Separator

The invention relates to a separator according to the preamble of claim 1.

Centrifugal separators for realizing a continuous operation have been known for a long time, separators of this type being known as nozzle separators in one embodiment from JP 62-117649 A. US 2,286,354 furthermore features a separator with solid drum lower sections and drum upper sections which are bolted together. Known in addition to nozzle separators are separators of this type with solid-material discharge openings with which is associated a hydraulically operable piston slide valve by means of which the solid-material discharge openings can be closed and opened. As a separator, US 2,017,734 features in one design a separator without solid-material discharge.

In the case of centrifuges of the known type of construction, the demand exists for new constructional methods especially with regard to the processing of products under hygienic conditions.

Embodiments of the invention seek to solve this problem.

According to an aspect, there is provided a separator for the centrifugal separation of a free-flowing product into different phases or for the centrifugal clarification of a product, the separator having at least the following features: a rotatable drum with a lower section and an upper section, ~~and~~ a means arranged in the drum for the clarification of a product which is to be processed in the centrifugal field, one or both of the following parts being of a conical design: the drum upper section and the drum lower section, ~~wherein~~ one, a plurality, or all of the following elements consist of plastic or a plastic-

composite material: the drum lower section, the drum upper section and the means for clarification, wherein at least one discharge channel for a dense product phase is integrated into the drum upper section.

The means for the clarification of a product which is to be processed - to be clarified - of solid material particles is preferably a separating plate packet consisting of conical separating plates consisting of plastic, but can also be for example a one-piece clarification/separation cartridge consisting of plastic in the manner of DE 10 2008 052 630 A1 or another means for the clarification of a product of solid material particles such as a finned body with radial fins or the like.

Accordingly, some, and preferably even all, of the product-contacting regions of the rotating system consist of plastic or a plastic-composite material, especially the drum lower section and the drum upper section and the plate packet. Especially preferably, the feed system and the discharge system also consist of plastic or a plastic-composite material.

In such a way, it is possible to design a part of the drum or preferably even the entire drum - preferably in addition to the feed and discharge systems or regions - for a one-time application, which is of interest and advantage especially with regard to the processing of pharmaceutical products such as fermentation broths or the like since, after the operation for the processing of a corresponding batch, no cleaning of the drum is to be carried out during operation which is preferably continuous during the processing of the batch, but rather the drum is to be exchanged as a whole. Problems of hygiene which are associated with cleaning are excluded in a simple manner as a result of this. The product-contacting parts can be entirely disposed of or recycled. The disposal is also of interest especially in the case of hazardous substances.

Claims

1. A separator for the centrifugal separation of a free-flowing product into different phases or for the centrifugal clarification of a product, having at least the following features:

   a. a rotatable drum with a lower section and an upper section,

   b. a means arranged in the drum for the clarification of a product which is to be processed in the centrifugal field,

   ~~wherein~~

   c. one or both of the following parts being of a conical design: the drum upper section and the drum lower section,

   ~~e~~d. one, a plurality or all of the following elements consist of plastic or a plastic-composite material:

      - the drum lower section,
      - the drum upper section,
      - the means for clarification~~.~~,

   wherein

   e. at least one discharge channel for a dense product phase is integrated into the drum upper section.

2. The separator as claimed in claim 1, wherein the means for clarification is a plate packet consisting of a stack of separating plates.

~~3. The separator as claimed in claim 1 or 2, wherein one or both of the following parts are of a conical design: the drum upper section and the drum lower section.~~

~~4.~~3. The separator as claimed in claim 1~~,~~ or 2~~ or 3~~, wherein the drum can be rotated by means of a

spindle construction which preferably consists of plastic or a plastic-composite material.

~~5.~~4. The separator as claimed in claim 3, wherein the spindle construction is coupled directly to the output shaft of a motor

and in that the spindle construction has no rotational bearings on its outside circumference.

~~6.~~5. The separator as claimed in one of the preceding claims, wherein the drum~~, especially its~~ comprises a feed system and ~~its~~ a discharge system, and wherein the drum is designed in a sealed type of construction.

~~7.~~6. The separator as claimed in one of the preceding claims, wherein all the product-contact regions of the drum consist of plastic.

~~8.~~7. The separator as claimed in ~~one of the preceding claims~~claim 5, wherein the drum is enclosed by a housing which preferably consists of plastic.

~~9.~~8. The separator as claimed in ~~one of the preceding~~ claim~~s~~ 4, wherein the entire separator, apart from the motor, consists of plastic.

~~10.~~9. The separator as claimed in one of the preceding claims, wherein the drum lower section is provided directly in one piece with a distribution attachment which has distribution channels for transferring the product to be processed from a feed pipe into the drum interior.

~~11.~~10. The separator as claimed in ~~one of the preceding claims~~claim 7, wherein the entire drum, in addition to the feed system and discharge system and possibly a part of the housing, is designed as an exchangeable preassembled module

consisting of plastic or a plastic-composite material.

~~12.~~ 11. The separator as claimed in ~~one of the preceding~~ claim~~s~~ 4, wherein the entire separator, apart from the motor, is designed as an exchangeable preassembled module consisting of plastic or a plastic-composite material.

~~13.~~ 12. The separator as claimed in ~~one of the preceding~~ claim~~s~~ 4, wherein the motor is flanged directly onto the housing.

~~14.~~ 13. The separator as claimed in one of the preceding claims, wherein the product-contacting sections of the discharge system preferably consist of plastic.

~~15. The separator as claimed in one of the preceding claims, wherein at least one discharge channel for a dense product phase is integrated into the drum upper section.~~

~~16.~~ 14. The separator as claimed in one of the preceding claims, wherein the discharge regions of the discharge system are designed as annular channels which open axially into annuluses in annular bodies.

~~17.~~ 15. The separator as claimed in ~~one of the preceding~~ claim~~s~~ 14, wherein the annular bodies consist of plastic or a plastic-composite material.

~~18.~~ 16. The separator as claimed in one of the preceding claims, wherein at least one discharge channel for a product phase is integrated into the drum upper section.

~~19.~~17. The separator as claimed in one of the preceding claims, wherein a drum cover consisting of plastic is mounted on the drum upper section.

~~20.~~18. A method for operating a separator as claimed in one of the preceding claims, wherein during a clarification process of a product very dense substances are concentrated, and in that the drum, after the processing of a batch, is melted down or is dissolved in an acid or the like, for example, in order to produce the dense substance as a residue of this process.

~~21.~~19. A use of a separator as claimed in ~~one of the preceding~~ claims 1 to 17 as a disposable separator for the one-time processing of a product batch.