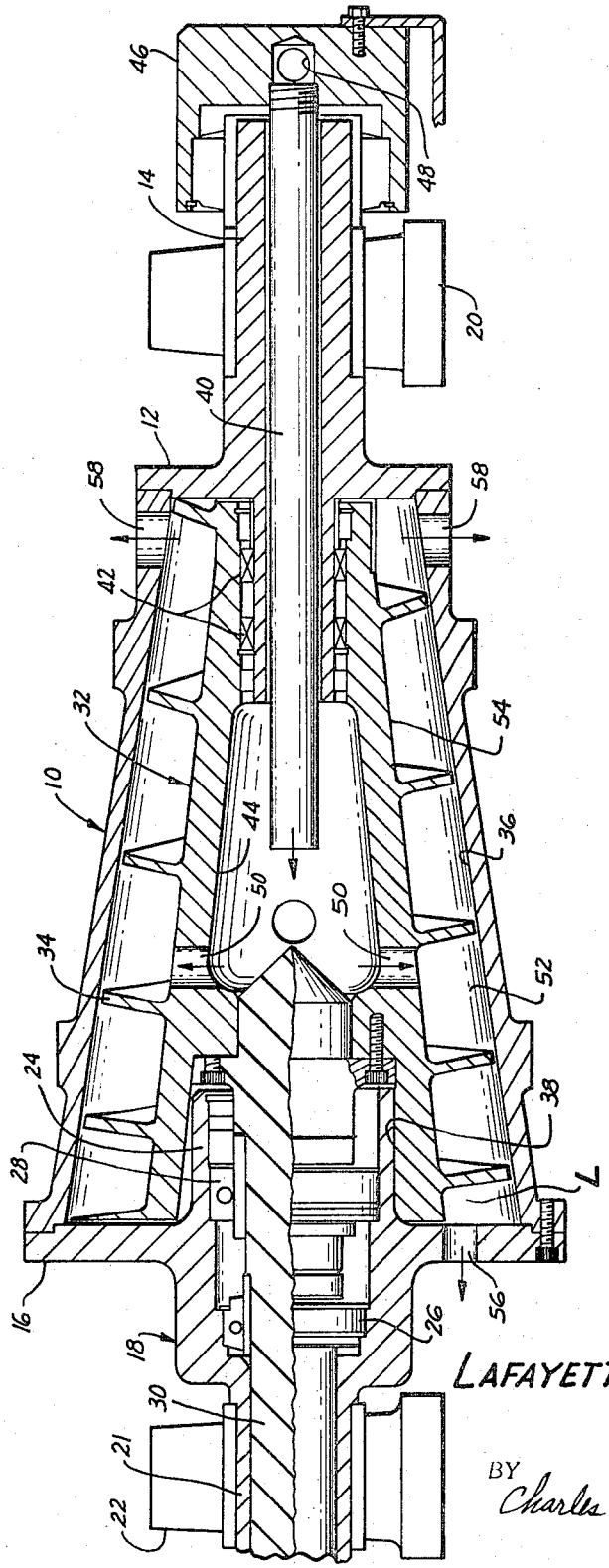
April 23, 1968 L. E. GILREATH 3,379,368

CENTRIFUGAL SEPARATOR

Filed Dec. 6, 1965



LAFAYETTE E. GILREATH
INVENTOR.

BY Charles E. Lightfoot
ATTORNEY

United States Patent Office

3,379,368

Patented Apr. 23, 1968

3,379,368

CENTRIFUGAL SEPARATOR

Lafayette E. Gilreath, Houston, Tex., assignor to Gilreath Hydraulics, Inc., Houston, Tex., a corporation of Texas

Filed Dec. 6, 1965, Ser. No. 523,812
4 Claims. (Cl. 233—7)

ABSTRACT OF THE DISCLOSURE

A centrifugal separator of the type having a longitudinally tapered barrel mounted for rotation about its longitudinal axis and a longitudinally tapering rotor tapered to conform to the taper of the barrel and mounted for rotation in the barrel about the same axis and provided with a spiral flight extending from end to end thereof whose pitch increases and whose radial extent diminishes toward the smaller end of the barrel to form with the barrel and rotor a spiral passageway whose cross-sectional area at any location is at least equal to the cross-sectional area of the passageway at any other location closer to the larger end of the barrel. The barrel and rotor are adapted to be rotated in the same direction at somewhat different speeds to cause solids separated by centrifugal action to be moved toward the smaller end of the barrel, the volume of the passageway due to the increasing pitch and diminishing radial dimensions of the flight being effective to prevent clogging of the passageway by the separated solids while allowing the flow of liquid through the passageway toward the larger end of the barrel.

This invention relates to apparatus for separating particles from fluids and more particularly to separator mechanism of the centrifugal type for the rapid removal of solid particles from liquids.

In the centrifugal separation of solid particles from liquids it has been customary to make use of separator mechanism comprising an outer longitudinally tapered barrel which is mounted for rotation about a central axis, and an inner rotor in the barrel mounted for rotation about the axis of the same, and having a screw or spiral flight which is also tapered to conform to the taper of the barrel, to provide a spiral passageway for the material which is to be operated upon. The barrel and rotor in apparatus of this kind are rotatable at high speeds to cause the solids of the material under treatment to be separated from the liquid by centrifugal action, the material being introduced into the spiral passageway at some location mediate its ends and the solids being separated and discharged from the barrel at the small end thereof while the liquid is discharged at the large end of the barrel.

Due to the fact that the barrel is longitudinally tapered and the flight of the rotor is shaped to conform to such taper, there is a tendency, in separator apparatus of this type, for the separated solids to clog the passageway toward the smaller end of the barrel, thus greatly reducing the capacity of the equipment. Under some conditions, it becomes necessary to slowly feed the material under treatment into the barrel to avoid clogging the passageway, thus greatly reducing the efficiency of the separator.

The present invention has for a primary object the provision of centrifugal separator mechanism of the type referred to which is constructed to prevent clogging of the passageway by the separated solids whereby the capacity of the equipment is greatly enhanced.

Another object of the invention is to provide centrifugal separator mechanism of the tapered barrel and rotor type wherein the capacity of the equipment is limited only by the amount of the material to be treated which can be supplied to the equipment.

A further object of the invention is the provision of centrifugal separator mechanism of the kind mentioned which is constructed in a manner such that any given length of the special passageway will be at least equal to the volume of any preceding portion of the same of equal length from the larger end of the apparatus to the smaller end thereof, whereby clogging of the passageway is effectively prevented.

The above objects and advantages of the invention may best be understood from the following detailed description constituting a specification of the same, when considered in conjunction with the annexed drawings wherein the single figure is a fragmentary, central, longitudinal, cross-sectional view of a preferred embodiment of the centrifugal separator apparatus of the invention.

Referring now to the drawings in greater detail the apparatus of the invention comprises an outer, longitudinally tapered barrel **10**, whose smaller end is closed by a cover or end plate **12**, formed with a central, tubular extension **14** to provide a bearing shaft or hub for one end of the barrel, and whose larger end is closed by a cover or end plate **16** formed with a central tubular extension **18**, whose outer end portion **21** provides a bearing shaft for the other end of the barrel.

The shaft **14** is rotatably supported on a suitable bearing such as the pillow block **20** and the shaft **21** is similarly supported on a pillow block **22**, the blocks being carried on a suitable support structure, not shown, in the usual manner to support the apparatus for high speed rotation about its longitudinal axis.

The shaft portion **18** of the plate or closure **16** is enlarged and the plate has an internal, central, tubular extension **24** to provide an inwardly opening counterbore within which suitable bearing means such as those indicated at **26** and **28** are received to rotatably support a central operating shaft **30**, extending through the extension **18** and which carries at its inner end the inner rotor **32** of the apparatus.

The rotor **32** is of generally longitudinally tapered configuration, having an external, spiralled, radially outwardly extending screw or flight **34** whose outer periphery is shaped to closely fit the inside tapering face **36** of the barrel. The rotor has at its larger end an end counterbore **38** which fits over the internal extension **24** of the closure plate **16** and is rotatably supported at its smaller end on an inner tubular shaft **40**, as by means of bearings **42**, which shaft also serves as an inlet pipe by which the material to be treated is supplied to an internal cavity **44** in the rotor. The tubular shaft **40** opens at its inner end into the cavity **44** and extends through the tubular shaft **14** of closure plate **12** and is provided at its outer end with a stationary cap **46** having a side inlet opening **48** through which material to be treated from any suitable source may be introduced through the shaft **40**.

The rotor **32** extends from end to end of the interior of the barrel between the closures **12** and **16**, there being only sufficient clearance between the barrel and rotor to allow the rotor to rotate freely in the barrel.

The shafts **21** and **30** are suitably extended longitudinally from the larger end of the apparatus and are provided with suitable driving mechanism therefor, not shown, to separately rotate the barrel and rotor at any desired speeds.

The rotor is provided with openings **50** through which the material under treatment may flow from the cavity or internal chamber **44** into the spiral passageway **52** formed by the flight **34** between the internal face **36** of the barrel and the external surface **54** of the rotor. The barrel also has one or more outlets **56** in the closure plate **16** through which the separated liquid may be dis-

charged from the spiral passageway **52**, at the larger end of the barrel, while discharge openings **58** are provided at the smaller end of the barrel through which the separated solids may be discharged from the spiral passageway **52**.

The depth or radial extent of the flight **34** may increase progressively from the smaller end of the rotor toward its larger end while the pitch of the spiral of the flight may increase progressively from the larger end of the rotor toward its smaller end, as shown, so that the volume of the material which may move along any given length of the flight or screw will be the same as that which may move along any other portion of the same of equal length.

The flight may also be formed so that the volume of any given length of the passageway will be greater than any preceding portion of the same of equal length from the larger end of the rotor to the smaller end thereof, thus assuring that the passageway expands from the larger end of the rotor toward the smaller end of the same, to effectively prevent clogging of the passageway by separated solids.

In the operation of the equipment of the invention the barrel and rotor are rotated in the usual manner at appropriate speeds to accomplish the most efficient separation of the solids from the liquid of the particular material to be treated, the relative speeds of the parts being such as to cause the separated solids to be moved toward the smaller end of the apparatus and to be discharged through the outlets **58**, while the liquid will be discharged through the outlet **56** at the larger end of the apparatus. The material to be treated will be supplied through the pipe **40** and it will be apparent that due to the construction and arrangement of the parts a maximum volume of the material may be introduced without danger of clogging the passageway **52**, the solids being separated out against the inner surface of the barrel under the influence of the centrifugal force imparted by the rapid rotation of the apparatus.

It will thus be seen that the invention constructed as described above provides centrifugal separating apparatus which is of simple design and rugged construction and which may be operated at high efficiency for the separation of solids from the liquids of a wide variety of materials.

The invention is disclosed herein in connection with a particular embodiment of the same, which it will be understood is intended by way of illustration only, it being apparent that various changes may be made in the construction and arrangement of the parts, within the spirit of the invention and the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. In a centrifugal separator an interally longitudinally tapered barrel, having longitudinally spaced outlets, a rotor in the barrel shaped to conform to the direction of the taper thereof, means supporting the barrel and rotor for rotation at different speeds about a common longitudinal central axis, means on said rotor forming a spiral passageway between the rotor and barrel in communication with said outlets, the cross-sectional area transversely of the passageway at any location therein being at least equal to such cross-sectional area at any other location therein closer to the larger end of the barrel, and means introducing a material to be treated into said passageway mediate said outlets.

2. The centrifugal separator as set forth in claim **1** wherein said passageway is of decreasing radial width from the larger end of said barrel toward the smaller end thereof.

3. In a centrifugal separator an internally longitudinally tapered barrel, having longitudinally spaced outlets, a rotor in the barrel shaped to conform to the direction of the taper thereof, means supporting the barrel and rotor for rotation at different speed about a common longitudinal central axis, means on said rotor forming a spiral passageway between the rotor and barrel in communication with said outlets, the volume of said passageway throughout any portion of the length thereof being at least equal to the volume of any preceding portion of equal length from the larger end of the barrel to the smaller end thereof, and means introducing a material to be treated into said passageway mediate said outlets.

4. The centrifugal separator as set forth in claim **3**, wherein said passageway is of lesser radial width at any location throughout the length of the passageway than at any location therein closer to the larger end of said barrel.

References Cited

UNITED STATES PATENTS

1,382,930	6/1921	Phillips	233—7
1,383,313	7/1921	Landreth	233—7
1,563,491	12/1925	Hoyle	233—7
1,710,315	4/1929	Laughlin	233—7
3,143,504	8/1964	Schneider	233—7

HENRY T. KLINKSIEK, *Primary Examiner.*