Sept. 8, 1959 H. E. LAMBERT 2,903,062

PULP-MOLDING DIES

Filed Sept. 16, 1955 5 Sheets-Sheet 1

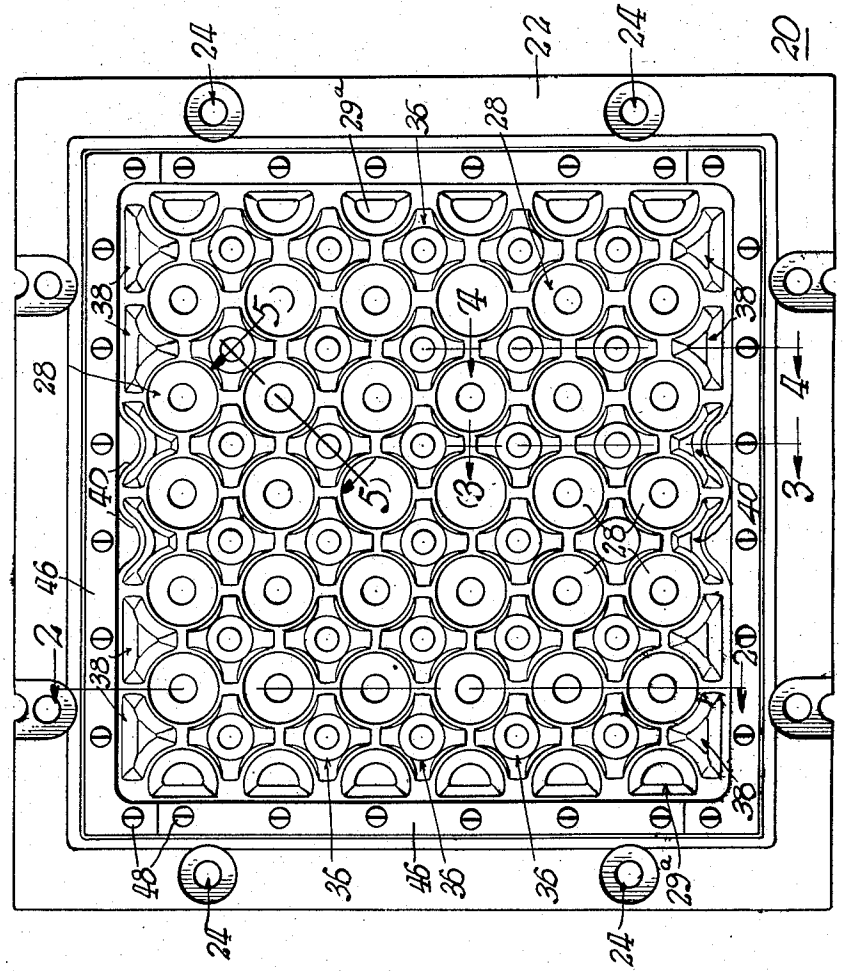


FIG. 1.

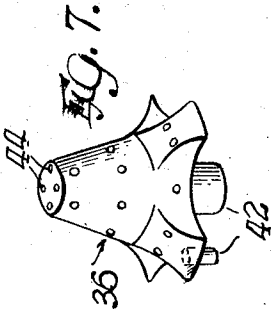


FIG. 7.

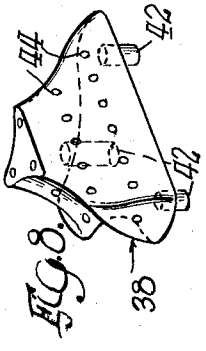


FIG. 8.

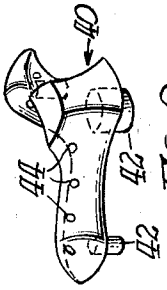


FIG. 9.

Inventor
Harry E. Lambert
Thiess, Olson, Mecklenburger, von Holst & Coltman
Attys

Sept. 8, 1959 H. E. LAMBERT 2,903,062

PULP-MOLDING DIES

Filed Sept. 16, 1955 5 Sheets-Sheet 2

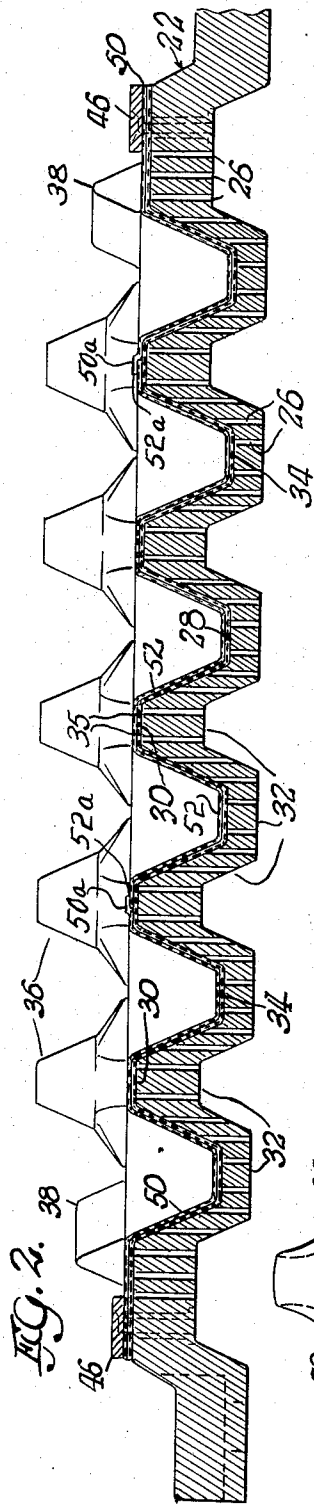


FIG. 2.

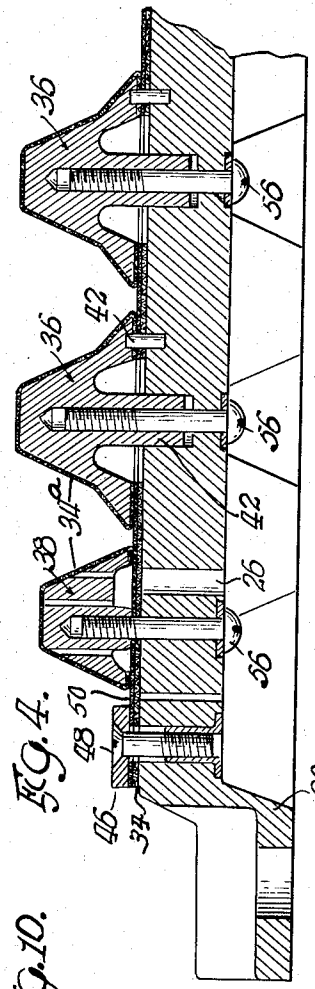


FIG. 4.

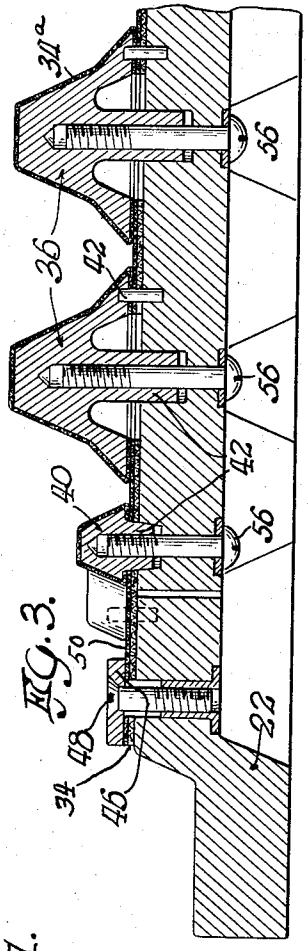


FIG. 3.

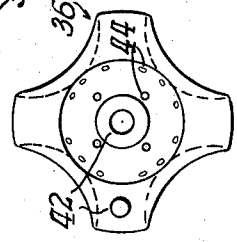


FIG. 10.

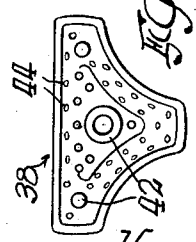


FIG. 11.

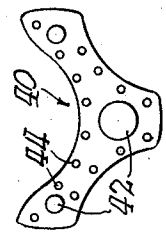


FIG. 12.

Inventor
Harry E. Lambert
Thies, Ilton, Mecklenburger, von Holst & Coltman
Attys

Sept. 8, 1959 H. E. LAMBERT 2,903,062

PULP-MOLDING DIES

Filed Sept. 16, 1955 5 Sheets-Sheet 3

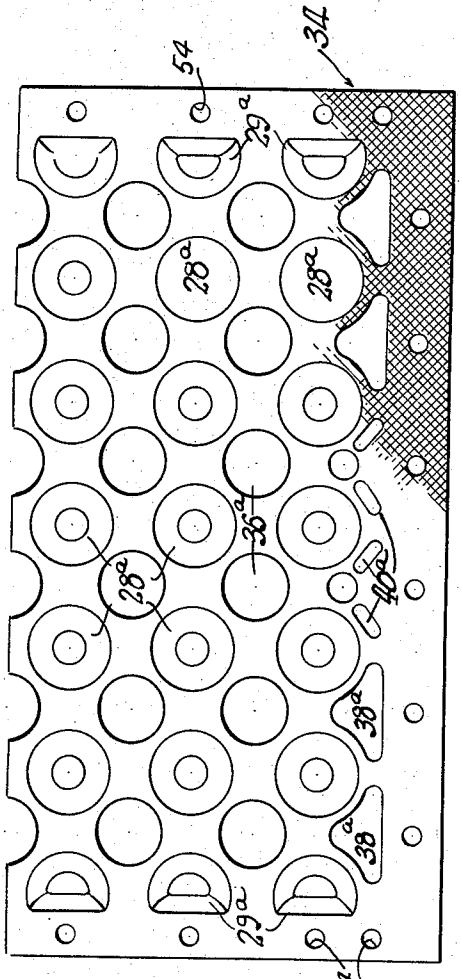


FIG. 15.

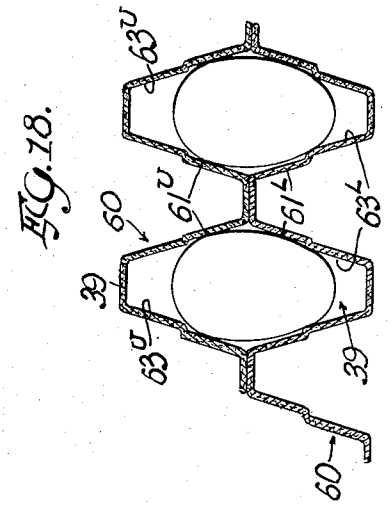


FIG. 18.

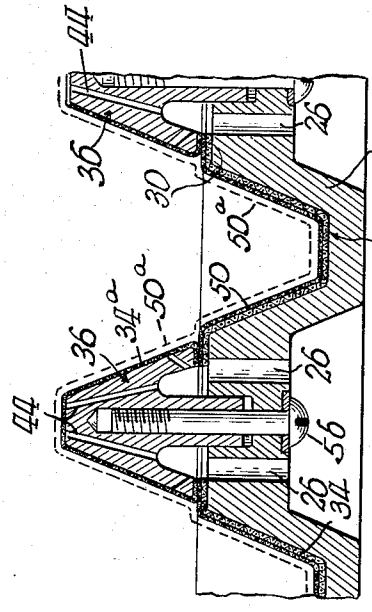


FIG. 5.

Inventor
Harry E. Lambert
Thiess, Olson, Mecklenburger.
von Holst & Coltman
Attys

Sept. 8, 1959 H. E. LAMBERT 2,903,062

PULP-MOLDING DIES

Filed Sept. 16, 1955 5 Sheets-Sheet 4

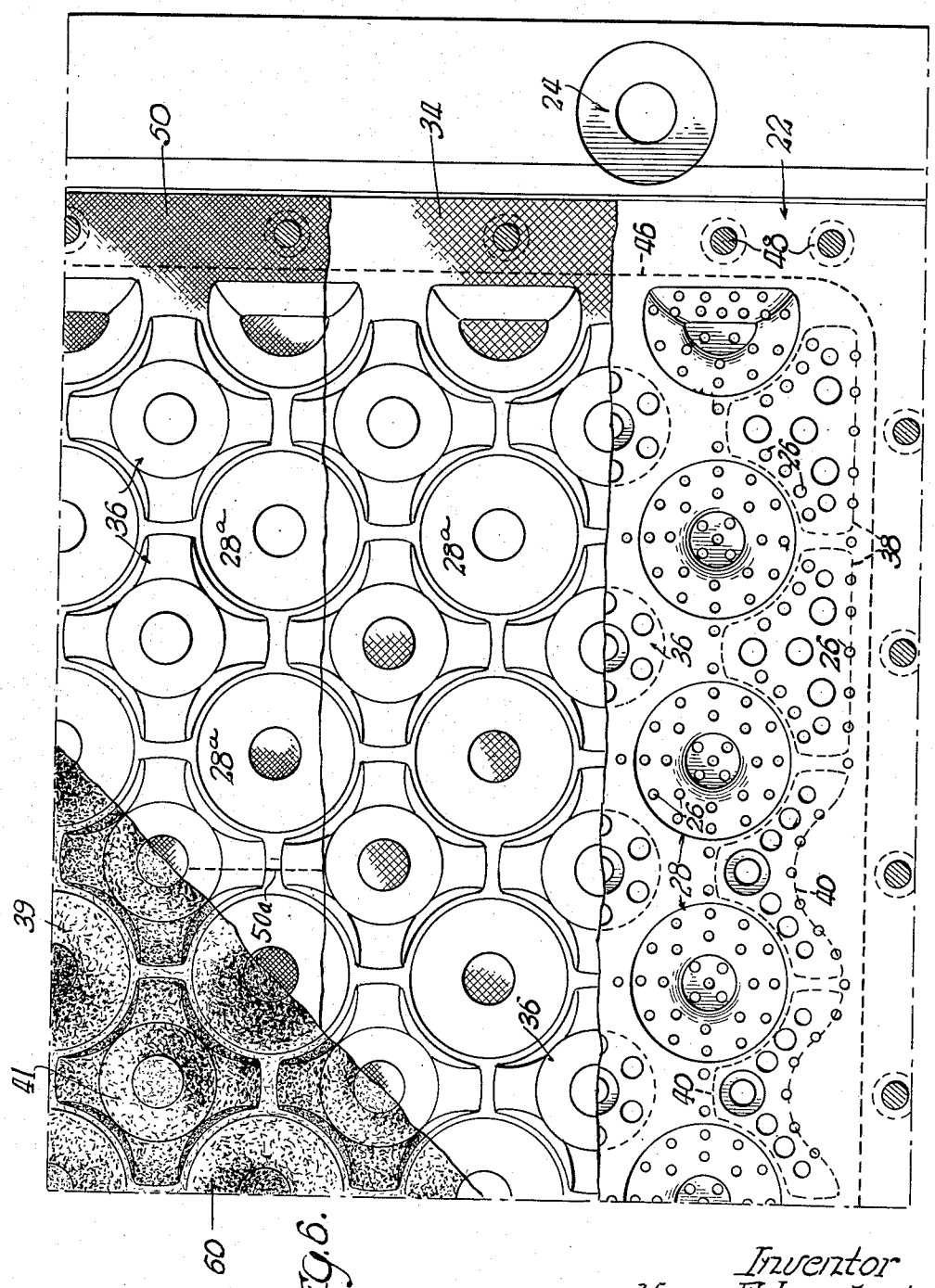


Fig. 6.

Inventor
Harry E. Lambert
Thiess, Olson, Mecklenburger, von Holst & Coltman
Attys

Sept. 8, 1959 H. E. LAMBERT 2,903,062

PULP-MOLDING DIES

Filed Sept. 16, 1955 5 Sheets-Sheet 5

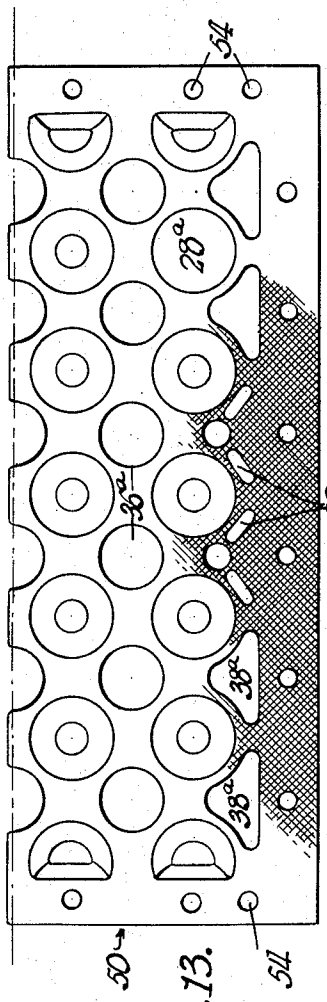


FIG. 13.

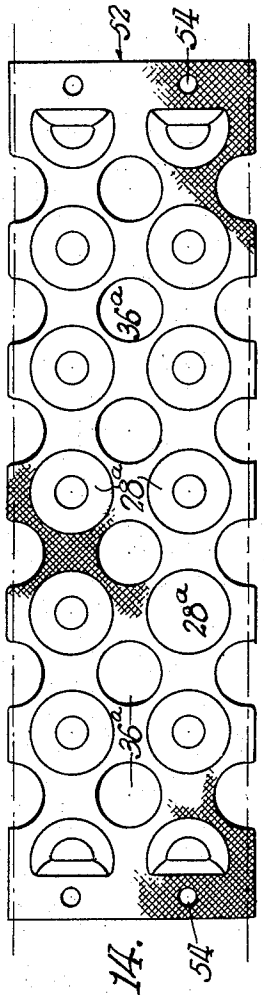


FIG. 14.

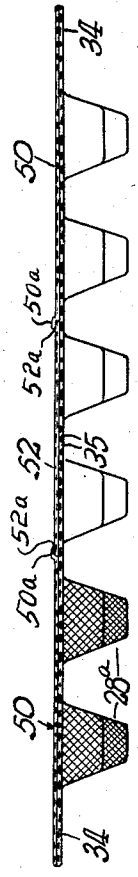


FIG. 16.

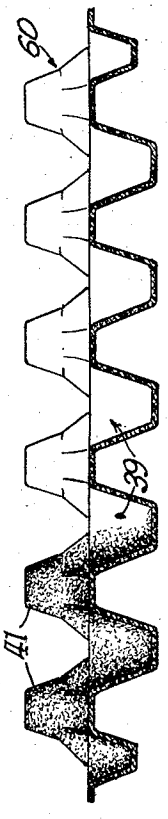


FIG. 17.

Inventor
Harry E. Lambert
Theiss, Olson, Mecklenberger, von Holst & Coltman
Attys

United States Patent Office 2,903,062 Patented Sept. 8, 1959

2,903,062

PULP-MOLDING DIES

Harry E. Lambert, Gary, Ind., assignor to Central Fibre Products Company, Quincy, Ill., a corporation of Delaware

Application September 16, 1955, Serial No. 534,763

7 Claims. (Cl. 162—411)

The present invention relates to pulp-molding dies of the type that are provided with wire mesh covered drainage surfaces and to the method of making such dies.

The die of my present invention is especially designed for the manufacture of a relatively large article, such as one with a surface contour comprising a series of upwardly and downwardly extending posts with deep side wall angles and sharp corners. As an example of an article of this general type, reference is made to the Kronenberger Patent No. 1,956,955 of May 1, 1934, therein termed a combination flat and filler. Articles of this type are now generally termed filler-flats, since they combine the functions of a filler and a flat. That is to say articles of this specific type are used in the packing of eggs in a standard egg case and do not require fillers as is the case when the conventional type flat is used.

The specific die structure of the present invention is designed to produce the filler-flat constituting the subject matter of applicant's co-pending application Serial No. 534,764, filed September 16, 1955, entitled Egg Packing Flats.

For articles having such large area and such pronounced irregular contour, difficulty is encountered in shaping the wire screening from a single piece of wire. To overcome this objection, it has been proposed to make articles of this type on so-called laminated dies that do not require wire screening. However, dies of that type are expensive to produce.

Another proposed solution is that disclosed in the Shepard Patent No. 2,192,937 of March 12, 1940. However, this patent comprises a large number of sectional members each of which extends from the highest plane to the lowest plane of the article to be produced. Each section is of intricate formation and also requires the wire screening to conform thereto from the highest to the lowest planes of the article to be produced. Again, all of these sections must be held together securely by a number of through rods, resulting in a complicated die structure.

One of the objects of the present invention is to provide a simplified die structure of the type utilizing wire screening and yet avoid undue stretching or distortion of the wire screening.

In order to obviate any undue stretching or distortion of the wire screening and subsequent failure thereof, it is an object of this invention to provide a novel die construction in which the wire screening is arranged in a plurality of sections positioned on dissimilar horizontal planes.

It is a further object of this invention to provide a die construction in which the distortion of the wire is maintained at a minimum thereby assuring optimum strength and maximum life.

It is another object of this invention to provide a novel cell construction which accommodates eggs of considerable size and those which vary widely in size.

It is a still further object of this invention to provide a die construction in which a worn portion thereof may

be readily replaced with little expenditure of time or expenditure of money for costly parts.

In accordance with one embodiment of the invention, a die base plate is provided having suction or water drainage passageways running vertically through the thickness thereof. Cavities are provided at regular intervals in the working surface of the base plate which are spaced apart by base plate horizontal planar areas. Discrete coarse screen sections which have been shaped and drawn into the surface configuration of the base plate are placed thereon. Similarly shaped fine screen sections are superposed thereover. The adjacent edges of juxtaposed sections of the fine screen overlap on the planar surface areas of the base plate. Projecting die portions which form the supporting posts of the filler-flats and which also have screen coverings are detachably mounted on the base plate planar areas and clamp the overlapping screen edges to the base plate. The end limits of the screen coverings disposed over the projecting die portions are disposed beneath the projecting portions bottom surfaces and thus also clamped to the base plate working surface. The projecting die portions which form the supporting spacer posts of the final molded product also have liquid passageways disposed therethrough in communication with the underlying liquid passageways, thereby enabling suction to be effected on the surface thereof.

For a more complete understanding of this invention reference should now be had to the drawings, wherein

Figure 1 is a top plan view of a pulp-molding die embodying the preferred form of the invention, the showing of the screening on the working surface of the die being omitted for better illustrative purposes;

Fig. 2 is a fragmentary vertical sectional view through the die on a scale enlarged over that of Fig. 1, as taken on the line 2—2 of said Fig. 1;

Figs. 3, 4 and 5 are fragmentary detailed vertical sectional views through the die, on the scale of Fig. 2, and as taken on the lines 3—3, 4—4 and 5—5 respectively of Fig. 1;

Fig. 6 is a top plan view of a corner fragment of the die, on the scale of Figs. 2, 3, 4 and 5, with parts of the coarse and fine screen sections broken away to better show a part of the base plate of the die and with a fragment of a filler-flat disposed upon the die;

Fig. 7 is a perspective view of one of a number of spacer post dies embodied in the improved die and which will hereinafter be described in greater detail;

Fig. 8 is a perspective view of one of a number of edge post dies embodied in the improved die and which will hereinafter be described in greater detail;

Fig. 9 is a perspective view of one of a number of finger hold post dies embodied in the improved construction and which will be hereinafter described in greater detail;

Figs. 10, 11 and 12, respectively, are views of the bottoms of the post dies appearing in Figs. 7, 8 and 9, respectively;

Fig. 13 is a plan view of one of the side sections of the fine screen forming the working surface of the die;

Fig. 14 is a plan view of the middle section of the fine screen which coacts with two sections such as appears in Fig. 13 to make up the complete working surface of the die;

Fig. 15 is a plan view of one of the counterpart coarse screen sections employed in the improved die between the fine screen sections and the base plate of the die;

Fig. 16 is a view in end elevation of the fine and coarse screens employed in the die in their superposed relation when removed from the die assembly;

Fig. 17 is a vertical sectional view through a filler-flat produced by the die; and

Fig. 18 is a detailed fragmentary vertical sectional view

through parts of two superposed filler-flats, produced by the die structure of the present invention, and showing how eggs fit in the cells formed thereby.

Base plate construction

Referring now to the drawings and more particularly to Fig. 1, a top plan view of a pulp-molding die assembly embodying one form of the invention is shown. A die **20** comprises a base plate **22** which is suitably drilled or tapped at **24** to facilitate affixing thereof to a support member not shown. As will be more clearly seen in Fig. 2, the base plate **22** comprises a plate member having a plurality of liquid passageways **26** normally disposed through the thickness thereof, whereby suction may draw a fibrous slurry in which the plate is positioned to the working surface thereof and the water content drained from the fibers; resulting in a fibrous molded product being formed on the working surface of the die member. It will also be noted from Fig. 2 that the base plate **22** has a plurality of cavities or frusto-conical indentations **28** formed on the working surface thereof. The cavities **28** are regularly arranged in a predetermined pattern on the base plate and are separated from each other by horizontal planar areas **30**.

Base plate filters

As has previously been mentioned, in the normal course of forming a filler-flat which is the end product produced by the subject die member, suction is applied to the undersurface **32** of the base plate **22**, thereby drawing a fibrous water slurry to the oppositely disposed working surface of the base plate.

In order to retain the fibers contained in the slurry, a filter medium in the form of screening is disposed over the working surface of the base plate **22**. As shown, it comprises two coarse screen sections **34**, one of which is shown in Fig. 15, which has been shaped or drawn so as to be snugly received in the cavities **28** disposed on the base plate-working surface. Referring once more to Fig. 2, the butt joint disposition of the two coarse screen halves **34** on the working surface of the base plate **22** is clearly shown.

Projecting post dies

Referring to Fig. 1, it will be noted that the assembled die construction not only provides depressions or cavities **28** which form the egg-receiving cell, but in addition the base plate **22** is provided with detachable spacer post dies **36**, one of which is clearly shown in perspective in Fig. 7. It is the function of the dies **36** to form a projection in the final fibrous molded article which will maintain a superposed filler-flat in spaced-apart relationship, whereby it is obvious that the need for a filler member may be disposed with. It will also be noted from Fig. 1 that the final molded pulp product has formed integrally therewith edge posts which in combination with the spacer posts formed by means of the dies **36** help to maintain a superposed filler-flat in spaced-apart relationship. An edge post die **38** is clearly shown in perspective in Fig. 8 and, as clearly seen in Fig. 1, is disposed along two edges of the base plate **22**.

To facilitate the ease with which a molded filler-flat may be removed from a shipment container, finger hold post dies **40** shown in perspective in Fig. 9 are provided on base plate **22** for purposes of forming finger accessible depressions which will enable a filler-flat snugly positioned in a walled container to be removed. It will be noted from Figs. 7, 8 and 9 that each of the post members is provided with locating stud members **42** which properly position the posts on the working surface of the base plate. It will also be noted from the latter figures that each of the post die members **36**, **38**, and **40** is provided with a plurality of traversing passageways **44** by means of which water may be removed from the fiber-pulp slurry. As is more clearly seen in Fig. 5, the air passageways **44** positioned in the spacer post dies **36** are in communication with air passageways **26** positioned in the base plate **22**. It is apparent from the bottom plan views of the spacer post die **36** illustrated in Fig. 10, of the edge post die **38** illustrated in Fig. 12, and of the finger hold die **40** illustrated in Fig. 13 that sufficient air passageways **44** traverse each of the post members, thereby assuring that adequate suction is exerted on the exterior surfaces of said post dies, thereby, in turn, assuring an adequate fibrous pulp build up.

Sectional nature of filter screens

Referring once again to Fig. 15, it is seen that the coarse screen filter sections **34** have depressions **28***a* to conform with the egg shell cavities **28** and hemispherical cavities **29***a* disposed along two opposed edges of the working surface of the base plate **22** and also has apertures **36***a* formed therein. If a single wire screen section composed of brass, copper, or other suitable material were drawn or shaped to cover the uppermost plane or working surface of the base plate **22**, the wire would be stretched and distorted to such an extent as to weaken it and cause premature breakage.

One of the main features of the present invention, therefore, is to cover the working surface of the base plate **22** comprising the planar areas **30** and the surfaces of the depressions **28** with discrete sections of filtering screen. Thus, maximum life and optimum service from the resulting die plate construction is assured.

As has previously been noted, the coarse screen sections **34** cover and engage the working surface of the base plate **22**. To secure the coarse screen to said surface, a retaining strip member **46**, shown in Figs. 1 and 2, is provided which clamps the peripheral edge end limit of the coarse screen sections **34** to the working surface of the base plate **22** by means of the bolt members **48** or other suitable means. To add to the filtering effectiveness of the coarse screen **34**, there is superposed thereover three sections of fine screen comprising two end sections **50** and a center section **52** which are shown in Figs. 1, 3 and 14. The coarse screen may be composed of wire having a diameter of approximately .014 inch, and the fine screen may be composed of wire having a diameter of approximately one half that of the coarse screen. It is also intended that the wire elements in the screen be on the bias when formed into sections, thereby assisting the ability to draw the same and increasing the strength of the resulting wire filter.

Referring now to Figs. 15, 13 and 14, it will be noted that each of the coarse screen sections **34** and each of the fine screen sections **50** and **52** is suitably apertured about the peripheral edge thereof at **54** to facilitate the passage of the bolt members **48** which secure the retaining strip **46** to the base plate **22**. It will also be noted that each of the fine screen sections illustrated in Figs. 13 and 14 is apertured at **36***a*, **38***a*, and **40***a* and shaped at **28***a* to conform with the cavities **28** positioned in the base plate **22**. Because of the greater ability of the coarse screen to be shaped and deformed, only two sections of the same are needed in covering the entire working surface of the base plate **22**, as is illustrated in Fig. 2. It will also appear from these latter figures that adjacent lateral edges **35** of the sections **34** are in abutting relationship. However, three sections of fine screen are needed. As is shown in Figs. 2 and 16, edge portions **50***a* of the fine screen sections **50** overlap opposed edges **52***a* of the centrally disposed screen section **52**. One edge **50***a* is also shown in elevation and in dotted lines in Fig. 6.

To assist in affixing the screen sections, both coarse and fine, to the surface of the base plate **22**, the bottom surfaces of each of the post members **36**, **38**, and **40** are clamped about the peripheral edge portions of the screen defining apertures **36***a*, **38***a*, and **40***a*. The screen sections are securely maintained against the working surface of the base plate by means of the re-

taining strip **46** about their outer edges, and by means of the post members illustrated in Figs. 7 through 9 over their remaining area. It is also apparent from Fig. 2 that a plurality of spacer post dies **36** are in alignment over the point of overlapping of the fine screen sections. By being so aligned, efficient securing of the fine screen filtering sections to the working surface of the base plate is assured. The spacing of the spacer posts also assures that only small areas of the fine screen sections where they overlap will be exposed. Consequently, a screen construction is provided which will adequately resist separation of the exposed overlap portions of the fine screening.

As will be noted in Figs. 3, 4 and 5, the projecting post members illustrated in Figs. 7 through 9 may be readily bolted to the working surface of the base plate **22** by bolt members **56**, or other suitable means. It will be further noted from Figs. 3, 4 and 5 that each of the center locating posts **42** on each of the post members is suitably tapped to receive the threaded bolt member **56**.

Post die filter covering

Since the post dies **36**, **38**, and **40** form desired projections in the final fibrous molded product, it is apparent that they also must be covered with fine screen filtering to retain the fibrous content thereon. As is noted from Fig. 5, each of the projecting dies **36** which forms a spacer post in the filler-flat is covered with a fine screen **34***a*. **50***a* in Fig. 5 represents the molded pulp filler-flat which is formed by the dies, two of which are shown in operative position in Fig. 18. The end limits of the fine screen covering on each post is bent and secured beneath the peripheral edge end limit of the post member being forced toward the securing bolt **56** and thereby clamped between the bottom peripheral portion of the post member and an annular planar area of the base plate **22**. It is thus seen that the bolt member **56** in securing the various posts to the various surfaces of the base plate **22** simultaneously clamps the filtering screen sections disposed over the surface of the base plate and the filtering screen disposed over the surfaces of the posts fixedly in position.

In Fig. 6 a broken away view illustrates the working surface of the base plate **22** in the lowermost portion. The base plate **22** having projecting post dies and filtering screen coverings disposed thereover is depicted in the middle third portion and the base plate and projecting die assembly having screen coverings in the upper third right end portion. In the upper left end corner, the entire assembly is shown having fibers from the water-fiber slurry disposed thereon. A sectional view of a formed filler-flat **60** is illustrated in Fig. 17 clearly depicting spacer posts **41** formed by post dies **36** and egg-receiving cells **39** formed by cavities **28** of the base plate **22**.

A further structural feature

A description of the die structure and the wire screening has already been given. However, there is one important feature which has not been explained. In this connection, reference is called particularly to Fig. 18 and Fig. 5.

Fig. 18 illustrates two filler-flats **60** arranged in a normal egg-holding position, with eggs positioned in the pockets or cells **39** formed thereby. It will be noted that the portion of the cell defined by the wall portions 61^L of the lower flat and wall portions 61^U of the upper flat is larger than the remainder of the cell which is defined by the wall portions 63^L of the lower flat and 63^U of the upper flat of this particular pair of flats. There is thus provided additional space to accommodate the largest part of the eggs. This same arrangement will obtain when another filler-flat is superposed on the upper filler-flat of Fig. 18 because the next cells will be laterally offset from those illustrated as in accordance with the manner of using the so-called filler-flats. The manner of forming the cells with restricted and enlarged portions is illustrated in Fig. 5, the offset or jog occurring at the meeting line of the wire disposed under the removable posts **36** and that covering the working face of the base plate **22**.

It is thus apparent that a novel die construction for forming molded pulp products has been provided which is composed of a plurality of filtering screens which are formed or shaped to a minimum extent and which are arranged in two dissimilar horizontal planes. As a result of such an arrangement, it is assured that the wire screening, in the drawing operation, is not subjected to such abnormal stress or stretch as will cause premature breakdown of the screening when in use. Furthermore, a molded fibrous pulp product has been disclosed which is adapted to handle eggs of extra large size in addition to eggs of normal size. It is intended that the inventive concept above disclosed be limited only by the scope of the appended claims.

I claim:

1. A pulp-molding die comprising in combination a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, means forming a coarse screen conforming to the said depressed portions and to at least parts of said intermediate series of aligned planar portions, a plurality of fine screen sections overlying the means forming the coarse screen and having marginal portions terminating along at least one of said intermediate series of aligned planar portions, a series of aligned posts spaced apart along at least that planar portion which underlies the terminating marginal portions of said fine screens and having base portions overlying said fine screen terminating marginal portions, and means for securing said posts to said base plate whereby said screens are held in assembled operative relation on the base plate.

2. A pulp-molding die comprising in combination a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, means forming a coarse screen conforming to the said depressed portions and to at least parts of said intermediate series of aligned planar portions, a plurality of fine screen sections overlying the means forming the coarse screen and having marginal portions terminating along at least one of said intermediate series of aligned planar portions, said terminating marginal portions of adjacent fine screen sections overlapping, a series of aligned posts spaced apart along at least that planar portion which underlies the overlapping terminating marginal portions of said fine screens and having base portions overlying said fine screen overlapping terminating marginal portions, and means for securing said posts to said base plate whereby said screens are held in assembled operative relation on the base plate.

3. A pulp-molding die comprising in combination a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, a plurality of coarse screen sections conforming to the said depressed portions and to at least parts of said intermediate series of aligned planar portions, a plurality of fine screen sections overlying said coarse screen sections, both said coarse and fine screen sections having marginal portions terminating along said intermediate series of aligned planar portions, a series of aligned posts spaced apart along at least those planar portions which underlie the terminating marginal portions of said fine and coarse screen sections and having base portions overlying said fine screen marginal portions, and means for securing said posts to said base plate whereby said screens are held in assembled operative relation on the base plate.

4. A pulp-molding die comprising in combination a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, means forming a course screen conforming to the said depressed portions and to at least parts of said intermediate series

of aligned planar portions, at least three fine screen sections overlying the means forming the coarse screen and having marginal portions terminating along at least one of said intermediate series of aligned planar portions, the central fine screen section having its marginal portions underlying the marginal portions of the adjacent fine screen sections, a series of aligned posts spaced apart along at least those planar portions which underlie the terminating marginal portions of said fine screens and having base portions overlying said fine screen terminating marginal portions, and means for securing said posts to said base plate whereby said screens are held in assembled operative relation on the base plate.

5. A pulp-molding die comprising in combination a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, a plurality of coarse screen sections conforming to the said depressed portions and to at least parts of said intermediate series of aligned planar portions, a plurality of fine screen sections overlying said coarse screen sections, said coarse screen sections having marginal portions terminating along those intermediate series of aligned planar portions over which substantially the central portion of an overlying fine screen section is disposed and said fine screen sections having terminating marginal portions spaced from the terminating marginal portions of said coarse screen section whereby said fine and coarse screen sections are never co-terminating, a series of aligned posts spaced apart along those planar portions which underlie the terminating marginal portions of both said fine and coarse screen sections and having a base portion overlying said fine screen marginal portions, and means for securing said posts to said base plate whereby said screens are held in assembled operative relation on the base plate.

6. A pulp-molding die comprising in combination a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, means forming a coarse screen conforming to the said depressed portions and to at least parts of said intermediate series of aligned planar portions, a plurality of fine screen sections overlying the means forming the coarse screen and having marginal portions terminating along at least one of said intermediate series of aligned planar portions, a series of aligned posts spaced apart along at least that planar portion which underlies the terminating marginal portions of said fine screen sections and having base portions overlying said fine screen terminating marginal portions, said base portions having foot portions projecting from the center thereof and overlying said fine screen terminal marginal portions whereby only small intervals of fine screen terminal marginal portions between the distal end limits of adjacent foot portions are uncovered, and means for securing said posts to said base plate whereby said screens are held in assembled operative relation on the base plate.

7. A filler-flat die comprising a base plate formed with a series of aligned depressions and a series of aligned intermediate planar portions, means forming a coarse screen conforming to the said depressed portions and to at least parts of said intermediate series of aligned planar portions, a plurality of fine screen sections overlying the means forming the coarse screen and having marginal portions terminating along at least one of said intermediate series of aligned planar portions, a series of aligned posts spaced apart along said intermediate planar portions and securing said screen marginal portions to said base plate planar portions, said base plate depressions having and inverted frusto-conical configuration, said posts being of substantially frusto-conical configuration, said posts and depressions being alternately arranged in either diagonal direction across said die, whereby each of said depressions is surrounded by four posts, the maximum diameter of each of said inverted frusto-conical depressions being less than the maximum interval between confronting portions of adjacent diagonally aligned posts disposed on opposite sides of each of said depressions as measured along a vertical plane passing through the centers of said adjacent posts, said difference between said depression diameter and post interval defining an abrupt offset at the juncture between said posts and planar portions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,984,384	Sheffield	Dec. 18, 1934
2,192,937	Shepard	Mar. 12, 1940
2,302,917	Smith	Nov. 24, 1942
2,359,201	Chaplin et al.	Sept. 26, 1944
2,424,189	Randall	July 15, 1947
2,585,049	Shepard	Feb. 12, 1952
2,601,815	De Reamer	July 1, 1952

FOREIGN PATENTS

708,393	Great Britain	May 5, 1954