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SLEEVE AND ROLL ASSEMBLY

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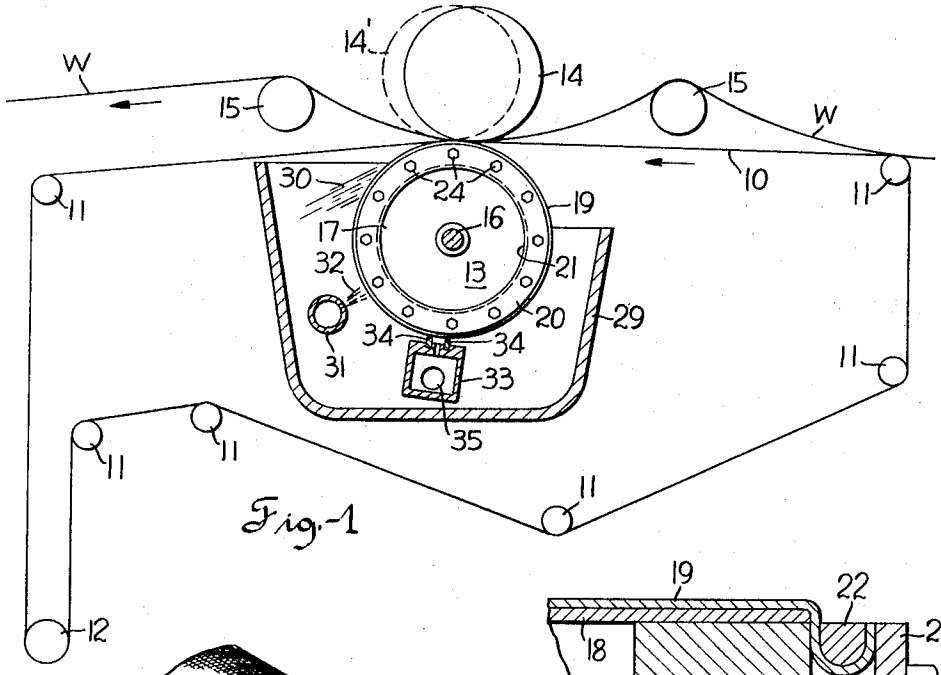


Fig. 1

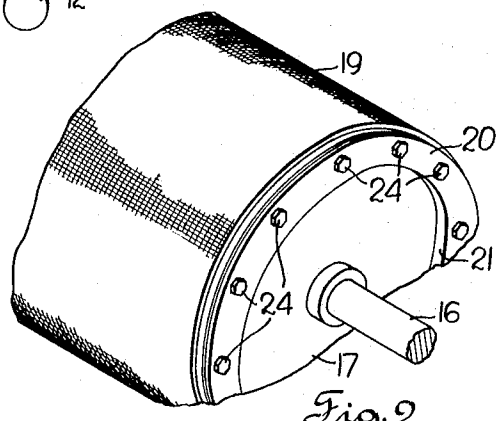


Fig. 2

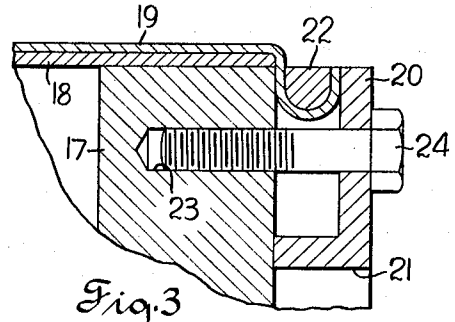


Fig. 3

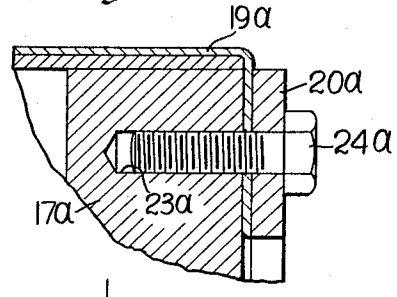


Fig. 5

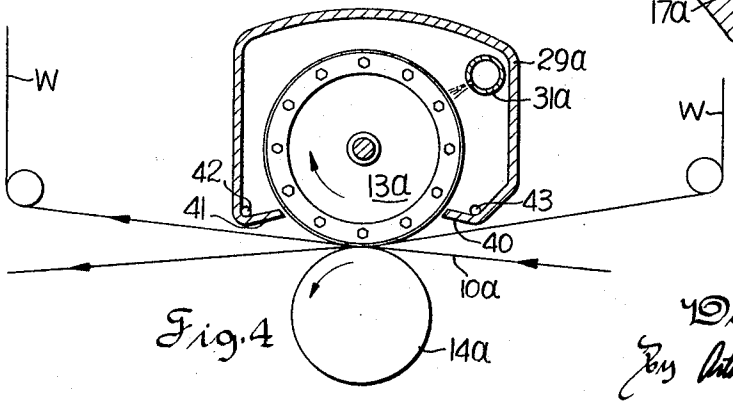


Fig. 4

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SLEEVE AND ROLL ASSEMBLY

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4 Claims. (Cl. 100—121)

This is a continuation of application Ser. No. 371,532 filed June 1, 1964.

This invention relates to the art of making paper and in particular to a portion of paper making apparatus called a press assembly. The function of the press assembly is to dewater a wet paper web that has been formed by a Fourdrinier, cylinder or other paper forming units.

Press assemblies according to popular prior art techniques usually provide an endless flat band for supporting the wet web and carrying it between a plain smooth surface roll and a suction roll. The suction roll is provided with a perforated revolving shell having a localized suction area within the roll. As the supporting felt carries the wet web between the rolls the web is squeezed by the rolls and subjected to suction through the perforations of the suction roll. Water squeezed and drawn from the web is sucked into the perforations in the suction roll with some water being drawn inwardly through the shell while some water is merely held in the perforations until the shell revolves beyond the suction area. Beyond the suction area water in the perforations is thrown outwardly by centrifugal force and caught in a drain pan assembly called a save-all. Several such dewatering stages are usually provided before the web is delivered to dryers.

A vacuum pump and such connections as are necessary to draw the suction for the perforated roll obviously represents an initial capital investment and a continuous operating cost. The perforated roll likewise is an expensive piece of equipment that while it does have a reasonably long useful life, it does have to be replaced from time to time and therefore results in a substantial reoccurring cost. It is accordingly a principal object of the present invention to provide a dewatering system that eliminates or at least substantially reduces one or both of the aforesaid costs.

Another object of the present invention is to provide a relatively inexpensive roll with an inexpensive, easily fitted, absorbent sleeve for such uses as may be exemplified by arranging such a jacketed roll with a plain roll to provide a web dewatering assembly without the need to provide a suction area within the jacketed roll.

Still another object of the present invention is to provide an inexpensive adsorbent sleeve that may be easily shrunk about and secured to a cylindrical roll.

These and other objects of the present invention and how they are attained will appear from the following description of the invention with reference to the drawing in which:

FIG. 1 is diagrammatical view of a press assembly according to this invention including a dewatering roll below a web and cooperating top roll, and an adsorbent sleeve fitted jacketing the dewatering roll;

FIG. 2 is a fragmentary perspective view of a dewatering roll as shown in FIG. 1;

FIG. 3 is an enlarged fragmentary cross sectional view of one end portion of a roll and sleeve according to this invention;

FIG. 4 is a diagrammatical view of an alternative arrangement of a press assembly according to this invention in which the jacketed dewatering roll is above a web; and

FIG. 5 is an enlarged fragmentary cross sectional view of an alternative end construction of a roll and sleeve according to this invention.

In FIG. 1 the reference numeral **10** designates an adsorbent carrier band such as a felt looped around guide rolls **11** and under a tensioning roll **12**. The upper run of the felt **10** conveys a web W through the nip of a press roll assembly comprising a dewatering roll **13** and a top roll **14** cooperating with the roll **13**. The web W is preferably raised off of the felt **10** and directed over lifting rolls **15** before and after the web and felt pass through the nip of the press roll assembly.

The dewatering roll **13** may be a built-up structure in which a shaft **16** carries a pair of axially spaced heads **17** and a shell **18** that is secured to the outer periphery of the heads **17**.

A sleeve **19**, woven of snythetic fibers or blends of synthetic and natural fibers (which will be described later) is shrunk tightly around the shell **18** to provide a jacket for the roll. End portions of the sleeve **19** are secured in a manner that will be described with reference to FIG. 3 and 5.

As shown in FIG. 3, an annular clamp **20** is provided with a cylindrical lip **21** that engages the outwardly facing surface of head **17**. A ring **22** is arranged between head **17** and clamp **20**, radially outward of lip **21**. The end portion of sleeve **19** is arranged both between head **17** and ring **22**, and also between ring **22** and clamp **20**. Head **17** is bored at a number of locations and the bores **23** are threaded to receive bolts **24**. Turning bolts **24** into the threaded bores causes the outer periphery of clamp **20** to bend toward head **17** and securely grip the end portion of the sleeve **19**.

In the alternative arrangement shown in FIG. 5, an annular clamp **20***a* is provided without the lip **21** shown in FIG. 3. As shown in FIG. 5, bolts such as **24***a* pass through a folded portion of sleeve **19***a* and into bores **23***a* in a head **17***a*.

In making sleeve **19** according to this invention, a wide variety of synthetic thermoplastic fibers, filaments or blends of natural and synthetic fibers or filaments may be employed in the process as long as the synthetic fibers are capable of being shrunk and taking and retaining a set at a temperature above that ordinarily encountered in pressing a web. Among the fibers having such qualities are fibers known as Dacron, nylon, dynel, Orlon and the like.

Dacron is a synthetic polyester fiber made by the condensation of dimethyl terephthalate and ethylene glycol; dynel is a synthetic fiber made by the copolymerization of, for example, 40% acrylonitrile and 60% vinyl chloride; nylon is a term applied to a series of fibers made of polyamide resins typically formed by the polymerization of a hexamethylenediamine salt of adipic acid; while Orlon is a synthetic fiber made principally from polyacrylonitrile.

The synthetic fibers enumerated are often supplied by the manufacturers in the form of staple fibers to resemble a natural wool fiber. Such fibers may be straight length fibers or crimped, curled or spiraled to more nearly approximate the natural wool fibers they replace and the fibers can be lustrous, dull or semidull in appearance.

Also Dacron, nylon, Orlon and certain other thermoplastic synthetic materials are supplied as monofilament fibers or in multiple filament yarn form. These materials may be employed in making sleeve **19** in the supplied

form or they can be textured or bulked prior to weaving. The term fibers as used in the claims is meant to include materials in any of these forms.

While there are a large number of synthetic fibers which may be employed satisfactorily in making sleeves in accordance with the teaching of this invention, the preferred fibers are Dacron or nylon as they have been found to be the most durable. The Dacron or nylon or a combination of these fibers can be used in both the warp and the filling yarns, or one of the fibers can be used in the warp and the other in the filling or monofilament strands may be woven plain, i.e., over and under similar strands at 90 degrees thereto to provide an open mesh fabric like household window screening material.

Examples of suitable fibers and fabrics that have desirable durability and shrink characteristics to be used for the sleeves **19**, include Dacron woven in a plain over and under weave, with 16 strands per inch; a textured nylon and Dacron plate type felt with 3/1 weave of textured nylon filament filling yarns and textured Dacron filament warp yarns; a felt composed of 14 cut regular staple fiber Dacron yarns and six cut shrinkable Dacron staple filling yarns; and a felt composed of a mixture of 75% wool with 25% nylon in the warp yarns and all shrinkable Dacron in the filling yarns.

Following the conventional steps of carding, spinning, weaving and splicing, if not woven endless, a sleeve **19** of oversize dimensions of about up to 5% is slipped over shell **18** and shrunk tightly thereto. This may be accomplished by rotating roll **13** partly submerged in a pan of water to which steam and/or flame is applied to elevate the temperature to, for example, about 200° F. and continuing until the sleeve fits tightly around shell **18**. This shrinking may also take place in hot air or steam. Portions of sleeve **19** overhanging shell **18** may be folded radically inward and ring **22** abated thereto in axial alignment. The end portion of sleeve **19** may then be drawn through ring **22** and radially outward between ring **22** and clamp **20**. Bolts **24** can then be turned tightly into bores **23** to secure the end portions of sleeve **19** to the roll assembly **13**.

The roll assembly **13** therefore is provided with a relatively inexpensive and easily replaceable surface full of small mesh or minute capillary pores and is adapted to uses exemplified by FIG. 1 wherein the pores adsorb water pressed from the web W as it passes through the nip of the assembly shown in FIG. 1. The water entering the pores of sleeve **19** is conveyed through the nip of the assembly and away from the web W and felt **10** as the roll **13** rotates. The rotation of the roll **13** effects a centrifugal discharge of some of the water in the pores of the sleeve **19**, as shown at **30**, to be caught in pan **29**. Pan **29** is provided with a wall of maximum height on the down turning side of roll **13** in order to trap a maximum amount of water thrown from roll **13**.

An air blast pipe **31** is positioned adjacent the sleeve **19** for blasting a jet of air **32** against the sleeve to remove any water that has not been thrown off by centrifugal force. The blast **32** impinges upon the sleeve **19** at a point spaced downwardly from the nip of the assembly so that the water does not contact the felt or web.

A suction box **33** may also be provided to communicate through seals **34** with the outer face of the sleeve **19** to draw out water from the pores of the shell. The suction box **33** may be evacuated and drained through an opening **35** in the end thereof.

The pores of the sleeve **19** thus have the water therein removed therefrom at points away from the nip area of the assembly so that as the sleeve **19** rotates into the nip area the pores thereof are in a dried and cleaned condition.

The cooperating top roll **14** is adjustable as shown in dotted lines at **14'** relative to the roll **13** for varying the nip position of the assembly.

From the above description of FIG. 1 it should be understood that a wet web W is received on an adsorbent carrier band such as a felt and directed through a vertical two-press roll assembly including a press roll having a porous water-adsorbent surface capable of receiving therein water expressed from the web. This water enters the pores of the adsorbent surfaced roll and is conveyed in these pores through the nip of the assembly thereby preventing an accumulation of water back of the nip that would tend to crush the web. As the adsorbent surfaced roll rotates away from the nip, part of the water in the pores thereof is discharged by centrifugal force and remaining portions of the water are cleaned from the pores by devices **31**, **33** cooperating with the outer face of the roll.

In the alternative arrangement shown in FIG. 4, a plain roll **14***a* is beneath a carrier band **10***a* and a dewatering roll **13***a*, as has been described, is above the web W. A pan **29***a* and air blast pipe **31***a* are provided in this arrangement for the same purposes pan **29** and pipe **31** are provided in the arrangement of FIG. 1. In this embodiment, pan **29***a* is provided with upwardly inclined lips **40**, **41** which define collecting troughs drained by parts **42**, **43**.

Thus it has been shown that the present invention provides a unique sleeve and roll assembly **13** having an inexpensive, easily applied and replaced jacket that may be advantageously applied to many uses and with particular advantage to paper press assemblies. Fibers that shrink when heated provide the desired shrink fit sleeve and the adsorbing character of the fabric provides the desired dewatering action of the press roll. The described sleeves can be used to make a dewatering roll by jacketing a plain imperforate roll or can jacket a perforated roll to increase its dewatering capacity and protect the more expensive perforated roll from wear. The present invention therefore accomplishes the objects stated therefor and others that will occur to those skilled in such arts.

Modifications and equivalents of the disclosed features of this invention, such as readily occur to those skilled in these arts, are intended to be included within the scope of this invention. The scope of this invention is therefore intended to be limited only by the scope of the claims such as are, or may hereafter be, appended hereto.

The embodiments of the invention for which an exclusive property or privilege is claimed are defined as follows:

1. A roll assembly comprising a cylindrical roll and a fabric sleeve shrunken tightly around the periphery and between the ends of said roll, said sleeve comprising shrinkable synthetic fibers interwoven in a mesh fabric defining pores adapted to adsorb liquid thereon, and means for securing to the roll portions of said sleeve overhanging the roll, said means comprising an annular ring coaxial with said roll for engaging an intermediate portion of said overhanging sleeve and an outer annular clamp connected through said ring to said roll for pressing the end of said overhanging portion against said ring to thereby secure said overhanging portion to said roll.

2. A roll assembly comprising a cylindrical roll and a fabric sleeve shrunken tightly about said roll, said sleeve comprising shrinkable fibers interwoven in a mesh fabric defining pores adapted to adsorb liquid thereon, and means for securing to the roll portions of said sleeve overhanging the roll, said means comprising an annular ring coaxial with said roll for engaging an intermediate portion of said overhanging sleeve and an outer annular clamp connected through said ring to said roll for pressing the end of said overhanging portion against said ring to secure said overhanging portion between said roll and said ring and between said ring and said outer clamp.

3. A press roll assembly comprising a pair of rolls with one roll over the other to define a nip for the passage of a web traveling in a substantially horizontal path, one of said rolls being an assembly according to claim **1** with said mesh defining in said fabric a plurality of pores

adapted to receive therein water squeezed from a web passing through said nip, and means for catching and collecting water thrown from said pores by centrifugal force, said means comprising a tray disposed about said jacketed roll and having a wall of said tray on the outrunning side of said nip terminating at a horizontal level in close proximity to the horizontal level of the nip.

4. In a roll assembly according to claim 1 wherein said sleeve is a disposable jacket which comprises a plurality of heat shrinkable moisture impervious fibers having the same heat shrink rate and characteristics, said fibers being interwoven to provide a shrinkable porous liquid adsorbent open mesh fabric joined to define a tubular sleeve that upon being heated to a temperature above 100 degrees Fahrenheit will shrink the peripheral and axial fibers of said tubular sleeve and provide a porous liquid adsorbent open mesh tubular sleeve of shrunk peripheral and axial moisture impervious fibers.

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