty hoisting (detaching hoisting), when the device is to be lifted out of the roll.

When the center hoisting device is placed or inserted in the center core 13 of the roll to be lifted, it is first locked in place, for example by lifting the piston rod by hand in order to force some of the hydraulic fluid 4 (which may be oil for example) through the apertures 5 in cylinder 15 into the space 11 defined between the teflon mantle 1 and the outer surface of cylinder 15. As will be apparent, the insertion of fluid into space 11, causes the flexible mantle 1 to swell and press against the inner wall of the center core 13. With the mantle 1 initially engaged with the core in this manner, the actual hoisting operation can then take place, as for example by the use of a crane or hoisting jack secured to the loop 10. As this occurs, the piston 9 is initially moved upwardly, through the piston rod 2, and rises in the cylinder 15 to force additional oil into the space 11 between the teflon mantle 1 and cylinder 15 until the oil pressure rises so high that the cylinder 15 and roll 14, which is now in frictional contact with the teflon mantle 1, begin to rise together. That is, the fluid inserted in the space 11 creates a radial outward pressure against the internal walls of the core 13, which provides a tight engagement therebetween so that as the hoisting device is lifted the roll 14, secured thereto, moves upwardly with the hoisting device.

If, for example, the weight of the roll is about 500 kg., the oil pressure can rise to about 20–30 atm. pressure. It is easy to calculate how large the surface area of teflon mantle 1 must be in order to create a sufficient frictional contact between the teflon mantle 1 and the roll center 13 in order to establish a tight engagement therebetween to enable the roll to be lifted. It has been found that the device can be used to hoist normal newsprint rolls of 750 kg. as well as Kraft liner rolls of over 3000 kg. Because the weight of the roll determines the hydraulic pressure in the chamber or space 11, the frictional force is regulated automatically if the device is correctly dimensioned.

At the end of the hoisting operation, i.e. when the lifted roll is returned to a supporting surface and the lifting force on loop 10 is removed, the piston 9 automatically returns to its lower position shown in FIG. 1, under the influence of the spring 3. The piston rod 2 is then locked in the lower position, in any convenient manner, to allow the center hoisting device to be lifted out of the center core 13. The movement of the piston 9 to its lower position reduces the pressure in chamber 11, and allows fluid in the chamber to return to the now enlarged chamber section 6', thereby reducing the frictional engagement of the mantle with the walls of the core 13, to allow the hoisting device to be removed vertically from the core. The locking of the piston rod in this lower position is desirable in order to prevent the center hoisting device from again pressing the teflon mantle against the roll core center 13 when the device is drawn out of the roll. Preferably, the center hoisting device must fit quite precisely in the center of the roll, for the diameter of the center hoisting device does not lengthen more than for example 5–10 mm during the hoisting procedure when the diameter of the center roll is about 70 mm.

Another embodiment of the invention is illustrated in FIG. 3. This embodiment of the invention is substantially similar to that shown in FIGS. 1 and 2. Basically, the device of FIG. 3 consists of a cylinder 20 having upper and lower ends 22, 24 which are respectively closed by plugs 26, 28 in the conventional manner to form a substantially fluid tight chamber 30 therein. The chamber 30 contains a slidable piston 32 which separates the chamber into upper and lower chamber sections 30', 30'', with the piston forming a substantially fluid tight seal between the two chambers. The upper chamber 30' contains the hydraulic fluid and a spring 33 which normally biases the piston 32 into its lower position.

Piston 32 is operatively connected in any convenient manner to a piston rod which extends through the upper plug 26 in a fluid tight relationship, in the conventional manner, to a hoisting loop 10.

The cylinder 20 is surrounded by a generally cylindrical teflon sleeve 34 which is secured at its upper and lower ends, in any convenient manner, and in fluid tight relation, to the periphery of the plugs 26, 28. This seal can for example be formed by means of an adhesive and/or surrounding band 36 which tightly holds the ends of the sleeve in fluid tight relationship about the plugs 26, 28. In this manner, the sleeve 34 forms an expandable space 38 between the sleeve and the exterior of cylinder 20. The latter has apertures 5 formed at its upper end, which provide communication between the upper chamber section 30' and the expandable space 38, so that fluid can be supplied to the space 38, in the manner previously described with respect to the embodiments of FIGS. 1 and 2. If desired, a stop ring (not shown in FIG. 3) similar to the stop ring 7 of the embodiments of FIGS. 1 and 2 can be provided on the upper surface 32' of piston 32. In addition, the lower plug 28 can be provided with a conically tapered centering piece 40 extending from the lower end of plug 28, in order to guide the hoisting device as it is inserted in the open hollow core of a roll to be lifted.

The operation of the device illustrated in FIG. 3 is identical to that of the embodiment shown in FIGS. 1 and 2 of the drawing in that when the device is inserted in the roll to be lifted, the piston 32 is initially moved upwardly, by hand or by a crane hoist or the like, to urge liquid in chamber section 30' through the apertures 5 into the space 38, thereby expanding the teflon sleeve 34 and moving the outer surface thereof into en-

gagement with the inner wall of the core. As the piston **32** is continually moved upward, under the influence of the lifting force applied to loop **10**, the pressure of the fluid urged into the expanding space **38** increases, thereby increasing the frictional engagement between the hoisting device and the roll core. When the pressure in chamber **38** is sufficiently high, the frictional engagement between the teflon sleeve and the core causes the core to move upwardly with the hoisting device. It will be apparent that when sufficient pressure is achieved in the space **38**, the piston **32** will no longer move upwardly in the cylinder **20**, but the whole device will then move as a unit to lift the roll.

Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it will be apparent that various changes and modifications can be effected therein by one skilled in the art without departing from the scope or spirit of this invention.

I claim:

1. An improved center hoisting device for rolls and similar pieces having a hollow core member, said device comprising a hydraulic cylinder having first and second opposite ends and adapted to be inserted inside of the core of said roll and including a piston located within the cylinder for movement between two extreme positions, and a piston rod secured to said piston and extending through said first end of the cylinder; a resilient cover attached on the hydraulic cylinder and enclosing at least a portion of the exterior of the hydraulic cylinder facing the core member of the roll to define an expandable space between the cover and the exterior of said cylinder, said cylinder having an aperture formed therein adjacent said first end of the cylinder beyond the extreme positions of said piston for providing communication between said space and the inside of the cylinder whereby, application of a pulling force to said piston rod causing said piston to move towards said first end, fluid in said cylinder between said piston and said first end is urged through said aperture into said space to expand said space and said resilient cover thereby to engage said cover with said core member and allow said pulling force to lift said roll.

2. The improved center hoisting device of claim **1**, further comprising a release spring located in said cylinder and operatively connected between the piston and the first end of the cylinder.

3. The improved center hoisting device of claim **1** further comprising a stop member attached to said piston rod adjacent the side of the piston facing said first end to limit movement of said piston towards said first end and define one of said extreme positions of the piston, thereby to prevent the piston from blocking the aperture during operation of the device.

4. The improved center hoisting device of claim **1**, in which the resilient cover surrounds substantially the entire exterior of said cylinder and is secured to the ends of the cylinder.

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