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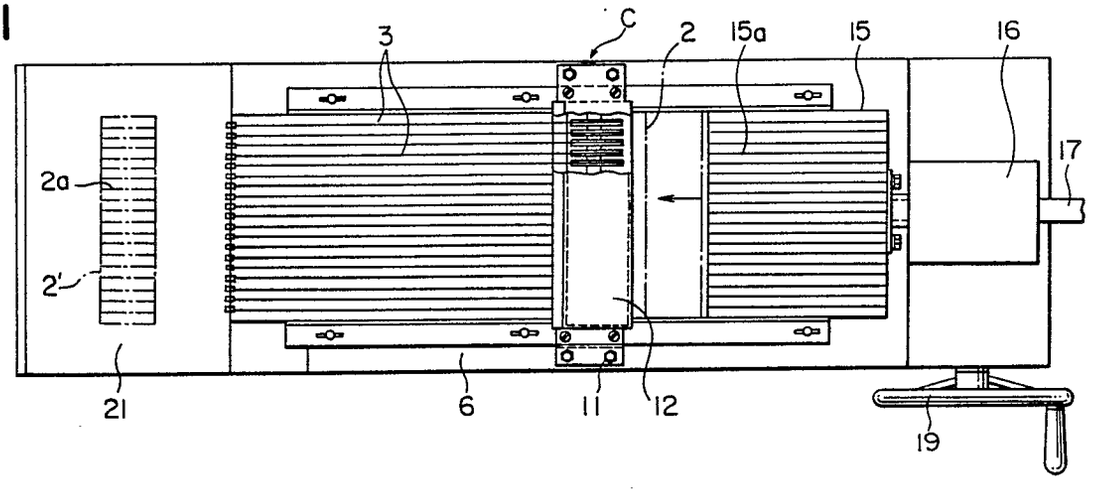
(54) Slicer.

(57) This invention is, on the slicer that slices the products for example meat or fish to many leaves simultaneously, that is equipped with the blades set parallel with each other as the plane including each blade edge set slantwise against products transfer plane, and that is equipped with the pusher that moves forward and backward on said product transfer plane. And is on the slicer that is furthermore equipped with the blades as the edges of blades set to shift one after another from the line at right angle to pusher moving line, to slice the products slantwise on the plan. And is on the slicer that is furthermore equipped with the blades as the side surface of the blades set to have inclination for the plane including said blade edges and to move said pusher for the direction of the cross line, where said side surface of the blade and the trasfer plane, to make slicing slantwise in plan and elevation.

The machine by this invention is simple and can slice said products by only pusher moving forward and backward.

FIG. 1



EP 0 326 010 A1

SLICER

This invention relates to a slicer applicable for slicing fresh and processed fish, meat, vegetable, fruits, bakery products and the like (hereafter described as work).

In the prior art, several slicers were disclosed as shown in the specification of the U.S. Pat. No.4308778 for slicing processed meat and fish and the like, but these slicers slice said work by a pair of frames with multi parallel knife blades (hereafter described as blade or blades) counter reciprocated by means of crank mechanism or other reciprocating devices, and pusher which pushes work 2 against said blades' cutting edge plane I (hereafter described as edge plane) vertically or slight slantwise in case of bread slicing seen in Fig. 23, and by passing said work through the clearaces between blades into slices.

Also bias slicing machine was proposed in 61-79597 (JP,A). This bias slicer comprises a pair of knife blade frame arranged slantwise against work pushing table plane (hereafter described as table) and reciprocated in the longitudinal direction of blade by means of crank mechanism. On the other hand, work is pushed on horizontal plane, vertically against the edge plane 1, and is sliced slantwise, because it is passed through slantwise arranged knife blades.

In the aforementioned conventional slicer shown in said U.S. Pat., work 2 is pushed vertically against edge plane 1 as shown in Fig. 23. And these slicers need heavy and large crank mechanism to reciprocate heavy knife blade frame, becoming higher in machine dimension for involving said large reciprocating blade frame,resulting in larger complexity and higher cost inevitably, which might be accepted only in large scale production line. And in aforementioned conventional bias slicer, although blades are arranged slantwise, the work 2 is pushed vertically against edges plane 1, as shown in Fig.23. And these slicers need heavy and large crank mechanism to reciprocate heavy weight of the frame of blades, resulting not desirable high in cost.

OBJECT OF THE INVENTION

The object of this invention is to solve aforementioned difficulty and defect encountered in the prior art slicers, in a slicer which slices work by pushing it against multi blade shape knives equipped in parallel direction with each other and by pushing said work through between clearances consisted of adjacent each blade, a slicer comprising said multi blades arranges as the plane constructed by cutting edges of blades against table, by setting the rear ends of blades at upper position above work upper surface and the front ends thereof at lower position under the plane of table, and without reciprocating against work, fixed at both ends of blades, and a pusher for pushing work against blades along and on the plane of table.

And the object of this invention is to solve aforementioned difficulty and defects in the prior art slicers, in a slicer, which slices a work slantwise by pushing said work against multi blade shape knives equipped in parallel direction with each other and by passing said work through between clearances consisting in adjacent each blade, a slicer comprising said multi blades arranged as the plane constructed by cutting edges of those blade , faces against table, each thereof slantwise positioned at each both of rear and front end, respectively by certain length deviated in the direction of pushing work motion from a line intersecting perpendicular to the direction thereof, arranged slantwise against the table plane by setting the rear ends of blade at upper position above work upper surface and the front ends thereof at lower position under the plane of table, and without reciprocating against work, fixed at both ends of blades, and pusher which push said work, shaped at the front surface parallely with blade ends line . slantwise positioned at both rear and front ends thereof aforementioned.

And the object of present invention is to solve aforementioned difficulty and defects in the prior art slicer, in a slicer, which slices a work slantwise by pushing said work against multi blade shape knives equipped in parallel direction with each other and by passing said work through between clearances consisted in adjacent each knife blade, a slicer comprising said blades set slantwise against said table plane by arranging rear ends thereof above the upper surface of work and front ends thereof under work table plane, and knife blades arranged slantwise at the sides thereof parallely and similarly at certain angle against the plane perpendicular to the plane constructed by a row of the said knife blade edges facing at the direction of pushing work, and said pusher which pushes work on the table against blades along the side plane of said blades slantwise at certain deviated angle from longitudinal direction of blades.

Work is loaded in front of the pusher on the table and transfered towards blades, pushed against blade edges plane, passed through clearances of parallel multi blades, sliced in same thickness onto delivery side table plane, left on the table sliced after pusher returns the initial position, ending slicing process at the

position, ready for next process.

And in this invention, work is loaded in front of pusher on the table, and is transfered and pushed against multi blade cutting edges, slantwise arranged against table plane and each thereof slantwise positioned at each both of rear and front end, respectively by certain length deviated in the direction of pushing work motion from a line perpendicular to the direction thereof, and is passed through clearances of parallel multi blades, sliced slantwise in same thickness onto delivery side table plane, left on the table sliced after pusher returns to initial position, ending slicing process, at the position ready for next process.

Further, in the slicer of this invention, work is loaded in front of pusher on the table and along the front surface of said pusher, and is transfered to the direction slantwise at certain angle against the longitudinal direction of parallel blades, which are arranged slantwise at the sides thereof parallelly and at certain angle against the plane perpendicular to the plane constructed by a row of the said blade edges facing downwards at the direction of the plane of the table, and is pushed against blades through the clearances of blades, and is sliced and left on the delivery side of table in two dimensionally slantwise sliced slices, after the pusher returns to initial position, ready for next process.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is a plan view of a slicer for example of the embodyment of claim 1 of this invention;
Fig.2 is a side view of the slicer of Fig.1;
Fig.3 is a cross sectional view taken along the line A-A of Fig.2;
Fig.4 is a view of part B of Fig.2 in enlarged scale;
Fig.5 is a view of part C of Fig.1 in enlarged scale;
Fig.6 is a perspective view of a sliced work by the slicer shown in Fig. 1 & Fig.2;
Fig. 7a is an explanation of angle of cutting function in pushing work against an edge of blade;
Fig.7b is a cross section view taken along the line X-X, Y-Y of Fig. 7 for explanation;
Fig.8 is a plan view of a slicer for example of the embodyment of claim 2 of this invention;
Fig.9 is a side view of Fig.8;
Fig.10 is a detailed drawing of part F of Fig.8;
Fig.11 is a plan view of sliced work by the slicer shown in Fig.9;
Fig.12 is a plan view of a slicer for example of the embodyment of claim 3 of this invention;
Fig.13 is a side view of Fig.12;
Fig.14 is a cross sectional view along the line of G-G of Fig.12;
Fig.15 is a cross sectional view along the line of H-H of Fig.12;
Fig.16 is a detailed plan view of part I of Fig.13;
Fig.17a is a view from arrow M direction of Fig.12;
Fig.17b is a plan view of Fig.17a;
Fig.18a is a perspective view of sliced work by the slicer shown in Fig.12 and Fig.13;
Fig.18b is an elevation view of sliced surface of the sliced work shown in Fig.18a;
Fig.19 is a view from arrow M of Fig.12 for explaining how the work is sliced;
Fig.20 is a plan view of Fig.19;
Fig.21 is a cross sectional view along the line of N-N of Fig.19;
Fig.22 is a view from arrow 0 direction of Fig.20;
Fig.23 is a view for explanation of slicing in pushing work perpendicular direction to a plane constructed by the blade edges, in a conventional reciprocating blade type slicer.

GENERAL DESCRIPTION OF THE PREFERRED EMBODYMENT

Folling is the explanation of preferred embodyments of the present invention shown in the drawings.

Before entering into above explanation, explanation referring to the principle how a slicer of the present invention can slice sharply a work by the drawing Fig.7a and Fig.7b. Blades 3 for slicing a work 2 are fixed without moving parallelly and at certain clearances in plurality, are arranged slantwise against the plane of the table 4. The angle θ of slant is preferrable 5°~45°.

Now, the work 2 is pushed on the table 4 in the direction of arrow Z against a plane 3a of the knife edges of the blade 3, and is sliced during passing a path a→c of the plane 3.

Now a study is made to understand the difference in sharpness of slicing looking at condition in case when work 2 is pushed against the plane 3a of the knife edges of the blade in a conventional slicer.

The line indicated in Fig. 7b is a cross sectional view along the line X-X in Fig.7a, appears as an isosceles triangle b c c′, and the dotted line in Fig.7b is a cross sectional view along the line Y-Y in Fig.7a, appears as an isosceles triangle a c c′. In this case, if the length of the segment b c and a c are respectively h and h_1, it is apparent $h < h_1$, so in the vertex angle β and β' of the triangle b c c′ and a c c′ respectively. $\beta > \beta'$. It must be noted that the thickness of blade 3 and blade knife edge are written thickes schmatically for easier understanding in Fig. 7b.

Therefore, as the slicing wedge angle β' in case the work 2 is pushed against the plane 3a in the direction of a→c slantwise is acuter and sharper than the slicing wedge angle β in case the work 2 is pushed against the plane 3a in the direction of b→c vertically, the forth to push the work 2 to make sharp slices is less in case pushed in the direction of arrow Z than in case pushed in the direction of arrow W. However, the slant angle θ of the blade 3 becomes smaller, the sharper the slicing wedge angle β becomes, too small slant angle θ makes the work 2 have contact with the plane 3a too long in length and time, so the slant angle θ is preferable about 5°~45°.

Following is an example of an embodyment of this invention refering to claim 1 by the drawing Fig. 1~Fig. 5. At the beginning, explanation is made about the construction of this embodyment by Fig.1~Fig.5. Parallel multi blades 3 are arranged facing at table 4 shown in Fig. 3 and Fig. 4, rear ends 36 thereof being fixed at fixing part 5, fixed at the upper position above the table 4, each of the blades 3 being inserted in a slit 5a of said fixing part 5, the front ends 3c of blades 3 being fixed at the lower position under the table 4, each of blades 3 being inserted in a slit 6a of a base 6. Front means the side to which the work 2 is pushed out and rear means the side from which the work 2 is pushed. And each blade 3 is set in a slit 5a of the fixing part 5 respectively in tesile condition pulled by a spring 8, which hooks the rear end 3b of the blade 3 at a pin 7, mentioned a little wider than both sides of the blade side face, the rear end of the said spring 8 being fixed at a carved part 5b of the spring fixing part 5 in tension rewards. The part 5 is fixed on the base 6 by support pieaces 10 bolted by bolts 9 at both sides by means of fixing bolts 11. Cover 12 is fixed to the fixing part 5 by screws 13, preventing blades 3 coming out from the slit 5a by stopping part 12a.

On the other hand, each blade 3 is set respectively at the end of the slit 6a of the base 6 by a pin 14, mounted a little higher projected than both side faces of the blade 3. A pusher 15 is for pushing the work 2 to the front side against the blade 3 and can be reciprocated on the table 4, by means of a rod 17 which is arranged at rear side in extention and held in a bearing 16, moved in reciprocating motion by a rack 18 in connection with revolving motion of a gear 20 by a handwheel 19 which is connected therewith. The pusher 15 has slits 15a corresponding to each of the blades 3 cut slantwise and upwards towards the rear side shown in Fig. 2.

Secondly, explanation about the function of the embodyment shown in Fig.1~Fig.5 is as followed. At the beginning, keep the blade 3 in the direction as the plane 3a is towards the table 4, and insert the front end 3c of the blade into the slit 6a of the base 6, and hook the pin 14 at the end of the slit 6a. And, insert the upper and rear end 3b of the blade 3 into the slit 5a of the fixing part 5, and pull with tension the blade 3 by hooking the pin 7 by the spring 8 at front end thereof, fixing the end projected piece 8a of the spring 8 in the carved part 5b of the fixing part 5, thus the blade 3 can be set slantwise according to the slant angle of the inclination of the slit 5a and 6a, and under tensile condition, as shown in Fig. 2. And then, fix the cover 12 to the fixing part 5 by the screw 13, and the upper rear ends of the blade 3 are restricted by stopping part 12a to prevent the blade3 from coming out.

Next, place the work 2 in front of the pusher 15 on the table 4 as shown in Fig.1 and Fig.2, pushing the work 2 against the blades 3 by stroke of the pusher 15 by means of the rack 18, driven by the gear 20 in connection therewith, revolved by rotation of the handwheel 19.

The work 2 is pushed against the plane 3a along the direction of arrow Z and sliced as shown in Fig.7a, and is pushed in a front table21, shaped as the product 2′, sliced in the shape of slice 2a having certain thickness. The product 2′ is left on the front table 21, after the pusher returns the initial position as shown in Fig.2, by means of reverse rotation of the handwheel 19, for preparing to start next slicing process.

Next, explanation about the construction of an embodyment referring to claim 2 shown in Fig.8~Fig.10 is as followed. Parallel multi blades 3 are arranged as the plane 3a of the blade edges facing downwards at table 4 shown in Fig.4, rear ends 3b thereof being fixed at the fixing part 5, fixed at the upper position above the table 4, each of the blade 3 being inserted in a slit 5a of said fixing part 5, the front ends 3c of blades 3 being fixed at the lower position under the table 4, each of the blades 3 being inserted in a slit 6a of the base 6, and fixing method of the rear ends 3b is same as shown in Fig. 4. The fixing part 5 is fixed on the base 6 by support pieces 10 bolted by bolts 9 at both sides by means of fixing bolt 11. Cover 12 is fixed to the fixing part 5 by screws 13, preventing blades 3 coming out from the slits 5a by stopping part 12a.

On the other hand, each blade 3 is set respectively at the end of the slit 6a of the base 6 by a pin 14,

mounted a little wider than both sides of the blade 3. A pusher 15, having the same slits 15a as shown in Fig. 1 and is for pushing the work 2 to front side against the blade 3 and can be reciprocated on the table 4, by means of a rod 17 which is arranged at rear side in extention and held in a bearing 16, moved in reciprocating motion by a rack 18 in connection with revolving motion of a gear 20 by a handwheel 19 which is connected therewith.

Further, the blades 3 are parallelly arranged as the plane 3a, constructed by cutting edges,faces against the table 4, and are also arranged slantwise by fixing the rear end 3b at the fixing part 5 and the front end 3c at the base 6, and moreover are arranged slantwise, deviating at the front end 3b and the rear end 3c of the blade 3 respectively, by a certain length in the longitudinal direction along the line inclined by θ degrees intersecting the line E, perpendicular to the pusher 15 stroke axis, thus the inclined lines 22 and 23 constructed by both front and rear ends of 3b and 3c respectively. For this reason, the fixing part 5 is formed parallely with the inclined line 22. And also a front plane 24 of pusher 15 is formed parallelly with said inclined line 22.

Next, explanation of function referring to this embodyment shown Fig 8~Fig.10 is as follows. At the beginning, keep the blade 3 in the direction as the plane 3a is towards the table 4, and insert the front end 3c of the blade into the slit 6a of the base 6, and hook the pin 14 at the end of the slit 6a. And, insert the upper and rear end 3b of the blade 3 into the slit 5a of the fixing part 5 as shown in Fig.4, and pull with tension the blade 3 by hooking the pin 7 by the spring 8 at the front end thereof, fixing the end projected piece 8a of the spring 8 in the carved part 5b of the fixing part 5, thus the blade 3 can be set slantwise according to the angle of the inclination of the slit 5a and 6a , and under tensile condition, as shown in Fig.9. And then,fix the cover 12 to the fixing part 5 by the screws 13, and the upper rear ends of the blade 3 from coming out.

Next, place the work 2 in front of the pusher 15 on the table 4 slantwise along the front plane 24 of the pusher 15 as shown in Fig.8, pushing the work 2 against the blade 3 as placed along the front plane of the pusher 15 slantwise, deviated from the direction the stroke axis, by means of the rack 18, driven by gear 20 in connection with revolved by rotation of the handwheel 19. The work 2 is pushed against the plane 3a along the direction of arrow Z and sliced as shown in Fig.7a ,and is pushed onto a front table 21, in shape of the sliced product $2''$, sliced in shape of each slice 2a having certain thickness. The produce $2''$ is left on the front table 21, after the pusher returns to initial position as shown in Fig.8, by means of reverse rotation of the handwheel 19, for preparing to start the next slicing process.

Next, explanation about the construction of an embodyment referring to claim 3 shown in Fig.12~Fig.17 is as follows. Parallel multi blades are arranged as a plane 3a of blade edges facing downwards at a table 4, and also arranged slantwise at the side plane thereof parallely by certain angle against the plane perpendicular to the plane constructed by a row of the blade edges, the rear ends 3b thereof being fixed at inclined grooves of the slit 5a′ of a fixing part 5 fixed at the upper position above the table 4, the front ends 3c of blades 3 being fixed at the lower position under the table 4, each of the blade 3 being inserted in an inclined groove of slit 6a′ of a base 6, and fixing method of the rear ends 3b with spring 8 is same as shown in Fig.4. The fixing part 5 is fixed on the base 6 by support pieces 10 bolted by bolts 9 at both sides by means of fixing bolt 11. Cover 12 is fixed to the fixing part 5 by screws 13, preventing blades 3 comming out from the slit 5a by stopping part 12a as shown in Fig.4. On the other hand, each blade 3 is set respectively at the end of an inclined groove of the slit 6a′ of the base 6 by a pin 14, mounted a little wider than both sides of the blade 3, thus the blade 3 is fixed at an end 3c shown in Fig.17. A pusher 15 having the same slit 15a as shown in Fig.1, is for pushing the work 2 against the blade 3 group in the direction of arrow L slantwise deviated by γ degrees from the longitudinal direction of the blade 3 on the table 4, by means of a rod 17 which is arranged at rear side in extention and held in a bearing 16, moved in reciprocating motion by a rack 18 in connection with revolving motion of a gear 20 by a handwheel 19 which is connected therewith, guided by guides 25 and 25 arranged at the both sides of the blade 3.

Next, explanation of function referring to this embodyment shown in Fig.12~Fig.17 is as follows. At the beginning, keep the blade 3 slantwise as the plane 3a of the blade edges, facing downwards at the table 4 and slso arranged slantwise at the side plane thereof parallelly by certain angle against the plane perpendicular to the plane constructed by a row of the blade edges, front ends 3 thereof being fixed by inserting the ends 3 in inclined slit 6 , and by hooking pins 14 at the ends of the slits 6 . And insert the upper ends 3 of the blades 3 in inclined slits of the stopping part 5, simultaneously pull with tension the blade 3 by hooking the pins 7 by the spring 8 at the front ends thereof, fixing the end projected pieces 8 of the spring 8 in the carved parts 5 of the stopping part 5, thus the blades 3 can be set slantwise according to the angle of inclination of the slits 5 and 6 , in two dimensional slant; longitudinal slant and blade side plane slant. And fix the cover 12 to the fixing part 5 by the screws 13, and the upper rear ends of the blade 3 are restricted by stopping part 12 to prevent the blade 3 from coming out.

Next, place the work 2 in front of the pusher 15 on the table 4 as shown in Fig.12 and Fig.13, pushing the work 2 against the blades by pusher guided by the guide 25 and 25, by means of stroke motion of the rack 18 and the rod 17 in connection with gear 20 rotated by the handwheel 19. The work 2 is pushed slantwise against the blade edge plane 3 in the direction of the arrow L, being sliced after passing the blade 3 group in shape of a slice 2 of two dimensionally slantwise sliced and of certain thickness of an intact sliced product 2‴, pushed onto the table 21. The intact sliced product 2‴ is left on the table 21 after the pusher 15 returns to the initial position as shown in Fig.12 by means of reverse revolution of the handwheel 19, for preparing the start the next slicing process.

Above-mentioned embodyments are not limited in only horizontal fixed table 4 as described. And the pusher thereof can be operated by any kinds of power.

Now, explanation about how the sliced produced shown in Fig.18a and b is slantwise sliced, when look from upward and also from side in the direction of pusher stroke, namely in two dimension, is as follows referring to Fig.19~Fig.22.

Fig. 19 is a drawing of blade 3 in elongated scale seen along the arrow M, and Fig.20 is a plan view of Fig.19 showing two blades 3. Fig.21 shows a cross sectional view along a line N-N in Fig.19. Fig.22 is a view seen in the direction of arrow 0 in Fig.20. Note, the direction of arrow 0 is the same direction L of the pusher stroke. Now, suppose the blade 3 is so arranged as the blade edge line in the blade edge plane 3a intersects the table 4 plane by θ degrees in Fig.19, and in Fig.21, the blade 3 is so arranged as the blade edge plane d~d′ intersects the blade side plane by ϕ degrees, and the plane perpendicular to plane d~d by $(90^\circ - \phi)$ degrees, and the width of the blade 3 is P, and the width of the blade 3 seen from the side is P_1,

$P_1 = P \times \sin\phi$ ① And if the width of blade 3 in plan is P_2,

$P_2 = P \times \cos\phi$ ②

In Fig.19 a horizontal plane rises by H_1 in hight from the table 4 intersects the blade cutting edge and blade back side edge at respectively point a′, point b′, then, in Fig.20, point a_1′, b′ and a_2′, b_2′ are the points where plane in H_1 hight intersects said blade cutting edge and back side edge respectively. Then, the cross section of blade 3 slong the horizontal plane H_1 is shown as 3′ in Fig.20, and the angle γ which the direction a_1′ - e along the length of blade 3 makes with the direction of cross section 3′ is the same angle γ which the line in arrow L direction makes with the line in arrow K direction in Fig.12.

Here, given the length of (a′~b′) in Fig.19 is (a′~ b′)E in Fig.20

$\gamma = \tan^{-1}\{ P / (a'\sim b')E\}$ ③ $(a'\sim b')E = P / \sin\theta$

from equation ①

$$P_1 / \sin\theta = P \times \frac{\sin\phi}{\sin\theta} \quad \cdots\cdots ④$$

$$\therefore \quad \gamma = \tan^{-1}\left\{ P \times \cos\phi / P \times \frac{\sin\phi}{\sin\theta} \right\}$$

$$= \tan^{-1}(\sin\theta \times \cos\phi / \sin\theta)$$

$$= \tan^{-1}(\sin\theta / \cos\phi)$$

In fig.20, as the angle the longitudinal direction of the blade 3 makes with the line a_1′ and a_2′ where the cutting edges thereof is right angle, then if the front surface 26 in Fig.12 of the pusher 15 is parallel with the line a_1′~a_2′, and the direction of stroke of the pusher 15 is in the direction of arrow 0, along the direction deviated by γ degrees from the longitudinal direction of the blade 3, it is clear that the work can be sliced slantwise by γ degrees in plan view.

And in Fig.19, a horizontal plane rises by H_2 in hight from the table 4 intersects the blade cutting edge and blade back side edge at respectively point g and i, a segment g~i is parallel with a′~b′, and slantwise by γ degrees from the longitudinal direction of the blade 3. And in Fig.20, a line m~g (the slit 6a′) where the blade 3 intersects the plane of the table 4 is also parallel with the segment g~1, and a_1′ b′.

And in Fig.19, the vertical lines including a′ and g intersects the plane of the table 4 at point k and l, then

length of k~l $= \{(H_1-H_2)/\tan\theta\}$ ⑥ length of k~m $= H_1 / \tan\theta$ ⑦ Therefore, in Fig.20

from ⑥ k-l $= \{(H_1-H_2)/\tan\theta\} \times \sin\gamma$ ⑧

from ⑦ k-m $= (H_1/\tan\theta) \times \sin\gamma$ ⑨

from ⑧ $\tan\delta = (H_1-H_2)/\{(H_1-H_2)/\tan\theta\} \times \sin\gamma \tan\theta/\sin\gamma$ ⑩

from ⑨ $\tan\delta = H_1/(H_1/\tan\theta) \times \sin\gamma = \tan\theta/\sin\gamma$ ⑪

By analysising the equations ⑤ and ⑪ , it appears clear that the smaller the angle ϕ (it means larger inclination of the side plane of the blade against the plane perpendicular to the horizontal plane and includes the cutting edge of the blade), the larger the angle γ in another word, the larger the degree of inclination of slice face in plan view of the work, and the larger the angle δ, namely the larger the degree of the inclination of slice face in side view of the work.

Next, in Fig.22, suppose that the pusher, the front face 26 thereof being parallel to the plane constructed by the two perpendiculars to the horizontal plane from a_1' and a_2' in Fig.20, is driven to slice the work 2 in the direction of the arrow 0 in Fig.20 (the direction of the arrow L in Fig.12) , and the hight of the work is H_1, then, during pushing motion, the surface of the work 2 gets into contact with the edge line along $a_1' \rightarrow b'$, $a_2' \rightarrow b_2'$ and by further pushing motion, the lower part of the work gets into contact with the edge line along the line $a_1' \sim g$ and $a_2' \sim g'$, finally the work is parallelly sliced along the line $a_1' \sim b'$ and $a_2' \sim b_2'$ in Fig.20. And the part of the work 2, at H_2 in hight, gets into contact with the edge line at point g and g' and further,the lower parts get into contact with the edge line along the line g~m and g'~m', finishing slicing at δ degree inclination in side view of the work.

And the relation among the angles, θ (inclination angle of the blade in its longitudinal direction), ϕ (inclination angle of the blade in its lateral direction), γ {angle of pushing direction: $\tan^{-1}$) $\sin\theta / \tan\phi$)}, and δ (inclination angle of slicing in the vertical plane of the work) is shown by an example of actual calculation as follows :

Table 1

θ°	ϕ°	γ°	δ°
13	30	21,29	32,45
13	45	12,68	46,45
13	50	10,69	51,22
13	60	7,399	60,84
13	70	4,68	70,54

EFFECT OF THIS INVENTION

As above explained. in the slicer of this invention, which comprises the blades, the edge plane of which facing downwards, fixing slantwise and not reciprocated, angle of cutting function, by which the work is pushed against the blades on the table, is far more sharper than in case the work is pushed against the blades in the direction perpendicular to the edge plane. By this reason, the slicer of this invention can slice the work into sharper, more beautiful and nicer slices with less forth required. Moreover this invention can provide cheaper and less trouble slicer, than conventional ones, because of its simple and compact structure, and so it is more acceptable to small scale works.

And the slicer of this invention is constructed by the blades arranged as the plane constructed by cutting edges of said blades faces against the table and is fixed without reciprocation, and each thereof is slantwise positioned at each both of rear and front end respectively by certain length deviated in the direction of pushing work motion from a vertical line intersecting the direction axis of pushing, and by the pusher, shaped at the front surface parallelly with blade ends line, slantwise positioned at both rear and front ends thereof, and so if the work is put on the table and in front of the pusher along the pusher front surface and is pushed in the direction of pushing axis, the work is easily sliced in certain thickness slantwise. In this case, too, angle of cutting function of the blade edge to the work is far more sharper than the angle of cutting function of the blade edge in a conventional slicer where the work is pushed against blade edges vertically.

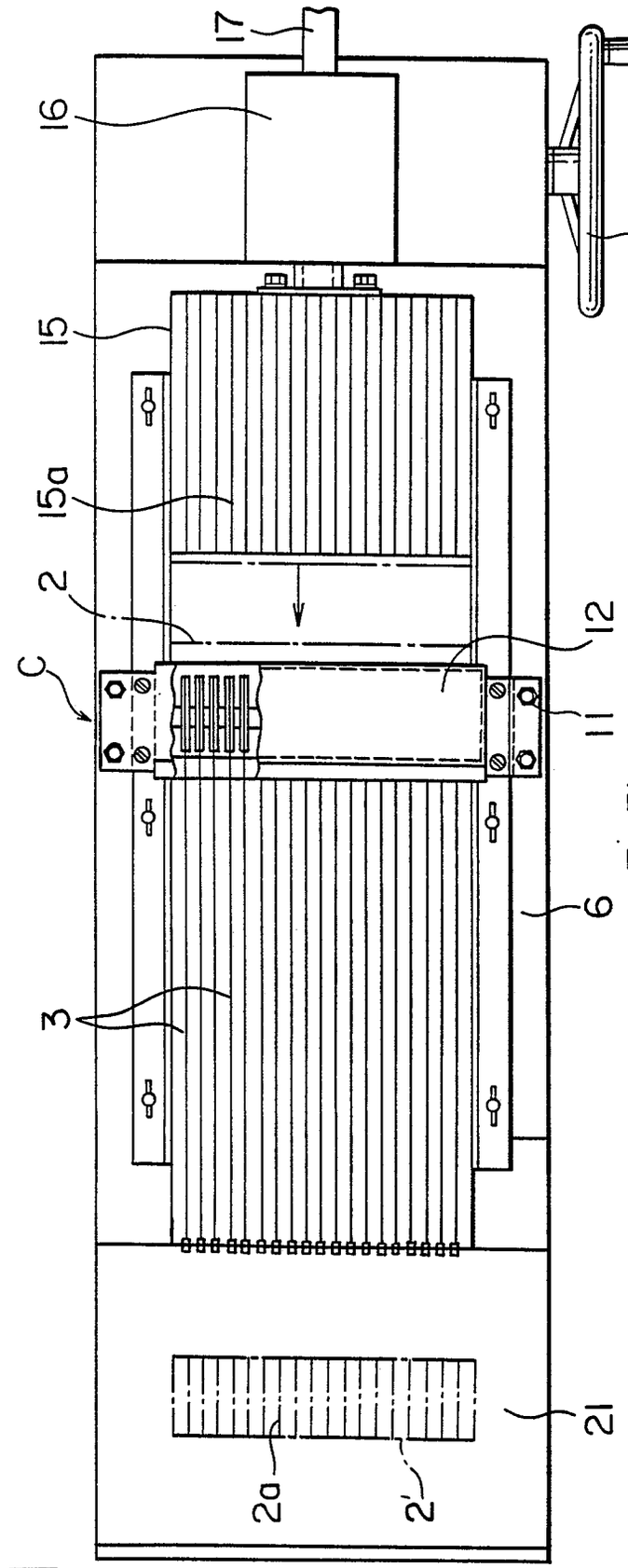
And. by the slicer of this invention, which comprises the blades, arranged slantwise in the direction from rear to front, and also slantwise at the side plane parallelly by certain angle against the plane perpendicular to the plane constructed by a row of the blade edges facing downwards, and the pusher which pushes the work in the direction deviated at certain angle from the longitudinal direction of the blades, the work is sliced by one stroke of slicing, by pushing said work against the row of blades, into two dimensionally slantwise sliced slicer.

Claims

1. In a slicer slicing a work by pushing said work against multi knife blades equipped in parallel direction with each other and by passing said work through between clearances consisting in adjacent each blade: a slicer which comprises said blades arranged as the plane constructed by cutting edges of said blades faces against a pushing work table, by setting the rear ends of said blades at upper position above said work upper surface and the front ends thereof at lower position under the plane of said table, and without reciprocating against said work, fixed at both rear and front ends of blades, and at least a pusher for pushing said work against said blades along and on the plane of said table.

2. In a slicer slicing a work slantwise by pushing said work against multi knife blades equipped in parallel direction with each other and by passing said work through between clearances consisting in adjacent each blade; a sliver which comprises said blades arranged as the plane constructed by cutting edges of said blades faces against a work pushing table, each thereof slantwise positioned at each both of rear and front end respectively by certain length deviated in the direction of pushing work motion from a vertical line intersecting the direction axis thereof, arranged slantwise against said table by setting the rear ends of said blades at upper position above upper surface of said work and the front ends thereof at lower position under the plane of said table, and without reciprocating against said work, fixed at both ends of said blades, and at least a pusher which pushes said work, shaped at the front surface parallelly with the intersecting line of the plane of said cutting edges of said blades and the plane of said table.

3. In a slicer slicing a work slantwise by pushing said work against multi knife blades equipped in parallel direction with each other and by passing said work through between clearances consisted in adjacent each knife blade; a slicer which comprises said blades arranged slantwise against a pushing work table plane by arranging rear ends thereof upper the surface of said work, and front ends thereof under the plane, and said blades arranged slantwise at the side plane thereof parallelly by certain angle against the plane perpendicular to the plane constructed by a row of the said blade edges facing downwards in the direction of pushing work motion, and at least a pusher which pushes said work on the plane of said table against said blades in the parallel direction of the intersecting lines of the side planes of the said blades and the plane of said table.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21
2a
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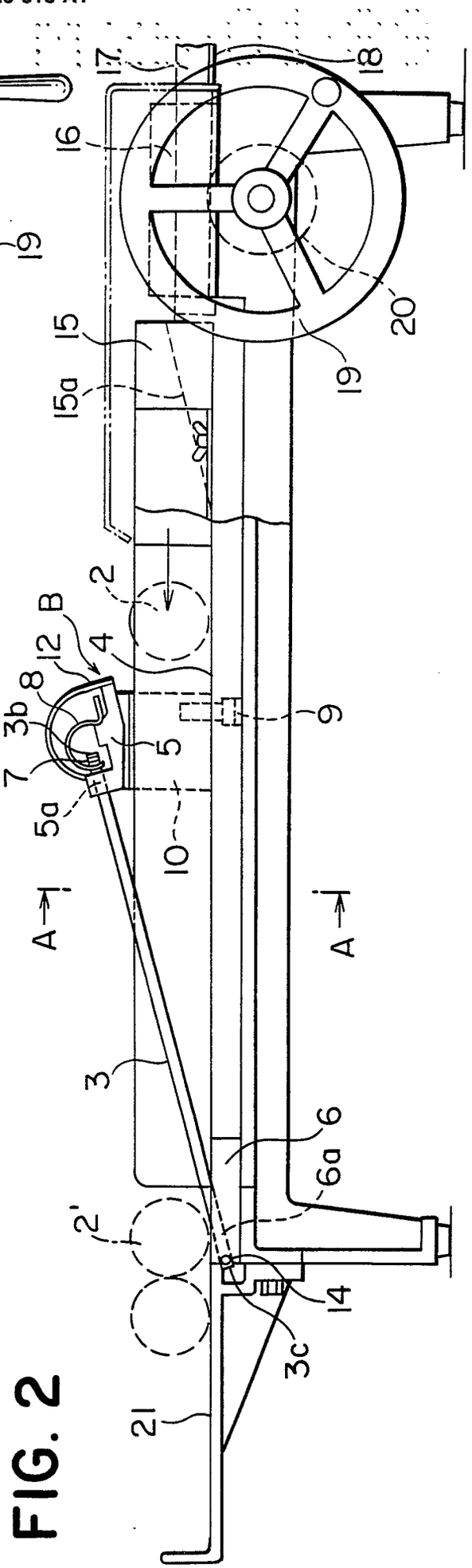
FIG. 1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15a
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B
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4
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3b
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5a
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A
A
3
6
6a
2'
14
3c
21

FIG. 2

FIG. 3

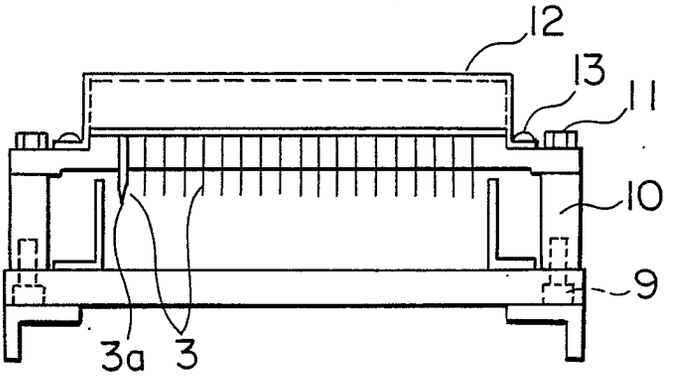


FIG. 4

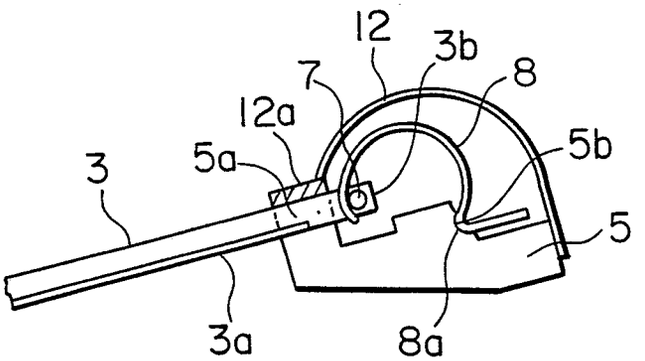


FIG. 5

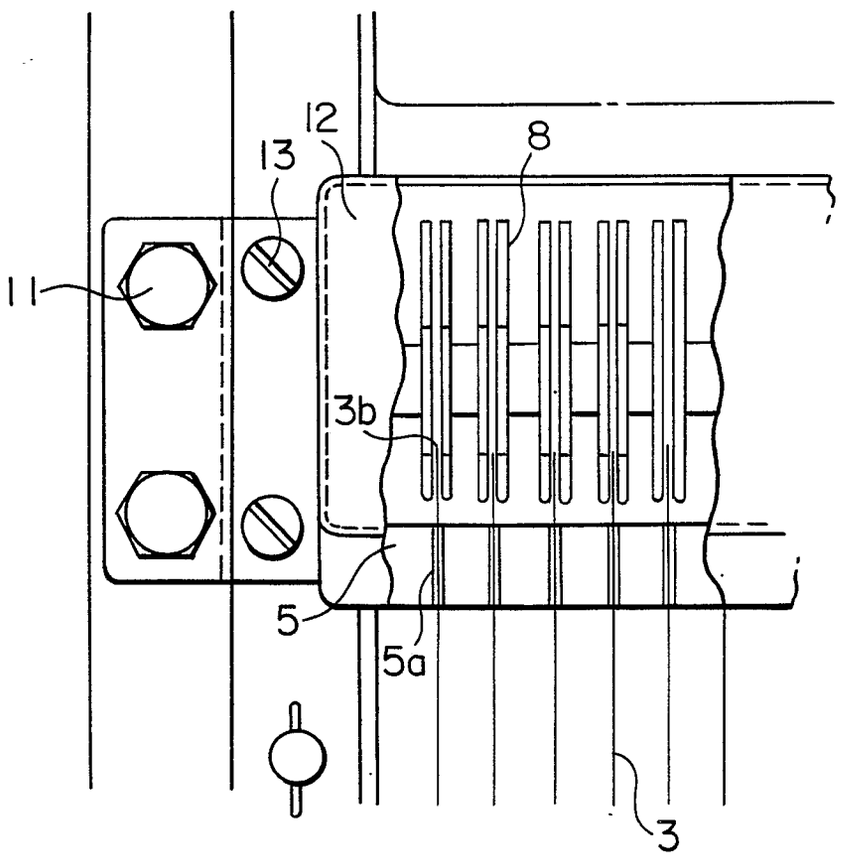


FIG. 6

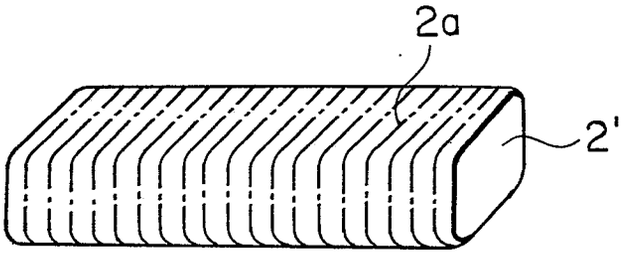
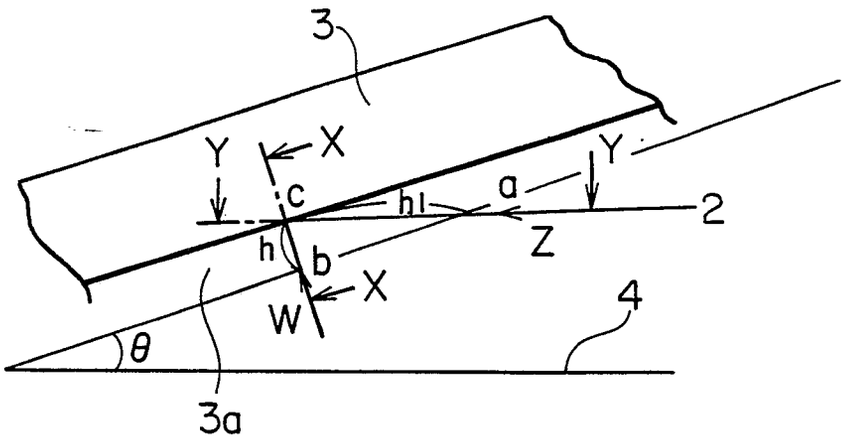


FIG. 7

(A)



(B)

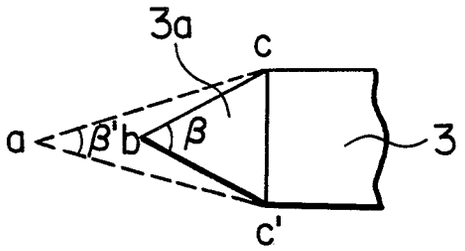


FIG. 8

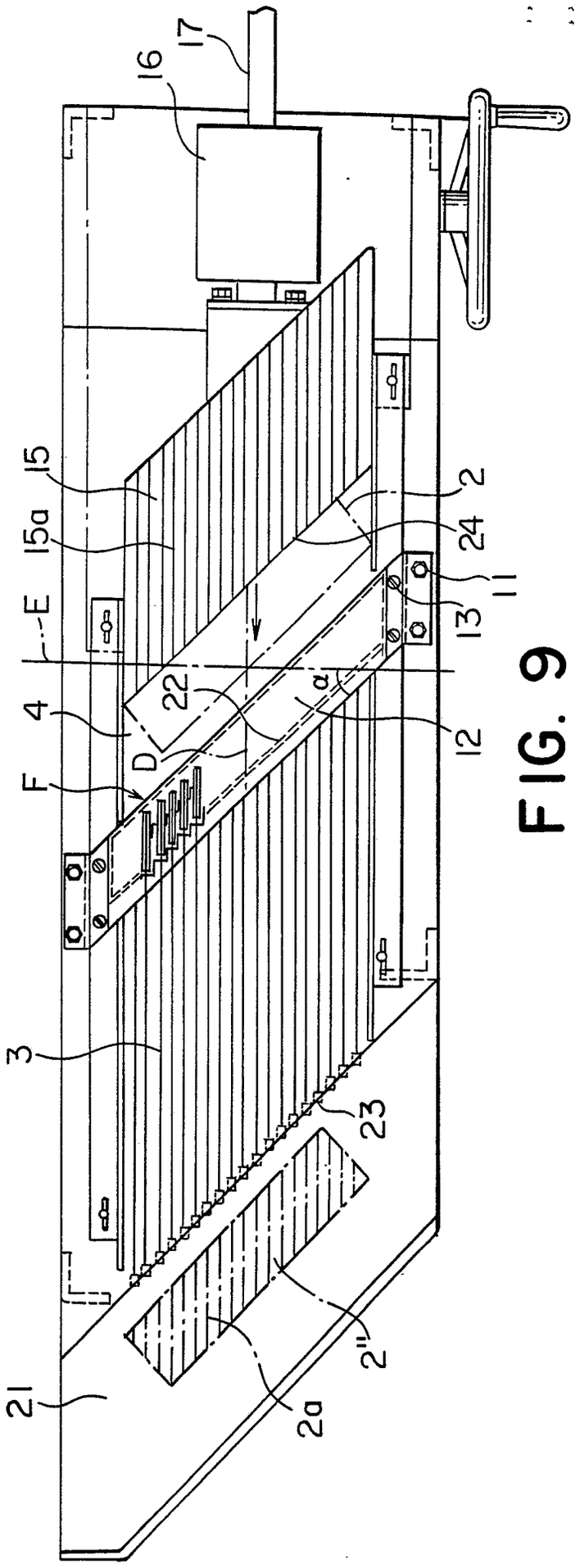

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FIG. 9

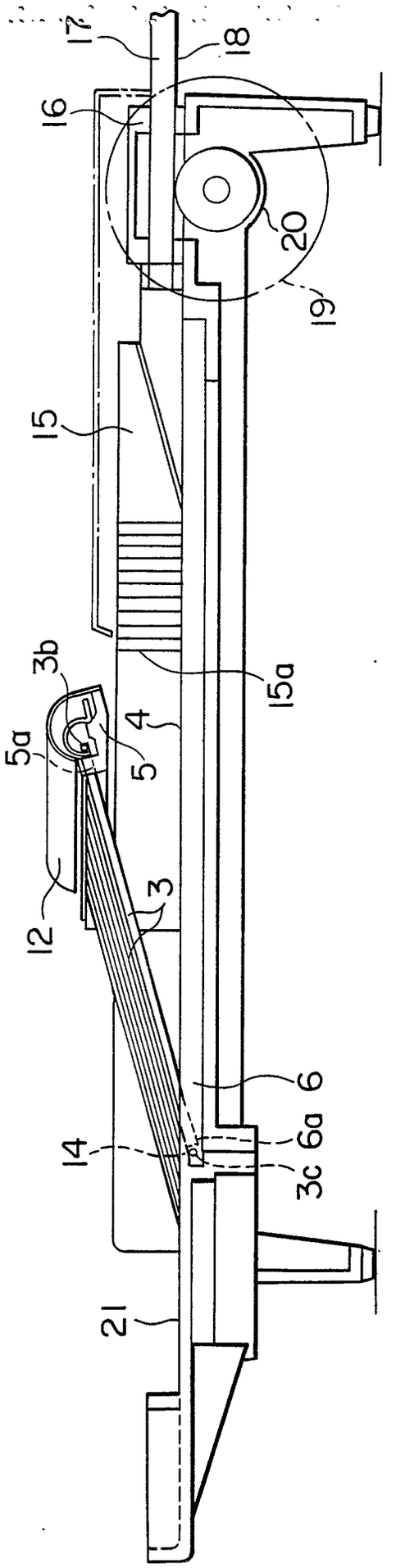
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FIG. 10

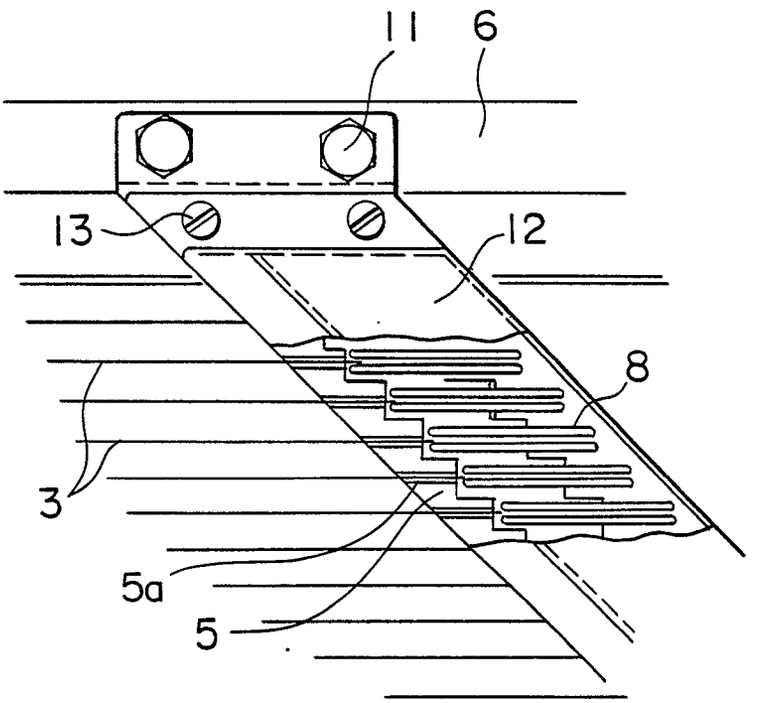


FIG. 11

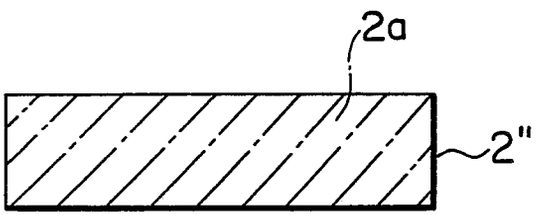
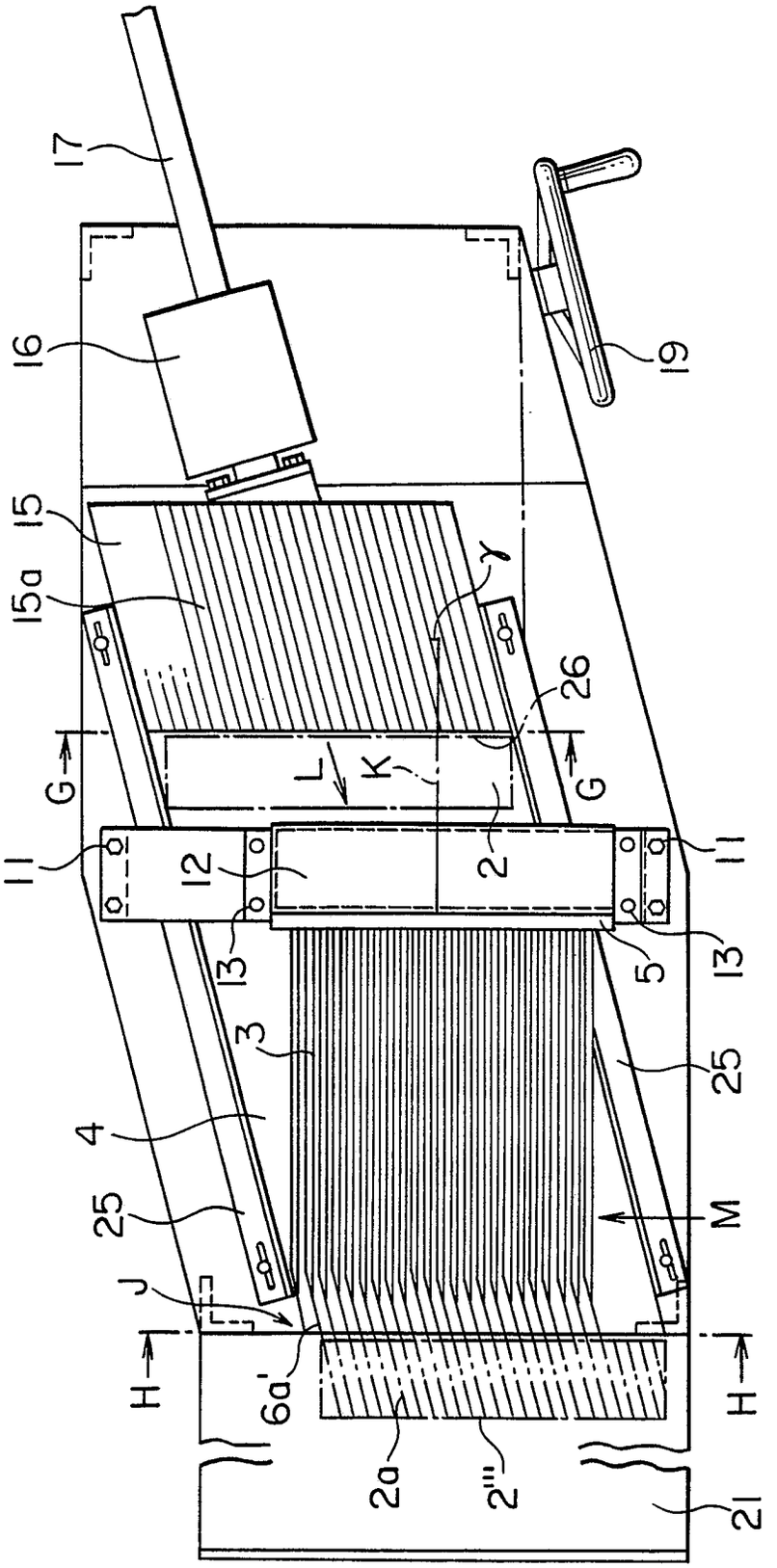


FIG. 12



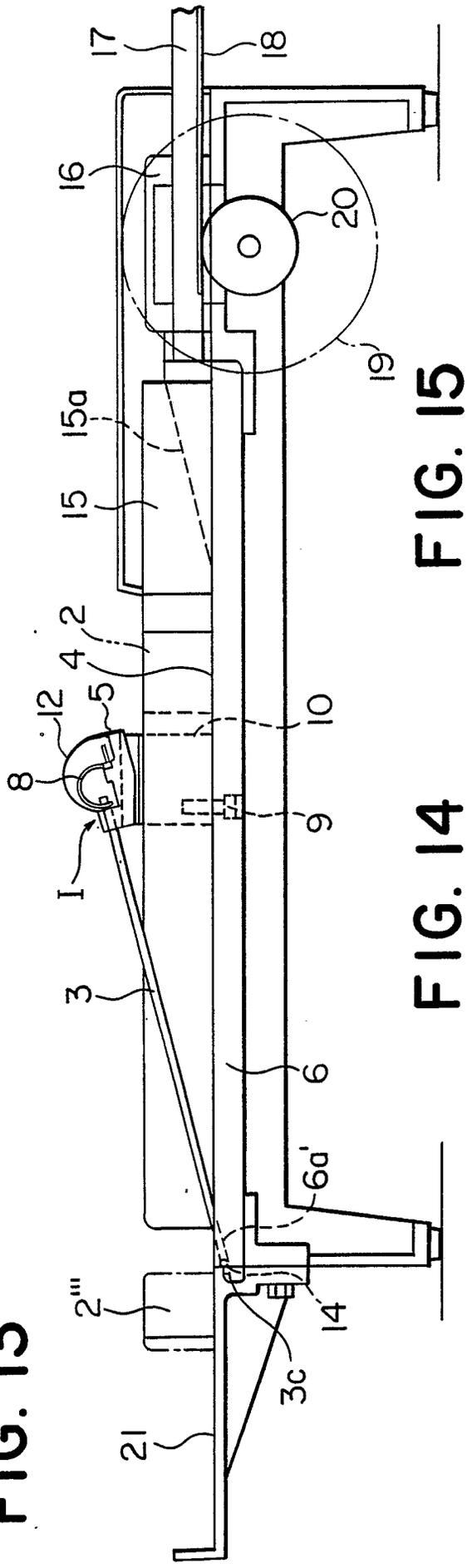


FIG. 13

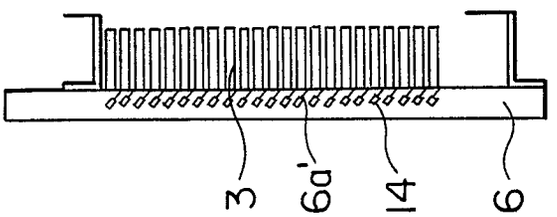


FIG. 15

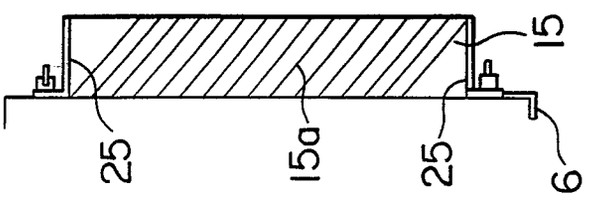


FIG. 14

FIG. 16

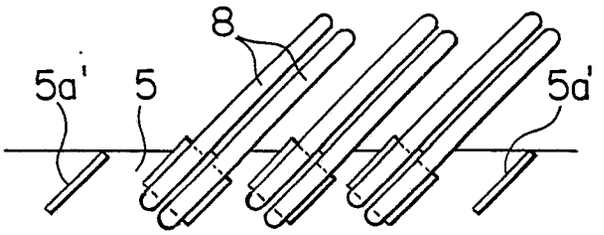


FIG. 17

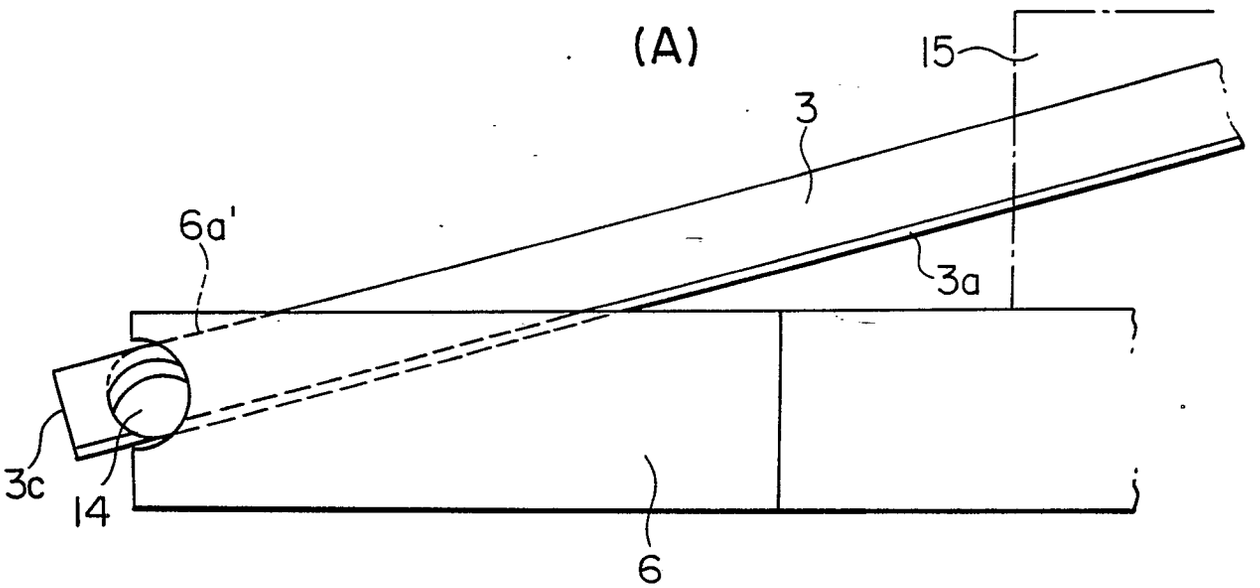


FIG. 18

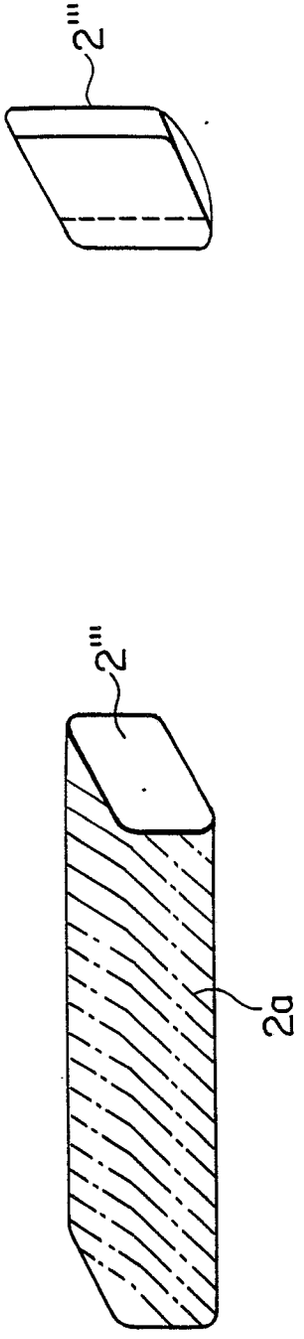


FIG. 19

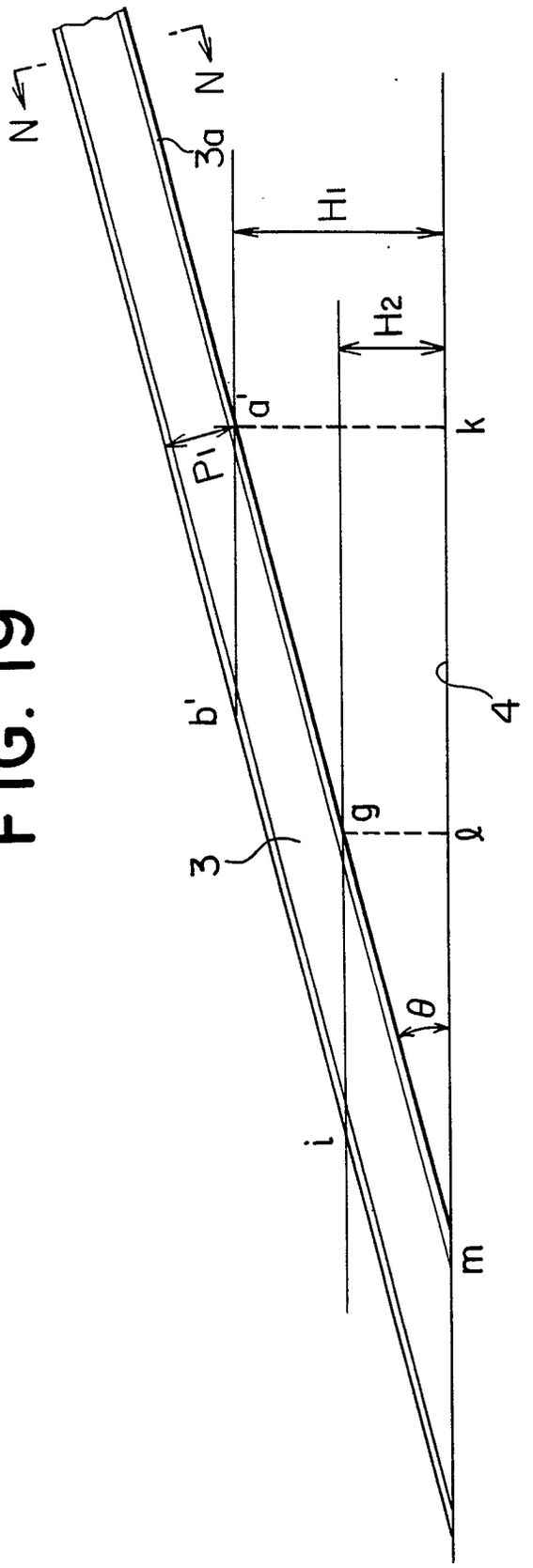


FIG. 20

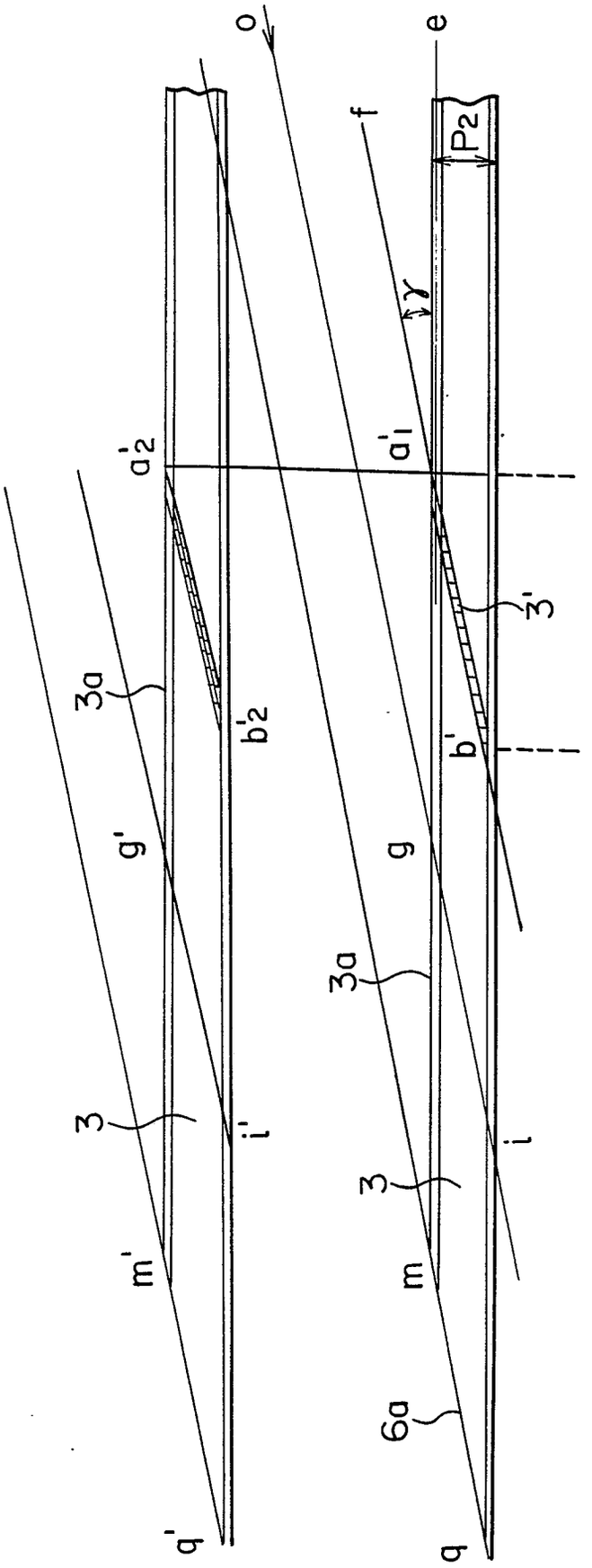


FIG. 21

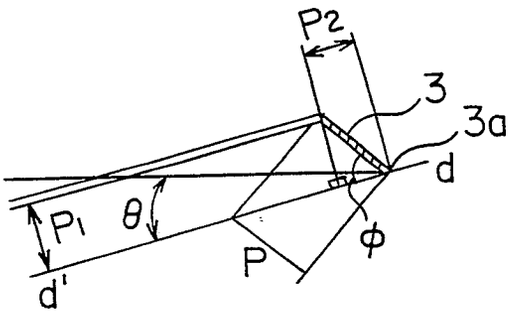


FIG. 22

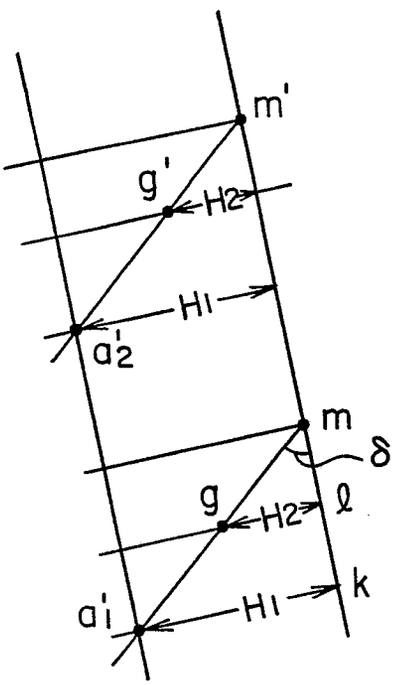
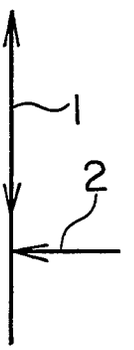


FIG. 23



European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 89100829.4

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US - A - 4 436 011 (JONES) * Totality * ----	1,2,3	B 26 D 1/03

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 26 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	14-04-1989	TRATTNER

CATEGORY OF CITED DOCUMENTS

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Y : particularly relevant if combined with another document of the same category
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P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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