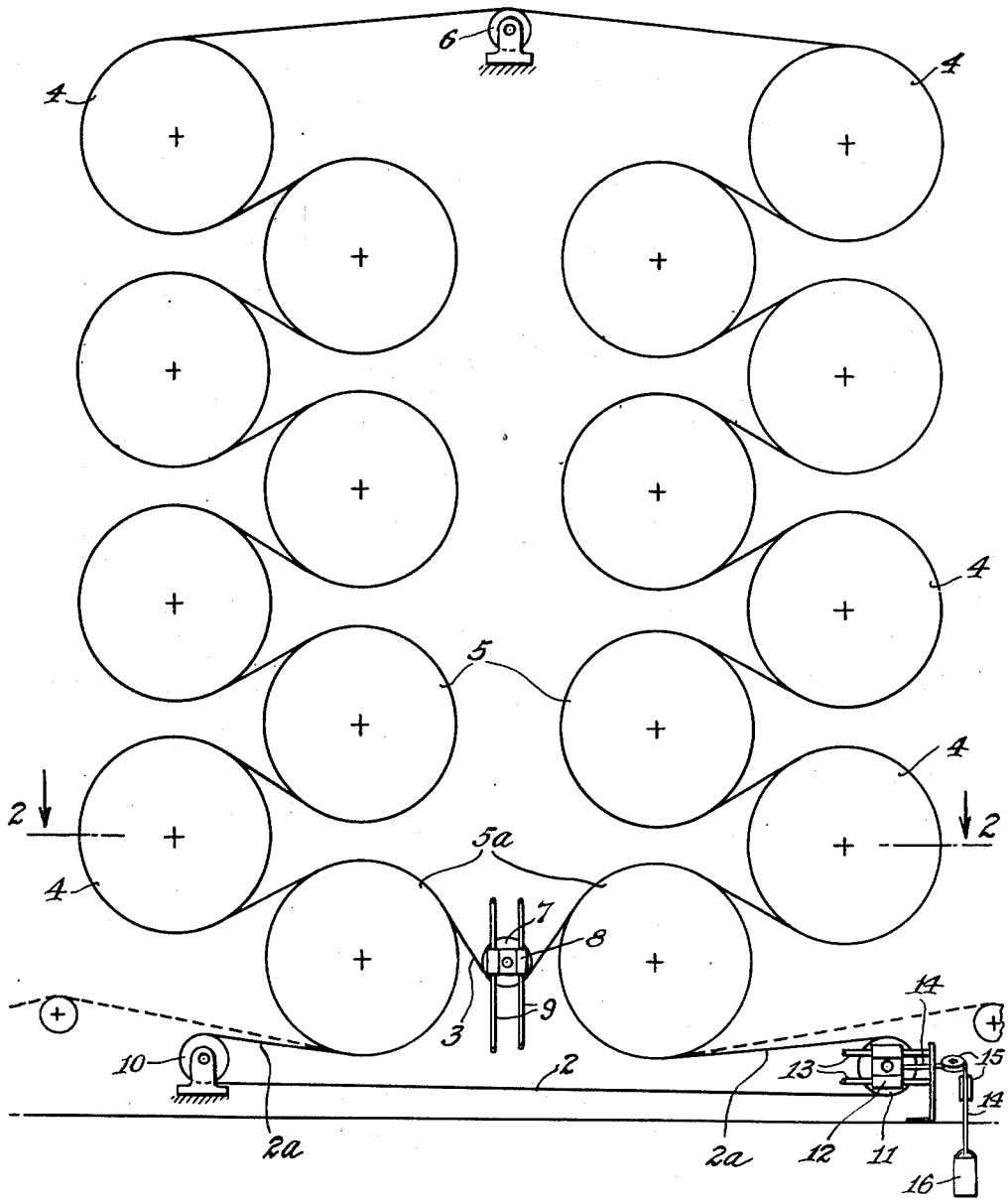
June 24, 1952 T. L. COLEMAN 2,601,502

CARRIER APPARATUS FOR PAPER DRIERS

Filed Feb. 4, 1950 2 SHEETS—SHEET 1

Fig. 1.



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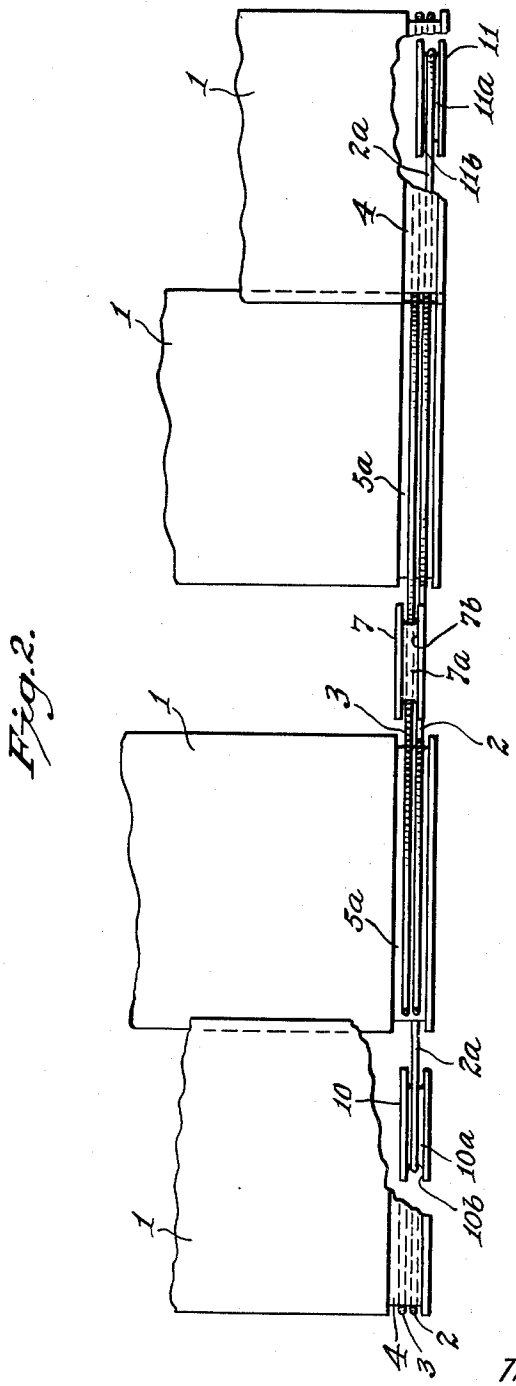


Fig. 2.

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CARRIER APPARATUS FOR PAPER DRIERS

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5 Claims. (Cl. 34—120)

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This invention relates to a paper dryer, paper web carrier of the type used for facilitating the threading, through the dryer, of the advancing end of the paper web.

A paper dryer, of the type used at the dry end of a paper making machine, conventionally includes a plurality of mutually spaced and parallel, heated drying cylinders journaled by a frame holding them in the form of a deck of cylinders. The paper web passes sinuously back and forth so it wraps or loops oppositely around the respective cylinders which heat and thus dry the paper web.

The cylinders are rotatively powered to turn in the proper directions to keep the paper web moving continuously through the deck of cylinders. Usually a plurality of these decks are required to adequately dry the paper web, the decks being arranged in succession so that the paper web travels through them continuously. Plant space limitations sometimes result in the various decks being arranged in upstanding positions to form a more compact assembly.

A paper drying machine having such upstanding decks of drying cylinders is particularly difficult to thread with the advancing end of the paper web. An uneconomical amount of time is lost when such a dryer is threaded by manually handing the advancing end of the paper web back and forth around the respective drying cylinders. Paper web carrier equipment or a so-called rope carrier may be used to aid in this threading.

Such rope carrier apparatus is applied to the paper dryer by providing peripheral rope seats at the ends of the various drying cylinders. These seats are radially aligned mutually throughout all of the decks. A pair of endless ropes are reeved around the seats of the cylinders of all the decks in the manner the paper web travels around the cylinders. With this arrangement the advancing end of the paper web may be formed into a nose-piece projecting laterally from the paper web and which is nipped between the two ropes at the entering end of the dryer, so that the ropes pull the advancing end and thus thread the web through the paper dryer. The seats are connected to turn with the various rotatively powered drying drums, and these seats may be proportioned in diameter so that the paper web is fed at the peripheral speeds of the cylinders. Sheaves are used to spread the ropes apart at the entrance and exit of the dryer, so that the paper web nose-piece may be initially nipped between the ropes and

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then removed after the threading. Sheaves are also used to tension the ropes properly. These sheaves are movable and are biased to deflect the ropes and thus maintain the proper tension on them.

Although a system of the above nature facilitates threading of the paper dryer, its operation and maintenance has heretofore been troublesome. Accessible loading and unloading stations and proper tensioning have been obtained, by prior art designs, only by using an excessive number of sheaves and excessive lengths of rope. Prior art arrangements require one or more of the sheaves to be angularly related radially respecting the rope seats. Practical requirements necessitate attachment of the carrier rope seats directly to the drying cylinders. Therefore, the carrier rope system must work continuously during the operation of the dryer, even though only needed during threading. The described angular sheave arrangement forces the ropes to bear continuously against the groove sides of the sheaves, thus causing excessive rope wear. Replacement of the ropes requires stopping of the entire paper making machine, which greatly reduces its over-all productivity and increases the paper-making costs.

A particularly troublesome feature of prior art designs arises from the fact that at the unloading station or exiting point of the system the two ropes are spread apart by being respectively passed oppositely around two oppositely positioned sheaves. Space limitations require these sheaves to be positioned very closely together. Therefore, undue difficulties are encountered in spearing off the nose-piece of the paper web as it leaves the dryer. Workmen are frequently compelled to reach in with their hands to free the paper web from the ropes at this location, and this is extremely hazardous because of the two oppositely rotating and closely spaced sheaves at this location.

Periodic lubrication of the excessive number of sheaves, required by prior art systems, results in an excessive maintenance cost. This is added to the rope replacement costs. The prior art requirement that certain of the sheaves be angularly related, requires, in these instances, angularly adjustable sheave mounting brackets, and these are a constant source of irritation because they easily get out of adjustment and their readjustment is difficult and time consuming.

The present invention was conceived and developed with the general objective of eliminating or reducing all of these operational and main-

tenance troubles inherent to the prior art arrangements. Specifically speaking, the objects are to reduce the number of sheaves formerly required, to reduce the excessive wear to which the ropes were previously subjected, to reduce the necessary lengths of the ropes, to eliminate the need for angularly adjustable sheaves, to permit the advancing paper web end to be more easily speared from the carrier ropes as this end exits from the dryer, and to avoid the need for using the two oppositely spaced sheaves at the exit end of the system and thereby eliminate the hazards incidental to this arrangement. Other objects may be inferred from the following disclosure.

A specific example of a paper dryer web carrier incorporating the present invention, is described hereinbelow with the aid of the accompanying drawings. This is for the purpose of disclosing the principles and operation of the invention. Once these principles and operation are understood they may be incorporated in forms other than those used in the case of this specific example. The manner of making this specific example presents no problems to those skilled in the art once the principles and operation of the invention are understood.

These accompanying drawings are generally schematic in character. They illustrate the invention with many unrelated parts unillustrated. This is desirable because it clarifies and emphasizes the features of the invention.

In these drawings:

Fig. 1 is a side view or elevation of the device.

Fig. 2 is a plan taken on the line 2—2 in Fig. 1.

These drawings show by Fig. 2 that each of the various heated and rotatively powered drying cylinders 1 is provided at one end with a peripheral seat for a set of carrier strands, provided by a pair of ropes 2 and 3. Each seat is numbered 4 or 5 as hereinafter explained and is provided, as illustrated, by an extension rigidly connected to or formed on the end of the cylinder with this seat bounded by radial flanges between which the ropes ride on the seats. The seats are shown as having cylindrical shapes. All of the various seats are radially aligned mutually throughout the entire dryer.

In Fig. 1 only the seats are illustrated it being understood that in each instance a drying cylinder is behind the seat. Therefore, Fig. 1 shows that the cylinders and their respective carrier rope seats are arranged as four successive upstanding decks respectively positioned with the outer two decks offset upwardly from the inner two decks. In the drawings the seats of the outer two, upwardly offset, decks are numbered 4 and the seats of the inner two decks are numbered 5. As previously mentioned, all of the seats are radially aligned mutually throughout all of the decks.

Although unillustrated, it is to be understood that the various cylinders, carrying their respective seats, are journaled by bearings and are rotatively driven properly to carry the paper web through the device continuously. The usual dryer frame may mount the various bearings required to position the cylinders.

As is also shown by Fig. 1, the pair of carrier ropes 2 and 3 are reeved downwardly around the seats of the cylinders of all the decks in the manner the paper web travels around the cylinders. Respecting the longitudinal center line of the dryer, the rope 2 is the outside rope and the rope 3 is the inside rope, as is shown by Fig. 2. At the top of the device both carrier ropes span the tops of the seats 4 of the top cylinders of the two outer decks, and it is from these seats that the two ropes are reeved downwardly around the seats of the other cylinders. The central portions of the ropes spanning the tops of the seats 4, of the two top cylinders, are supported against sagging by a sheave 6. This sheave may have journals solidly mounted by bearings which are solidly mounted by the dryer frame. But when this sheave is used it should be radially aligned mutually with the seats of the various cylinders and its axis should be parallel to the axes of these seats. This sheave 6 may be primarily a supporter.

The paper web enters and exits from the bottom of the dryer. Therefore, it is here that the two ropes 2 and 3 must be separated to permit the connection and disconnection of the paper web nose-piece respecting the ropes.

According to the present invention, a sheave 7 is shown journaled between and downwardly offset from the tops of the seats 5 of the bottom cylinders of the two inner decks. These seats are numeraled 5*a* to identify them in particular. This sheave 7 is mounted to move vertically between the seats 5*a*. Thus it is illustrated as being journaled by a bracket 8 that vertically reciprocates on guide bars 9 which may be rigidly mounted on the usual dryer frame or the floor. The weight of the sheave 7 and its bracket 8 serve to downwardly bias the sheave 7.

The inside rope 3 is arranged to span the tops of the bottom-cylinder seats 5*a* and is bent around or looped under and deflected by the sheave 7. This rope 3 does not wrap downwardly around the seats 5*a* so as to extend oppositely from their lower portions. This rope 3 may be made very short because it is only required to go around the various seats above the seat 5*a*, in the usual fashion, and at the seats 5*a* it directly spans therebetween with the only excess necessary being that required to loop downwardly so it partially wraps under the sheave 7. The downward gravitational bias on this sheave 7 serves to properly tension the rope. Other biasing force may be used.

The other of the ropes, the outside rope 2 in this instance, is bent or wrapped downwardly around the bottom cylinder seats 5*a* and extended as a loop portion outwardly from the bottoms thereof in opposite directions.

Sheaves 10 and 11 are journaled outwardly beyond each of the bottom-cylinder seats 5*a*. The sheave 10 is journaled outwardly beyond the left-hand one of the seats 5*a*, in Fig. 1, while the sheave 11 is journaled beyond the right-hand bottom-cylinder seat 5*a*.

With the above sheave arrangement the rope 2 is looped directly around the sheaves 10 and 11. Therefore, the rope 2 extends outwardly from the bottoms of the two seats 5*a*, in opposite directions, and spans to the tops of the two sheaves 10 and 11, the rope 2 being bent around these two sheaves 10 and 11 and being spanned between their respective bottoms.

One of the sheaves 10 and 11, the sheave 11 in this instance, is mounted to move horizontally. This is done, in this instance, by the sheave 11 being journaled by a bracket 12 that horizontally slides on horizontal guide bars 13 which may be solidly mounted. This sheave 11 is horizontally biased to move to tension the strand 2. As shown in Fig. 1, this is done by connecting the sheave mounting bracket 12 with a tension rope

14 which extends around pulleys 15 so it is directed downwardly to a weight 16 with which the rope 14 connects. This continuously applies a pull to the bracket 12 in the right-hand direction as the arrangement is seen in Fig. 1. Here also other types of force may be used to properly bias this sheave 11.

The sheave 10 is solidly mounted and does not require any adjustment whatsoever. None of the sheaves 6, 7, 10 and 11 require any angular adjustment.

As can be appreciated from Fig. 2, the sheave 7 is made in the usual fashion of a rope sheave to provide a rope seat 7*a*. This sheave 7 is arranged so that this rope seat 7*a* is radially aligned and parallel with the inside rope 3. Therefore, there is no angular deflection of this rope such as might cause it to bear against its flanges, marked 7*b*, which bound its seat 7*a*.

The rope 3 runs truly in a single vertical flat plane at all times and the sheave seat 7*a* is radially aligned parallel with this plane.

Likewise, the sheaves 10 and 11 respectively provide rope seats 10*a* and 11*a* also bounded, respectively, by the usual sheave flanges 10*b* and 11*b*. In each instance the carrier seats 10*a* and 11*a* are radially aligned with the outside rope 2. Therefore, in this instance also, there is no angularity between the sheaves and the rope such as might cause the rope 2 to be forced against either the flanges 10*b* or 11*b* of the respective sheaves 10 and 11. The seats 10*a* and 11*a* and the rope 2 are all truly aligned in the same flat vertical plane throughout the entire dryer.

This rope 2 runs always in a single flat vertical plane parallel to the plane of the rope 3. Both of the sheaves 10 and 11 are radially aligned parallel with this plane. The sheaves 10 and 11 are respectively positioned far enough outwardly from the two bottom-cylinder seats 5*a* to be manually accessible. This forms short spans 2*a* in the rope 2 which may be used at the exit and entering points of the dryer.

Note that all the tensioning motion of the sheaves 7 and 11 is in each instance in and parallel with the planes of the respective ropes 3 and 2.

The paper web nose-piece may be curled around the rope 2 at one of these spans 2*a* and carried thereby in and under the corresponding one of the seats 5*a* and then upwardly until the nose-piece is nipped by the rope 3 so that the two ropes carry the nose-piece on through the dryer and, therefore, thread the advancing end of the paper web.

At the exit end the nose-piece may be easily speared from the other span 2*a*. There is nothing to get in the way at this location. If it is necessary to manually remove the nose-piece, or to otherwise handle it, no hazards are presented. There is only the one sheave, and the rope travels over and downwardly around this sheave so that all dangerous hazards are eliminated.

It may now be appreciated that the example described by the foregoing and illustrated by the accompanying drawings fully attains all of the objects previously stated.

I claim:

1. In a paper dryer having a plurality of upstanding decks of drying cylinders with each cylinder provided at one end with a seat for a set of carrier strands and with all of said seats mutually aligned radially, a set of endless carrier strands arranged with each strand lying in a flat vertical plane throughout its entire extent, said strands being arranged to span

the tops of the seats of the top cylinders of said decks and to reeve downwardly around the seats of the cylinders, in the manner in which the paper web travels around the cylinders, to the tops of the bottom-cylinder seats, one of said strands being arranged to form a span between the tops of said bottom-cylinder seats and a sheave radially aligned with said span and mounted for radial movement in the flat plane of said one of the strands and means biasing said sheave to move it to engage and deflect said span and thus tension said one of the strands, the other of said strands being bent further around and under said bottom-cylinder seats and having a loop portion, and sheaves radially aligned with the flat plane of said other strand mounted to engage and stretch said loop portion horizontally so its opposite loop ends extend outwardly beyond said bottom-cylinder seats, one of said second-named sheaves being mounted for radial movement in the flat plane of said other strand and means biasing said last-named sheave to stretch said loop portion and thus tension said other of the strands.

2. In a paper dryer having a plurality of decks of drying cylinders including entry and exit cylinders spaced transversely of said decks having carrier strand seats, a pair of carrier strands of different lengths arranged with each strand lying in a flat plane throughout its entire extent, said strands being reeved around said seats throughout major portions of said decks and the shorter of said strands being spanned together between two of said seats which are spaced transversely respecting said decks on the entry and exit cylinders, a sheave movably mounted for movement radially of itself in the plane of said shorter strand and engaging said shorter strand radially between the seats on said entry and exit cylinders, a biasing means urging said sheave into tensioning engagement with said shorter strand, the other strand being continued and bent oppositely around said seats on the entry and exit cylinders to a greater extent than said shorter strand and formed into a loop therebeyond a second sheave movably mounted for movement radially of itself adjacent said loop in the plane of said other strand and engaging said other strand radially in said loop and a second biasing means urging said second sheave into tensioning engagement with said other strand.

3. In a paper dryer having a plurality of decks of drying cylinders having carrier strand seats, a set of carrier strands arranged with each strand lying in a flat plane throughout its entire extent, said strands being reeved around said seats throughout major portions of said decks and one of said strands being spanned together between two of said seats which are spaced transversely respecting said decks adjacent the ends of said decks and the other strand being continued and bent oppositely around said seats which are spaced transversely respecting said decks adjacent the ends of said decks and formed into a loop therebeyond which is elongated transversely respecting said decks, a pair of tensioning sheaves each of which is arranged in radial parallel alignment with the flat plane in which one of the strands lies and is movably mounted in said plane and biased to engage and deflect and tension the strands, one sheave engaging one strand in said loop and the other engaging the other strand where it spans said seats adjacent the ends of said decks.

4. In a paper dryer having a plurality of decks of drying cylinders having carrier strand seats, a set of carrier strands arranged with each strand lying in a flat plane throughout its entire extent, said strands being reeved around said seats throughout major portions of said decks and one of said strands being spanned together between two of said seats which are spaced transversely respecting said decks adjacent the ends of said decks and the other strand being continued and bent oppositely around said seats which are spaced transversely respecting said decks and adjacent the ends of said decks and formed into a loop therebeyond which is elongated transversely respecting said decks, a pair of guiding sheaves each of which is arranged in radial parallel alignment with the flat plane in which one of the strands lies, one sheave engaging one strand in said loop and the other engaging the other strand where it spans said seats adjacent the ends of said decks.

5. In a paper dryer having four upstanding decks of drying cylinders arranged with the outer two decks offset upwardly from the inner two decks and with each cylinder provided at one end with a seat for a set of carrier strands and with all of said seats mutually parallel and aligned radially, a set of endless carrier strands arranged with each strand lying in a flat vertical plane throughout its entire extent, said strands being arranged to span the tops of the seats of the top cylinders of the outer two decks and to reeve downwardly around the seats of all the cylinders, in the manner the paper web travels,

to the tops of the seats of the bottom cylinders of the two inner decks, one of said strands being arranged to form a span between the tops of said bottom-cylinder seats and a sheave radially aligned parallel with said span and mounted for radial movement in the flat plane of said one of the strands and means biasing said sheave to move it to engage and deflect said span and thus tension said one of the strands, the other of said strands being bent further around and under said bottom-cylinder seats and having a loop portion, and sheaves radially aligned parallel with the flat plane of said other strand and mounted to engage and stretch said loop portion horizontally to its opposite loop ends extend outwardly beyond said bottom-cylinder seats, one of said second-named sheaves being mounted for radial movement in the flat plane of said other strand and means biasing said last-named sheave to stretch said loop portion and thus tension said other of the strands.

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