sedimentation box (container with settling chambers arranged in a labyrinth), as well as centrifugal separators operating in batch mode. With the latter, however, only the sedimenting solids can be separated. DE 1 178 014 can be cited as an example of such a centrifugal separator operating in batch mode.

However, in order to detect the entire range of plastics (polymers) with different densities using centrifugal separation technology, it is necessary to detect both sedimenting and floating polymers.

It is therefore the object of the disclosure to create a centrifugal separator which is particularly suitable for purifying the liquid-solid mixture of floating solids and sedimenting solids. In addition, a suitable method for purifying the liquid-solid mixture of floating solids and sedimenting solids is to be created.

The disclosure solves this problem by means of the (centrifugal) separator as described herein and the method as described herein.

According to the disclosure, a separator with a rotatable bowl is provided, wherein the bowl is designed for purifying a liquid-solid mixture with sedimenting and floating solids from the solids in the centrifugal field during batch operation, so that the liquid-solid mixture can be separated into a liquid phase and a first lighter solid phase of floating solids and a second heavier solid phase of sedimenting solids, wherein the bowl has a separating chamber and a liquid discharge continuously discharging the purified liquid phase from the separating chamber during the processing of the batch, and at least two solids-collecting regions provided at different radii of the bowl, one of which is designed or serves to collect the first lighter solid phase and the other to collect the second heavier solid phase, wherein the solids-collecting regions can be filled with the relevant solid phase over time while the relevant batch is being processed.

In one aspect, the disclosure provides a centrifugal separator having a rotatable bowl which is designed to purify a liquid-solid mixture containing sedimenting and floating solids from the solids in the centrifugal field during batch operation, wherein the bowl comprises a separating chamber and a liquid discharge continuously discharging the purified liquid phase (L) from the separating chamber during processing of the batch, and at least two solids-collecting regions provided at different radii of the bowl, one of which serves to collect a first lighter floating solid phase (SI) and the other to collect a

second heavier sedimenting solid phase (Sh), so that the solids-collecting regions can be filled with the relevant solid phase (Sl, Sh) over time while the relevant batch is being processed.

Such a separator is particularly advantageous for purifying a product that contains at least one flowable phase with a first density ϱL and at least two solid phases with two different density classes ϱSl and ϱSh. The two solid phases preferably contain plastic particles of different density classes ϱSl and ϱSh and the following applies: ϱSl < ϱL < ϱSh. The lighter solid phase and the heavier solid phase can in turn be composed of solids of different densities, which are only lighter or heavier than the liquid phase. The lighter solid phase, the liquid phase and the heavier liquid phase are separated from

each other and collected separately.

According to a preferred advantageous further development, the bowl is designed in such a way that the liquid phase is discharged from the separating chamber on a central radius, the first solids-collecting region for the lighter solid phase is located on a smaller radius relative to the central radius and the second solids-collecting region for the heavier solid phase is located on a larger radius relative to the central radius. In this way, the solids of different densities can be advantageously collected radially further inwards and radially further outwards in the bowl during operation.

It is preferable and advantageous and supports the separation process if at least one means for increasing the equivalent clarifying surface is formed in the separating chamber.

The means for increasing the equivalent clarifying surface can be a disk pack or a ribbed insert with ribs that extend essentially radially, for example.

The central radius on which the continuous liquid discharge takes place can also be realized in various ways, for example with a separating disk or with one or more tubes whose inlet is located in the region of the central radius and through which the liquid is conducted out of the rotating bowl.

According to an advantageous further development, it may be provided that the bowl can be opened so that the solid phases can be removed from the bowl after a batch has been processed and when the bowl is stationary. For this purpose, it appears particularly useful if the bowl can be opened in a lower region, so that after processing a batch the solid phases and a residual liquid can run out of the bowl via a drain into a container.

The disclosure also provides a use of a separator as described herein, for centrifugally clarifying a liquid-solid mixture comprising sedimenting and floating solids from the solids.

In another aspect, the disclosure provides use of a separator as described herein, for centrifugally clarifying a liquid-solid mixture with sedimenting and floating solids from the solids.

The disclosure also provides a method for centrifugally clarifying a liquid-solids mixture comprising sedimenting and floating solids from the solids in a separator as described herein, comprising the following steps:

Step 100:

Providing the separator and a batch of the liquid-solid mixture with a medium-heavy liquid phase (L) and a lighter solid phase (Sl) with floating solids and a heavier solid phase (Sh) with sedimenting solids,

Step 200:

Rotating the bowl and feeding the bowl with the liquid-solid mixture so that centrifugal separation takes place within the separating chamber between the medium-heavy liquid phase and the lighter solid phase with the floating solids and the heavier solid phase with the sedimenting solids, so that the lighter solid phase is displaced into the center of the separating chamber by the medium-heavy liquid phase and the heavier solid phase flows into the region of the largest diameter on the inside of the bowl wall;

Step 300:

Collecting the light floating solid phase in the center of the separating chamber in at least one first solids-collecting region in the center of the disk pack or in the center of the ribs and collecting the heavy sedimenting solid phase in a second solids-collecting region in the area of the largest diameter on the inside of the bowl wall; and

Step 400:

Opening the bowl after processing the batch and discharging or removing the solids from the open bowl.

In another aspect, the disclosure provides a method for centrifugally purifying a liquid-solid mixture comprising sedimenting and floating solids from the solids in a separator as described herein, in a batch operation, comprising the following steps:

Step 100:

Providing the separator and a batch of the liquid-solid mixture with a medium-heavy liquid phase (L) and a lighter solid phase (Sl) with floating solids and a heavier solid phase (Sh) with sedimenting solids;

Step 200:

Rotating the bowl and feeding the bowl with the liquid-solid mixture so that centrifugal separation takes place within the separating chamber between the medium-heavy liquid phase (L) and the lighter solid phase (Sl) with the floating solids and the heavier solid phase (Sh) with the sedimenting solids, so that the lighter solid phase is displaced into the center of the separating chamber by the medium-heavy liquid phase and the heavier solid phase flows into the region of the largest diameter on the inside of the bowl wall;

Step 300:

Collecting the light floating solid phase (Sl) in the center of the separating chamber in at least a first solids-collecting region and collecting the heavy sedimenting solid phase (Sh) in a second solids-collecting region in the region of the largest diameter on the inside of the bowl wall; and

Step 400:

Opening the bowl after processing the batch and discharging or removing the solids from the open bowl.

The solids can then be examined more closely or disposed of.

With the separator and the method according to the disclosure, it is possible in particular - but not exclusively - to discontinuously separate microplastics from water in batch or batching operation. This technical solution can also be used to purify water and wastewater from plastic and/or microplastics.

The specific density of the individual polymers present in microplastics varies greatly. Thus, in a mixture of water (reference approx. 1.0 g/cm^3 for freshwater or 1.02 to 1.03 g/cm^3 for seawater) and microplastics in the gravitational field, a distinction can be

CLAIMS

1. Centrifugal separator having a rotatable bowl which is designed to purify a liquid-solid mixture containing sedimenting and floating solids from the solids in the centrifugal field during batch operation, wherein the bowl comprises a separating chamber and a liquid discharge continuously discharging the purified liquid phase (L) from the separating chamber during processing of the batch, and at least two solids-collecting regions provided at different radii of the bowl, one of which serves to collect a first lighter floating solid phase (Sl) and the other to collect a second heavier sedimenting solid phase (Sh), so that the solids-collecting regions can be filled with the relevant solid phase (Sl, Sh) over time while the relevant batch is being processed.

2. Separator according to claim 1, characterized in that the liquid phase is discharged from the separating chamber on a central radius and in that the first solids-collecting region for the lighter solid phase (Sl) is located on a smaller radius relative to the central radius and the second solids-collecting region for the heavier solid phase (Sh) is located on a larger radius relative to the central radius.

3. Separator according to claim 1 or 2, characterized in that at least one means for increasing the equivalent clarifying surface is formed in the separating chamber .

4. Separator according to claim 3, characterized in that the means for increasing the equivalent clarifying surface is a disk pack.

5. Separator according to claim 3, characterized in that the means for increasing the equivalent clarifying surface is a ribbed insert.

6. Separator according to one of the preceding claims, characterized in that the liquid discharge comprises a separating disk.

7. Separator according to one of the preceding claims, characterized in that the liquid discharge comprises one or more tubes, the inlet of which is located in the region of the central radius and through which the liquid is conducted out of the rotating bowl.

8. Separator according to one of the preceding claims, characterized in that the stationary bowl can be opened so that the solid phases can be removed from the bowl after a batch has been processed.

9. Separator according to one of the preceding claims, characterized in that it has no solids drain for discharging solids during centrifugal processing when the bowl rotates.

10. Separator according to claim 8 or 9, characterized in that the bowl can be opened in a lower region, so that after processing a batch the solid phases (Sh, Sl) and a residual liquid can run out of the bowl via a drain into a container.

11. Separator according to one of the preceding claims, characterized in that it has a sensor in the liquid discharge by means of which the density of the discharged liquid phase can be monitored.

12. Use of a separator according to one of the preceding claims, for centrifugally clarifying a liquid-solid mixture with sedimenting and floating solids from the solids.

13. Method for centrifugally purifying a liquid-solid mixture comprising sedimenting and floating solids from the solids in a separator according to one of the preceding claims, in a batch operation, comprising the following steps:

Step 100:

Providing the separator and a batch of the liquid-solid mixture with a medium-heavy liquid phase (L) and a lighter solid phase (Sl) with floating solids and a heavier solid phase (Sh) with sedimenting solids;

Step 200:

Rotating the bowl and feeding the bowl with the liquid-solid mixture so that centrifugal separation takes place within the separating chamber between the medium-heavy liquid phase (L) and the lighter solid phase (Sl) with the floating solids and the heavier solid phase (Sh) with the sedimenting solids, so that the lighter solid phase is displaced into the center of the separating chamber by the medium-heavy liquid phase and the heavier solid phase flows into the region of the largest diameter on the inside of the bowl wall;

Step 300:

Collecting the light floating solid phase (Sl) in the center of the separating chamber in at least a first solids-collecting region and collecting the heavy sedimenting solid phase (Sh) in a second solids-collecting region in the

region of the largest diameter on the inside of the bowl wall; and

Step 400:

Opening the bowl after processing the batch and discharging or removing the solids from the open bowl.

14. Method according to claim 13, characterized in that the solids are plastic particles.