E. G. WILLARD.

APPARATUS FOR FORMING HOLLOW WARE OF PAPER.

APPLICATION FILED APR. 12, 1913.

1,151,843.

Patented Aug. 31, 1915.

2 SHEETS—SHEET 1.

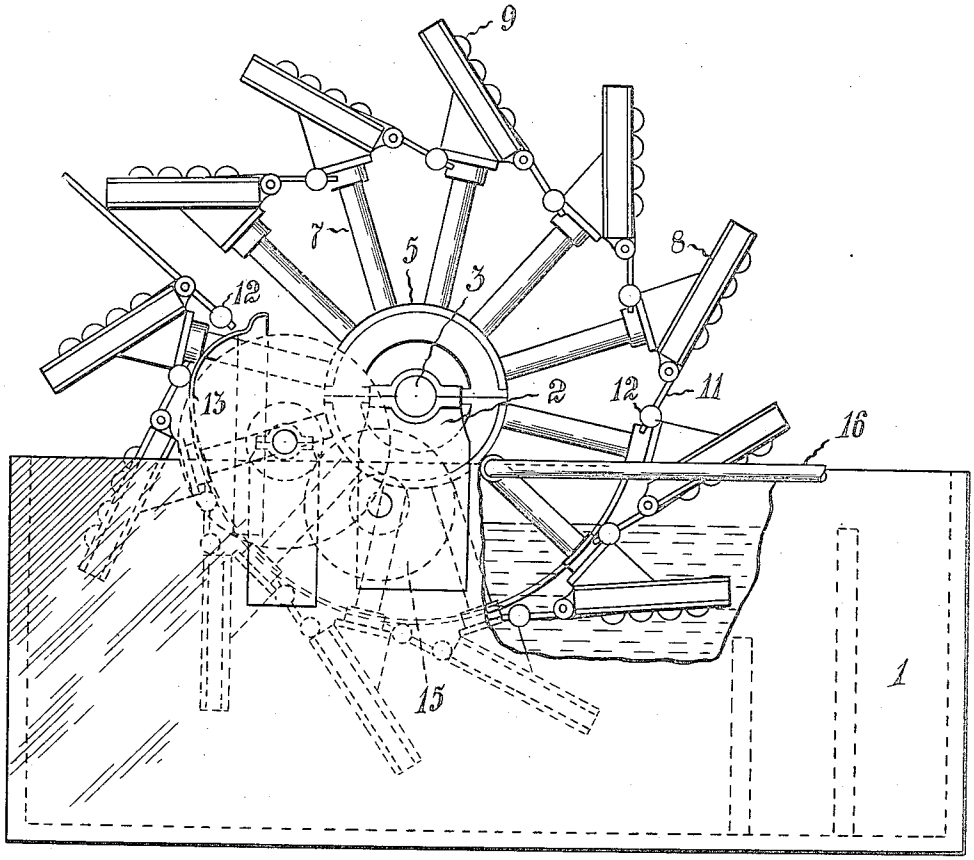


Fig. 1.

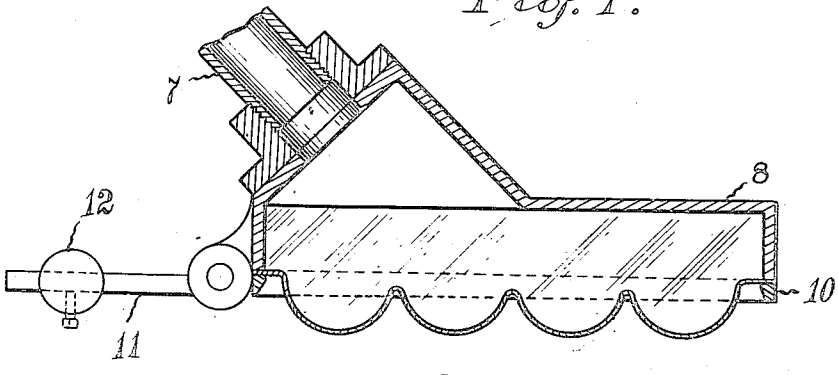


Fig. 4.

Witnesses.
C. Cunningham
E. P. Hall.

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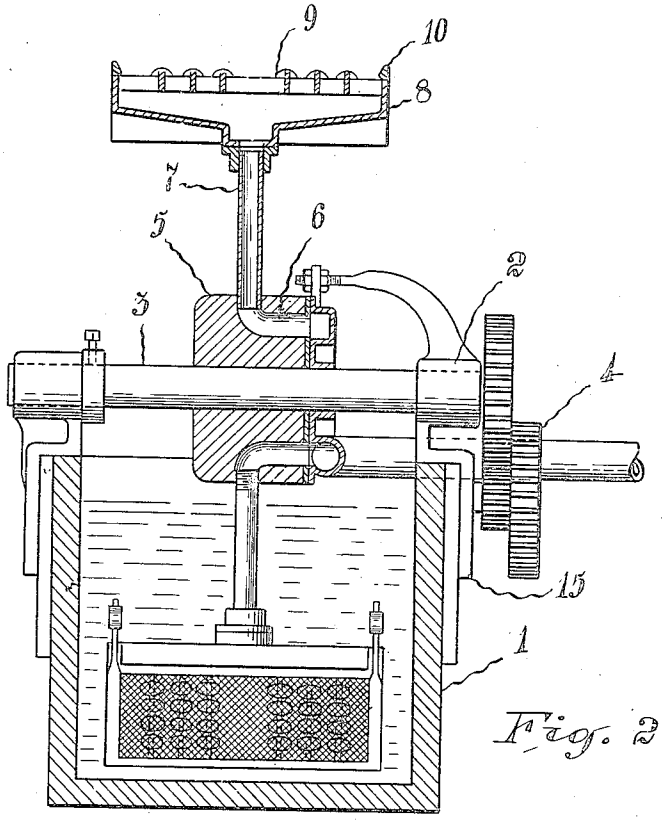


Fig. 2.

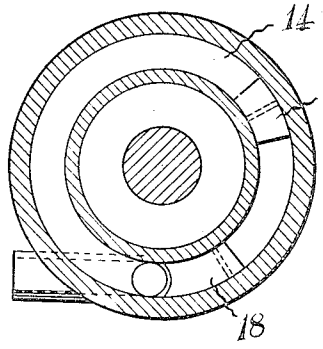


Fig. 3.

Witnesses.
C. Cavanaugh
E. P. Hall

Inventor
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UNITED STATES PATENT OFFICE.

EDWARD G. WILLARD, OF HAMILTON, ONTARIO, CANADA.

APPARATUS FOR FORMING HOLLOW WARE OF PAPER.

1,151,843. Specification of Letters Patent. Patented Aug. 31, 1915.

Application filed April 12, 1913. Serial No. 760,813.

To all whom it may concern:

Be it known that I, EDWARD G. WILLARD, of the citiy of Hamilton, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Apparatus for Forming Hollow Ware of Paper, of which the following is a specification.

This invention relates particularly to the formation of paper hollow-ware such as disclosed in U. S. Patent No. 755,640 dated March 29th, 1904, the term hollow-ware being usually employed to designate any ware partly or completely concaved or hollowed and in which the material does not vary greatly in thickness at different parts of the ware, including paper cups, bottles and the like as well as the egg trays disclosed in the said patent.

Briefly my process consists in forming shapes or forms of perforated metal or wire gauze which are supported on hollow chambers in which a vacuum may be maintained as desired. These forms are immersed in paper pulp suspended in water until a sufficient thickness of pulp has been accumulated on the forms. The forms are then withdrawn from the pulp and the action of the suction suspended. The forms with their accumulated coatings of pulp are then detached from the vacuum chambers and laid aside for the pulp to dry.

Preferably the vacuum chambers are carried on a rotary reel whereby the process may be made continuous, as while some forms are acquiring their coating others are being removed with their coatings and fresh forms applied to the chambers from which they have been removed, substantially as hereinafter described and illustrated in the accompanying drawings in which—

Figure 1 is a side elevation of the machine used in carrying out my process; Fig. 2 is a vertical section of the same; Fig. 3 is a face view of the hub to which the vacuum chambers are secured. Fig. 4 is a cross-section on an enlarged scale of one of the vacuum chambers with a form applied thereto.

In the drawings like figures of reference indicate corresponding parts in the different figures.

1 is a tank in which is placed paper pulp suspended in water. Suitably journaled on the bearings 2 on the walls of the tank is a shaft 3, which is driven from any suitable source of power through the medium of the gearing 4. On this shaft is secured the hub 5 in which are formed a series of passages 6 opening through the periphery of and also through one side of the hub. Into the peripheral openings of these passages are screwed a series of tubular arms 7, each carrying at its outer end a vacuum chamber 8 with the interior of which the bore of the arm communicates. Each chamber is open at its outer side and is adapted to have a form 9 of wire gauze applied thereto. This gauze is shaped to suit the form of the article it is desired to produce, in the present case an egg carrier such as is shown in the prior patent hereinbefore referred to.

The form 9 is held in place by means of the frame 10 hinged on the chamber preferably at the side nearest the shaft. This frame rests on the edges of the form and holds the edges down against the edges of the walls of the vacuum chamber. These frames it is evident must be raised and lowered to enable forms to be placed in position or removed as may be necessary. I prefer to employ the means shown, an arm 11 being extended from the hinged side of each frame and provided with a counterbalancing weight 12.

When the chambers 8 are carried about the shaft 3 by the rotation of the latter each one occupies consecutively the positions shown in Fig. 1. It is evident that when the chambers are in the lower positions shown, the weights tend to hold the frames closed, whereas as the chambers approach and pass the highest position the weights will open the frame as shown. The left hand side of the apparatus, shown in Fig. 1, is therefore the side at which forms will be removed and replaced.

To insure the closing of the frames 10 as the vacuum chambers approach the liquid in the tank I prefer to arrange a bracket 13 projecting into the path of the weights 12, or any other suitable part of the arms 11, so as to contact with the same and tip each one over to cause the closure of the frames. The bracket 13 is continued as the track forming an arc of a circle struck form a center in the axis of the shaft 3. This track by its engagement with the weights 12 securely holds the frames closed independent of the vacuum. The process requires that a vacuum be alternately created and removed in each of said chambers, the vacuum being created as soon as the chamber with

its form is immersed in the fluid in the tank and removed after the chamber is removed from the fluid preferably just at the point where it is desired to remove the filled form and replace it with an empty one.

I obtain the desired result by the following means: An annular chamber 14 is supported about the shaft 3 preferably by being secured to a bracket 15 extending from one wall of the tank. With this chamber communicates a pipe 16 which in practice will be connected with a suitable air pump. The chamber is so proportioned that the openings of the passages 6 are directly opposite the annular space of the chamber. To regulate the times at which suction takes place or is relieved I provide in the annular chamber 14 a fixed abutment 17 and a movable abutment 18, this latter determining the point at which the vacuum is created in the vacuum chambers as they move down into the liquid.

The mode of carrying out my process by means of the mechanism described will now be readily understandable. The apparatus is suitably driven and the pipe 16 connected with an air pump in operation. As each vacuum chamber approaches the left hand side of the machine, as shown in Fig. 1, a form 9 is placed in position and the corresponding frame 10 closed to hold the form in place and to so clamp its edges to the walls of the vacuum chamber as to prevent the passage of air through these edges. Each vacuum chamber with its form is in turn plunged beneath the surface of the pulp in suspension in the tank. As each vacuum chamber passes beneath the surface of the liquid, a partial vacuum is created therein which tends to suck the suspended pulp and liquid through the wire gauze of the forms. The pulp, however, is caught on the wire forms, being strained off from the liquid which tends to pass through the gauze. A layer of pulp thus accumulates on the form and the thickness of this layer depends on the amount of suction, the time of immersion and the amount of pulp in suspension. As each vacuum chamber passes out of the solution the suction is relieved and the fluid drains off therefrom. When each form returns to the initial position the form is removed with its coating of pulp and carried off to a suitable drying rack while a new form is placed in position ready for a repetition of the operation. The process it will be seen therefore consists in forming a fluid containing paper pulp in suspension, immersing the porous form therein, maintaining a partial vacuum or suction behind the said form while it is immersed in order to cause a deposit of pulp thereon. This process it is evident can be carried out by apparatus other than that shown and described, and is also applicable to many other forms of hollow paper ware than that referred to.

It is preferable I find to maintain the suction as long as possible after the form is removed from the fluid, to compact the pulp on the surface of the form, and remove as much water as possible

What I claim as my invention is:—

1. In apparatus for making paper hollow-ware, the combination of a tank; a shaft journaled over the same; a hub secured to said shaft; a plurality of passages formed in said hub each extending through its periphery and through one end; an annular chamber fixedly supported in contact with the end of the hub and in communication with the aforesaid passages; an exhaust pipe communicating with said chamber; abutments in said chamber limiting the segment thereof in communication with the exhaust pipe; means for adjusting one of said abutments circumferentially of the chamber to vary the length of the segment thereof in communication with the exhaust; hollow arms connected to said hub in communication with said passages; vacuum chambers carried by said arms, each open at one side; and porous forms applied to the open sides of said chambers.

2. In apparatus for making paper hollow-ware, the combination of a tank; a shaft; a hub secured thereto; hollow arms carried by said hub; means for creating suction in said arms while the apparatus is in motion; vacuum chambers carried by said arms each open at one side; removable porous forms applied to the open sides of said chambers; hinged frames adapted to hold said forms in place; and counterbalancing weights connected with said frames adapted to open the latter to release the forms when the latter by the rotation of the apparatus are brought to the place of discharge.

3. In apparatus for making paper hollow-ware, the combination of a tank; a shaft; a hub secured thereto; hollow arms carried by said hub; means for creating suction in said arms while the apparatus is in motion; vacuum chambers carried by said arms each open at one side; removable porous forms applied to the open sides of said chambers; hinged frames adapted to hold said forms in place; counterbalancing weights connected with said frames adapted to open the latter to release the forms when the latter by the rotation of the apparatus are brought to the place of discharge; and a bracket suitably supported to contact with parts rocking with said frames to rock the frames to their closed position previous to submersion in the tank.

4. In apparatus for making paper hollow-ware, the combination of a tank; a shaft; a hub secured thereto; hollow arms carried by said hub; means for creating suction in

said arms while the apparatus is in motion; vacuum chambers carried by said arms each open at one side; removable porous forms applied to the open sides of said chambers; hinged frames adapted to hold said forms in place; counterbalancing weights connected with said frame adapted to open the latter to release the forms when the latter by the rotation of the apparatus are brought to the place of discharge; a bracket suitably supported to contact with parts rocking with said frames to rock the frames to their closed position previous to submersion in the tank; and an arc shaped extension of said bracket adapted by engagement with said parts to hold the frames closed independent of the effects of the vacuum or of the weights.

Toronto this 26th day of Mar. 1913.

EDWARD G. WILLARD.

Signed in the presence of—
J. EDW. MAYBEE,
E. P. HALL.