PNEUMATIC ROLL CHUCK

William F. Collard, Sr., Camas, Wash., and Lewis L. Collard, deceased, late of Camas, Wash., by William F. Collard, administrator

Application April 13, 1953, Serial No. 348,528

12 Claims. (Cl. 242—72)

The present invention relates in general to improvements in devices for facilitating rotation of rolls of sheet material such as paper, and relates more specifically to improvements in the construction and operation of pneumatic roll driving chucks especially useful for effecting unwinding of paper rolls or the like.

The primary object of the present invention is to provide a pneumatic roll driving chuck for compact construction and highly efficient in operation.

It is common practice in the paper making industry, to wind the finished paper stock on relatively heavy cardboard cores or tubes which become a permanent part of the final paper rolls. While some mills have heretofore resorted to the use of removable metal cores instead of cardboard tubes, the latter are relatively expensive and besides effectively protecting the inner layers of the stacked rolls, they may be utilized to greatly facilitate unwinding of the rolls if a suitable drive for rotating the cores is provided.

It is therefore an important object of this invention to provide an improved roll chuck especially adapted for the purpose of unwinding rolls of paper of the like, and which may be conveniently applied to such rolls and used to effectively rotate the same in either direction.

Another important object of the invention is to provide a roll chuck readily applicable to either end of a hollow roll, and which is pneumatically operable to either establish or to release the driving connection between the roll and a source of power.

An important object of the present invention is to provide an improved pneumatic roll chuck having two sets of jaws operable by a common inflatable element to drive a rotation of rollers centered around the roll.

Still another important object of this invention is to provide a compact and relatively inexpensive chuck for driving the inner hub of the roll and centering on a drive shaft extending centerally through the roll, which may be easily applied or removed and functions to effectively drive the roll at will.

An additional object of the invention is to provide a durable roll driving chuck for hollow rolls of various types, which comprises relatively few sturdy parts adapted to accurately centralize the rolls relative to their supporting and driving shaft and to produce an effective driving connection.

These and other more specific objects and advantages of the invention will be apparent from the following detailed description from which it will be noted that the gist of the present improvement is the provision of a chuck for drivingly connecting a rotary shaft with a hollow roll of paper or the like, with the aid of inner and outer revolving jaws adapted to be simultaneously spread apart by means of an inflatable element so as to cause the inner jaws to grip the shaft while also causing the outer jaws to grip the interior of the roll, and wherein the driving connection is interrupted whenever the element is deflated.

A clear conception of the features constituting the present improvement and of the construction and operation of a typical roll driving chuck embodying the invention, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the two views.

Fig. 1 is an approximately central longitudinal section through a commercial pneumatic roll chuck taken along the line 1—1 of Fig. 2, showing the same applied to fragments of a driving shaft and of a hollow paper roll surrounding the shaft; and

Fig. 2 is a partial end view and transverse section through the chuck, the section having been taken along the line 2—2 of Fig. 1, and the roll being omitted.

While the improved chuck illustrated and described herein embodies inner and outer sets of gripping jaws each comprising three individual jaws adapted to grip the driving shaft and the interior of a paper roll core near its extreme end, it is not the intent to strictly limit the invention by virtue of this limited embodiment; and it is also contemplated that specific descriptive terms employed herein be given the broadest possible interpretation consistent with the disclosure.

Referring to the drawing, the improved pneumatic roll chuck shown therein is adapted to drivingly connect the paper driving member of shaft 6 disposed coaxially of the hollow roll 5; and the chuck comprises an annular support 7 loosely surrounding the shaft 6; a set of three inner shaft gripping jaws 8 slidably associated with the support 7; a set of three outer core gripping jaws 9 pivotally suspended from the support 7; and an annular expandable element or cylindrical bag 10 interposed between the jaws 8, 9 and being inflatable to simultaneously force the inner jaws 8 into driving engagement with the shaft 6 and the outer jaws into driving engagement with the interior of the core 4.

The annular support 7 has a cylindrical externally smooth housing or casing 12 firmly but removably attached to one end thereof by means of cap screws 13 so that the casing in effect constitutes a part of the support, and the opposite end of the support 7 is provided with an integral annular flange having thereon integral suspension ears 14 carrying pivot pins 15 from which the outer jaws 9 are radially swingably suspended while the medial portion of the support 7 has elongated radial slots 16 formed therein for slidably mounting the inner jaws 8. The end wall of the casing 12 remote from the pivot pins 15 is also provided with integral external parallel guide ways 17 for the swinging ends of the outer jaws 9, and has an inner guide plate 18 secured thereto by screws 19.

Each of the three inner jaws 8 lies loosely within and is freely radially movable or slidable in one of the slots 16 of the unitary support 7, and is provided at its outer portion with oppositely directed flanges 21 which cooperate with the arcuate flanges of the adjacent jaws 8 to provide substantially a complete hollow cylinder surrounding the inner hub portion of the support 7 and this hub portion is provided with radial sockets 22 facing the inner jaw flanges 21. A helical compression spring 23 is confined within each of the sockets 22 and presses outwardly against the adjacent jaw flange 21, thereby constantly urging the adjacent jaw 8 radially away from the periphery of the driving shaft 6, and the flanges 21 also serve to retain the springs 23 confined within the sockets 22.

Each of the three outer jaws 9 is provided at its pivoted end with an integral suspension lug 25 coacting with the adjacent pivot pin 15 between its carrying ears 14, while its opposite swinging end has arcuate externally serrated gripping extensions 26 formed integral with long integrally projecting flat guiding portions 27 slidably coacting with the guide ways 17 of the casing 12, and the portion of each jaw 9 between the lug 25 and its guiding portion 27 is provided with oppositely directed integrally formed radial sockets 30 on opposite sides of stop screws 30 and which face the sinusoidal portions 31 of the jaws 9 located between the flanges 28 and the guiding portions 27. A helical compression spring 32 is confined within each of the sockets 29 and presses inwardly against the adjacent jaw portion 31, thereby constantly urging the outer jaw gripping extensions 26 inwardly toward the shaft 6, and the springs 32 are confined within their...
sockets 29 by the jaw portions 31 and by screw plugs 33 secured to the casing end wall.

The annular portion of the support 45 is configured between the flanges 21, 28 of the inner and outer jaws 8, 9, is preferably formed of material such as rubber, and surrounds and extends throughout the entire length of the annular portion of the support 45. The inner section of the bag 10 is provided with a normally sealed and unobstructed annular chamber 35, and the bag 10 has a single inlet and outlet opening 36 at one end with which air valve 20 is associated. This valve assembly 37 is somewhat similar to an automobile tire valve, and comprises a body 38 having a seat 39 formed therein, and a valve 40 constantly urged against the seat 39 by a helical spring 41. When placed to normally seal the chamber 35 of the bag 10. This construction permits the valve 40 to be opened either by the admission of fluid under pressure such as compressed air through the body 38 in order to inflate the bag 10, or by manually pressing the valve away from its seat so as to permit fluid to escape from the chamber 35.

When the various parts of the improved pneumatic roll chuck have been properly constructed as above described, they may be readily assembled as shown, by merely manipulating the screws 13, 19 and the pins 15 and plugs 17 to maintain the inner jaws 8 radially within the slots 16 into firm frictional engagement with the shaft 6 and the three outer jaw extensions 26 into driving engagement with the interior of the roll core 4.

After the chuck unit has been thus applied to the shaft 6 and roll 5, the stop screws 30 should be adjusted to limit and equalize the outward swinging motion of the jaws 8 and the extensions 26, whereas such air pressure as compressed air, may be admitted to the chamber 35 of the annular bag 10 through the valve assembly 37 and opening 36. The bag 10 will then expand and will simultaneously force the three inner jaws 8 radially within the slots 16 into firm frictional engagement with the shaft 6 and the three outer jaw extensions 26 into driving engagement with the interior of the roll core 4. When a cardboard core 4 is provided, the teeth or serrations of the outer jaw extensions 26 will bite into the relatively soft core 4 and will thus provide a positive drive for the roll 5 in the process of centralizing this roll relative to the shaft 6. The shaft 6 may thereafter be rotated to revolve the roll 5 in the proper direction so that paper may be unwound therefrom or additional stock may be wound thereon, and the improved inner jaw units may be applied to either or both ends of the rolls 5.

In order to release the improved chuck from a roll core 4, it is only necessary to stop the driving motion of the roll 5 and depress the valve 40 away from its seat 39 with the aid of any blunt ended implement. When the valve 40 is thus unseated, the compression springs 23 quickly become effective to release the inner jaws 8 radially within their confining slots away from the shaft periphery, and the compression springs 32 likewise act to simultaneously move the outer jaws 9 and their extensions 26 toward the shaft sufficiently to release the roll core 4. The core 4 may then be slid longitudinally off of the extensions 26 and a new roll may be applied in like manner,

The peripheral smooth annular casing 12 normally conceals most of the mechanism and thus protects attendants from injury while the chuck is in use.

From the foregoing detailed description it will be apparent that the present invention is unique, and extremely compact and durable roll driving chuck unit which may be conveniently applied to and removed from the ends of paper rolls 5 or the like, and which is adapted to provide a reliable means for unwinding or winding purposes. The pneumatic bag 10 cooperates with the arcuate jaw flanges 21, 28 to quickly establish a firm driving connection between the shaft 6 and the roll 5 whenever the bag is inflated, and the springs 23, 32 function to maintain this driving connection when the bag 10 is opened to the ambient atmosphere. The improved unit may be readily assembled or dismantled by merely manipulating a few screws and pins, and the assembly may be operated with utmost safety due to the smooth external surfacing of the annular casing 12 which also protects the internal mechanism from damage. The improved chucks have gone into extensive and highly successful commercial use, and may be manufactured in various sizes for diverse uses.

It should be understood that it is not desired to limit this invention to the exact details of construction and operation of the pneumatic roll chuck herein specifically shown and described, but various modifications within the scope of the appended claims may occur to persons skilled in the art.

We claim:

1. In a chuck for drivingly connecting a rotary shaft with a hollow roll, a support surrounding the shaft, inner jaws movably associated with said support and being engageable with said roll, drivingly connecting the support to the shaft, outer jaws movably suspended from said support and being engageable with the interior of said roll to drive the roll to the support, and an inflatable element for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated.

2. In a chuck for drivingly connecting a rotary shaft with a hollow roll, a support surrounding the shaft, inner jaws movably associated with said support and being engageable with said shaft to drivingly connect the support to the shaft, outer jaws movably suspended from said support and being engageable with the interior of said roll to drive the roll to the support, an inflatable element for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and resilient means coacting with said support and with said jaws for releasing the latter when said element is deflated.

3. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a support surrounding the shaft, inner jaws slidably associated with said support and being inwardly movable into frictional engagement with said shaft to drive the roll to the support, outer jaws pivotally suspended from said support and being outwardly swingable into driving engagement with the interior of the roll core to drive the roll to the support, and a resilient inflatable element for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated.

4. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a support surrounding the shaft, inner jaws slidably associated with said support and being inwardly movable into frictional engagement with said shaft to drive the roll to the support, outer jaws pivotally suspended from said support and being outwardly swingable into driving engagement with the interior of the roll core to drive the roll to the support, an inflatable element for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and springs coacting with said support and with said jaws for releasing the latter when said element is deflated.

5. In a chuck for drivingly connecting a rotary shaft with a hollow roll, a support surrounding the shaft and having radial slots and guideways therein, an inner jaw radially slidable within each of said slots and being engageable with said shaft to drive the roll to the support, an outer jaw radially slidable within said guideways and being engageable with the interior of the roll core to drive the roll to the support, an inflatable element for simultaneously moving all of said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and resilient means coacting with said support and with said jaws for releasing the latter when said element is deflated.

6. In a chuck for drivingly connecting a rotary shaft with a hollow roll, a support surrounding the shaft and having radial slots and guideways therein, an inner jaw radially slidable within each of said slots and being engageable with said shaft to drive the roll to the support, outer jaws movably associated with said guideways and being engageable with the interior of said roll to drive the roll to the support, an inflatable element for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and resilient means coacting with said support and with said jaws for releasing the latter when said element is deflated.

7. In a chuck for drivingly connecting a rotary shaft with a hollow roll, a rigid annular support having
2,707,082

radial slots and intervening radial guideways therein, inner jaws radially slidably confined within said slots and being engageable with said shaft to drivingly connect the support to the shaft, outer jaws radially slidably confined within said guideways and being engageable with said roll to drivingly connect the roll to the support, and an inflatable annular element disposed between the jaws for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated.

8. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a support surrounding the shaft and having rigid radial slots and intervening radial guideways therein, inner jaws radially movably confined within said slots and being engageable with the periphery of said shaft to drivingly connect the support to the shaft, outer jaws radially movably confined within said guideways and being engageable with the interior of said roll to drivingly connect the roll to the support, an annular inflatable element interposed between the jaws for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and resilient means carried by said support and coating with said jaws for releasing the latter when said element is deflated.

9. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a support surrounding the shaft, inner jaws slidably associated with said support and being inwardly movable into engagement with said shaft to drivingly connect the support to the shaft, outer jaws pivotally suspended from said support and being outwardly swingable into engagement with the interior of said roll to drivingly connect the roll to the support, each of said jaws having arcuate flanges thereon cooperating to form inner and outer hollow cylinders, and an inflatable element interposed between said cylinders for simultaneously moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated.

10. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a support surrounding the shaft and having radial slots and intervening radial guideways formed therein, inner jaws slidably confined within said slots and being inwardly movable into engagement with said shaft to drivingly connect the support to the shaft, outer jaws slidably confined within said guideways and being outwardly swingable into engagement with the interior of said roll to drivingly connect the roll to the support, said jaws having arcuate flanges thereon forming inner and outer hollow cylinders, and an inflatable element between and coating with said flanges to simultaneously move said jaws into driving engagement with said shaft and with said roll whenever the element is inflated.

11. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a support surrounding the shaft and having rigid slots and intervening guideways therein, inner jaws slidably engaging said slots and being inwardly movable into engagement with said shaft to drivingly connect the support to the shaft, outer jaws pivotally suspended from said support and being outwardly movable along said guideways into engagement with the interior of said roll to drivingly connect the roll to the support, each of said jaws having a pair of oppositely directed arcuate flanges thereon forming inner and outer hollow cylinders, an inflatable annular bag interposed between said cylinders for moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and springs coating with said support and with said jaw flanges for releasing the latter when said element is deflated.

12. In a chuck for drivingly connecting a rotary shaft with a hollow roll disposed coaxially of the shaft, a rigid support surrounding the shaft, inner jaws slidably associated with said support and being inwardly movable into engagement with said shaft to drivingly connect the support to the shaft, outer jaws pivotally suspended from said support and being outwardly swingable into engagement with the interior of said roll to drivingly connect the roll to the support, each of said jaws having oppositely directed arcuate flanges cooperating to form inner and outer concentric hollow cylinders, an inflatable annular rubber bag interposed between said cylinders for moving said jaws into driving engagement with said shaft and with said roll whenever the element is inflated, and springs coating with said support and with said jaw flanges for releasing the latter when said element is deflated.

References Cited in the file of this patent

UNITED STATES PATENTS

2,520,126 Collard ------------ Aug. 29, 1950
2,558,055 Meredith ------------ June 26, 1951
2,621,867 Grettie -------------- Dec. 16, 1951