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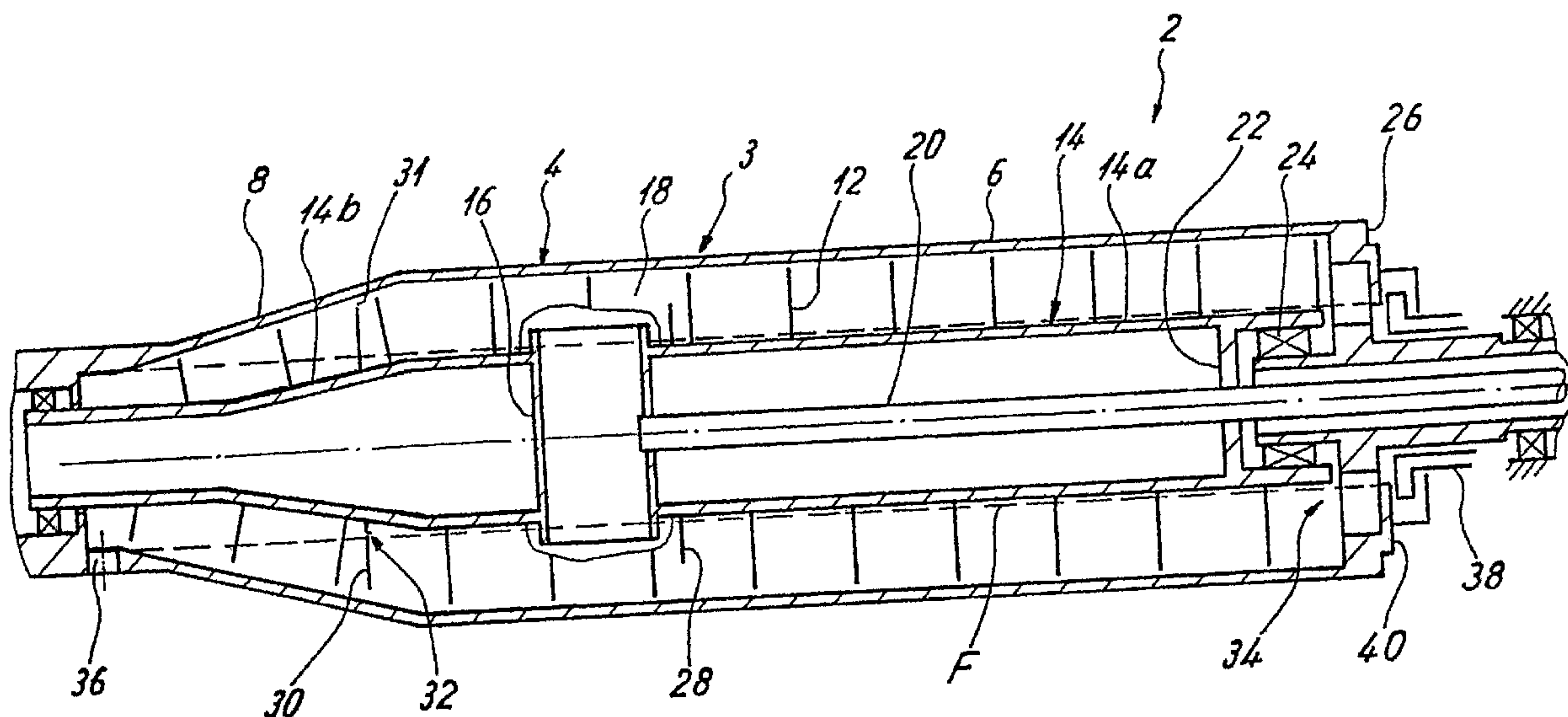
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(54) Titre : CENTRIFUGE A VIS A BOL PLEIN POUR TRAITER UNE MASSE RESIDUELLE CENTRIFUGEE ENCLINE AU MOUSSAGE

(54) Title: SCREW-TYPE SOLID BOWL CENTRIFUGE



(57) Abrégé/Abstract:

The invention relates to a screw-type solid bowl centrifuge (2) for processing a material to be centrifuged that has a tendency to foam. The inventive centrifuge comprises a centrifugal drum (3) with a liquids discharge (34) and a solids discharge (36) and with a rotatable bowl jacket (4) in which a rotatable screw (12) is disposed. The centrifugal drum is provided with a feed section with a central feed pipe (20) that is configured coaxially relative to the axis of rotation of the centrifuge drum. Said feed pipe feeds the material to be centrifuged through a distributor (16) to the centrifuge chamber (18) between the screw (12) and the bowl jacket (4) which is designed as a substantially airtight, closed system. The invention further provides a special kind of a baffle plate system (28, 30) that prevents foam that is produced when the material is centrifuged from escaping through the liquids discharge (34) and/or the solids discharge (36).

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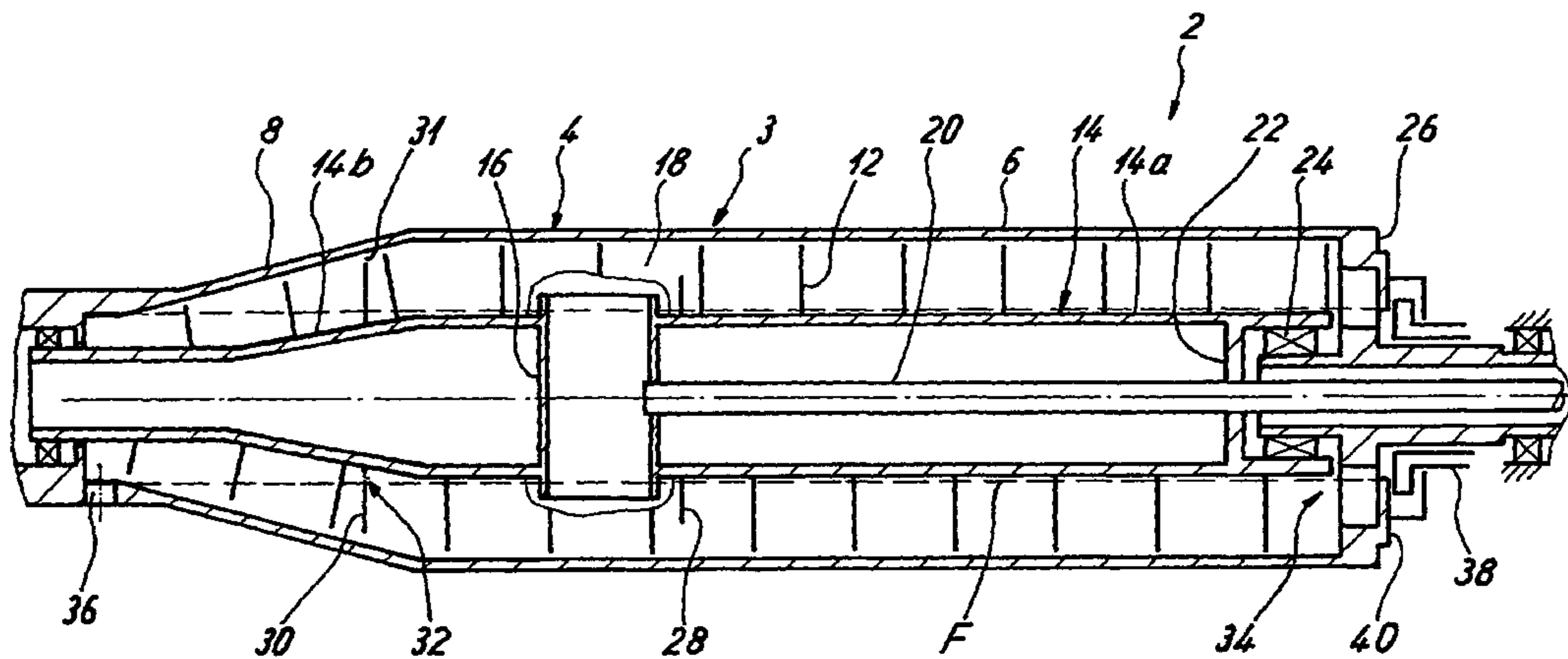
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(54) Title: SCREW-TYPE SOLID BOWL CENTRIFUGE

(54) Bezeichnung: VOLLMANTEL-SCHNECKENZENTRIFUGE ZUR VERARBEITUNG EINES ZUR SCHÄUMUNG NEIGENDEN SCHLEUDERGUTES



(57) Abstract: The invention relates to a screw-type solid bowl centrifuge (2) for processing a material to be centrifuged that has a tendency to foam. The inventive centrifuge comprises a centrifugal drum (3) with a liquids discharge (34) and a solids discharge (36) and with a rotatable bowl jacket (4) in which a rotatable screw (12) is disposed. The centrifugal drum is provided with a feed section with a central feed pipe (20) that is configured coaxially relative to the axis of rotation of the centrifuge drum. Said feed pipe feeds the material to be centrifuged through a distributor (16) to the centrifuge chamber (18) between the screw (12) and the bowl jacket (4) which is designed as a substantially airtight, closed system. The invention further provides a special kind of a baffle plate system (28, 30) that prevents foam that is produced when the material is centrifuged from escaping through the liquids discharge (34) and/or the solids discharge (36).

(57) Zusammenfassung: Die Erfindung betrifft eine Vollmantel-Schneckenzenrifuge (2) zur Verarbeitung eines zur Schäumung neigenden Schleudergutes, welche eine Schleudertrommel (3) mit einem Flüssigkeitsaustrage (34) und einem Feststoffaustrag (36) und einem drehbaren, Trommelmantel (4) aufweist, in dem eine drehbare Schnecke (12) angeordnet ist, wobei ein Zulaufabschnitt mit einem konzentrisch zur Drehachse der Schleudertrommel ausgebildeten, zentralen Zulaufrohr (20) zur Zuführung des Schleudergutes durch einen Verteiler (16) in den Schleuderraum (18) zwischen der Schnecke (12) und dem Trommelmantel

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(4) vorgesehen ist, der als im wesentlichen luftdichtes, geschlossenes System ausgelegt ist. Durch eine spezielle Art einer Stauscheibenanordnung (28, 30) wird ferner beim Schleudern des Schleudergutes entstehender Schaum am Austritt durch den Flüssigkeitsaustrag (34) und/oder den Feststoffaustrag (36) gehindert.

SCREW-TYPE SOLID BOWL CENTRIFUGE

The invention relates to a screw-type solid bowl centrifuge for processing a material to be centrifuged which has a tendency to foam.

Decanters in the form of screw-type solid bowl centrifuges have been known in various embodiments for a long time. A known decanter is illustrated in Figure 2. When processing easily oxidizing material to be centrifuged - consisting, for example, of cut-up fruit, such as apples -, it is desirable to minimize as much as possible the possibility of an oxidation of the material to be centrifuged during the centrifugal treatment.

The present invention addresses this problem by providing a Screw-type solid bowl centrifuge for processing a material to be centrifuged which has a tendency to foam, characterized (a) by a centrifugal drum having a liquids discharge and a solids discharge and a rotatable bowl jacket in which a screw is arranged which is rotatable relative to the bowl jacket, (b) by a feed section with a central feed pipe constructed concentrically with respect to the axis of rotation of the centrifugal drum for the

feeding of the material to be centrifuged through a distributor into the centrifuge chamber between the screw and the bowl jacket, (c) in that the feed section through the feed pipe and the distributor into the centrifuge chamber is designed as an essentially hermetical, closed system, (d) in that a baffle plate arrangement is provided which is designed for preventing foam and/or other small or floating particles forming during the centrifuging of the material to be centrifuged from being discharged through the liquids discharge, (e) in that the baffle plate arrangement has two baffle plates, one of the latter being arranged relative to the distributor in the direction of the liquids discharge on the screw body, and the other being arranged in the direction of the solids discharge on the screw body, and (f) in that the baffle plate arranged between the distributor and the solids discharge has openings toward its inner circumference for the passage of foam in the direction of the solids discharge.

Accordingly, the feed section through the feed pipe and the distributor into the centrifuge chamber is designed as an essentially hermetic closed system, which in a simple manner reduces the possibility of an oxidation of the product to be centrifuged in the feed system or section of

the drum. The other sections of the centrifuge may - but do not have to - also have a closed design. The hydrohermetical feed already reduces the oxidation.

Preferably the feed pipe is fixedly connected with the screw by way of the distributor, so that the feed pipe rotates along with the screw during rotations of the screw. In this manner, in contrast to prior the art illustrated in Figure 2, a "soft" preacceleration and thus a correspondingly careful treatment of the material to be centrifuged is achieved. Because the feed pipe has a rotatable design, it is, in addition, possible to connect the distributor and the feed pipe directly in a quasi "one-piece" manner with one another without any gap or opening, so that foam can no longer penetrate into any gaps or spaces between the feed pipe and the distributor, as was the case in the prior art.

The hygienic effect is increased by the further measure of fastening the distributor directly without a gap and an opening in circumferential openings of the screw body. This creates a free path which has no gaps and openings from the feed pipe into the centrifuge chamber of the decanter. In contrast to the prior art, material to be

centrifuged can no longer reach the area between the outer circumference of the feed pipe and the inner circumference of the screw body because this feed section

of the centrifuge is designed in a "hydrohermetically" closed manner.

According to another variant of the invention, the distributor has an essentially pipe-shaped construction, so that it has at least one - preferably two - radial discharge openings leading into the centrifuge chamber. If, in addition, the distributor has such a radial dimension that, during the operation of the centrifuge, it projects into the liquid or under the liquid level in the centrifuge chamber, so that its discharge openings are situated under the liquid level, the effect of the hermetic closing of the feed section of the centrifuge is further improved. This measure also contributes to the fact that a particularly careful treatment of the product/material to be centrifuged takes place.

During the processing of material to be centrifuged, which, in addition to a solid and a liquid phase in the decanter, has the tendency to form a foam as a quasi third phase - for example, a fruit mash for producing fruit juice or a highly protein-

containing material to be centrifuged -, the problem arises that, in an undesired manner, the foam also exits the decanter

through the liquids discharge and thereby impairs the quality of the liquid phase. In the case of highly foaming products, there is also the problem that the foam contaminates the decanter, particularly in that it enters into gaps at the discharge of the feed pipe into the distributor and, in the worst case, virtually wells out of the centrifuge. The present invention is also designed to eliminate this problem.

The present invention eliminates this additional problem by employing a baffle plate arrangement which is designed for preventing foam generated during the centrifuging of the material to be centrifuged from exiting through the liquids discharge (and/or - if this should, against all expectations, be significant - through the solids discharge).

Particularly preferably, the baffle plate arrangement has at least one or preferably even two baffle plates which project into the liquids level, one of which, relative to the distributor, preferably being arranged in the direction of the liquids discharge on the screw body, and the other being arranged in the direction of the solids discharge on the screw body. At least one of the baffle plates projects

into the liquids level and thereby forms a barrier in the direction of the corresponding discharge for foam formed during the centrifuging of the material to be centrifuged.

According to another variant of the invention, at least one of the baffle plates is formed directly to the distributor and/or to the outer circumference of the screw body in the area of the distributor.

Furthermore, one of the baffle plates is preferably constructed as a solid-ring baffle without openings, and the other baffle plate is provided with openings toward its inner circumference for the passage of foam in the direction of the solids discharge, particularly when the baffle plate arranged preferably between the distributor and the solids discharge is dimensioned such that only a relatively narrow gap remains between the drum shell and the baffle plate, which gap is designed such that a slimy solid phase can pass through it, in which case the return flow through the gap is prevented by the pushing solid phase which follows.

A particularly advantageous effect is achieved by means of a combination of baffle plates and the rotatable

sealed-off feed pipe, because this arrangement meets the highest hygienic requirements with respect to the feeding of material to be centrifuged as well as with respect to the foam barrier in the direction of the liquids discharge.

In the following, the invention will be described in detail by means of an embodiment with reference to the drawing.

Figure 1 is a sectional view of a centrifugal drum of a screw-type solid bowl centrifuge according to the invention; and

Figure 2 is a schematic representation of a screw-type solid bowl centrifuge according to the prior art.

Figure 2 illustrates a screw-type solid bowl centrifuge 2 which has a centrifugal drum 3 and an outer bowl jacket 4 which comprises a cylindrical section 6 and a conically tapering section 8 adjoining the cylindrical section 6. A rotatable screw 12 for the discharge of solids is arranged within the outer rotatable bowl jacket 4 which according to Figure 1 can be

rotatably disposed on an outer machine frame 10.

The screw 12 has an inner, essentially cylindrical screw body 14 whose geometry is adapted essentially to the geometry of the outer centrifuge bowl jacket 4 and, in turn, corresponding to the contour of the bowl jacket 4, comprises a cylindrical section 14a as well as a conical section 14b adjoining the cylindrical section. This geometry preferred here is to be understood purely as an example. Alternative geometries of the screw body 14 - for example, purely cylindrical geometries - are conceivable within the scope of the invention.

In the end area of the cylindrical section 14a, the screw body 14 is penetrated by a distributor (pipe) 16 which preferably has a rectangular cross-section and which, at its two axial ends, leads in an open manner into the centrifuge chamber 18 between the screw body 14 and the bowl jacket 4 and is welded to the screw body, so that a direct - quasi one-piece 3 - connection is established between the feed pipe 20 and the screw body 14, which connection is free of gaps and openings.

The feed pipe 20 is constructed in the area of the center axis of the screw-type centrifuge. At its end facing away from

the distributor 16, the feed pipe 20 is fastened by way of a ring 22 to the inner circumference of the screw body 14, which, in turn, rotatably by means of roller bearings 34, is disposed on a projection of the axial lid 26 which closes off the bowl jacket 4 essentially axially. At its end facing away from the lid 24, the feed pipe 20 penetrates an opening in the distributor 16. Also the rotatable feed pipe 20 is therefore arranged (for example, welded) at the distributor 16 such that a gap-free connection is established between these elements and no material to be centrifuged or foam can enter into any gaps in this area. Here, the feed pipe 20 projects from the right or from the cylindrical section of the centrifuge into the latter. A reverse arrangement of the feed pipe 20 from the left or conical side of the drum 4 is conceivable.

On the outer circumference of the screw body 14, a baffle plate arrangement is constructed which here consists of two baffle plates 28, 30, of which one (baffle plate 28) in the direction of the liquids discharge, here, in the cylindrical section 14a of the screw body 14 and the other (baffle plate 30) toward the side of the solids discharge, here, in the conical section 14b of the screw body, is fitted onto the latter. Both baffle plates 14 have such a radial dimension that, during the

operation of the screw-type centrifuge, they project into the liquid level F. The baffle plate 28 fastened to the cylindrical section of the screw body 14 is constructed as a ring plate without openings, while the baffle plate 30 fastened to the conical section of the screw body 14 has openings 32 - for example, of a slot-type or of another contour - toward the inner circumference. The radial dimension of this baffle plate 30 is larger than that of the baffle plate 28 in the cylindrical area of the screw body 14. It is dimensioned such that only a relatively narrow gap 31 remains between the bowl jacket 4 and the baffle plate 31.

The screw-type centrifuge operates as follows:

A material to be centrifuged which has the tendency to foam (for example, a mash of cut-up apples from which apple juice is to be obtained) enters through the rotating feed pipe 20 into the distributor 16 and through the latter into the centrifuge chamber 18. Since the feed pipe 20 is designed to be rotatable and, at its end pointing to the distributor 16, is welded in an opening of the distributor 16, and because, furthermore, the distributor 16 is welded to the screw body 14, no foam can penetrate into any openings or slots and contaminate the

decanter. A hermetic feed section is formed from the feed pipe 20 through the distributor into the centrifuge chamber 18. This effect is intensified in that the lateral discharge openings (situated radially with respect to the feed pipe 20 and axially in the direction of the distributor 16) of the distributor 16 formed here as a rectangular pipe project into the liquids level so that the inflowing material to be centrifuged when entering into the centrifuge chamber also virtually cannot come in contact with air, which reduces the oxidation of the entering material to be centrifuged. In addition, the rotating feed pipe 20 has the advantage that the entering material to be centrifuged is virtually "preaccelerated" in the feed pipe 20 which, in turn, results in a particularly careful treatment of the material to be centrifuged.

As a result of the baffle plate 28, which projects into the liquids level, the exiting of foam through the liquids discharge 34 is prevented, which further improves the quality of the liquid phase. Toward the liquids discharge 36, the foam can, on the contrary, exit from the decanter through the slot-type openings 32 in the baffle plate 30. The baffle plate 30 essentially has the purpose of preventing the return flow of a slimy solid phase, which pushes out of the narrow gap 31,

through the gap 31 back into the cylindrical section 8 of the drum 4. In this case, the openings 32 in this baffle plate 30 permit the exiting of the foam in the direction of the solids discharge which, when this baffle plate 30 has a closed design, could not escape from the drum 4 without the openings 32.

The liquid level is determined at the liquids discharge 34, at which the liquid is discharged through a rotary cutting tube 38, by the position of the inner circumference of another baffle plate 40. In the present case, the liquids level reaches almost to the screw body 14.

In this manner, an impairment of the quality of the liquid phase (for example, apple juice) as a result of oxidation and/or foam is prevented without any significant constructive expenditures while a particularly high hygienic standard is ensured.

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Reference Numbers

2	Screw-type solid bowl centrifuge
3	drum
4	bowl jacket
6	cylindrical section
8	conically tapered section
10	machine frame
12	screw
14	screw body
14a	cylindrical section
14b	conical section
16	distributor (pipe)
18	centrifuge chamber
20	feed pipe
22	ring
24	roller bearing
26	axial lid
28,30	baffle plates
31	gap
32	slot-type openings

34	liquids discharge
36	solids discharge
28	rotary cutting tube
40	baffle plate
F	liquids level

CLAIMS:

1. Screw-type solid bowl centrifuge (2) for processing a material to be centrifuged which has a tendency to foam, characterized

a) by a centrifugal drum (3) having a liquids discharge (34) and a solids discharge (36) and a rotatable bowl jacket (4) in which a screw (12) is arranged which is rotatable relative to the bowl jacket (4),

b) by a feed section with a central feed pipe (20) constructed concentrically with respect to the axis of rotation of the centrifugal drum for the feeding of the material to be centrifuged through a distributor (16) into the centrifuge chamber (18) between the screw (12) and the bowl jacket (4),

c) in that the feed section through the feed pipe (20) and the distributor (16) into the centrifuge chamber (18) is designed as an essentially hermetical, closed system,

d) in that a baffle plate arrangement is provided which is designed for preventing foam and/or other small or floating particles forming during the centrifuging of the material to be centrifuged from being discharged through the liquids discharge (34),

e) in that the baffle plate arrangement has two baffle plates (28, 30), one of the latter being arranged relative to

the distributor (16) in the direction of the liquids discharge (34) on the screw body, and the other being arranged in the direction of the solids discharge (36) on the screw body (14), and

f) in that the baffle plate (30) arranged between the distributor (16) and the solids discharge (36) has openings (32) toward its inner circumference for the passage of foam in the direction of the solids discharge (36).

2. Screw-type solid bowl centrifuge according to Claim 1,

characterized in that the feed pipe (20) by way of the distributor (16) is fixedly connected with the screw (12) so that, during rotations of the screw (12), the feed pipe rotates along with the latter.

3. Screw-type solid bowl centrifuge according to Claim 1,

characterized in that an end of the feed pipe (20) is directly connected with the distributor (16) without any gaps or openings.

4. Screw-type solid bowl centrifuge according to Claim 3,

characterized in that the distributor (16) directly communicates without any gaps or openings with circumferential openings in the screw body (14).

5. Screw-type solid bowl centrifuge according to any one of claims 1 to 4, characterized in that the distributor (16) has an essentially pipe-type construction.

6. Screw-type solid bowl centrifuge according to any one of claims 1 to 5, characterized in that the distributor (16) has at least one radial discharge opening leading into the centrifuge chamber (18).

7. Screw-type solid bowl centrifuge according to any one of claims 1 to 6, characterized in that the distributor (16) has such a radial dimension that, during the operation of the centrifuge, it extends to below the liquids level in the centrifuge chamber (18), so that its discharge openings are situated below the liquids level.

8. Screw-type solid bowl centrifuge according to any one of claims 1 to 7, characterized in that at least one of the baffle plates (36) is constructed on a conical section of the screw-type body.

9. Screw-type solid bowl centrifuge according to any one of claims 1 to 8, characterized in that at least one of the baffle plates (28) projects into the liquid level in the centrifuge chamber.

10. Screw-type solid bowl centrifuge according to any one of claims 1 to 9, characterized in that at least one of the baffle plates (28) fastened to the screw body (14) is constructed as a solid-ring plate without openings.

11. Screw-type solid bowl centrifuge according to any one of claims 1 to 10, characterized in that the radial dimension of the baffle plate (30) situated toward the solids discharge (36) is larger than that of the other baffle plate (28) toward the liquids discharge (34).

12. Screw-type solid bowl centrifuge according to any one of claims 1 to 11, characterized in that the baffle plate (30) arranged between the distributor (16) and the solids discharge (36) is dimensioned such that, between the bowl jacket (4) and the baffle plate (30), only a relatively narrow gap (31) remains which is designed such that a slimy solid phase can pass through it, the return flow through the gap (31) being prevented by the pushing slimy solid phase which follows during the centrifuging.

13. Screw-type solid bowl centrifuge according to any one of claims 1 to 12, characterized in that one baffle plate (28) is shaped directly on the distributor (16).

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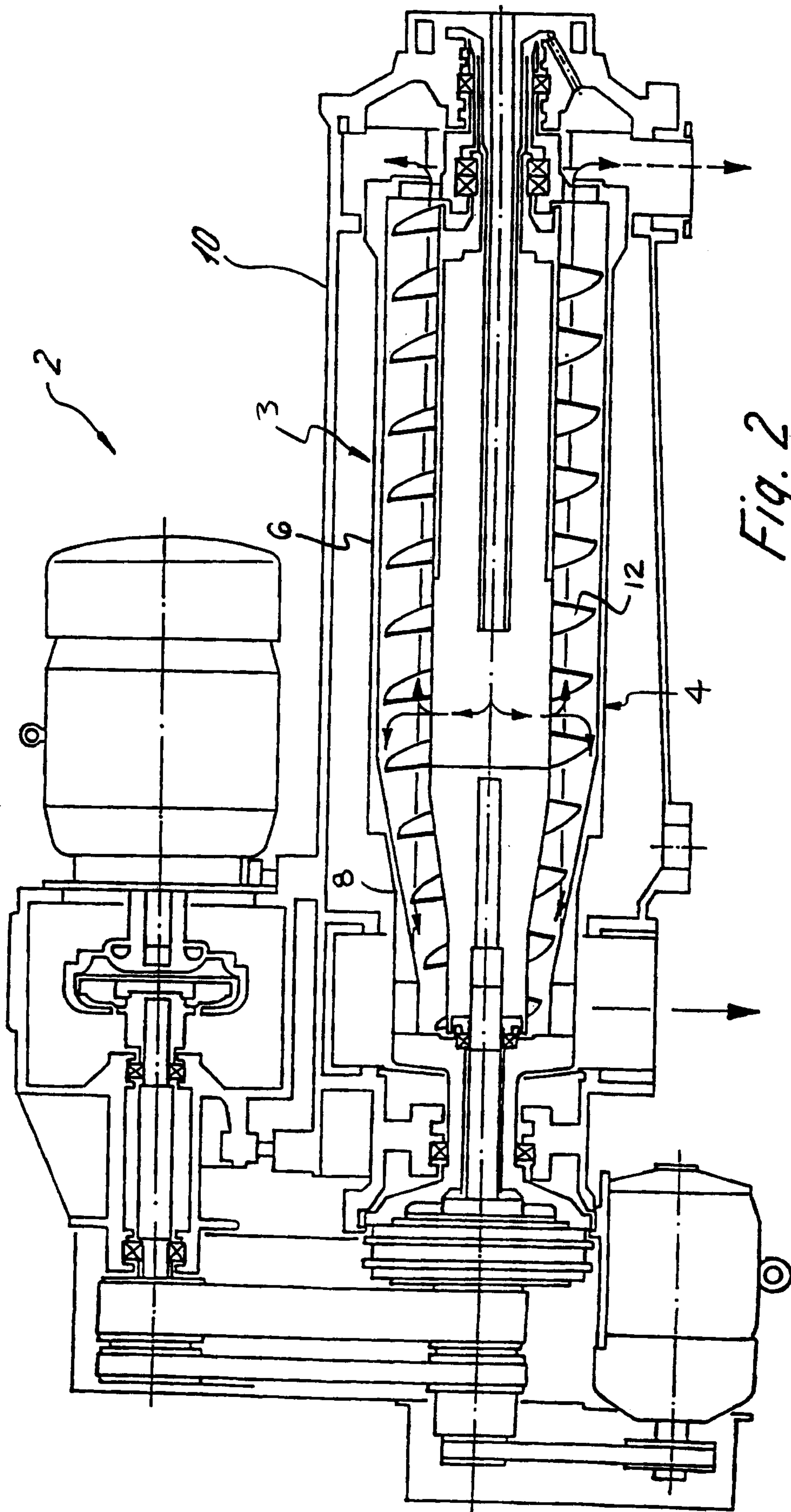


Fig. 2

PRIOR ART

