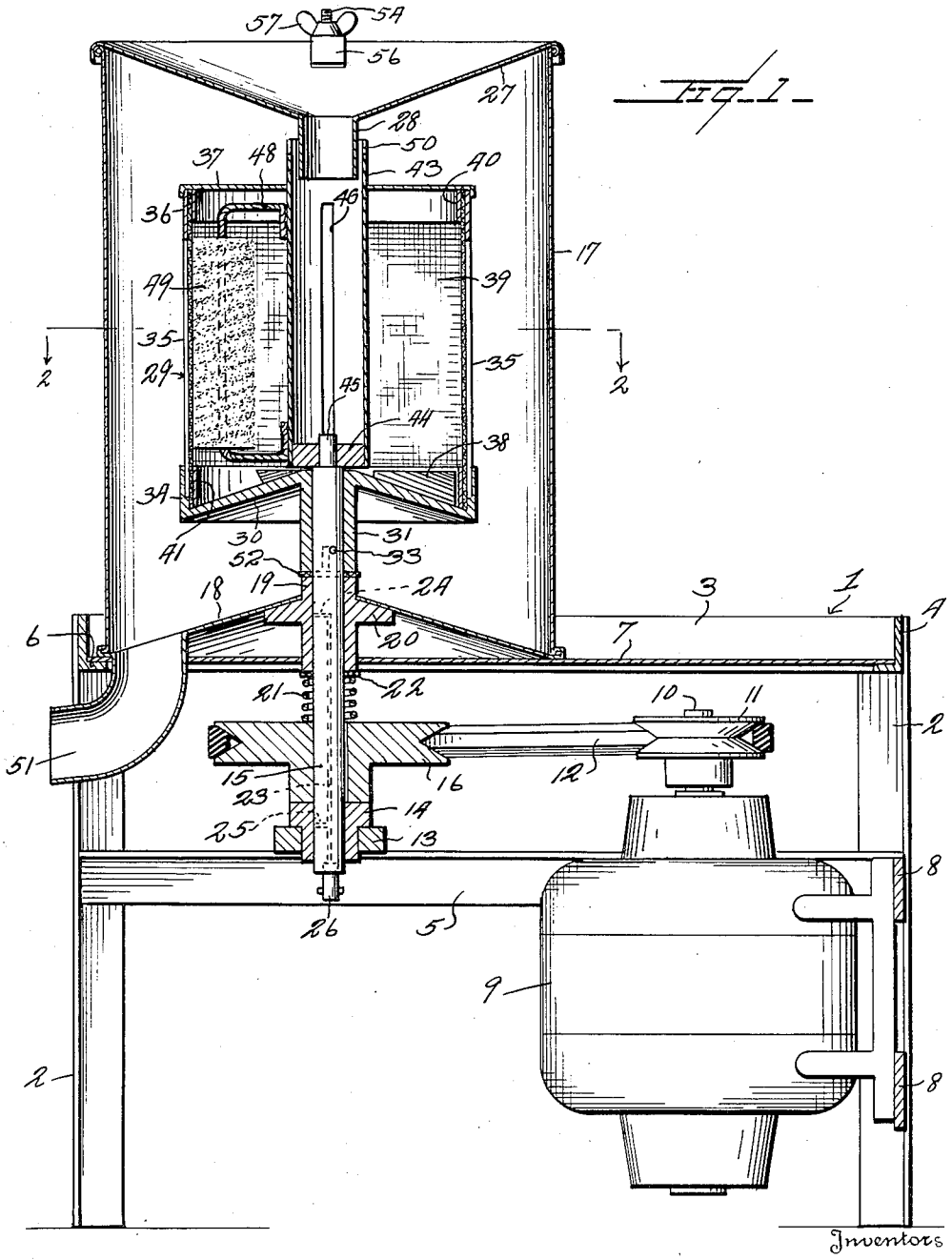
April 27, 1937. J. E. GAGE ET AL 2,078,604

CENTRIFUGAL STRAINER

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FIG. 1



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Fig. 2

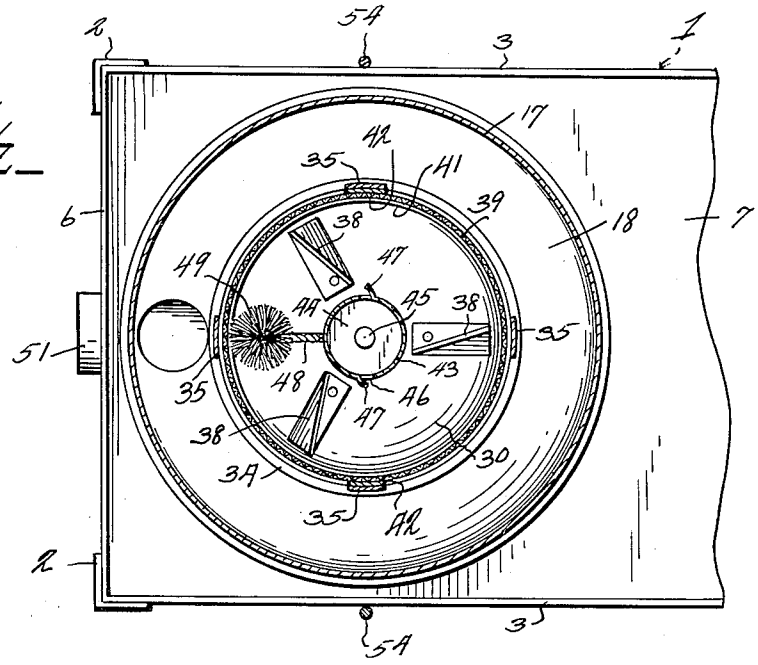


Fig. 3

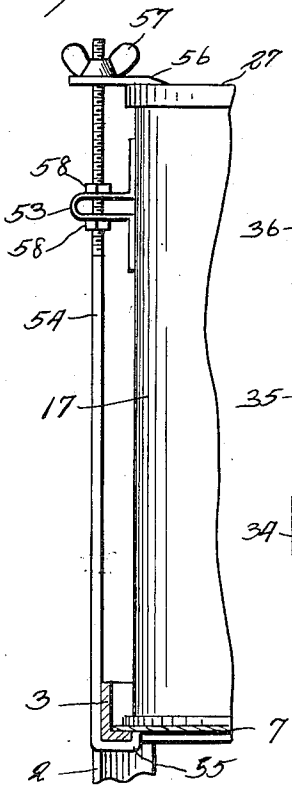


Fig. 4

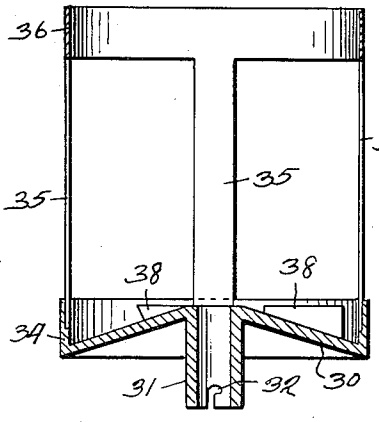
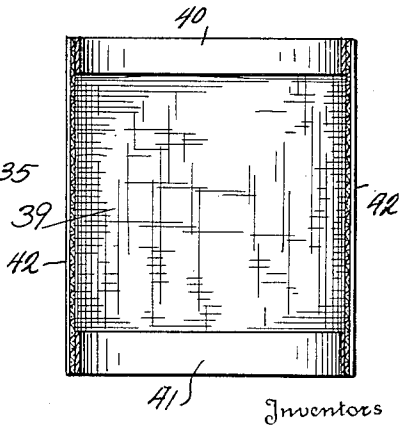


Fig. 5



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UNITED STATES PATENT OFFICE

2,078,604

CENTRIFUGAL STRAINER

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Pasadena, Calif.

Application December 10, 1935, Serial No. 53,826

9 Claims. (Cl. 210—63)

This invention relates to the class of straining devices and pertains particularly to improvements in rotary or centrifugal strainers.

The primary object of the present invention is to provide a centrifugal strainer having a rotating screen which is provided with an intake tube rotatably mounted and from which material introduced for straining is centrifugally cast against the rotating screen.

Another object of the invention is to provide in association with a rotary screen strainer, a rotating intake tube having a brushing element engaging the wall of the screen and adapted to be rotated relative thereto for the purpose of cleaning the same.

Another object of the invention is to provide in a rotary screen strainer a strainer structure having an imperforate bottom which is provided with means for centrifugally casting back against the screen wall of the strainer any material which may fall to the bottom of the screen.

A still further object of the invention is to provide in a rotary screen structure a novel means for providing a floating drive whereby the elimination of a certain amount of friction is effected.

A still further object of the invention is to provide a centrifugal straining machine in which novel means is provided for introducing material to be strained into a rotary screen or screened wall receptacle while the receptacle is being rotated.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:—

Figure 1 is a view in vertical section through the strainer embodying the present invention.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a detail view showing the holding means for the receptacle.

Fig. 4 is a view of the strainer cylinder per se.

Fig. 5 is a sectional view of the straining screen per se.

Referring now more particularly to the drawings wherein like numerals of reference indicate corresponding parts throughout the several views, the numeral 1 indicates generally a frame or stand structure having the corner legs 2 which are connected by top side rails 3 and end rails 4. Spaced below these side rails 3 are intermediate side rails 5. The top and end rails 3 and 4 are preferably formed of angle iron material so as to provide inwardly extending supporting flanges 6 upon which a floor 7 is mounted.

At one end of the stand are two transversely extending plates 8 which are vertically spaced and which are secured at their ends to the adjacent legs 2. These plates have secured thereagainst by suitable securing elements the electric motor 9 which has its armature shaft 10 disposed vertically, as shown. Upon the extended upper end of the motor armature shaft is a driving pulley 11, about which a belt 12 passes to connect the pulley to a driven pulley hereinafter described.

Extending across the stand structure and mounted at its ends upon the intermediate side rails 5 is a plate 13 which carries a bearing 14 through which the lower end of a vertically disposed shaft 15 passes. This shaft extends upwardly through the floor 7, and keyed to the shaft and normally resting against the bearing 14 is a driven pulley wheel 16 about which the belt 12 passes.

Mounted upon the floor 7 of the structure is a strained material receiving receptacle 17, the bottom 18 of which is cone-shaped and has extending through the center or apex portion, the upper end of a fixed bearing sleeve 19, which is provided with a surrounding flange 20 which engages against the underside of the receptacle bottom and is secured thereto, as illustrated. This bearing sleeve 19 has the upper end of the shaft 15 extended therethrough into the receptacle 17.

Interposed between the lower end of the bearing sleeve 19 and the top of the driven pulley 16 is a helical spring 21 which surrounds the shaft 15, bearing at its lower end on the pulley and having its upper end in engagement with the fibre washer 22 which it forces against the lower end of the bearing 19.

The shaft 15 is provided with an oil or grease passage 23, which opens through the lower end of the shaft and passes upwardly to the bearing 19 where it joins the lateral passage 24. Intermediate its ends a second lateral passage is formed, as at 25, and through these lateral passages grease or oil is adapted to pass to the bearings 14 and 19. In order to facilitate the injection of oil or grease into the passage 23, a suitable fitting 26 is connected with the lower end of the shaft.

The receptacle 17 is provided with the funnel-like cover 27, the central part of which merges into a downwardly opening tube 28. Within the receptacle 17 is a cylindrical straining unit which is indicated generally by the numeral 29. This straining unit comprises an imperforate bottom 30 having a relatively long sleeve-like hub 31 through which the upper end of the shaft 15 passes.

The lower edge of this hub is provided with a bayonet slot 32 which receives a pin 33 carried by the shaft so that when the shaft turns the sleeve 31 is forced to turn therewith. The bottom 30 slopes downwardly from the sleeve 31 and terminates in the up-turned flange 34 with which are connected vertical portions 35 which at their upper ends are joined with a band 36. There is thus formed an open walled cylinder which is joined with the shaft for rotation thereby and which has an outwardly and downwardly sloping imperforate bottom and a centrally apertured cover, which is indicated by the numeral 37.

Disposed upon the top surface of the cylinder bottom 30 are a number of fin members or blades 38 which are radially arranged and which are inclined from the vertical away from the direction of rotation of the strainer. These fins are spaced at their outer ends from the flange 34 so as to permit the extension between them and the flange of the lower edge of a removable strainer cylinder 39. This strainer cylinder may be formed of wire screen of any desired mesh according to the character of the material to be strained and the strainer cylinder illustrated is provided with top and bottom reinforcing bands 40 and 41, respectively, which are connected by two or more reinforcing strips 42.

Disposed upon the axial center of the strainer cylinder and screen is an intake tube 43, the lower end of which is closed by the centrally apertured disk 44, the central aperture of which receives the reduced upper end 45 of the shaft 15.

The disk 44 rests upon the shoulder which is formed as a result of the formation of the reduced end portion 45 so that it will be held in spaced relation with the upper end of the cylinder bottom hub 31. This tube 43 is provided with any suitable number of longitudinally extending outlet slots 46, one edge of each of which slots is bordered by an outwardly extending louvre blade 47.

Secured to the outer wall surface of the intake tube 43 is a brush which is here illustrated as comprising a centrally twisted wire 48 having the ends bent for attachment to the tube and having bristles 49 extending lengthwise thereof in a line parallel with the tube and so spaced therefrom as to have their ends in contact with the screen 39 and by reason of this contact between the tube carried brush and the screen, the screen when rotated will effect the rotation of the tube also.

The upper end of the tube extends above the lower end of the tubular central portion 28 of the receptacle cover 27 and surrounds the same, as illustrated, and the top edge of the intake tube 43 is provided with a pair or more of notches 50 in which a suitable instrument may be engaged when the cover 27 has been removed to effect the rotation of the tube and the brush 49 relative to the screen 39 so as to clean the latter of any material which may be adhering thereto.

In the operation of the present strainer the material to be strained, whether it be of liquid or dry powder character, is poured into the funnel-like top 27 of the receptacle 17 while the motor 9 is operating to turn the straining unit 29 at a high rate of speed. This material will first enter the rotating intake tube 43 and will be thrown by centrifugal force through the slots 46 thereof and from the edges of the louvre blades 47 against the wall of the removable screen body 39. The combined centrifugal action and force of expulsion of the liquid from the intake tube to and against the screen will effect the passage of most of the material through the screen, but any which may not pass through and which falls to the bottom 30 of the rotating cylinder will be picked up by the inclined blades 38 and it will be flung off of the same upwardly and outwardly against the screen. This continued action will finally effect the passage of all of the material through the screen into the receptacle 17 from which it will flow through the drain tube or pipe 51 which leads from the bottom 18 adjacent the outer edge thereof.

Surrounding the shaft 15 and interposed between the upper bearing sleeve 19 and the hub sleeve 31 of the cylinder bottom, is a fibre washer 52. This washer operates to prevent contact between the moving metal parts and is lubricated by oil which passes from the passage 24 into the bearing sleeve. By providing the receptacle 17 with the outwardly and downwardly inclined bottom the strained material will be led at once to the outlet 51 away from the bearing 19 and thus will be protected from contamination by any oil or grease which may work its way between the washer 52 and the surfaces which it separates.

In assembling the structure the driven pulley 16 when at rest and in engagement with the lower bearing 14, will be at a slightly lower elevation than the pulley 11. By this arrangement when the motor is running the pulley of the belt 12 will tend to raise the driven pulley 16 to the level of the pulley 11 against the spring 21 and by this means remove the pulley from contact with the bearing 14 and thus provide a floating bearing.

From the foregoing it will be apparent that with a strainer of the character herein described two forces will be made use of for effecting the straining of the material introduced into the machine through the tube 27, which are the impact of the material as it is thrown against the screen 39, and the centrifugal effect upon the material of the rotating screen against which the material lies. It will also be apparent that novel means is provided for cleaning the screen and also for returning to the surface of the screen any material which may have dropped to the bottom of the strainer. By this arrangement the passage of all of the material introduced through the straining screen is eventually accomplished.

While any suitable means may be employed for securing the receptacle 17 upon the floor structure 7, it is preferred that the receptacle be provided at opposite points with apertured outstanding ears 53, through which tie bolts 54 may be extended to have their lower ends which are laterally turned, as indicated at 55, engage under the adjacent side rails 3 and their upper ends which are screw-threaded, pass through the ears 56 carried by and projecting outwardly from the receptacle top 27.

The threaded upper ends of these tie-bolts are provided with thumb-nuts 57 which bear against the ears 56 and thus secure the cover 27 firmly in place. In order that the tie bolts may not

drop from position when the thumb nuts 57 are removed, each bolt is provided with two holding nuts 58 which have the adjacent ear 57 secured therebetween in the manner illustrated.

What we claim, is:

1. A strainer of the character described, comprising a receptacle having a bottom raised at its central portion, an outlet in the lower part of the cylinder, a shaft extending through the central part of said bottom into the cylinder and mounted for rotation, means for rotating the shaft, a cylindrical strainer unit mounted upon the shaft within the receptacle, said strainer unit having an imperforate bottom, means within the cylinder strainer unit for receiving material to be strained, said means being rotatable with the cylinder and casting the material by centrifugal action against the interior wall of the cylinder, means upon said cylinder bottom for picking up and casting against the wall by centrifugal action any material falling to the bottom of the cylinder, and a brush element carried by said material receiving means and engaging the wall of the straining cylinder, said material receiving means being adapted for rotation independently of the cylinder.

2. A strainer, comprising a receptacle, a shaft mounted for rotation and extending vertically thru the bottom of the receptacle, said receptacle having an outlet, means for rotating said shaft, a straining cylinder having a bottom, a hub carried by the cylinder bottom and receiving said shaft, a material receiving tube disposed vertically in the cylinder and adapted to receive material in its upper end, said tube having a longitudinally extending wall slot for the passage of material therethrough into the cylinder, means frictionally coupling the lower end of the tube with said shaft whereby the cylinder receives rotary motion from the shaft but is rotatable independently thereof and of the cylinder, and means carried by the tube forming a wiping contact between the same and the wall of the cylinder.

3. A strainer, comprising a receptacle, a shaft mounted for rotation and extending vertically thru the bottom of the receptacle, said receptacle having an outlet, means for rotating said shaft, a straining cylinder having an imperforate bottom, a hub carried by the cylinder bottom and receiving said shaft, a material receiving tube disposed vertically in the cylinder and adapted to receive material in its upper end, said tube having a longitudinally extending wall slot for the passage of material therethrough into the cylinder, means connecting the lower end of the tube with said shaft means carried by the tube forming a frictional connection between the same and the wall of the cylinder, and fin members disposed radially within the cylinder upon the bottom thereof and inclined from the vertical away from the direction of rotation of the cylinder whereby material introduced into the cylinder will be centrifugally cast upwardly and outwardly against the wall thereof.

4. A strainer, comprising a receptacle, a supporting stand therefor, a bearing sleeve in the bottom of said receptacle, a bearing carried by the stand beneath said sleeve, a vertically disposed shaft mounted in said bearings and having an end extending upwardly into the receptacle, a drive motor mounted upon the stand and having a vertical drive shaft, a pulley carried by the motor shaft, a pulley carried by the first mentioned shaft, resilient means normally urging said second mentioned pulley away from said bearing sleeve, said second mentioned pulley being normally at a lower elevation than the motor pulley but adapted to move vertically against said spring, a connecting belt between the pulleys, and a strainer unit within the receptacle carried by and rotatable with the shaft.

5. A strainer comprising a receptacle having a centrally raised bottom, an outlet in the lower part of the receptacle, a cover for the receptacle in the form of a funnel having a central downwardly opening outlet tube, a vertically disposed rotatable shaft having its upper end extending through the central part of the receptacle bottom and terminating in a reduced portion, a strainer unit comprising a cylinder having an apertured side wall and an imperforate bottom, said bottom having a hub receiving the upper end of said shaft to which it is attached for rotation therewith, said last bottom being outwardly and downwardly sloping, a straining screen cylinder within the first cylinder, a vertically disposed material receiving tube having its lower end closed but provided with an aperture for the reception of the reduced end of said shaft, the upper end of said tube receiving the cover discharge tube, said material receiving tube having a longitudinally extending slot, a louvre blade bordering an edge of the slot, means connecting the tube with the strainer unit whereby the strainer unit and the material receiving tube will be simultaneously rotated, means upon the sloping bottom of said strainer unit for effecting the centrifugal distribution over the screen cylinder of material falling to the bottom of the strainer unit, and means for rotating the shaft.

6. A rotary strainer, comprising a receptacle having a bottom outlet, a vertical bearing sleeve centrally of the receptacle, a vertical shaft extending through said sleeve, means for rotating the shaft, a cylinder in the receptacle having a foraminous side wall and a central vertical bearing sleeve in its bottom into which the upper end of the shaft extends and is secured, a cover for the receptacle having a central inlet, said shaft having a reduced extension upon its upper end forming a shoulder having its top in the plane of the surrounding part of the cylinder bottom, and a vertical tube having a bottom resting on and frictionally coupled only with said cylinder bottom and having an opening receiving the reduced extension of the shaft, said tube having a longitudinal material discharging slot in its wall and having its upper end arranged to receive material introduced through said cover inlet.

7. A rotary strainer, comprising a receptacle having a bottom outlet, a vertical bearing sleeve centrally of the receptacle, a vertical shaft extending through said sleeve, means for rotating the shaft, a cylinder in the receptacle having a foraminous side wall and a central vertical bearing sleeve in its bottom into which the upper end of the shaft extends and is secured, a cover for the receptacle having a central inlet, said shaft having a reduced extension upon its upper end forming a shoulder having its top in the plane of the surrounding part of the cylinder bottom, a vertical tube having a bottom resting on and frictionally coupled only with said cylinder bottom and having an opening receiving the reduced extension of the shaft, said tube having a longitudinal material discharging slot in its wall and having its upper end arranged to receive

material introduced through said cover inlet, an elongated circular brush disposed vertically within the cylinder and in contact with the foraminous wall thereof, and means connecting the ends of the brush with said tube.

8. A drive unit, comprising a vertical bearing, a shaft mounted vertically in said bearing for rotation, a pulley disposed upon said shaft and having movement longitudinally thereon, said pulley having contact with the underlying bearing, a second bearing above and in spaced relation with the pulley and having the shaft passing therethrough, a spring member surrounding the shaft and interposed between the pulley and said second bearing and normally urging the pulley downwardly, a second vertically disposed shaft in spaced relation with said first shaft, drive means for rotating said second shaft, a pulley carried by the second shaft, and a belt connection between said pulleys, said second mentioned pulley being normally disposed in a plane slightly above the first pulley whereby simultaneous rotation of the pulleys through the medium of the belt will effect the movement of the first mentioned pulley upwardly on the first mentioned shaft against the tension of said spring.

9. Means for securing a receptacle upon a support, said receptacle having a top, comprising an ear secured to the side of the receptacle and extending laterally therefrom, a rod extending vertically in spaced relation with the receptacle and passing through said ear, said rod being screw threaded from its upper end to a point below the ear, means connecting the lower end of the rod to the support, a pair of nuts threaded onto the rod and having the ear secured therebetween, a lug carried by the receptacle top and projecting laterally therefrom, the threaded upper end of said rod pasing through said lug, and a thumb nut threaded onto the upper end of the rod and bearing against said lug.

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