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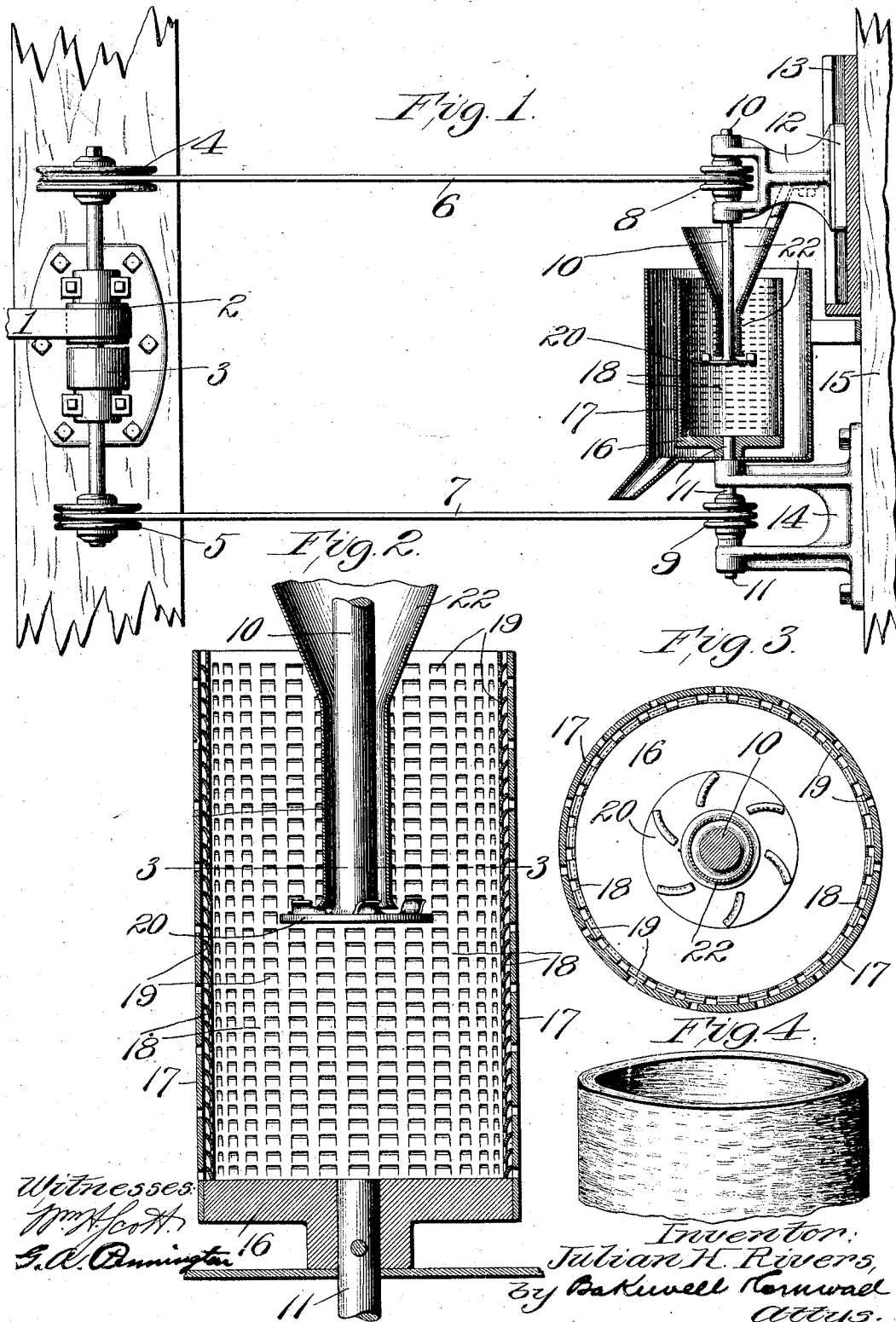
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J. H. RIVERS.

PROCESS OF FORMING HOLLOW PULP ARTICLES.

APPLICATION FILED AUG. 20, 1903.

NO MODEL.



UNITED STATES PATENT OFFICE.

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PROCESS OF FORMING HOLLOW PULP ARTICLES.

SPECIFICATION forming part of Letters Patent No. 768,306, dated August 23, 1904.

Application filed August 20, 1903. Serial No. 170,121. (No specimens.)

To all whom it may concern:

Be it known that I, JULIAN H. RIVERS, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Processes of Forming Hollow Pulp Articles, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevational view, partly in section, of my improved machine for forming hollow pulp articles. Fig. 2 is an enlarged view of the forming-mold. Fig. 3 is a cross-sectional view on the line 3 3 of Fig. 2, and Fig. 4 is a detail view of a portion of a hollow pulp article made by my improved machine.

This invention relates to a new and useful process for forming hollow pulp articles, the same consisting in delivering the pulp-water by centrifugal action against the inner face of a perforated revolving mold in a finely-divided condition, whereby the water passes off through the perforations of the mold and the pulp fibers are deposited against the face of the mold. The force with which the fibers are deposited on the face of the mold and the speed at which the mold rotates regulate the density of the finished article, and by moving the feeding devices along the mold the fibers are deposited in layers or strata, the said fibers lying principally in helical lines, each superposed layer being of different pitch or angle, with the result that the fibers composing the article partake of the nature of a woven mass.

In the drawings I have shown an apparatus for carrying out my improved process, of which apparatus the following is a description.

In the drawings, 1 indicates a driving-belt which is capable of being placed on fast and loose pulleys 2 and 3, as is well understood. The shaft of these pulleys carries driving-pulleys 4 and 5, which driving-pulleys are of different diameters, said pulleys having mounted thereon belts 6 and 7, which pass over pulleys 8 and 9, arranged on shafts 10 and 11.

The shaft 10 is preferably mounted upon a vertically-slidable bracket 12, mounted in guideways 13, whereby a bearing and its carried shaft may be adjusted vertically. Any suitable mechanical means may be employed for moving this bearing up and down, and such movement may be manually or mechanically controlled, as is well understood. The shaft 11 is preferably mounted in a fixed bracket 14, secured to a suitable post or support 15, upon which the guideways 13 are also mounted.

The upper end of shaft 11 carries a head 16, upon which is mounted a perforated hollow cylinder 17. This cylinder 17 is preferably fixed to the head 16, although it may be removable if desired. Within the cylinder 17 is an inner screening cylinder or mold 18, whose cut tongues are preferably bent outwardly to provide a space between the cylinder 17 and mold 18 for the passage of water, the water finally escaping through the openings in cylinder 17. These tongues, which are indicated at 19, extend in a longitudinal direction and in operation, after the pulp is deposited against the inner face of the mold 18, the said mold and its contained lining of pulp is removed from the cylinder 17, after which the pulp may be slid endwise from the mold 18, the longitudinal disposition of the tongues readily lending themselves to this movement without offering any obstruction. Of course such movement would be in a downward direction with the cylinder in the position shown in Fig. 2 or in a direction from the free ends of the tongues toward their attached portion.

The pulp and water are distributed throughout the length of the mold 18 by appropriate feeding devices, and it is a feature of my invention to speed up these feeding devices, whereby pulp and water are thrown outwardly by centrifugal force at a speed equal to or greater than the circumferential speed of the mold. In this way, in addition to the action of centrifugal force upon the pulp fibers deposited against the mold, the said fibers are

thrown forcibly against the mold and lie in layers or strata which are quite compact. Of course the compactness of the pulp article in the course of formation depends upon the circumferential speed of the mold. Empirically I have found that where the mold travels two hundred and seventy-five feet per minute the density of the pulp is about ten grains per cubic inch, and where it travels four hundred and seventy-two feet per minute, about nineteen and one-half grains per cubic inch; seven hundred and eighty-six feet per minute, about thirty-one and one-fourth grains per cubic inch; seventeen hundred and seventy feet per minute, about fifty-four grains per cubic inch; two thousand nine hundred and ninety feet per minute, about seventy-eight grains per cubic inch; four thousand three hundred and eighty-three feet per minute, about ninety-three grains per cubic inch; five thousand eight hundred and thirty-nine feet per minute, about one hundred grains per cubic inch; seven thousand three hundred feet per minute, about one hundred and twelve grains per cubic inch. The pulp and water when introduced into the mold approximate a density of two grains per cubic inch of water. The pulp fibers and the water are thrown centrifugally against the inner surface of the mold 18, upon which the fibers are deposited, the water passing outwardly through the openings in the cylinder 17 and mold 18. The circumferential speed determines the density of the pulp, and consequently as the density of the cast increases the percentage of water therein diminishes. I have further found that after the pulp has been deposited against the mold it can be dried to some extent by continuing the same or increasing the speed up to within certain limits.

I consider it important in the manufacture of hollow pulp articles, in order to avoid rupture or breakage on the inner face of the article, to speed up the mold to the point of required density and maintain that speed until the desired thickness of pulp fibers has been deposited upon the mold 18.

The feeding mechanism is preferably in the form of a disk 20 on the lower end of the shaft 10, which disk may have upwardly and outwardly extending curved lips or wings for the purpose of catching and carrying the pulp-water to the periphery of the disk for the purpose of delivering the same with considerable centrifugal force against the mold 18 and in lines slightly tangential. In other words, due to the unequal speeds at which the mold 18 and the disk 20 are driven, the pulp-water will be thrown off tangentially from the disk and this action contributes to the laying of the pulp fibers with great evenness circumferentially, with the result that a more compact and a stronger structure results. In fact, the hollow pulp-cylinder formed by my improved apparatus possesses the char-

acteristic of having its fibers in overlying strata, the individual fibers lying generally in a circumferential direction.

While I have shown a feeding-disk 20 as being driven at a faster speed than the perforated mold 18, it will be obvious that because of the difference in diameters of these two parts their circumferential speed will be approximately the same.

22 indicates a funnel whose mouth surrounds the shaft 10, so as to equally distribute pulp-water over the disk 20, said funnel being preferably mounted on the bracket 12 so as to be movable therewith and maintain at all times a fixed relation between the lower extremity of the funnel-mouth and the disk 20.

In operation the pulp-water, containing a density preferably of from two to three grains per cubic inch, is fed into the funnel and distributed by the disk 20 in a finely-divided condition in the form of a spray upon the perforated mold 18. The driving-belt 1 is operated at the desired speed, and manually or otherwise the bracket 12 is raised and lowered, so as to feed the pulp lengthwise the cylinder 18. When the desired thickness of pulp fibers of the required density is deposited upon the mold 18, the bracket 12 is raised, so as to permit the removal of the mold 18. I prefer to allow the hollow pulp article to dry in the mold 18, when it can be removed without danger of losing its shape, particularly where it possesses a small density. The action of moving the feeding devices longitudinally along the mold causes the fibers to lie in a helical direction. Starting at one end of the mold and moving the feeding devices toward the opposite end, it will be obvious that the fibers observe a pitch in a given direction, and upon the return movement an opposite pitch will result. The consequence is that the second stratum, which is deposited upon the first in oppositely-disposed helical lines, will become practically woven on account of the intersecting axes of the several fibers and produce an article possessing this peculiar characteristic. After a layer is deposited upon the face of the mold a second layer is then built up, and so on, the fibers of each successive layer having an opposite pitch until the desired thickness is obtained. Where it is desired to provide the hollow pulp article with a closed end it is obvious that pulp-water can be sprayed under pressure in the bottom of the mold, so as to deposit the pulp fibers in such manner that the bottom will be integral with the sides. The bottom can be formed before or after the cylinder. In this operation of spraying the principle is the same as the centrifugal delivery of the pulp-water against the rotating mold, in that the pulp-water is delivered under pressure, the fibers being in a finely-divided condition, which are impacted fiber by fiber upon the mold to make a cast of even density throughout. This uniform density,

by depositing the fibers from the distributing-disk or from the spray, utilizes to the utmost extent the felting properties of the fibers.

I do not in this application claim the apparatus for forming hollow pulp articles, nor the article itself as an article of manufacture, as the same are shown, described, and claimed in companion applications filed by me of even date herewith, Serial Nos. 170,122 and 170,123.

I am aware that minor changes in the construction, arrangement, and combination of the several parts of my process can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of forming hollow pulp articles which consists in delivering the pulp-water under the action of centrifugal force against the inner surface of a mold and in moving the point of delivery of the pulp-water over the face of the mold until the desired thickness is reached; substantially as described.

2. The process of forming hollow pulp articles which consists in delivering pulp-water under the action of centrifugal force against the inner surface of a rotating mold and in moving the point of delivery of the pulp-water over the face of the mold until the desired thickness is reached; substantially as described.

3. The process of forming hollow pulp articles which consists in depositing pulp fibers under the action of centrifugal force in helical lines against the inner face of a rotating mold in successive layers until the desired thickness is reached; substantially as described.

4. The process of forming hollow pulp articles which consists in depositing the pulp-water against the inner face of a rotating mold and in moving the delivery-point of the pulp-water back and forth longitudinally the mold so as to deposit successive layers of oppositely-disposed helical fibers upon the inner face of the mold until the desired thickness is reached; substantially as described.

5. The process of forming hollow pulp articles which consists in delivering the pulp-water

upon a rotating disk which throws the said pulp-water out by centrifugal force against the inner face of a perforated rotating mold whose inner peripheral speed is approximately the same as the outer peripheral speed of the supply-disk; substantially as described.

6. The process of forming hollow pulp articles which consists in delivering pulp-water having a density of about two grains of pulp per cubic inch of water upon a rotating disk whence it is thrown by centrifugal force against the inner face of a perforated rotating mold, there being a relative longitudinal movement between the disk and the mold whereby the pulp is deposited in successive layers upon the mold, the fibers of the pulp lying principally in helical lines having different pitches; substantially as described.

7. The process of forming hollow pulp articles which consists in delivering pulp-water having a density of about two grains of pulp per cubic inch of water upon a rotating disk, whence the pulp-water is thrown by centrifugal force against the inner face of a rotating mold, the inner periphery of said mold traveling at approximately the same circumferential speed as the outer periphery of the supply-disk; substantially as described.

8. The process of forming pulp articles which consists in centrifugally delivering pulp-water in a finely-divided condition, under pressure, against the face of the mold and changing the delivery-point until the desired thickness is reached; substantially as described.

9. The process of forming pulp articles which consists in centrifugally spraying pulp-water against a moving mold and moving the point of delivery of the spray over the mold so as to form successive layers until the desired thickness is reached; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 13th day of August, 1903.

JULIAN H. RIVERS.

Witnesses:

GEORGE BAKEWELL,
LENORE WILSON.