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(54) Continuous slicing machine with blade rotating in a horizontal plane

(57) A slicing machine (1) with its blade (2s) rotating in a horizontal plane (6) comprises fixed product conveyors (4) having a discharging section (5) opposite to the plane (6) of rotation of the blade (2s) and a first and second elements (7, 8) bearing the products respectively situated between the conveyor (4) and the blade (2) and inferiorly to the plane (6) of rotation of the blade (2s). The first bearing element (7) is provided with a surface (9) able to rotate with periodically intercepts the discharge section (5) of the conveyors (4) sustaining and bearing the products contained therein. The second bearing element (8) is provided with a surface (11) able to rotate about the axis of rotation (10) of the blade in synchrony with the first bearing element (7). The bearing elements (7,8) are provided with continuous motion and are angularly offset from each other in such a way as to subdivide the total angle of rotation of the blade (2s) into two angle fractions (b, a); in the first (b) whereof the products are subdivided into two parts initially kept in superposed contact, which are then separated by sending one towards a discharge section while the other one is loaded on the first bearing element (7) which then sustains it and bears it in sweeping the second angle fraction (a).

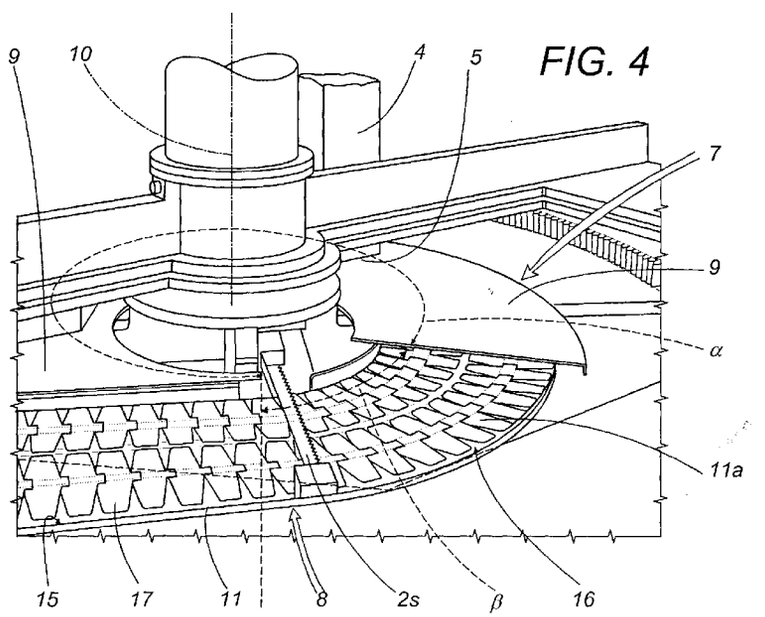

FIG. 4

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Description

[0001] The present invention relates to industrial machines for cutting food products and in particular it pertains to a continuous cutting machine with its blade rotating in a horizontal plane.

[0002] Cutting machines with blade rotating in the horizontal plane are employed in the food industry to cut products destined to be consumed in appropriately sized slices; this is the case for instance of certain large fish which, after the removal of parts not destined to human consumption, such as fins, tail and bones, are cut into slices, individually packaged and marketed.

[0003] To effect such a preparation a slicing machine is known, substantially corresponding to the preamble of claim 1, which in particular comprises a blade rotating in a horizontal plane and is provided with: tubular product conveyors having a discharge section opposite to the plane of rotation of the blade; a first bearing element for the products to be cut which is horizontally planar and is positioned between the conveyor and the blade; and lastly a second bearing element positioned inferiorly to the plane of rotation of the blade.

[0004] The two bearing elements are fixed, mutually parallel, suitably distanced and shaped in such a way as to leave the rotating blade uncovered only for a limited angular portion of its plane of rotation. The tubular conveyors instead are movable and, rotating about the axis of rotation of the blade, interact with the bearing elements in such a manner as periodically to bring a portion of product into the space interposed between the two bearing elements, where the blade at each turn of the tubular conveyors periodically intercepts the product cutting a slice therefrom.

[0005] The operating cndurance of the machine is linked to the capacity for accumulating products to be cut presented by the tubular conveyors. When the products accumulated in the convcyors have been exhausted, it is necessary to stop the machine, replenish it with new products to be cut and start a new production cycle.

[0006] Such machines fully meet the functional aims for which they are designed, however their discontinuous operation entails numerous drawbacks, such as: requiring numerous start-stop cycles which subject the machine to harsh operating conditions; requiring the constant personal supervision of operators assigned specifically to replenishing the machine; introducing inoperative cycle times which negatively bear on the unit cost of the product; and lastly not allowing to incorporate the group in groups of machines set up to perform the automatic processing and packaging of products.

[0007] The aim of the present invention therefore is to eliminate the aforementioned drawbacks.

[0008] In accordance with the invention this aim is attained by a slicing machine wherein said one or each conveyor is immobile, and said first bearing element is provided with a surface which is able to rotate about the axis of rotation of the blade and which periodically intercepts the discharge section of said one or each conveyor supporting the products contained therein; said second bearing element being provided with a surface able to rotate about the axis of rotation of the blade in synchrony with the first bearing element; said first and second bearing elements being provided with continuous motion and being angularly offset from each other to subdivide the total rotation angle of the blade into two angle fractions, in the first whereof the products transit freely through the discharge section of said one or each conveyor until bearing against the second bearing element, whereupon they are traversed by the blade and are subdivided into two parts kept in mutual superposition contact, said condition being maintained until a first part of the product is sent by the second bearing element towards a discharge section of the machine, whilst a second overlying part of the product contained in said conveyor is taken up by the first bearing element which is interposed anew after the cut between the plane of rotation of the blade and the conveyor, said first bearing element supporting said second product portion for the sweeping of the second said angle fraction.

[0009] The machine according to the invention, having stationary conveyors, can operate with continuous cycle and can be fed without any need to stop the rotating blade. Such a feature allows to reduce cycle down times and makes the machine usable, in addition to autonomous usage conditions, also under employment conditions providing for the incorporation of the machine within more complex processing lines.

[0010] The technical features of the invention, according to the aforesaid aims, shall become more clearly understandable from the contents of the claim that follow and its advantages will be made more readily apparent from the detailed description here below, made with reference to the accompanying drawings, which represent an embodiment provided purely by way of non limiting example, wherein:

- Figure 1 is a perspective overall view of a machine according to the invention shown in its entirety;
- Figures 2a and 2b are respectively a perspective overall view and a top plan view of the machine in Figure 1;
- Figures 3, 4, 5, 6 and 7 are perspective views of some details of the machine of the previous figures.

[0011] In accordance with the figures of the accompanying drawings, the number 1 indicates in its entirety a cutting machine essentially comprising a cutting apparatus 23 contained within a metal case 14 and operatively interconnected with a plurality of tubular, vertical, conveyors, fastened superiorly to the case 14 and provided with discharge section 5 inferiorly open for feeding the products towards the machine 1. The machine 1 further comprises a transfer apparatus 20 whereby the products cut into slices by the cutting apparatus 23 are ejected outside the machine 1.

[0012] The cutting apparatus 23 (Figure 2a) essentially comprises a rotating drum 13 which is peripherally sustained by rollers 24, freely rotating, borne by the case 14, and it is driven by related motor driving means which allow the rotation with continuous motion of the drum 13 about a vertical axis of rotation 10 and which, in particular, are constituted by an internally toothed crown gear 25, integral with the drum 13, and by a pinion 26 meshing with the crown gear 25, driven in continuous motion by a gearmotor 27 associated to a top horizontal wall 28 of the case 14.

[0013] The drum 13 sustains in a vertical plane, oriented radially thereto (Figures 3 and 5), a continuous metal ribbon 2, provided with saw teeth. The ribbon 2 is enclosed in a horizontal loop elongated around a pair of pulleys 29,30 with parallel horizontal axes 29a, 30a, whereof one 30 is driven to rotate by related motor driving means which, in particular, are embodied by a conventional gearmotor 31, shown in Figure 2. The metal ribbon 2, which is able to rotate about the vertical axis of rotation 10 together with the drum 13, defines by means of its two parallel branches 2s, 2i two corresponding radial blades, vertically superposed which rotate in two parallel horizontal planes 6 of the machine 1. (Figure 3 shows the horizontal plane 6 relating to the upper branch 2s of the ribbon 2, which is opposite and proximate to the discharge surface 5 of the conveyors 4 and which directly involves the functionality of the cutting machine 1)

[0014] The drum 13 also sustains two bearing elements 7,8 of the products which are positioned, in the vertical, bilaterally to the top horizontal branch 2s of the saw ribbon 2 (Figure 4) and are angularly and horizontally offset with respect to each other in order to interact with the products of the conveyors at times and operating phases that differ and are distinct from each other.

[0015] The first bearing element 7 of the products is horizontally planar and has its surface 9 shaped according to a portion of circle, in particular according to an arc of an annulus, which is integral to the drum 13, is centred on the axis 10 of rotation thereof and is vertically interposed between the plane 6 of rotation of the rotating blade 2s and the overlying conveyors 4; it is also located at such a distance from the axis 10 of rotation as to be able to oppose the discharge section 5 of the conveyors 4.

[0016] In correspondence with the rotation of the drum 13, the surface 9 of the first bearing element 7 rotates about the axis of rotation 10 of the blade 2s, and as a consequence of its deformation it intercepts, for a first fraction b of the total angle of rotation of the drum 13, the discharge section 5 of each conveyor 4 (Figure 2b). In correspondence with this condition, the products stacked within the conveyor 4 are supported by and bear against the surface 9. In the remaining second fraction a of the total angle of rotation of the drum 13, wherein the surface 9 is instead laterally offset with respect to the conveyors 4, the products contained in the conveyors 4 instead are free to transit outwards, through the discharge section 5, as shall become more readily apparent farther on in this description.

[0017] The second product bearing element 8 is positioned inferiorly to the plane 6 of rotation of the blade 2 (Figures 3 and 4) and presents a horizontal surface 11 with its plane parallel to the surface 9 of the first bearing element 7. The horizontal surface 11 of the second bearing element 8 is shaped substantially according to a portion of a circle which in particular comprises an annulus arc 11a centred on the axis or rotation 10 of the blade and joined to a rectilinear section 15 positioned in continuation of an extremity of the arc.

[0018] The second bearing element 8 is also fastened to the drum 13, so that moving integrally therewith it rotates about the axis of rotation 10 of the blade 2s in synchrony with the first bearing element 7.

[0019] The second bearing element 8 is provided with translation means 16, 19 (Figure 6) which transfer towards a lower discharge section 12, located centrally to the case 14 in a position coaxial to the drum 13, the product parts cut by the blade 2s. The translation means, in particular, comprise a continuous conveyor belt 16 associated to the surface 11 of the second bearing element 8; belt 16 which is wound around the second bearing element 8 in such a manner as to cover its surface 11 completely and which comprises a plurality of elements 17 for supporting the products concatenated in mutual succession and articulated around two axes 18x, 18z respectively parallel and transverse to the surface 11 of the second bearing element 8.

[0020] The means for translating the cut products further comprise a conveyor 19 for discharging the cut products positioned between a terminal end 11t of the surface 11 of the second bearing element 8 and the product discharge section 12.

[0021] The drum 13 further comprises (Figure 7) a scraping blade 22 borne in vertical projection towards a horizontal wall 21 of the case 14. The wall 21 (which centrally bears the discharge section 12 of the cut products) is provided with a section 32 for discharging cutting scraps and is lapped with continuity by the blade 22 which, as a result of the dragging motion imparted thereto by the drum 13, intercepts the scraps and routes them onto the related discharge section 32 through which they are then evacuated outside the machine 1.

[0022] In regard to the apparatus 20 for the continuous transfer of the cut products, referring again to Figure 1, it is noted that said transfer apparatus 20 comprises in particular a continuous conveyor belt which is situated with respect to the case 14 with its own receiving end 33 positioned inferiorly to the section 5 for the discharge of the cut products. Thus the belt allows to receive the cut products and to transfer them towards its own loading end 34 associated to a station for the further processing of the products, not shown herein, which can be embodied for instance by a station for packaging the product slices.

[0023] In use, the operation of the machine 1 can be described referring to Figure 2b, and observing that as a result of the rotation of the drum 13, and as a result of the angular offset existing between the first and the second bearing element 7, 8, the various conveyors 4, which are immobile, in the relative motion of the drum 13 with respect thereto, individually shift to two distinct conditions that depend on the fraction of angle a,b of rotation being swept.

[0024] When the rotation of the drum 13 brings a generic conveyor 4 into the first angle fraction b wherein the first bearing element 7 is displaced laterally to the discharge section 5 of the conveyor 4 itself, the products contained in the conveyor 4, freely transiting through the discharge section 5 (not intercepted by the first bearing element 7) reach a position wherein they bear against the second bearing element 8, situated inferiorly. Since in such a condition a part of the products is positioned to traverse the plane 6 of rotation of the blade 2s, upon the arrival thereof the products of the various conveyors 4 are traversed in succession and subdivided into two distinct parts: a first part situated below the plane 6 of rotation of the blade 2s and a part situated above. After the passage of the blade 2s the two parts are however kept in contact and in mutual superposition. At the end of the sweeping of said angle fraction b, the first bearing element 7 returns to intercept in succession the discharge section 5 of each conveyor 4; the lower part of the product (cut slice) thus progressively comes to separate from the overlying part of the product, whilst simultaneously advancing towards the discharge section 12 of the machine 1, by intervention of the second bearing element 8. The upper part of the product in the meantime is progressively taken up by the first bearing element 7 which again interposes itself between the plane 6 of rotation of the blade and the conveyor 4 and which sustains the products for the duration of the sweeping of the entire second angle fraction a; at the end whereof, the described cycle is repeated again in the same manner.

[0025] From the description above, it is readily apparent that the machine 1 according to the invention fully attains the stated aims and can be fed by means of the conveyors 4 with continuity without any need to stop the drum 13 whilst also being able to discharge, through the discharge section 5, uninterruptedly to the exterior the cut product parts The invention thus conceived may be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept. Moreover, all components can be replaced with technically equivalent elements.

Claims

1. Cutting machine (1) with blade (2s) rotating in a horizontal plane (6) comprising at least a product conveyor (4) having a discharge section (5) opposite to the plane (6) of rotation of the blade (2s); a first element (7) for bearing the products to be cut which is horizontally planar and is situated between the conveyor (4) and the blade (2); a second bearing element (8) positioned inferiorly to the plane (6) of rotation of the blade (2), characterised in that said one or each conveyor (4) is immobile, and in that said first bearing element (7) is provided with a surface (9) which is able to rotate about the axis of rotation (10) of the blade and which periodically intercepts the discharge section (5) of said one or each conveyor (4) sustaining the products contained therein; said second bearing element (8) being provided with a surface (11) able to rotate about the axis of rotation (10) of the blade in synchrony with the first bearing element (7); said first and second bearing element (7,8) being provided with continuous motion and being angularly offset from each other in such a way as to subdivide the total angle of rotation of the blade (2s) in two fractions (b,a) of angle, in the first (b) whereof the products freely transit through the discharge section (5) of said one or each conveyor (4) until they bear against the second bearing element (8), whereupon they are traversed by the blade (2s) and are subdivided into two parts kept in contact and in mutual superposition, said condition being maintained until a first part of the product is sent by the second bearing element (8) towards a discharge section (12) of the machine (12), whilst a second overlying part of the product contained in said conveyor (4) is taken up by the first bearing element (7) which interposes itself after the cut again between the plane of rotation 86) of the blade (2s) and the conveyor (4), said first bearing element (7) sustaining and bearing said second product part for the sweeping of the second said fraction (a) of angle.

2. Machine, according to claim 1, characterised in that it comprises a plurality of said fixed tubular conveyors (4), however positioned around the axis of rotation (10) of the blade (2s).

3. Machine, according to claim 1, characterised in that it comprises a drum (13) rotating about the axis of rotation (10) of the blade (2s) which is sustained by a fixed case (14), unitarily supports at least said bearing element (7, 8) and sends towards a discharge section 812) the cut parts of the product received from said one or each conveyor (4).

4. Machine, according to claim 3, characterised in that said discharge section (5) is coaxial with said drum (13).

5. Machine, according to claim 1, characterised in that the surface (9) of the first bearing element comprises an annulus arc centred on the axis of rotation

(10) of the rotating blade (2s).

6. Machine, according to claim 1, characterised in that the surface (11) of the second bearing element comprises an annulus arc centred on the axis of rotation 810) of the rotating blade (2s).

7. Machine, according to claim 6, characterised in that the surface (8) of the second bearing element comprises a linear section (15) off-centred with respect to the axis of rotation (10) of the blade (2s) and joined to said annulus arc.

8. Machine, according to claim 7, characterised in that said linear section (15) is rectilinear.

9. Machine, according to claims 1, 5, 7 and 8, characterised in that it comprises translating means (16, 19) which transfer towards the discharge section (12) the product parts cut by the blade (2s).

10. Machine, according to claim 9, characterised in that said translating means include a continuous conveyor belt (16) associated with the surface (11) of the second bearing element (8).

11. Machine, according to claim 10, characterised in that said belt (16) is wound around the second bearing element (8) in such a way as to encompass its surface completely (11).

12. Machine, according to any of the claims 9 through 11, characterised in that said belt (16) comprises a plurality of support elements (17) concatenated in mutual succession and articulated around two axes (18x, 18z) respectively parallel and transverse to the surface (11) of the second bearing element.

13. Machine, according to claim 8, characterised in that the means for translating the cut product comprise a conveyor (19) for discharging the cut products situated between the surface (11) of the second bearing element (8) and the product discharge section (12).

14. Machine, according to any of the previous claims, characterised in that it comprises an apparatus (20) for the continuous transfer of the cut products from the discharge section 812) to a station for the further processing of the products.

15. Machine, according to claim 3, characterised in that said case (14) comprises a wall (21) for collecting the scraps resulting from the work processes, said drum (13) comprising a scraping blade (22) which scrapes along the collecting wall (21) and transfers the scraps towards a related discharge section.

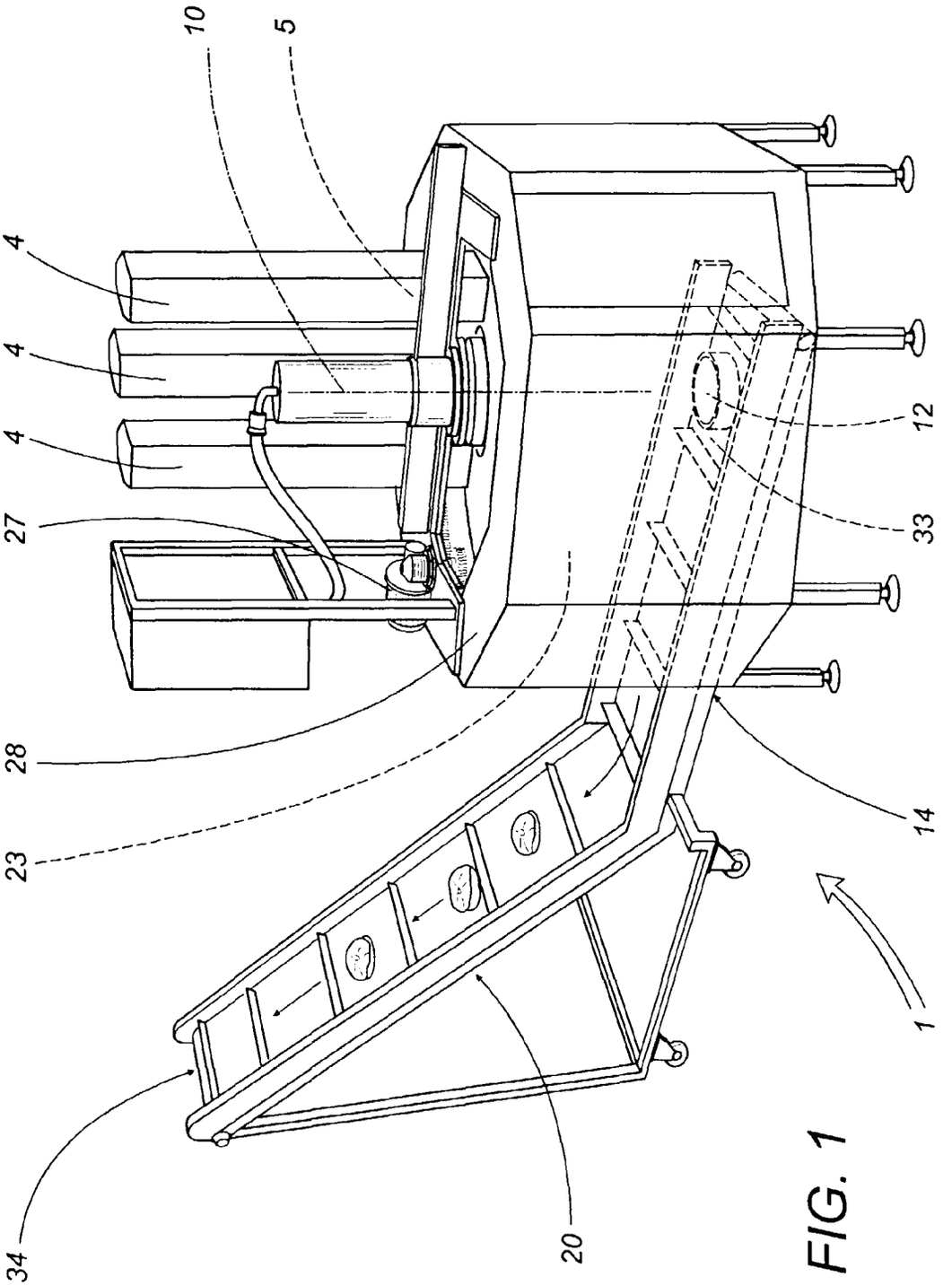
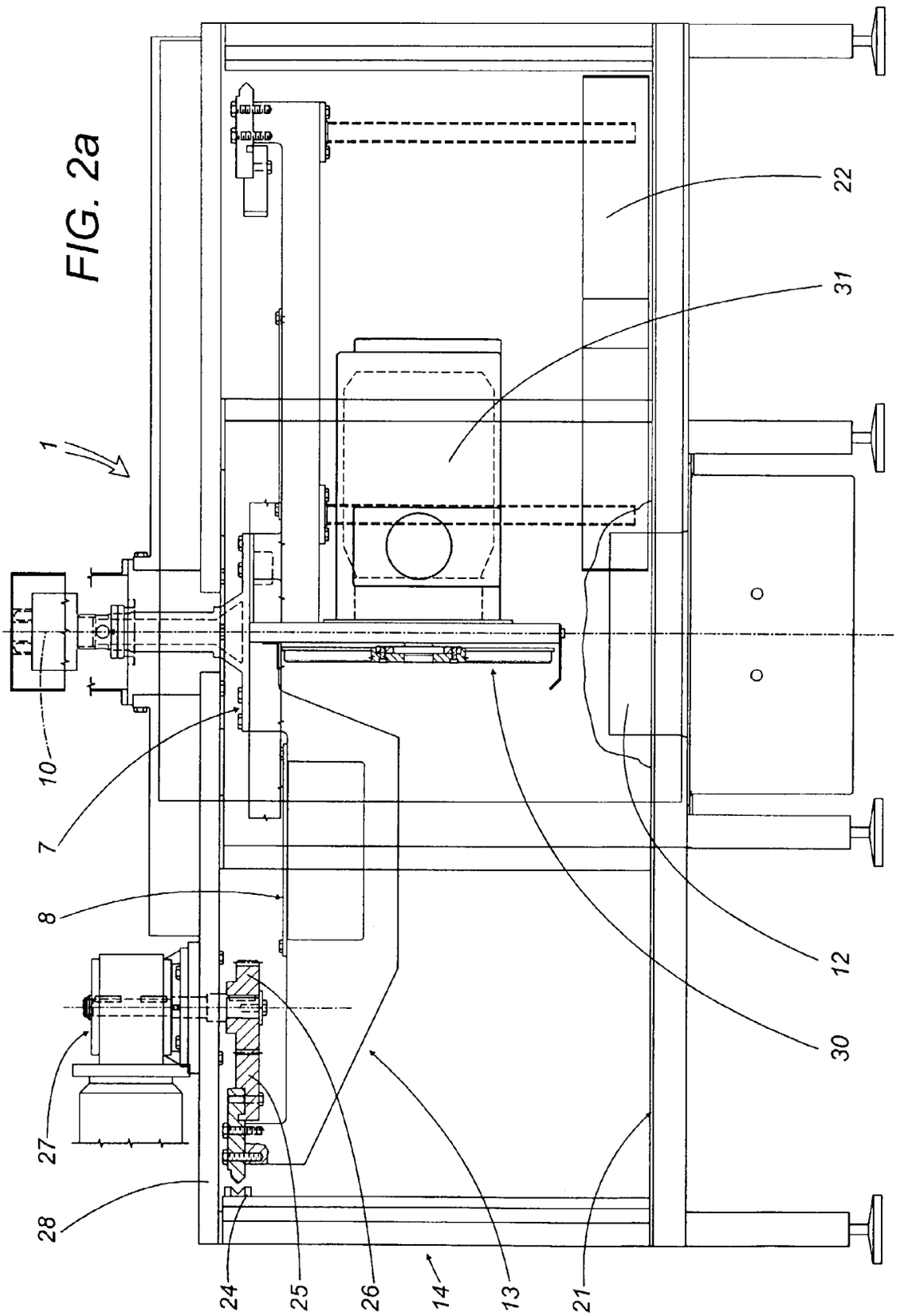


FIG. 1

FIG. 2a



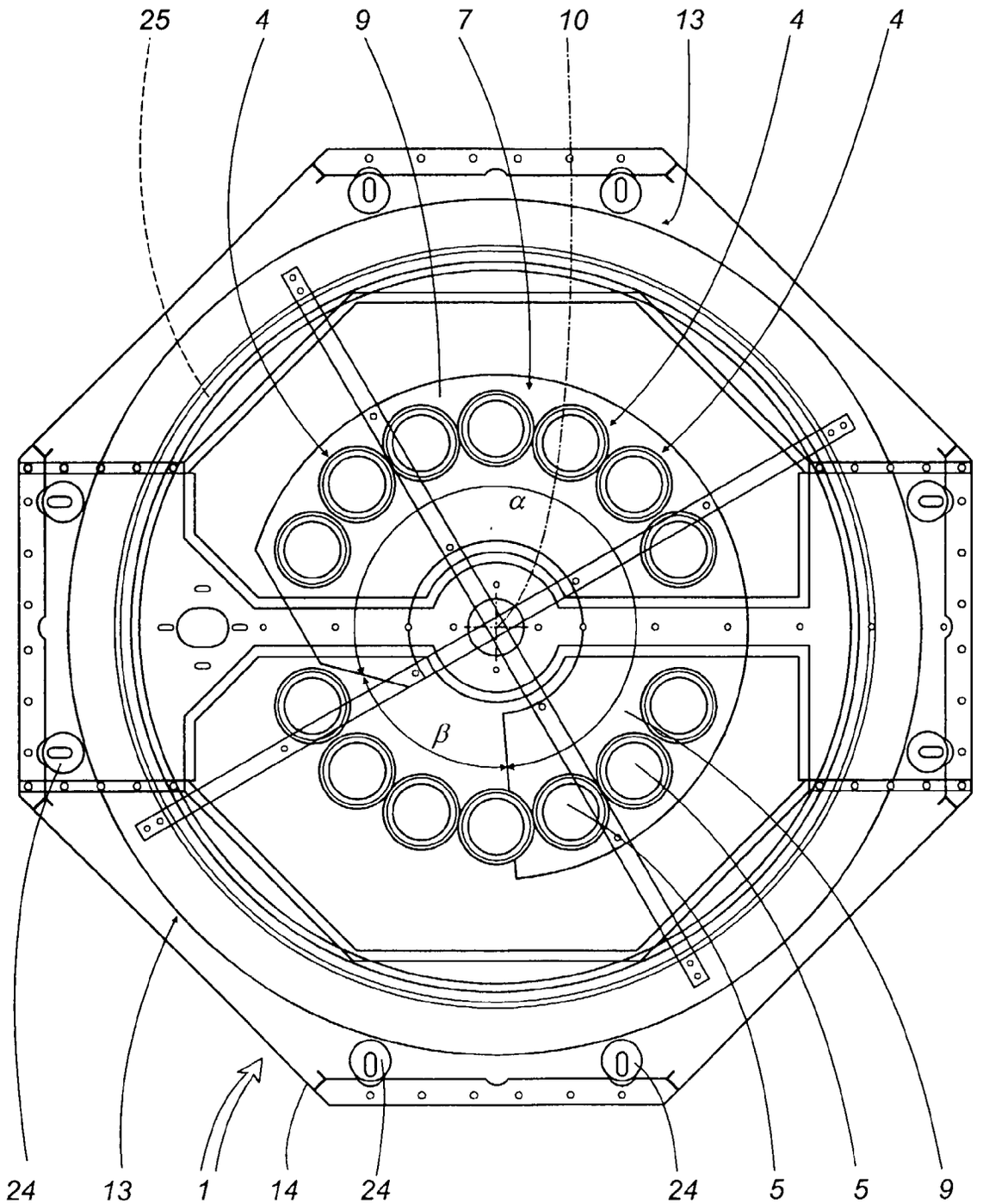


FIG. 2b

FIG.3

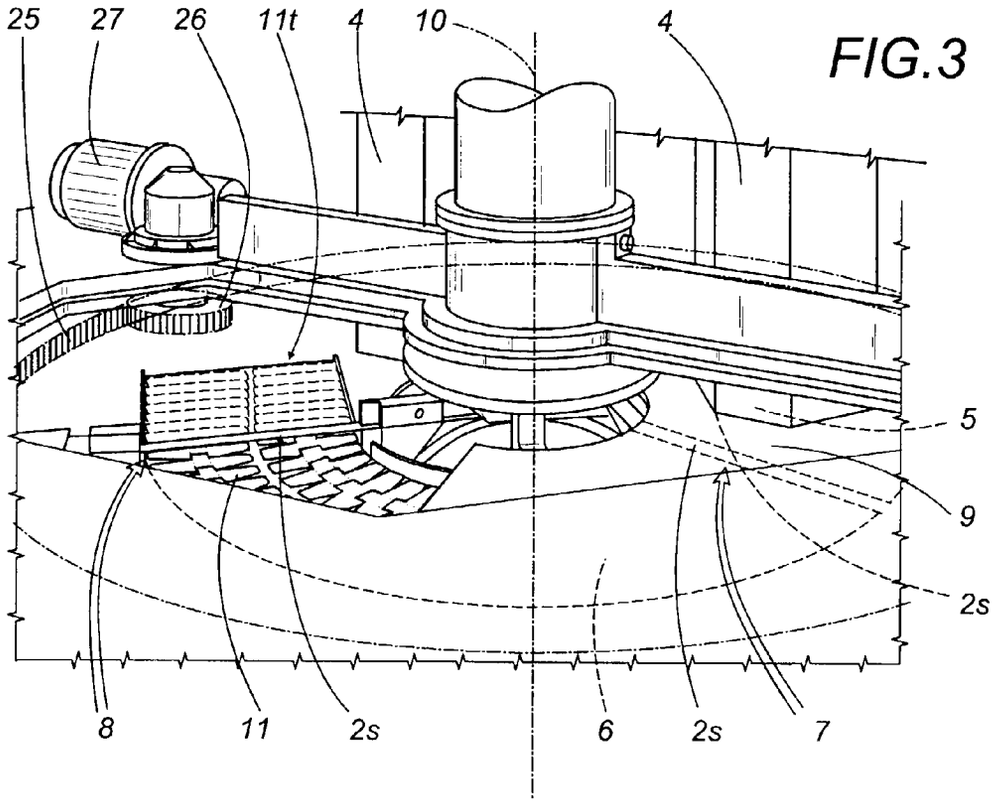
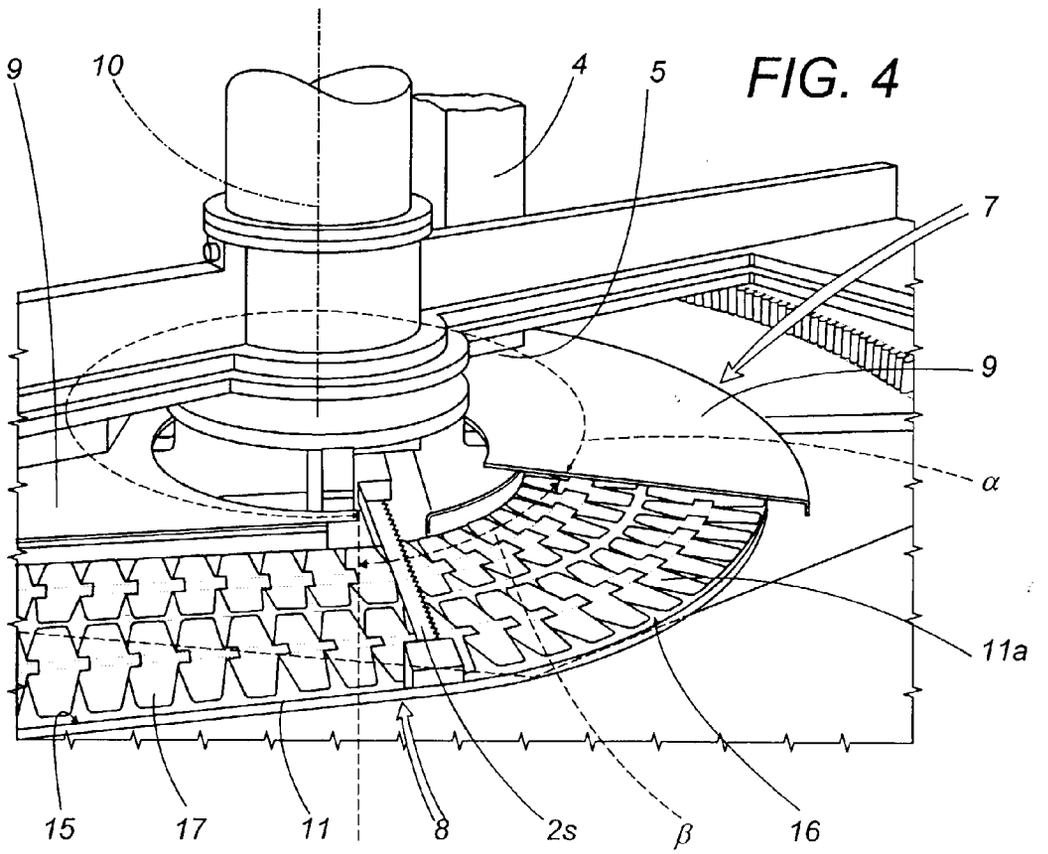


FIG. 4



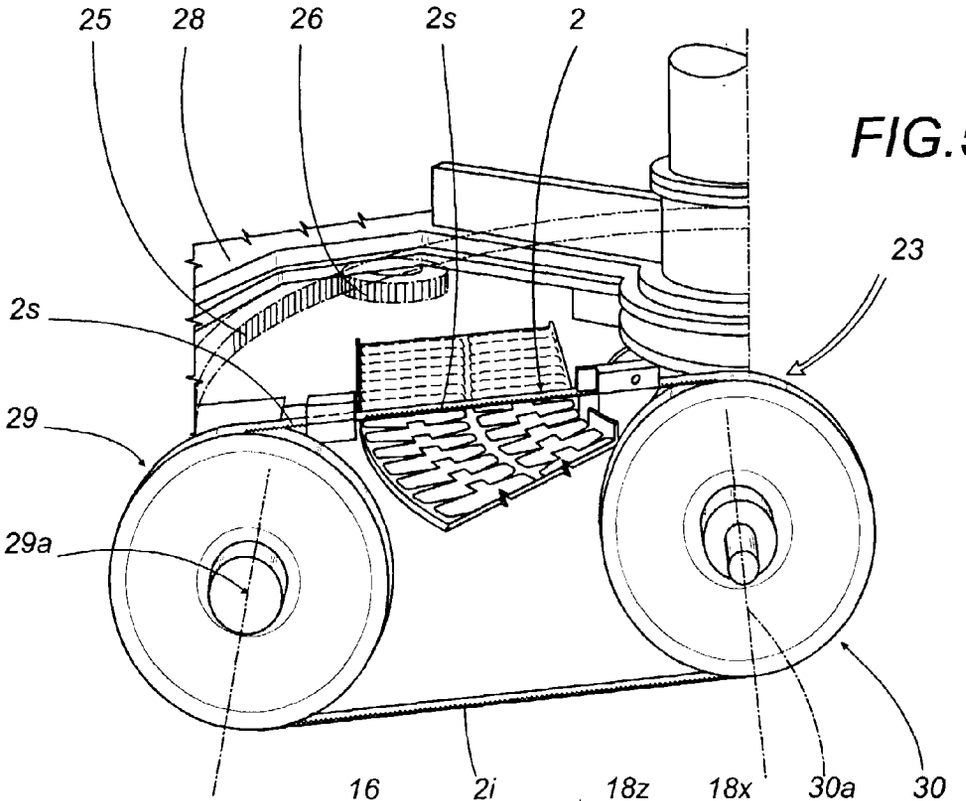


FIG.5

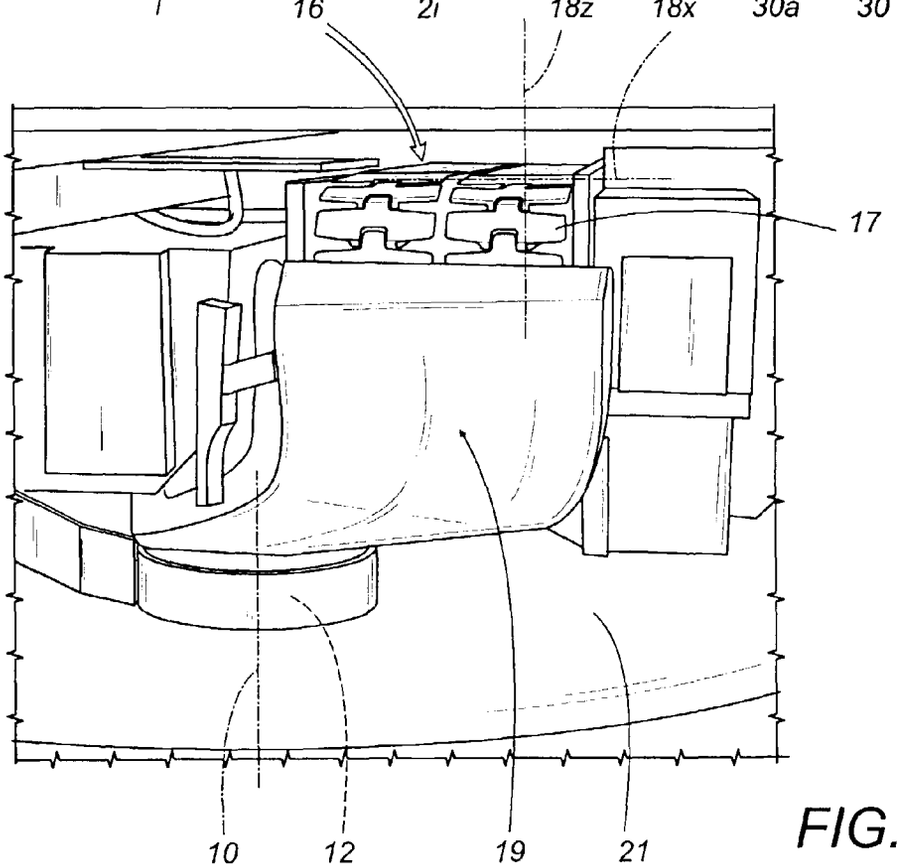


FIG. 6

FIG. 7