Jan. 18, 1949. L. L. LANGE 2,459,660

STRAINING DEVICE

Filed Nov. 5, 1947

FIG. 1

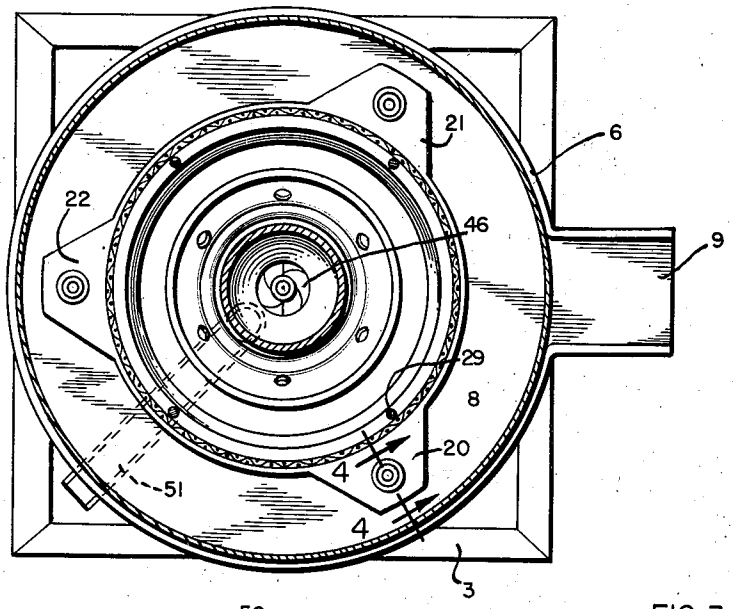


FIG. 2

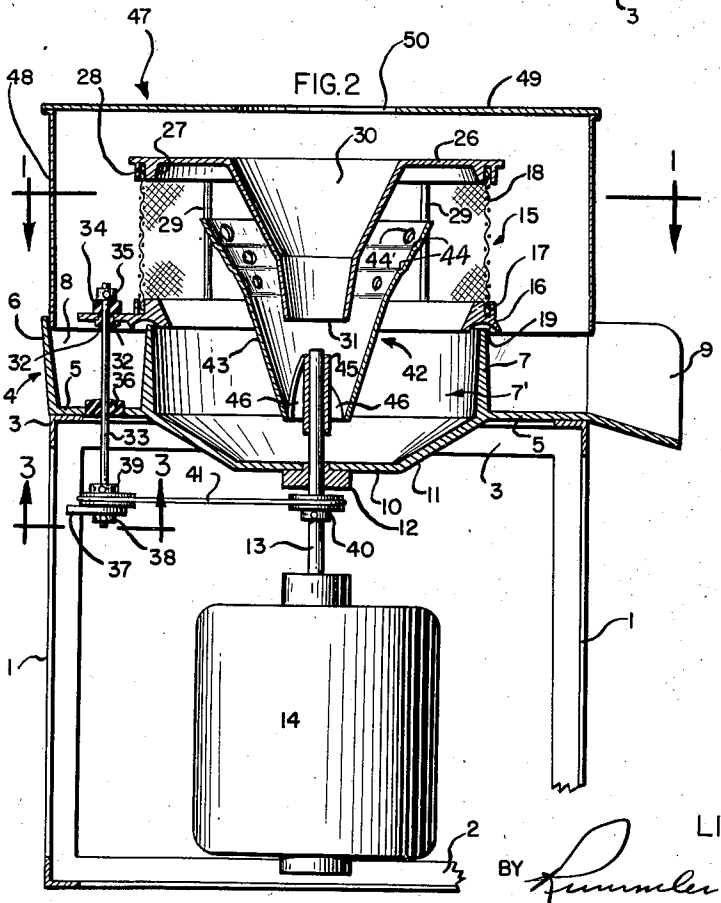


FIG. 3

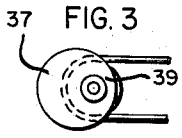
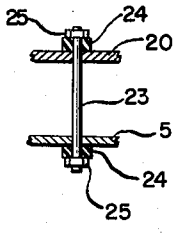


FIG. 4



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STRAINING DEVICE

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8 Claims. (Cl. 210—149)

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This invention relates to improvements in vibrating, rotary or centrifugal strainers used primarily in sifting and straining fluid materials, such as vitreous or porcelain enamel, "slip" for chinaware, clay, paints, porcelain and the like.

The main objects of this invention are to provide an improved rotary centrifugal strainer device; to provide a device of this character having a vibrating screen; to provide in a device of this character a rotary cone pump provided with means for positively throwing the fluid by centrifugal force against a screen in such a manner that the entire inner face of the screen will have material impinged thereagainst; to provide in a device of the character described unitary means for rotating the cone pump and screen; to provide in a device of this character automatic means associated with the rotary cone for returning the fluid which does not pass through the screen into the cone; and to provide a device of this character which is simple in construction and operation, inexpensive to manufacture, readily assembled and disassembled and containing substantially no parts which can get out of order.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Figure 1 is a cross sectional view of the device of my invention taken on the line 1—1 of Fig. 2.

Fig. 2 is a vertical sectional view through the strainer embodying the present invention.

Fig. 3 is an elevational view taken on the line 3—3 of Fig. 2 of the driven wheel and eccentric for producing the vibrating movement to the screen.

Fig. 4 is a cross sectional view taken on the line 4—4 of Fig. 1.

Referring in detail to the drawings, I provide a skeletal frame base, preferably constructed of angle irons and comprising vertical legs 1, bottom side rails 2 and top side rails 3, all anchored together at their ends by any suitable means, such as by welding. The base supports a cylindrical metal casting generally indicated by the numeral 4, the bottom wall 5 of which rests on the top rails 3 as is clearly shown in the drawing.

The casting 4 is provided with an integrally formed outer, diagonally extending side wall 6 and an integrally formed dividing vertical wall 7, whereby to form a trough-like passageway 8 between the walls 6 and 7. The wall 6 is provided with an outlet port or spout 9. A portion 10 of the bottom wall 5 lies in a plane below that of the plane of the wall 5 and is provided with a diagonally extending portion 11, whereby to form

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a bowl-like structure 7', the purpose of which will hereinafter be described.

A guide or thrust bearing 12 is positioned centrally in portion 10 of the bottom wall 5 to receive the vertically extending shaft 13 of the motor 14. The motor 14 is rigidly secured in the base by any suitable means, such as by brackets, braces or the like which are not illustrated, as being obvious.

A cylindrical screen cage 15, open at the bottom, is provided with a metal ring 16 having a groove 17 into which the lower end of the screen 18 is securely seated. The ring 16 is also provided with a groove 19 in which the upper end of the wall 7 seats, whereby to support the screen cage 15.

The ring 16 is also provided with radial arms 20, 21 and 22. The arms 20 and 21 are each provided with a tie rod 23 which extends downwardly through the wall 5 and carries suitable elastic washers 24, such as rubber or the like, and locking means 25 on its ends, such as collars or nuts, or the like, whereby to flexibly secure the screen cage 15 in position.

The cover 26 of the screen cage 15 is provided with an annular boss 27 having a groove 28 therein into which the upper edge of the screen 18 seats. The cover 26 is held in position by supporting rods 29 extending between the ring 16 and the cover 26.

The cover 26 is also provided with a funnel-shaped port 30 which extends downwardly into the interior of the screen cage. The lower opening 31 therein lies in the same horizonal plane as the ring 16.

The arm 22 of the ring 16 is provided with a thrust bearing 32, through which the upper end of shaft 33 projects. The upper end of shaft 33 is provided with an elastic washer 34 and a collar 35 which is anchored to said shaft 33.

The wall 5 is also provided with a flexible journal, such as an elastic washer or support 36 through which the shaft 33 projects. The lower end of shaft 33 is provided with an eccentric 37 held in position thereon by collar 38 and pulley wheel 39. The shaft 33 is driven through the pulley wheel 40 mounted on shaft 13 and belt 41.

The pump 42 comprises an inverted truncated cone-like housing 43 which is open at its top and provided with a plurality of spaced steps or offsets 44 having a plurality of apertures 44' therein, each located adjacent an offset or step 44. As will be apparent from the drawings, the upper end of the cone wall 43 substantially envelops the lower end of the funnel-shaped port 30 of the screen cage

15. The lower end of the pump is provided with a bearing sleeve 45 which is rigidly seated on the upper end of the shaft 13 and has a number of fin members or blades 46 secured thereto and radially arranged and which are inclined from the vertical away from the direction of rotation of the cone wall. The lower free ends of the blades 46 are rigidly secured to the lower end of the cone wall 43.

The upper end of my strainer is enclosed by a cylindrical cover 47 having a side wall 48 and a top wall 49 in which an opening 50 is provided. The diameter of the side wall is slightly smaller than the diameter of the upper end of the side wall 6 of the casting 4, whereby it readily supports the cover 47 as will be apparent from Fig. 2 of the drawing.

In operation the motor 14 is started whereby it will, through shaft 13, cause the pump to rotate and simultaneously cause the screen cage to vibrate through the action of the eccentric 37 on shaft 33 which is rotated by pulley wheels 39, 40 and belt 41.

The fluid material to be strained is poured into the device through the opening 50 and into the funnel 30 which directs it into the lower end of the rotating pump 42, whereby, because of the diagonal walls and the speed of rotation, the fluid will creep upwardly toward the top of the pump by the centrifugal action. As the fluid progresses upwardly and passes over each step 44 it tends to hesitate and build up in mass whereby a portion of the material is ejected through the apertures 44' and against the screen face 18 while the balance continues its upward movement to the next step. The steps in each case serve as accumulators so that the material being ejected is substantially uniform for each step whereby the entire inner face of the screen is brought into use.

The fluid will also be forcibly thrown out of the pump 42 and over the top marginal edge of the pump and against the vibrating screen 18 where that portion of the material that passes through the screen will flow downwardly into the trough 8 and outwardly from the apparatus through spout 9 where it is collected.

That portion of the material which does not pass through the screen will flow downwardly into bowl 7'. When the height of the fluid in the bowl 7' reaches the opening in the bottom of the pump, the blades 46, which are rotating at high speed, will cause the liquid to be drawn up into the interior of the pump 42 and will be processed again until it either passes through the screen or settles in the bottom of the bowl 7'. In this manner the rejected material is continually reclaimed and all possible usable fluid passed through the screen 18.

If the residue is large and the bowl 7' becomes filled with heavy particles, it may be drained off through drain tube 51 which is attached at one end to the portion 10. Suitable valves, not shown, are to be provided for manually controlling this draining.

It will now be apparent that the vibrating screen improves the performance of the unit in that it makes it possible, when straining fluids, to cause more usable fluid to pass through the screen than was heretofore possible in systems employing stationary screens. This is a direct result of the vibrating action which prevents particles in the fluid from lodging themselves on the screen or becoming embedded in the mesh where normally they tend to clog the screen and eventually substantially close all of the opening whereby none of the fluid may pass through the screen. Also the vibrating screen assists in causing the fluid to pass downwardly more readily on both sides of the screen mesh.

It can readily be appreciated that the top cover 47 can easily be removed for cleaning purposes by merely lifting the same away from the apparatus. Similarly, the screen cage may be readily removed by removing the collars 25 and 35 whereby the screen cage may be lifted upwardly away from the apparatus and, therefore, it can be readily cleaned. When the cover 47 and the screen cage 15 have been removed from the apparatus, the bowl 7' and trough 8 are exposed and they can each be easily cleaned in any of the many suitable ways.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that numerous details of the structure shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

I claim:

1. A fluid straining device comprising a base, a motor mounted centrally in and to said base and having an elongated drive shaft extending in a vertical plane; a cylindrical casting open at its upper end and having a bottom wall, said casting being positioned on the upper end of said base and provided with a diagonally extending peripheral wall and a vertically extending inner dividing wall, whereby to form a trough between said walls, the bottom wall within the area of said inner wall lying in a plane below that of said bottom wall of said trough and having a portion thereof lying in a diagonal plane, whereby to form a bowl; a tubular cylindrical screen cage having its wall positioned above and in line with said dividing wall and without the area of said trough; a cover plate for said screen cage having an axially positioned funnel extending downwardly and having its discharge opening located below the plane of the lower marginal edge of said screen cage; a pump comprising an impeller and a hollow casing attached thereto secured to the upper end of said drive shaft and extending into said bowl, means for rotating said pump and adapted to draw into the interior of said pump any material to be strained falling into said bowl, said pump being located partially within said bowl and partially within the inner area of said screen and spaced away therefrom, the upper end of said funnel being positioned within the upper area of said screen and the remainder of said funnel being positioned within and spaced away from said hollow casing; means for simultaneously vibrating said screen while said pump is being rotated; and a cylindrical cover housing for said screen.

2. A straining device of the class described, comprising a motor having an elongated vertical drive shaft, a pump comprising an impeller and a hollow casing attached thereto positioned on the upper end of said shaft and carried thereby, a vertically positioned tubular cylindrical screen cage spaced away from and housing the upper end of said hollow casing, a vertically extending cylindrical casting located between said pump and motor having a dividing wall to form a bowl and a trough, with said dividing wall below and in alignment with the wall of the screen cage a vertically extending funnel member spaced away from and substantially surrounded by said hollow casing, a cylindrical housing for said screen cage,

and means for vibrating said screen cage simultaneously with rotation of said pump.

3. The device according to claim 2 wherein said means for vibrating said screen cage comprises a vertically extending driven shaft journaled at its upper end to said screen cage and in a bearing positioned in the bottom wall of said trough, the lower end of said shaft being provided with an eccentric and a pulley wheel, said vertical drive shaft also being provided with a pulley wheel positioned on said shaft below the bottom wall of said bowl and aligned with said pulley wheel on said driven shaft, and a belt connecting said pulley wheels.

4. The device according to claim 2, wherein said pump includes a series of radially arranged inclined blades, the outer lower edges of said blades being rigidly secured to said lower end of said hollow casing, the inner edges of said blades being rigidly secured to a bearing which is rigidly secured to the upper end of said drive shaft whereby upon rotation of said drive shaft said blades will pick up and draw into the hollow casing any material to be screened falling into said bowl.

5. A fluid straining device comprising a base, a motor mounted centrally in and to said base and having an elongated drive shaft extending in a vertical plane; a cylindrical casting open at its upper end and having a bottom wall, said casting being positioned on the upper end of said base and provided with a diagonally extending peripheral wall and a vertically extending inner dividing wall, whereby to form a trough between said walls, the bottom wall within the area of said inner wall lying in a plane below that of said bottom wall of said trough and having a portion thereof lying in a diagonal plane, whereby to form a bowl; a tubular cylindrical screen cage having its wall positioned above and in line with said dividing wall and without the area of said trough whereby the screened material will flow into said trough; a cover plate for said screen cage having an axially positioned funnel extending downwardly and having its discharge opening located below the plane of the lower marginal edge of said screen cage; a pump comprising an impeller and a hollow casing attached thereto secured to the upper end of said drive shaft and extending into said bowl to draw into the interior of said hollow casing any material to be strained falling into said bowl, said pump being located partially within said bowl and partially within the inner area of said screen and spaced away therefrom, the upper end of said funnel being positioned within the upper area of said screen and the remainder of said funnel being positioned within and spaced away from said hollow casing; and a cylindrical cover housing for said screen.

6. A straining device of the class described, comprising a motor having an elongated vertical drive shaft, a pump positioned on the upper end of said shaft and carried thereby, said pump comprising an impeller and a hollow conical casing secured thereto, a series of offsets in the upper portion of said hollow casing, said offsets each provided with a series of spaced ports, a vertically positioned tubular cylindrical screen cage spaced away from and housing the upper end of said hollow casing, a vertically extending cylindrical casting located between said pump and motor having a dividing wall to form a bowl and a trough with the dividing wall in line with and below the screen cage wall, a vertically extending funnel member spaced away from and substantially surrounded by said hollow casing, a cylindrical housing for said screen cage, and means for vibrating said screen cage simultaneously upon rotation of said pump.

7. The device according to claim 6 wherein said means for vibrating said screen cage comprises a vertically extending driven shaft journaled at its upper end to said screen cage and in a bearing positioned in the bottom wall of said trough, the lower end of said shaft being provided with an eccentric and a pulley wheel, said vertical drive shaft also being provided with a pulley wheel positioned on said shaft below the bottom wall of said bowl and aligned with said pulley wheel on said driven shaft, and a belt connecting said pulley wheels.

8. The device according to claim 6, wherein said pump includes a series of radially arranged inclinded blades, the outer lower edges of said blades being rigidly secured to said lower end of said hollow casing, the inner edges of said blades being rigidly secured to a bearing which is rigidly secured to the upper end of said drive shaft whereby upon rotation of said drive shaft said blades will pick up and draw into the hollow casing any material to be screened falling into said bowl.

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