Sept. 17, 1968 I. R. STOCK 3,401,800

CENTRIFUGE BOWL

Original Filed Oct. 4, 1965 2 Sheets-Sheet 1

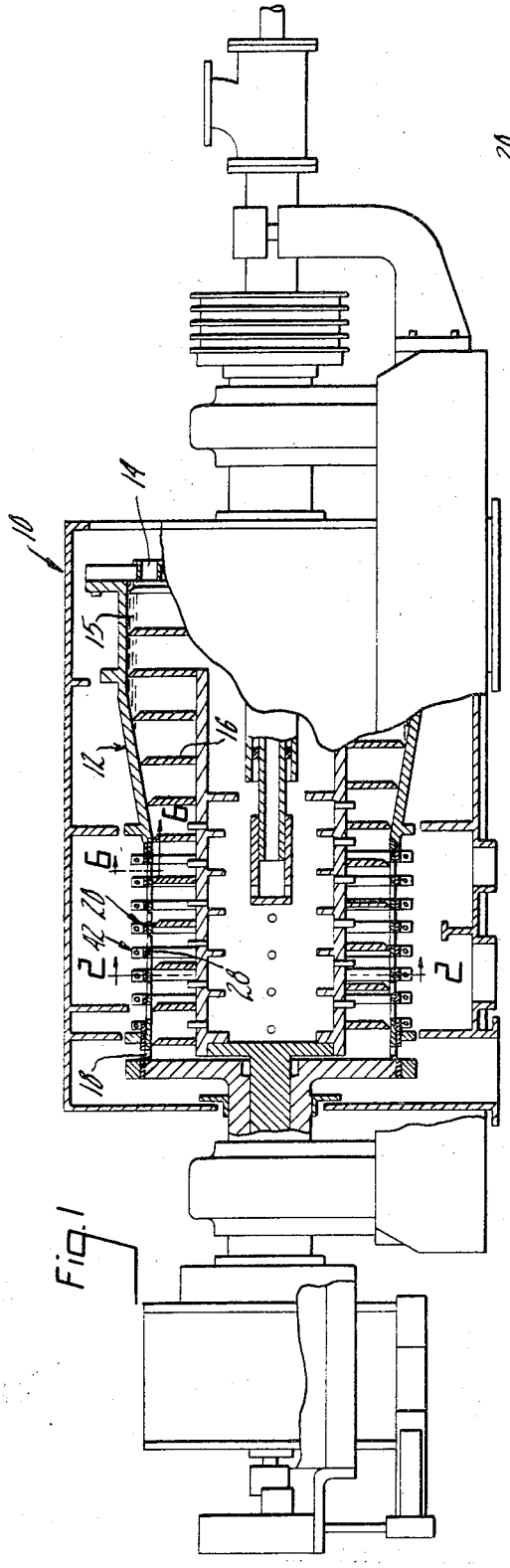


Fig. 1

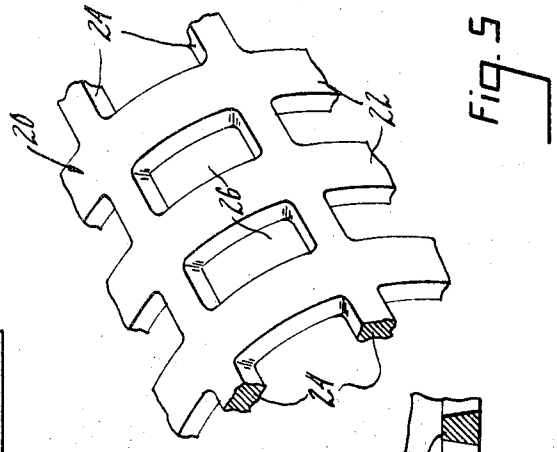


Fig. 5

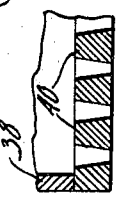


Fig. 4

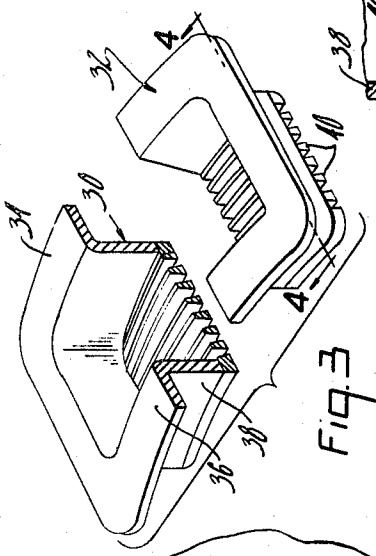


Fig. 3

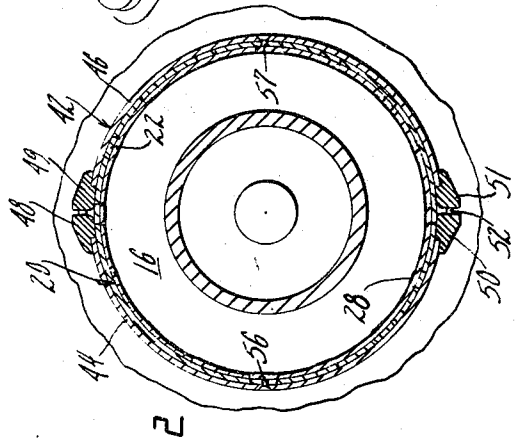


Fig. 2

CENTRIFUGE BOWL

Original Filed Oct. 4, 1965 2 Sheets-Sheet 2

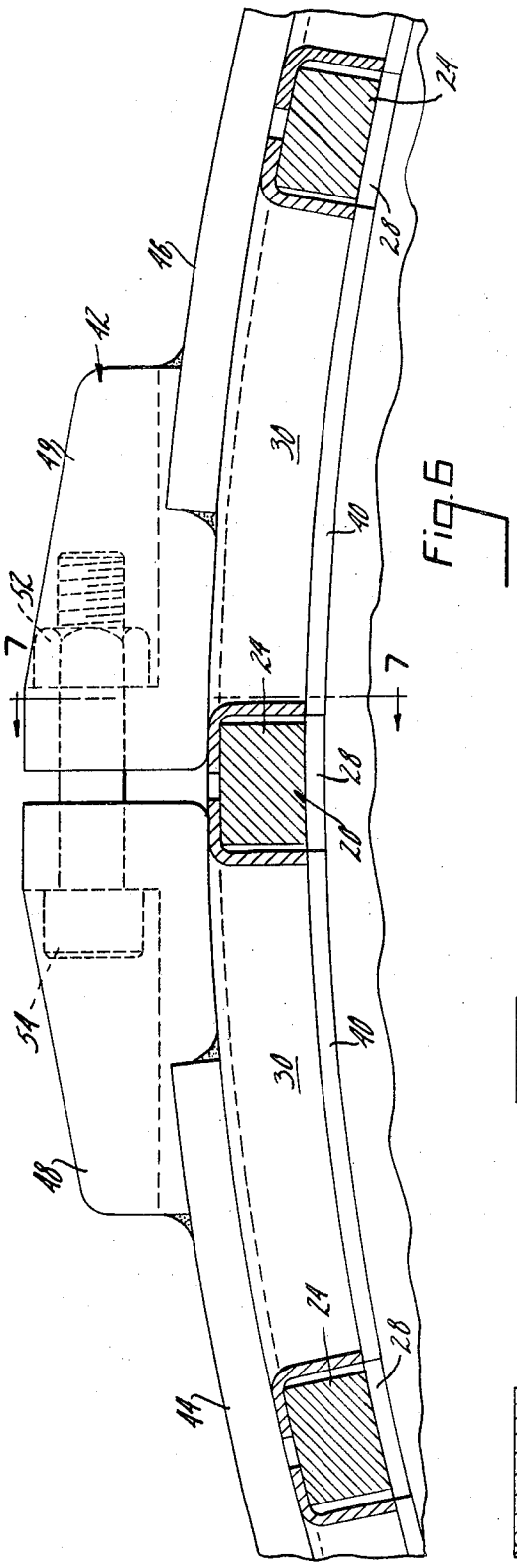


Fig. 6

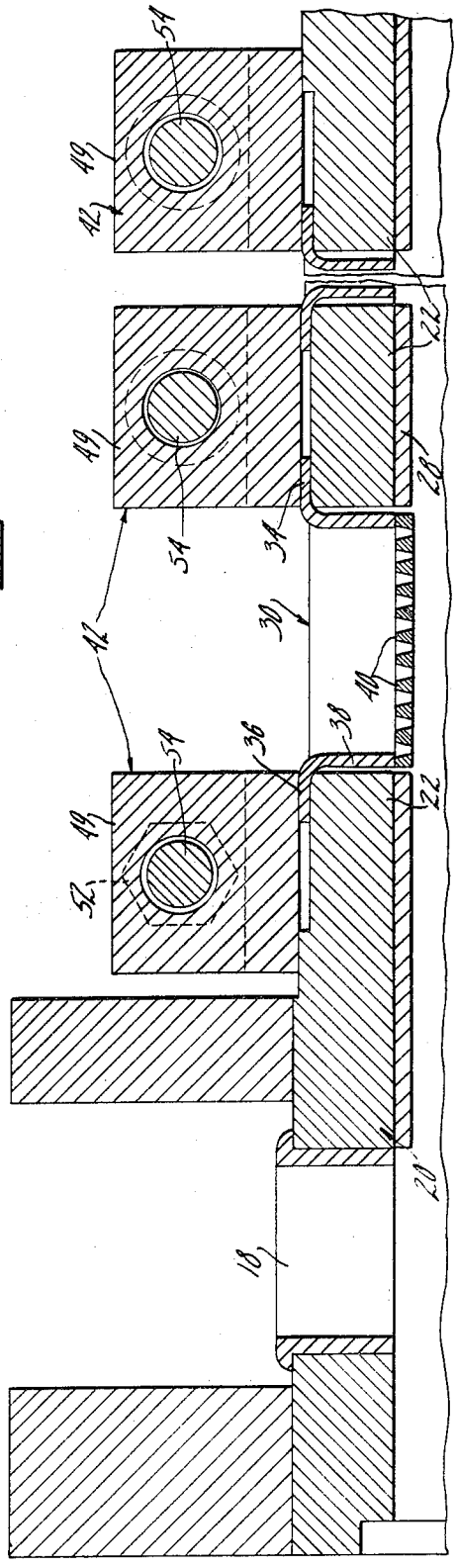


Fig. 7

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3,401,800

CENTRIFUGE BOWL

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Continuation of application Ser. No. 492,562, Oct. 4, 1965. This application Aug. 31, 1967, Ser. No. 664,885
4 Claims. (Cl. 210—380)

ABSTRACT OF THE DISCLOSURE

Centrifugal separator in which replaceable screens are secured in perforations in the bowl wall by clamps having clamping surfaces that can be tightened from the exterior against flanges on the screens to press the flanges against the exterior bowl surface.

This is a continuation of application S.N. 492,562, filed Oct. 4, 1965, now abandoned.

This invention relates to a centrifugal separator for separating solids from a liquid slurry and more particularly relates to a centrifugal separator for continuous operation having replaceable screen units and means for removably holding the screen units therein.

In any centrifugal separator in which solids are separated from a slurry by passing over a screen portion of a rotatable tubular bowl, wear is a significant problem. This is particularly true of continuous separators where large volumes of slurry are continuously passed therethrough. Since such wear may not be uniform over each portion of the bolw, particularly where solids concentration varies axially along the bowl, it is desirable to provide separately replaceable screen portions in the bowl. However, because down-time is very costly, it is necessary that replacement be as simple and expeditious as possible. It is to these ends that the present invention is directed.

It is therefore one object of this invention to provide a centrifuge bowl in which readily removable screen units are firmly positioned.

It is another object to provide simple ad inexpensive means for securely and positively mounting the screen units in place.

In general, this invention comprises a bowl having a plurality of screen units arranged in perforations in the bowl wall. Each screen unit is provided with flanges overlying and abutting adjacent portions of the bowl. Clamp members fasten the screen units at the flanges firmly to the bowl and permit fast and simple removal for replacement.

Other objects, features, and advantages of this invention will be apparent to those skilled in the art from the following detailed description thereof together with the accompanying drawings in which:

FIG. 1 is a view in elevation partly in section of a centrifugal separator embodying this invention;

FIG. 2 is a section along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged isometric view partially broken away of a preferred form of screen unit employed in this invention;

FIG. 4 is an enlarged fragmentary sectional view along the line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary isometric view of a perforated bowl according to this invention;

FIG. 6 is an enlarged fragmentary view along the line 6—6 of FIG. 1; and

FIG. 7 is a fragmentary view, partially broken away, along the line 7—7 of FIG. 6.

With reference now to the drawings, particularly FIG. 1 thereof, a centrifugal separator generally designated 10

is provided with an imperforate frustro-conical and cylindrical bowl portion 12, means 14 for continuously removing a liquid portion 15 of a slurry therefrom, a helical conveyor 16 for continuously removing solids therefrom toward a solids discharge 18, and a perforate bowl portion 20 intermediate the solids discharge 18 and the imperforate bowl portion 12. The details and operation of the complete separator 10 are explained more fully in the application of Francis X. Ferney, Ser. No. 449,159, filed Apr. 19, 1965, now Patent No. 3,348,767, for Screen Bowl Centrifuge.

Basically, however, a pool of slurry 15 is continuously fed into a rotating cylindrical bowl portion 12. The dense solids fraction of the slurry 15 concentrates on the bowl 12 wall while the liquid portion flows outwardly through aperture 14 at least a portion of which has a greater radius than the perforate bowl portion 20. Conveyor 16 rotating in the same direction at a differential speed relative to the bowl portions 12, 20 continuously removes the solids from the imperforate bowl portion 12, across the perforate bowl portion 20 where additional liquid is removed, finally to the solids discharge 18. As the present invention relates only to the perforate bowl 20 and associated features, there will be herein no further description of the separator 10 than is necessary to an understanding of the present invention.

The perforate bowl portion 20 is secured to and rotates with imperforate bowl portion 12 in separator 10. In general the perforate bowl portion 20 comprises a tubular grid of circumferentially extending spaced ribs 22 and axially extending spaced ribs 24 defining a plurality of circumferential rows each having a plurality of perforations 26 therein as shown most clearly in FIG. 5.

In each perforation of bowl 20, FIGS. 2, 6 and 7, is positioned a screen unit 30. The screen units 30 as most clearly shown in FIG. 3 are generally dish shaped. A flange portion 32 is provided on each unit to provide at least a pair of lateral flanges 34, 36 to overlie ribs 22. Preferably the flange portion 32 extends completely about the periphery of each unit to overlie axial ribs 24 as well. Flanges 34, 36 are arcuately shaped for a flush abutment with the outer circumference of bowl 20.

The screen portion of each unit 30 is connected to the flanges 32 by a wall 38 which is sized for slip fit into perforations 26. The screen is preferably formed of a plurality of spaced circumferentially extending parallel wires 40 of frustro-triangular section, FIG. 4. The screen is positioned adjacent the inner circumference of bowl 20 and preferably extends to a position adjacent conveyor 16 which may preferably be inwardly from bowl 20. The screen units 30 and the perforations 26 are of uniform size so that the screen units are interchangeable with each other and readily replaceable.

In the preferred embodiment, FIGS. 6 and 7, where the screen extends inwardly from bowl 20, replaceable wear surfaces 28 are positioned about the inner circumferential surfaces of bowl ribs 22 to protect the relatively expensive bowl grid. The wear surfaces 28 extend inwardly to the same extent as the screens.

The screens are maintained in the bowl grid by strap clamps 42 which overlie arcuate flanges 34, 36. Preferably each strap clamp overlies the flanges of two adjacent rows of screen units, FIG. 7. In the illustrated preferred embodiment, FIG. 2, each strap clamp 42 comprises a pair of straps 44, 46, each extending approximately 180° about the bowl, having clamps 48, 49, 50, 51 at their ends. The clamps join the straps together by means of nuts 52 and bolts 54 as illustrated in FIG. 6. To balance the entire assembly, the nuts and bolts in alternate strap clamps are preferably reversed relative to those in the other strap clamps. To assist in assembling and disassembling

the unit, the strap clamps are preferably also secured by screws **56, 57**, FIG. 2, to the bowl portion **20** at the midpoint of each 180° strap segment. Screws **56, 57** may be removed after assembly if desired.

To assemble the bowl, screen units **30** are inserted on the uppermost 180° segment of perforate bowl **20**. Half segments of the clamp straps are then positioned over flanges **34, 36** and fastened to bowl **20** by screws **56, 57**. The bowl is then rotated 180°. The remaining screen units **30** are then positioned in bowl **20**. The remaining half segments of the clamp straps are positioned over the screen flanges, the screws **56, 57** are inserted therein and the nuts and bolts are inserted into the clamps and fastened. The unit is then ready for operation. To replace screen units, the strap clamp segments over the flanges of units to be replaced are simply removed, the screen units removed, new screen units inserted, and the strap clamp segments fastened over the flanges again.

Other embodiments of this invention will be apparent to those skilled in the art which are within the spirit and scope of the appended claims.

What is claimed is:

1. In a centrifugal separator for separating solid particles from the liquid portion of a slurry, having a rotatable tubular bowl including a screen portion in its wall, said screen portion having a multiplicity of perforations about its circumference, that improvement comprising

a multiplicity of separate screens, one removably mounted at each of said perforations, each said screen having a pervious portion covering said perforation, upstanding rigid members extending outwardly from said pervious portion and integral securing flanges extending laterally from said rigid members and extending along at least two sides of said pervious portion to overlie the exterior surfaces of said bowl adjacent said perforation, and

clamps having

clamping surfaces adjacent the surface of each said flange facing away from the bowl,

said perforations extending in a plurality of axially spaced endless rows,

said clamping surfaces extending circumferentially over adjacent flanges of screens in adjacent rows thereby holding one flange of each pair of adjacent screens, and

tightening portions operable from outside said bowl for forcing said clamping surfaces toward said bowl to tightly press said flanges against said exterior surface.

2. The improvement of claim **1** wherein each said clamping surface overlies the flanges of a plurality of said screens so that said plurality of screens can be removed upon the withdrawal therefrom of a single clamping surface.

3. The improvement of claim **2** wherein said plurality of screens extend in a row about the circumference of said bowl, and said clamps comprise straps overlying said flanges.

4. The improvement of claim **3** wherein each said clamp comprises two straps and two connectors for joining said straps to each other at each end so that said clamp surrounds said bowl overlying the flanges of a complete row of screens.

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