Oct. 15, 1929. H. B. HOUSTON 1,731,779

FLOTATION SCREEN

Filed April 9, 1926

Fig. 1.

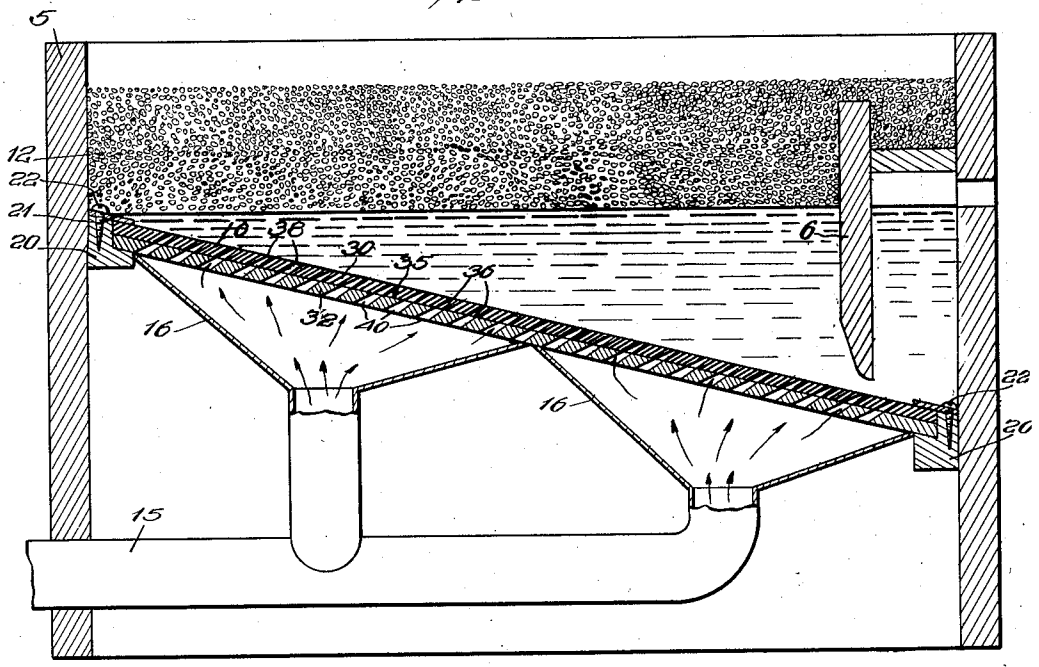


Fig. 2.

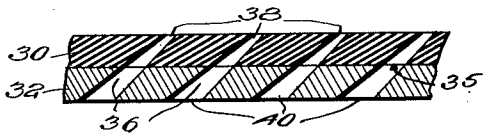


Fig. 3.

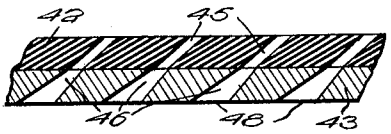


Fig. 4.

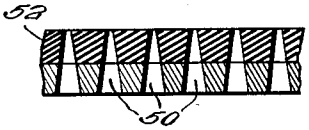


Fig. 5.

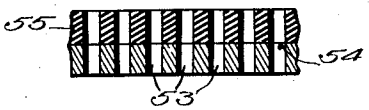
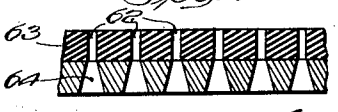


Fig. 6.



Fig. 7.



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UNITED STATES PATENT OFFICE

HENRY B. HOUSTON, OF DETROIT, MICHIGAN

FLOTATION SCREEN

Application filed April 9, 1926. Serial No. 100,816.

This invention relates to screens for flotation processes and the like and its objects are the provision of a generally improved and simplified screen construction that may be economically produced and which will operate efficiently and positively without flexing the screen as a whole and without requiring interconnecting grooves between the apertures or openings through the screen.

The invention is illustrated in the accompanying drawing in which,

Figure 1 is a more or less diagrammatic vertical section through an illustrative flotation cell or box showing an embodiment of the present invention in connection therewith;

Fig. 2 is a fragmentary section through the screen shown in Figure 1 and on an enlarged scale; and

Figs. 3, 4, 5, 6 and 7 are fragmentary sections similar to Figure 2 and showing a number of different embodiments of the present invention.

Referring to the drawing the flotation box or cell shown is of the type shown in my copending application Serial No. 38,608, filed June 22, 1925. This showing is merely illustrative and it is to be understood that the screen of my present invention has utility in a wide variety of flotation machines and analogous apparatus and that therefore the details of a cell or box, per se, are immaterial and may be varied as desired.

The cell shown comprises a generally rectangular box 5 having a baffle 6. The pulp may be fed into the box 5 at the left of the baffle 6, as well understood in the art, and the froth overflows the sides while the tailings may be discharged or withdrawn through a suitable pipe or outlet, not shown.

The screen of Figures 1 and 2 is designated generally at 10 and in the particular embodiment of the invention shown in Figure 1 it constitutes the sloping bottom of the flotation box or tank 5. Air under the desired pressure and from a suitable source, not shown, is disseminated into the flotation pulp 12 through the screen 10, the air being brought to the screen 10 by means of suitable conduit means 15. The particular conduit means 15 shown has a plurality of flared outlets 16 for distributing the air beneath the under or inlet side of the screen.

The screen 10 may be mounted in any suitable or preferred manner. In the particular embodiment shown it is mounted obliquely upon internal ledges 20 to give the sloping bottom effect. The ledges 20 may be scarfed, for example, with the screen 10 set down into the general plane of the ledges and secured as by means of overlying strips 21 secured in place by suitable fastening means 22.

The screen of Figures 1 and 2 comprises a sheet or layer 30 of resilient material mounted upon a rigid backing member 32. The backing member 32 may be formed of hard rubber, metal or any other suitable or preferred material and the resilient sheet or layer 30 is preferably vulcanized, cemented or otherwise secured to the backing member 32 at 35 over its entire area. Extending through both the backing member 32 and the resilient layer or sheet 30 are a multiplicity of apertures 36 and the air stream coming from below or from the inlet side of the screen is disseminated through these apertures 36 and passes up through the outlet side of the screen and into the emulsion above in a great number of small streams or bubbles.

In the embodiment of Figures 1 and 2, the apertures or openings 36 are of generally conical formation, decreasing from the bottom or inlet side of the backing member 32 of the screen to the reduced or restricted outlets 38 opening through the upper surface or outlet side of the resilient sheet or layer 30. The restricted outlets 38 may open directly from the upper surface of the resilient layer 30 and the enlarged inlets 40 may open directly from the bottom surface of the backing member 32 and there need be no interconnected grooves between the apertures 36 on either side of the screen.

The apertures 36 are shown in Figures 1 and 2 as extending obliquely through the screen, at least, they are in Figures 1 and 2 obliquely disposed with respect to the upper or outlet side of the layer 30, so that the weight of the water and ore pulp or other

material upon the screen 10 and particularly upon the upper surface of the resilient layer 30 will close the apertures 36 when there is no air passing therethrough and the closing of the apertures 36 in this manner prevents back leakage of the water or pulp and prevents the water or pulp in detrimental quantities from passing down through the screen to the inlet side.

The resilient upper sheet or layer thereby forms in effect a check valve for closing the apertures 36 against leakage of the pulp or water therethrough. The resilient layer 30 is preferably of relatively soft rubber although any other material having the desired action may be employed. When the air is turned on the pressure thereof overcomes the aperture closing pressure imposed upon the upper surface of the screen by the water and ore pulp thereon and the air is permitted to pass freely through the aperture 36 and is disseminated by the screen and issues as bubbles or fine streams into the overlying pulp.

In operation, the backing member 32 holds the active area of the layer or sheet 30 substantially rigid or in substantially fixed position. The apertures 36 may be normally open, i. e., in the absence of the pressure imposed upon the upper surface of the screen by the weight of the water and pulp thereon or at least said apertures 36 are opened without flexing the sheet or layer 30 as a whole and without lifting it from the backing member 32 by the pressure of the air on the inlet side of the screen or otherwise.

The resilient layer or sheet of rubber 30 is preferably of a thickness and softness which will permit closing of the apertures by internal displacement of the rubber or other material of the sheet 30. By internal displacement I refer to that closing displacement which occurs in the sheet or layer 30 by the overlying pulp or other material and without flexing or retracting of the sheet as a whole. The weight of the water and pulp or other material upon the sheet or layer 30 with the backing member holding said layer 30 rigid or in fixed position as whole and against bodily downward flexing causes an internal compression of the layer 30 and it is this internal compression and accompanying internal displacement of the material of the sheet 30 that closes the apertures 36 and imparts the self-sealing action against downward flow or leakage of the pulp or water through the screen.

In the form of screen of Figures 1 and 2 the oblique or diagonal disposition of the apertures 36 or at least the oblique or diagonal disposition of the upper ends of the apertures 36 with respect to the top or upper surface of the soft rubber or resilient sheet 30 particularly adapts the sheet 30 for closing the apertures 36 by the weight of the overlying material and with the restricted outlets it is especially suitable for preventing the pulp or water from flowing down through the screen. The diagonal disposition of the apertures 36 provides in the sheet 30 portions which overlie the apertures 36, that is, portions which overlie the apertures 36 below the upper ends thereof and these overlying portions are forced or compressed down by the overlying material and close the apertures 36 when air is not being passed through the screen. The internal compression of the sheet or layer 30 may also set up a lateral displacement of the material in the sheet which may further aid in closing and sealing the apertures through the sheet. The enlarged inlet 40 facilitates the entry of the air or other fluid under pressure into the apertures from the inlet side of the screen when the air is turned on or a flow of air is set up through the screen.

In the embodiment of Fig. 3, the relatively soft resilient material or soft rubber upper layer of the screen is designated at 42 and the rigid backing is designated at 43. In this case, the apertures through the screen comprise straight or non-conical portions 45 through the relatively soft resilient upper layer and conical portions 46 opening downwardly through the lower layer or backing 43 therefrom and of conical formation providing enlarged inlets 48 at the bottom surface of the backing 43. This gives the upper restricted outlets 45 a somewhat greater length for the self-closing action by the weights of the overlying material without sacrificing the enlarged inlets 48 at the bottom surface of the backing 43. The apertures of Fig. 3 are as in the previous embodiment shown as disposed obliquely through the screen.

In the embodiment of Fig. 4, the apertures 50 are of generally conical formation with the enlarged inlets at the bottom and the restricted outlets at the top. In this case, however, the apertures 50 are shown as extending vertically or perpendicularly through the screen 52. In this case, the conical formation of the apertures 50 provides some overhang of the upper layer so that upon compression thereof by the overlying weight along with the lateral internal displacement of the material of the upper layer which accompanies the compression thereof positively and effectively closes the apertures 50 when air is not being passed through the screen.

In the embodiment of Fig. 5, the apertures 53 are shown in the form of straight holes extending vertically or perpendicularly through the screen 54. In this case, there is no appreciable overhang of the material of the upper soft layer and the closing of the apertures 53 is by the internal lateral displacement of the material of the upper soft layer 55 which is set up by the compression

imposed upon the layer 55 by the overlying material.

In the embodiment of Fig. 6, the apertures 58 are in the form of straight openings extending obliquely through the upper layer 59 and lower backing member 60 of the screen. In this case the overhang is again present and the openings are sealed by the compression and accompanying internal displacement of the material of the upper layer 59 which is caused by the weight of the overlying material when air is not being passed through the screen.

In the embodiment of Fig. 7, the apertures extend vertically or perpendicularly through the screen with the upper portions 62 in the form of straight perpendicular openings through the upper relatively soft layer 63 and the lower portions 64 of the apertures being of conical formation through the backing member 64 with the enlarged inlets at the bottom. In this case any appreciable overhang in the layer or sheet 63 is again omitted and the lateral internal displacement accompanying compression of the sheet 63 closes the apertures 62.

I do not intend to be limited to the precise details of construction nor to the particular use or application shown or described.

I claim:—

1. A flotation screen comprising a layer of resilient material provided with apertures therethrough and means holding the active area of said layer in substantially fixed position and against bodily flexing in either direction.

2. A flotation screen comprising a layer of resilient material, said resilient layer having a plurality of apertures extending therethrough, said apertures being closed by internal displacement of the resilient material and means holding the active area of said layer in substantially fixed position and against bodily flexing in either direction.

3. A flotation screen comprising a layer of resilient material having a plurality of apertures therethrough, said resilient layer being relatively thick and soft to permit opening and closing of said apertures by internal displacement within the body of the resilient layer and without stretching or bodily flexing the resilient layer and means holding said layer against bodily flexing in either direction.

4. A flotation screen comprising a layer of resilient material having a plurality of normally open apertures therethrough and means holding said layer against bodily flexing in either direction.

5. A flotation screen comprising a layer of rubber having a plurality of apertures therethrough, said layer being of a thickness and softness permitting closing of said apertures by internal displacement of the rubber and without flexing the layer as a whole and means for holding said layer against bodily flexing.

6. A flotation screen comprising a layer of relatively soft resilient material, said layer having a plurality of apertures therethrough and said apertures being closed by internal compression of the resilient material from its normal condition and means holding said layer against bodily flexing in either direction.

7. A flotation screen comprising a rigid backing and a layer of relatively soft resilient material attached to said backing throughout the entire active area of the screen for preventing bodily flexing thereof, said screen having a plurality of apertures extending through said backing and through said relatively soft resilient layer.

8. A flotation screen comprising a rigid backing having apertures therethrough and a layer of soft rubber attached to said backign throughout the entire active area of the screen for preventing bodily flexing thereof, and having apertures registering with the apertures in said backing.

9. A flotation screen comprising a hard rubber backing and a layer of soft rubber vulcanized to said backing over the active area of the screen, said screen having apertures extending through said soft rubber layer and through said backing.

10. In flotation apparatus the combination of a chamber adapted to contain flotation pulp having a wall of resilient material provided with openings therethru, means for admitting fluid under pressure to the outer side of the resilient wall, said wall being relatively thick and soft with the openings therethru open in the normal condition of the wall, means for holding said wall against bodily flexing, said openings being capable of being closed by internal displacement produced in the resilient wall by the force of the pulp on one side and being capable of being opened by overcoming, by the pressure of the fluid admitted to the opposite side, the internal displacement produced by the pulp.

In witness whereof, I hereunto subscribe my name this 27 day of March, 1926.

HENRY B. HOUSTON.