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MOLDED EGG CARTON
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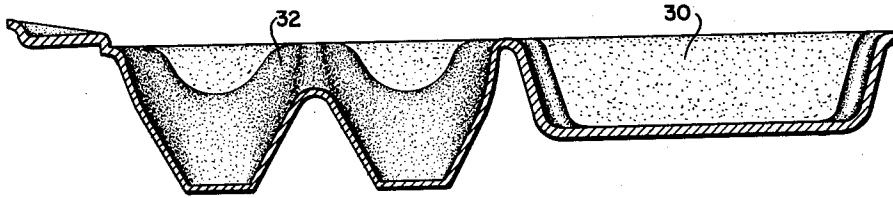


FIG. 1.

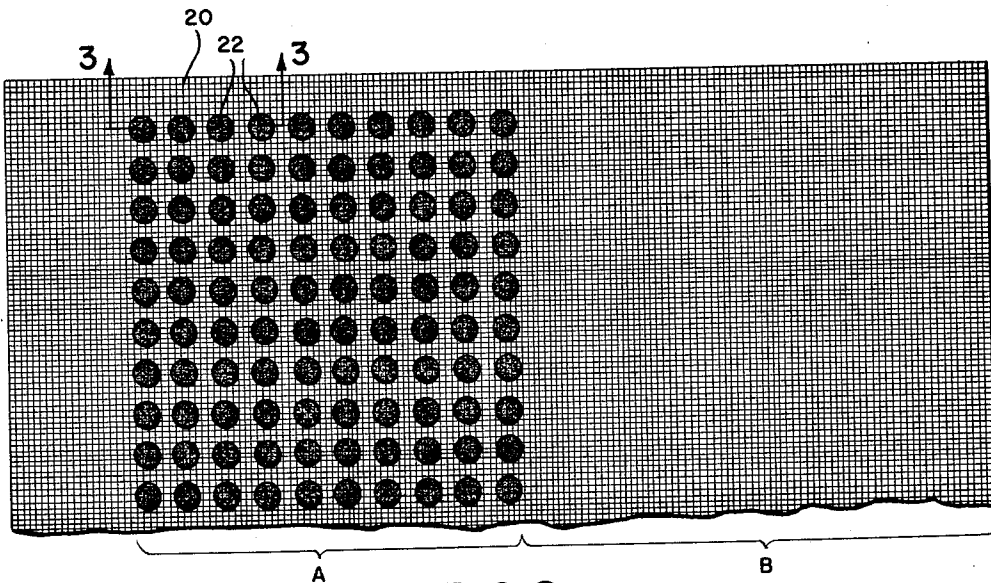
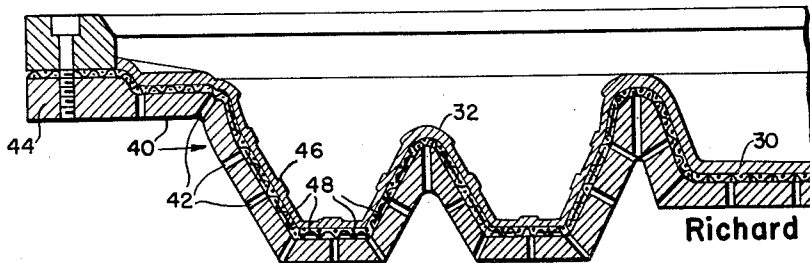


FIG. 2.



FIG. 3.



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FIG. 4.

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MOLDED EGG CARTON

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8 Claims. (Cl. 229-2.5)

The present invention relates to pulp molding and more particularly to a new construction of pulp molding die, a new method of pulp molding and the resulting product.

Heretofore not much success has been achieved in attempting to reduce pulp thickness by restricting drainage holes behind the screen. Also attempts to reduce the number of openings in the wire itself has not proved commercially useful. In like manner, building up the thickness of pulp in unit areas to a large dimension has been attempted through use of coarser wires and increased back drainage of the die, and this too has proved to be a commercial failure.

The broad concept of blocking out relatively large unit areas of the die for various purposes has likewise been proposed. However, all prior attempts have been made with one or more large blocked out areas.

It is an object of the present invention to produce a molded pulp article having a large unit area of an apparent uniform thickness that is generally much lighter in weight than other areas of the product.

Another object of the present invention is to provide a method of molding using standard pulp, molding time and vacuum to produce an article of lesser weight than previously obtained, with the lesser thickness being restricted to given areas of the article.

It is a still further object of the present invention to provide a molded pulp article that has a reduced nesting interval.

A still further object of the present invention is to provide a method of molding pulp articles so that they have a reduced nesting interval.

Another object of the present invention is to provide a method of molding a pulp article having portions thereof of a lesser thickness than other portions thereof.

A still further object of the present invention is to provide a novel molding die for pulp articles which permits molding articles having portions thereof of a lesser thickness than other portions thereof.

Other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a cross sectional view of an example of a pulp product made in accordance with the present invention;

FIGURE 2 is a top plan view of a die screen in accordance with the present invention before it has been formed into its three dimensional shape;

FIGURE 3 is an enlarged cross sectional view of the screen taken along the line 3-3 of FIGURE 2; and

FIGURE 4 is a partial cross sectional view showing the screen and molding apparatus.

In the usual process of molding pulp articles, such as egg cartons for example, using a standard pulp material, the same molding time and vacuum, the entire product resulting has a uniform thickness of pulp throughout the product and the weight of each product so molded is uniform. Various procedures have been tried in an attempt to reduce the overall weight of the article and to make weaker areas of the article thicker than the stronger areas thereof.

The present invention solves this problem by utilizing a molding screen in which relatively large areas thereof are blocked out in a plurality of discrete small areas in a repeated geometric pattern. As best shown in FIG-

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URE 2 a wire screen 20 is shown in which an area B is not blocked out and a large area A, is blocked out at a plurality of small, discrete areas 22 which are identical in configuration. As shown, the blocked out areas are small circles arranged in horizontal and vertical rows.

It should be understood that the shapes of the blocked out areas need not be identical, and may be of various shapes. Also, the arrangement of the areas need not be in horizontal and vertical rows. The only important and critical limitations are in the total area blocked out in the area A, and the diameter of each of the small discrete areas blocked out.

In tests which have been conducted, the preferred size of the small blocked out areas is $\frac{5}{16}$ " diameter circles, however good results have been obtained with smaller areas and up to $\frac{3}{8}$ " diameter. When too great a proportion of an area is blocked out difficulty is experienced in transferring the molded article from the screen due to insufficient unblocked area. Excellent results were obtained in a test run with 25% of the screen area blocked out. It should be noted, of course, that of the 75% screen area unblocked, only 30% is actually open due to the thickness of the wire, etc. In another test run with 81% of the screen area blocked out, the test run was unsuccessful as the articles molded would not transfer. Further tests have shown that excellent results are obtained when the blocked out area is as high as 55%, but difficulties begin to be experienced when the blocked out area rises to approximately 65%. Using special techniques to aid in the transfer, a blackout area up to 75% can be used; however, the preferred range is up to 45%.

The method of blocking out of the screen die can be accomplished in a number of ways. When it is desired that the molded surfaces be uniform in appearance, the impregnation or blocking out of the screen is so conducted that the surface characteristics of the screen are not affected as shown in FIGURE 3. This is done by impregnating less than the thickness of the screen. Good results have been obtained by using polyethylene to block out the small screen areas. An ironing technique may be employed for embedding the polyethylene into the screen. The use of a stencil having the desired cut out areas may be used. In conjunction with the use of a stencil, plastic or paint-like material can be sprayed onto the screen for blocking out the desired areas. The use of a mask in conjunction with a hot spray of a metal, such as lead, against the die could be utilized. A further method is the use of electroplating onto the screen in controlled areas to build up the thickness of deposit sufficiently to reduce or completely block out these areas.

After the wire screen has been blocked out as described above in the desired portions, that is, in the area where a lesser thickness of the molded product is desired, then the screen is formed into the three dimensional finished shape. The molding process is conducted in the usual manner.

In the usual molding processes utilizing wire screen dies, the die acts as a filter medium so as to separate the water from the pulp fibers which are in suspension in the pulp. The amount of open area in the wire screen generally far exceeds the amount of open area necessary to successfully mold an article. One of the reasons for having the openings as large as they are and in such a high percentage is to prevent the dies from becoming clogged in continued use.

After the first instant of stock formation, it is well known in present techniques that the pulp itself becomes a filtering medium to the suspension of pulp fibres being sucked against it. Since the rate of water thru the molded pulp is at a much lesser rate than the screen itself located underneath, it can be seen that the screen is simply acting

as a constructive shape to hold the original pulp mat that has no ability itself to withstand such vacuum forces.

Thus, in accordance with this invention, when a portion of the screen is blocked out, the usual drainage as in the unblocked portion B of the die in a direct vertical direction thru the die and pulp is changed. In the blocked out section A of the die, the drainage translates itself from vertical drainage to horizontal and angular drainage and thus increases the distance of travel thru the new filter medium formed. Thus, the amount of pulp deposited is less in section A of the die than in the unblocked section B of the die where the vertical drainage takes place and a thicker mat is formed. Thus the effective thickness of the resulting article in the portions corresponding to the blocked out areas of the die is uniformly less than in the portions corresponding to the unblocked out areas of the die. When the term "effective thickness" is used in the claims, it should be noted that the average thickness of pulp in these blocked out areas is meant.

By treating the screen wire as described heretofore in accordance with this invention, a filter of varying density is produced thereby causing a slower rate of build up of material in a given unit area as compared with another untreated area.

As a specific example, an egg crate as shown in FIGURE 1 was molded on a wire screen die as shown in FIGURE 4 wherein the portion of the die corresponding to the cover 30 of the egg carton was untreated, and the portion of the die corresponding to the bottom of the egg carton 32 was treated as illustrated with dots of polyethylene embedded therein, each dot having a diameter of $\frac{1}{16}$ " and 25% of that area of the die being blocked out. After the molding process using standard pulp, molding time, vacuum and pressure, an egg carton was obtained in a production run which had an overall weight reduction of over 5% from that obtained under the same conditions using a standard untreated die. In the cell area, where the die had been treated by partially blocking it out, the weight reduction was 12½%.

The molding apparatus of FIGURE 4 includes a former member 40 provided with a plurality of apertures 42 passing therethru. The edge of the former is provided with a flange 44 which is bolted to the apparatus. The molding die 44 of wire screen shaped to correspond to the shape of the former rests thereon and is also bolted to the apparatus. The pulp 46 is shown forming on the die. The portion of the die which forms the bottom of the egg carton has been partially blocked out by the dots of polyethylene 48. As shown, the pulp forming over the partially blocked out area of the die is thinner than the pulp forming over the remainder of the die. The finished article shown in FIGURE 1 shows the difference in wall thickness of the two portions of the egg carton.

There are many advantages to the use of this technique. First of all, less pulp is used, therefore resulting in a lower cost per egg carton. Secondly, due to the thinner lower section of the egg carton in the cell areas, more flexibility and resiliency is obtained to the eggs in these areas. Using less material in the complex regions of the die requires less heat in the rough drying. In a subsequent hot press operation, due to the smaller mass to compress, it can be accomplished better with a given tonnage of force. The thinner section results in a reduction in the stacking interval, thus reducing freight-costs due to the ability to pack more cartons in a given area. At the customer's level, a better denesting is obtained.

This method is particularly well suited for an egg carton construction since the cell areas therein have always been overly strong as compared to the cover portion of the carton. By reducing the thickness of the pulp in the portions of greater strength, namely the cell areas, and retaining the thickness of the cover portion, no loss in strength from that required is obtained in the weaker portions of the carton, and the stronger portion, even though

of lesser thickness than previously, is sufficiently strong for the purpose required.

Although the blocking out has been described with an impregnation of the screen of a thickness less than that of the screen, it is contemplated that for some purposes the blocking out can be either flush with or higher than the thickness of the screen. Certain decorative or esthetic effects can be obtained in this manner.

The block out technique utilized must not seriously affect the screen contouring properties necessary to make a three dimensional die. It is therefore important that the block out technique used be flexible to stretching in the screen forming technique. The use of a rubber latex solution for this purpose to obtain maximum flexibility is contemplated. The block out medium must be capable of withstanding harsh chemicals, steam and other cleaning procedures normally used on the screens in production. It must be able to withstand the acid action of the molded pulp along with the abrasive action experienced by the die in actual production.

The present technique has great magnitude of importance to production economy. Broadly it permits the reduction of the thickness of portions of molded pulp articles where less strength and greater flexibility is required, and also, it permits the reduction of the thickness of portions of an article to be nested to reduce the nesting interval.

When the terms "ply" and "single ply construction" are used herein, the usual meaning of a web, layer, or thickness is meant. In pulp molding, the web which is deposited at one time as a single thickness or layer is identified as a ply or a single ply.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. An egg carton molded of pulp of single ply construction comprising a cover portion and a bottom portion having cells therein adapted to hold the eggs, said bottom portion containing the egg cells having a uniformly lesser effective thickness of pulp and weight per square inch than said cover section.

2. A molded pulp article of single ply construction having portions thereof of an irregular configuration which inherently gives greater strength to said portions than other portions thereof, said portions being formed of pulp of a uniformly lesser effective thickness and weight per square inch than the remaining portions of the article.

3. An egg carton molded of pulp of single ply construction comprising a cover portion and a bottom portion having cells therein adapted to hold eggs, said cover portion and bottom portion being integral, said bottom portion containing the egg cells having a uniformly lesser weight per square inch than said cover portion, said bottom portion having discrete areas therein in a repeated geometric pattern of less than $\frac{3}{8}$ " major dimension to each discrete area which are of lesser thickness than the remainder of said bottom portion and which are each completely surrounded by thicker pulp areas.

4. A molded pulp article of single ply construction, comprising certain portions thereof of lesser weight of pulp per square inch and portions of greater weight of pulp per square inch, the portions of lesser weight per square inch being of irregular shape and having a plurality of small discrete thinner pulp areas therein in a repeated geometric pattern, said areas not exceeding $\frac{3}{8}$ " major dimension to each area, each said area being surrounded by thicker pulp areas whereby the weight per square inch of said portions of lesser weight is uniformly reduced as compared to said portions of greater weight per square inch.

5. A molded pulp article in accordance with claim 4

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wherein said discrete thinner pulp areas are in the shape of circles not exceeding $\frac{3}{8}$ " in diameter.

6. An egg carton in accordance with claim 3 wherein said discrete areas of lesser thickness are in the shape of circles not exceeding $\frac{3}{8}$ " in diameter.

7. An egg carton molded of pulp of single ply construction comprising a cover portion and a bottom portion having cells therein adapted to hold eggs, said cover portion and said bottom portion being integral, said egg cells each having a uniformly lesser weight per square inch than the remainder of said carton, said cells having discrete areas therein in a repeated geometric pattern of less than $\frac{3}{8}$ " major dimension to each area which are of lesser thickness than the remainder of said cell and which are each completely surrounded by thicker pulp areas.

8. A molded pulp article comprising a ply therein, said ply having a portion thereof of an irregular configuration which inherently gives greater strength to said por-

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tion than other portions thereof, said portion being formed of pulp of a uniformly lesser effective thickness and weight per square inch than the remaining portions of the article.

References Cited in the file of this patent

UNITED STATES PATENTS

1,850,584	Gray	Mar. 22, 1932
2,009,874	Cauley	July 30, 1935
2,423,756	Chaplin	July 8, 1947
2,515,113	Chaplin	July 11, 1950
2,560,847	Chaplin	July 17, 1951
2,738,914	Hatch	Mar. 20, 1956
2,739,750	Cox	Mar. 27, 1956
2,829,568	Chaplin	Apr. 8, 1958
2,843,304	Reifers	July 15, 1958
2,927,635	Crane	Mar. 8, 1960
2,974,847	Hurn et al.	Mar. 14, 1961
3,040,948	Wells	June 26, 1962