Sept. 21, 1965 L. H. HASKIN, JR., ETAL 3,207,452

WINDING APPARATUS

Filed Nov. 7, 1962 2 Sheets-Sheet 1

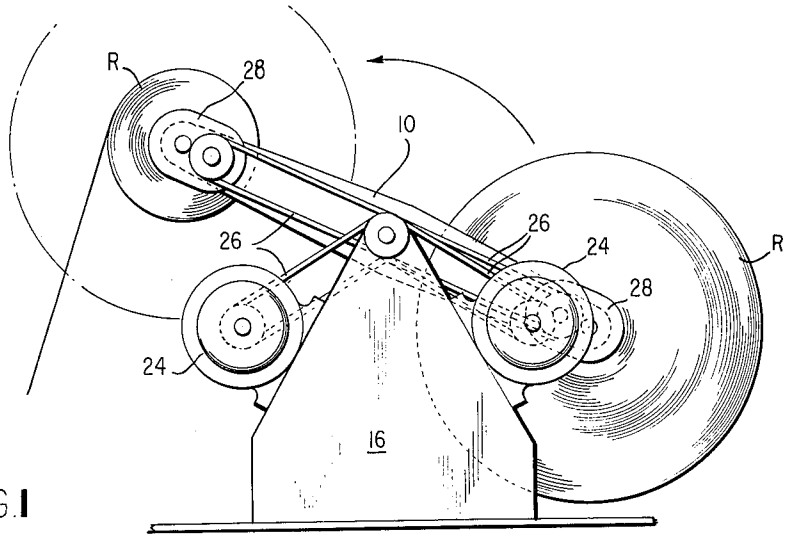

FIG. 1

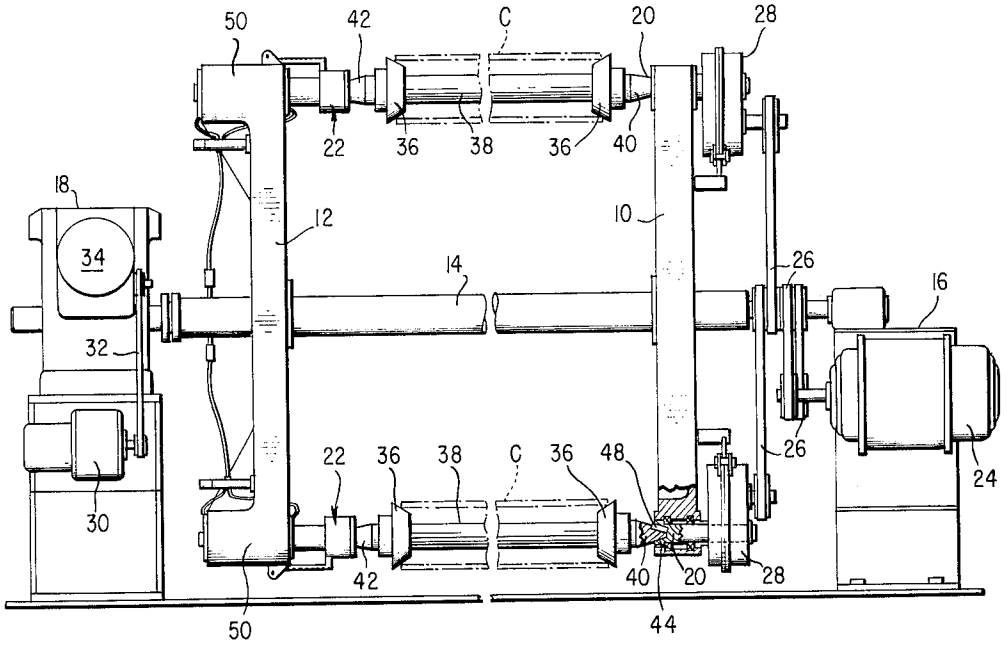

FIG. 2

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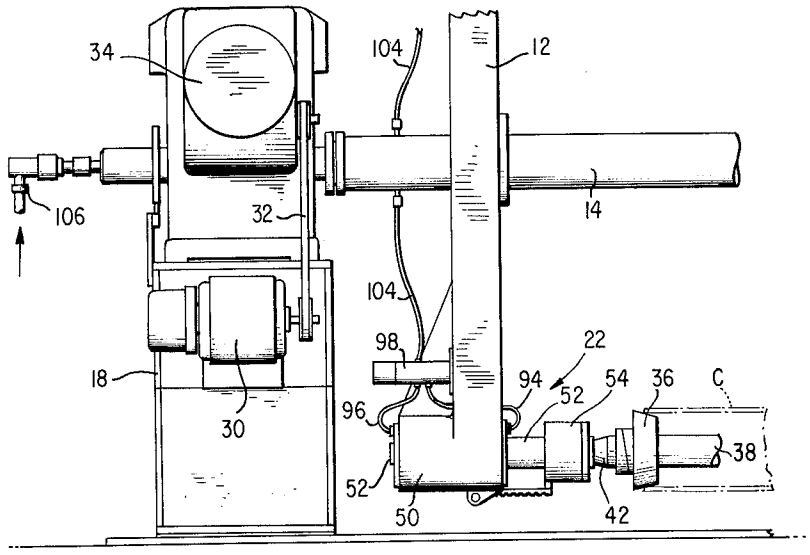
FIG. 3



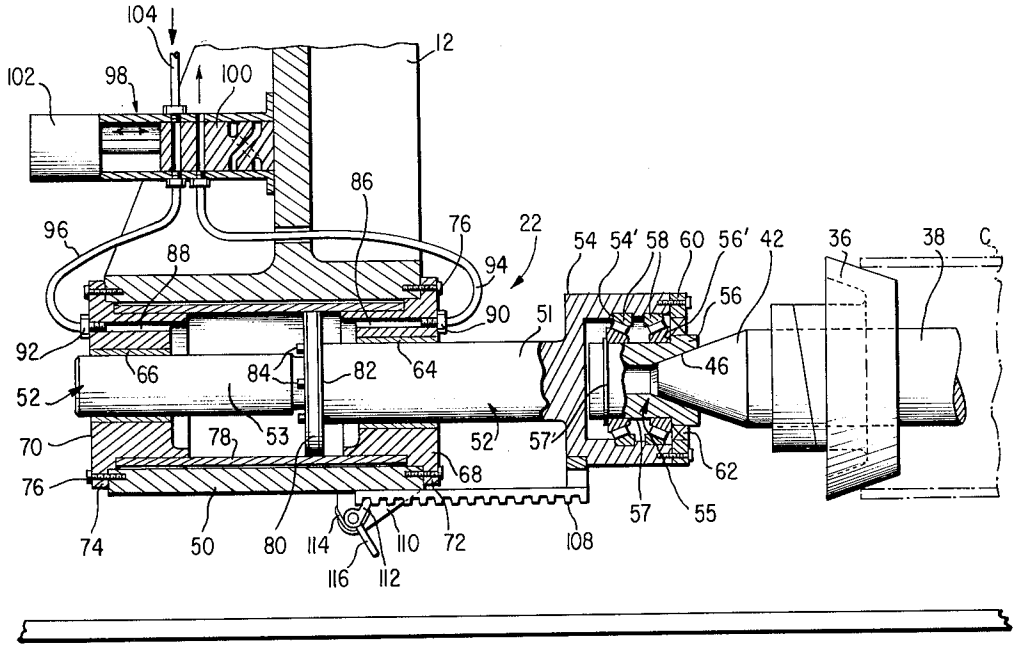


FIG. 4

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WINDING APPARATUS

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5 Claims. (Cl. 242—64)

This invention relates to improvements in turnover roll stands and more particularly to the chuck mechanism for releasably supporting the rolls on the stands.

Turnover roll stands are used for supporting large rolls of web material as the material is unwound for feeding into a machine for operation thereon, or as it is rewound after such operation. These stands comprise a spaced pair of arms centrally supported by a shaft journaled in outer standards. The arms are provided at their ends with chucks for removably supporting rotatively a roll of material therebetween so that as one roll at one end of the arms is in operative position, another roll may be mounted or removed from the other end of the arms, and as soon as the operative roll has been completed its cycle, the arms are turned over or revolved through a limited angle, usually approximately 180°, to place the other roll in operative position.

In roll stands of this type, the chuck elements on one of the arms usually are adapted to be keyed or otherwise secured to a roll and are driven or braked for winding or unwinding the web material, while the chuck elements on the other of the arms is reciprocally movable axially toward and from the other arm to accommodate mounting and dismounting a roll between cooperating chuck elements at the end of the arms. Due to the weight of the rolls, which frequently is more than a ton each, the axially movable chuck elements must be adequately supported with relatively long journals.

In recent times, fluid operated cylinders or servomotors have been employed to move the chuck elements axially to speed up the change-over between rolls. For this purpose, the servomotors have been mounted on the outer sides of the particular arm and in axial alignment with the spindle carrying the chuck element, the piston rod of the motor being connected directly to the outer end of the chuck spindle.

Consequently, the piston rotates with the chuck spindle and is subject to rotational wear that promotes leakage. Moreover, the chucks are retained in operative position only by fluid pressure and the leakage leads to malfunction. Finally, to accommodate the motor between the arm and the adjacent standard, has necessitated spacing the standard outwardly which in turn has required lengthening the central arm supporting shaft. Due to the tremendous weights involved, lengthening the shaft has also required strengthening the shaft and this in turn has caused a substantial increase in costs.

Having in mind the defects of the prior art apparatus, the primary object of the present invention is to provide a turnover roll stand with improved and simplified means for mounting and dismounting rolls upon the roll support arms.

A further and more specific object of the invention is to provide a chuck spindle mounting which is highly compact and simplified in design, very sturdy and durable, economical to manufacture and reliable and efficient in operation.

Another object of the invention is to provide a hydraulically actuated reciprocal chuck and spindle assembly wherein the piston for actuating the spindle is not subject to rotation and the consequent wear thereon.

A still further object of the invention is to provide a reciprocable chuck unit for winding apparatus having

safety lock means to hold the same in the proper extended position while engaging the roll supporting shaft means.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings, wherein like reference characters indicate like parts throughout the several figures and in which:

FIG. 1 is an end view in elevation of a turnover roll stand;

FIG. 2 is a side view in elevation of the roll stand shown in FIG. 1 and incorporating the present invention;

FIG. 3 is an enlarged fragmentary side view in elevation of the roll stand shown in FIG. 2, and embodying the improved means for mounting rolls according to the invention, and

FIG. 4 is an enlarged fragmentary central vertical section, partly in elevation, through the winding roll mounting means.

Referring now in detail to the drawings, specifically to FIGS. 1 and 2, a turnover roll stand may comprise a spaced pair of arms **10** and **12** centrally mounted on a shaft **14** that is journaled in spaced standards **16** and **18**. respectively, beyond the arms. One of the arms **10** has journaled in its ends axially fixed chuck means **20** while the other arm **12** has journaled in its ends axially movable chuck means **22** respectively axially aligned with the chucks **20** for removably supporting rotatively therebetween the cores C of rolls R of web material therebetween. The axes of the cooperative chucks **20, 22** are parellel with the axis of the supporting shaft **14.**

The apparatus shown is adapted for winding as well as unwinding, and has a pair of motors **24** mounted on the standard **16** and respectively connected by belt transmissions **26** and gear reduction units **28** to the chucks **20** for driving said chucks for winding purposes or braking said chucks in unwinding operations. In addition, a motor **30** is mounted on the standard **18** and connected by a belt or chain transmission **32** and gear reduction unit **34** with the central shaft **14** for driving said shaft to turnover the arms **10, 12** when operations are transferred from one roll to another. The foregoing structure is more or less standard.

Usually the chucks **20** and **22** terminate at their inner ends with frusto-conical or similar chuck elements, such as elements **36**, which directly engage the roll cores C. With such an arrangement, the stands are limited to use with rolls of fixed length only and centering the web cannot be effected once the stand is in position. To provide versatility, a pair of chuck elements **36** are removably and adjustably mounted on a shaft **38** having conical ends **40** and **42** engageable in conical sockets **44** (FIG. 2) and **46** (FIG. 4) in the chucks **20** and **22**, the end **40** and chuck **20** being rotatively fixed by a key **48** in the socket **46**. Thus, a core C can be accurately centered on its shaft **38** regardless of variation in length of the core or width of the web.

The present invention is more specifically directed to the reciprocal chucks **22** which are respectively mounted in journals **50** at the ends of the arm **12**. As best shown in FIG. 4, each reciprocable chuck unit **22** comprises a spindle **52** provided at its inner end with an enlarged tubular head **54**, integral therewith. Housed within the head **54** rotatably is a chuck element **55** including a head portion **56** containing the socket **46** and a reduced shaft portion **57** fitted in frictionless bearings **58** which are secured against a shoulder **56'** on the head portion **56** by a snap ring **57'** on the shaft portion. The frictionless bearings **58** are secured within the bore of head **54** against a

shoulder 54' by an end cover ring or cover plate 60, detachably rigidly secured to the head 54. A lubricant seal 62 is disposed between the ring 60 and chuck head portion 56. Thus, the chuck element 55 is freely journaled in the spindle head 54 for rotation independently thereof.

The spindle 52 extends axially through the journal 50 centrally thereof, and is slidably mounted for reciprocation in spaced bushings 64 and 66, secured fixedly within the bores of cylinder heads 68 and 70 which have outer flanges 72 and 74 integral therewith, and are detachably rigidly secured to the ends of journal 50 by screws 76. A tubular cylinder body 78 is disposed bodily within the bore of journal 50, with opposite end portions thereof telescoped over reduced portions of heads 68 and 70 and rigidly clamped between the cylinder heads in a fluid tight manner. The periphery of the cylinder body may be spaced slightly from the bore of the journal.

The spindle 52 includes a larger inner end portion 51 slidable in the bushing 64 and supporting the head 54, and a smaller outer end portion 53 slidable in the bushing 66, a shoulder 82 separating the two portions. A piston 80 is fitted over the smaller portion 53 of the spindle and rigidly secured to the shoulder 82 by screws 84, and has a sliding fluid tight engagement within the bore of cylinder body 78 for reciprocation therein between the cylinder heads 68 and 70.

The heads 68 and 70 have longitudinal ports 86 and 88 therethrough, communicating at their inner ends with the interior of cylinder body 78. The outer ends of ports 86 and 88 receive fluid fittings 90 and 92, connected with fluid lines 94 and 96 leading to a conventional transfer valve 98 which, for purposes of illustration, is shown diagrammatically as having a reciprocable valve element 100 operated by a solenoid 102 or the like. A fluid inlet line 104 leads into the valve 98 and extends to a passage in the central shaft 14 and which is connected by an end fitting 106 (FIG. 3) with a source of fluid under pressure in a conventional manner.

The valve element 100 is ported internally as illustrated, for example, in FIG. 4 so that in one position thereof fluid under pressure from the inlet line 104 passes to and through the line 96 and port 88 to one side of the piston 80 to urge the piston and spindle 52 to the right toward coupling engagement. Fluid is simultaneously exhausted from the cylinder through port 86 and line 94. When valve element 100 is shifted to the left by solenoid 102, fluid from the line 104 will enter the cylinder body 78 on the opposite side of piston 80 through line 94 and port 86, and simultaneously be exhausted through port 88 and line 96. At this time, piston 80 and chuck spindle 52 shifts to the left or away from coupling engagement, and the chuck unit releases the roll.

In order to assure that the chuck unit 22 maintains positive engagement with the roll R when required, the chuck unit is provided with a safety lock comprising a longitudinal rack bar 108 rigid with the head 54 and slidable along journal 50 through a guide bracket 110 thereon. A pawl 112, pivoted on bracket 110, is biased into engagement with the teeth of rack bar 108 by a spring 114, and this pawl trips over these teeth when the spindle 52 is extended toward the roll R. The pawl prevents retrograde movement of the spindle 52 by engagement with a particular tooth of the rack bar until the pawl is manually released by a lever 116. Moreover, the sliding fit of the bar 108 in the bracket 110 positively prevents angular movement of the spindle 52 and piston 80.

As is now apparent, the invention provides a simplified construction wherein the reciprocable cylinder-piston means for chuck unit 22 is integrated with and fully enclosed by the support arm journal 50. The two spaced bushings 64 and 66 in the cylinder heads provides even greater support for the chuck spindle than the usual single journal. The construction is very strong and durable and is highly compact which enables closer spacing between the arm 12 and the adjacent standard 18 and consequent reduction in the main shaft 14. Only the head 54 of the chuck unit is disposed externally of the support arm journal 50 with the other parts arranged within the journal, and the rotational support of the chuck element 55 by the spindle head 54 avoids rotary wear on the spindle 52 which, in fact, is precluded by the rack 108. In essence, by means of the invention, the integral journal serves a dual function in the organization for supporting and journaling the roll and for housing and supporting the cylinder-piston means without the necessity of an external attachment for such means on the support arm or journal as has been customary.

Although a certain specific embodiment of the invention has been shown and described, it is obvious that many modifications thereof are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

That which is claimed is:

1. In an apparatus for winding and unwinding sheet material and including spaced companion supports, an axle journaled in the supports and a pair of web roll carrying arms mounted on said axle for rotation; the improvement comprising a housing provided at the end of one of said arms and arranged transversely thereof and parallel with the axle, said housing having open ends, head members removably secured to and closing off said open housing ends and having axially aligned center openings, a spindle slidably disposed coaxially in the housing and sealingly and slidably extending through the openings in the head members, a piston provided on the spindle and sealingly slidable in the housing, said head members having ports formed therethrough and communicating at their inner ends with the interior of the housing on opposite sides of the piston, fluid lines communicating with the ports at their outer ends for the introduction into and removal from of pressure fluid in the housing to act on opposite faces of the piston, control means carried by the arm for controlling the flow of fluid in the lines, said spindle having an enlarged end extending beyond the housing and located between the supports, said spindle end having a cavity, a chuck element rotatably mounted in said cavity, means for rotatably mounting the chuck element in the cavity, a removable cover plate closing off the cavity and having an opening through which the chuck element rotatably extends to clampingly engage one end of a roll of sheet material.

2. In an apparatus for winding and unwinding sheet material and including spaced companion supports, an axle journaled in the supports and a pair of web roll carrying arms rotatably mounted on said axle; the improvement comprising a housing provided at the end of one of said arms and arranged transversely thereof and parallel with the axle, said housing having open ends, head members removably secured to and closing off said ends and having axially aligned center openings, a spindle slidably disposed coaxially in the housing and sealingly and slidably extending through the openings in the head members, a piston provided on the spindle and sealingly slidable in the housing, said head members having ports formed therethrough and communicating at their inner ends with the interior of the housing on opposite sides of the piston, fluid lines communicating with the ports at their outer ends for the introduction into and removal from of pressure fluid in the housing to act on opposite faces of the piston, control means carried by the arm for controlling the flow of fluid in the lines, said spindle having an end extending beyond the housing and located between the supports, a chuck element rotatably mounted on the spindle end for clamping engagement with one end of a roll of sheet material and means directly connected between the housing and the spindle to releasably lock the spindle in a selective extended position and to prevent relative rotation between the spindle and the housing.

3. The combination of claim 2, wherein said last named means includes a toothed rack bar secured to the spindle longitudinally thereof and movable therewith longitudinally of the housing, bracket means carried by the housing, and a spring urged escapement pawl supported by said bracket means and adapted to ride over the teeth of the rack bar during extension of the spindle and positively lock the same against retrograde movement through engagement of the pawl with one of the teeth of said rack bar, said bracket means defining a guide slidably receiving said rack bar to retain the spindle against rotary movement relative to the housing .

4. The combination of claim 2, wherein a tubular cylinder body is sleeve fitted in the housing and held in place by the head members and against which the piston slidably and sealingly bears so that the cylinder body and head members constitute a removable fluid cylinder in the housing.

5. In an apparatus for winding and unwinding sheet material and including spaced companion supports, an axle journaled in the supports and a pair of web roll carrying arms mounted on said axle for rotation; the improvement comprising a housing provided at the end of one of said arms and arranged transversely thereof and parallel with the axle, said housing having inner and outer open ends, a tubular cylinder body sleeve fitted in the housing, inner and outer head members removably secured to and closing off said open housing ends and engaging the tubular cylinder body to hold it in place, said tubular cylinder body and the head members constituting a removable fluid cylinder in the housing, the head members having aligned central openings, a piston disposed within the

cylinder body and sealingly and slidably engaging the inner wall thereof, a spindle carrying the piston and sealingly and slidably extending through the openings in the head members and having an outer end beyond the inner head member, said head members having ports formed therethrough and communicating at their inner ends with the interior of the cylinder body on opposite faces of the piston, fluid lines communicating with the ports at their outer ends for the introduction into and removal from of pressure fluid in the cylinder body to act on opposite faces of the piston, control means carried by the arm for controlling the flow of fluid in the lines, a chuck element rotatably mounted on the outer end of the spindle for clamping engagement with one end of a roll of sheet material and means directly connected between the housing and the spindle to prevent relative rotation between the piston and the housing.

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