Sept. 16, 1958 A. M. LEITZEL 2,851,931

POROUS SINTERED METAL MOLDING DIE

Filed April 4, 1955

FIG. 1

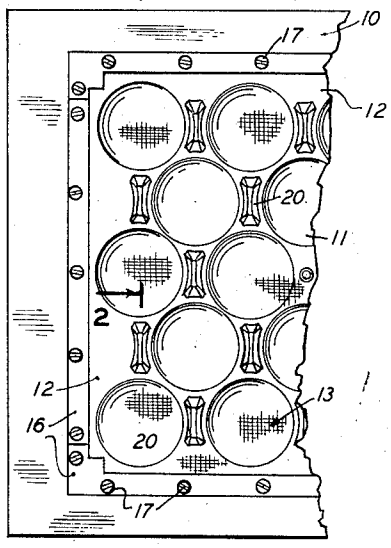


FIG. 3

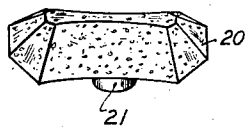
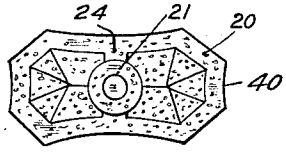


FIG. 4



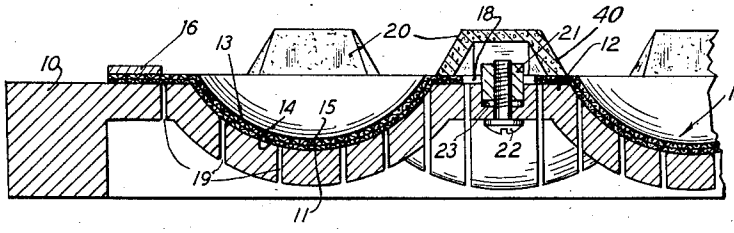


FIG. 2

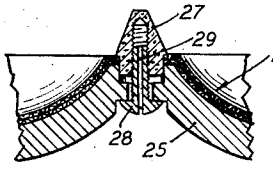


FIG. 6

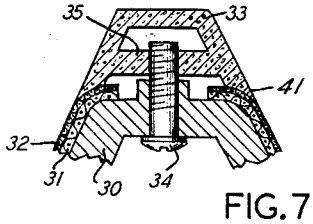


FIG. 7

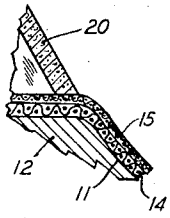


FIG. 5

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POROUS SINTERED METAL MOLDING DIE

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Application April 4, 1955, Serial No. 498,986

5 Claims. (Cl. 92—54)

My present invention relates to the formation of suction molding dies for fiber articles, particularly articles having pockets separated by relatively narrow ridges including peaks which protrude to considerable height above the rims of the pockets. A typical article is disclosed in the patent to Friday, No. 2,351,754, of June 20, 1944, and which is primarily used as a packing tray for choice fruits. Other molded pulp articles such as egg boxes, egg flats, insulating separators for wall panels, cushioning flats, trays and boxes for packing fragile articles, and the like, are well known.

Molded pulp articles of this type are formed by suction molding, a layer of fibers being drawn from a pulp slurry onto the surface of a suction molding die comprising a base having suction passages therethrough and covered with screen capable of preventing passage of the fibers. The suction dies utilized in this process are generally quite expensive, being difficult to make, and maintenance thereof is usually costly. One of the reasons for costly maintenance is that the screens become clogged with deposited fibers and have to be cleaned frequently or replaced. Cleaning is usually accomplished in one of two manners, either by burning away the accumulated deposits, or dissolving them in an acid solution. The former method of cleaning is usually unsatisfactory, since excessive heat at any spot is likely to burn the relatively fragile wires of the screen as well as the deposits thereon, and uneven application of heat sometimes results in buckling of the screen which may cause permanent distortion thereof. The latter method of cleaning by the use of acids is likewise unsatisfactory since excessive acid reaction corrodes and may dissolve the screen, and unsatisfactory results are inherent because the base plate is usually made of aluminum alloy and the screen is usually made of bronze, resulting in an electrolytically induced reaction which corrodes and weakens the screen. An object of the present invention is to provide a die of this character which may be relatively easily cleaned by removing the screen and scrubbing the same in detergent or neutral solutions.

As disclosed in the patent to De Reamer 2,601,815, of July 1, 1952, it has sometimes been found necessary to make the base plate in sections, in order that the screen covering may be made in sections to be clamped between the sectional parts of the plate and thus avoid deep drawing of the screen. Many articles have ridges or other projections which are too small or extend to too great a height to be covered by a unitary screen cover, since the screen cannot be drawn to the shape desired. This has been answered somewhat satisfactorily by making the die sectional, either along a horizontal division as disclosed in the De Reamer patent, or along a plurality of vertical planes, as shown in other prior patents. In such prior patents individual base plate parts are covered by individual screen parts, the edges of which are clamped between the adjacent plate parts. This results in the formation of flashing on the molded pulp article itself, such flashing being readily visible as ridges

on the finished article and readily enabling an observer to determine the division lines of the suction mold. Aside from the objectionable appearance of the numerous flashings, a further objection is encountered as follows. If the mold is divided horizontally as in the De Reamer patent, the flashing grips the surface of the mold at right angles to the plane of the mold, sometimes preventing removal of the article from the mold. A further object of the present invention is to provide a sectional die which results in a molded article having no flashing thereon.

A further objection to the previous sectional dies is that small parts thereof are numerous, especially in a die such as disclosed in De Reamer, divided along a horizontal plane, and the operations of drawing small screens to fit the die parts and making certain that they are properly clamped between the die parts, is tedious and expensive. A further object of the present invention is to provide a sectional die in which a base plate is provided, and to which die projections are attached which do not need to be covered by screen, and in which a single large screen which may be easily fabricated and applied is the only screen required.

Further objects and advantages of the present invention will be more readily apparent by inspection of the accompanying drawings taken in connection with the following specification, wherein like numerals refer to like parts throughout.

In the drawings,

Fig. 1 is a partial plan view of a molding die embodying the present invention, the die being designed for creating the article illustrated in the above-identified patent to Friday;

Fig. 2 is a partial, vertical section taken along line 2—2 of Fig. 1 and on an enlarged scale;

Fig. 3 is an isometric view, on a further enlarged scale, of a removable lug for forming a peak on the die in accordance with the present invention;

Fig. 4 is a bottom view of Fig. 3;

Fig. 5 is a partial, vertical section, on a greatly enlarged scale, taken along line 2—2 of Fig. 1;

Fig. 6 is a partial, vertical section through a modification of the present invention; and

Fig. 7 is a partial, vertical section through a further modification of the present invention.

Referring to Figs. 1 to 5, inclusive, the present invention comprises a die for molding a fibrous article having a plurality of pockets with their rims lying in a common plane and separated by irregularly shaped, narrow separating portions upon which are mounted a plurality of separated peaks rising above the common plane, such as disclosed in the above-identified Friday patent. The die comprises a base plate **10** formed of a suitable rigid material such as an aluminum alloy. The plate is so formed as to have a plurality of depressions **11** for forming pockets in the article, and separating portions **12** having surfaces lying in a common plane. A pulp screen, generally indicated by the numeral **13**, overlies the base in contact with the surfaces of the depressions and the separating portions. While I refer to a pulp screen herein, it is to be appreciated that the construction usually incorporates a pair of screens in surface-to-surface contact with each other, comprising an inner screen **14** of coarse texture and an outer screen **15** of fine texture. The screen is a single screen within the definition herein given, and extends over the entire operating surface of the die, having its edges clamped in position by edge strips **16** and screws **17**. The screen is formed to fit snugly against the surface of the die and is provided with a plurality of small openings, such as indicated at **18**, centrally of the portions **12**. The die is provided with a plurality of suction passages **19** therethrough, leading to the inner surface of the screen. It is to be appreciated that the die is to be mounted in

a suction head whereby suction may be applied through the entire screen to cause the collection of a layer of fiber thereon when the die is immersed in a pulp slurry.

A plurality of porous metal lugs **20** are mounted on the separating portions **12**, said lugs conforming in shape to the interior surfaces of the peaks of the article and having continuous basal rims whose outer edges are in contact with the outer surface of the screen. Each lug is provided with an interior spider portion **24** including a downwardly projecting portion **21** in which there is a vertical threaded bore for reception of a screw **22**. The projection **21** fits into a socket **23** in the portion **12**, the socket having a coaxial extension from its bottom through which the screw **22** may be inserted. The head of the screw rests against the lower surface of the base and may be tightened to draw the outer edge of the basal rim **40** of the lug tightly against the portion of the screen overlying the portion **12** and surrounding the opening **18** through the screen.

The lug **20** is formed under heat and pressure from a powder of metal particles, and is commonly known as an article formed of sintered metal. Such articles are formed of comminuted or otherwise finely divided metal particles. The metal may be various alloys of copper or iron, with or without a proportion of a bonding metal. A suitable material comprises a plurality of small copper alloy spheres bonded together by a thin coating of solder. Various mtehods and apparatus exist for molding such articles from a wide variety of metals and alloys. A commercially available type of such metal which is satisfactory for the present purpose is commonly used for filtering the lubricating oil in internal combustion engines. In other words, the degree of porosity is quite high compared with other sintered metal products of the type which are utilized for self-lubricating bearings. The preferred metal utilized in the present invention is a bronze having the same composition as the screen, in order to reduce as much as possible any corrosive effect due to electrolytic action during usage when the die is in constant contact with the slurry, and with steam formed from the slurry in those instances where the article is ironed smooth by a matching ironing die while still in contact with the suction die.

In Fig. 5 it is seen that the outer edge of the basal rim of the lug is stepped back from the rim of the depression **11**, so that a slight shoulder appears in the molded article. Such a shoulder may serve to strengthen the article, usually blends into the design of the article, and even imparts an ornamental appearance thereto. By so stepping back the lug edges, the formation of reentrant crevices in the die, as was necessary in the prior practice of forming a separate part over which screen was wrapped, is avoided. Thus, the present invention eliminates the formation of flashing extending in the plane of the die, and the formed article may be easily removed from the die.

A modification of the structure is illustrated in Fig. 6 wherein a die comprising a base plate **25** covered by a screen **26** and including separable lugs **27** for forming peaks, is illustrated. The lug **27** is, in this instance, quite small so that it would not extend over the suction passages **19** in the die. For this reason the mounting screw **28** is provided with a bore **29** extending therethrough from end to end whereby suction may be applied to the hollow interior of the lug.

The modification disclosed in Fig. 7 comprises a base plate **30** having a coarse screen **31** and a fine screen **32** thereon, and in which the porous lug **33** is mounted by a screw **34** extending into a spider portion **35** within the interior of the lug. In this instance the basal rim **41** of the porous lug is inwardly recessed or chamfered, whereby the outer edge of the basal rim is knifelike and fits tightly against the screen covering the shoulders on the die. By reason of this construction the die may be so formed that the surfaces of the upwardly protruding parts of the die merge smoothly with the surfaces of the pockets.

Having illustrated and described several embodiments of the present invention, it should be apparent to those skilled in the art that the same permits of other modifications in detail and arrangement. I claim as my invention all such modifications as come within the true spirit and scope of the following claims.

I claim:

1. A die for suction molding a fibrous article having a plurality of pockets with their rims lying in a common plane and separated by irregularly shaped, separating portions upon which are separated peaks rising above said common plane, comprising a base having a plurality of depressions for forming the pockets and separating portions having their surfaces lying in a common plane, a screen overlying said base in contact with the surfaces of said depression and the separating portions, a plurality of sintered metal lugs mounted on said separating portions, each of said lugs conforming in shape to the interior surface of one of said peaks and having a continuous basil rim, the outer edge of said rim being in contact with the outer surface of the screen throughout, and a plurality of screw means individually detachably securing said lugs to said base and drawing the basil rims thereof tightly against said screen.

2. The construction set forth in claim 1 in which said sintered lugs are hollow and have spider portions to which said screw means are connected so that fluid may readily be drawn through substantially all portions of said lugs.

3. The construction set forth in claim 1 wherein said lugs are hollow and said screw means provide suction passages thereinto.

4. The construction set forth in claim 1 in which said basil rims of said lugs are stepped back from the adjacent rims of said depressions.

5. The construction set forth in claim 1 in which said basal rims are inwardly chamfered to define a sharp outline edge whereby the walls of the peaks and pockets on the formed article merge smoothly into each other.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,851,931 September 16, 1958

Ammon M. Leitzel

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 28, for "depression" read -- depressions --; lines 32, 35 and 45, for "basil", each occurrence, read -- basal --.

Signed and sealed this 25th day of November 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents