Feb. 14, 1956 H. H. KLETZIEN 2,734,430

METHOD OF MAKING MOLDED FIBROUS PRODUCTS

Filed Sept. 2, 1952 2 Sheets-Sheet 1

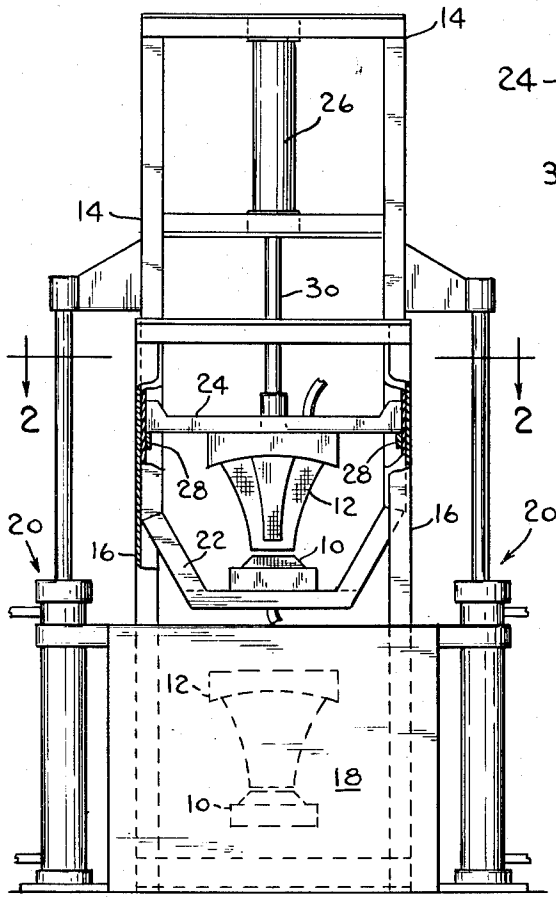


FIG. 1

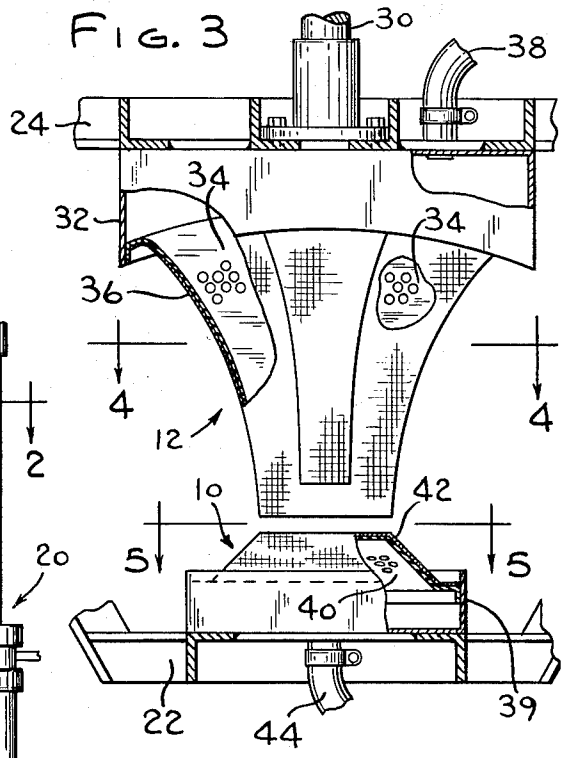


FIG. 3

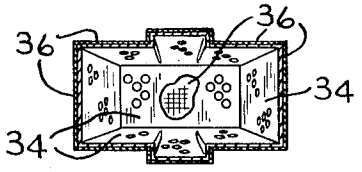


FIG. 4

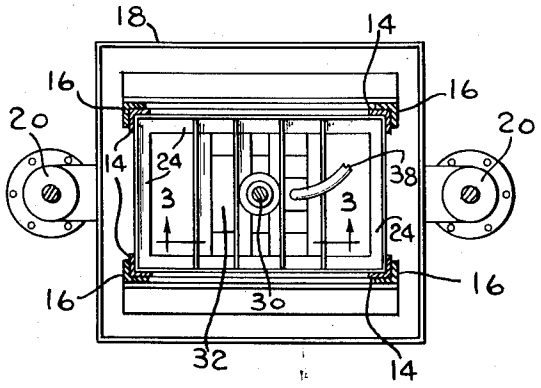


FIG. 2

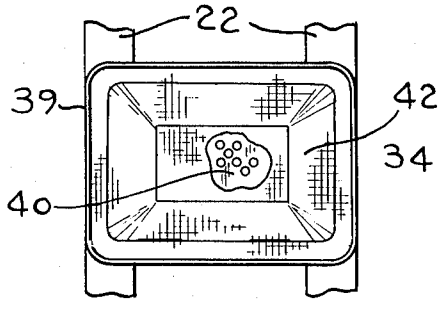


FIG. 5

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METHOD OF MAKING MOLDED FIBROUS PRODUCTS

Filed Sept. 2, 1952 2 Sheets-Sheet 2

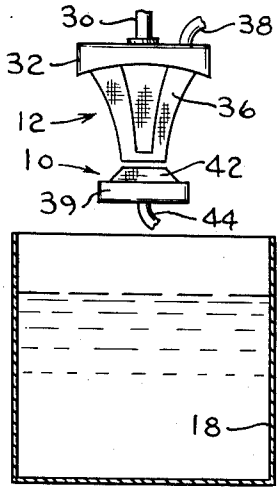


FIG. 6

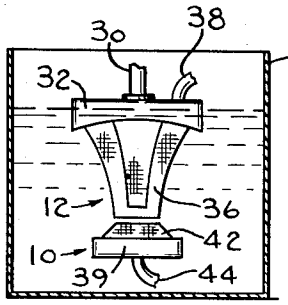


FIG. 7

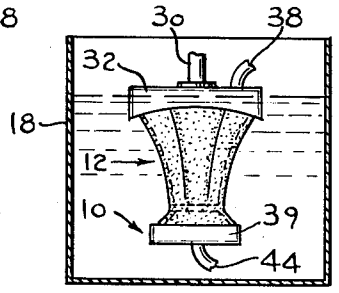
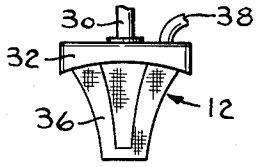
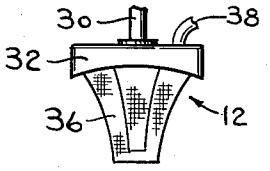


FIG. 8





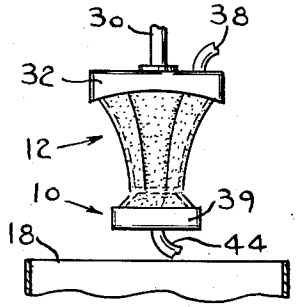


FIG. 9

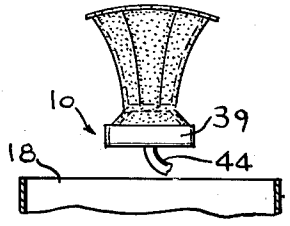


FIG. 10

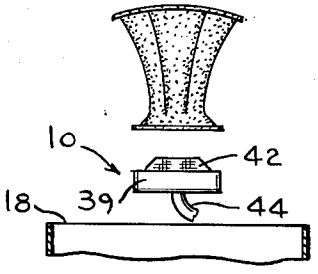


FIG. 11

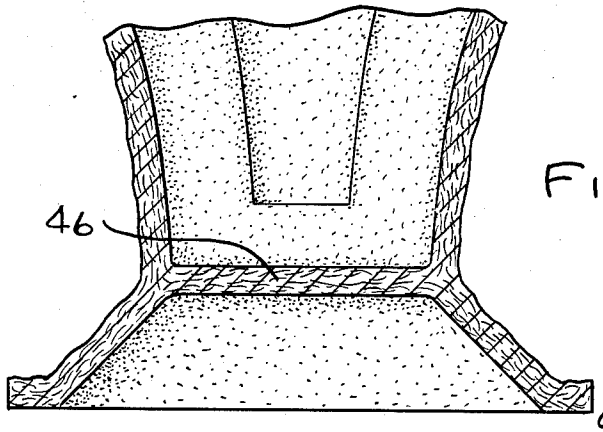


FIG. 12

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2,734,430

METHOD OF MAKING MOLDED FIBROUS PRODUCTS

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Application September 2, 1952, Serial No. 307,448

4 Claims. (Cl. 92—54)

This invention relates to the method of and apparatus for making molded fibrous products and particularly molded fibrous containers in which the top and bottom of the containers have greater cross-sectional areas than a portion between the top and bottom and having a partition at said portion.

The art of making molded fiber containers by the vacuum process is old and well known. In manufacturing such containers a rigid but porous form (usually of fine wire screening backed by perforated metal) is dipped into a pulp or other fiber bath and the pressure in the interior of the form reduced to deposit pulp on the exterior of the form. When the desired pulp thickness is attained the form is withdrawn from the bath and the reduced pressure maintained for a period of time to withdraw as much moisture as possible from the deposited pulp. At the end of this step a pressure above atmospheric is applied to the interior of the form to free the pulp from form. This permits removal of the molded paper fiber container from the form.

When it is desired to make a container having a base wider than some portion of the container intermediate the base and the top, the customary practice was to mount a premolded core of sand or other material on the bottom of the porous form prior to immersion in the pulp bath. This core is porous and when pressure is reduced in the interior of the form the vacuum is effectively applied to the porous core. Therefore, the pulp is deposited on the exterior of the core as well as the exterior of the form and when the pressure is subsequently applied to the interior of the form it is a simple matter to withdraw the form. The porous core has now become an integral part of the container having the flared base. While the containers having the flared core base are quite stable in that they resist tipping, they are not altogether desirable since the sand adds considerable weight to the molded paper fiber container and the shipping cost is greatly increased. In fact, the great weight of the sand core constitutes a material limitation upon the design of such containers since any base of considerable dimensions would require so much sand as to encounter prohibitive transportation costs. Furthermore, the molding of the sand and other types of cores constitutes an extra and comparatively costly step in the process.

The principal object of this invention, therefore, is to provide a method of and apparatus for fabricating fiber containers having flared bases without the use of sand cores or the like in the base.

Another object is to provide a method of and apparatus for manufacturing paper fiber containers having flared bases in which an integral dividing wall is formed between the top and bottom of the container at substantially the smallest dimensional point.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the method and the single embodiment of the apparatus shown in the drawings, in which:

Fig. 1 is a front elevation of the apparatus for manufacturing papier mâché containers in accordance with this invention;

Fig. 2 is a section of the apparatus shown in Fig. 1 taken on line 2—2;

Fig. 3 is an enlarged elevation taken as indicated by line 3—3 on Fig. 2;

Figs. 4 and 5 are views taken as indicated by lines 4—4 and 5—5 on Fig. 3;

Figs. 6 through 11 are schematic views illustrating the method and apparatus; and

Fig. 12 is a fragmentary cross section of the product of the method and apparatus.

While the drawings show the apparatus for producing but one container and illustrate a rather simple arrangement with a small pulp bath tank, it will be understood that for production the apparatus is so designed as to produce a multiplicity of containers simultaneously. As may be seen in Fig. 1 the bottom form **10** and the top form **12** are mounted on the frame **14** for vertical movement within a stationary frame **16** into and out of the pulp bath in tank **18**. Vertical movement of the frame **14** is regulated by a pair of hydraulic or air rams **20**. The rams are, of course, provided with suitable valves and hose connections to the fluid pressure source and sump and are provided with suitable bleed orifices to prevent movement beyond the upper and lower limits of travel. The stationary frame **16** is shown as comprised of four angle irons which guide movement of the movable frame **14**. When the rams are actuated the two forms **10**, **12** carried by frame **14** move simultaneously in the same direction.

The bottom form **10** is fixed to the movable frame **14** by means of bracket **22** while the upper form **12** is vertically movable with respect to frame **14** and the bottom form **10**. The upper form is carried by bracket **24** which is vertically movable within the angle iron legs comprising the movable frame **14**. Movement of bracket **24** and the upper form **12** is regulated by the hydraulic or air ram **26** carried by the vertically movable frame **14**. Ram **26** is, of course, provided with suitable hose connections to the fluid pressure source and sump and is provided with suitable bleed orifices to prevent injury upon reaching the limits of upward or downward movement of the bracket **24**. It will be noted that a stop member **28** is provided on the inside of each channel leg of the movable frame **14** to prevent movement of the bracket **24** and the upper form **12** towards the stationary form beyond a predetermined point to thus properly space the small ends of the two forms. In this case the stop **28** is shown as being permanently fixed to the movable frame but it will be understood that in normal practice this bracket would be adjustable so as to permit use of the same apparatus with various forms to compensate for the different heights of the forms. The spacing between the forms determines the thickness of the partition wall between the top and bottom parts of the completed container. This spacing must be determined so as to insure adequate thickness of the partition wall to obtain the desired structural strength while avoiding too thick a partition wall which would require too long a period of time to build up to the selected thickness.

As shown in Fig. 1 the forms are in their proper relationship and are prepared for submersion in the pulp bath tank **18**.

Figs. 3, 4, and 5 show the details of construction of the two forms and Fig. 3 additionally shows in more detail the relationship of the two forms prior to immersion in the pulp bath. While the construction of each of the two forms is basically the same as the forms found in the prior art, it is well to review the details of construction in order to insure proper understanding of the instant invention. Referring first to the top form shown in Figs. 3 and 4, it will be noted that the movable bracket **24** is provided with a connection to the piston **30** of the fluid ram **26** to regulate upward and downward movement of the bracket and of form **12**. The form is provided with an impervious support **32** for the porous portion of the form. As will be appreciated from remarks above, no pulp will be deposited on the impervious part of the form but will be deposited only on the porous portion of the form. The porous portion is comprised of a relatively stiff, perforated metallic form **34** which is covered by a fine woven wire screen **36**. The principal purpose of the perforated metallic backing **34** is to impart the desired degree of stiffness to the form to prevent deformation thereof. The pulp is deposited on the screen **36** on the outside of the form. A hose connection **38** to a vacuum pump and compressed air pump is provided for reducing or raising the pressure on the interior of the form below or above atmospheric pressure. The bottom form (shown in Figs. 3 and 5) is constructed in a manner similar to the top form and is provided with the impervious backing or support **39** and the porous portion having a perforated metallic backing **40** covered by the fine wire screen **42**. A hose **44** is connected to the interior of the bottom form and, as the case with hose **38** connected to the top form, is connected either to a vacuum pump or to a source of compressed air for reducing or raising the pressure on the interior of the form below or above atmospheric pressure. It will be appreciated that suitable valving, not shown, regulates the application of the vacuum or pressure above atmospheric to the interior of the form.

It will be noted that each form is generally tapered. This permits removal of the form from the pulp deposited on the form at the completion of the process. Theoretically the sides could be straight up and down. However, as a practical matter it is more convenient to design the containers with a slight taper to insure easier removal upon completion of the process.

The method of making papier-mâché containers according to this invention and the use of the apparatus shown in Figs. 1 through 5 is illustrated schematically in Figs. 6 through 11. In Fig. 6 the two forms are shown properly spaced above the pulp bath in tank **18** prior to immersion in the bath. Then the rams **20** are actuated to lower both forms into the pulp bath while maintaining the desired spaced relationship between the forms as illustrated in Fig. 7. At this point the valving is manipulated to connect the interior of both forms to the vacuum pump so that the pressure on the interior of the forms will be reduced below atmospheric pressure. This causes pulp to be deposited from the bath on the exterior of both forms and in the space between the two forms as illustrated in Fig. 8. When the desired thickness of pulp has been deposited on the form, the rams **20** are again actuated to raise both forms simultaneously from the bath as shown in Fig. 9. The interior of each form is maintained below atmospheric pressure for a short period of time after the forms are withdrawn from the bath to remove excess moisture from the pulp and effect a partial drying of the pulp. The next step is the application of a pressure above atmospheric pressure to the interior of the upper form while maintaining the pressure at or below atmospheric inside the lower form. This effects a slight separation between the upper form and the pulp deposited thereon to permit withdrawal of the upper form from the pulp by actuating ram **26**. The suction is maintained on the lower form or is shut off while the upper form is withdrawn to prevent the pulp from sticking to or following along with the upper form. After the upper form has been withdrawn as shown in Fig. 10 the pressure on the interior of the lower form can be raised above atmospheric pressure to free the pulp from the lower form or atmospheric pressure can be maintained and the pulp freed manually (Fig. 11). The pulp container is sufficiently firm to sustain its own weight and is placed on a drying rack until dry.

Fig. 12 shows a fragmentary cross section through the container produced in accordance with this method and apparatus. It will be noted that the pulp has formed dividing wall **46** between the flared top and flared bottom of the container. As noted above, the separation of the two forms determines the thickness of the dividing wall **46** and if the separation be too great a correspondingly great amount of pulp will be deposited on the exterior of the forms in a manner such as to be wasteful. Extreme separation of the forms will result in failure of the horizontal pulp mass between the top and bottom to unite the upper and lower pulp forms. If the forms are spaced too close together the dividing wall **46** will not be of sufficient thickness to have the desired structural strength. I have found that the small ends of the forms should be separated by about five-sixteenths of an inch to seven-sixteenths of an inch when making a container as illustrated of a height of seventeen inches to twenty-one inches.

From the above, it will be seen that the present method and apparatus result in a molded paper container which may be provided with a flared base without resorting to the sand core construction of the prior art. The integral dividing wall **46** possesses all the structural strength necessary to effect a completely practical container of this type. It will be appreciated that containers of different shapes and varieties may be designed without departing from the spirit of this invention. Similarly, deviations in the method or in the design of the apparatus may occur to those skilled in the art without departing from the spirit of the invention. Accordingly, I desire to be limited only by the scope of the claims.

I claim:

1. The method of manufacturing hollow molded fibrous products comprising the steps of placing two hollow forms each having porous side walls and a porous end wall, in proximity to each other, with the end walls thereof in opposed relation and spaced apart a distance defining the thickness of a wall of fibers to be formed therebetween, immersing the forms in a fiber bath while maintaining said spaced relationship, reducing the pressure on the interior of said forms to cause fibers from the bath to be deposited simultaneously on the exterior surfaces of said porous side and end walls, and maintaining the reduced pressure within said forms while so immersed and while so spaced until a layer of fibers of desired thickness has been deposited on each of said forms connected by a common wall of fibers formed within the space between the spaced end walls of the forms.

2. The method described in claim 1 wherein the forms are then withdrawn from the bath with the thus joined fiber layers clinging thereto, and then separating the forms from said fiber layers.

3. The method described in claim 1 wherein the forms are then withdrawn from the bath while maintaining the reduced pressure within the forms to cause the deposited fibers to adhere to the forms, and then separating the forms from said fiber layers.

4. The method described in claim 3 wherein the fiber layers are separated from the forms by increasing the pressure within one of said hollow forms and then in-

creasing the pressure within the other of said hollow forms.

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