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(73) Patenthaver: **MULTIVAC Sepp Haggenmüller SE & Co. KG, Bahnhofstrasse 4, 87787 Wolfertschwenden, Tyskland**

(72) Opfinder: **Fickler, Bernhard, Krokusweg 7, 87749 Hawangen, Tyskland**
MÖRSCHNER, Lars, Zugspitzstraße 10, 87493 Lauben, Tyskland

(74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**

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Destacker for trays

The present invention relates to a destacker according to claim 1 and a method for operating such destacker.

Destackers of the generic kind are known from EP 3246277 A1 and from US 4,048,915. Such destackers are not suitable for destacking trays individually, which are stacked one inside the other as a stack of trays in such a way that the tray edge angled downwards on the outside overlaps the sealing surface of the tray edge of the tray underneath (cf. Fig. 5). Such trays are known as menu trays with wall thicknesses of less than 300 µm. The destacker screws, which always rotate in one and the same direction, cannot radially enter via the tray edge between two trays stacked one on top of the other and thus reliably separate the trays. WO 2016/034179 A1 describes, by contrast, a destacker enabling destacking individual trays. A separation disk immerses into the stack of trays, an upper part of which has before been lifted by a lifting device and in which the destacked tray is then further lowered in a helically formed spiral.

A destacker with special destacking elements for destacking the above-mentioned trays is known from WO 2016/169566 A1. These destacking elements do not rotate in an endless mode, but they rotate by 90° to 180° in a first direction and back again, i.e. reversingly, so as to destack one tray at a time. These destacking elements have a spring-loaded support element and a spring-loaded separating element, a gap being provided between the support element and the separating element in the direction of the axis of rotation of the destacking element. At the beginning of the destacking process, the lowermost tray rests on the support element with its downwardly angled edge and, due to the rotation of the destacking element, the separating element laterally applies pressure to the angled edge of the lowermost tray. As the rotation continues and the flank of the separating element rises, the angled tray edge enters the gap and, as the rotation continues still further, the support element ends and the lowermost tray can drop downwards. The separating element moves radially in the direction of the support of the tray edge and holds the next tray. The drawback of this is that trays which adhere to one another in the stack of trays, possibly also through adhesion at the tray walls, do not drop reliably after the tray no longer rests on the support element, as well as the reversible mode of operation.

It is the object of the present invention to provide a destacker for continuous operation by means of destacking screws, so as to destack the above-mentioned stacks of trays.

This object is achieved by a destacker having the features of claim 1 or by a method according to claim 6. Advantageous further developments of the invention are specified in the subclaims.

The invention relates to a destacker comprising a rack for accommodating at least one stack of trays and further comprising a plurality of destacking screws configured to be operated continuously in a respective direction of rotation, each destacking screw having a separating disk and a helically configured spiral. The invention is characterized in that the separating disk comprises a first insertion element and a second insertion element, the first insertion element being configured to enter a gap between two neighboring trays during rotation of the destacking screw so as to move these two neighboring trays apart to a larger distance, and the second insertion element being configured to enter the gap that has been produced by means of the first insertion element. This allows destacking of trays even if these trays overlap very widely and exhibit only a very small gap at the angled outer tray edges.

Preferably, both insertion elements are provided on the separating disk such that they are integral therewith, so that it is not necessary to provide possibilities of adjusting the two insertion elements relative to one another.

According to an inventive method of operating in particular a destacker of the type described hereinbefore, the destacking screw, while rotating, enters with the first insertion element the gap between the lower tray, i.e. the tray to be destacked, and the tray located above the lower tray until the upper tray has been lifted to such an extent that a larger gap is formed between the upper side of the tray edge of the lower tray and the tray edge of the tray located above the lower tray, before the second insertion element enters this gap at least partially via the upper side of the tray edge. In this way a highly reliable method can be provided, so as to allow destacking of e.g. menu trays having a low stability and overlapping widely in the stack of trays and exhibiting a very small distance between the outer tray edges, e.g. a distance that is smaller than 3 mm.

In the following, the invention will be explained in more detail making reference to embodiments. The individual figures show in detail:

Fig. 1 a tray sealer with a destacker,

Fig. 2 an isometric view of a detail of the destacker with a destacking screw and a tray,

Fig. 3 a detail view of a separating disk,

Fig. 4 a side view with a stack of trays and a destacking screw at a first position of the destacking screw and

Fig. 5 to 9 further positions of the destacking screw in the view according to Fig. 4.

Like components are provided with like reference numerals throughout the figures.

Fig. 1 shows a tray sealer 1 comprising a conveyor 2 by means of which trays 3 from a destacker 4 are taken up and conveyed to the tray sealer 1. Along the conveyor 2, the trays 3 are filled with products manually or automatically. The destacker 4 comprises a rack 40 and a plurality of destacking screws 5.

Fig. 2 shows in an isometric representation a detail of the destacker 4 with trays 3 and a destacking screw 5. The destacking screw 5 comprises a separating disk 6 with a first insertion element 7 and a second insertion element 8. For destacking individual trays 3, the destacking screw 5 shown rotates clockwise in the direction of rotation R.

Figure 3 shows the separating disk 6 in an enlarged individual representation. The first insertion element 7 has, with respect to its upper side 7a, an upward gradient in a direction opposite to the direction of rotation R. The first insertion element 7 exhibits an increase in diameter in comparison with the outer diameter D of a vertical wall of the separating disk 6, the increase in diameter corresponding to a first insertion depth T1. T1 may reach a maximum value of e.g. 1.5 mm to 3.5 mm. The upper side 8a of the second insertion element 8 begins slightly below the upper side 7a of the first insertion element 7. Also, the upper side 8a has an upward gradient in a direction opposite to the direction of rotation R. The second insertion element 8 exhibits an increase in diameter in comparison with the outer diameter D, the increase in diameter corresponding to a second insertion depth T2 that may reach a value of e.g. 4 to 7.5 mm. The function of the two insertion elements 7, 8 will be described in more detail in the following Figures 4 to 9.

Fig. 4 shows a stack of trays 9 comprising, exemplarily, five trays 3. At the beginning of a destacking cycle, in which a first tray 3a is to be destacked downwards individually, the first tray 3a and thus the stack of trays 9 rest on a support 11 of a spiral 10 of the destacking screw 5. The

second tray 3b located above the first tray 3a exhibits a gap 13 relative to the first tray 3a, the distance between the two tray edges 12 being a first distance A1 of e.g. 2 mm.

Fig. 5 shows an enlarged representation comprising the first tray 3a and the second tray 3b. It shows a rotated position of the destacking screw 5, at which the separating disk 6 enters with its first insertion element 7 the gap 13 between the tray edges 12 of the first 3a and of the second tray 3b. Reference numeral 14 stands for the sealing surface onto which a cover film will be sealed to the tray 3 later on.

Fig. 6 shows how, due to the gradient of the first insertion element 7, the second tray 3b and the trays 3, which lie on top of this second tray 3b and which are not shown in detail, rest on the upper side 7a and are lifted during the continued rotation of the destacking screw 5, while the first tray 3a rests with its tray edge 12 on the downwardly oriented spiral 10. This has the effect that the distance A1 between the tray edges 12 of the first 3a and of the second tray 3b increases to e.g. 5 to 6 mm at the position shown.

Fig. 7 shows a further rotation of the destacking screw 5, in the case of which the insertion element 7 has lifted, by means of its end, the second tray 3b to such an extent that the second insertion element 8 of the separating disk 6 moves into the gap 13 that has been enlarged to a value of e.g. A1 = 7.5 mm. Meanwhile, the first tray 3a is moved further down by means of the spiral 10.

In Fig. 8, the distance A1 of the gap has increased still further to 9 mm, by way of example, since the first tray 3a is conveyed further down, while the second tray 3b simultaneously rests on the second insertion element 8.

Fig. 9 shows a further rotation of the destacking screw 5, in the course of which the second tray 3b and together therewith the stack of trays 9, which is not shown in detail, are moved along a downwardly oriented incline of the second insertion element 8 to an upper starting level, so that, in the subsequent working cycle, the first insertion element 7 will again be able to enter the gap 13 between the second tray 3b and the and the next tray 3 located on top of the latter (cf. Fig. 4).

Patentkrav

1. Afstablingsindretning (4), der omfatter et stativ (40) til optagelse af mindst en stak bakker (9) og omfatter en flerhed af afstablingsskruer (5), der er konfigureret til at blive drevet kontinuerligt hver især i en rotationsretning (R), hvor hver afstablingsskrue (5) har en adskillelsesskive (6) og en spiralformet skrue (10), hvor adskillelsesskiven (6) har et første nedsænkningselement (7) og et andet nedsænkningselement (8), hvor det første nedsænkningselement (7) er konfigureret til at nedsænke sig i et mellemrum (13) mellem to tilstødende skaller (3) ved rotation af afstablingsskruen (5) for at øge en afstand (A1) mellem de to tilstødende skaller (3) med mindst 2 mm, hvor det andet nedsænkningselement (8) er konfigureret til at nedsænke sig i mellemrummet (13), der er udvidet ved hjælp af det første nedsænkningselement (7), hvor det første nedsænkningselement (7) har en overside (7a), der hæver sig mod rotationsretningen (R) af afstablingsskruen (5), og hvor en overside (8a) af det andet nedsænkningselement (8) har en opadgående hældning modsat rotationsretningen (R) for afstablingsskruen (5).

2. Afstablingsindretning ifølge krav 1, **kendetegnet ved, at** begge nedsænkningselementer (7, 8) er anbragt i ét stykke på adskillelsesskiven (6).

3. Afstablingsindretning ifølge et af de foregående krav, **kendetegnet ved, at** det andet nedsænkningselement (8) rager horisontalt længere ud fra en vertikal væg i adskillelsesskiven (6) end det første nedsænkningselement (7).

4. Afstablingsindretning ifølge et af de foregående krav, **kendetegnet ved, at** det første nedsænkningselement (7) har en første nedsænkningsdybde (T1) på 1,5 mm til 3,5 mm og/eller ved, at det andet nedsænkningselement (8) har en anden nedsænkningsdybde (T2) på 4 mm til 7,5 mm.

5. Afstablingsindretning ifølge et af de foregående krav, **kendetegnet ved, at** det andet nedsænkningselement (8) starter med sin overside (8a) lidt under

en øvre ende af oversiden (7a) af det første nedsænkningselement (7).

6. Fremgangsmåde til drift af en afstablingsindretning (4) til bakker (3), hvor afstablingsindretningen (4) har et stativ (40) til optagelse af mindst en bakkestabel (9) og en flerhed af afstablingsskruer (5), hvor afstablingsskruerne (5) hver især har en adskillelsesskive (6) og en spiralformet skrue (10), hvor adskillelsesskiven (6) desuden har et første nedsænkningselement (7) og et andet nedsænkningselement (8), og

hvor fremgangsmåden omfatter kontinuerlig rotation af afstablingsskruerne (5) hver især i en rotationsretning (R), hvor det første nedsænkningselement (7) har en overside (7a), der stiger mod rotationsretningen (R) af afstablingsskruen (5), og hvor en overside (8a) af det andet nedsænkningselement (8) har en opadgående hældning mod rotationsretningen (R) af afstablingsskruen (5), og

hvor fremgangsmåden omfatter følgende fremgangsmådetrin:

- nedsænkning af afstablingsskruen (5) under dens rotation i rotationsretningen (R) med det første nedsænkningselement (7) i et mellemrum (13) mellem en nederste bakke (3), der skal afstables, og en bakke (3b), der befinder sig ovenover,
- løft af bakken (3b), der befinder sig ovenover, ved hjælp af oversiden (7a) af det første nedsænkningselement (7) med yderligere rotation af afstablingsskruen (5),
- udvidelse af mellemrummet (13) ved at løfte bakken (3b), der er placeret over bakken (3a), der skal afstables,
- nedsænkning i det udvidede mellemrum (13) mellem bakken (3a), der skal afstables, og bakken (3b), der befinder sig ovenover, ved hjælp af det andet nedsænkningselement (8), og
- sænkning af bakken (3a), der skal afstables, ned på den spiralformede skrue (10), mens bakken (3b), der er placeret over bakken (3a), der skal afstables, forbliver fastholdt på det andet nedsænkningselement (8).

7. Fremgangsmåde ifølge krav 6, **kendetegnet ved, at** den lodrette dimension (A1) af mellemrummet (13) øges fra en indledende værdi med mindst 50% eller med mindst 100%.

8. Fremgangsmåde ifølge et af kravene 6 eller 7, **kendetegnet ved, at** den lodrette dimension (A1) af mellemrummet (13) øges fra en indledende værdi i området fra 1,5 til 3 mm til 7 til 14 mm.

9. Fremgangsmåde ifølge et af kravene 6 til 8, **kendetegnet ved, at** det andet nedsænkningselement (8) nedsænkes længere ned i mellemrummet (13) i vandret retning end det første nedsænkningselement (7)

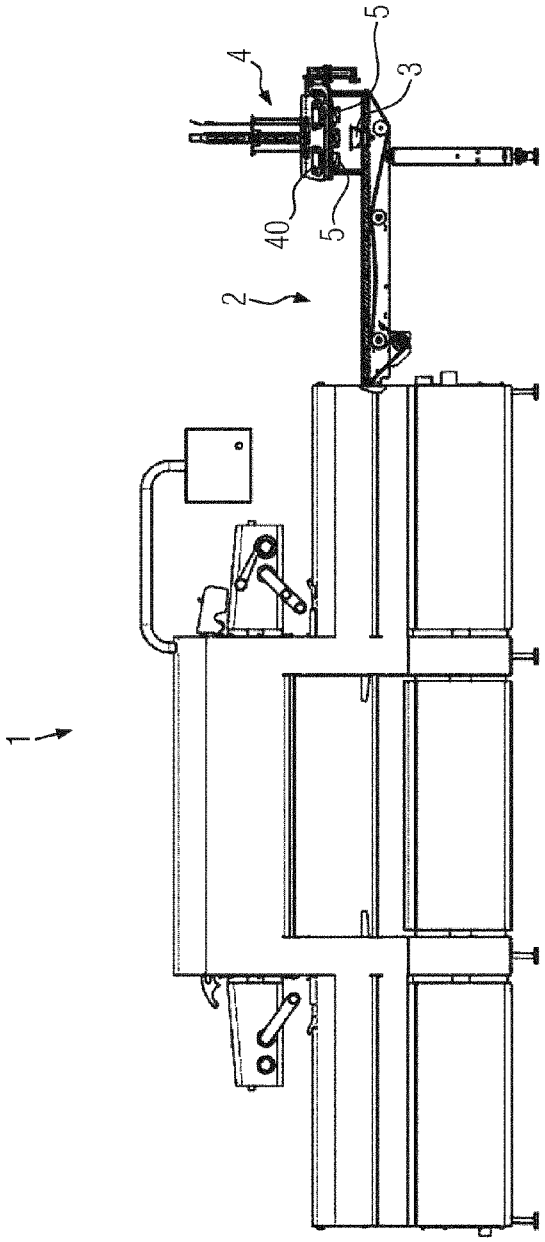

FIG. 1

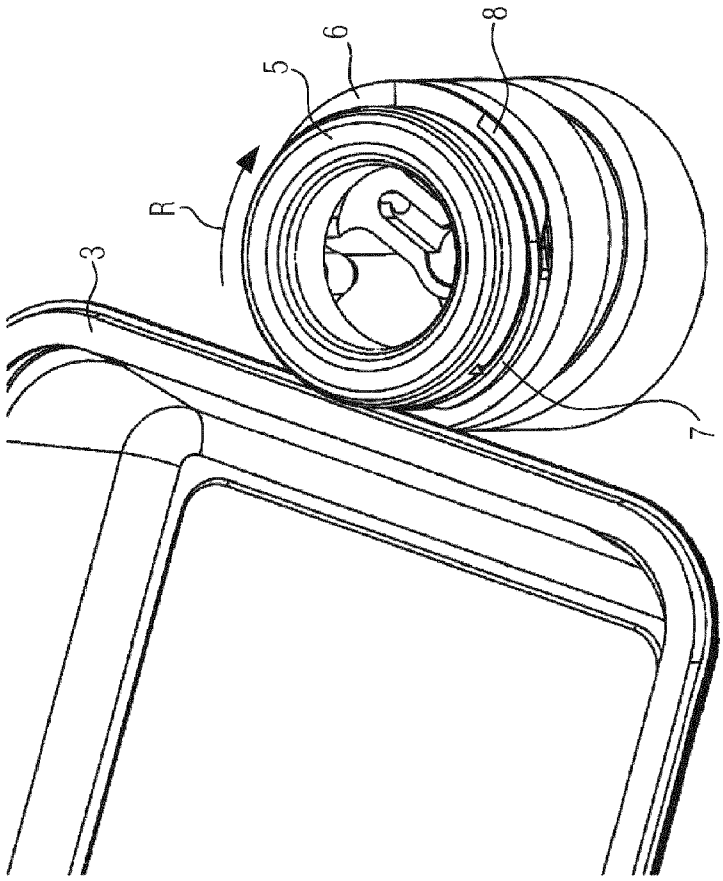

FIG. 2

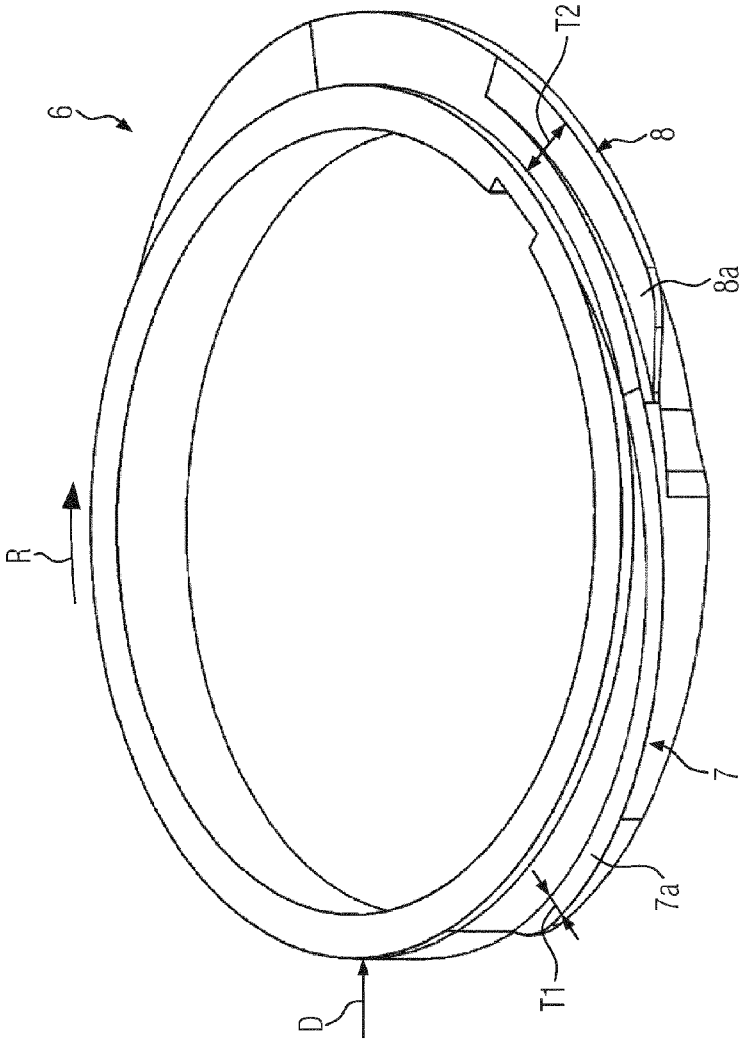

FIG. 3

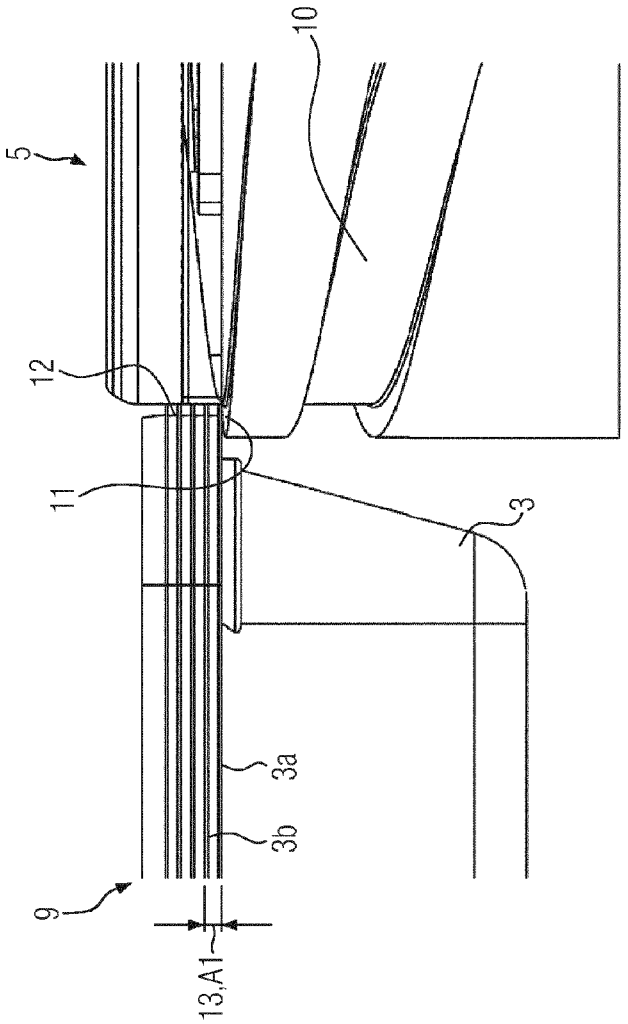

FIG. 4

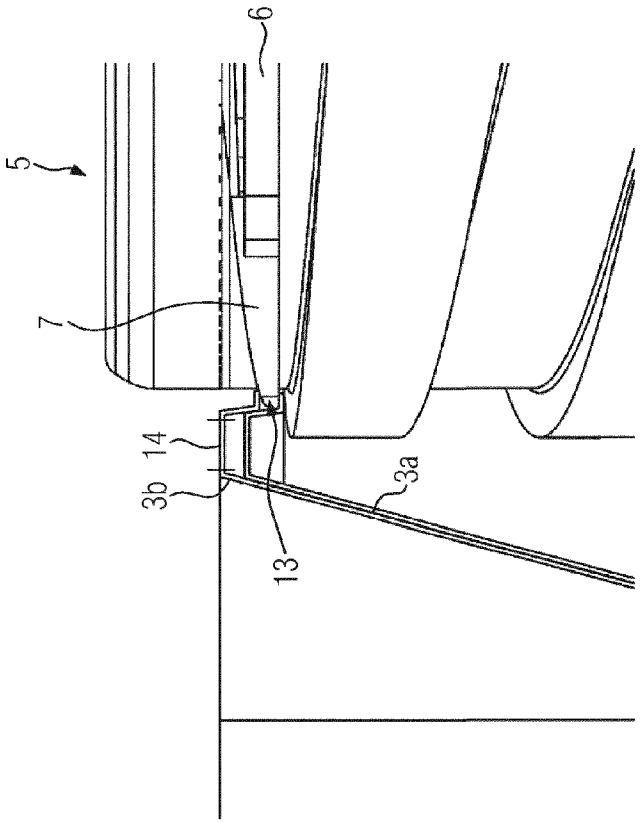

FIG. 5

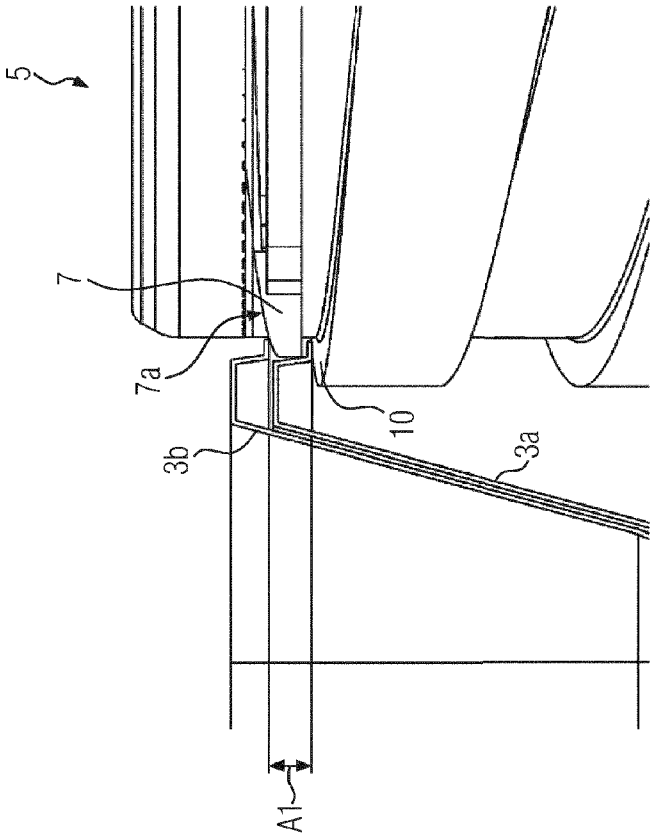

FIG. 6

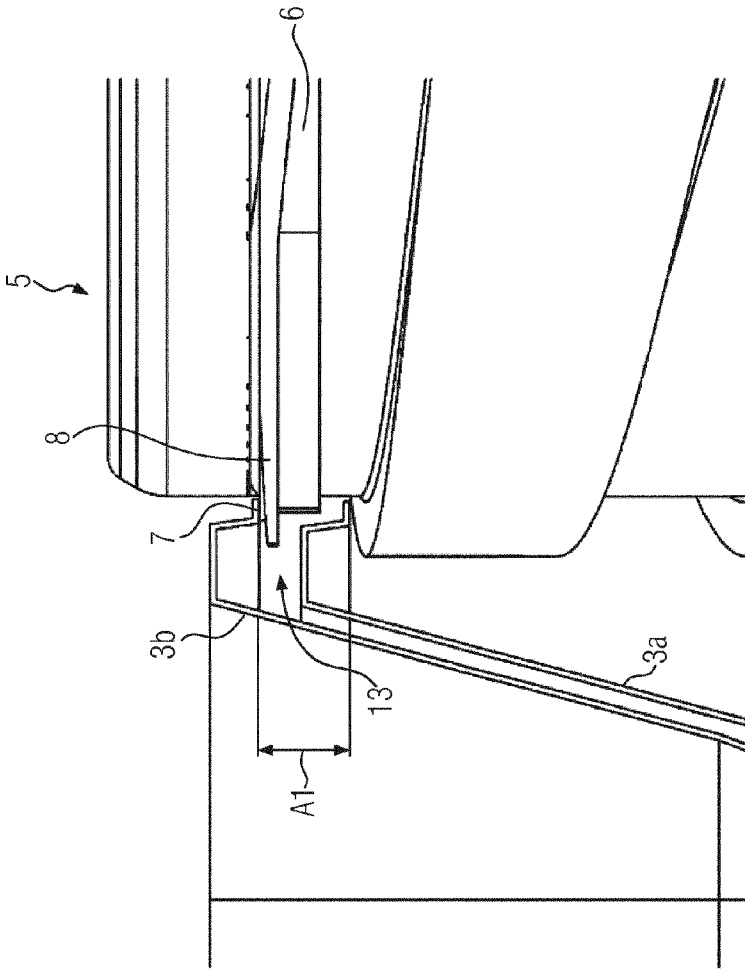

FIG. 7

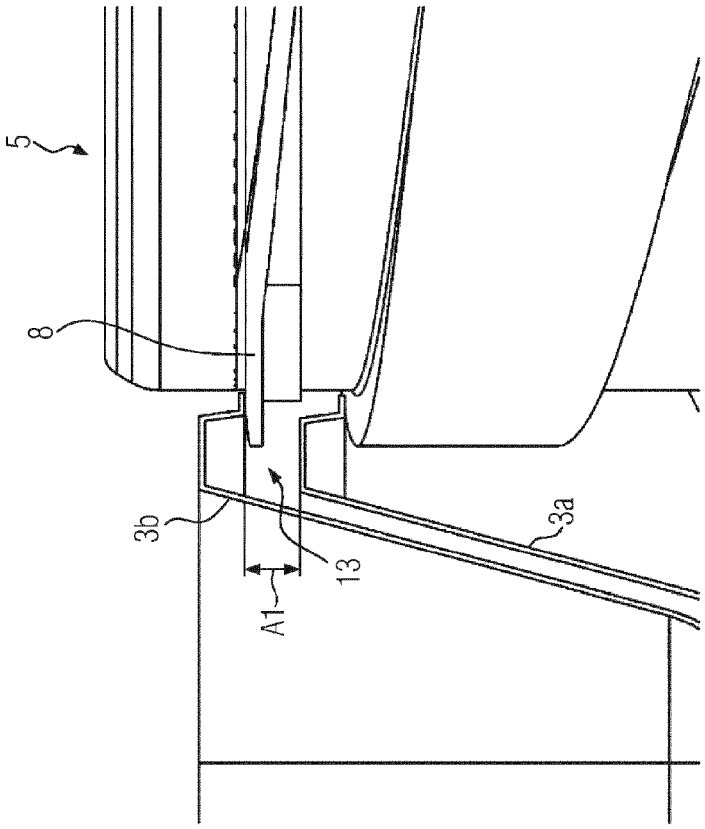

FIG. 8

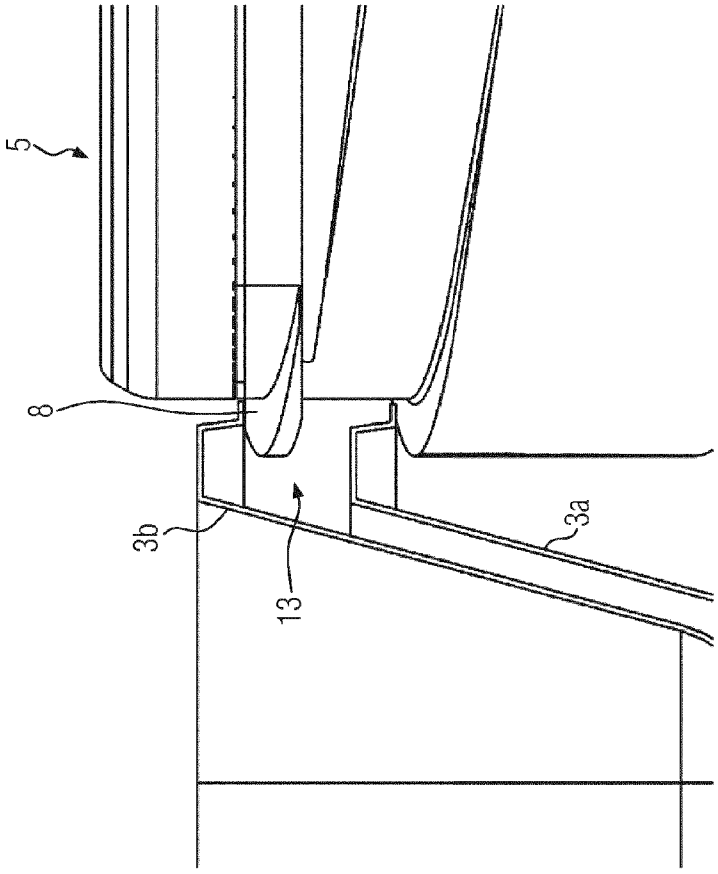

FIG. 9