

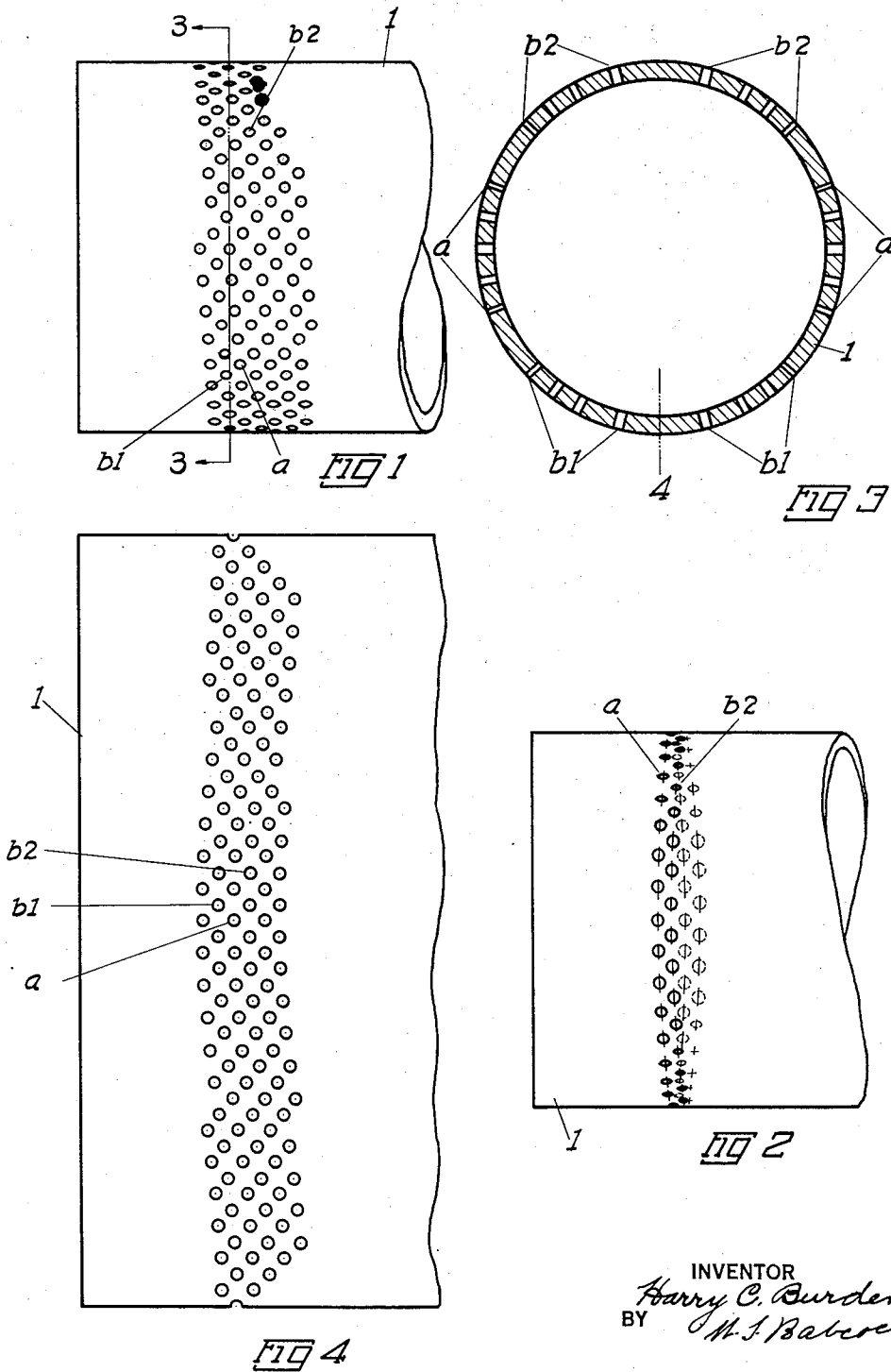
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SUCTION ROLL SHELL DRILLING

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SUCTION ROLL SHELL DRILLING

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The present invention relates to paper making machinery and more particularly to the disposition or distribution of the drilling or perforations of the shell for the suction roll.

The suction rolls in general use in machines of this type are perforated throughout their operative surface with a great number of small diameter closely placed and radially disposed holes. Wherever the metal of the shell is thus cut or drilled through it is weakened to just that extent. In the larger machines these large cylinder shells, when used for couch rolls, measure as much as 30" to 36" diameter by 25' length. Such shell is supported only at its extreme ends. When used as a press roll of corresponding proportions, it is also supported at its extreme ends but must in addition sustain the weight of the cooperating top press roll. In practice, the drilling of these large shells is made by a multiple spindle machine, a great number of drills all acting at one time to produce a corresponding number of perforations. To provide a uniform spacing between the drill holes and a uniform distribution throughout the surface of the shell, an indexing plate is provided.

As is well known, these shells comprise the revolving or movable member of the suction roll assembly, the stationary member being the suction box supported in well known manner therewithin. The box, as is well known, in assembling, is so adjusted relatively to the enclosing shell as to maintain a light running contact between the box packing and inner shell surface or wall. In the modern paper making machine, the shell surface travels at a high speed, often as high as 1,000 feet per minute, or more. In the paper stock there is more or less foreign matter of a gritty or abrasive nature which passes through the perforations of the shell. A certain portion of this, invariably follows the inner wall of the shell and is picked up or engaged by the box packing. The packing, itself, in its light rubbing contact with the shell wall has a slight abrading action, even under the most favorable cir-

cumstances. The continual addition of the foreign matter multiplies this grinding action. This scores the inner wall of the shell into alternate circumferential ridges and grooves so that many shells, after a few years use, must be rebored. Obviously, this reboring cannot be carried beyond certain safety limits. The shell wall thickness can not be reduced beyond that essential to withstand the strains imposed by the working conditions to be met in operating the machine.

The main purposes of the present invention are to overcome these and other serious objections and, at the same time, provide a drilling or perforation which may be easily and quickly applied to a suction roll shell.

In order to more clearly disclose the construction, operation, and use of the invention reference should be had to the accompanying drawings forming part of the present application. Throughout the several figures of the drawings like reference characters designate the same parts in the various views:

In the drawings:—

Fig. 1 is a fragmentary side elevation of a suction roll with the invention applied;

Fig. 2 is a top plan view of the same roll, showing the invention in diagram, the invisible perforations being shown in dotted line, and only two rows.

Fig. 3 is a vertical cross section in a plane at right angles to the longitudinal axis of the roll on line 3—3 of Fig. 1; and

Fig. 4 is a plan view of the fragment of Fig. 1 split longitudinally on line 4—4 of Fig. 3 and flattened to develop the lines of the drilling.

It will be obvious to those skilled in the art that drawings of a roll of the size used, when reduced to such size as is required for a patent application, can not be kept in exact proportion as to such matters as the perforations or the relative positions of the lines of perforations, etc. These features are necessarily considerably enlarged or exaggerated in order to more clearly and definitely bring out the ideas of the invention.

For instance, the diameter of drill hole in a couch shell is about $\frac{5}{16}$ of an inch and, in one known type of drilling, the distance between centers of perforations in the same row, circumferentially of the roll is 1.0162 inches and, longitudinally, .5666 inches. For a shell 30 inches in diameter by 25 feet long, a proportional reduction would nearly eliminate the perforations and run the lines so close as to confuse.

The shell illustrated is for a suction press roll. For couch roll drilling the perforations are of greater diameter than for press roll drilling and have their outer ends countersunk. Likewise, there is a difference between the drilling for first and second press rolls, all as will be well understood.

After a shell has been drilled the inner wall which, in operation, travels at high speed across the contacting surface of the packing strips of the suction box presents many thousands of small diameter round holes each surrounded by a metal edge. As these edges cross the packing strips they act to plane them down. Consequently, where planed in this manner, the packing and grit or other foreign matter, has little or no opportunity to wear the inner surface of the shell. On the other hand, where it is not so planed, the shell is worn away, leaving grooves and intervening ridges. In other words, this planing action keeps the planed portion of the packing from wearing the shell surface. Heretofore, the perforations have been so distributed that they do not plane, equally, all parts of the packing strips. The result in principle is the same as though the packing strips were not planed at all—the shell is badly scored.

By the present construction, arrangement, and disposition of the perforations, the planing action is uniform throughout the entire surface of the packing strips so that there are no sections capable of exerting a greater grinding or abrading action than any other section. Consequently, the inner shell surface is evenly worn and does not need rebor-ing at any time.

Referring to the drawings in detail, 1 indicates the shell of a suction press roll for fourdrinier paper making machines. This shell is perforated with many thousands of small holes, a , b^1 and b^2 , drilled a great many at a time by a multiple drill machine. In drilling, the perforations are made in a great number of very closely disposed parallel ellipses in a corresponding number of parallel planes all at the same inclination to the longitudinal axis of the shell. The perforations of a series lie in a continuous line defined by a transverse intersecting plane angularly related to the roll axis and if projected onto a plane surface parallel to the roll axis would define the outline of an ellipse. Two such ellipses are shown in Fig.

2, one half being shown in dotted line, because in the opposite half of the roll from that toward which the view is taken. One of these ellipses represents the first series or a perforations and the other the second or b^1 , b^2 series. This second series then may be spaced slightly more circumferentially of the shell than would automatically result from its longitudinal spacing. Similarly, third, fourth, and other series may be drilled, each being spaced circumferentially to give the desired offset relatively to the others. In this way, the full number of perforations required may be provided, while, at the same time, those perforations will be so distributed as to provide relatively long distances between any two perforations in the same line parallel with the longitudinal axis of the shell, thus overcoming or greatly reducing the objection known as "line-contact".

The planing effect or action may be very clearly seen on reference to Fig. 3. This view is taken on a line at right angles to the longitudinal axis of the roll, which has in this case, been drilled with two series, the second series being spaced or slightly offset circumferentially relatively to the first, as above explained. From Figs. 3 and 1 it will be seen that the point on the suction box packing strip corresponding with the line 3—3 on which Fig. 3 is taken, will be successively traversed by all of the inner edges of all of the perforations shown in that section.

The cross section cuts three separate ellipses including one first-series and two second-series, the first series ellipse lying between the two second series and the two second-series being equally and similarly offset circumferentially of the shell relatively to the first-series ellipse. For convenience, the first-series and first and second of the second series are designated a and b^1 b^2 respectively on the drawings.

In any type of drilling in which the perforations all fall in one or more lines extending continuously about the shell from end to end, there is, as the shell revolves across the packing strip of the suction box, a screw feed action tending to push the box packing in the direction of the inclination of the drilling, and, of course, an equal reaction on the shell.

In the present invention this objection is completely eliminated. One half of each curve acts to progressively plane and tend to force the packing in one direction and following half acts reversely so that for each revolution of the shell one half of the revolution just counterbalances or offsets the effects of the other half.

The section line 3—3, cutting through the shell at right angles to its longitudinal axis shows clearly how a given point of the pack-

ing will be traversed and planed by a number of perforation edges in every revolution of the shell. It also shows that these perforations are in three separate, longitudinally spaced rows one of which is considerably spaced circumferentially relatively to both of the others. And this or a similar relation holds true for any point on the packing and wherever a similar cross section be taken throughout the length of the shell. It will also be obvious that the degree of planing action increases or decreases progressively along the packing from the point at which it may be considered as beginning, due to the disposition of the perforations on parallel ellipses.

While the ellipses have been shown as inclined in one direction it is to be understood that they may be inclined in the opposite direction. It is also intended to include within the scope of the claims, other degrees of inclination than that shown, that shown being merely for purposes of illustration. The inclination could be such as to start the ellipse at one end of the shell and have it extend even beyond the longitudinal centre of the roll. Likewise, the ellipses may be arranged either more closely or farther apart as may be desired, though approximately the disposition shown is considered most satisfactory.

While the shell illustrated is shown as having press roll drilling, it is clear that such showing in no wise marks the boundary of this invention. I wish it distinctly understood that my invention comprises the drilling herein set forth whether applied to the shell of a couch roll, press roll of any kind, transfer roll, or any other suction roll in any type of paper making machine and to include, also, the assembly of such roll in its regularly recognized combinations in the trade, all of which are familiar to me.

Many changes may be made in the construction, arrangement and disposition of the several parts of the invention within the scope of the appended claims without in any degree departing from the field of the invention and it is meant to include all such within this application wherein only a preferred form has been disclosed by way of selective illustration.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. A suction roll shell for use in paper making machines provided with perforations disposed in a line at an angle other than a right angle relatively to the longitudinal axis of the shell all perforations of said line lying in a common plain.

2. A suction roll shell for use in paper making machines provided with a plurality of perforations all disposed in a line at an

angle other than a right angle relatively to the longitudinal axis of the shell all perforations of said line lying in a common plain.

3. A suction roll shell for use in paper making machines provided with perforations disposed in a curved line extending about said shell at an angle other than a right angle relatively to the longitudinal axis of the shell all perforations of said line lying in a common plain.

4. A suction roll shell provided with perforations disposed in an ellipse.

5. A suction roll shell provided with perforations disposed in an endless line at an angle other than a right angle relatively to the longitudinal axis of the shell.

6. A suction roll shell provided with perforations disposed in endless lines at angles other than a right angle relatively to the longitudinal axis of the shell.

7. A suction roll shell provided with perforations disposed in parallel endless lines at angles other than a right angle relatively to the longitudinal axis of the shell.

8. A suction roll shell provided with perforations disposed in parallel ellipses at angles other than a right angle relatively to the longitudinal axis of the shell.

9. A suction roll shell provided with perforations disposed in parallel endless lines at angles other than a right angle relatively to the longitudinal axis of the shell, the perforations of each line being in different longitudinal lines parallel to the longitudinal axis of the shell.

10. A suction roll shell provided with perforations disposed in closely arranged parallel endless lines at angles other than a right angle relatively to the longitudinal axis of the shell, the perforations of each line being in different longitudinal lines parallel to the longitudinal axis of the shell.

11. A suction roll shell provided with perforations arranged in two series of parallel endless lines at angles other than right angles relatively to the longitudinal axis of the shell.

12. A suction roll shell provided with perforations arranged in two series of parallel endless lines at angles other than right angles relatively to the longitudinal axis of the shell, one series alternating with the other.

13. A suction roll shell provided with perforations arranged in two series of parallel endless lines at angles other than a right angle relatively to the longitudinal axis of the roll, each endless line of one series being disposed between two endless lines of the other series.

14. A suction roll shell provided with perforations arranged in two series of parallel endless lines at angles other than a right angle relatively to the longitudinal axis of

the roll, each endless line of one series being disposed between two endless lines of the other series and being displaced circumferentially relatively thereto.

Signed at Sandusky, Ohio, this 17th day of November, 1928.

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