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M. KOPPELMAN ET AL

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METHOD AND APPARATUS FOR MAKING PACKING FOR FRAGILE ARTICLES

Filed April 15, 1922

3 Sheets-Sheet 1

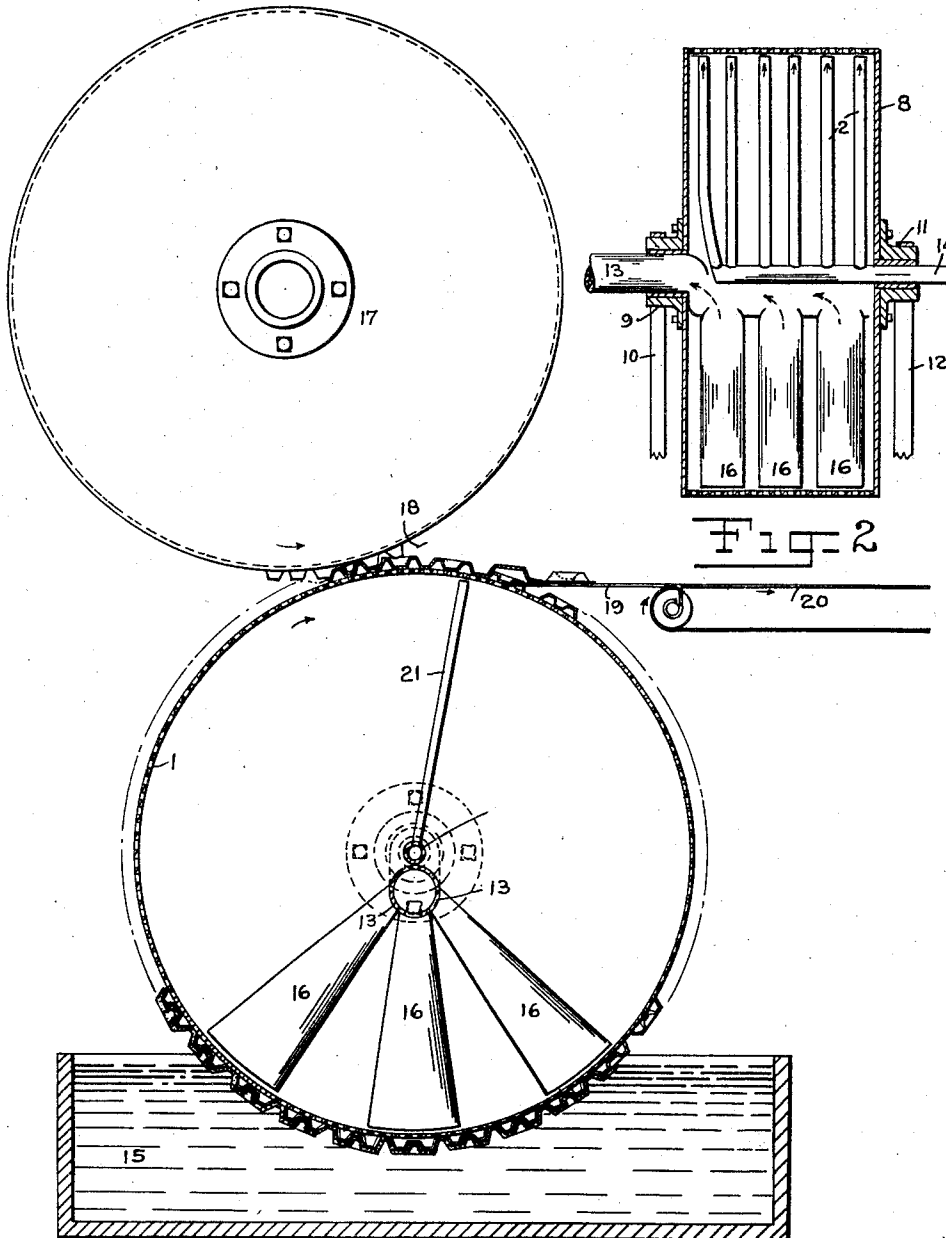


Fig 1

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3 Sheets-Sheet 2

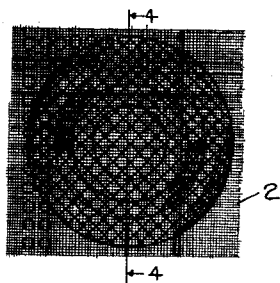


Fig-3

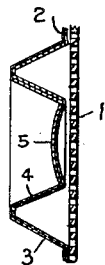


Fig-4

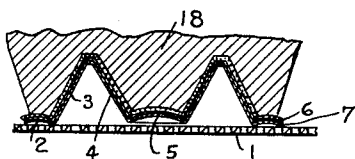


Fig-5

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3 Sheets-Sheet 3

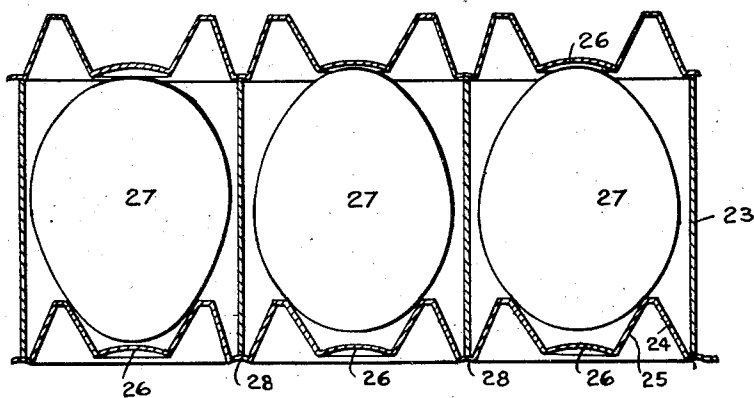


Fig-6

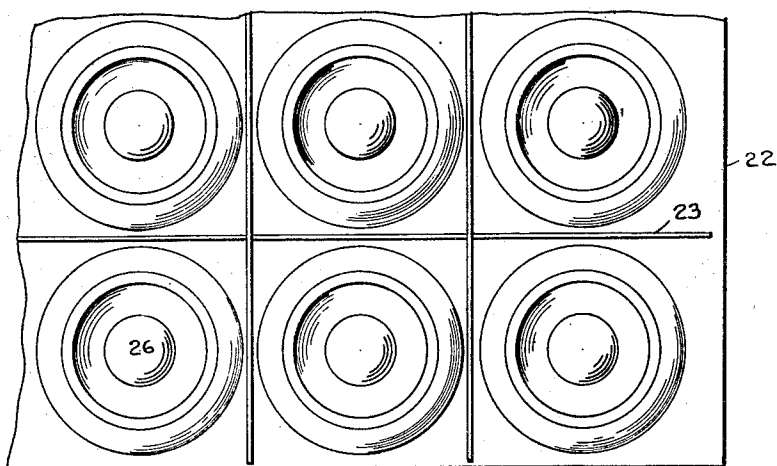


Fig-7

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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR MAKING PACKING FOR FRAGILE ARTICLES.

Application filed April 15, 1922. Serial No. 553,139.

This invention relates to packing units for fragile articles, such as eggs, electric light bulbs, and other globular objects made of glass or other brittle material, and have for their object, among others, the production of a packing unit of highly efficient form in such a manner and of such materials that the strength, durability, and usefulness of the unit are increased and the cost of production decreased.

Heretofore it has been proposed to make packing units having holders projecting from a sheet or "flat", by taking a sheet of straw-board, heavy paper or the like, and stamping or rolling it so as to produce the projecting holders, but so far as we are informed none of these proposed devices has ever been extensively used, and none of them has proved to be of any practical or commercial value. One reason for this is that even if the paper or board is thoroughly saturated with water or other liquid, and then formed by flat dies or rolls, or otherwise, the fibres having once been set—in the original making—in certain positions and relations will always have a tendency to return thereto, and to deform the unit and the parts thereof; and to reduce its strength to such an extent that it will not do its work. Another reason is found in the fact that in forming the projecting members from such a sheet of material the area is necessarily very greatly increased, and the fibers stretched and torn, even where openings are made in the material and the displacement of the opening utilized in forming the projections. The result is that the holders are weak and badly formed and will not hold their shape or resist the shocks and strains of use. If board of sufficient thickness were used to permit the formation of holders thereon without rupturing or unduly weakening the material, the objection first noted would still be present, and the weight of the board and its cost would be prohibitive. Other reasons which account for the fact that these prior devices have never gone into use are found in the shape and proportions of the holding projections which give them a tendency to yield under ordinary strains and permit the eggs or other articles to become loose in their cells, and even permit

the cells to move thereon and displace the eggs or cause them to break, through contact on opposite sides of cell walls or otherwise.

In practicing the present improvements upstanding holders of substantially conical form are formed in the sheet or flat simultaneously with the formation of said sheet, as set forth in the said co-pending application, the formation of the sheets and the projecting holders being accomplished by one and the same process or series of operations, and these holders have a web or cup-like connecting and reinforcing portion extending over the space circumscribed by the edges of their upper openings, the pitch or inclination of the outer walls of the holders being in the opposite direction to that of its inner walls, which, with the bottom portion, form the cup-like interior. In forming these parts wood pulp or cellulose or other loose fibrous material is employed, the fibres being first placed in a liquid bath. Macerated paper, thoroughly disintegrated and mixed with water until it has the consistency of a thick soup may be employed, as may other similar materials. The loose floating fibres are then drawn against suitable formers by means of interior suction, so that they will lie on one another and conform to the shape of the article before becoming set, and the coating thus formed is subjected to the pressure of a former, after it has passed from the bath but before it is dry so that it will have a comparatively smooth surface and be fairly compact. It is now permitted to set and dry to form the packing unit. If desired, and particularly where the nature of the fibre employed makes it advisable, a hardening substance, such as Portland cement may be added to the bath in quantity sufficient to secure the desired result, but this is not necessary or even preferable in most cases.

We are aware that packing members of this general type have heretofore been described in United States Letters Patent, and that in such patents it has been proposed to form such holders by means of a pulp sucking process, but the holders proper have not been of the upstanding type and have not been capable of performing the functions

and securing the advantages of the present holders; and so far as we are informed a unit of the peculiar character of the present units has never been successfully made in this manner. The advantages are apparent. The holders are of such form and are so constructed and arranged as to hold the eggs or other articles securely and to lock the cell walls or "fillers" against all lateral movement, while at the same time they are only relatively rigid and will have a sufficient degree of elasticity to accommodate themselves to slight variations in the sizes of the eggs or other articles without cracking or checking them, or permitting such injury under the most severe shocks and strains of use. Moreover the method of making them insures proper and accurate form and the preservation of that form in use, since any pressure on the unit or any part thereof will tend to move its fibres from their normal position and will be constantly resisted thereby, to the end that the parts will always have a tendency to return to their original form, which causes them to exert a counter pressure when slightly pressed or drawn therefrom and to hold the articles in a firm but only relatively rigid grip.

The usefulness of the device in preventing breakage of eggs and other articles in packing, shipping and handling and for other purposes will be apparent. In addition to these advantages however the construction permits the inspection of the eggs without removing them from the flats on which they are mounted and the exhibition of them in stores and elsewhere on the said flats. When the cell-forming fillers are removed from the flat the eggs will remain in position on their holders, and a flat—usually supporting thirty-six eggs—may be taken out of a case or crate without disturbing the eggs thereon, and restored thereto after inspection or exhibition. This is largely due to the fact that the holders are preformed in the manner herein described so that the flat and its holders thereon maintain their form, even after the innumerable shocks and vibrations of a long railroad journey, cartage and handling.

The improvements are illustrated in the accompanying drawings, referred to herein, in which Figure 1 is a diagrammatic elevation of a mechanism for practicing the method or process; Fig. 2 is a vertical medial section of a drum such as that shown in Figure 1, with suction and compressed air tubes and their connections indicated in full lines; Fig. 3 is a plan of one of the formers for the holders and connecting portions; Fig. 4 is a vertical section of the same on the line 4—4 of Fig. 3; Fig. 5 is a detail of the former of Figs. 3 and 4 and a fragment of one of the compressing dies applied to the holder which has been formed thereon;

Fig. 6 is a vertical medial section of a portion of two of the packing units with fillers of standard form between them and eggs positioned in the holders, and Fig. 7 is a plan thereof.

In order that the process may be fully understood, and may be practiced by those skilled in the art mechanism by which it may be performed has been illustrated, and will be described. Any other suitable mechanism however may be employed, and the operations may also be performed largely by hand.

A drum or roller is indicated at 1, and on the outer periphery of this drum the forms for shaping the packing unit are mounted, in cross rows, preferably six or twelve holders to the row, as it is customary in egg packing to pack the eggs in rows of six each. Each form consists of a relatively flat base and connecting portion 2, a ring in truncated cone form projecting therefrom and consisting of the upstanding outer portion 3, the inner inwardly and downwardly inclined portion 4, and the bottom middle portion 5, these parts being composed of outer and inner sheets of wire fabric, the outer one 6 being finer than the inner one 7, which is stronger and acts primarily as a backing or reinforcement for the outer, finer mesh. These forms are wired or otherwise mounted on the perforated shell of the drum, which may be made in one piece of sheet metal or in strips, as desired. The drum may be provided with suitable heads, as indicated at 8, and hubs 9 and 11 which may act as pulleys for operating belts 10 and 12. In the illustrated device shown the drum is journaled on the suction pipe 13 and compressed air pipe 14 which run through the hub and are secured together on the interior. It will be understood, however, that this mechanism is indicated merely for the purpose of giving an illustration or example of how the process may be practiced with the aid of machinery.

The drum is mounted above the tank or tub 15 containing a liquid composed of water and loose fibres, preferably cellulose or other suitable vegetable fibre suspended therein so as to give the bath the consistency of a thick soup, and the lower part of the drum is constantly immersed in this bath, so that as it rotates the forms will be passed through it and will receive a coating of fibres or "pulp," depending for its thickness on the thickness of the bath or "soup," the speed of rotation and the degree of interior suction.

The suction pipe 13 has radial branches 16 extending therefrom to a point in close proximity to the inner periphery of the drum at its lower part and where it passes through the bath, so that a stronger suction is produced at this point than at other parts of the drum. The branch pipes 16 are preferably flared so as to present a large suction

area, but any desired form may be employed. Other branches may be located above the bath, and particularly opposite the compression dies, to draw air through the layer of fibrous material on the forms and remove excess water, and also to hold the same tightly against the forms.

From the point where the sheet is removed from the drum and the point where the forms again enter the bath, a sector having rubber or other suitable strips in contact with the inner periphery of the drum may be located for the purpose of isolating that portion of the periphery from the suction and preventing the reduction of the partial vacuum by the inrush of air through the open forms. This will also facilitate removal of the sheet by the fingers.

As the forms pass through the bath the liquid is drawn in through the forms, and the loose floating fibrous material deposited on the exterior thereof so that a sheet or coating conforming to the said forms is applied thereto. The forms with the coating thereon now ascend out of the bath and through an arc of approximately 120°, and are then subjected to the action of the compressing dies 18 on the drum 17 mounted above the first drum and geared therewith, so as to insure registration of the dies with the forms. The dies, being set closer to the forms than the outer surface of the sheet, will compress the latter and smooth and accurately shape its outer surfaces, taking out any small irregularities that may be found thereon, and also squeezing out any excess water that may remain. The sheets then pass to the blowing jets, where they are removed from the drum and caused to travel over fingers 19 to a belt 20, which may be employed to convey them to and through a drier, such as an oven provided with heating burners. After this they may be cut into separate sheets as desired.

The removal of the formed sheets in a moist state is accomplished by air under pressure first applied to one edge of the continuous sheet and from there across the sheet. For this purpose a series of pipes 21 branching from the compressed air pipe 14 are employed. As each row of forms with the formed holders thereon approaches the point of removal a valve will be opened so that compressed air will be projected against the underside of the forms and through them against the underside of the formed sheet. In order to accomplish this automatically the branch pipes 21 are made of progressively smaller diameter from one edge of the drum to the other so that the volume of air will be greater and the air jet will be applied first at that edge, and then across the sheet. If desired, or if the results in any particular case are not satisfactory, a nozzle having an opening in its top near one

end may be employed, and this nozzle may be thrust into the pipe 14 so that its opening will register with the pipes 21 successively, beginning at one side. A nozzle of this character may also be arranged to work automatically instead of by hand, and may pass back and forth through the pipe 14 more than once if better results are thus attained.

During the operation of forming, pressing, and removing the sheet of holders the suction is maintained, but it is much greater at the points opposite the branch suction conduits 16 and therefore, while the forms are passing through the bath. The maintenance of the suction after that tends to dry the sheet, and when it reaches the point of removal from the forms it tends to prevent the removing blast from deforming the sheets, and holds them close to the forms so that they will not become bent or distorted, until they are stripped off by the fingers 19, the ends of which are in close proximity to the outer periphery of the drum. Water will be removed from the bottom of the drum by the suction tubes, and returned to the tank through a suitable conduit, and this applies to water drawn in at the tank by the tubes as well as water which may be removed later from the forms and the molded sheet. If desired the cylinder 1 may be provided with an outlet for this purpose.

The holding and packing units formed by the process described consist of sheets of material 22 with raised cone frustum-like members thereon, arranged in parallel rows. Each sheet will usually have six rows of six holders each, making thirty-six holders in all, this being the standard capacity of ordinary sheets or "flats" and the cell forming members or fillers between them. The portions of the sheets between the projecting holders are curved upwardly to a slight extent or grooved as shown at 28, where they receive the edges of the filler 23, so that when a sheet is placed on the top of a filler it will engage the upper edges of the filler members in these grooves and thereby provide a means for further positioning and holding the two parts. The lower edges of the filler are securely held between the projecting holders. Each holder consists of an upwardly and inwardly inclined ring 24 and a downwardly and inwardly inclined interior wall 25 with an approximately horizontal bottom and central portion 26, the angles and arrangement of these members may be varied to some extent, but it is important that the opening at the top shall be large enough to receive either end of the egg or other article to be placed therein, so the edges of the opening will engage the wall of the article at such an angle that there will be a degree of wedging action. The depressed central portion

of the holder extends to a point above the sheet proper 22, which is the base of the holder, so that normally it does not come in contact with the article positioned therein, except at its upper part. If however pressure is exerted in forcing the article therein so that the holder is spread to some extent no harm will be done, and the holder will grip the article because of the tendency of the holder to return to its normal shape due to the fact that the fibres of which it is composed have been brought together and permitted to set and dry in substantially normal positions, that is to say without being distorted to any material extent by force or any other influence. It has been found that where the holders are thus formed they have greater strength, and will preserve their shape under all ordinary conditions of use. The bottom portion 26 is preferably slightly concavo-convex, but this is not absolutely essential, nor is its exact position. These may be varied according to the nature of the article, and the use to which the packing is put. In the drawings eggs 27 are shown, and it will be observed that they rest upon the lower holders above their bottoms and have their upper ends immediately below the bottom portions 26 of the holders above, which may receive other eggs or be employed as a cushion between the top or bottom layer and the walls of the case or package. Usually ten layers of eggs formed in the manner shown are placed in one case, making 360 in all. The packing unit therefore serves to hold the eggs or other articles above and below it, so that but one flat or unit is used for each layer of eggs, except where additional units are used at top and bottom as cushions. If desired the holders may be made lower, and the middle portion 26 permitted to project below the base sheet so that each egg will be within the upper and lower edges of its cell or compartment, and will at the same time be separated from those above and below it and held. Nor is the construction limited to one in which the upper end of the egg is held by the middle bottom portion of the holder above it.

An important advantage of the construction herein set forth is that any number of sheets may be superposed one upon another, with the holders telescoped, so that a nested relation is obtained, greatly reducing the space occupied by a certain number of fillers when they are stored or shipped empty.

The mesh 6 is not in close contact with the backing 7, and this permits a limited relative movement and also circulation of liquid, which tends to remove fibres lodged therein, and secures other advantages.

If desired a nozzle for removing the sheets by means of an air jet may be inserted, mechanically or by hand, near the

periphery of the drum and through one of its heads, and the pipes 14 and 21 thus dispensed with.

What we claim is:

1. The method or process of making packing units for globular fragile articles, comprising flat portions with hollow members projecting therefrom in truncated conical form, with depressed middle portions adapted to receive the globular article at its inner upper edges, which consists in taking a form of foraminous material, producing suction on one side thereof, immersing the form in a liquid having fibrous material floating therein, thereby causing the liquid to be drawn through the foraminous form and to deposit the fibrous material thereon, then removing the form from the liquid with the coating of fibrous material thereon, pressing a die corresponding in contour to the form against the exterior of the said coating, then removing the die and then progressively applying jets of air or the like under pressure to the side of the form to which the suction is applied and thereby removing the formed coating therefrom.

2. In the process specified in claim 1, the additional step of maintaining the suction adjacent to the parts at which the fluid under pressure is applied while applying the air under pressure.

3. In the process specified in claim 1, the application of the air under pressure first at one edge of the formed coating and then at the interior to remove it from the form at the edge before removing it therefrom in its interior.

4. The method or process of making articles of fibrous sheet material such as packing units for globular fragile articles, which consists in taking a form of foraminous material having flat portions and portions projecting therefrom, producing suction on one side thereof, immersing it in a liquid having fibrous material in a finely divided state therein, causing the liquid to be drawn by the suction through the foraminous form and to deposit the fibrous material thereon to form a continuous sheet or layer corresponding in shape to the exterior of the form, removing the form and the layer thereon from the liquid and removing the said layer from the form by projecting a current of air through the foraminous material and against the said layer in the form of a traveling jet moving across said layer from one edge toward the other.

5. In an apparatus of the character described, a hollow member mounted to rotate, foraminous forms carried thereby and arranged to rotate therewith, fixed suction conduits extending to the interior of said hollow rotating member and to proximity with said forms, whereby suction through said forms may be maintained, fixed pressure

conduits extending into the interior of said hollow rotating member and to proximity with said forms whereby fluid pressure may be maintained against said forms, said pressure conduit having branches of varying diameter extending to different zones of the said hollow member.

6. In an apparatus of the character described, a hollow member mounted to rotate, foraminous forms carried thereby and arranged to rotate therewith, fixed suction conduits extending to the interior of said hollow rotating member and to proximity with said forms whereby suction through said forms may be maintained, fixed pressure conduits extending into the interior of said hollow rotating member and to proximity with said forms whereby fluid pressure may be maintained against said forms, said suction and pressure conduits extending through the axis of said hollow rotating member and forming bearings for the same.

7. In a device of the character described, a suction form comprising foraminous sheet material having formed therein hollow projections comprising upwardly extending walls inclined toward the vertical axis thereof, downwardly and inwardly extending walls joining them at their upper part and a laterally extending bottom portion connecting said downwardly extending walls and forming therewith a cup-like form.

8. In a device of the character described,

a suction form comprising foraminous sheet material having formed therein hollow projections comprising upwardly extending walls inclined toward the vertical axis thereof, downwardly and inwardly extending walls joining them at their upper part and a laterally extending bottom portion connecting said downwardly extending walls and forming therewith a cup-like form, a backing sheet of relatively thick material upon which the said form is mounted, said backing sheet being provided with numerous openings.

9. In a device of the character described, a suction form comprising foraminous sheet material having formed therein hollow projections comprising upwardly extending walls inclined toward the vertical axis thereof, downwardly and inwardly extending walls joining them at their upper part and a laterally extending bottom portion connecting said downwardly extending walls and forming therewith a cup-like form, a backing sheet of relatively thick material upon which the said form is mounted, the said inwardly and downwardly inclined walls terminating in proximity to said backing sheet.

Witness our hands this 13th day of April, 1922, at the city of New York, in the county and State of New York.

MORRIS KOPPELMAN.
SIMON COOPER.