Nov. 28, 1939. W. W. HARTMAN 2,181,233

BAND BLADE SLICING MACHINE

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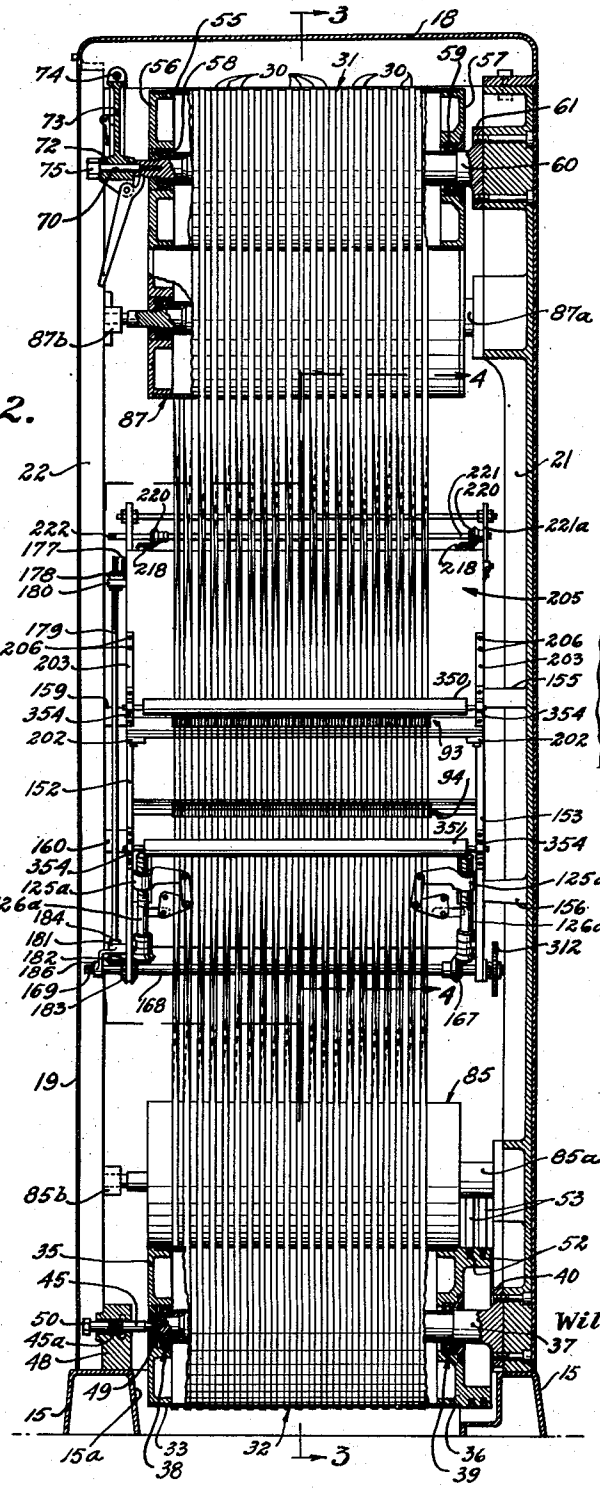


Fig. 2.

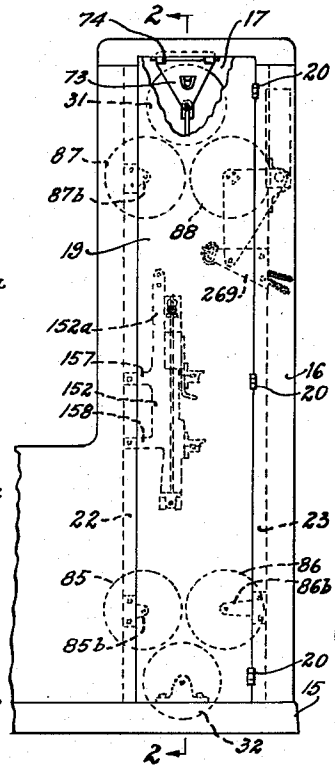


Fig. 1.

Inventor.
William Walter Hartman.

Attorney.

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Fig. 3.

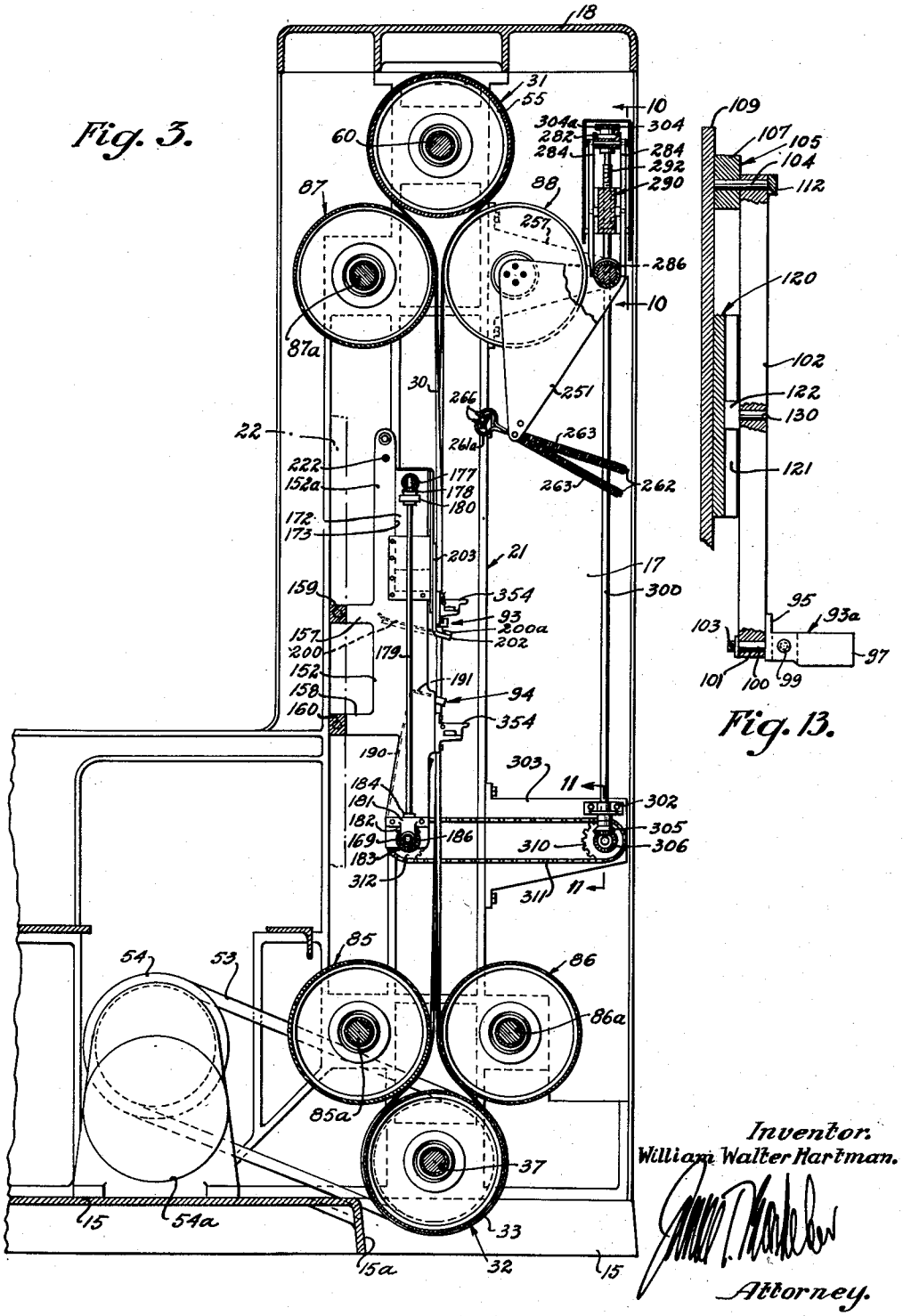


Fig. 13.

Inventor.
William Walter Hartman.

Attorney.

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BAND BLADE SLICING MACHINE

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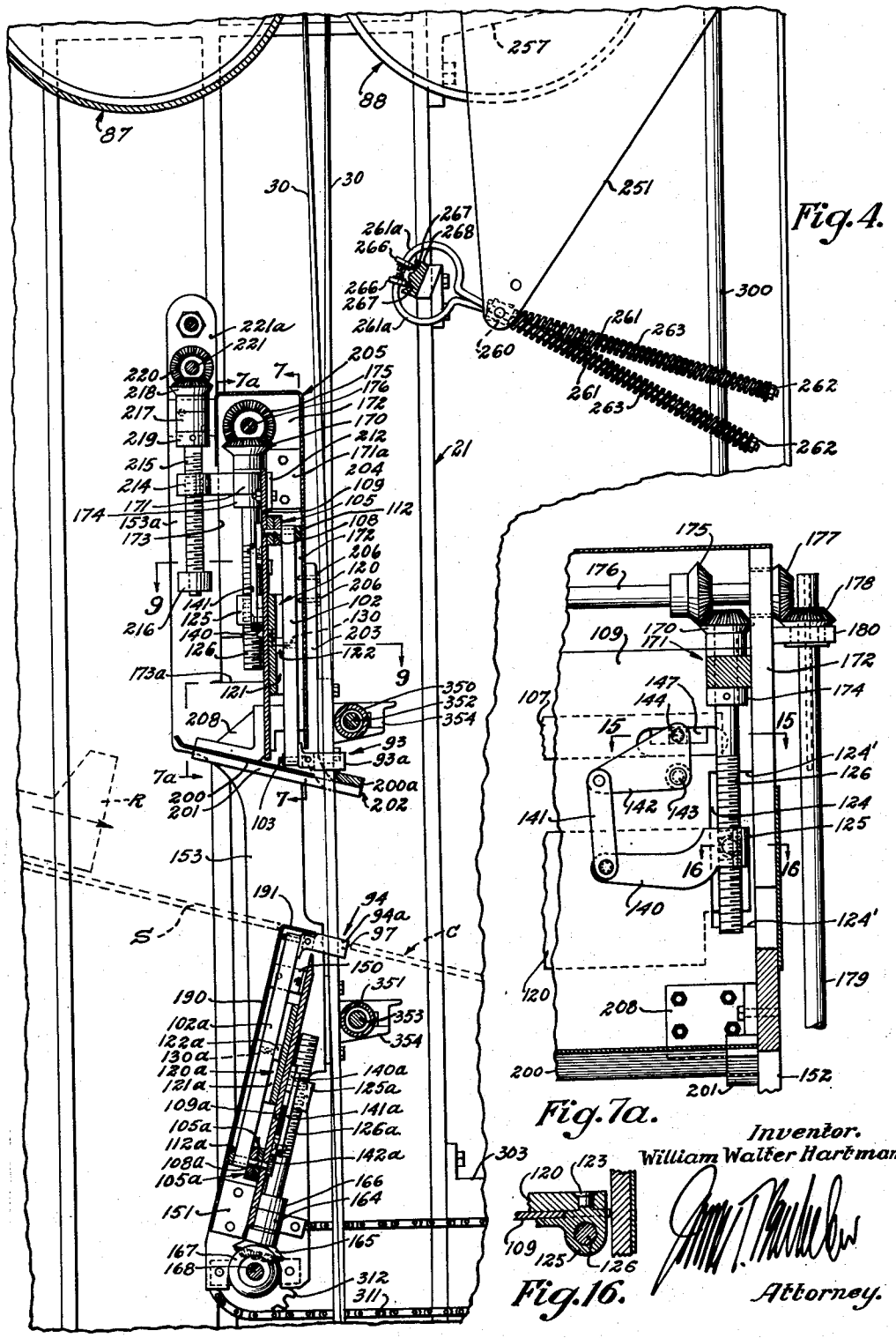


Fig. 4.

Fig. 7a.

Fig. 16.

Inventor.
William Walter Hartman.

Attorney.

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BAND BLADE SLICING MACHINE

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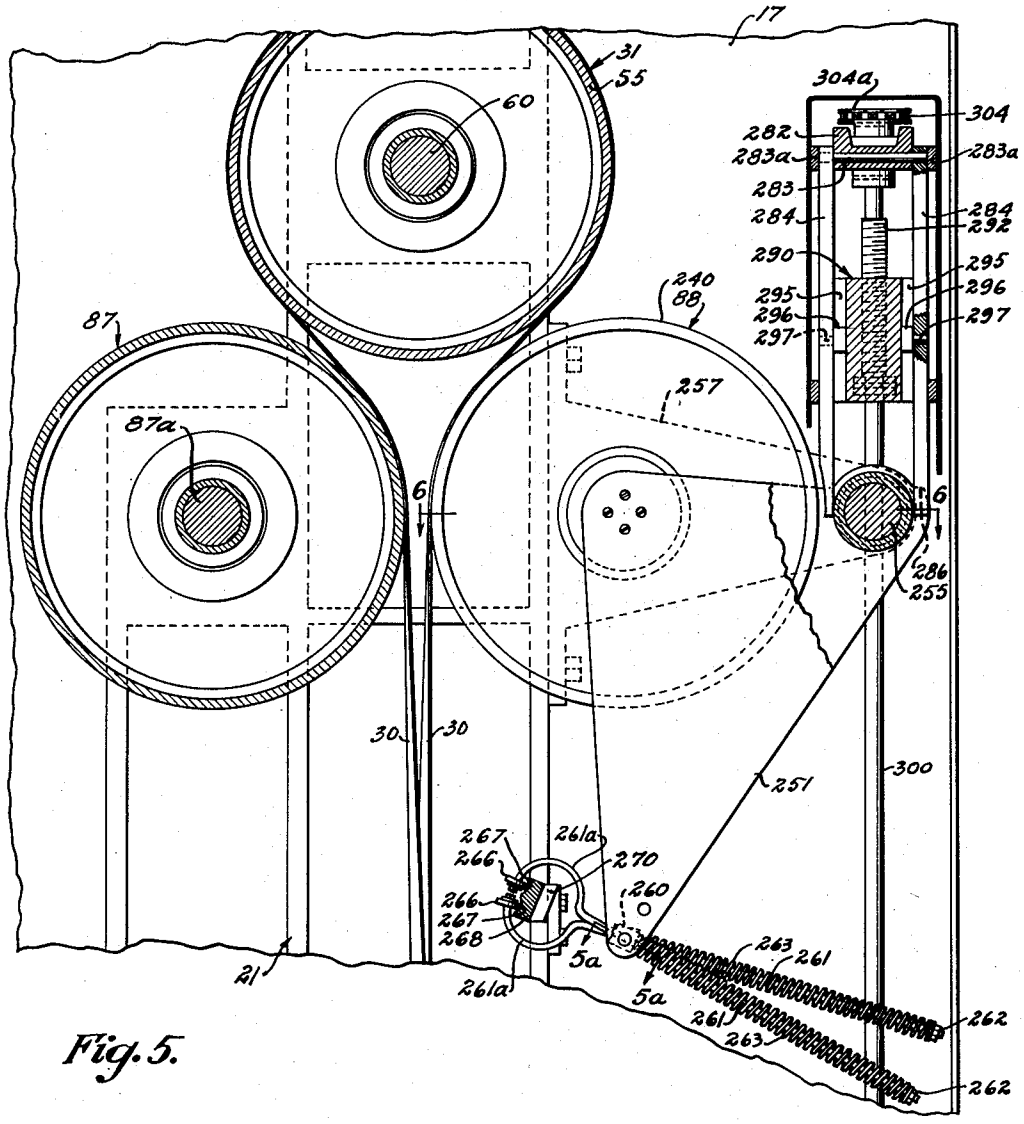


Fig. 5.

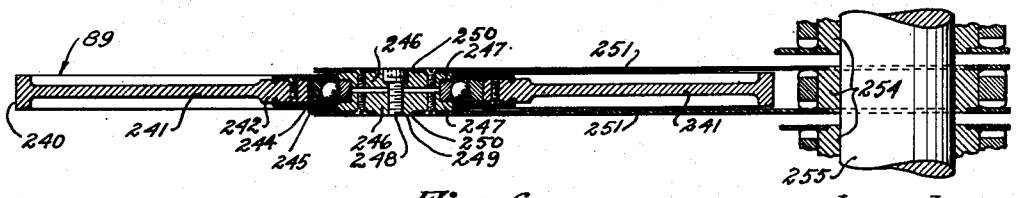


Fig. 6.

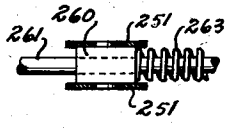


Fig. 5a.

Inventor.
William Walter Hartman.

Attorney.

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Fig. 7.

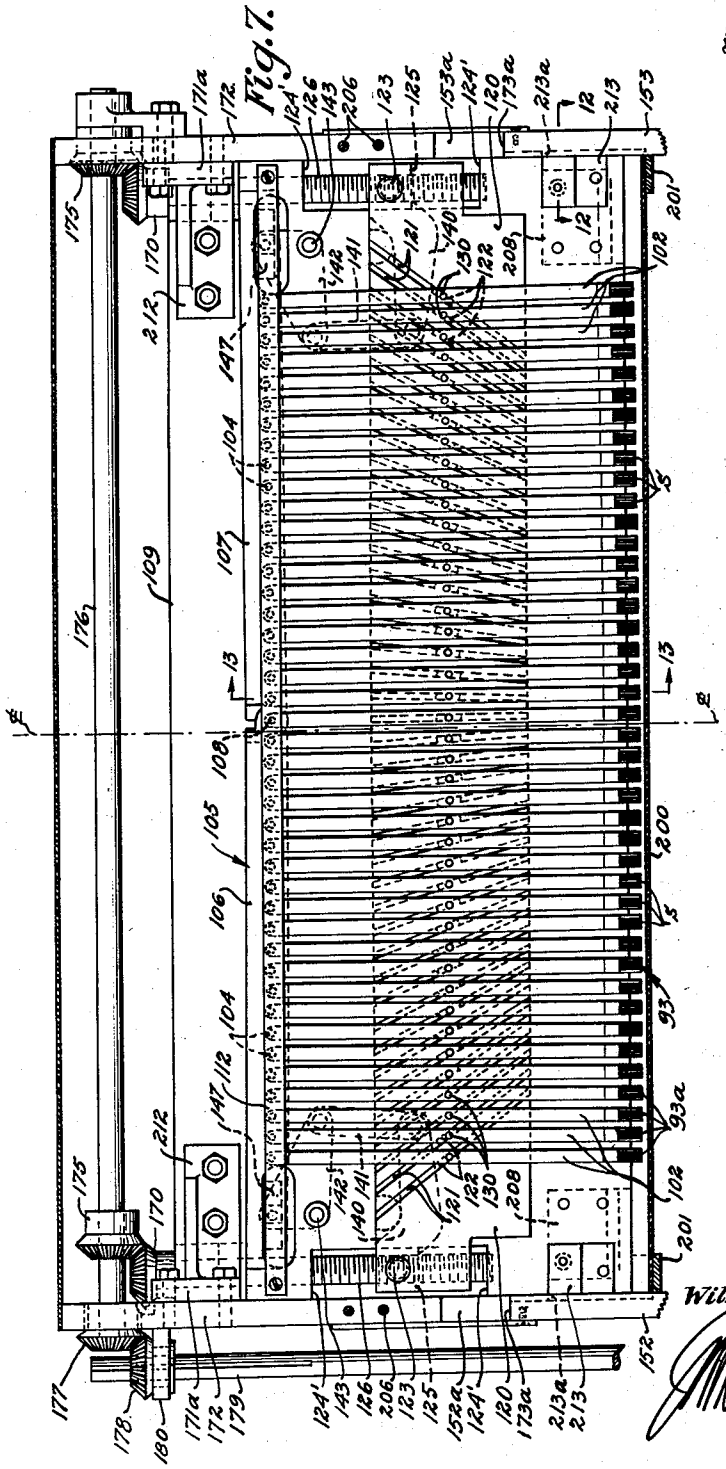


Fig. 12.



Fig. 14.

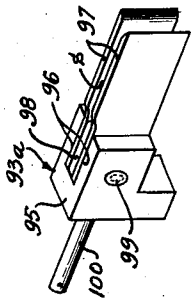
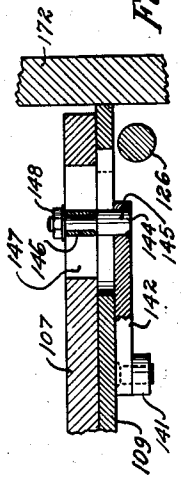


Fig. 15.



Inventor.
William Walter Hartman.

Attorney.

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Fig. 8.

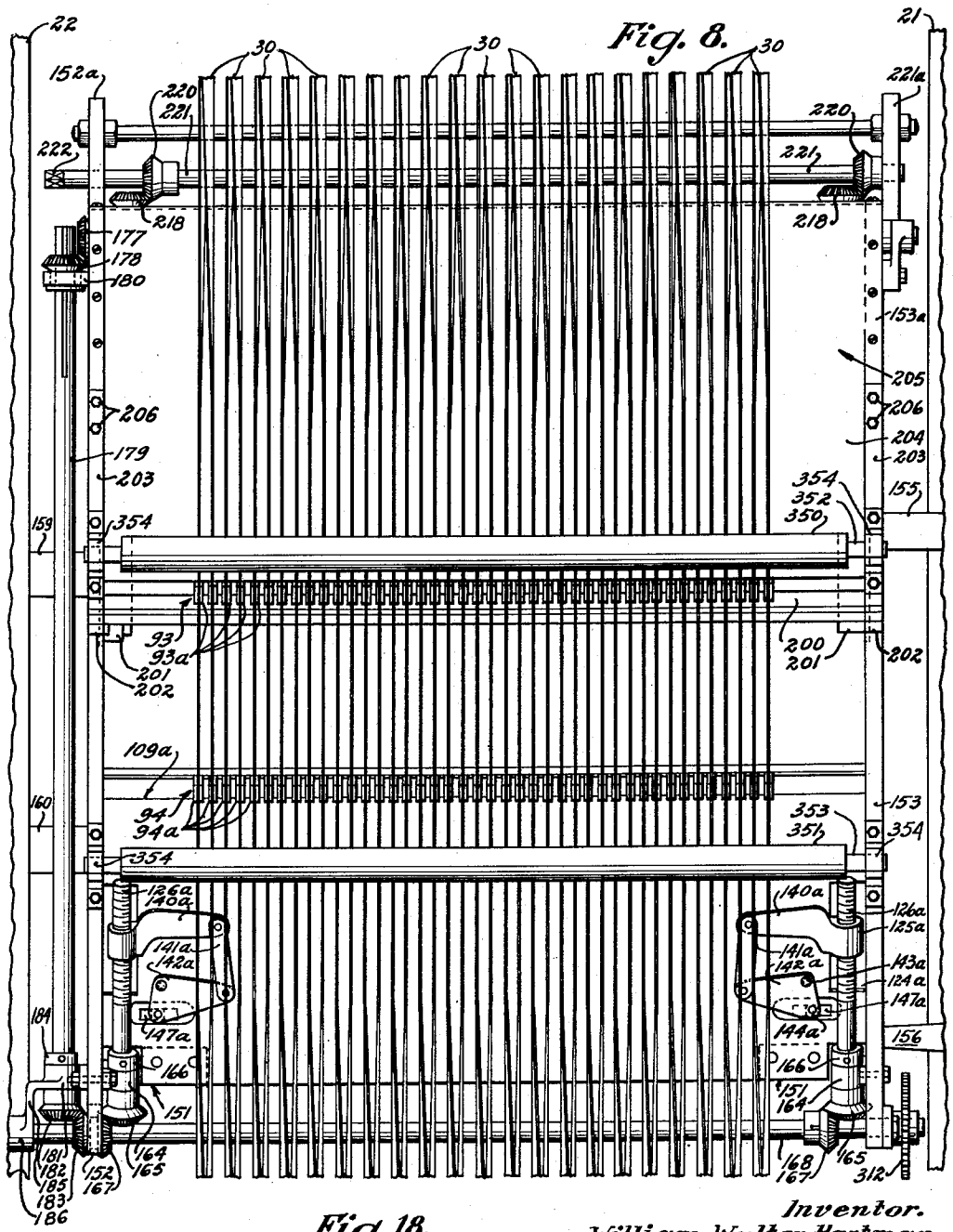


Fig. 18.

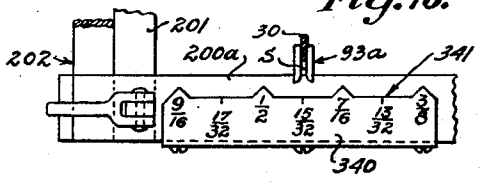
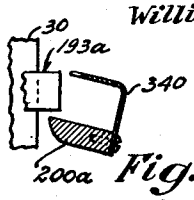


Fig. 17.



Inventor.
William Walter Hartman.

Attorney.

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BAND BLADE SLICING MACHINE

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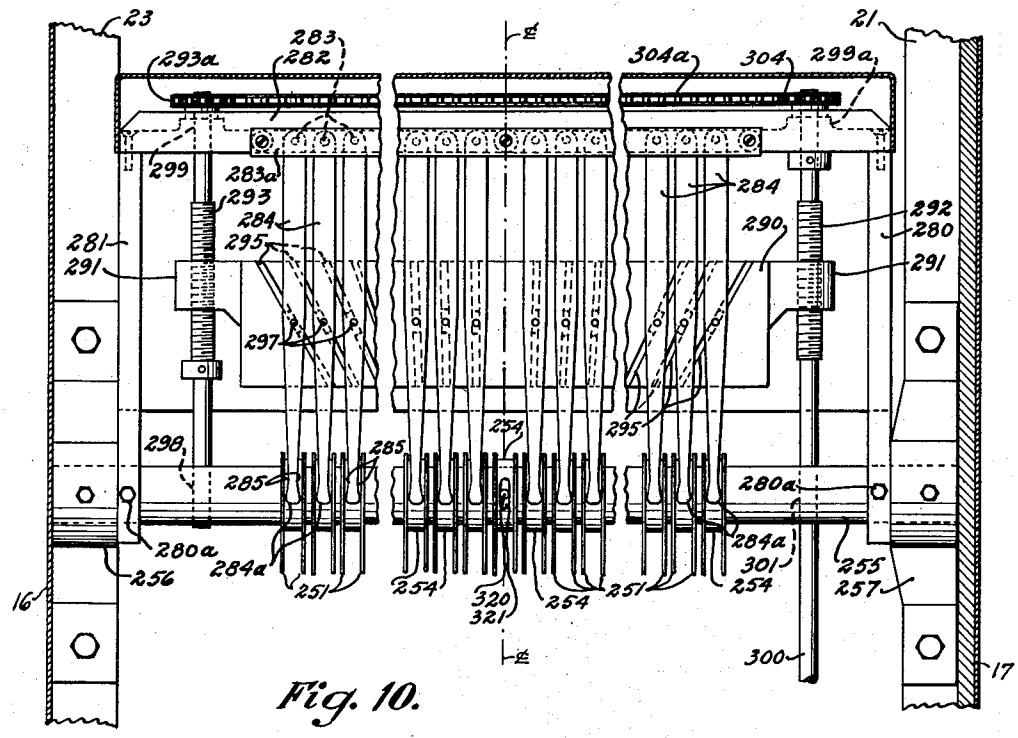


Fig. 10.

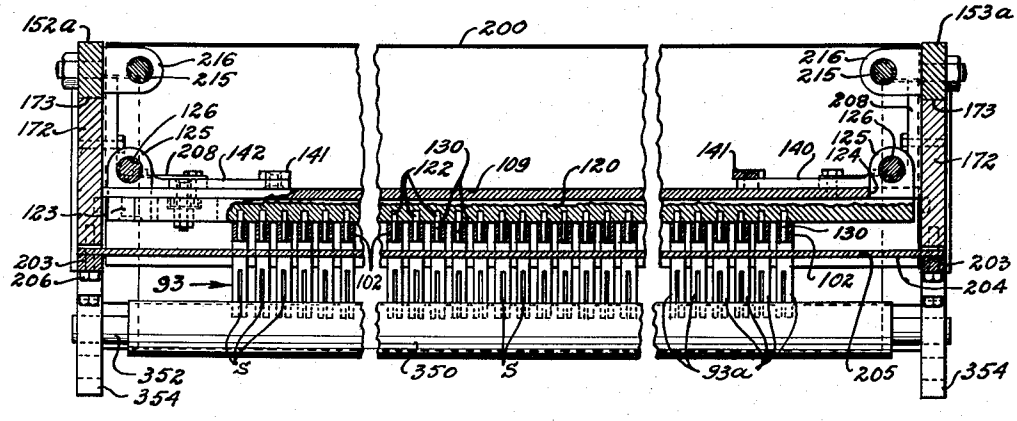


Fig. 9.

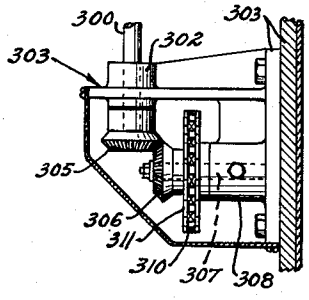


Fig. 11.

Inventor.
William Walter Hartman.

Attorney.

Patented Nov. 28, 1939 2,181,233

UNITED STATES PATENT OFFICE

2,181,233

BAND BLADE SLICING MACHINE

William Walter Hartman, Los Angeles, Calif.

Application March 24, 1939, Serial No. 263,928

16 Claims. (Cl. 146—88)

This invention relates generally to bread and other article slicing machines of the endless band blade type, and deals more particularly with means for adjusting the blade separation distance in such machines for the purpose of regulating thickness of slice.

Bread slicing machines of the endless band blade type comprise a multiplicity of endless band blades trained on a system of drums or rollers, and so arranged as to present a multiplicity of blade courses disposed in spaced parallel planes, against and through which the loaves to be sliced may be successively moved. Guide means are ordinarily provided to space the blade courses for the slice thickness desired. Various types of mechanisms have previously been proposed for the purpose of regulating the spacing interval between the guides for the individual blade courses in order to adjust for different slice thicknesses. The provision of a suitable mechanism for regulating the spacing interval between the blade guides, however, is a problem that is difficult of solution in a practical manner, and the various previously proposed slice thickness adjustment mechanisms of which I am aware are either exceptionally complicated, expensive to manufacture, of a type involving accumulation of frictions to such an extent as to render them difficult if not impossible of operation, or are incapable of assuring a uniform thickness of slice at a given setting.

It is accordingly the object of the present invention to provide a mechanism for varying the spacing interval between blade courses in a multiple band blade slicing machine, which is comparatively simple, inexpensive to manufacture, is freely and easily operable under the control of a manual operating device such as a crank, and which at the same time positively assures precise uniformity of slice thickness at any given setting.

The particular band blade slicing machine chosen for exemplification of the invention is of a type having certain individual blade tensioning devices, and it is a further object of the invention to provide means for simultaneously adjusting in a corresponding manner the spacing of said tensioning devices.

Further objects of the invention have to do with novel features of design, structure and arrangement, directed toward simplicity, convenience of operation and adjustment, freedom of manipulation for adjustment purposes, etc. The invention itself will be fully understood from the following detailed description of one present preferred embodiment thereof, reference for this purpose being directed to the accompanying drawings, in which:

Fig. 1 is a side elevation of the machine, with parts broken away;

Fig. 2 is a vertical section taken on line 2—2 of Fig. 1;

Fig. 3 is a section taken on broken line 3—3 of Fig. 2;

Fig. 4 is an enlarged section taken as indicated by line 4—4 of Fig. 2;

Fig. 5 is an enlargement of a portion of Fig. 3;

Fig. 5*a* is a detail taken on line 5*a*—5*a* of Fig. 5;

Fig. 6 is a section taken on line 6—6 of Fig. 5;

Fig. 7 is a section taken on line 7—7 of Fig. 4;

Fig. 7*a* is a section taken on line 7*a*—7*a* of Fig. 4;

Fig. 8 is an enlargement of a portion of Fig. 2;

Fig. 9 is a section taken as indicated by broken line 9—9 of Fig. 4;

Fig. 10 is a section taken as indicated by line 10—10 of Fig. 3;

Fig. 11 is a detail taken as indicated by line 11—11 of Fig. 3;

Fig. 12 is a detail section on line 12—12 of Fig. 7;

Fig. 13 is a detail section on line 13—13 of Fig. 7;

Fig. 14 is a perspective view of a blade guide device;

Fig. 15 is a detail section taken on line 15—15 of Fig. 7*a*;

Fig. 16 is a detail section taken on line 16—16 of Fig. 7*a*;

Fig. 17 shows a portion of Fig. 4, with the addition of a slice thickness gauge; and

Fig. 18 is a view looking downwardly on the gauge device of Fig. 17.

The general frame structure of the machine includes base 15, and mounted on this base is a vertically extending frame structure, somewhat box-like in external form, including parallel front and rear sides 16 and 17 and a top 18. Front side 16 is provided with a swinging door 19 hinged as at 20. A frame casting 21 extends vertically from base 15 to top 18 adjacent the inner surface of frame side 17, and supports the mechanism as hereinafter to be explained. A pair of vertical frame bars 22 and 23 extend from base 15 to top 18 adjacent the inner surface of side 16, and also serve to support the mechanism.

A plurality or series of endless band blades 30 are looped over upper and lower blade supporting drums 31 and 32, respectively, which are preferably of the same diameter and preferably have

their axes substantially parallel and in the same vertical plane. The blades preferably go on drums 31 and 32 in the manner indicated in the several figures, the blade loop being first passed over upper drum 31, then being twisted through a half-turn (180°), and finally passed over lower drum 32. This threading arrangement brings the cutting edges of the central portions of both courses of each of the band blades to a position directed toward the front end of the machine, from which direction the loaves or other articles are fed against the blades.

Lower drum 32 is mounted as low in the machine as possible. For this purpose, base member 15 is formed with an opening 15a adapted to receive the lower portion of the drum, as indicated in Fig. 3. This drum 32 comprises a cylindrical shell 33 mounted on drum ends 35 and 36, which are in turn mounted for rotation on a non-rotatable shaft 37, suitable bearings being provided as typically indicated at 38 and 39 in Fig. 2. The rearward end of shaft 37 is provided with a flange 40 by which it is secured to mounting casting 21, as indicated. A removable support is provided for the other end of the shaft, and as here shown, comprises a pointed centering shaft 45 screwthreaded, as at 45a, within a supporting member 48 mounted on base 15 and engageable at its forward end with a conical socket 49 in the end of shaft 37. The outer end of shaft 45 has a hexagonal head 50 by which it may be screwed into and out of engagement with drum shaft 37, members 37 and 45 being thus separable to clear a space for placing the endless blades on over drum 32. During operation of the machine the drum is steadied by shaft 45.

The inner end of drum 32 is formed with a pair of peripheral V-grooves 52 for driving belts 53 driven by a pulley 54, the latter being driven through suitable reduction gears, not shown, from the shaft of an electric motor 54a mounted on base 15.

Upper drum 31 consists similarly of a cylindrical shell 55 mounted on drum ends 56 and 57, which are in turn rotatably mounted by means of bearings 58 and 59 on a non-rotatable shaft 60, the inner end of the latter having a flange 61 secured to frame casting 21, as clearly indicated in Fig. 2. The outer end of shaft 60 is drilled and internally screwthreaded to receive the screwthreaded extremity of a shaft 70 which is rotatably mounted in a bearing 72 carried by the lower end of a hanger 73 pivotally mounted at 74 on top member 18. Shaft 70 has a hexagonal head 75 by which it may be screwed into or backed out of engagement with the screwthreaded socket in the end of shaft 60, so that members 60 and 70 are separable from one another for the purpose of placing new blades on over drum 31.

Mounted at an elevation above that of lower drum 32, and preferably one on each side of the plane passing through the axes of upper and lower drums 31 and 32, are rotatable blade deflecting idlers or guide drums 85 and 86, the drums 32, 85 and 86, in the machine here shown, being located quite close to one another, as illustrated. Similarly, there is mounted at an elevation below that of upper drum 31, and preferably one on each side of the plane passing through the axes of drums 31 and 32, a pair of rotatable blade deflecting drums 87 and 88, the drums 31, 87 and 88 likewise being located quite close to one another in the form of the machine here illustrated.

To provide automatic, individual tensioning of the blades 30, one of the aforementioned blade engaging drums is segmented into a plurality of individual blade engaging drums, one for each of band blades 30. In the present illustrative embodiment of the invention, drum 88 is so segmented. Thus, this drum 88 is made up of a series of individual blade tensioning drums 89, as will later be described in more detail, but insofar as the blade deflecting function is concerned the segmented drum 88 may for present purposes be broadly considered as a single drum like 31, 32, 85, 86, and 87. Drums 85, 86 and 87 are mounted for rotation on fixed center shafts 85a, 86a and 87a, respectively, and these center shafts may be substantially like the previously described shafts 37 and 60, their rearward ends being provided with mountings on frame casting 21 similar to those described for shafts 37 and 60. The forward ends of shafts 85a, 86a and 87a, however, are supported by bracket arms 85b, 86b and 87b secured to frame posts 22 and 23.

As shown in the drawings, drums 85, 86, 87 and 88 engage all the courses of the band blades between upper and lower drums 31 and 32 and deflect said courses substantially over toward the plane that passes approximately midway between upper drums 87 and 88, and lower drums 85 and 86, this plane, in the illustrative embodiment, also passing approximately through the substantially parallel axes of drums 31 and 32.

Along the blade course between the drums, I provide two sets or rows 93 and 94 of individual blade twisting guide elements or devices which rows are so spaced apart as to form between them a slicing zone through which the loaves or other articles to be sliced are fed. In this slicing zone the blades run in spaced parallel planes, being twisted into such planes by the blade twisting guide devices.

It is of course to be understood that while I have illustrated and described one particular drum and blade arrangement with some particularity this is for illustrative purposes only, and while the specific arrangement illustrated is preferred, nevertheless any other suitable or desired drum and blade arrangement may be employed which will bring the blade courses into spaced parallel planes at the slicing zone, and which will permit the spacing between the blade courses to be regulated.

The individual blade guide devices for the upper and lower rows are designated by the numerals 93a and 94a, respectively. In accordance with the invention, these blade guide devices 93a and 94a are adjustably movable to vary the spacing interval between blade courses. As here shown, the guide devices 93a (see Fig. 14) each embody a mounting block 95 formed with a vertical slot 96 in which is received the rearward ends of a pair of forwardly projecting blade guide plates 97, a spacer 98 placed between the rearward end portions of plates 97 spacing said plates apart by a distance just slightly greater than the thickness of a blade so as to afford a blade guide slot *s* providing a free running fit for the blade. Plates 97 are secured to blocks 95 as by means of pins 99. It will be understood that there is one such blade guide device 93a for each of the two vertical courses of each band blade.

Projecting rearwardly from the mounting blocks 95 of blade guide devices 93a are mounting pins 100. These pins 100 project through and are pivotally received within drill holes 101 in the lower ends of depending, swinging arms 102, the rearward sides of blocks 95 engaging and being

rotatable upon the adjacent surfaces of arms 102. Suitable provision is made such that the guide devices will not become separated from arms 102; for example, the end portions of pins 100 projecting through arms 102 may be provided with cotter pins 103. However, whatever the nature of the means employed to fasten the guide devices against separation from the arms, ready detachability is very desirable, as there are a large number of the guide devices, and they must be changed from time to time as wear occurs. The cotter pin construction illustrated is one simple expedient; any other may be substituted. Blocks 95, together with blade guide plates 97, are thus rotatable on the axes of pins 100 in the ends of arms 102.

The upper ends of arms 102 are pivotally mounted, by means of pivot pins 104, on a supporting means or arm carrier 105 extending transversely of the blade courses (Figs. 4, 7 and 13). As will be clear from Fig. 7, the upper ends of arms 102 are pivotally mounted on supporting means 105 on equally spaced centers, the spacing preferably being equal to the mean of the minimum and maximum slice thicknesses desired. For example, if the minimum slice thickness desired is $\frac{3}{8}$'' and the maximum is $\frac{9}{16}$'', then the space between pivot centers of arms 102 will preferably be approximately $\frac{15}{32}$''. Preferably, and in the specific illustrative form of the invention here shown, supporting means 105 comprises a pair of approximately horizontal arm carrier bars or arms 106 and 107 hinged or pivotally connected to one another near the center line of the machine, as by means of a pivot pin 108, and this pivot pin 108 is set in and extends from a vertical transversely extending mounting plate 109 (see Figs. 4 and 7), the supporting arrangements for which will be described later. Pivot pin 108 takes the place of the pivot pin 104 which would be at that location if the pivot connection between arms 106 and 107 were not employed, and serves as a mounting for the corresponding arm 102, as will be clear from Figs. 4 and 7. The location of this pin connection between arms 106 and 107 is preferably offset approximately half the thickness of a slice, e. g., $\frac{3}{16}$'', from the center line of the machine (see Fig. 7). There are then an equal number of arms 102 on each side of the center line. A keeper strap 112 secured to plate 109 (Figs. 4 and 7) confines arms 120 against working off the pivot pins 104 which constitute the mountings for the arms.

The adjacent ends of bars 106 and 107 are thus pivotally mounted on an anchoring pin 108 projecting from mounting plate 109. The outer ends of bars or arms 106 and 107 are supported and arranged for limited vertical movement to compensate certain conditions as will later be described; for the present this movement of arms 106 and 107 may be disregarded.

There has been provided, then, one swinging arm 102 carrying a blade-guide device 93a for each course of each blade, or in other words, two of said arms and guide devices for each blade, and these arms are adapted to swing on the parallel axes of pivots 104 in a plane extending transversely of the blade courses (that is in a general way crosswise of the machine) for the purpose of regulating the distance between the blade guide devices, and therefore between adjacent blade courses. Since blade guide devices 93a are pivotally mounted on the lower ends of arms 102, they are capable of relative rotation with reference to arm 102 as the latter are moved in this plane of action. Accordingly, these blade guide devices, under the constraint imposed by the vertically travelling central portions of the blade courses, pivot on the lower ends of the arms in such a way that their blade guide slots *s* remain vertical during swinging of the arms. At the same time, however, the blade guide devices support the blade courses in positions twisted 90° from their positions on the drums 30 and 31, or in other words, in spaced parallel planes extending longitudinally of the machine. Thus it will be understood that as arms 102 are swung on their pivot mountings 104, blade guide devices 93a will be separated or moved closer together, and that as this operation takes place, the blade guide devices, under the constraint imposed by the blades themselves, have a relative pivotal action on the lower ends of the arms such as to maintain their blade guide slots *s* vertically disposed.

I now proceed to a description of a preferred means in accordance with the invention for swinging arms 102 in such a way as to regulate the spacing distance between the guide slots of the multiplicity of blade guide devices. This means, in the specific form here illustrated, comprises a vertically movable cam member or plate 120, provided with a multiplicity of cam elements, preferably in the form of angular cam slots 121 of diverse pitches, one for each of arms 102, together with cam follower elements carried by arms 102, preferably in the form of follower blocks 122 received within cam slots 121. This plate 120 is located between arms 102 and the aforementioned mounting plate 109 (see Fig. 4). Secured to the ends of this mounting plate, on its side opposite from arms 102, as by means of studs 123 (Figs. 7, 7a and 16) are nut members 125 which project through apertures 124 in plate 109 and which engage vertical lead screws 126 located beyond plate 109. These lead screws 126, which are supported and operated as later to be described, are operable to move cam plate 120 in a vertical direction between limits which are set by the ends 124' of apertures 124 in plate 109 through which nut members 125 project.

As previously mentioned arms 102 are furnished with follower blocks 122 received in cam slots 121. These follower blocks are pivotally connected to arms 102, preferably at approximately the mid-points of the latter, by pivot pins 130, and cam slots 121 are angularly disposed, so that when cam plate 120 is moved in a vertical direction, arms 102 are swung, in a transverse plane, on their upper pivots 104.

In the particular embodiment of the invention here illustrated, the cam slot in plate 120 corresponding to the arm 102 suspended from fixed pivot pin 108, is vertically disposed and hence imparts no movement to the associated arm 102. This fixed arm and vertical cam slot, though preferably offset a slight distance from the true center line of the machine, represent the center of symmetry of the cam slots, and of the swinging action of the arms. The remaining cam slots are thus symmetrically arranged on opposite sides of said vertical slot, and in the illustrative form here shown, slope inwardly or toward the center in a downward direction, the angle of inclination of successive slots being progressively greater with increasing distance from the center (see Fig. 7). While the cam slots are illustrated in the drawings as straight or substantially so,

it is to be understood that they are not necessarily straight, but may, if desirable or necessary, be modified in shape or direction for the purpose of modifying the kinematics of the mechanism to compensate any effects such as may be introduced, for example, by the later described movement of arm carrying bars 106 and 107.

In the illustrative machine here illustrated, the central band blade will be understood to have its two courses received by the blade guide devices carried by the fixed arm and by the next adjacent arm on the left hand side, as viewed in Fig. 7. The next band blade on the left hand side of center has its two courses received by the guide devices carried by the next two arms, while the two courses of the band blade on the immediate right hand side of the central blade are received by the guide devices carried by the two arms just to the left of the central arm, and so on.

Suppose now for illustration the machine is to vary the slice thickness within a range of $\frac{3}{8}$'' to $\frac{9}{16}$''. The positioning and spacing of the cam slots will then be such that when cam plate 120 is at the lowermost limit of its stroke, the blade guide slots *s* will have a spacing interval from center to center of $\frac{3}{8}$''. The inclination and the position of the cam slot immediately to the left of the vertical central slot is then such that when cam plate 120 is moved from its lowermost to its uppermost position, the spacing interval between the center of the blade guide slot associated with the fixed arm and the center of the blade guide slot associated with the arm 102 immediately to the left increases from $\frac{3}{8}$'' to $\frac{9}{16}$''. The inclination of the cam slot immediately to the right of the vertical cam slot will be such that the spacing interval between the blade guide slot of the fixed arm 102 and the blade guide slot of the arm next to it on the righthand side will be correspondingly increased to $\frac{9}{16}$''. Thus, the two blade guide slots immediately to the right and to the left of the fixed guide slot will have been moved outwardly through distances equal to $\frac{3}{16}$''. The two cam slots next outside will then have such inclination that the corresponding blade guide slots will at the same time have been moved through distances of $\frac{3}{8}$''. The next cam slots will have such inclinations that the two next blade guide slots will have been moved outwardly through distances of $\frac{9}{16}$'', and so on by equal increments.

Thus, it will be understood that movement of cam plate 120 from its lowermost to its uppermost position will move arms 102 in opposite directions on the two sides of the center of symmetry, so as to increase the spacing distances between successive blade guide slots while maintaining said spacing distances uniform with one another at all times. The adjustment is preferably made while the machine is running, and the blades travelling through the guide slots provided by the blade guide devices easily move along their guide drums to accommodate themselves to the adjusted positions of the guide devices.

A similar means is provided for correspondingly adjusting the spacing between the lower row of blade guide devices 94*a*. In a specific form of the invention here shown, I employ for this purpose a mechanism similar to that described for the upper row of blade guide devices 93*a*, the only difference being an inversion, both top for bottom and front to rear, and also, preferably, the use of an inclined position in the case of the lower spacing means. It is deemed preferable, assuming the blade courses to be vertically disposed at the slicing zone, that the loaves pass through the blades in somewhat of a downward direction, so as to present a corner of the loaf to be attacked by the blades. Thus, as here indicated, the loaves are advanced toward the blades along some suitable downwardly inclined sustaining means, diagrammatically indicated at S. The disposition of the swinging supporting arms for the lower blade guide devices is then preferably arranged to be substantially normal to the direction of loaf travel as established by this inclined loaf supporting means S.

As illustrated, blade guide devices 94*a*, which may be exactly similar to the aforementioned upper blade guide devices 93*a*, are pivotally mounted on the upper ends of swinging arms 102*a*, which are exactly similar to arms 102, the only difference being that they extend upwardly instead of hanging downwardly from their pivotal mountings. It is also to be observed, however, that whereas the mounting members 106 and 107 for upper arms 102, and also the cam plate 120 for said arms, are located on the opposite side of said arms from the blade courses, in the instance of the lower adjustment mechanism, the corresponding members are located between the arms and the blade courses. With these points of difference and resemblance in mind, a detailed description of the mechanism for operating lower arms 102*a* will not be necessary, attention simply being called to the fact that corresponding parts of the adjustment mechanisms for upper blade guide devices 93*a* and lower blade guide devices 94*a* are identified by the same reference numerals, but with the subletter *a* adjoined in the case of the latter.

It will be evident, from reference to Fig. 7, that because of the substantial angle of swing of the outermost arms 102, the blade guide devices associated therewith will, unless counter-provisions are made, have a substantial component of vertical movement in the course of adjustment between minimum and maximum blade spacing. This effect is preferably compensated for by moving the outer ends of the supporting bars or arms 106 and 107 for the pivotal mountings of the arms as blade spacing adjustments are made. As a simple and convenient means to this end, the nut members 125 through which vertical movement is imparted to cam plate 120 are formed with inwardly extending brackets 140, the inner ends of which are connected by means of links 141 to bell-crank members 142 pivotally mounted at 143 on the aforementioned mounting plate 109, and having connection at 144 with the outer, swinging ends of arms 106 and 107. This connection may comprise (see Figs. 9 and 15) a stud 145 projecting from member 142, the latter pivotally carrying a square block 146 slidably received within a longitudinal slot 147 formed in the outer end portion of the corresponding swinging arm, a nut 148 screw-threaded on the outer end of stud 145 holding the members in assembly.

It will be evident that as cam plate 120 is moved in an upward direction, for example, so as to swing arms 102 in an outward direction, the corresponding elevation of brackets 140 will act through links 141, bell-crank members 142 and sliding blocks 146 to lower the outer ends of arms 106 and 107. The multiplying ratio of the interconnecting linkage between cam plate 120 and arms 106 and 107 is such that arms will be lowered by approximately the correct distance to

compensate for the otherwise substantial elevation of the blade guide devices carried by the swinging arms 102. Thus the vertical position or alinement of the blade guide devices is maintained approximately constant throughout the adjustment for different slice thicknesses.

Corresponding compensation is provided for the swinging arms 102a associated with lower blade guide devices 94a, so that the latter also are maintained approximately in vertically alined position throughout the adjustment operation. Since the arrangements for accomplishing this compensation are again the counterparts of those described in detail in connection with the upper blade guide devices, no further detailed description will be necessary, it being sufficient to point out that corresponding members are identified by the same numerals, but with the subletter a adjoined in the case of the mechanism associated with lower blade guide devices 94a.

The mechanism for supporting lower swinging arms 102 includes mounting plate 109a (corresponding to previously described mounting plate 109) to which lower arm supporting bars 106a and 107a are connected by pin 108a, and against which slides cam plate 120a, it being noted that mounting plate 109a and also cam plate 120a are disposed parallel to the plane of inclination of arms 102a. This plate 109a is secured at its opposite edges by upper and lower brackets 150 and 151 to vertical frame members 152 and 153. These frame members 152 and 153, which serve as the supports for the upper and lower blade guide adjustment mechanisms, are located just outside and extend throughout the vertical extent of said mechanisms. Frame member 153 is supported from main frame casting 21 by suitable brackets or posts, such as indicated at 155 and 156, while frame member 152, on the side adjacent front door 19, is provided with a pair of horizontally extending arms 157 and 158, which are secured by means of suitable brackets or posts 159 and 160 projecting inwardly from vertical main frame member 22.

The lead screws 126a for operating lower cam plate 120a, and which are of course disposed at the angle of the inclination of cam plate 120a and its direction of travel, are supported at the bottom by bearings 164 formed on the aforementioned mounting brackets 151. On the lower ends of these lead screws are bevel gears 165, the hubs of which come adjacent bearings 164. Collars 166 pinned on said lead screws immediately above bearings 164 confine the lead screws against longitudinal movement. Bevel gears 165 mesh with bevel gears 167 mounted on a transverse shaft 168, the latter being rotatably mounted in the lower end portions of frame members 152 and 153. The forward end of this shaft 168 is provided with a square end portion 169, adapted to be engaged by a manual crank, not illustrated, by means of which it may be rotated. Such rotation of shaft 168 will be understood to drive bevel gears 167 and 165 to rotate lead screws 126a, thereby moving cam plate 120a which operates the swinging arms 102a carrying lower blade guide devices 94a.

The upper lead screws 126 for upper cam plate 120 are also driven from shaft 168. Mounted on the upper ends of these lead screws 126 are bevel gears 170, the hubs of which bear downwardly against bracket members 171 in which the lead screws are journaled, said brackets 171 having portions 171a (Fig. 4) secured to plates 172 which are vertically slidable, for a purpose later to be mentioned, on off-set portions 152a and 153a of frame members 152 and 153, respectively. Thus the vertical edges of plates 172 slidably engage vertical edges 173 of frame members 152 and 153, the shoulders 173a provided at the offset in frame members 152 and 153 being engageable by the lower ends of plates 172 to provide stops limiting downward movement of said plates. Collars 174 pinned on lead screws 126 immediately below brackets 171 confine the lead screws against vertical movement. Bevel gears 170 mesh with bevel gears 175 mounted on a transverse shaft 176 journaled in the aforementioned plates 172. Shaft 176 has on its forward end, forwardly of plate 172, a bevel gear 177, which meshes with a bevel gear 178 splined on a vertical shaft 179, the latter being journaled near the top in a bearing 180 mounted on plate 172, and at its lower end in a bearing 181 mounted on frame member 152. A bevel gear 182 on the lower end of shaft 179, below bearing 181, meshes with a bevel gear 183 mounted on shaft 168 (Fig. 8). A collar 184 pinned on shaft 179 immediately above bearing 181 serves to confine shaft 179 against vertical movement. Preferably, bearing 181 is formed with an extension bracket 185 carrying an extension bearing 186 for the outer end portion of shaft 168.

Thus rotation of shaft 168 not only operates lower swinging arms 102a to adjust the spacing of the lower blade guide devices, but, through the described operative interconnection with upper lead screws 126, simultaneously operates the latter to move upper cam plate 120 and therefore swing upper arms 102 to adjust the upper blade guide devices in a corresponding manner. The interconnection is of course synchronized so that the spacing of the upper blade guide devices will always be equal to and correspond with the spacing of the lower blade guide devices.

It has previously been mentioned that the loaves preferably pass through the slicing zone along a somewhat downwardly inclined path, and it has been mentioned that the loaves in advancing toward the blades along such a path may be supported by an inclined sustaining plate or member, such as indicated at S, which may support the loaf until it is advanced substantially through the slicing zone. This sustaining member may then be retracted to permit the next loaf to be lifted to position along a guide plate 190 (Fig. 4), the latter being located just forwardly of knife guide supporting arms 102a, and being mounted, for example, on the aforementioned brackets 150 and 151. As illustrated, this guide plate 190 along which the loaves are elevated to the slicing zone is disposed at the same angle of inclination as arms 102a, or in other words, at an inclination normal to the direction of travel of the loaves in passing through the slicing zone. Guide plate 190 has a forwardly turned portion 191, overlying the upper ends of arms 102a and the rearward or mounting portions of blade guide devices 94a. This forwardly turned portion 191, the upper side of which is located in the plane of the upper side of loaf sustaining member S, serves as a bottom support for the loaves in passing toward and partially through the blades. Blade guide plates 97 project forwardly beyond supporting member 191, their upper edges being approximately in the plane of 191, as illustrated in Fig. 4. The upper edges of these plates 97 thus serve to support the bottom of the loaf forwardly of support 191. Immediately beyond the forward ends of guide

plates 97, there is provided a suitable out-feed means for receiving the sliced loaf and conveying it forwardly from the blades. Thus, any suitable out-feed conveyor, diagrammatically indicated in Fig. 4 at C, may be employed. A suitable out-feed conveyer is completely disclosed in my application, Ser. No. 207,931, filed May 14, 1938, and entitled Band blade slicing machine, to which reference may be had for a complete description of such a mechanism. Any suitable loaf feeding means may be employed for advancing the loaves one at a time through the blades. Thus, there may be employed a conventional reciprocating ram, indicated diagrammatically at R, and which will be understood to have the usual spaced ram fingers adapted to advance between the blade courses. It will of course be evident that provision must be made for changing the spacing of the ram fingers to correspond with changes in blade spacing. Suitable infeed mechanism of the type indicated at R and S is described in my Patent No. 2,106,949.

A suitable means is provided for guiding, or serving as a hold-down member for, the top sides of the loaves, and in the present specific illustrative form of the invention, I provide a means for this purpose separate of and below upper blade guide devices 93a. As a typical construction, I illustrate a hold-down plate 200 located ahead of the blades and disposed at the inclination of the path of loaf travel through the slicing zone. This hold-down plate 200 is supported at its opposite edges by the lower legs 201 of bracket members 202, said brackets also having vertically extending legs 203 which are mounted against the vertical wall 204 of a casing 205 enclosing the upper blade guide adjustment mechanism; screws 206 reaching through casing wall 204 and engaging the edges of the aforementioned vertically adjustable mounting plates 172 serve to secure brackets 202 rigidly to said plates 172. Loaf hold-down plate 200 is further supported by brackets 208 secured to the aforementioned vertical mounting plate 169.

To provide for loaves of different heights, loaf hold-down plate 200 together with the entire upper blade guide mechanism are adjustably movable in a vertical direction. The previously mentioned brackets 171a which serve to journal and support lead screws 126, have portions 212 to which the previously described mounting plate 169 is rigidly secured. Plate 169, end plates 172, together with the entire upper blade guide and spacing adjustment mechanism mounted thereon, as well as hold down plate 200, thus comprise a unit which is bodily movable in a vertical direction. It has been mentioned that the edges of plates 172 slide vertically along the vertical edges 173 of the offset portions 152a and 153a of frame members 152 and 153. The described vertically adjustable assembly is further guided for vertical travel on frame members 152 and 153 by means of key members 213 mounted on plate 169 and engaging in vertical keyways 213a formed in frame members 152 and 153 (see, e. g., Figs. 7 and 12).

Brackets 171 also have projecting nut portions 214 which threadedly engage vertical lead screws 215. These lead screws 215 are supported by bearings 216 and 217 extending from the upper, offset portions 152a and 153a of frame members 152 and 153. Mounted on lead screws 215 immediately above bearings 217 are bevel gears 218, collars 219 immediately below bearings 217 confining the lead screws against endwise movement. Bevel gears 218 mesh with bevel gears 220 on a horizontal transverse shaft 221, the latter being journaled in the upper end portion of frame member 152a and in a plate 221a secured to and extending upwardly from the upper end portion of frame member 153a. Shaft 221 may be driven in any suitable or convenient manner; for example, its forward end is shown as having a squared portion 222 adapted to be engaged by a hand crank, not shown.

It will be understood that rotation of shaft 221 will effect rotation of lead screws 215, and therefore vertical adjustment movement of the assembly comprising mounting plates 169 and 172, together with the blade guide devices and their spacing adjustment mechanism, and also loaf hold-down plate 200. During such adjustment the gear 178 through which the upper blade guide spacing adjustment mechanism is operated, and which has previously been described as splined on its vertical driving shaft 179, simply slides vertically on the latter. Thus the adjustment just described enables the spacing distance between loaf bottom guide member 191 and loaf top guide or hold-down member to be regulated for loaves of different heights.

There is preferably also employed, in addition to loaf hold-down member 200, which is located ahead of the blades, a second loaf hold-down plate or bar 200a located just beyond the blades. This member 200a (see Fig. 4) is mounted on brackets 202, its lower surface being in the plane of the lower surface of member 200, and it will be obvious that members 200 and 200a will move alike in the course of adjustment of the machine for loaves of different heights.

Drum 88, as previously mentioned, comprises a series or row of individual drums or rolls 89, the peripheries of which engage individual band blades travelling between upper drum 31 and idler drum 85. The make-up of this segmented drum 88 is shown best in Figs. 5 and 6, to which reference is now directed. Each roll 89 comprises a rim 240, whose periphery is adapted to engage an individual blade, and a web 241 and hub 242. Hub 242 is formed with an axial bore 244, within which is received a ball bearing 245. The inner race ring of bearing 245 is mounted on a pair of disks 246, and between flanges 247 formed on said disks, the disks being secured together and pressed against the sides of the inner race ring of bearing 245 by means of screw 248. The outer flat faces of disks 246 are provided with trunnions 249 which are received in circular openings 250 formed in a pair of parallel substantially triangular flat plates 251, the latter being secured to disks 246 by suitable screws, as illustrated. Plates 251 are mounted on a hub 254 which is rotatable on, as well as freely slidable along, a relatively stationary shaft 255 extending transversely of the machine and having its ends held by mountings 256 and 257 secured to frame bar 23 and frame casting 21, respectively. Each drum or roll 89 is similarly supported for rotation on a pair of plates 251 mounted on a hub which is rotatable on and slidable along common shaft 255, the rolls thus being independently rotatable and arranged for independent swinging about the axis of shaft 255. Shaft 255 is located to the rear of the axis of drums 89, and substantially at the height of center shaft 87a, and it will be evident that swinging movement of plates 251 in a right handed direction, as viewed in Figs. 3 and 5, will bring individual rolls

89 into tensioning engagement with the individual blades passing over drum 81.

The hubs being slidable along shaft 255, they, together with the pairs of roll-carrying plates 251 which they support, may be moved therealong for the purpose of adjustment of the spacing between the individual blade engaging rolls 89. Means in accordance with the present invention for so moving the pairs of plates 251 along shaft 255 will be described at a later point in the specification.

The blades being placed in equally spaced portions on upper and lower drums 31 and 32, and the rolls 89 being spaced so as to be opposite them, the blades are then tensioned by swinging plates 251 in a righthanded direction, as viewed in Figs. 3 and 5, said plates 251, which act as lever means or bell-cranks, thereby lifting rolls 89 into engagement with the blades just below upper drums 31. The blades are then separably tensioned by individual blade tensioning assemblies, a preferred form of which in accordance with the present invention will now be described.

A block 260 is trunnioned between the lower portion of each pair of plates 251 (see Fig. 5a), and slidable through this block is a tension rod 261. The rearward end of this rod 261 has mounted thereon a tension adjustment nut 262, which engages one end of a compression spring 263 encircling rod 261 and engaging at its other end against block 260. The forward end of each tension rod 261 is formed with a hook portion 261a, on which is mounted a roller 266 adapted to engage in a longitudinally extending groove 267 formed in a bar 268 extending transversely of the machine and mounted on the main frame, as by means of brackets 269 and 270 (Figs. 1 and 5).

Because of the desirability of employing rollers 266 of fair diameter, the hook portions of successive rods 261 taken transversely across the machine are arranged alternately above and below bar 268, the rollers 266 of the lower hooks engaging in a lower groove 267, while the rollers 266 of the upper hooks engage in a parallel groove 267 placed just above. As the pairs of roll-carrying plates 251 are moved along mounting shaft 255, the rollers 266 at the forward ends of tensioning rods 261 will roll freely along grooves 267, the anchoring means for the tensioning assemblies thus accommodating themselves freely and readily to the adjusted positions of blade tensioning rolls 89.

Preferred and illustrative means in accordance with the invention for shifting the pairs of roll-carrying plates 251 along shaft 255 for the purpose of regulating the spacing between the tensioning rolls will now be described. A pair of upstanding frame members 280 and 281 (Fig. 10) are mounted on opposite ends of shaft 255, immediately adjacent shaft mountings 256 and 257, being secured in upright positions in any suitable manner, as by means of screws 280a set against shaft 255, and mounted on the upper ends of members 280 and 281 is a transversely extending frame member 282. Extending transversely through this frame member 282 are a plurality of pivot pins 283, the ends of which project through opposite sides of member 282, as indicated in Fig. 5. These pivot pins 283 are equally spaced along frame member 282, and there is one for each of blade tensioning rolls 89 except for the middle roll, as appears in Fig. 10. Keeper bars 283a placed against the outer ends of pins 283, and mounted at their ends on frame member 282, confine the pins in proper endwise position. Pivotally mounted on the projecting ends of these pins 283 are depending arms 284, the lower ends of the latter being located one on each side of shaft 255 and reaching in between the individual members of each pair of plates 251, in the manner clearly shown in Figs. 5 and 10. It will be evident from inspection of Fig. 10, that swinging movement of arms 284 on pivots 283 will result in translation of the pairs of plates 251 along the shaft 255. The lower ends of arms 284 fit in between plates 251 without substantial clearance, and are so rounded or shaped, as at 284a (see Fig. 10) as to reach substantially the full distance between the plates throughout the angular swing of the arms. Above said rounded portions, the arms are necked down somewhat, as at 285, in order to avoid interference with the edges of plates 251 at the extremes of angular movement of the arms, and for the same purpose, plates 251 are cut fairly low where the interference would otherwise occur, as indicated at 286 in Fig. 5.

For the purpose of swinging arms 284 to adjust the separation distance between pairs of plates 251, there is provided a vertically movable cam member formed with cam slots of progressively increasing pitches, of the same general type as that used in connection with the arms that carry the blade guide devices. This cam member, designated generally at 290, is arranged between shaft 255 and frame member 282, and between the two rows of swinging arms 284, as illustrated. Nut members 291 projecting from opposite ends of cam member 290 are mounted on vertical lead screws 292 and 293, by means of which the cam member may be adjusted in a vertical direction. The two opposite, flat faces of cam member 290 are formed with a plurality of diagonal cam slots 295, and received in these cam slots are follower blocks 296 which are on the ends of pivot studs 297 pivotally mounted in arms 284.

Lead screw 293 is journaled at its lower end in a vertical bore 298 in shaft 255 and at its upper end in a bearing 299 on frame member 282, the upper end of said lead screw 293 having mounted thereon a sprocket 293a whose hub engages the upper end of bearing 299 and supports the lead screw in a vertical position.

Lead screw 292 is on the upper end portion of a long vertical shaft 300, which, at the top, is journaled in a bearing 299a in frame member 282, and which extends downwardly through and has bearing in a vertical transverse bore 301 in shaft 255, and is provided near its lower end with a bearing 302 mounted on a bracket 303 extending from frame casting 21. On the upper end of shaft 300 is a sprocket 304, the hub of which bears downwardly on the upper end of bearing 299a, and which is connected with sprocket 293a by means of chain 304a.

On the lower end of shaft 300 below bearing 302, there is mounted a bevel gear 305, which meshes with a bevel gear 306 mounted on a shaft 307 journaled in a bearing 308 forming a part of mounting 303 (Fig. 11). Also mounted on shaft 307 is a driving sprocket 310, driven by chain 311 from sprocket 312 mounted on the rearward end of shaft 168 (Fig. 8). It will be recalled that this shaft 168 is manually rotated to accomplish adjustment of the spacing interval between blade guide devices 93a and 94a. By means of the interconnection between shaft 168 and cam plate 290, the spacing between blade tensioning rolls 89 is automatically simultaneously adjusted in a corresponding manner, the interconnection being, of course, so arranged and adjusted that the blade

spacing devices 93a and 94a and the tensioning roll adjustment arms 284 are synchronized.

It has previously been mentioned that, in the present illustrative embodiment of the machine, no shifting arms 284 are necessarily provided for the central pair of tensioning-roll carrying plates 251, the reason for this being that one course of the central band blade is not moved longitudinally along drums 31 and 32 during blade spacing regulation, while the movement imparted to its other course is not sufficiently great to make this necessary. Accordingly, the carrying plates 251 for the central blade tensioning roll are preferably confined against longitudinal movement along shaft 255 and are fixed with said central roll centered on the center line of the machine. For this purpose I may provide any suitable means, such for example, as a pin 320 set in and projecting from shaft 255 through a circumferential slot 321 in the hub 254 on which the central plates are mounted, the pin confining the assembly against longitudinal movement along shaft 255, but not interfering with the necessary rotative movement about said shaft, slot 321 of course being made of sufficient length to provide the necessary degree of rotation.

The cam slots 295 on each face of cam member 290 are symmetrically arranged on each side of the center line, and, as here shown, slope inwardly in a downward direction. The inclinations of successive cam slots increase progressively from the center outwardly in both directions, as illustrated, the position and inclination of each cam slot being such as will cause the associated swinging arms 284 to move the corresponding pair of tensioning-roll carrying plates 251 to positions transversely of the machine corresponding to the adjusted positions of the blades as the spacing interval between the courses of the latter is regulated. Under any conditions the blades will of course be constrained to pass over drums 30 and 31 in equally spaced positions located longitudinally of the latter as determined by the adjusted positions of the blade guide devices 93a and 94a; the disposition of the angular cam slots 295 controlling the positions of the tension rolls 89 is then such that the latter at all times assume positions corresponding to the positions of the blades as so regulated. For example, assuming that the blade guide devices are initially adjusted for a blade course spacing interval of 3/8", and that the adjustment is to be changed to a spacing interval of 1/16", then if in the course of this adjustment the blade guide devices of the two courses of a given blade move outwardly through distances of 3/8" and 1/16", the angularity of the cam slot 295 controlling the position of the tensioning roll 89 for that blade will be such that said tensioning roll will at the same time be moved outwardly through a distance which is approximately the mean of 3/8" and 1/16", or in other words, through a distance of 1 1/2". Thus it will be seen that a single easily performed operation accomplishes at once simultaneous and corresponding adjustment of the spacing interval of the upper and lower blade guide devices, as well as of the spacing interval of the individual blade tensioning rolls.

Figs. 17 and 18 show the optional provision of a gauge to indicate the exact thickness of slice for which the machine is adjusted. This gauge consists simply of a plate 340 mounted on bar 290a and provided with scale indicia 341 suitably calibrated in slice thicknesses, as illustrated, the pointer element comprising the guide slot s of the outside blade guide device 93a which is movable therealong as the mechanism is adjusted for different slice thicknesses.

The drawings illustrate the preferred use of a pair of long backing-up rollers 350 and 351, which are rotatably mounted in any suitable manner on shafts 352 and 353, respectively, said shafts being supported as by means of suitable mountings 354 secured to the edges of frame members 152 and 153. These rollers back up the blade courses at the slicing zone, holding the blades against deflection by the pressure of the loaves as the latter are moved against the blades. For a more complete description of such back-up rollers, reference may be had to my copending application entitled "Band blade slicing machine", filed May 14, 1938, Ser. No. 207,931.

In the form of my invention shown in Figure 7 where the series of elements to be adjusted are the blade guides 93a which are mounted on and adjusted by the swinging arms 102, and also in the form of my invention shown in Fig. 10 where the series of elements to be adjusted are the blade-tensioning assemblies which are mounted and are slidable on shaft 255, it can be said that these series of elements in both cases are adjustable with respect to each other substantially longitudinally of, i. e. lengthwise, of the approximate alinement which these elements bear to each other, this extending transversely of the machine; and it can also be said that these elements, both in Figs. 7 and 10, are operatively associated with the swinging arms 102 or 284 and are movable therewith for adjustment. In Fig. 7, even if the arm supporting bars 107 were not movable vertically about pivot 108, or movable in any other manner for correcting the alinement of the blade guide members 93a, it would still be entirely proper to say that these elements 93a remain in substantial alinement with respect to each other in all positions of adjustment notwithstanding the minor discrepancies introduced by the arc along which they are adjusted by the swinging of arms 102 about pivots 104. In any event the discrepancy from perfect alinement would be small, so that the series of elements 93a could still be said to be in substantial alinement even if bars 107 were not movable. However, the movement of bars 107 does make the alinement more perfect and I consider this as a further feature of my invention.

I have now described in considerable detail one present preferred and illustrative embodiment of the present invention; it is to be understood, however, that this is for illustrative purposes only, and that various changes in design, structure and arrangement may be made without departing from the spirit and scope of the invention or of the appended claims.

I claim:

1. Adjusting mechanism comprising the combination of a multiplicity of substantially alined elements, said elements being adjustable with respect to each other substantially longitudinally of said alinement, arm supporting means, a multiplicity of swinging arms pivotally mounted on said supporting means on parallel pivot axes, each of said elements being operatively associated with one of said swinging arms and being movable therewith for adjustment, and means operatively associated with said arms for simultaneously swinging successive arms through progressively varying angles to vary the spacing uniformly between said elements.

2. Mechanism for regulating the spacing between a multiplicity of elements arranged in a substantially alined row, comprising an arm supporting bar normally disposed substantially parallel to said row of elements, a multiplicity of swinging arms pivotally mounted on said supporting bar on parallel axes spaced along said bar, said swinging arms having operative connection with said elements, means operatively engaging all of said arms and adapted to swing successive arms through progressively increasing angles, and means for swinging said arm supporting bar as said arms are swung on their individual pivot axes to cooperate in maintaining said row of elements in good alinement.

3. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums and providing between said drums blade courses that run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, pivotally mounted on said arm carrying means on spaced parallel pivot axes, there being one such arm for each of said blade courses, said arms being adapted to swing in planes which are transverse of said blade courses, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guides which are adapted to guide said blade courses into said spaced parallel slicing planes, and means for swinging said arms to spread them apart or draw them together.

4. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms pivotally mounted on said arm carrying means on spaced parallel pivot axes, there being one such arm for each blade course, said arms being adapted to swing in a common plane, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guides adapted to guide and twist said blade courses into said spaced parallel slicing planes, and means for swinging successive arms through progressively increasing distances.

5. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying means on spaced parallel pivot axes, said arms being adapted to swing in a plane which is transverse of said blade courses, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guide ways which are parallel to the pivot axis of the blade guide device on the swinging arm, and means connected with said arms for swinging successive arms through progressively increasing distances in both directions from the center positions of said arms.

6. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying means on spaced parallel pivot axes, said arms being adapted to swing in a plane which is transverse of said blade courses, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guides adapted to guide and twist the blade course into said spaced parallel slicing planes, and means for spreading said arms apart or drawing them together comprising a cam member formed with a plurality of cam elements of diverse pitches operable on said arms.

7. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying means on spaced parallel pivot axes, said arms being adapted to swing in a plane which is transverse of said blade courses, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guide ways which are parallel to the pivot axis of the blade guide device on the swinging arm, means for spreading said arms apart or drawing them together comprising a cam member movable in a plane substantially parallel to the plane of swing of said arms and formed with a plurality of cam slots of diverse pitches, and follower elements on said arms received within said cam slots.

8. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying means on spaced parallel pivot axes, said arms being adapted to swing in a plane which is transverse of said blade courses, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guides adapted to guide and twist the blade courses into said spaced parallel slicing planes, means for spreading said arms apart or drawing them together comprising a cam plate movable in a plane substantially parallel to the plane of swing of said arms, said cam plate having a plurality of cam elements extending at progressively increasing inclinations in both directions with reference to a center line located approximately midway of said plurality of cam elements, and follower elements on said arms cooperating with said cam elements.

9. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel

slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying means on spaced parallel pivot axes, said arms being adapted to swing in a plane which is transverse of said blade courses, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guide ways which are parallel to the pivot axis of the blade guide device on the swinging arm, means for spreading said arms apart or drawing them together comprising a cam member movable in a plane substantially parallel to the plane of swing of said arms, and formed with a plurality of cam slots of diverse pitches, follower elements on said arms received within said cam slots, and manually operable lead screw means for moving said cam member in said plane.

10. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, arm carrying means extending transversely of said blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying means on spaced parallel pivot axes, said arms being adapted to swing in a plane which is transverse of said blade courses, blade guide devices pivotally mounted on the free ends of said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guide ways which are parallel to the pivot axis of the blade guide device on the swinging arm, means for spreading said arms apart or drawing them together comprising a cam member movable in a plane substantially parallel to the plane of swing of said arms and formed with a plurality of cam slots of diverse pitches, and follower elements extending from intermediate points of said arms and received within said cam slots.

11. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, a mounting means opposite said blade courses, arm carrying means comprising a pair of bars extending transversely of the blade courses in opposite directions from a center line and pivotally mounted at their adjacent ends on said mounting means so as to be capable of swinging action in a plane transverse of the blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying bars on spaced parallel axes which are parallel to the pivot mounting axes of said bars, a plurality of approximately aligned blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guides adapted to guide and twist the blade courses into said spaced parallel slicing planes, means connected with said arms for swinging successive arms in both directions from said center line through progressively increasing distances, and means for simultaneously swinging both said arm-carrying bars in said transverse plane to maintain said blade guide devices in approximate alinement.

12. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums, courses of said blades between said blade supporting drums being adapted to run in spaced parallel slicing planes, a mounting means opposite said blade courses, arm carrying means comprising a pair of bars extending transversely of the blade courses in opposite directions from a center line and pivotally mounted at their adjacent ends on said mounting means so as to be capable of swinging action in a plane transverse of the blade courses, a plurality of swinging arms, one for each blade course, pivotally mounted on said arm carrying bars on spaced parallel axes which are parallel to the pivot mounting axes of said bars, blade guide devices pivotally mounted on said swinging arms on axes which are substantially parallel to the pivot axes of the arms, said blade guide devices having blade guide ways which are parallel to the pivot axis of the blade guide device on the swinging arm, means connected with said arms for swinging successive arms in both directions from said center line through progressively increasing distances, and means interlinked with said last mentioned means for simultaneously and automatically swinging both said arm-carrying bars in directions toward said blade guide devices to maintain said device in approximate alinement.

13. In a band blade slicing machine having spaced blade supporting drums, a plurality of band blades running side by side about said drums, a corresponding plurality of individually movable blade tensioning assemblies mounted side by side in opposition to said blades, said blade tensioning assemblies each comprising a blade tensioning roller engaging the corresponding blade, yielding means urging said roller into pressural engagement with the blade, and a supporting means extending transversely of the blades along which said blade tensioning assemblies may be moved, means for adjusting the spacing of said blade tensioning assemblies along said supporting means comprising a support, a plurality of swinging arms pivotally mounted on said support and adapted at their free ends for operative engagement with said blade tensioning assemblies, a cam member having a plurality of cam elements of diverse pitches operating on said arms, and means for moving said cam member.

14. Adjusting mechanism comprising the combination of a multiplicity of substantially alined elements, said elements being adjustable with respect to each other substantially longitudinally of said alinement, arm supporting means, a multiplicity of swinging arms of which each is operatively associated with one of said elements, pivotal connections for supporting said arms on said arm supporting means, said arms being adapted to swing on said pivotal connections in a common plane, and means operatively associated with said arms and movable in a straight line in a direction approximately parallel to said plane for simultaneously swinging successive arms through progressively varying angles to uniformly vary the spacing between said elements.

15. Adjusting mechanism comprising the combination of a multiplicity of substantially alined elements, said elements being adjustable with respect to each other substantially longitudinally of said alinement, movably mounted arm supporting means, a multiplicity of swinging arms

pivotally mounted on said arm supporting means on parallel axes spaced along said supporting means, each of said arms carrying one of said elements at a location spaced from said pivotal mountings, movably mounted means operatively associated with said arms for swinging said arms to uniformly vary the spacing between said elements, and means for imparting to said arm supporting means a movement to cooperate in maintaining said elements in good alinement with respect to each other.

16. A band blade slicing machine comprising spaced blade supporting drums, a multiplicity of band blades running about said drums and providing between said drums blade courses that run in spaced parallel slicing planes, arm carrying means arranged transversely of said blade courses, a plurality of swinging arms, a plurality of spaced pivotal connections for pivotally mounting said swinging arms on said arm carrying means, a plurality of blade guide devices of which there is one for each of said blade courses, pivotal connections for pivotally mounting said blade guide devices on said swinging arms at places spaced from the pivotal connections by which the arms are mounted on the arm carrying means, said blade guide devices having blade guides adapted to guide said blade courses into said spaced parallel slicing planes, and means for swinging said arms to vary the spacing between said blade courses.

WILLIAM WALTER HARTMAN.