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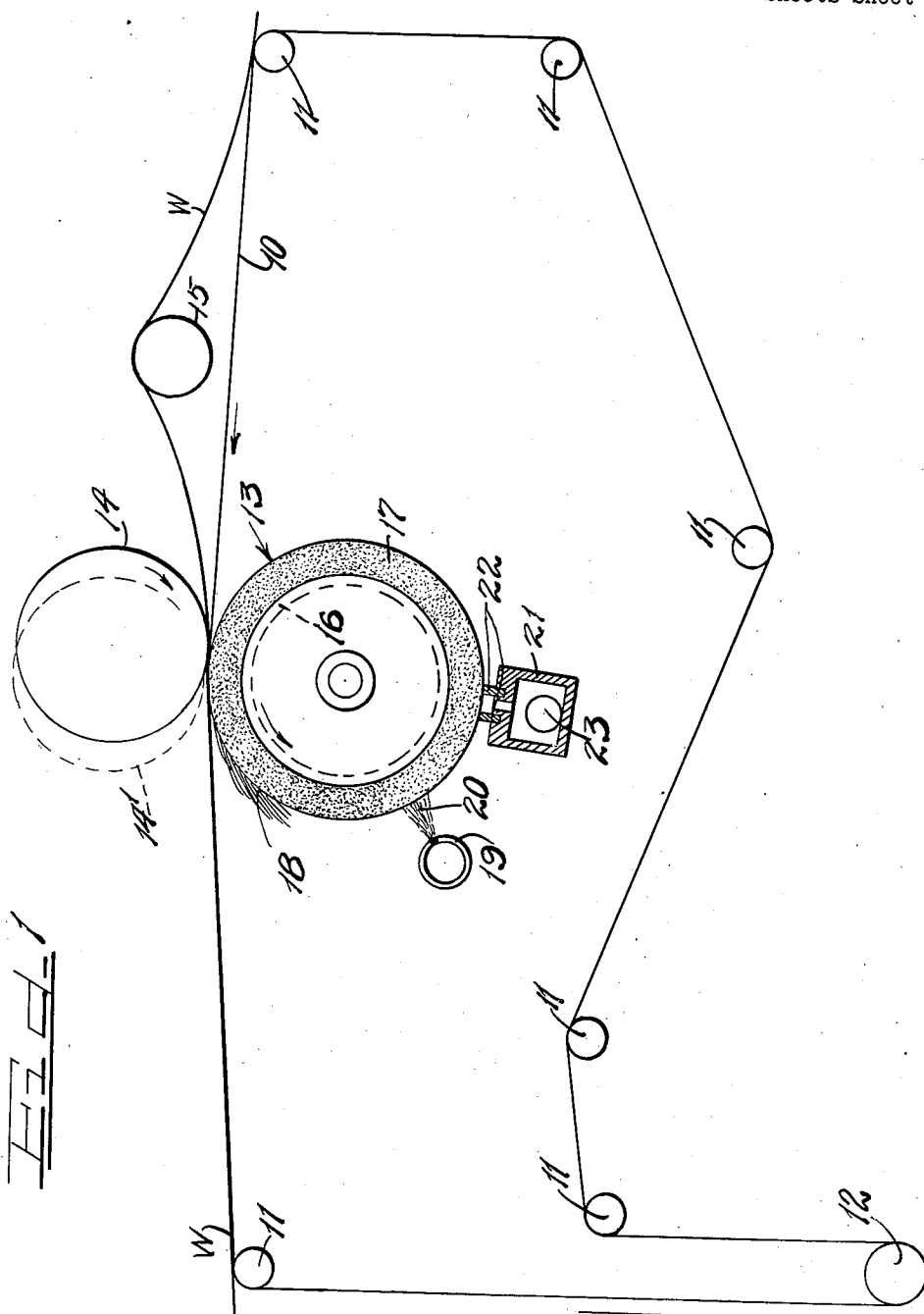
E. E. BERRY

2,209,759

ABSORBENT PRESS ROLL ASSEMBLY

Filed June 28, 1937

2 Sheets-Sheet 1



INVENTOR
Earl E. Berry.

Earl E. Berry

Charles F. Hill

Att:TS

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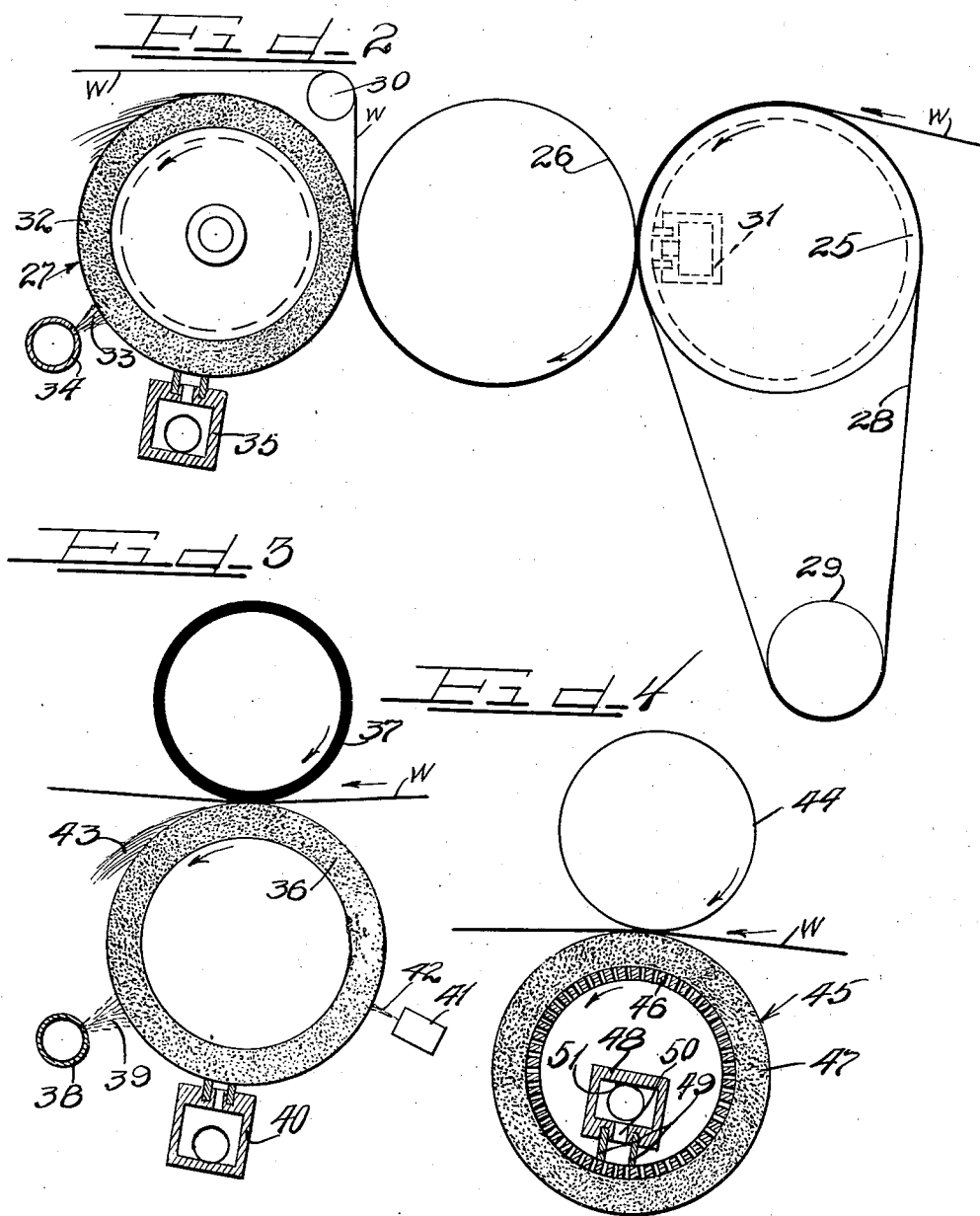
E. E. BERRY

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INVENTOR
Earl E. Berry.
Charles E. Berry
ATTY.

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ABSORBENT PRESS ROLL ASSEMBLY

Earl E. Berry, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

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3 Claims. (Cl. 92—49)

This invention relates to press roll assemblies wherein at least one of the rolls has a hard, porous surface adapted to absorb or otherwise receive liquid pressed from a web of paper for conveyance of the liquid away from the web.

More specifically this invention relates to press roll assemblies having a hard but porous surfaced roll adapted to receive water therein for conveyance away from the nip between rolls of the assembly together with means spaced from the nip for cleaning and drying the porous surface before the same reenters the nip.

In the patent to Wiley C. Smith No. 1,990,102, dated February 5, 1935, rolls having porous surfaces are described. The porous surfaces of these rolls are for receiving water therethrough. The porous surfaces are thus utilized for transmitting water to the interior of the roll, for example, into a suction head.

Hard porous surfaces on press rolls, however, are better suited for conveying water away from the nips of press roll assemblies than for transmitting water therethrough at the nip of the assembly as in the case of a suction press in which the suction roll has a porous surface, because a vacuum cannot be sustained in such a suction roll. In suction rolls having hard, porous surfaces, even though the suction head of the roll is confined to a fixed area on the interior of the roll, this area is unconfined at the exterior of the roll because of the porosity of the roll surface. As a result, air will enter the roll surface from all directions and a vacuum or suction area on the exterior of the roll cannot be maintained.

According to this invention, I utilize the porous surface of a press roll to receive therein water squeezed out from a web and convey the water entered into the surface of the roll away from the web. During this conveyance, some of the water is thrown from the roll by centrifugal force and remaining portions of the water are sucked or blown out of the roll at points spaced from the web. The roll surface may be washed prior to the sucking or blowing operation to clean the pores of the roll.

The porous roll surface allows water pressed from the web to enter therein in sufficient quantities to be carried through the nip instead of accumulated back of the nip and thus prevents a crushing of the web as it passes through the nip. Further, a smoothing effect is obtained on the web since the web may be squeezed between two hard surfaced rolls. Heretofore it has always been necessary to use an absorbent felt between the press rolls and the wet web if the web con-

tained above a certain amount of moisture dependent upon the type of stock from which it was formed. The felt marks the web appreciably. The felt marks are hard to remove from the web and added smoothing presses are required for removing the marks. The hard absorbent surfaced press rolls of this invention do not mark the web but instead smooth the same as well as extract water therefrom.

Many types of materials can be used to form the porous surfaces of the roll such as, for example, ceramic materials, filter aids, refractory grains such as silicon carbide and aluminum oxide and the like. These granular materials can be bonded together with a vitreous material and baked to form a hard cylinder of sufficient thickness so as to be self-sustaining or the materials and binder can be baked on a metal roll or cylinder to form a porous surface on said roll or cylinder.

It is then an object of this invention to provide press roll assemblies including a porous surfaced roll.

Another object of this invention is to provide a press roll assembly including a hard, porous surfaced roll for conveying water away from the nip of the assembly and for smoothing a web passed thru the nip.

A further object of this invention is to provide a press roll with a hard, porous surface and to remove water from this surface by mechanical means positioned at points away from the point where the water enters the surface.

A further object of this invention is to provide a press roll assembly including a hard, porous surfaced roll and a suction device cooperating with the outer surface of the roll to draw water from the pores thereof.

A further object of this invention is to provide a press roll assembly including a hard, porous surfaced roll and a mechanical blower device cooperating with the inner surface of the roll to blow water from the pores thereof.

Another object of this invention is to provide a process of dewatering webs utilizing a hard, porous surface for conveying water away from the web.

A further object of this invention is to provide a process of dewatering paper sheets wherein water expressed from the sheets is absorbed in a hard, rotating surface and thrown out of said surface away from the sheets by centrifugal force.

Other and further objects of this invention will become apparent to those skilled in the art from the following detailed description of the

annexed sheets of drawings which disclose preferred embodiments of the invention.

On the drawings:

Figure 1 is a diagrammatical view of a press assembly according to this invention including a hard, porous surfaced bottom roll and a cooperating top roll.

Figure 2 is a diagrammatic view of a horizontal press roll assembly according to this invention utilizing a hard, porous surfaced roll in the assembly.

Figure 3 is a diagrammatic view of a press roll assembly according to this invention including a rubber covered top roll.

Figure 4 is another diagrammatic view of a press roll assembly according to this invention wherein the hard, porous surfaced roll has a perforated supporting shell and a suction or blower head cooperates through the foraminations of the shell to remove water from the pores of the surface material.

As shown on the drawings:

In Figure 1 the reference numeral 10 designates an absorbent 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 porous surfaced 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 a lifting roll 15 before it enters the nip of the press roll assembly.

The press roll 13 of the assembly comprises a cylindrical metal sleeve 16 having a porous shell 17 of granular material such as a ceramic material, filter aid or the like, bonded thereon in integral relation therewith. The shell 17 is full of minute pores and is adapted to receive water pressed from the web W as it passes through the nip of the assembly therein. The water entering the shell 17 is conveyed in the shell 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 shell 17, as shown at 18.

A shower pipe 19 is positioned adjacent the shell 17 for ejecting a spray of water 20 or other cleaning fluid against the shell to wash the same. The spray 20 impinges upon the shell 17 at a point spaced from the nip of the assembly so that the water does not contact the felt or web.

A suction box 21 communicates through seals 22 with the outer face of the shell 17 to draw out water from the pores of the shell. The suction box 21 may be evacuated and drained through an opening 23 in the end thereof.

The pores of the shell 17 are thus washed and have the water therein removed therefrom at points away from the nip area of the assembly so that as the shell 17 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 press roll 13 for varying the nip position of the assembly.

From the above description of Figure 1 it should be understood that a wet web W is received on an absorbent carrier band such as a felt and directed through a vertical two-roll assembly including a press roll having a porous water-absorbent surface capable of receiving therein water expressed from the web. This water enters the pores of the absorbent

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 absorbent 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 sucked from the pores by a mechanical suction device cooperating with the outer face of the roll.

In the press roll assembly shown in Figure 2, the reference numeral 25 designates a perforated suction roll; the reference numeral 26 designates a plain metal press roll; and the reference numeral 27 designates a porous surfaced press roll similar to the press roll 13. The rolls 25, 26 and 27 are horizontally arranged with their axes on the same horizontal plane, or substantially the same plane. The end rolls 25 and 27 are urged toward the center roll 26 to exert pressures in the two nips between the rolls.

An absorbent carrier band such as a felt 28 is trained around the suction roll 25 and around a guide or tensioning roll 29 positioned below the suction roll.

A wet web W is conveyed on the felt 28 around the roll 25, down through the first nip of the assembly, around the lower portion of the roll 26 and up through the second nip of the assembly. From the second nip the web W is directed around a guide roll 30 positioned above the assembly.

Water expressed from the web in the downward passage nip of the assembly is sucked from the nip into a suction box 31 mounted in the suction roll 25. The upward passage nip of the assembly is a free draining nip, but some of the water expressed from the web in this nip enters the pores of the absorbent shell 32 of the press roll 27. This water in the pores of the shell 32 is conveyed away from the web W and partly discharged from the pores by centrifugal force as the pores begin their descending passage on the side of the roll opposite the upward passage nip.

The pores are then washed by a spray of water 33 ejected from a shower pipe 34 at a point away from the nip. Remaining portions of water in the pores of the shell 32 are drawn from the pores by a suction box 35 cooperating with the outer face of the shell 32. Therefore the pores enter the nip in a cleaned and dried condition for receiving water therein expressed from the web passing through the nip.

The web passes through the second nip of the assembly shown in Figure 2 unsupported by a felt and directly contacts the hard surfaces of the rolls 26 and 27 which smooth and iron out the web. Since the porous shell 32 removes water from the nip the web will not be crushed thereby eliminating the heretofore necessary absorbent felt and the added smoothing presses for removing felt marks from the web.

In Figure 3, the press roll assembly comprises a bottom roll 36 and a cooperating top roll 37 receiving a web W through the nip therebetween. The roll 36 is made of a vitreous bonded porous material of sufficient thickness to be self-sustaining. The roll 37 is rubber-covered.

A shower pipe 38 ejects a spray of water or other cleansing fluid 39 against the outer face of the roll 36, at a point spaced from the nip of the assembly.

A suction box 40 is positioned adjacent the

roll 36 at or near the bottom of the roll for drawing water or liquid out of the pores of the roll.

A burner head 41 may be positioned after the suction box 40 for ejecting a flame 42 or a plurality of flames against the outer surface of the roll to burn off fibers or other impurities remaining in the pores of the roll after the suction treatment. The flame 42 will further dry the roll.

A web of paper W enters the nip of the assembly in the direction indicated by the arrow and the rolls 36 and 37 express water from the web. This water is absorbed into the pores of the roll 36 and conveyed through the nip of the assembly away from the web where it is partially discharged from the pores by centrifugal force as at 43. The pores are then washed by a spray 39 and sucked dry by the suction box 40. Then if desired the porous material can be further treated by heat before the treated pores reenter the nip area. The use of the porous surfaced roll prevents accumulation of water back of the nip since this water is absorbed into the pores of the roll.

In Figure 4 a two-press roll assembly comprising a top roll 44 and a bottom roll 45 receives a wet web W in the nip therebetween.

The roll 45 comprises a foraminous sleeve or supporting mandrel 46 having a shell 47 of porous material bonded thereon.

A box or head 48 is positioned in the sleeve 46 and carries seals 49 rubbing against the inner surface of the sleeve. The interior of the box communicates through a slot 50 with an area of the sleeve between the seals 49.

Compressed air from a blower (not shown) may enter the box 48 through an opening 51 in the end thereof and is ejected through the slot 50 against the inner surface of the sleeve 46 from which it travels through the foraminations thereof to blow water out of the pores of the shell material 47.

A shower pipe such as is shown in Figures 1 to 3 can also be used in the assembly shown in Figure 4.

In the assembly shown in Figure 4, the web W enters the nip of the rolls 44 and 45 and water is expressed from the web by pressure exerted by the rolls. This water is absorbed into the pores of the surface material 47 of the roll 45 and conveyed through the nip in these pores. Part of the water is then discharged by centrifugal force as the pores rotate away from the web and

the remaining portions of the water in the pores are either blown out of the pores by an air blast or are sucked out of the pores by suction.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A press roll assembly comprising three rolls in pressure relation having their axes on substantially the same horizontal plane to define a downward passage nip and an upward passage nip for a web of paper, a suction device for removing water from the downward passage nip, a cylindrical water absorbent stone-like shell full of minute pores on a roll defining the upward passage nip adapted to receive water in the pores thereof for conveyance away from a web passing through the assembly, and a suction box cooperating with the outer surface of the cylindrical shell at a point spaced from the upward passage nip for drawing water out of the pores of the shell.

2. The method of dewatering wet webs which comprises passing a wet web through the nip between a roller having a hard, porous surface and another roller to express water from the web, immediately absorbing the expressed water into the pores of said porous surface, conveying the water in said pores through the nip and away from the web, removing water from the pores at a point remote from the nip and web, directing a flame against the porous surface after said removal of water to heat the surface and continually supplying dewatered and heat-treated pores to the nip.

3. A horizontal press roll assembly including three rolls in pressure relation having their axes in substantial horizontal alignment to define an upward passage nip and a downward passage nip, a relatively thick hard stone-like cover on one of said rolls having minute water-absorbent pores extending in all directions and adapted to receive therein water squeezed from a web passing through the nip partially defined thereby for conveyance away from the web, and means remote from the nip and web cooperating with the cover to draw the water out of the pores before the same re-enters the nip.

EARL E. BERRY.