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Beck

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[54] **SHOWER STRUCTURE FOR PAPER MACHINE**

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[52] **U.S. Cl.** **162/310,** 162/275, 162/353, 239/597

[51] **Int. Cl.** **D21g 9/00**

[58] **Field of Search** 162/310, 353, 297, 286, 162/275, 195, 115; 239/597, 562

[56] **References Cited**

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[57] **ABSTRACT**

A paper making machine structure including a mechanism for directing a blade-like jet of fluid against a moving surface such as a traveling fourdrinier wire where in one form the blade-like jet extends parallel to the forming surface to form a deckle edge and where in another form the jet extends across within the wire on the return side to provide a web knockoff. The jet mechanism includes an elongate hollow shell formed in a general U-shape to provide a continuous fluid chamber with a pair of lips integral with the shell with their distal edges separated in a jet gap and a gap control device pressing against the outer surface of the shell and applying a force thereto to control the width of the jet gap.

9 Claims, 6 Drawing Figures

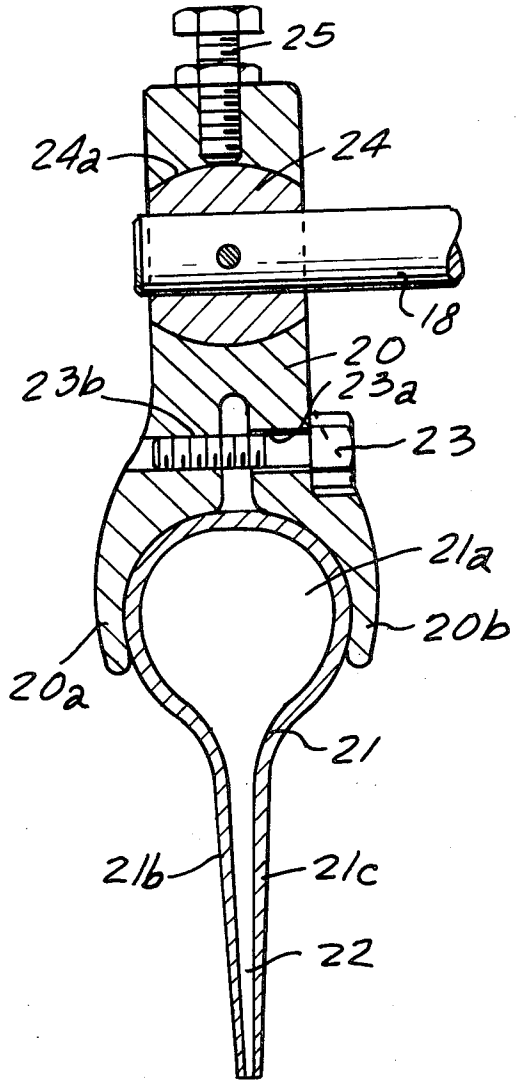


Fig. 1

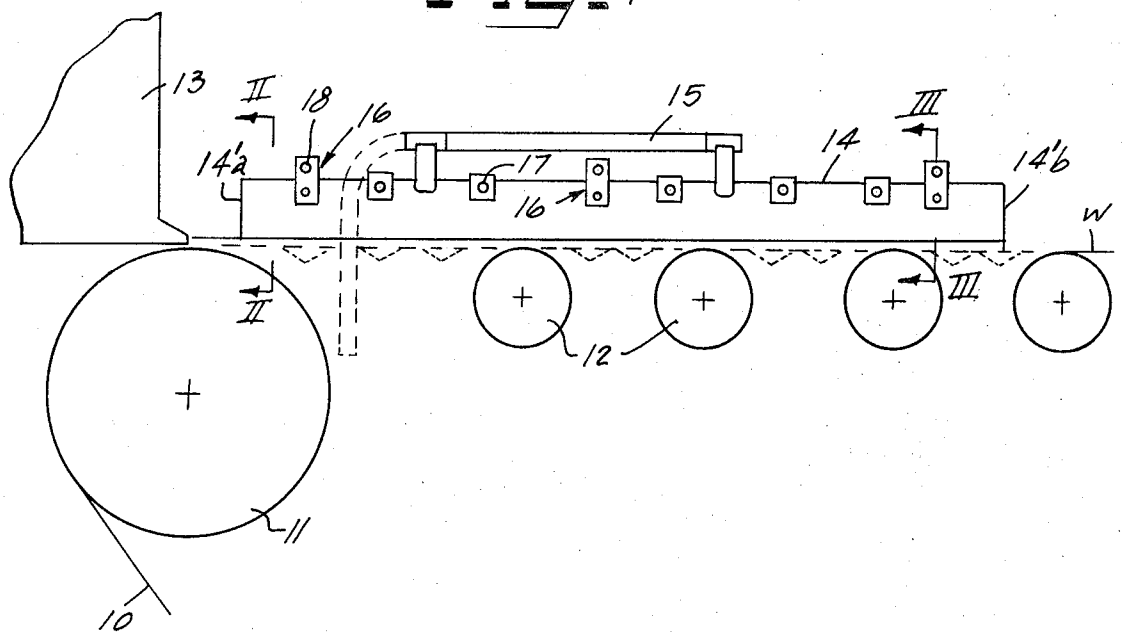


Fig. 2

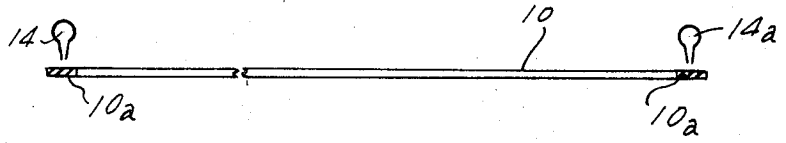


Fig. 6

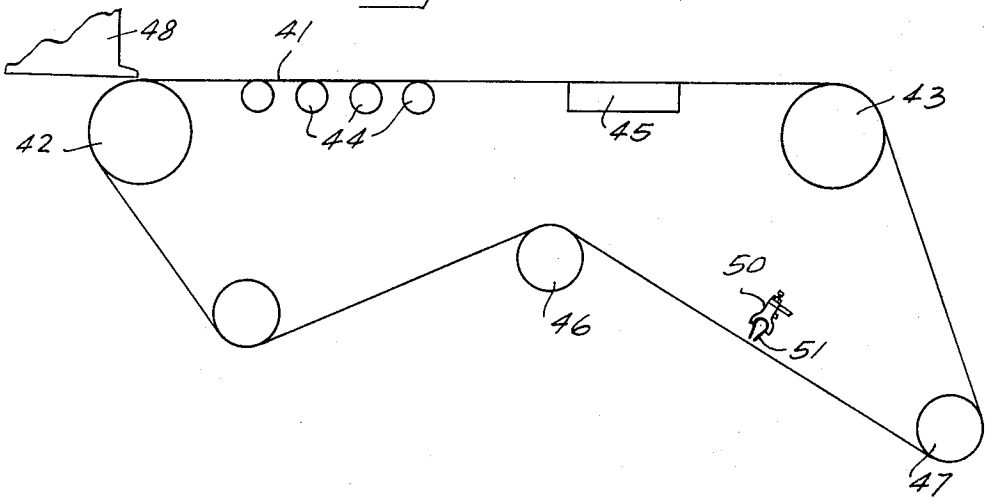


Fig. 3

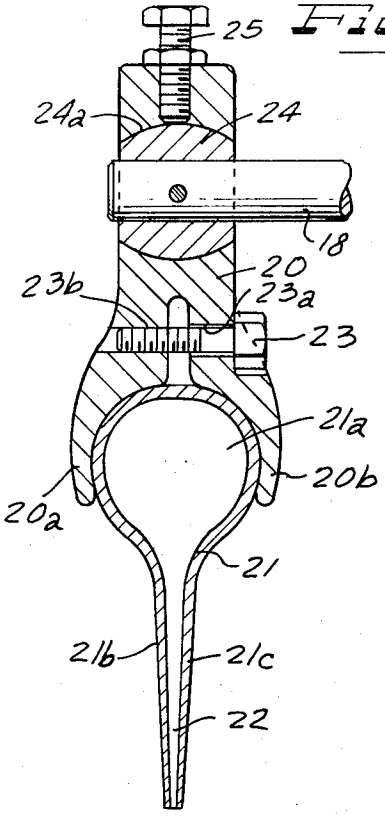
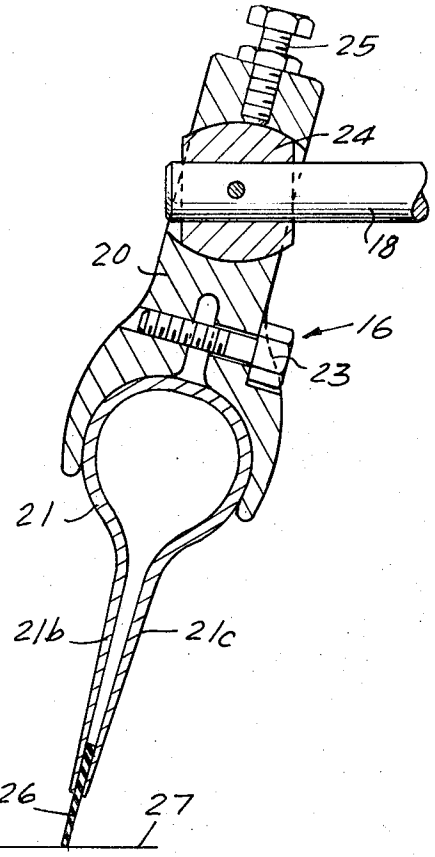


Fig. 4



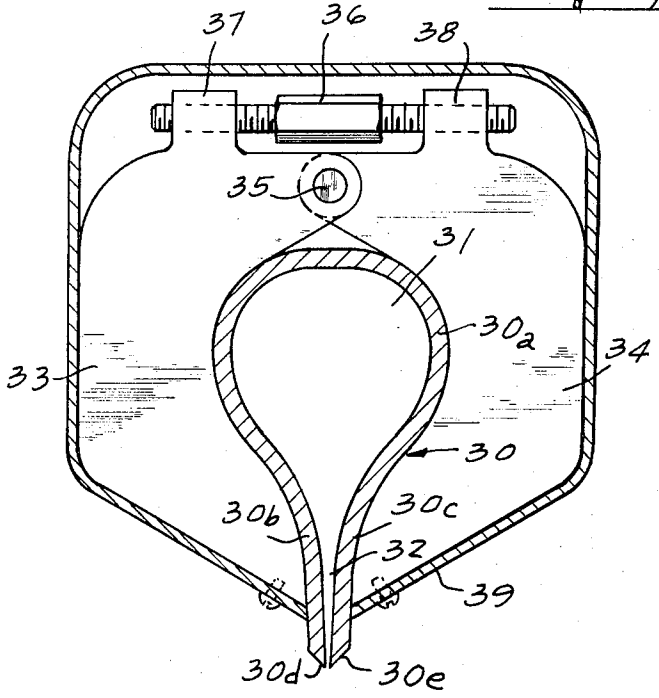


Fig. 5

SHOWER STRUCTURE FOR PAPER MACHINE

BACKGROUND OF THE INVENTION

The invention relates to improvements in paper machines and more particularly to an improved shower or jet mechanism for directing an elongate blade-like unbroken shower of fluid against a moving surface such as a traveling fourdrinier wire.

In various sections of paper making machines where a jet is used to direct a fluid such as water, air or steam against a traveling surface, an adjustable jet would be advantageous. In a fourdrinier knock-off shower, for example, structures conventionally use a pipe which extends across the width of the wire and have a number of individual stream-like jets issuing from the pipe. To insure knock-off, an oscillator is frequently used to move the jets back and forth to get full width coverage.

Showers and jets are directed against moving surfaces in other locations in paper machines such as in forming the deckle edge on a traveling fourdrinier wire. In this use it is necessary to be able to control the angle of the jet and its location of engagement. Jets are used in other locations for directing streams of fresh water, air or steam against surfaces, and it would be advantageous to be able to control the amount of fluid delivered by the jet both to match varying operating conditions and to be able to use the jet mechanism in different locations on the machine.

It is accordingly an object of the present invention to provide a continuous jet or shower mechanism which is capable of delivering a shower of fluid against a moving surface across an extended continuous and unbroken width or length of the machine and is able to readily control the volume of fluid delivered.

Another object of the invention is to provide a shower structure design that is capable of being utilized at any section of a paper making machine where a full width adjustable jet would be advantageous, such as could be used for forming a deckle edge, a fourdrinier knock-off shower, for doctors, for the dandy roll or lump breaker roll, on press rolls or for felt wetting, for sizing coating or putting moisture on the sheet at the calender stack for sheet threading or air chutes, or other applications in a paper making machine.

A further object of the invention is to provide an improved forming section such as for a board machine with a deckle edge mechanism that has an adjustable orifice and can be set at a selected height to reduce or eliminate edge waves.

Other objects, advantages and features, and equivalent structures which are alternative to the preferred embodiment shown and which are intended to be covered herein will become apparent to those skilled in the art in connection with the teaching of the principles of the invention in the disclosure of the preferred embodiments in the specification, claims and drawings, in which:

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a forming section of a paper making machine constructed and operating in accordance with the principles of the present invention;

FIG. **2** is a somewhat schematic vertical sectional view taken substantially along line II—II of FIG. **1**;

FIG. **3** is a vertical sectional view taken substantially along line III—III of FIG. **1**;

FIG. **4** is a sectional view similar to FIG. **3** showing adjustment of the structure and illustrating another form of operation;

FIG. **5** is a sectional view taken through a shower mechanism illustrating another form of the invention; and

FIG. **6** is a schematic elevational view showing a fourdrinier section of a paper making machine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** illustrates a section of a paper making machine, preferably of a type for forming board. A traveling forming wire **10** passes over a breast roll **11** and subsequently passes over table rolls **12** for dewatering a web W formed on the outer surface thereof through the wire. A suitable headbox such as **13** is provided and for forming board, a broader slice opening may be provided on the uprunning side of the breast roll **11** using an open breast roll. As the web is formed on the upper surface of the wire **10**, the edges of the board are formed by deckle members **14** and **14***a*, FIG. **2**, positioned adjacent each edge of the wire. The deckle members extend in the direction of wire travel with an upstream end **14***'a* and a downstream end **14***'b*, and direct a jet or shower which is of uniform width and is blade-like and continuous extending in the direction of wire travel. Clear water or air is fed into the deckle members **14** through a supply line **15.** In the arrangement shown, either air or water may be used to provide the fluid for the stream, but the features of the invention are well adapted to a mechanism for directing either stream, air or water. In other constructions, material such as coating may be used where a traveling web is to be coated. The deckle members **14** are supported at spaced locations by deckle holders **16.** At spaced locations, for example, 6 inches apart, are located gap control means **17** which adjust the size of the jet gap or orifice thereby adjusting the width of the jet stream.

As illustrated in FIG. **2,** if desired, the wire **10** can be made with a plastic impregnation at each edge at **10***a* to reduce the water or air blow through.

FIG. **3** illustrates the deckle member in greater detail. As illustrated, the deckle member is supported on overhead attachment rods **18.** At their ends, the attachment rods have ball joints **24** which fit into a ball socket **24***a* in a holder **20.**

As illustrated in FIG. **4,** the holder **20** can be swiveled from side to side on the ball **24** to change the direction of the jet relative to the traveling wire and to change the location of impingement between the jet and the wire. The holder is locked in its adjusted position by a set screw **25** which is tightened down upon the ball **24** to lock the jet in its adjusted position.

The holder **50** is bifurcated at its lower end with clamping jaws **20***a* and **20***b* to grip a hollow shell **21** which provides the jet. The hollow shell is of uniform cross-section along its length, and the bifurcated jaws **20***a* and **20***b* grip the outer surface and are locked in their gripping position by clamping cap screw **23** which passes through an opening **23***a* in one of the jaws and threads into the other jaw **23***b*. Tightening of the cap screw **23** will apply an increasing pressure to the walls of the shell **21.** The shell has a general U-shape with a bulbous end to form a hollow elongate chamber or

header 21*a*. The chamber opens up to a jet gap **22** formed between a pair of lips 21*b* and 21*c* which are an integral part of the shell **21.** As will be seen from FIG. **3,** increased pressure applied to the shell **21** by the bifurcated ends **20***a* and **20***b* of the holder will force the lips 21*b* and 21*c* together to reduce the size of the jet **22.** Release in pressure by the jaws **20***a* and **20***b* will open the jaws. The shell is originally constructed so that the jaws will resiliently tend to spring open so that the shell will be originally formed with a gap **22** wider than the gap intended to be used in operation.

Preferably, the shell **21** is formed of stainless steel. However, a hardened plastic can be used so that the shell can be an extrusion. By providing a shell of a continuous extruded material of uniform cross-section, the ends of the chamber 21*a* and the ends of the gap are closed by a hard rubber end wall inserted at each edge of the chamber 21*a*. This end will only be locked in place by a pin extending through the end ball and the shell and a clamp providing at the end to squeeze the resilient end wall together so that the gap **22** will be of uniform length throughout the length of the shell. With this arrangement, the size of the jet gap **22** can be changed when using different fluids such as when changing from fresh water to air. Also, the same structure can be used for various fluids of different viscosities and can be used under different operating conditions such as when a change of machine speeds is employed, when paper webs of different thickness are formed, or for other variances in environment.

In the formation of board, a wavy end is sometimes encountered, and to obtain a uniform edge and reduce or eliminate edge waves which are frequency associated with deckle boards, a rubber strip arrangement may be employed shown in FIG. **4.** A continuous strip **26** is positioned between the ends of the jaws 21*b* and 21*c* and clamped in position. The strip is positioned into the jet gap **22** a sufficient distance so that its lower edge will be substantially rubbing on the traveling wire **27.** Thus, this continuous rubber strip will form a non-waving deckle edge for heavy board.

FIG. **5** illustrates another arrangement wherein an elongate shell **30** is shaped in the form of a general U-shape with a bulbous end **30***a* providing a continuous fluid chamber **31** therein. The shell **30** is shaped to provide lips **30***b* and **30***c* with a jet gap **32** therebetween. The lower distal edges of the lips **30***b* and **30***c* are tapered to form a sharp edge **30***d* and **30***e* immediately adjacent the gap **32.** End walls are positioned in the continuous chamber **31** shaped in the then general cross-sectional shape of the shell **30.**

Fluid is directed into the chamber **31** either along its length or through the end walls at one or both ends. Again, the shell may be of plastic, hard rubber or, aluminum or stainless steel. The clamping jaws can be located at spaced locations spaced in accordance with the force necessary to prevent distortion of the gap **32** between clamps. The clamps include a pair of clamping jaws **33** and **34** which may be of cast silicon bronze or other satisfactory material. The jaws are connected by a pivot pin **35.** The jaws are provided with ears **37** and **38.** The ears are internally threaded and a threaded rod **36** which is threaded with the a left hand thread at one end extends into each of the ears **37** and **38** so that when the rod is turned in one direction, an increasing pressure is applied to the walls of the shell **30** to decrease the gap **32,** and when the bolt **36** is turned in the other direction, the gap is increased. This provides controllable adjustment and, for example, an orifice or jet **32** may be provided which is adjustable from ¼ inch to zero gap. A shaped cover **39** encloses the mechanism protecting the threads of the rod **36.**

FIG. **6** illustrates an arrangement for an improved knock-off shower wherein a traveling looped fourdrinier wire **41** is carried on a breast roll **42** and a couch roll **43.** A headbox **48** delivers stock onto the upper forming surface of the wire, and the web formed thereon is dewatered by dewatering devices such as table rolls **44** in a suction box **45.** The wire passes down over a turning roll **47** and over a return roll **46,** and a knock-off shower **50** is positioned within the wire on the return run. The knock-off shower has a continuous downwardly facing jet gap **51** directed toward the surface of the wire, and the member **50** may have a construction such as shown in FIG. **5.** With provision of a continuous uninterrupted jet across the entire width of the machine, an oscillator need not be provided, and complete and full dislodgement of the web from the wire for the knock-off function will be accomplished whenever fluid under pressure is directed to the interior of the chamber shown for the shower **50.**

As above stated, the structure provides a continuous adjustable jet which is of uniform interrupted width for the full length of the jet which is provided. The structure could be used in various other locations such as replacing doctors on the fourdrinier return run in conjunction with saveall pans and could be used in the dandy roll or lump breaker roll. Use could also be employed on press rolls or for felt wetting, or for the application of sizing coating or putting water on a sheet at the calender stack, or it could be used for sheet threading or air chutes. The structure is inexpensive to construct and reliable and avoids the disadvantages of difficult cleaning encountered in structures heretofore employed. By release of the clamps along the length of the structure, the gap width can be automatically widened and the washing liquid or steam directed in through the chamber to clean the gap. This eliminates the possibilities of partial nonoperation encountered with jets which employ separate streams and which can fouled by foreign particles or caking or coagulation of the fluids employed. Also, the construction yields itself to utilization of extruded plastic and the obtaining of the advantages of non-corrosion which plastic affords. While preferably employed in a straight line jet, surfaces which have curvatures can be accommodated by a jet member which is shaped to conform with the surface so as to obtain uniform distance between the jet and the surface to engage with the fluid emerging therefrom.

I claim as my invention:

1. A mechanism for directing a fluid jet against a traveling member in a paper machine comprising:

an elongate hollow shell formed in a general U-shape to provide a continuous fluid chamber,

the shell formed of one piece and having opposite sides terminating in a pair of lips integral therewith and of the same piece with their distal edges separated in a jet gap to determine the size of a fluid jet issuing therefrom;

said shell having walls for closing the ends of said shell so that a pressurized fluid directed into the shell will be projected through said jet gap; and

a gap control means including a pair of jaws forcibly engaging the outer surface of the opposite sides of

the shell for controlling the space in between the lips with the shell having a normal spring bias tending to separate the lips so that the jet gap changes with change in force applied by said jaws.

2. A mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

wherein said shell is formed of a metal having sufficient flexibility so that the width of said jet gap will change responsive to said gap control means.

3. A mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

wherein said hollow shell is formed of a shaped plastic material.

4. A mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

including means pivotally connecting said jaws; and a threaded member connected to said jaws for applying a force to pivot the jaws and change the width of said jet gap.

5. A mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

wherein said gap control means includes a holder with a bifurcated end to provide the jaws engaging the outer surface of the shell;

and means for applying a closing force to the jaws for controlling the width of said jet gap.

6. A mechanism for providing a deckle edge on a traveling porous web forming member in a paper machine constructed in accordance with claim **1**:

wherein an elastic plug member is clamped between the shell lips for closing the gap.

7. A fluid mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

wherein said walls are positioned at the ends of said shell and one of said walls has a fluid delivery opening therethrough for directing fluid into the shell chamber.

8. A mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

wherein said shell extends parallel to the edge of a traveling forming wire with the jet gap facing the wire adjacent its edge so that a deckle edge is formed on a web being formed on the wire.

9. A mechanism for directing a fluid jet against a traveling member in a paper machine constructed in accordance with claim **1**:

wherein said shell extends in a cross machine direction within the loop of a traveling fourdrinier wire on its return run with the gap directed at the wire to provide a stream of knock-off fluid through the wire.

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