June 1, 1943. E. G. BAUER 2,320,335

QUALITY GRADER

Filed May 28, 1940 4 Sheets-Sheet 1

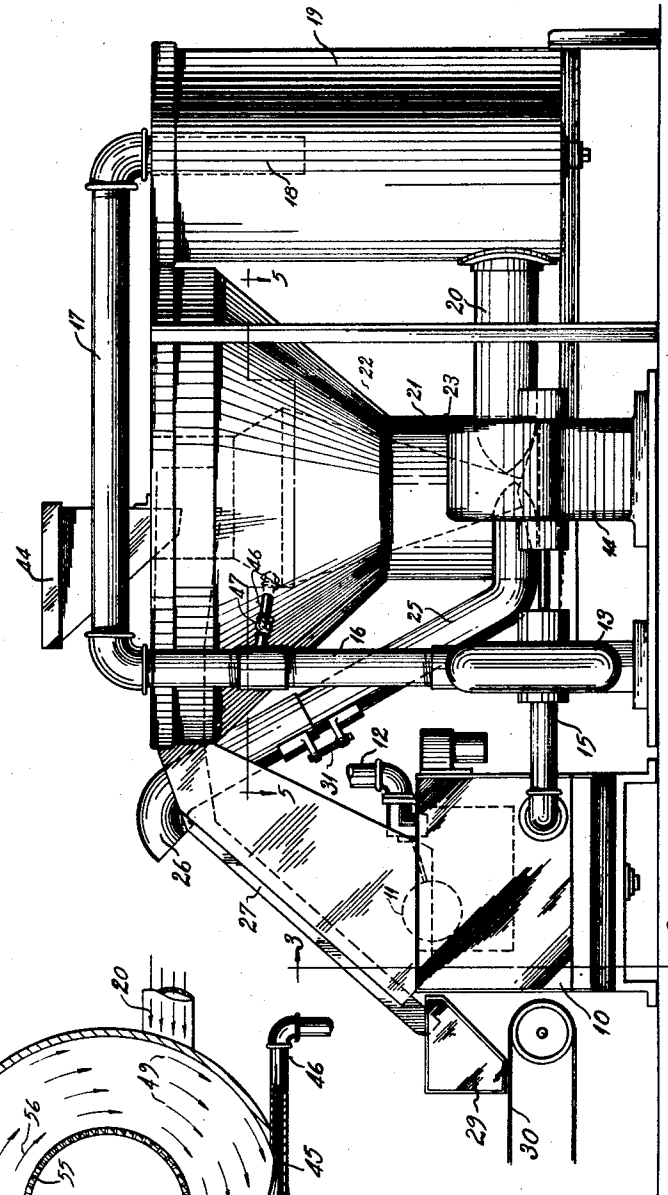


FIG. 1

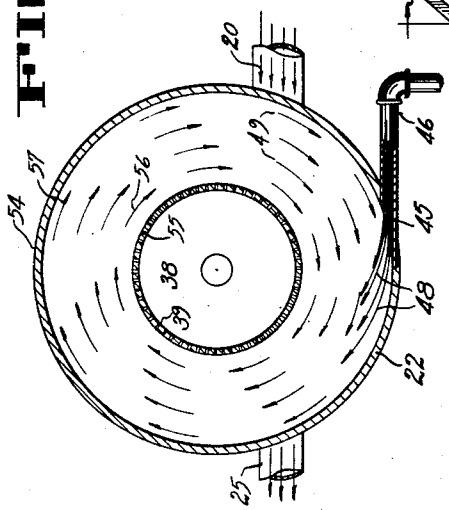


FIG. 5

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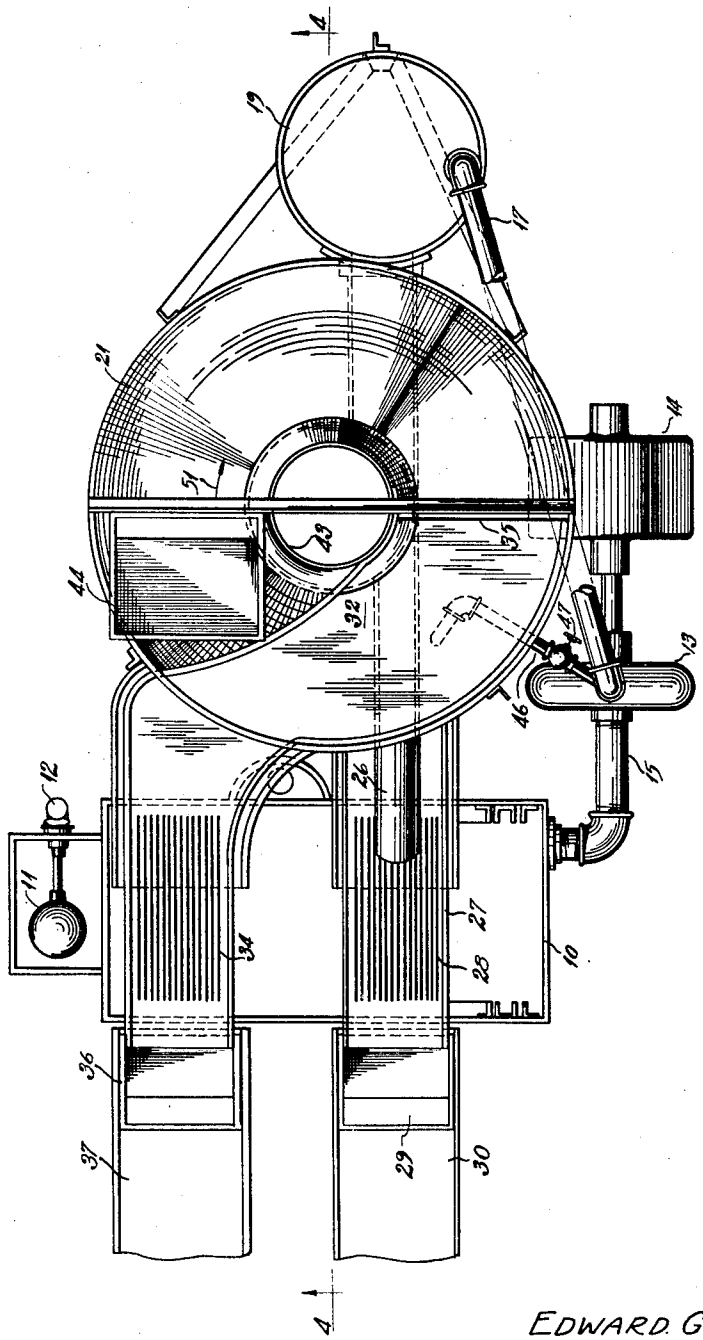
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QUALITY GRADER

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FIG. 2



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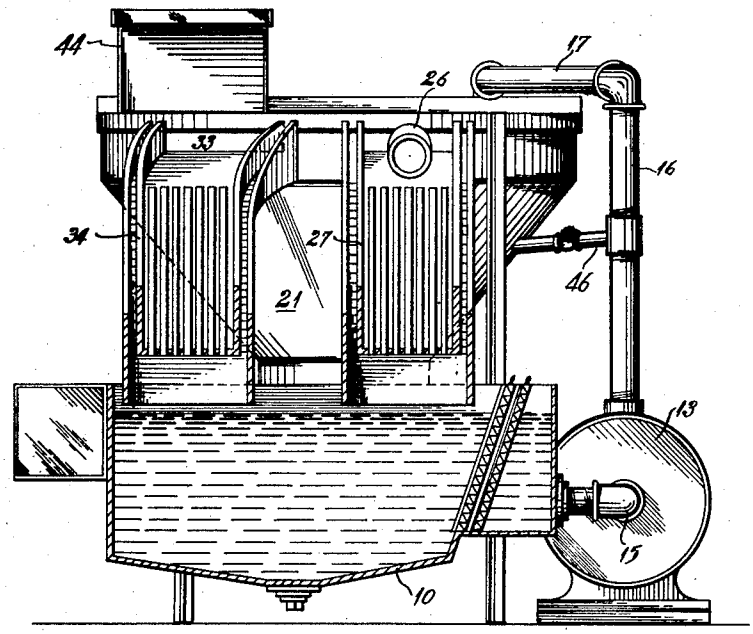
Attorney

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QUALITY GRADER

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FIG. 3



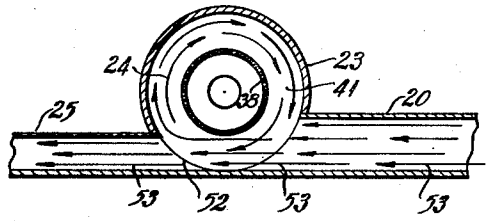


FIG. 6

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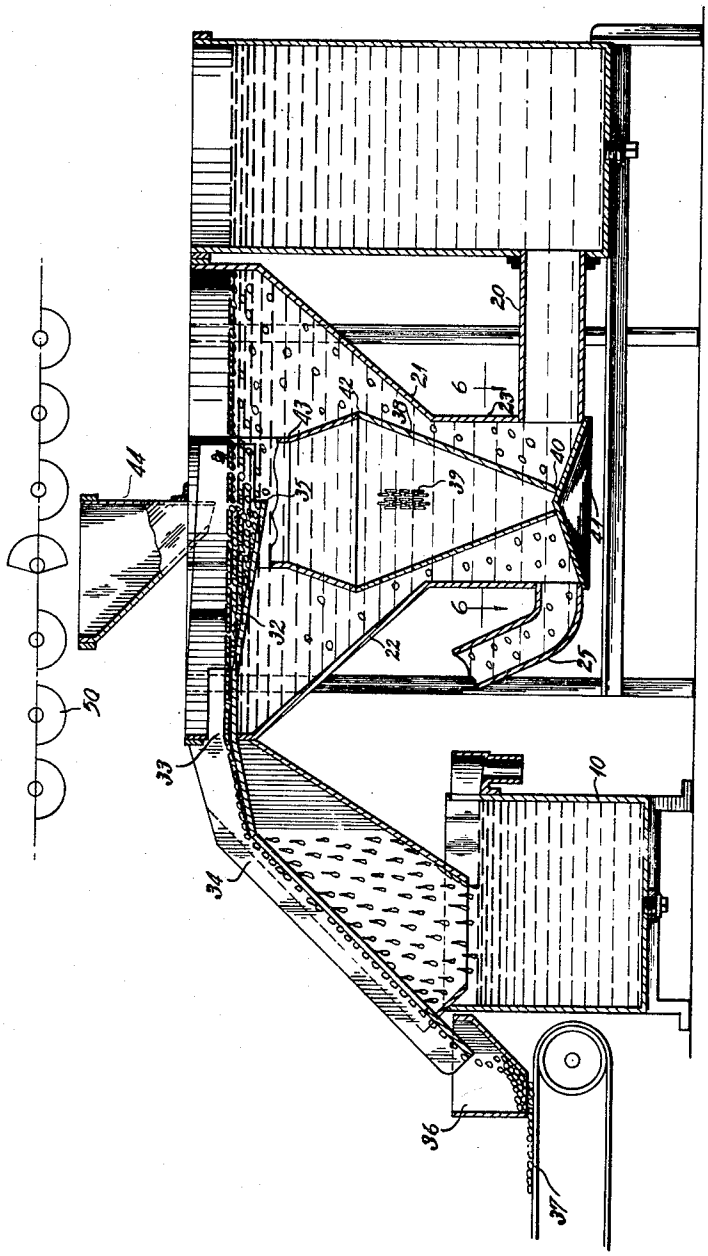


FIG. 4

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UNITED STATES PATENT OFFICE

2,320,335

QUALITY GRADER

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Application May 28, 1940, Serial No. 337,605

5 Claims. (Cl. 209—173)

This invention relates to machines for grading peas and the like in accordance with their quality and particularly to separate tender peas from hard peas.

One of the objects of the invention is to provide an improved construction in graders of the type disclosed in the patent to Lewis No. 1,996,022, issued March 26, 1935, in order to obtain a more efficient grading operation, and to increase the capacity of the apparatus.

In graders of this type, peas which have been previously graded for size and usually blanched are deposited on the surface of a whirling pool of brine solution. The tender peas float on the surface and are skimmed off. The hard peas sink and are drawn off at the bottom of the pool. One of the difficulties which has been encountered in commercial use with machines of this type is the tendency of some hard peas to collect in the center of the whirlpool. These peas are usually on the border-line as to quality and are sensitive to the buoyant action of air bubbles and the agitating movement of eddies in the whirlpool. This difficulty is almost inherent in this type of apparatus for the reason that objects carried around in a whirlpool tend to move toward the center thereof on account of the higher angular velocity of the fluid nearer the center of the whirlpool. Two undesirable results follow: (1) there is danger of some of these border-line or intermediate quality peas being carried up in the whirlpool to the surface where they would be skimmed off with the tender peas; (2) in changing from a run of peas of one size to that of a different size, which often happens in commercial use as frequently as every half hour, it is necessary to clear the grader of all peas of the preceding size before the peas of the new size can be run into the apparatus. These peas which tend to remain in the center of the whirlpool greatly delay the time interval between runs, because it takes them an unnecessarily long time to work their way out of the apparatus. By a comparatively simple structural change in the apparatus, applicant has altered the mode of operation thereof to overcome these difficulties, with the result that intermediate quality peas are quickly and positively separated with the hard peas, and with the additional result that the clean-out time between runs of different size has been reduced one-half, or from about nine minutes to from four to five minutes. With frequent changes in size in the course of a day's operation, this time-saving materially increases the capacity of the apparatus.

An apparatus with the improved structure embodied therein will now be described. It is to be understood that while in this specification and the appended claims the product is referred to as "peas," it will be apparent to one skilled in the art that other products, such as beans, can also be handled by this apparatus.

In the drawings:

Fig. 1 is an elevation of the apparatus.

Fig. 2 is a plan view thereof.

Fig. 3 is a section and elevation taken as indicated by the arrows 3—3 in Fig. 1.

Fig. 4 is a vertical section taken as indicated by the arrows 4—4 in Fig. 2.

Fig. 5 is a horizontal section taken as indicated by arrows 5—5 in Fig. 1.

Fig. 6 is a horizontal section taken as indicated by the arrows 6—6 in Fig. 4.

A supply of the brine solution is maintained in the tank 10 (Fig. 1) by means of a float 11 controlling a valve which admits additional solution from the pipe 12 which is connected to a source not shown. A pump 13 driven by a motor 14 draws the brine from the tank 10 through the pipe 15, discharging it into the vertical pipe 16, which is connected to a transversely-extending pipe 17 having an outlet 18 in the reservoir 19. Brine flows from the reservoir 19 through the conduit 20 into the separating tank 21. The upper portion 22 of the separating tank 21 is frusto conical in shape, and the lower portion 23 is cylindrical. The inlet conduit 20 is attached tangentially to the cylindrical portion 23 (Fig. 6) so that the brine enters the bottom of the separating tank in a whirling current, as indicated by the arrows 24. A discharge conduit 25 is provided for conducting the heavy peas out of the separator. The discharge conduit 25 (Fig. 1) extends upwardly and is fitted on its upper end with a telescopic discharge spout 26 which discharges the heavy peas on a drainage chute 27 (Figs. 2 and 3) having slots 28 therein to permit the brine to drain off into the supply tank 10, as the peas roll down the chute 27 into a hopper 29, which deposits them on a conveyor 30.

The telescopic spout 26 (Fig. 1) may be adjusted by means of the screw 31 to vary the height of the discharge outlet. This determines the fluid level in the separating tank 21. In order to remove the tender peas floating on the surface or near the surface of the brine in the separating tank 21 (Fig. 4) an adjustable skimming plate 32 is provided. In practice the discharge spout 26 is adjusted to a height to obtain the desired fluid level in the tank 21, so that

there will be an adequate overflow of brine at the point 33 (Fig. 4) to carry the tender peas out on to the drainage chute 34. The skimming plate 32 is also adjustable to position the leading edge 35 at the desired depth beneath the surface of the fluid. The drainage chute 34 is similar to the chute 27 and is provided with slots which permit the brine to drain off into the tank 10 as the peas descend the chute into the hopper 36 which deposits them on the conveyor 37.

The successful operation of apparatus of this type depends to a great extent on accurate control of the flow of the brine. For a purpose which will presently be described, an inverted cone 38 (Fig. 4) of sheet metal is mounted centrally in the tank 21. The cone 38 is perforated throughout its surface with small slots 39. The foot or apex of the cone 38 is secured at 40 to the conical bottom 41 of the cylindrical portion 23 of the tank 21. The upper edge of the cone 38 is secured at 42 to a vent 43 which extends upwardly above the surface of the brine.

A hopper 44 is suitably mounted in the top of the tank 21, and, as shown in Fig. 2, is disposed at one side of the tank adjacent the vent 43. The leading edge 35 of the skimming plate 32 is located on the other side of the vent 43.

It will be recalled that brine is admitted through the conduit 20 (Fig. 6) to the bottom of the cylindrical portion 23 of the tank tangentially so as to create a circular current. This current flows spirally and upwardly into the conical portion 22 (Fig. 5) of the tank where it is given added impetus by additional fluid injected tangentially under pressure from the outlet 45 of a pipe 46 which is connected to the pump discharge line 16 (Fig. 1). A valve 47 is provided to control the booster action. As shown in Fig. 5 the solution is injected in the direction of the arrows 48, the established flow of the current being indicated by the arrows 49. It will be understood that the solution not only has a circular flow in the tank, but that the current rises spirally on account of the fact that there is a constant overflow at the outlet 33 (Fig. 4).

The peas which are to be graded for quality are introduced into the hopper 44 by any suitable means such as the conveyor indicated diagrammatically at 50. The hopper 44 deposits the peas on the surface of the brine which is flowing clockwise in Fig. 2, as indicated by the arrow 51. The brine flow is preferably controlled so that it requires from seven to twelve seconds for tender peas to float from the hopper 44 to the leading edge 35 of the skimming plate 32. During this traverse the peas have an opportunity to spread out on the surface of the brine and the hard peas disengage from the mass and sink in the brine. They sink down into the cylindrical portion (Fig. 4) of the tank and collect on the bottom 41 from which they are swept by the current indicated by the arrows 24 in Fig. 6 around to the outlet 52, where they are carried into the conduit 25 by a portion of the incoming brine which passes directly from the inlet conduit 20 to the discharge conduit 25, as indicated by the arrows 53.

There is no opportunity for peas to collect in the central portion of the tank, because they are excluded therefrom by the cone 38 (Fig. 4), which serves as a baffle and directs the sinking peas to the bottom. The slots 39 are too small to admit a pea. These slots are provided to permit the escape of air bubbles which are carried down into the tank with the sinking peas. It will be noted that the diameter of the portion 42 of the vent is substantially the same diameter as the cylindrical portion 23 of the tank, so that any air bubbles rising therefrom would encounter the inclined wall of the cone 38 and escape through the perforations therein. This construction serves, then, as a trap for rising air bubbles, which tends to prevent the bubbles from attempting to rise to the surface of the solution through the upper portion of the tank 21. Such air bubbles would tend to buoy up peas, particularly of intermediate quality, and enable them to be returned to the surface where they would intermingle with the tender peas.

The cone 38 not only controls the escape of air bubbles but also reduces to a minimum eddy currents which would otherwise occur in the central portion of the tank. Instead of merely imparting a whirling current to the whole mass of brine in the lower portion of the tank, the cone 38 establishes a controlled flow which is more like the flow of fluid through an enclosed conduit than the free whirling action of a whirlpool. For example, in Fig. 5 the flow of the brine is confined between the outer wall 54 of the tank and the inner wall 55, provided by the cone 38. If the wall 55 were not present, the angular rate of flow at 56 would be materially greater than the rate at 57. This is the characteristic whirlpool action where the center tends to race ahead of the periphery. This was the action which tended to draw the peas into the center of the whirlpool where they remained and were difficult to remove. With the wall 55 present, a smooth and unagitated flow takes place in very much the same manner as the flow of fluid in a trough. This has been found to greatly improve the efficiency of operation of the apparatus, because there are no disturbing eddy currents to oppose the descent of sinking peas. The peas are free to descend through the current which is smooth flowing and has no agitating or disturbing effect on the peas.

In addition to improving the grading operation of the apparatus as a whole, the provision of the cone 38 also reduces the clean-out time between runs, as previously explained, and the resultant saving of time in effect increases the capacity of the apparatus.

While I have described a particular embodiment of the present invention, it will be obvious that various changes and modifications may be made in the details thereof without departing from the spirit of the present invention and the scope of the appended claims.

Having thus described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. In an apparatus for grading peas and the like for quality, having a tank into which fluid is introduced to produce a whirling current, means at the top of the tank to remove the floating peas from the surface of the fluid, and a discharge outlet at the bottom of the tank for the removal of peas which sink: means including a baffle disposed substantially centrally in said tank to form an enclosure from which sinking peas are excluded, said baffle having apertures therein smaller than a pea for the escape of air bubbles from the current of fluid outside said enclosure to the interior thereof and means for venting said air bubbles.

2. In an apparatus for grading peas and the like for quality, having a tank into which fluid

is introduced to produce a whirling current, means to remove the floating peas from the surface of the fluid in the tank, and a discharge outlet at the bottom of the tank for the removal of peas which sink: a tank construction comprising, the outer wall of the tank disposed symmetrically with respect to the vertical axis of the tank, an inner wall in the form of an inverted cone disposed with the axis of the cone coincident with the axis of the tank, the upper end of said cone communicating with an air vent, said inner wall having apertures smaller than a pea to permit the escape of air bubbles from the current, whereby the peas sinking from the surface of the fluid in the top of the tank are confined in their descent between said inner and outer walls and air bubbles tending to buoy up the peas are separated therefrom by passing through the apertures in said inner wall.

3. In an apparatus for grading peas and the like for quality, including a tank into which fluid is introduced to produce a spirally and upwardly flowing current, means at the upper portion of the tank to remove the floating peas from the surface of the fluid, and a discharge outlet for the removal of peas which sink: means including a baffle disposed within said tank to form a peripheral space within which to confine the sinking peas, said baffle having apertures therein of a size barring passage of the peas yet permitting escape of gas bubbles from the current confined in said peripheral space to the interior of said baffle, and means for venting said gas bubbles.

4. In an apparatus for grading peas and the like for quality including a tank having a substantially inverted conical upper portion, a substantially cylindrical base portion connected to said inverted conical portion, means at the upper portion of the tank to remove the floating peas from the surface of the fluid and a discharge outlet for the removal of peas which sink; means including a baffle having an upper frusto-conical portion and a lower inverted conical portion extending downwardly to the bottom of the tank, the intersection of said conical portions of said baffle lying within said inverted conical portion of the tank and the transverse dimension thereof being substantially at least as great as the transverse dimension of said intersection of the inverted conical and cylindrical portions of the tank, said inverted conical portion of the baffle having a plurality of relatively small apertures of a size barring passage of peas but permitting escape of gas bubbles from the fluid confined between said baffle and inner side of said tank, to the interior of said baffle, and said baffle including means to vent said gas bubbles.

5. In an apparatus for grading peas and the like for quality, including a tank into which fluid is introduced to produce a spirally and upwardly flowing current, means at the upper portion of the tank to remove the floating peas from the surface of the fluid, and a discharge outlet for the removal of peas which sink: means including a baffle disposed within said tank to form a peripheral space within which to confine the sinking peas, the lower portion of said baffle being of inverted conical form and said portion of said baffle having apertures therein of a size barring passage of the peas, yet permitting escape of gas bubbles from the current confined in said peripheral space to the interior of said baffle, and means for venting said gas bubbles.

EDWARD G. BAUER.