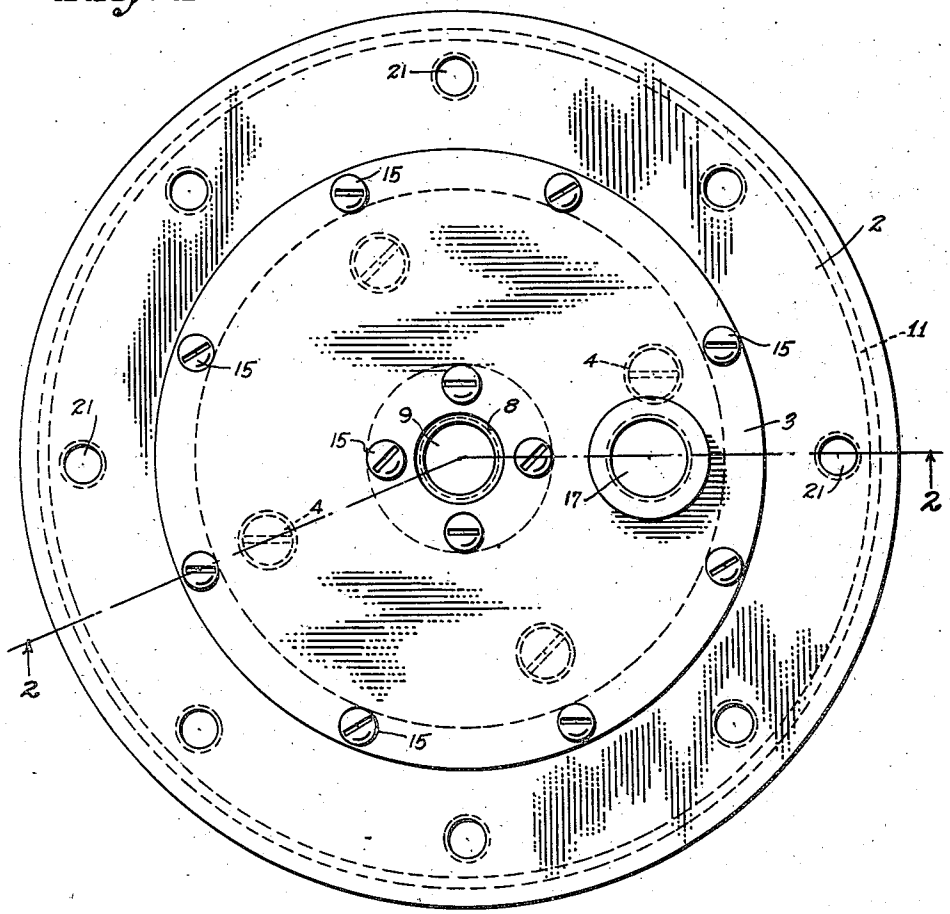
June 1, 1943. S. F. MONTAGUE ET AL 2,320,789

METHOD OF AND APPARATUS FOR MOLDING FIBROUS PULP ARTICLES

Filed Oct. 18, 1939

Fig. 1



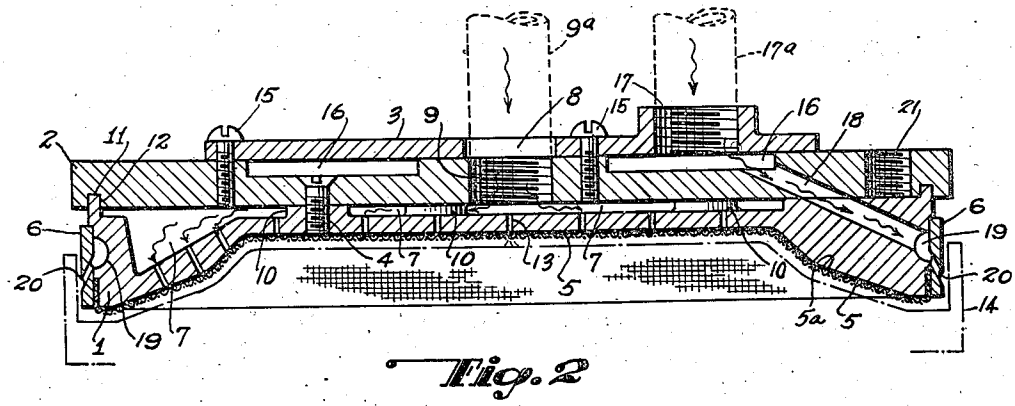


Fig. 2

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Patented June 1, 1943 2,320,789

UNITED STATES PATENT OFFICE

2,320,789

METHOD OF AND APPARATUS FOR MOLDING FIBROUS PULP ARTICLES

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Application October 18, 1939, Serial No. 299,936

4 Claims. (Cl. 92—54)

This invention relates to improvements in the method of making molded paper pulp articles and is directed also to a pressure head useful in the carrying out of the method.

It has heretofore been common practice in the making of molded pulp articles to compress the pulp between perforated dies and, as pressure is applied, the pulp is formed into the desired shape, while the residual water is squeezed out through the perforations of one or both dies. It is found in practice, however, that the nature of the pulp acted upon is such that it tends to clog the openings in the dies, with the result that water is trapped in the pulp and consequently the article, as it leaves the dies contains so much water that prolonged application of heat to the formed articles is necessary to adequately dry them.

One object of the present invention is to permit of the removal of a greater amount of water than heretofore possible during manipulation of pulp between dies, so that the article may be delivered from the dies in a dryer and harder condition than under prior procedures.

We have been able to accomplish this result through a departure from the methods heretofore practised. We employ complementary perforated dies as heretofore, but instead of depending solely upon the pressure of the dies to squeeze the water from the pulp, we force compressed air through the perforations of one die, thence through the pulp and out through the perforations in the other die. In this way we utilize the pressure of the dies to squeeze out the water and at the same time force out additional water by the passage of compressed air through the dies and through the pulp while the latter is under pressure. In other words, we accompany the mechanical pressure of the dies with the flow of compressed air through the pulp, to entrain and carry off residual water and at the same time preclude clogging of the perforations.

Another difficulty which has long vexed the industry is the tendency of the pulp to squeeze from between cooperating dies and form at the periphery of the article thus molded, protruding fibers, which, when dried produce a rough and undesirable edge which in some cases must be trimmed or cut off.

A further object of the present invention, therefore, is to obviate the formation of protruding fibers at the periphery of the articles so that a smooth edged article may result.

We have been able to efficiently accomplish this latter object by directing a blast of compressed air against the outer peripheral edge of the molded article, while the latter is under compression between the dies, for we have found that such a blast of compressed air will cause a matting of the fibers at the edge of the article and produce a smooth finished edge.

The die which we preferably employ for the carrying out of the foregoing method comprises, in one preferred practical form, a hollow perforated pressure head interiorly chambered, with the perforations disposed throughout the molding face in spaced apart relation and leading from a chamber in the pressure head to the molding face of said head. The molding face is covered by a screen mesh shaped to conform therewith and cover the perforations so that pulp cannot enter thereinto. The pressure head is preferably provided with an additional chamber communicating with a plurality of nozzles, positioned peripherally of the pressure head and inclined so as to direct compressed air, fed from said chamber, into the joint between the pressure head and a cooperating die, for the purpose of matting the fibers of the interposed pulp and producing a smooth edged article. Suitable means is provided for feeding air under appropriate pressure or pressures to the respective chambers of the pressure head and for controlling this flow of air as may be desired to accomplish the results specified.

Experience has shown that, when the pressure head of the present invention is employed in the carrying out of our method, the articles leaving the forming dies are much dryer and harder than under prior methods and consequently require the application of less heat to dry them. Moreover the edges of these articles are smooth and lack that furry appearance commonly found in articles as heretofore made.

Features of the invention, other than those adverted to, will be apparent from the hereinafter detailed description and claims, when read in conjunction with the accompanying drawing.

The accompanying drawing illustrates one practical embodiment of apparatus for carrying out the method of this invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a plan view of a pressure head embodying the structure of the present invention.

Figure 2 is a central section on the line 2—2 of Figure 1.

In the preferred form of this invention, the pressure head comprises a molding plate 1, a

back plate 2 and a cover plate 3. The exposed face 5a of the molding plate constitutes the molding face thereof. It has a contour appropriate to the article to be molded and is adapted to be covered by an overlying relatively fine mesh screen 5, which conforms to its surface and is held in place by a supporting ring 6 peripherally embracing the molding plate. This ring 6 may have a forced fit or it may be attached by screws, or it may have threaded engagement with the die plate. While screens of various mesh may be used in this connection, a 40 mesh screen has been found to give satisfactory results.

The back portion of the molding plate is hollowed out to form, within its body, a chamber 7 into which air may be fed through a hole 8 in the cover plate and a tapped hole 9 in the back plate. The molding plate and back plate are bound tightly together by the screws 4 which thread into bosses 10 in the molding plate, as shown, and in order to insure against pressure leakage between these plates, the molding plate is provided with a marginal flange 11 fitted into a registering channel 12 in the back plate.

Compressed air, fed into the chamber 7, from compressed air feeding means 9a, is adapted to pass from this chamber through perforations 13 which extend through the plate to the molding face thereof. These perforations may differ in size and number without departing from the invention, but, in practice, we have found that they may be conveniently spaced approximately ½" apart and have a diameter of about 3/64". They are disposed throughout the molding face, so that the air passing therethrough from the chamber 7 may be substantially uniformly distributed throughout the surface thereof.

The air thus discharged through the perforations 13 is adapted, by virtue of its inherent pressure, to force its way through the pulp article compressed between the molding face and the complementary face of a cooperating die, indicated in dotted lines at 14, which is perforated for the escape of such air. The passage of this air, as stated, causes the residual water of the pulp to be evacuated from the article between the dies, so that at the conclusion of the pressing operation, the pulp will be relatively firm and free from water content. The presence of the screen over the perforations 13 serves to preclude the clogging of these perforations by the pulp and assures the passage of compressed air therethrough without interference.

Another advantage of the screen mesh 5 is that it forms in the contiguous face of the molded article a symmetrical pattern which is more sightly than a flat fiber matted surface. If the die of the present invention is used, as specified, as a compression die cooperating with a forming die, this symmetrical pattern will be present in the article when it is delivered from the compression die and if it is thereafter acted upon by one or more additional dies having mesh screen faces, these latter faces will, in turn, apply their own particular mesh screen pattern and the resulting aggregate will constitute a relatively smooth surface of pleasing appearance.

It will be noted from Figure 2 of the drawing that the cover plate is secured to the back plate by screws 15 and that the back face of the back plate is hollowed out to form, with the cover, an annular chamber 16 into which compressed air may be fed, from compressed air feedings means 17a through a tapped boss 17. From this air chamber 16, compressed air is fed through a passage 18 to an annular channel 19, formed in the periphery of the molding face within and adapted to be closed by the screen attaching ring 6. This screen attaching ring is provided, at closely spaced apart intervals circumferentially thereof, with holes 20 bored in inclined relation to the face of the ring and constituting nozzles, so that air discharged therethrough will be directed against the outer edge of the article, as the latter is molded between the pressure head and the cooperating die 14. The inclined holes 20 may conveniently be about 3/64" in diameter and spaced about ¼" apart, so as to form around the outer periphery of the pressure head a substantially frusto-conical curtain of compressed air directed against the outer edge of the pulp article operated upon. In the showing of Figure 2, this blast of air will be directed within the peripheral flange of the cooperating die 14 and will serve to blow down and matt the fibers at the outer edge of the article in such manner as to produce a smooth uniform edge in the finished molding.

The pressure of air supplied through the nozzles 20 will largely depend upon the character of the pulp operated upon and the same is true of the pressure of the air supplied through the perforations 13 of the molding face, for the purpose of extracting water from the article, but for ordinary operation, we have found that substantially the same pressure may be supplied for both purposes. In some cases we may artificially heat the air used for either or both purposes, but this is optional. In practice the air streams used for these different purposes are controlled by appropriate air valves, preferably cam actuated, so as to be synchronized with the operations of the machine in which the pressure head is used.

The mounting of the pressure head of this invention in cooperative relation with the other parts of the machine with which it is to be used, may be accomplished in any desired way, but for illustration we have shown the back plate 2 as provided therein with a number of tapped holes 21 adapted to receive attaching studs for this purpose.

It will have been noted from the description of the structure shown in the drawing, that the pressure head of this invention is operated in accordance with a method quite different from those heretofore employed in the molding of paper pulp articles. As previously stated, it has generally been the common practice to compress pulp between dies which were perforated, so that the water of the pulp could be squeezed out through holes in one or both dies. If these holes become clogged with the pulp during this operation, the water was more or less trapped and satisfactory evacuation thereof was out of the question. In accordance with the present invention, in contradistinction, the pulp is compressed between the dies while air under sufficiently high pressure is forced through perforations in one of the dies and through the pulp, to effectually propel water out through the perforations in the other die. In other words, the present invention includes the method steps of compressing pulp and simultaneously forcing air through the pulp, as it is compressed, for the purpose of evacuating the water therefrom. We are of course aware that air under suction or pressure has been used to carry off water squeezed from pulp during the molding thereof, but we believe we are the first to actually force water out of pulp by forcing air through the pulp body while it is be-

ing molded, and we believe that we are also the first to produce smooth edged articles by forcing air under pressure against the edges of such articles while they are being molded for the purpose of matting the pulp fibers which tend to squeeze from the edges of the dies.

We wish it understood in this connection that we may employ the method by extracting the water from the pulp as described, exclusively of the method of producing the smooth edged articles, and, conversely, we may use the method of producing smooth edged articles without necessarily employing the method of extracting the water. For best results, however, both of these methods are concurrently employed. Likewise, and with respect more particularly to structure, the pressure head may be made to carry out either method to the exclusion of the other, although the best results are obtained when the structure is such as to concurrently carry out both.

In the accompanying drawing, we have shown the pressure head as built up of a number of plates to provide the air chambers to which we have referred. This constitutes a convenient method of fabricating the pressure head, but we wish it understood that the structure may be otherwise formed without departing from this invention.

The foregoing detailed description sets forth the invention in its preferred practical form, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what we claim as new and desire to secure by Letters Patent is:

1. A die for molding fibrous pulp, having a molding face against which an article of fibrous pulp is adapted to be molded, said die having gaseous pressure outlets arranged about the entire periphery fo the die and peripherally of and spaced from the margin of said molding face and positioned to direct a blast of compressed gas to impinge directly against the entire peripheral edge of the article in engagement with said face to blow down and mat the pulp fibres at said edge.

2. In the method of molding fibrous pulp articles, the steps which comprise compressing fibrous pulp between dies into an article of the desired shape, and directing a blast of compressed gas to impinge directly against the entire peripheral edge of said article while the article is held under compression between the dies, the pressure of said gas being sufficiently forceful to blow down and mat the pulp fibres at said edge.

3. In the method of molding fibrous pulp articles, the steps which comprise compressing fibrous pulp between molding dies to form the pulp into the desired shape, and simultaneously directing a blast of compressed gas into the joint between the dies and directly against the edge of the pulp article, the pressure of said gas being sufficiently forceful to blow down and mat the pulp fibres which tend to squeeze from between the dies, for the production of a smooth edge.

4. A die for molding fibrous articles having therein a plurality of chambers and provided exteriorly with a molding face against which an article of fibrous pulp is adapted to be molded and through which face passages lead to one of the chambers in the die, another chamber of the die having outlets arranged about the entire periphery of the die and peripherally of and spaced from the margin of the molding face and positioned to direct a blast of compressed gas to impinge directly against the entire peripheral edge of the article in engagement with said face to blow down and mat the pulp fibres at said edge, and means for supplying compressed gas to the latter chamber of the die.

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