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APPARATUS FOR IMPINGING LIQUID INTO A FIBER WEB FROM BENEATH A WIRE IN A FOURDRINIER PAPER MACHINE

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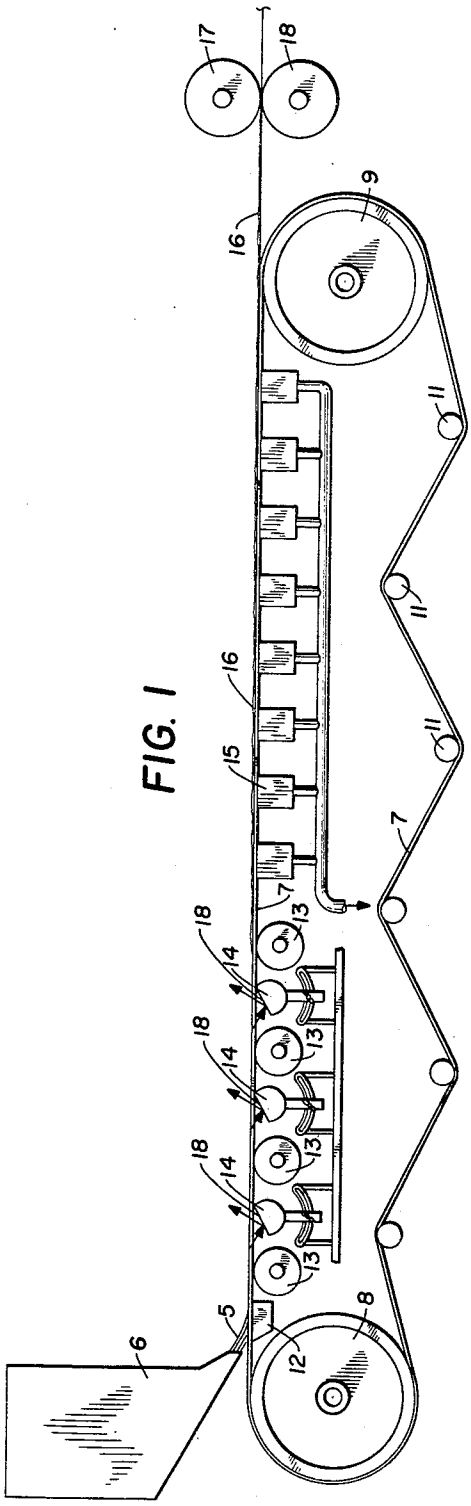


FIG. 1

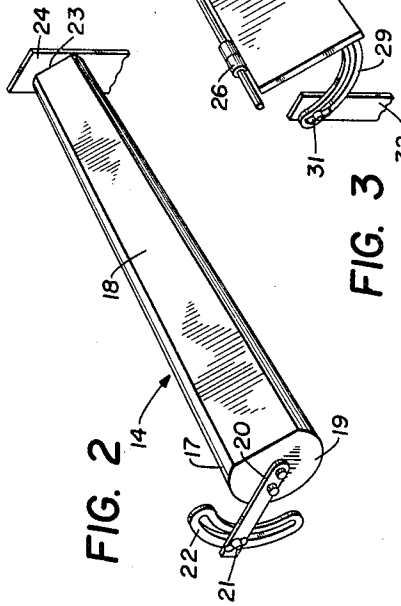


FIG. 2

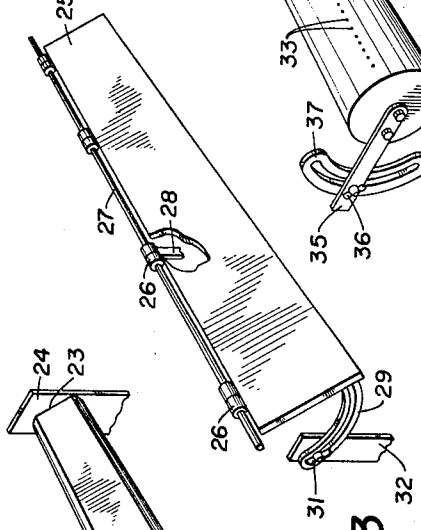


FIG. 3

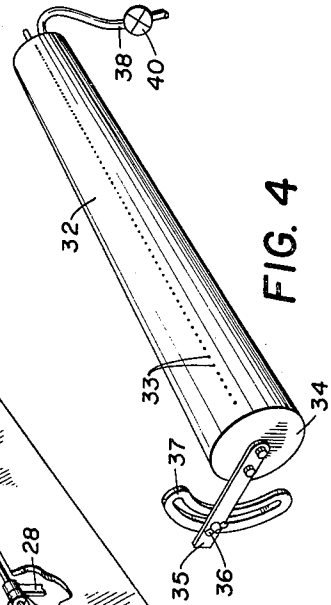


FIG. 4

INVENTOR
DAVID H. RHINE

V. Bryan Medlock, Jr.
ATTORNEY

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APPARATUS FOR IMPINGING LIQUID INTO A FIBER WEB FROM BENEATH A WIRE IN A FOURDRINIER PAPER MACHINE

David H. Rhine, Dallas, Tex., assignor to Texas Instruments Incorporated, Dallas, Tex., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

Apparatus for impinging a liquid into a fiber web on a Fourdrinier machine wire utilizing a traversely disposed planar surface beneath said wire adjustably oriented at an angle to the wire, or a traversely disposed elongated conduit with orifice means for discharging a liquid into the web at an adjustable rate and angle.

This invention relates to a method and apparatus for creating a positive nip on a Fourdrinier paper machine, and more particularly, but not by way of limitation, to a method and apparatus for adjustably directing a fluid against the bottom of the web on a Fourdrinier paper machine.

In the manufacture of paper by use of a Fourdrinier machine, the paper stock, containing approximately 99½% water is discharged onto a wire through which the water will flow and upon which the paper fibers will collect. During drainage of the water from the paper fibers, the fibers, if left undisturbed, will tend to orient in a linear pattern. Paper formed from fibers which have assumed a non-random pattern will not have the strength of that formed from fibers assuming a random pattern. Consequently, it is often desirable to introduce agitation in the paper fibers at varying points on the Fourdrinier until about 10% by weight of the water has been removed, at which time the danger of linear orientation does not as a practical matter exist.

With conventional Fourdrinier machines, the table rolls which serve to support the continuous traveling wire between the breast roll and a couch roll will create a positive nip of some degree in front of the point at which they contact the wire due to the adhesion of water to these rolls. The positive nip is created by reinjection of water adhering to the rolls back into the paper stock supported by the wire. This reinjected water, or positive nip as it is termed in the art, can create too much disturbance causing poor formation and poor fines retention on certain grades. However, since the nip created by the table roll cannot be adjusted, on heavier weights this agitation may not be sufficient.

This invention is directed to providing an adjustable nip, and the method of this invention may be generally described as a method of creating an adjustable positive nip on a Fourdrinier paper machine provided with a breast roll and a couch roll over which travels an endless moving wire and onto the top of which is discharged a paper stock, which includes the step of impinging a fluid against the web at a point between the breast roll and the couch roll at a point where the stock carried by the wire contains greater than about 90% by weight water, and wherein the rate at which the fluid is so impinged against the web is controllable, either as to volume, velocity, density or the angel of impingement, for example.

The apparatus of the present invention may be generally described as an apparatus for creating an adjustable positive nip on a Fourdrinier paper machine provided with a breast roll and a couch roll over which travels an endless moving wire onto the top of which is discharged a paper stock, including first means for impinging a fluid against the web at a point where the stock carried by said wire contains greater than 90% by weight water; and second means for adjusting the rate at which said fluid is impinged against the web.

To be more specific, reference is here made to the drawings, in which:

FIGURE 1 is a diagrammatic elevational view of a Fourdrinier paper machine embodying the novel structure of this invention and effective to practice the method of the invention;

FIGURE 2 is a perspective view of one embodiment of apparatus of the invention;

FIGURE 3 is a perspective view of yet another embodiment of apparatus of the invention; and

FIGURE 4 is a perspective view of yet another embodiment of apparatus of the invention.

With reference to FIGURE 1, a paper stock **5** is discharged from headbox **6** onto a wire **7** in a conventional fashion. Wire **7** is a continuous traveling wire carried about a breast roll **8** and a couch roll **9**. Return rolls **11** maintain the proper tension on wire **7**, the top of which travels from left to right as viewed in FIGURE 1. Stock **5** is discharged onto wire **7** as it traverses forming board **12** which serves to aid in supporting the wire **7** under the weight of stock **5**. After passing the forming board **12**, the wire **7** traverses a plurality of table rolls **13** intermediate which are disposed adjustable deflector bars **14**, more clearly illustrated in FIGURE 2. After traversing rolls **13** and deflector bars **14**, wire **7** travels over a plurality of conventional suction boxes **15** which serve to vacuum water from the fiber web **16** formed on wire **7** so that it may be discharged into the press section as represented by pressure rolls **17** and **18**.

Deflector bars **14**, more clearly illustrated in FIGURE 2, are transversely disposed beneath wire **7** and take the form of a cylindrical bar **17** which has been milled to provide a substantially planar surface **18**, which, as illustrated in FIGURE 1, is oriented obliquely to the bottom of wire **7**. Fixed to the end **19** of bar **17** is an arm **20** containing a pin and wing-nut means **22** which is slidably carried in an arcuate yoke **22**. The opposite end **23** of bar or member **17** is rotatably mounted by conventional means, not illustrated, in a support plate **24** to permit adjustment of the angle of obliqueness between face **18** and the bottom of screen **7**.

Deflector bars **14**, as illustrated in FIGURE 1, will deflect water flowing through the bottom of wire **7** back through the wire **7** and impinge against the bottom of the web to create a positive nip for the purpose of disturbing the fibers supported by wire **7**. The rate at which the water is deflected may be controlled by adjusting the position at which arm **20** is affixed in yoke **22**. For example, with a heavier paper being formed on wire **7**, it may be desirable to decrease the angle between face **18** and wire **7** to increase the velocity with which the water is impinged against the web on wire **7** to achieve the desired disturbance of the heavier fibers. The angle is adjustable from a zero angle, which results in no positive nip, up to substantially any desired maximum.

The alternative embodiment illustrated in FIGURE 3 takes the form of a deflector plate or member **25** which carries at one edge integral sleeves **26** through which pass a cylindrical rod **27** supported by a plurality of brackets **28**. Plate **25** has integral therewith at one end an arcuate yoke **29** which slidably carries a pin and wing-nut means **31** secured to a stanchion **32**. Deflector plate **25**, like deflector bar **14**, may be disposed transversely beneath wire **7** to deflect water flowing through wire **7** back through the bottom of the wire to impinge on the fiber web **16**.

The embodiment illustrated in FIGURE 4 includes a cylindrical elongated conduit **32** provided with an elongated orifice means, such as the apertures **33**, or an elongated slot (not illustrated) opening toward the bottom of the wire **7**. End **34** of conduit **32** carries an integral arm **35**, which by adjustment of pin and wing-nut means **36** may be rotated relative to stationary yoke **37**, in the same manner that deflector bar **14** may be adjusted. A fluid under pressure may be introduced into conduit **32** through a hose means **38** connected thereto in a conventional fashion to permit discharge of the fluid through apertures **33** and through the bottom of wire **7** so as to impinge on the web. The conduit **32** may be disposed in the same manner as deflector bar **14**. The angle at which the fluid exiting apertures **33** strikes the bottom of wire **7** may be adjusted by adjustment of arm **35** in yoke **37**, and the force of the fluid may be varied by varying the pressure of the fluid communicating with conduit **32**, such as by valve means **40**. With the embodiment of the invention illustrated in FIGURE 4, water other than that flowing from wire **7** may be used to create the positive nip. Also, other fluids, such as air, steam, or other gases or other liquids may be used if desired.

While several of the deflector bars **14** are illustrated in FIGURE 1, only one of the deflectors may be utilized. The deflectors are preferably mounted so that the portion thereof proximate the bottom of wire **7** is disposed within about .2 inch of the bottom of wire **7** and the depth of the faces **18** and **25** are preferably between 1 and 1½ inches though they may be as narrow as ½ inch and as wide as 3 inches.

While the embodiments illustrated in FIGURE 1 include deflector bars **14** between table rolls **13**, they may be positioned at any point along the wire **7** where a positive nip will be effective. For example, the deflector **14** could be supported proximate one of the suction boxes **15**. The deflector bars **14** may be used in conjunction with any suitable wire support means other than the table rolls **13** illustrated, such as for example, foils, wet end suction boxes, etc.

What is claimed is:

1. An apparatus for creating an adjustable, positive nip on a Fourdrinier paper machine provided with a breast roll and a couch roll over which travels an endless moving wire onto the top of which is discharged a paper stock, comprising:

a relatively elongated member transversely disposed beneath said wire and having a substantially planar surface oriented obliquely to said wire for deflecting water flowing through said wire back through said wire against the web carried by the wire; and

means for adjusting the angle of obliqueness between said substantially planar surface and said wire to control the rate at which said water is deflected against the bottom of said wire.

2. An apparatus for creating an adjustable, positive nip on a Fourdrinier paper machine provided with a breast roll and a couch roll over which travels an endless moving wire onto the top of which is discharged a paper stock, comprising:

a relatively elongated conduit transversely disposed beneath said wire at a point where the web contains greater than ninety percent by weight water, said conduit provided with an elongated orifice means opening toward the bottom of said wire and at an angle with respect to the wire; means connecting said orifice to liquid under pressure in order that the liquid will pass from the elongated orifice means and through the wire to impinge on the web carried by the wire, means for adjusting the angle at which the liquid discharged through said orifice means strikes said wire, and means to control the rate at which said liquid is discharged.

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S. LEON BASHORE, Primary Examiner

R. H. TUSHIN, Assistant Examiner

U.S. Cl. X.R.

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