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(54) **METHOD AND APPARATUS FOR SEPARATING A BLOCK OF MUTUALLY ADHERING OBJECTS,
IN PARTICULAR FRUITS**

VERFAHREN UND VORRICHTUNG ZUM TRENNEN EINES BLOCKS VON ANEINANDER
HAFTENDEN OBJEKTEN, INSBESONDERE FRÜCHTEN

PROCEDE ET APPAREIL POUR SEPARER UN BLOC D'OBJETS COLLES ENTRE EUX, TELS QUE
NOTAMMENT DES FRUITS

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Description

[0001] The invention relates to a method for mechanically separating a block of mutually adhering objects, in particular fruits like currants or raisins, by inserting a plurality of profiled agitating members into the block from at least one side, and moving the agitating members in the block, wherein the agitating members are inserted into the block in substantially the same direction and perform a rotating movement around an axis running substantially parallel to the direction of insertion. A method including these steps, albeit for mechanically mixing animal fodder or forage, is known from DE 203 05 983 U1.

[0002] When fruits, and particularly somewhat sticky fruits such as for instance currants or raisins, are compressed for a long time, there is a chance that they adhere or stick to each other such that they form a more or less solid block. This occurs for instance when the fruits are packaged in a box or bag which is almost completely full.

[0003] Currants and raisins are thus often transported in bulk packaging from the countries where they are produced to processing locations close to the market. At these processing locations the currants or raisins are then removed from the bulk packaging and either repacked in small packages suitable for retail sale or processed into products such as ready-to-eat meals or dough for currant and raisin pastry. After unpacking of the bulk packaging, the currants or raisins, which often come out of the bulk package as a block, must then be separated again. It is of great importance here that care is taken to prevent damage. On the other hand, the separating must of course take up as little time and manpower as possible.

[0004] The prior art document DE 203 05 983 U1 discloses a method for mechanically mixing animal fodder or forage, in which the fodder is dumped into an open top mixing hopper. Two conical mixing screws are vertically arranged in the hopper and are rotated in the same direction to mix and chop the fodder. After mixing, the fodder is discharged through an opening in a sidewall of the hopper onto a belt conveyor. This prior art document does not disclose any other use for the conical screws than mixing relatively loose fodder or forage.

[0005] Document De 203 05 983 U1 also discloses an apparatus according to the preamble of claim 7.

[0006] There is therefore a need for a method for mechanically separating a block of mutually adhering fruits, in particular currants or raisins, which can be performed rapidly and with relatively little effort, and wherein the fruit is damaged as little as possible. According to the invention this is now achieved in that the agitating members are disposed in mutually adjacent rows, and the agitating members in a first row rotate in the one direction and the agitating members in an adjacent row in the other direction. By making use of agitating members, which can be inserted into the block and then moved carefully, the block is broken into smaller pieces and eventually into individual fruits in relatively rapid and simple manner, wherein the risk of damage is low. The block can be kept

in motion very efficiently by the rotating movement of the profiled agitating members. When the agitating member has for instance a helical profile, the block can be moved up and downward on the agitating member by periodically reversing the direction of rotation, whereby the block is shaken apart effectively. Rotating the agitating members in different directions allows an efficient separation to be achieved.

[0007] For an optimal effectiveness each agitating member is preferably of at least partly tapering form in the direction of insertion. It can thus be readily inserted into the block, wherein the force on the block increases gradually.

[0008] In order to enable the method to be performed with simple means, it is advantageous when the agitating members are disposed fixedly and the block is brought into contact therewith. The agitating members are herein preferably in upright position and the block descends thereon under the influence of the force of gravity. A complicated feed mechanism can thus be dispensed with.

[0009] An efficient separation of the objects with minimal damage thereto is in this case achieved when the block is urged upward by the agitating members. The block thus as it were "dances" on the agitating members under the influence of the opposing influences of the force of gravity and the agitating members, whereby the objects are shaken loose therefrom.

[0010] In order to separate the objects in efficient manner the objects separated from the block by the at least one agitating member are preferably discharged through at least one sorting opening, the size of which roughly corresponds to that of the individual objects.

[0011] The invention also relates to an apparatus according to claim 7 for separating a block of mutually adhering objects with which the above described method can be carried out. According to the invention such an apparatus comprises a plurality of substantially parallel profiled agitating members adapted to be inserted from a side into the block; and means for moving the agitating members, the moving means being adapted to rotate each agitating member around an axis running substantially parallel to the direction of insertion; wherein the agitating members are disposed in mutually adjacent rows; and the moving means are adapted to rotate the agitating members in a first row in the one direction and the agitating members in an adjacent row in the other direction.

[0012] Preferred embodiments of the separating apparatus according to the invention associated with the above described preferred variants of the method form the subject-matter of the dependent claims 9 to 12.

[0013] In order to enable proper processing of the block, the agitating members can be disposed in a container accommodating the block to be separated, and the at least one sorting opening can be formed in or close to a bottom of the receiving container, so that the separated objects can leave the container under the influence of the force of gravity.

[0014] In order to simplify placing of the block in the

separating apparatus, and to prevent separated objects remaining behind in the apparatus, it is recommended that the container is at least partly funnel-shaped and the at least one sorting opening is defined between the agitating members and the funnel-shaped part of the container.

[0015] The container can comprise a funnel-shaped part for each agitating member.

[0016] So as to prevent reduced blocks of not yet completely separated fruits from leaving the apparatus in such an embodiment via a space between the rows left clear by a number of adjacent agitating members, at least one at least partly tapering, stationary separating member is then preferably disposed therein which partly defines the sorting opening(s).

[0017] The invention is now elucidated on the basis of an embodiment, wherein reference is made to the accompanying drawing, in which:

Fig. 1 is a partly cut-away side view of the separating apparatus according to the invention in combination with conveyors for discharging objects separated thereby,

Fig. 2 is a top view of the separating apparatus as according to arrow II in fig. 1,

Fig. 3 and 4 show respectively a perspective front view and a perspective rear view of the separating apparatus,

Fig. 5 is a perspective top view of the container with the agitating members of the separating apparatus therein,

Fig. 6 is a top view of the container having therein a block of objects for separating, and

Fig. 7 is a rear view of the underside of the separating apparatus, where the separated fruits are discharged.

[0018] An apparatus 1 for separating a block B of mutually adhering fruits, in particular currants or raisins R, comprises a number of agitating members 2 for inserting from a side into block B. Separating apparatus 1 further comprises means 3 for moving the agitating members 2. In the shown embodiment the agitating members 2, which are tapered or conical in the direction of insertion, are each bearing mounted in a transmission unit 26 fixed in a frame 4. Frame 4 is disposed such that agitating members 2 are oriented practically vertically. Mounted on frame 4 is a container 5 in which block B is received, whereafter it sinks gradually further over agitating member 2 under the influence of the force of gravity. In the shown embodiment the direction of insertion is therefore substantially vertical.

[0019] Agitating members 2, six in number in the shown embodiment, are disposed in container 5 in two rows of three. Container 5 is at least partly funnel-shaped, with a relatively wide top side 6 and a narrower underside 7. In the shown embodiment container 5 is of rectangular cross-section, with two long side surfaces 9 and two short

side surfaces 10, wherein side surfaces 9, 10 each incline so that a rectangular funnel is formed. In order to further accentuate the funnel shape at the position of each agitating member 2, ribs 11 flaring in a V-shape are formed on the inner side of the inclining side surfaces 9, 10. These ribs 11 also function as friction-loosening members whereby raisins R are scraped or rubbed off the outer sides of block B. On the underside, at the position of the bearing-mounting of agitating members 2, container 5 ends in a peripheral wall 12 which is defined by six cylinders and inside which are incorporated moving means 3.

[0020] On the underside 7 of container 5 circular sorting openings 13 are defined between the agitating members and V-shaped ribs 11 on side walls 9, 10. In the centre of container 5, where spaces are left clear in each case between the rows of agitating members 2, these sorting openings 13 are partly bounded by tapering or pyramid-shaped stationary separating members 14, which protrude here slightly less far into container 5 than agitating members 2. The width of sorting openings 13 roughly corresponds with the thickness of the objects R for separating.

[0021] On top side 6 the container 5 is provided with covering means 15, here in the form of a transparent lid with a fixed part 16 and a part 17 slidable therealong in rails 18.

[0022] Under the influence of moving means 3 the agitating members 2 are each rotatable around an axis A running roughly parallel to the direction of insertion. In the shown embodiment the agitating members 2 are profiled in the sense that a helical rib 19 is welded onto the conical form. Moving means 3 can be adapted to rotate agitating members 2 in a fixed direction such that block B is forced upward by helical ribs 19 counter to the influence of the force of gravity. Block B hereby as it were comes to "dance" on agitating members 2, wherein it strikes each time against ribbed side walls 9, 10 so that raisins R are shaken loose from the sides of block B. Moving means 3 can optionally rotate agitating members 2 reciprocally so that block B is moved alternately up and downward by helical ribs 19, whereby it is shaken even more intensively. Moving means 3 are further adapted to rotate the agitating members 2 in the one row in a first direction R_1 and the agitating members 2 in the other row in the opposite direction R_2 .

[0023] For this purpose the moving means 3 comprise a motor 20 which is mounted on a side of container 5 and which via a right-angled transmission 21 drives two parallel screw spindles or worms 22 having screw thread in opposing directions. These worms 22 are in engagement with toothed wheels (not shown here) in transmission units 26 of Agitating members 2, which are thus rotated in opposing directions. It is of course also possible to envisage other transmission methods, for instance by means of toothed belts or chains. For safety reasons motor 20 is otherwise connected controllably to a switch (not shown here) which indicates a closed position of covering

means 15.

[0024] In the shown embodiment there is further arranged in frame 4 a discharge conveyor 23 which runs under sorting openings 13 and which is driven by a motor 24. Motor 24 can be synchronized with motor 20 of moving means 3 such that discharge conveyor 23 also runs when separating apparatus 1 is in operation. This is important because sorting openings 13 cannot be closed. In the shown embodiment this conveyor 23 discharges the separated objects R to an elevator conveyor 25 which connects thereto and which carries objects R to a subsequent processing station.

[0025] The separation of a block B of mutually adhering fruits using apparatus 1 as described above now proceeds as follows. After the slidable part 17 of the lid has been slid open, block B is placed in container 5, wherein it come to rest on the tips of the conical agitating members 2. The lid is then closed again, whereafter motors 20 and 24 are started. Agitating members 2 then start to rotate and, using their ribs 19, release individual fruits R from block B. An increasing amount of space is herein created around agitating members 2, whereby block B drops down increasingly further over the agitating members 2, which thus penetrate still more deeply into block B. Block B is moreover forced upward by the rotation of the profiled agitating members 2 and thus kept in continuous movement. The sides of block B herein come into contact with the ribbed side walls 9, 10 of container 5, whereby fruits R are here also loosened. The fruits R detached out of or from block B fall through sorting openings 13 in the bottom of container 5 onto discharge conveyor 23. Fruits R are discharged by conveyor 23, in this embodiment to elevator conveyor 25, which must therefore be started simultaneously with separating apparatus 1. Block B is thus broken up into individual fruits R with minimal effort and at relatively high speed, wherein the risk of damage to the fruits is minimal.

[0026] Although the invention is elucidated above on the basis of one embodiment, it will be apparent that it the invention not limited thereto. The agitating members could for instance have a shape and dimensions other than shown here, and could also be moved in a different way. The number of agitating members and their disposition could also be varied. At least some of the agitating members could for instance be oriented horizontally. In addition, the container could take a different form. The form and position of the sorting openings could also be chosen differently. Finally, a collecting container could for instance also be placed at the bottom of the frame instead of a discharge conveyor, or the frame could be arranged directly above a further processing device, for instance a mixing machine. The scope of the invention is therefore defined solely by the following claims.

Claims

1. Method for mechanically separating a block (B) of

mutually adhering objects, in particular fruits like currants or raisins (R), by inserting a plurality of profiled agitating members (2) into the block (B) from at least one side, and moving the agitating members (2) in the block (B), wherein the agitating members (2) are inserted into the block (B) in substantially the same direction and perform a rotating movement around an axis (A) running substantially parallel to the direction of insertion, **characterized in that** the agitating members (2) are disposed in mutually adjacent rows, and the agitating members (2) in a first row rotate in the one direction (R_1) and the agitating members (2) in an adjacent row in the other direction (R_2).

2. Method as claimed in claim 1, **characterized in that** each agitating member (2) is of at least partly tapering form in the direction of insertion.

3. Method as claimed in claim 1 or 2, **characterized in that** the agitating members (2) are disposed fixedly and the block (B) is brought into contact therewith.

4. Method as claimed in claim 3, **characterized in that** the agitating members (2) are in upright position and the block (B) descends thereon under the influence of the force of gravity.

5. Method as claimed in claim 4, **characterized in that** the block (B) is urged upward by the agitating members (2).

6. Method as claimed in any of the foregoing claims, **characterized in that** objects (R) separated from the block (B) by the agitating members (2) are discharged through at least one sorting opening (13).

7. Apparatus (1) for separating a block of mutually adhering objects, in particular fruits like currants or raisins, comprising:

a plurality of substantially parallel profiled agitating members (2) adapted to be inserted from a side into the block (B); and
means (3) for moving the agitating members (2), the moving means (3) being adapted to rotate each agitating member (2) around an axis (A) running substantially parallel to the direction of insertion;

characterized in that:

the agitating members (2) are disposed in mutually adjacent rows; and
the moving means (3) are adapted to rotate the agitating members (2) in a first row in the one direction (R_1) and the agitating members (2) in an adjacent row in the other direction (R_2).

8. Separating apparatus (1) as claimed in claim 7, **characterized in that** each agitating member (2) is of at least partly tapering form in the direction of insertion.
9. Separating apparatus (1) as claimed in claim 7 or 8, **characterized in that** each agitating member (2) is mounted in a frame (4).
10. Separating apparatus (1) as claimed in claim 11, **characterized in that** each agitating member (2) is oriented substantially vertically.
11. Separating apparatus (1) as claimed in any of the claims 7-10, **characterized by** at least one sorting opening (13) for discharging objects (R) separated from the block (B) by the agitating members (2).
12. Separating apparatus (1) as claimed in claim 11, **characterized in that** the agitating members (2) are disposed in a container (5) accommodating the block (B) for separating, and the at least one sorting opening (13) is formed in or close to a bottom (7) of the receiving container (5).
13. Separating apparatus (1) as claimed in claim 12, **characterized in that** the container (5) is at least partly funnel-shaped and the at least one sorting opening (13) is defined between the agitating members (2) and the funnel-shaped part of the container.
14. Separating apparatus (1) as claimed in claim 13, **characterized in that** the container (5) comprises a funnel-shaped part for each agitating member (2).
15. Separating apparatus (1) as claimed in any of the claims 11-14, **characterized in that** at least one at least partly tapering, stationary separating member (14) which partly defines the sorting opening(s) (13) is disposed in a space between the rows left clear by a number of adjacent agitating members (2).

Patentansprüche

1. Verfahren zum mechanischen Trennen eines Blocks (B) von aneinander haftenden Objekten, insbesondere von Früchten wie Korinthen oder Rosinen (R), durch Einführen einer Mehrzahl von Profil-Agitationselementen (2) in den Block (B) von einer Seite aus, und durch Bewegen der Agitationselemente (2) in dem Block (B), wobei die Agitationselemente (2) in im Wesentlichen der gleichen Richtung in den Block (B) eingeführt werden und eine Drehbewegung um eine Achse (A) durchführen, die im Wesentlichen parallel zu der Einführrichtung verläuft, wobei die Agitationselemente (2) in zueinander benachbarten Reihen angeordnet sind und sich die Agitationselemente (2) in einer ersten Reihe in der

einen Richtung (R_1) drehen und sich die Agitationselemente (2) in einer benachbarten Reihe in der anderen Richtung (R_2) drehen.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** jedes Agitationselement (2) in der Einführrichtung eine zumindest teilweise verjüngte Form hat.
3. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Agitationselemente (2) fest angeordnet sind und der Block (B) damit in Kontakt gebracht wird.
4. Verfahren gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die Agitationselemente (2) in aufrechter Position sind, und sich der Block (B) daran unter dem Einfluss der Schwerkraft nach unten bewegt.
5. Verfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** der Block (B) durch die Agitationselemente (2) in Richtung nach oben gezwungen wird.
6. Verfahren gemäß irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** Objekte (R), die durch die Agitationselemente (2) von dem Block (B) getrennt werden, durch mindestens eine Sortieröffnung (13) hindurch abgeleitet werden.
7. Vorrichtung (1) zum Trennen eines Blocks von aneinander haftenden Objekten, insbesondere von Früchten wie Korinthen oder Rosinen, aufweisend:

eine Mehrzahl von im Wesentlichen parallelen Profil-Agitationselementen (2), die angepasst sind, um von einer Seite aus in den Block (B) eingeführt zu werden, und

Mittel (3) zum Bewegen der Agitationselemente (2), wobei die Bewegungsmittel (3) angepasst sind, um jedes Agitationselement (2) um eine Achse (A) zu drehen, die im Wesentlichen parallel zu der Einführrichtung verläuft,

dadurch gekennzeichnet, dass:

die Agitationselemente (2) in zueinander benachbarten Reihen angeordnet sind, und die Bewegungsmittel (3) angepasst sind, um die Agitationselemente (2) in einer ersten Reihe in der einen Richtung (R_1) und die Agitationselemente (2) in einer benachbarten Reihe in der anderen Richtung (R_2) zu drehen.
8. Trennvorrichtung (1) gemäß Anspruch 7, **dadurch gekennzeichnet, dass** jedes Agitationselement (2) in der Einführrichtung eine zumindest teilweise ver-

jüngte Form hat.

9. Trennvorrichtung (1) gemäß Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** jedes Agitationselement (2) in einem Rahmen (4) montiert ist.

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10. Trennvorrichtung (1) gemäß Anspruch 9, **dadurch gekennzeichnet, dass** jedes Agitationselement (2) im Wesentlichen vertikal ausgerichtet ist.

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11. Trennvorrichtung (1) gemäß irgendeinem der Ansprüche 7 bis 10, **gekennzeichnet durch** mindestens eine Sortieröffnung (13) zum Ableiten von Objekten (R), die **durch** die Agitationselemente (2) von dem Block (B) getrennt sind.

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12. Trennvorrichtung (1) gemäß Anspruch 11, **dadurch gekennzeichnet, dass** die Agitationselemente (2) in einem Behälter (5) angeordnet sind, der den Block (B) zum Trennen aufnimmt, und die mindestens eine Sortieröffnung (13) in oder nahe bei einem Boden (7) des Aufnahmebehälters (5) ausgebildet ist.

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13. Trennvorrichtung (1) gemäß Anspruch 12, **dadurch gekennzeichnet, dass** der Behälter (5) zumindest teilweise trichterförmig ist, und die mindestens eine Sortieröffnung (13) zwischen den Agitationselementen (2) und dem trichterförmigen Teil des Behälters definiert ist.

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14. Trennvorrichtung (1) gemäß Anspruch 13, **dadurch gekennzeichnet, dass** der Behälter (5) einen trichterförmigen Teil für jedes Agitationselement (2) aufweist.

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15. Trennvorrichtung (1) gemäß irgendeinem der Ansprüche 11 bis 14, **dadurch gekennzeichnet, dass** mindestens ein zumindest teilweise verjüngtes stationäres Trennelement (14), das die Sortieröffnung (en) (13) teilweise definiert, in einem durch eine Anzahl von benachbarten Agitationselementen (2) freigelassenen Raum zwischen den Reihen angeordnet ist.

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Revendications

1. Procédé pour séparer mécaniquement un bloc (B) d'objets qui se collent entre eux, en particulier des fruits comme les raisins de Corinthe ou les raisins secs (R), en insérant une pluralité d'éléments d'agitation profilés (2) dans le bloc (B) à partir d'un côté, et en déplaçant les éléments d'agitation (2) dans le bloc (B), dans lequel les moyens d'agitation (2) sont insérés dans le bloc (B) sensiblement dans la même direction et réalisent un mouvement rotatif autour d'un axe (A) s'étendant sensiblement parallèlement à la direction d'insertion, dans lequel les éléments

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d'agitation (2) sont disposés dans des rangées mutuellement adjacentes, et les éléments d'agitation (2) dans une première rangée tournent dans la première direction (R_1) et les éléments d'agitation (2) dans une rangée adjacente, dans l'autre direction (R_2).

2. Procédé selon la revendication 1, **caractérisé en ce que** chaque élément d'agitation (2) a une forme se rétrécissant au moins partiellement progressivement dans la direction d'insertion.

3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** les éléments d'agitation (2) sont disposés de manière fixe et le bloc (B) est amené en contact avec ces derniers.

4. Procédé selon la revendication 3, **caractérisé en ce que** les éléments d'agitation (2) sont dans une position verticale et le bloc (B) descend sur ces derniers sous l'influence de la force de la gravité.

5. Procédé selon la revendication 4, **caractérisé en ce que** le bloc (B) est poussé vers le haut par les éléments d'agitation (2).

6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les objets (R) séparés du bloc (B) par les éléments d'agitation (2) sont déchargés par au moins une entrée de triage (13).

7. Appareil (1) pour séparer un bloc d'objets qui se collent entre eux, en particulier des fruits comme des raisins de Corinthe ou des raisins secs, comprenant :

une pluralité d'éléments d'agitation profilés (2) sensiblement parallèles, adaptés pour être insérés à partir d'un côté dans le bloc (B) ; et des moyens (3) pour déplacer les éléments d'agitation (2), les moyens de déplacement (3) étant adaptés pour faire tourner chaque élément d'agitation (2) autour d'un axe (A) s'étendant sensiblement parallèlement à la direction d'insertion ;

caractérisé en ce que :

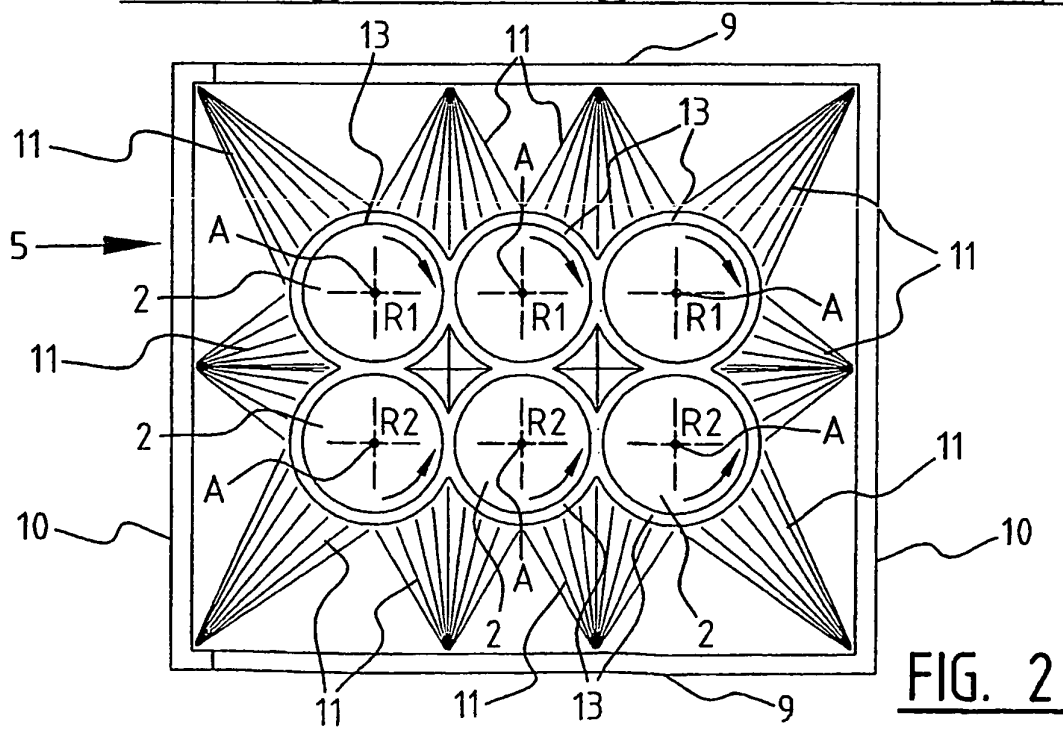
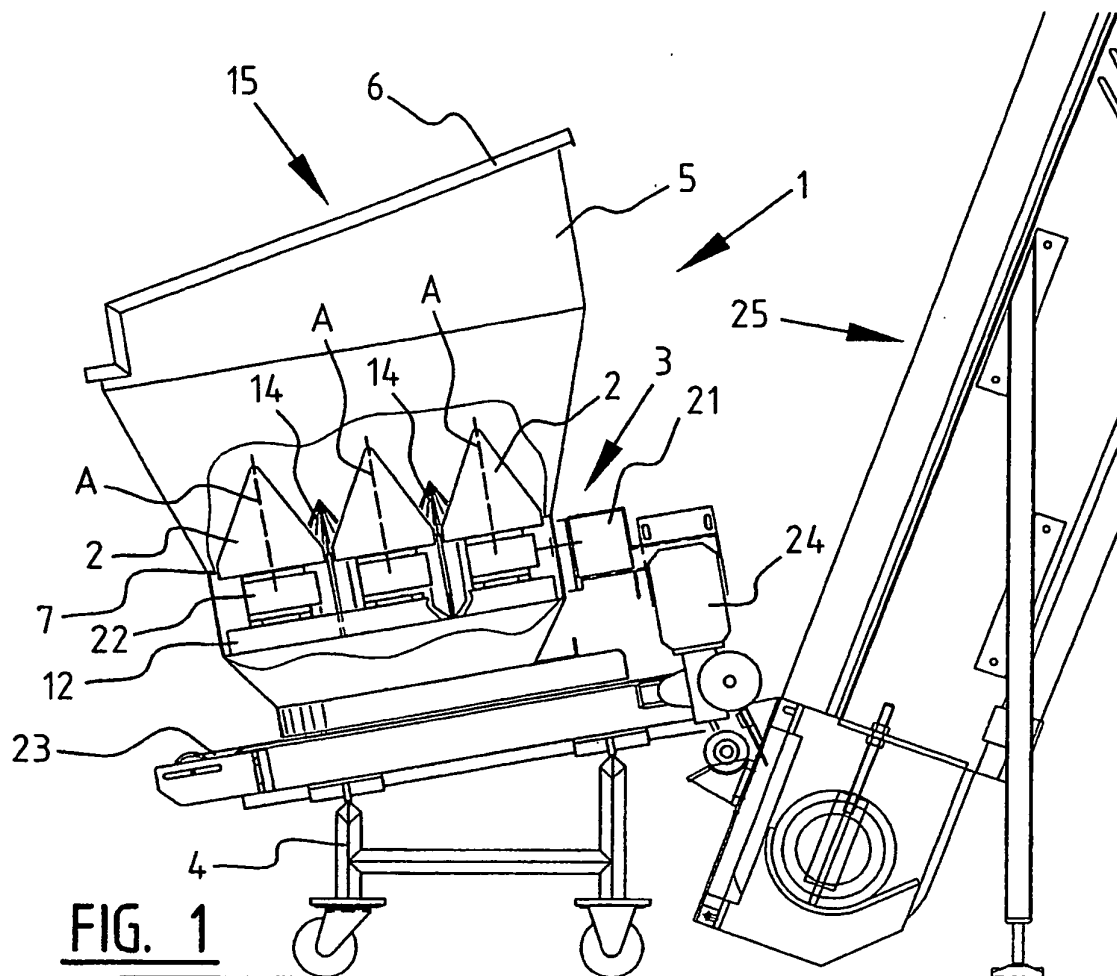
les éléments d'agitation (2) sont disposés dans des rangées mutuellement adjacentes ; et

les moyens de déplacement (3) sont adaptés pour faire tourner les éléments d'agitation (2) dans une première rangée dans la première direction (R_1) et les éléments d'agitation (2) dans une rangée adjacente dans l'autre direction (R_2).

8. Appareil de séparation (1) selon la revendication 7, **caractérisé en ce que** chaque élément d'agitation

(2) a une forme se rétrécissant au moins partiellement progressivement dans la direction d'insertion.

9. Appareil de séparation (1) selon la revendication 7 ou 8, **caractérisé en ce que** chaque élément d'agitation (2) est monté dans un châssis (4). 5
10. Appareil de séparation (1) selon la revendication 9, **caractérisé en ce que** chaque élément d'agitation (2) est orienté de manière sensiblement verticale. 10
11. Appareil de séparation (1) selon l'une quelconque des revendications 7 à 10, **caractérisé par** au moins une ouverture de triage (13) pour décharger les objets (R) séparés du bloc (B) par les éléments d'agitation (2). 15
12. Appareil de séparation (1) selon la revendication 11, **caractérisé en ce que** les éléments d'agitation (2) sont disposés dans un contenant (5) logeant le bloc (B) pour la séparation, et la au moins une ouverture de triage (13) est formée dans ou à proximité d'un fond (7) du contenant de réception (5). 20
13. Appareil de séparation (1) selon la revendication 12, **caractérisé en ce que** le contenant (5) est au moins partiellement en forme d'entonnoir et la au moins une ouverture de triage (13) est définie entre les éléments d'agitation (2) et la partie en forme d'entonnoir du contenant. 25
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14. Appareil de séparation (1) selon la revendication 13, **caractérisé en ce que** le contenant (5) comprend une partie en forme d'entonnoir pour chaque élément d'agitation (2). 35
15. Appareil de séparation (1) selon l'une quelconque des revendications 11 à 14, **caractérisé en ce que** l'élément de séparation fixe (14) au moins partiellement progressivement rétréci qui définit partiellement la (les) ouverture(s) de triage (13) est disposé dans un espace entre les rangées dépourvues d'un certain nombre d'éléments d'agitation (2) adjacents. 40
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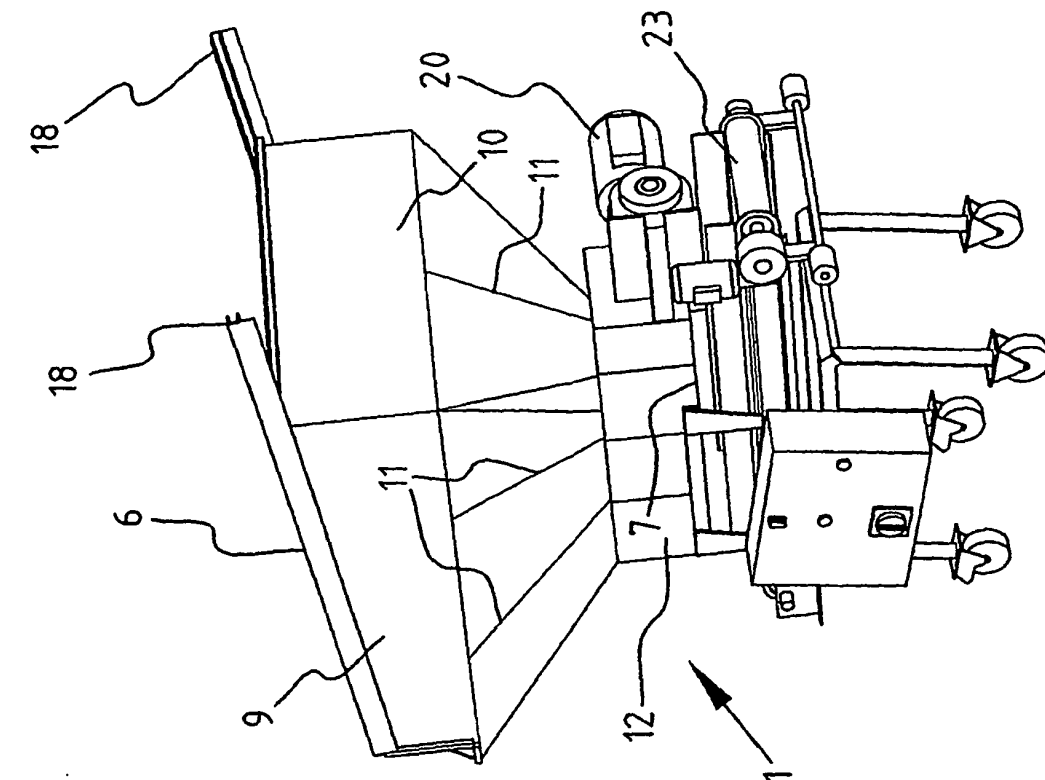


FIG. 3

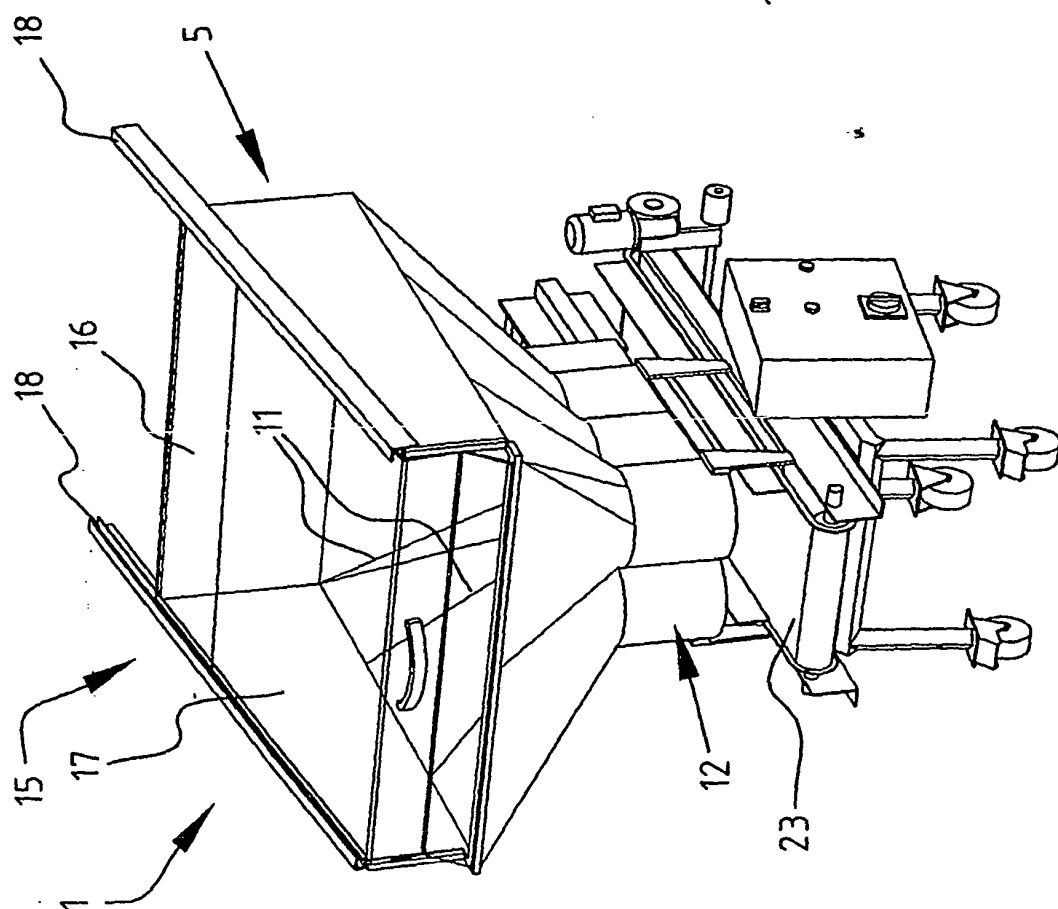


FIG. 4

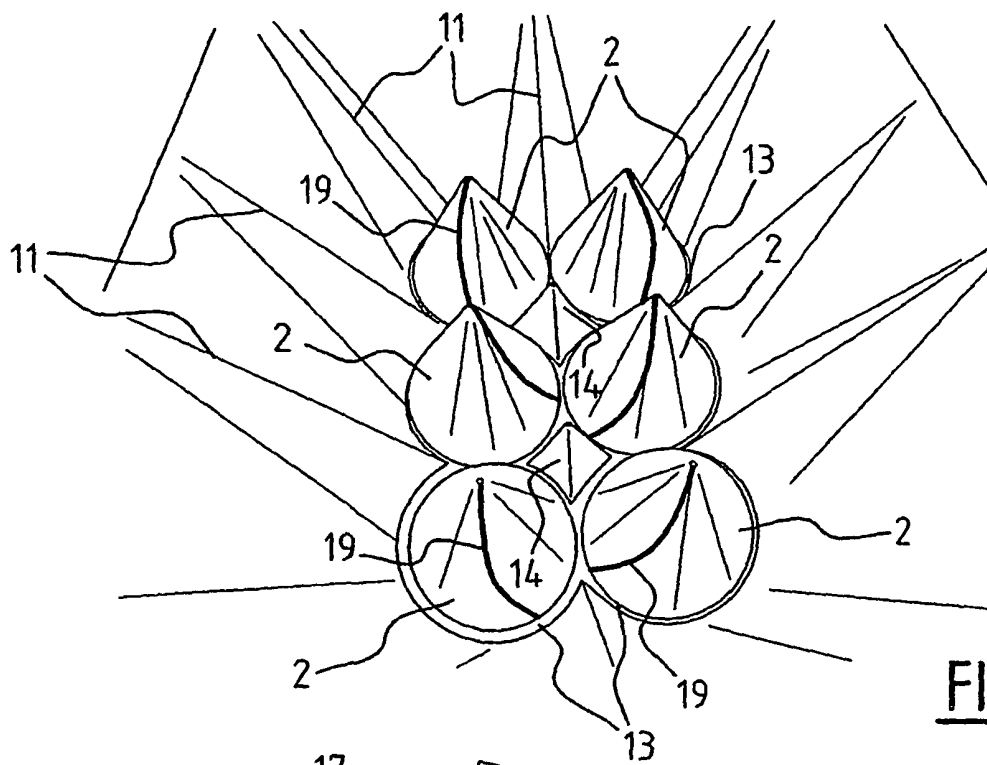


FIG. 5

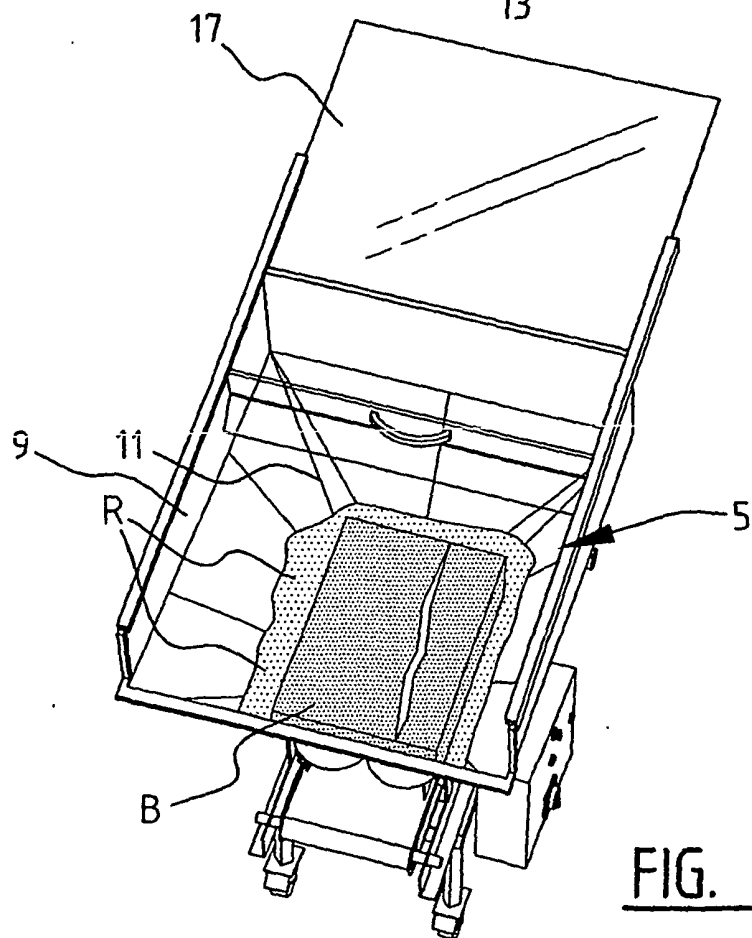


FIG. 6

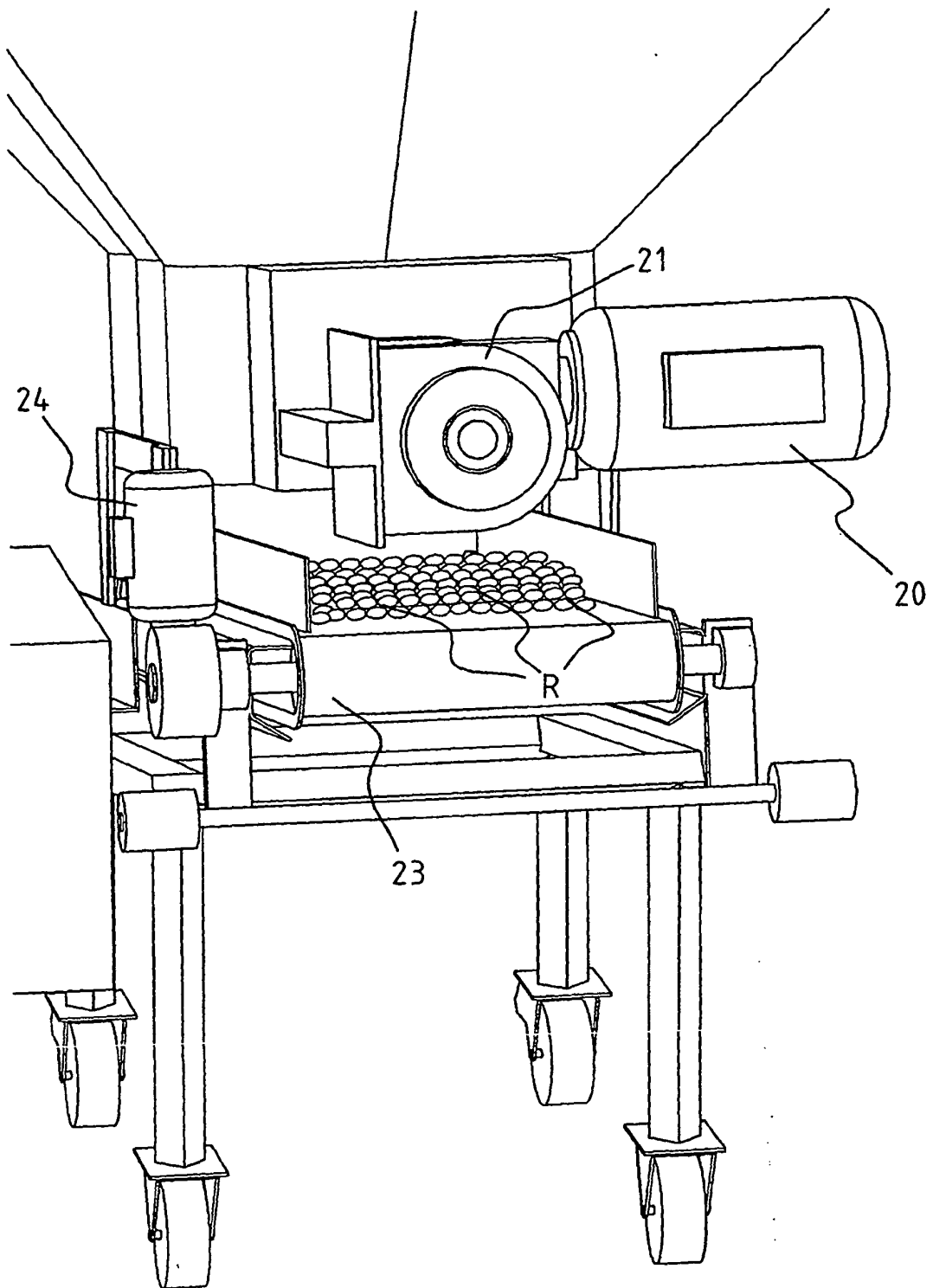


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 20305983 U1 [0001] [0004] [0005]