

May 29, 1962

R. H. HALBACH
CENTRIFUGE CONSTRUCTION

3,036,760

Filed April 16, 1959

2 Sheets-Sheet 1

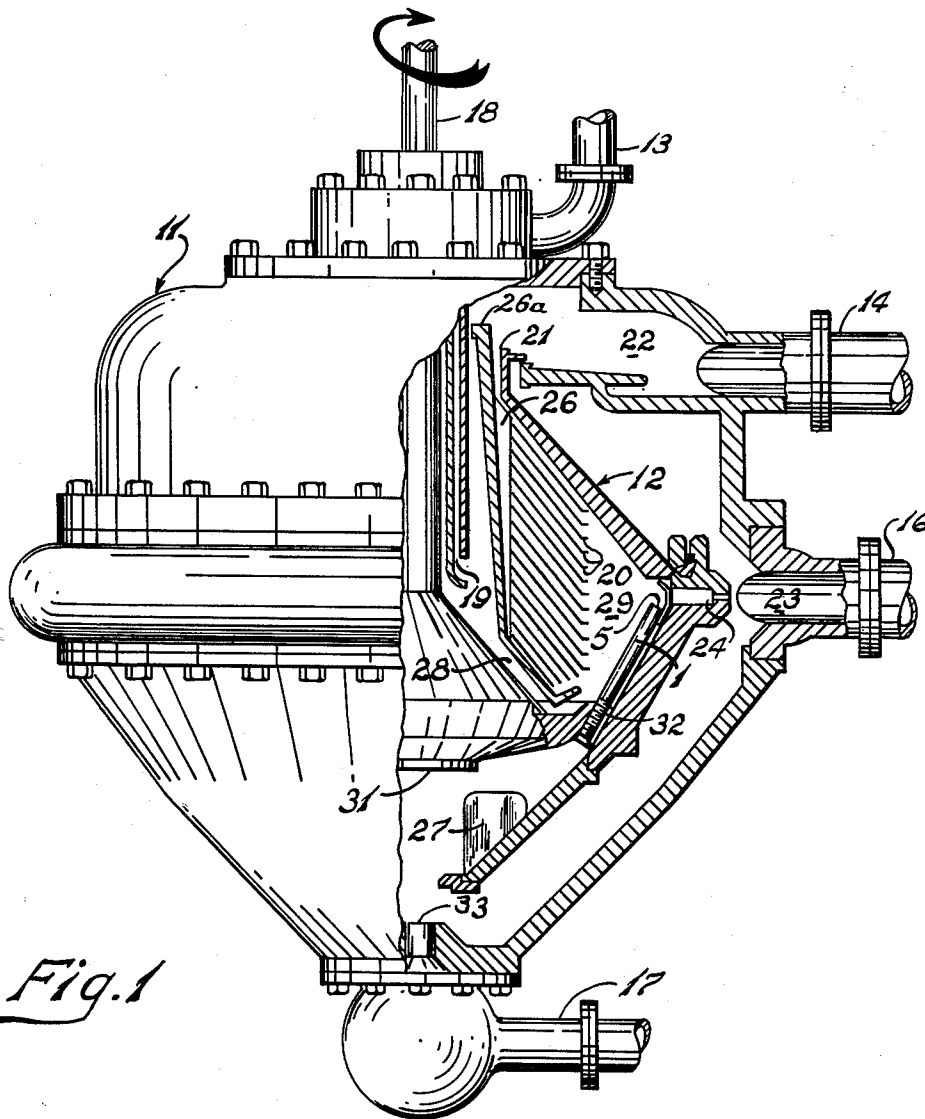


Fig. 1

INVENTOR
Ralph H. Halbach
BY *Robert R. Finch*
ATTORNEY

May 29, 1962

R. H. HALBACH
CENTRIFUGE CONSTRUCTION

3,036,760

Filed April 16, 1959

2 Sheets-Sheet 2

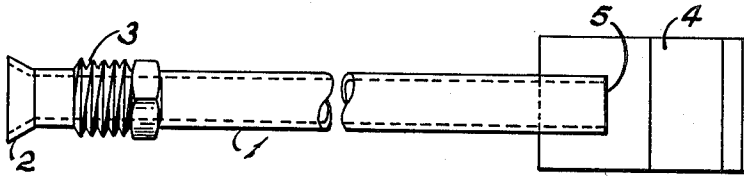


Fig. 2

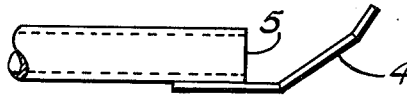


Fig. 3

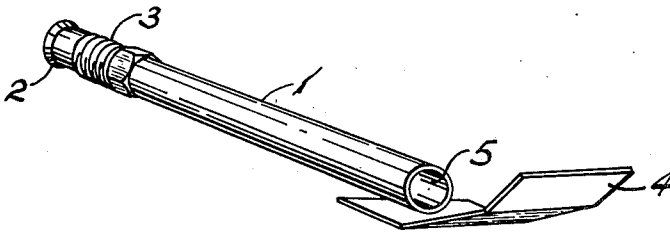


Fig. 4

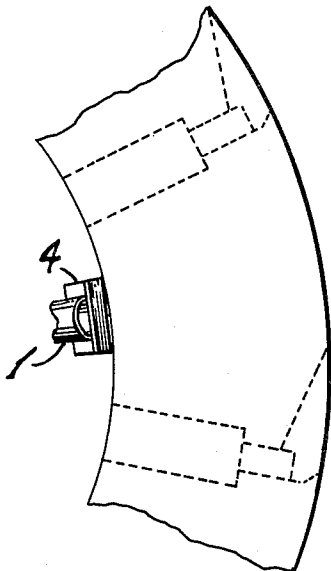


Fig. 5

INVENTOR
Ralph H. Halbach
BY *Robert A. Simch*
ATTORNEY

1

3,036,760

CENTRIFUGE CONSTRUCTION

Ralph H. Halbach, San Leandro, Calif., assignor to Dorr-Oliver Incorporated, Stamford, Conn., a corporation of Delaware

Filed Apr. 16, 1959, Ser. No. 806,855

2 Claims. (Cl. 233-46)

This invention relates generally to centrifuges of the type adapted particularly for the continuous separation and discharge of solid components from a feed material containing suspended solids.

Continuous centrifuges of the type disclosed in Letters Patent 1,923,454, 2,060,236 and 2,525,629 utilize a so-called return circuit by means of which a large part of the centrifugally separated underflow is continuously returned into the centrifuge rotor. A commercial machine of this character employs a volute surrounding the rotor to receive the centrifugally separated underflow. The rotor is provided with a lower conical shaped impeller portion having an axially disposed, downwardly facing opening adapted to receive the returned underflow material. A pipe connects from the volute to a suitable nozzle disposed below the lower end of the rotor, whereby a closed return circuit is formed to deliver the underflow into the impeller under pressure. The impeller is constructed in such a manner to deliver the returned material into an annular chamber forming a part of or communicating with the separating chamber of the rotor.

More recent centrifuge constructions, employing the general structure described above, have utilized a plurality of radially positioned return tubes or conduits which receive returned underflow material from the impellers and carry it radially as confined high velocity streams to discharge at locations proximate the outer periphery of the separating chamber of the rotor and adjacent the discharge nozzles located on such periphery.

In centrifuges as described above it is desirable to position the return conduits at spaced positions intermediate the several underflow discharge nozzles so that the recycled underflow material travels from the discharge end of the return conduits circumferentially to the discharge nozzles, thus providing a scouring action which prevents accumulation of solids between such nozzles.

However, centrifuges as so constructed have presented certain maintenance difficulties due to positioning of the discharge ends of the return conduits in close proximity to periphery of the rotor. This is so because high velocity impingement of recycled underflow solids against the inner surface of the rotor causes considerable erosion at the point of impact. When this erosion becomes sufficiently severe, the centrifuge must be disassembled, the worn portions of the rotor built up with new metal, and the rotor machined and rebalanced.

To prevent such erosion to the rotor bowl by the discharge of returned solids, it has been suggested to insert a hard faced, disposable annular protective ring within the inner periphery of the rotor. The use of such a disposable wear ring has not been entirely satisfactory due to the difficulty of removing and replacing it within the rotor. Also, such rings tend to shift position during rotation of the rotor and may eventually block the discharge openings.

Accordingly, it is the principal object of this invention to provide ways and means to prevent erosion and wear to centrifuge rotors at those points where return tubes discharge recycled underflow solids.

Another object of this invention is to provide inexpensive and readily replaceable wear plate means which will prevent erosion to the inner periphery of centrifuge rotors at such points where recycled underflow impinges against the inner peripheral walls of the rotor.

2

Briefly, the objects of this invention are achieved by intercepting and dispersing the streams of recycled underflow before they reach the final locations adjacent the discharge means. This is accomplished by fixedly positioning wear plates at the discharge ends of the underflow return tubes. Recycled underflow solids discharged from the ends of the return tubes are directed against and deflected by such wear plates, thus preventing impingement on and resulting erosion of the rotor.

In order that the invention may be readily understood and carried into effect, reference is made to the following description in which, by way of example, a preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a view in side elevation, partially cut away, showing a preferred embodiment of the invention.

FIG. 2 is a plan view of a return tube with baffle as contemplated by the invention.

FIG. 3 is a partial elevational view of the structure shown in FIG. 2.

FIG. 4 is a perspective view of the embodiment shown in FIG. 2.

FIG. 5 is a partial top plan view showing location of the baffle in the centrifuge with respect to the rotor wall and discharge nozzles.

Referring to FIGURE 1, there is illustrated a centrifuge having a housing structure 11 generally surrounding a rotor 12. The housing is provided with a feed conduit 13, an overflow discharge conduit 14, an underflow discharge conduit 16 and a return underflow conduit 17.

The rotor 12 is fixedly attached at hub 31 to rotor shaft 18. An annular feed passage 19, co-axial to the rotor shaft 18, is in communication with feed inlet 13. Annular passage 19 in turn communicates with the interior of separating chamber 29 by way of a passage 28. Separating chamber 29 contains a series of stacked discs 20 that are positioned by and supported on vertical ribs or vanes 26 which in turn are formed on sleeve member 26a which is part of the rotor structure and surrounds the annular stationary feed passage 19. An overflow lip 21 is positioned radially toward the center of rotation of the bowl 12 and is in free communication with an overflow volute 22 and discharge conduit 14. At the outer radial extent of the rotor 12 there is located a plurality of nozzles 24 positioned to discharge into an underflow volute 23 whence the discharged material flows through discharge conduit 16.

Underflow return conduit 17 is in communication with the lower portion of the rotor housing 11 via an orifice 33. Impeller vanes 27 are mounted adjacent the lower end of the rotor 12.

Conduit 17 is connected by suitable means to conduit 16 to enable return of a selected quantity of underflow to the rotor in known fashion. This return or recycle underflow passes through conduit 17 into the lower portion of the rotor housing 11 via a suitable orifice 33. Impeller vanes 27 throw the recycle underflow radially outward through return tubes 1 to discharge via the opposite tube end 5 at points proximate the underflow nozzles 24.

With specific regard to the details of the return tube 1, reference is made to FIGS. 2, 3, 4 and 5. The return tube 1 is illustrated as an elongated conduit having a flared inner end 2 and an outer discharge end or orifice. A sleeved coupling member 3 is slidingly positioned about the return tube 1 and is suitably threaded to sealingly engage and seat the flared inner end of the tube securely to the rotor 12 as at 32 in FIG. 1.

A wear or deflecting plate 4 is fixedly positioned at the outer discharge end of the tube. Such wear plate may be secured to the tube in any suitable manner, but in the illustrated embodiment it is shown as welded onto

the tube. Alternately, the plate 4 may be detachably mounted by threading.

With respect to configuration of wear plate 4, it is necessary that it be shaped to intercept the underflow issuing from orifice 5 and it is preferable to have the plate shaped to conform with the inner wall of rotor 12 as illustrated in FIG. 5. This latter feature will enable the plate to fit flush against the rotor 12 and prevent accumulation of static solids between the rotor and the plate. It is desirable to hard face the receiving surface of the wear plate in order to prolong its useful life.

In operation, return underflow material impinges directly against wear plate 4, hence abrasion of the inner surface of the rotor bowl 12 is avoided. If the wear plate becomes eroded it may be simply replaced either by replacing the tube and the plate in combination or the plate alone, depending on the construction employed.

I claim:

1. A centrifuge rotor of the nozzle type for discharging an underflow slurry fraction through the nozzles while discharging a lighter liquid fraction through an overflow, comprising conically shaped end portions with their wide ends adjacent to each other to constitute an annular separating chamber including an extreme peripheral channel portion of generally shallow cross-sectional configuration formed by the juncture of said conically shaped portions; a number of underflow discharge nozzles mounted in said peripheral portion uniformly spaced from one another for discharging a solids bearing potentially abrasive fraction; an equal number of straight divergent underflow return tube members disposed around the rotor axis and mounted to extend close to the inner face of one of said conical end portions and in staggered arrangement relative to said nozzles for delivering underflow return slurry to respective points of said peripheral channel portion substantially medially between respective nozzles; and a protective wear plate member for each of said return tubes, each said wear plate member consisting of

relatively thin sheet material of a shape adapted substantially to the cross-sectional profile of said peripheral channel, with one end portion thereof fastened to a respective return tube member substantially tangential to the outer side of the delivery end thereof, whereby each said shaped wear plate member is held close to the cross-sectional inner contour of said peripheral channel portion.

2. The centrifuge rotor according to claim 1, wherein said peripheral shallow channel portion has an inner contour defined by the conical faces of said rotor end portions and by a short cylindrical intermediate face, and wherein each said wear plate member comprises an intermediate flat plate portion adjacent to said short cylindrical face, an inner flat plate end portion extending at an angle from said intermediate portion corresponding to the adjacent inner conical face of the respective rotor end portion and fastened to the delivery end of the associated return tube member, and an outer flat plate end portion opposite to said inner plate end portion and extending at an angle from said intermediate plate end portion corresponding to the conical face of the respective rotor end portion.

References Cited in the file of this patent

UNITED STATES PATENTS

316,124	Dearden	Apr. 21, 1885
436,419	Hart	Sept. 16, 1890
1,866,638	Fawcett	July 12, 1932
2,525,629	Zimmerman et al.	Oct. 10, 1950
2,702,124	Stengel	Feb. 15, 1955
2,928,592	Johnson	Mar. 15, 1960
2,949,282	Kirkby	Aug. 16, 1960
2,958,461	Peltzer	Nov. 1, 1960
(U.S. corresponding to Belgium Patent 513,122)		

FOREIGN PATENTS

159,286	Sweden	June 18, 1957
513,122	Belgium	Aug. 14, 1952