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Wallace et al.

[11] **3,910,143**

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[54] **ADJUSTABLE SLICING APPARATUS**

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[52] **U.S. Cl.** **83/342;** 83/422; 83/473

[51] **Int. Cl.²** **B26D 1/56;** B26D 7/06

[58] **Field of Search** 83/298, 340, 342, 422, 83/349, 471.3, 472, 473

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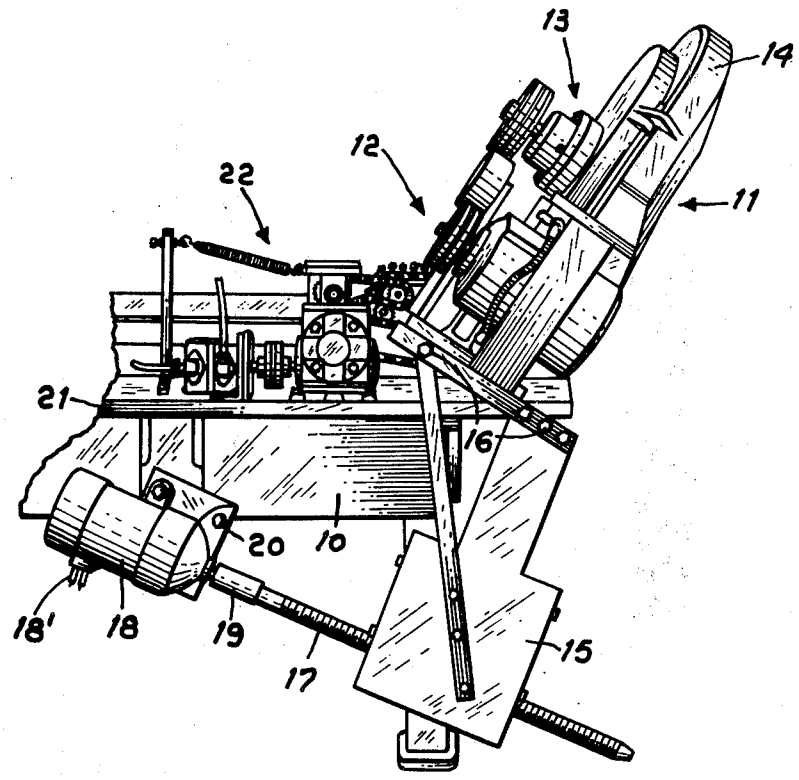
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Attorney, Agent, or Firm—John T. O'Halloran; Menotti J. Lombardi, Jr.

[57] **ABSTRACT**

Adjustable slicing apparatus for slicing slabs of bacon and the like which compensate for deviation in thickness of slabs. Basically, this is accomplished by adjustably cutting the slabs on a bias using the improved apparatus which feeds and slices the bacon slabs. The apparatus includes an angularly displaceable cutting means, and means to control the angular displacement so that the slabs may be cut on a selected bias when advanced through the cutting plane.

17 Claims, 7 Drawing Figures



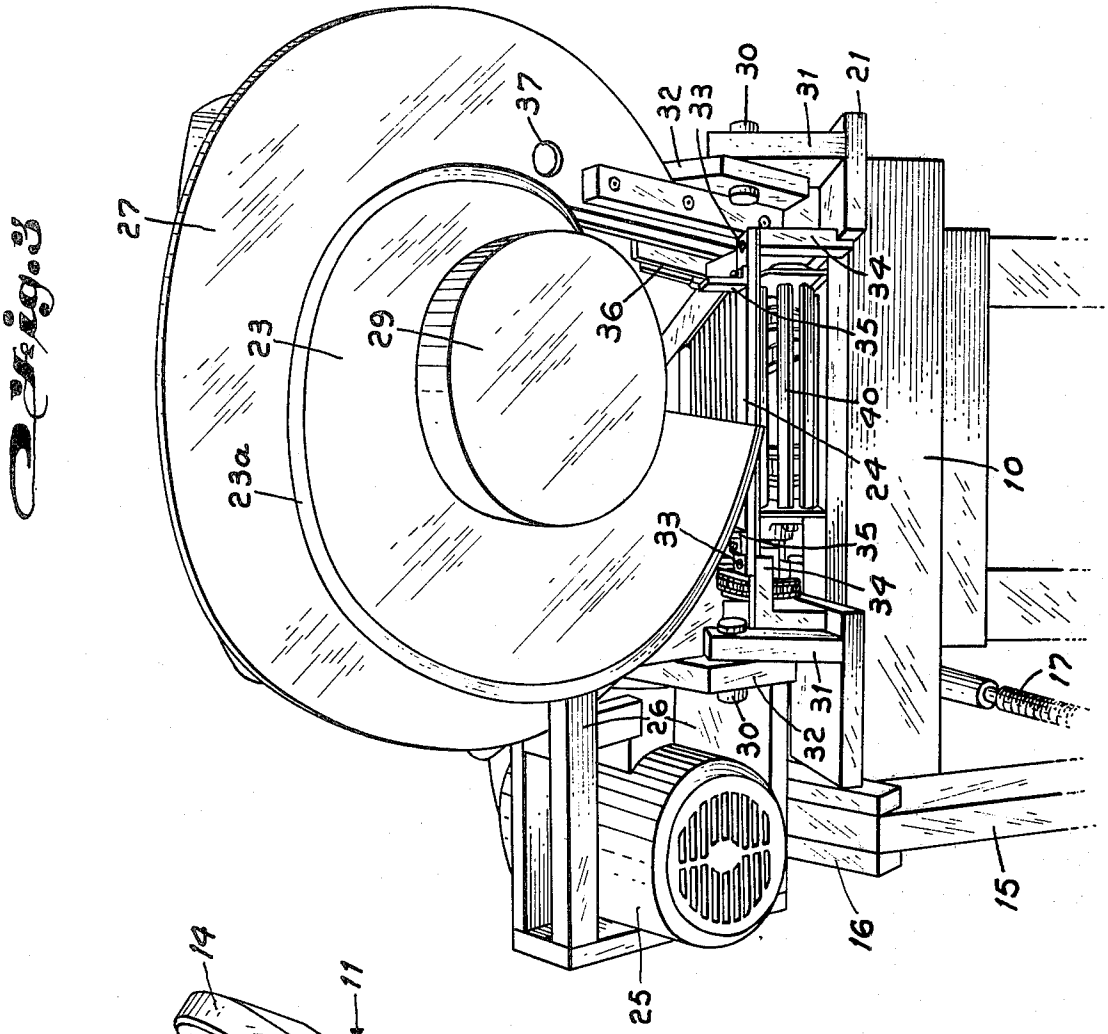

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Fig. 3

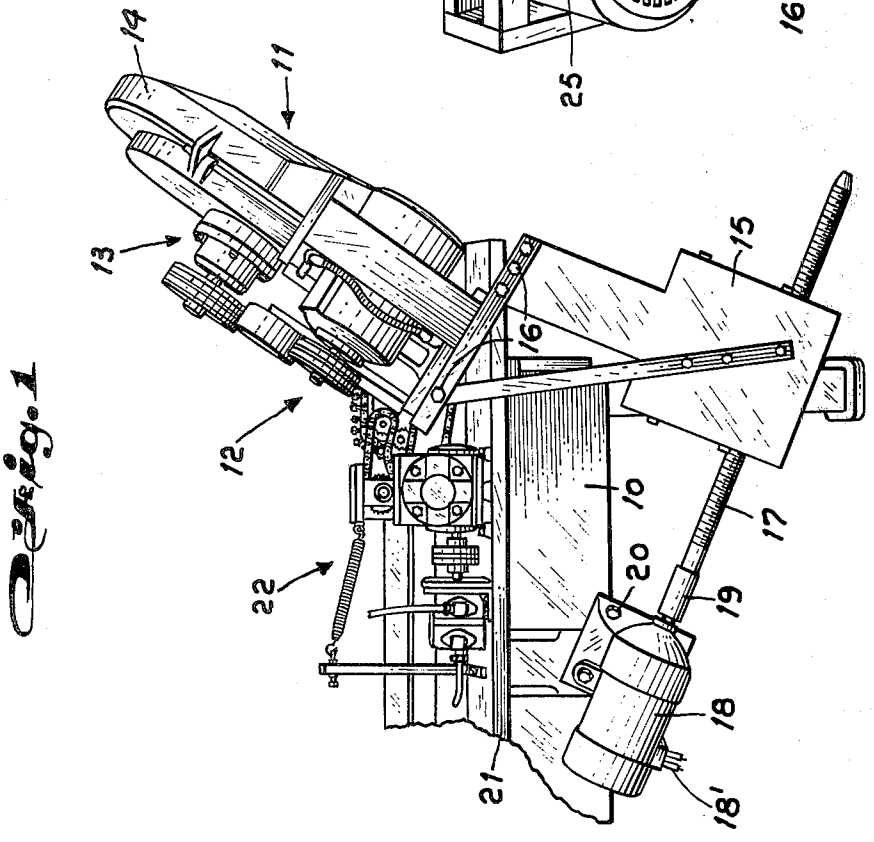

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Fig. 1

Fig. 4

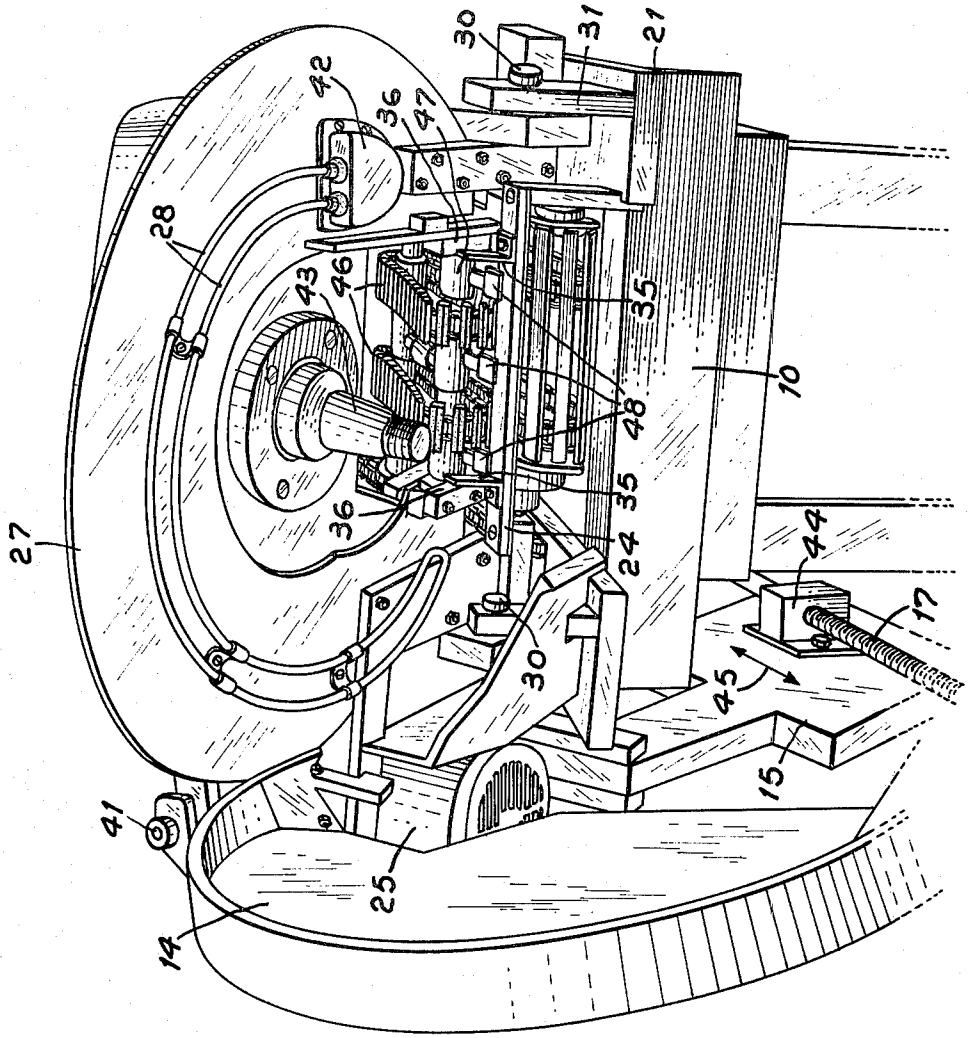

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Fig. 2

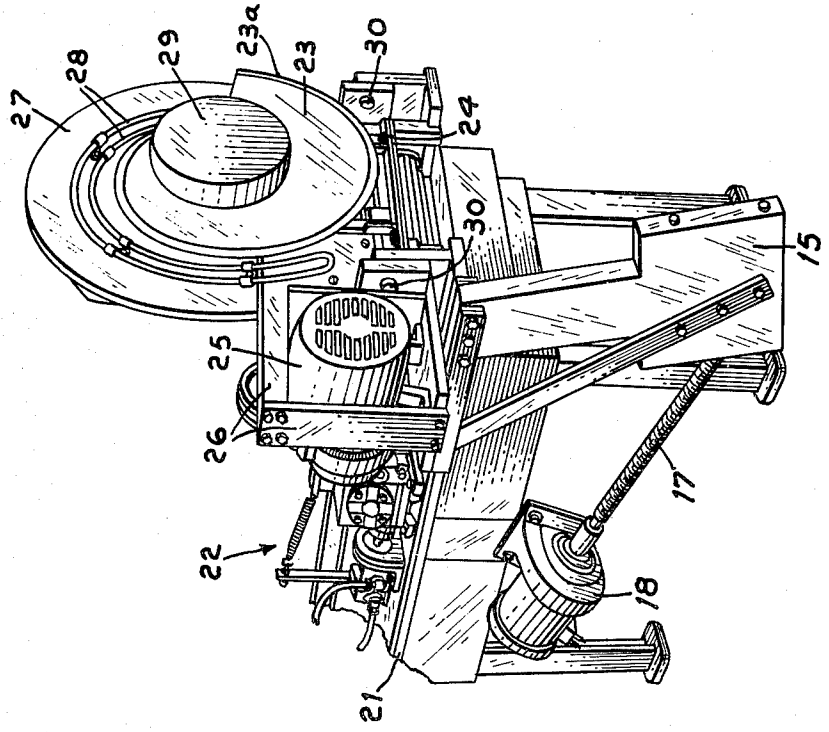
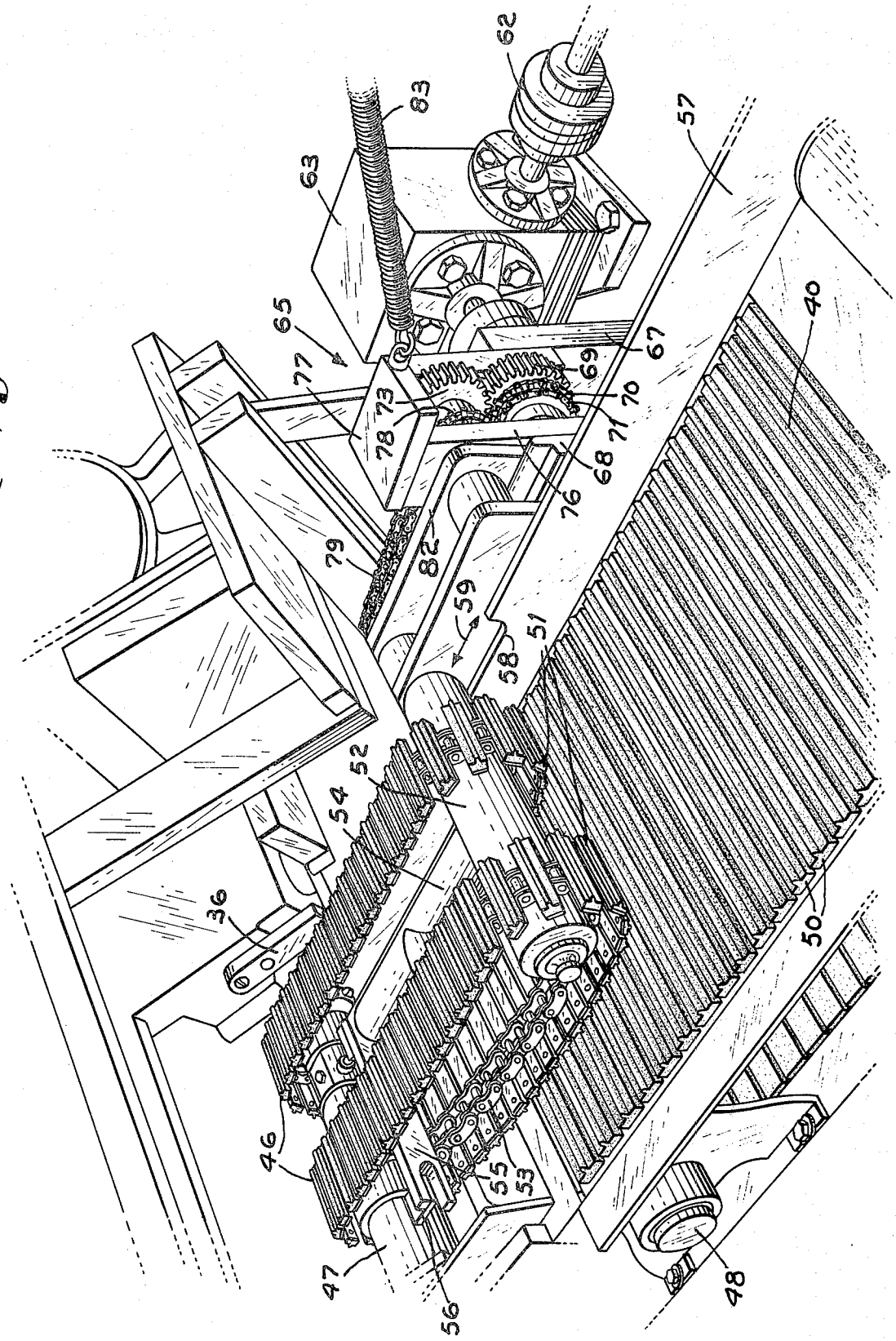

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Fig. 5


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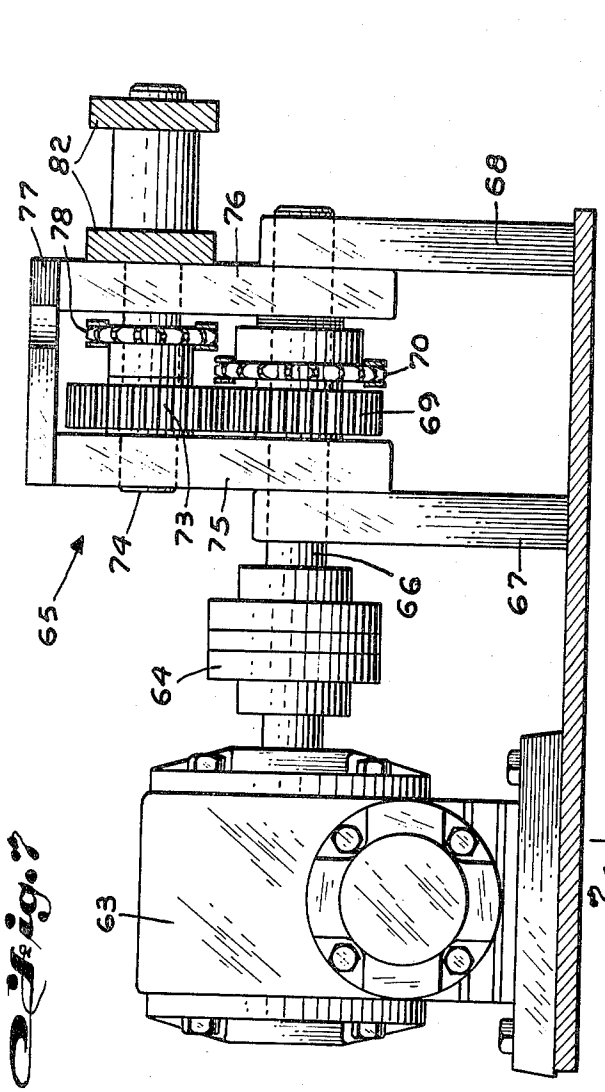

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Fig. 7

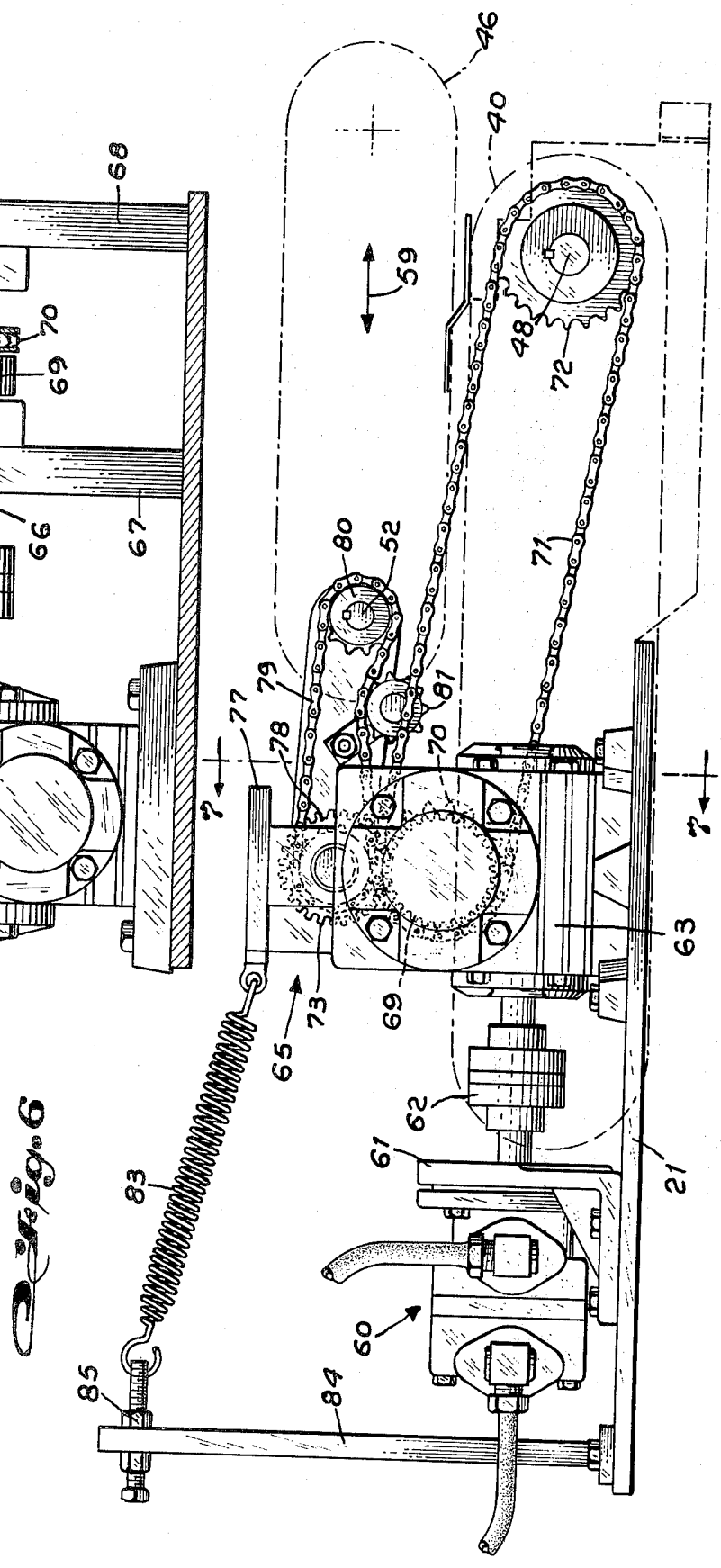

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Fig. 6

ADJUSTABLE SLICING APPARATUS

BACKGROUND OF THE INVENTION

In general, this invention relates to an improved slicing apparatus, and more particularly to an adjustable slicing apparatus for slicing slabs of bacon so that compensation may be made for dimensional variations in the thickness of a slab.

One of the major problems in the meat packing industry is to maximize the return per ounce on animal carcasses, and of particular concern is the slicing and scaling of bacon slabs. Always in the background of such considerations, is the object of producing a slice of bacon in consumer packages which are attractive and uniform regardless of the original dimensions of the slab. In slicing of bacon, the dimensions of the slab such as height may vary considerably, the height (thickness of the slab) may vary anywhere from ¾ to 2½ inches. From the standpoint of percentage deviation, variations in the width of the slabs are considerably less appreciable, and grading of a slab with grade A toward the higher thickness of slab to grade B toward the lower thickness of the slab accounts for the primary grading considerations.

As can be imagined, grade B bacon has a considerably less market value than grade A bacon, primarily due to the variation in height or thickness of the slab which results in considerably less red meat per slice. Although numerous solutions have been suggested for providing classifying equipment which can produce approximately the same number of slices with varying thickness per slice, to accommodate the variations in height of the slab to produce a uniform package wherein the weight is accurately determined, there still remains hidden beneath the packaging small strips of bacon with little red meat.

Further, no one has attempted, prior to this invention, to provide a means for upgrading the bacon slabs from class B to class A to accomplish both the objectives of increased economic yield by upgrading, and thereby improving the sliced bacon produce for the consumer.

Accordingly, the invention proposes means for upgrading bacon slabs so that the slices of bacon produced from variable thickness slabs are uniform standard slices. Basically, this is accomplished by adjustably cutting the slabs on a bias from the front perpendicular surface such that the height and thickness of an individual slice can be maintained substantially uniform, while the thickness (height) of the slab is variable over the grade A to grade B range. The use of this invention allows all grade A slices to be produced and effects a substantial economic return in view of the present pricing scales of the grade A and grade B bacon slabs.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide means for accomplishing the improved slicing.

Another object of the invention is to provide improved slicing apparatus which compensates for deviation in thickness of slabs by adjustably positioning the cutting means.

Yet another object of the invention is to provide an improved apparatus which permits angularly displacing the cutting means with respect to the product so that the product may be sliced on a bias.

Basically, the apparatus includes an angularly displaceable cutting means for cutting the individual slabs of bacon on a bias, feeding means adjustable with the angular displacement of the cutting means for advancing the slab to the cutting point, and means to control the angular displacement of the cutting means from a perpendicular position at the cutting point to an angular displaced position from the perpendicular plane.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and features of the invention will become apparent from the following detailed description of the preferred embodiments thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a side view of apparatus according to the invention with the cutting means in an angularly displaced position;

FIG. 2 is a perspective view of the apparatus showing the blade in a vertical position;

FIG. 3 is a frontal view of certain portions of the apparatus showing the cutting blade in the angular displaced position;

FIG. 4 is also a frontal view of the apparatus in the angular displaced position with the cutting blade removed to show other features of the apparatus;

FIG. 5 is a partial rearward perspective view of FIG. 4 and shows additional features of the apparatus;

FIG. 6 illustrates the drive means for the feed mechanism; and

FIG. 7 is a view of the drive taken along line 7–7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. 1 illustrates the improved slicing apparatus having the adjustable rotary slicing blade in an angularly displaced or tilt forward position. On a base frame **10** is a pivotally mounted and angularly displaceable slicer assembly **11** including a slicer drive means **12**, a rotary slicer blade head assembly **13** and a hingedly attached blade cover **14**. A counter balance assembly **15** is fixedly attached to the slicer assembly by means **16** and coupled to drive screw **17**. The drive screw motor **18** is coupled by means **19** to the drive screw **17**, and is fixedly mounted by plate **20** to base **10** of the frame. Mounted to the base top **21** is the feed drive means **22** for feeding the slabs of bacon in a continuous manner into the rotary slicing blade. The details of the drive assembly are more particularly described in connection with FIGS. **5–7**.

The angular displacement of assembly **11** is accomplished by supplying power to leads **18'**, such that the rotation of motor drive **18** will cause the screw to turn and the screw follower mounted on the counter balance assembly **15** will cause the angular displacement about the pivot point of the assembly **11**. The motor drive **18** may be an AC or DC reversible motor, with or without braking means depending on the type jack screw utilized as a drive screw **17**. Normally, the jack screw utilized will retain the position at which the motor stops without need of a brake on the motor due to the load, and the turning on and off of the motor is sufficient to accurately position the assembly **11** to the desired angular displacement from the vertical position.

Referring now to FIG. **2**, the slicing apparatus is shown in the standard vertical position for perpendicu-

larly cutting the slabs of bacon, as compared to FIG. 1 for cutting the slabs on a bias. A rotary slicing blade 23 with blade edge 23*a* is positioned with respect to a cutting edge or anvil 24 to pass through the cutting plane of the apparatus. The foremost point of the cutting edge 24 is maintained at approximately 0.016 inch (or the desired slice thickness) behind the rearward surface of blade edge 23*a* for all positions of angular displacement of the blade from the vertical position illustrated in FIG. 2 to the maximum angular displaced position. The apparatus illustrated is capable of angular displacement from the vertical of FIG. 2 of at least 50°. In other words, assuming a "zero" vertical position in FIG. 2, the rotary slicing blade 23 may be angularly displaced forward (as shown in FIG. 1) at least 50° by the arrangement of the apparatus as hereinafter described.

The slicing drive motor 25 is mounted by mounting means 26 and forms an integral part of the tiltable assembly. The motor 25 is angularly displaceable with the rotating slicing blade and drives the blade through pulley coupling means, illustrated in FIG. 1, so that the blade rotates at approximately 1200 rpm. Additionally illustrated in FIG. 2 is the rear wall 27 forming the back surface of the blade head assembly, and blade heating elements 28 which keep the blade edge relatively warm since the bacon slabs are normally sliced in a semifrozen condition according to standard practices and requirements. The rotary blade cover 29 is positioned to cover the attaching elements of the blade. The pivot studs 30 form the axis about which the blade assembly is angularly displaced.

Referring now additionally to FIG. 3, the apparatus of FIG. 2 is shown in a frontal view with the rotary slicing blade angularly displaced forward or tilted toward the viewer. It should be noted that the blade cover 14 has been removed in both FIGS. 2 and 3 for simplification of the drawing. Mounted to the frame base top 21 are the upstanding frame base supports 31 in which the pivot studs 30 are positioned and retained. The heating element connected to power through a hole 37 in wall 27 has also been removed in FIG. 3 for simplicity, and to illustrate the fact that it is not necessary in connection with this improved apparatus if not required because of temperature considerations of the slab to be sliced. The slicer assembly 11 contains pivot members 32 through which the studs 30 pass through and are retained therein in a manner which permits displacement of the blade assembly 11 as illustrated. The pivot support members 32, the blade assembly rear wall 27, the slicer drive motor 25 and mounting means 26 are all movable about the studs 30, and the rearward surface of blade edge 23*a* is retained at a predetermined distance from the foremost point of the cutting edge 24. Adjustment of the foremost point of the cutting edge 24 can be made by means of screws 33 which retain the edge in the desired position by attachment to members 34 of the base frame top 21. Upstanding guides 35 are positioned and fixed to the cutting edge to retain the bacon slabs in the proper lateral position within the cutting zone. A lower tractor feed 40 is positioned with the base, and U-shaped bearing mounts 36 are positioned on the wall for the hold-down tractor assembly illustrated and described in connection with subsequent figures.

Referring now to FIG. 4, the figure is similar to that of FIG. 3 with the exception that the cover, heating element, and the hold-down tractor assembly is illustrated, and the rotary blade has been removed. In addition, cover 14 as shown is hingedly attached by means 41 to upstanding wall 27. The power connecting means 42 is shown mounted to the blade wall 27 for supplying power to the heating elements. The blade shaft and mounting 43 is illustrated with the blade 23 and attachment cover 29 removed. Attached to counter balance assembly 15 is screw follower 44 which, according to the direction of rotation of screw 17, moves in the direction indicated by arrow 45 to permit movement of the slicer assembly about the axis formed by pivot studs 30. Also illustrated in FIG. 4 is a pair of hold-down tractor assemblies 46 rotatably mounted and driven in a similar manner to tractor feed 40, as more specifically described in connection with FIGS. 5, 6 and 7. The hold-down tractor assembly 46 comprises two parallel tracks which are rotatably mounted about a forward mounting shaft assembly 47 which is slidably mounted in the U-shaped bearing mounts 36. Attached and angularly positioned are pressure fingers 48 which retain the bacon slabs firmly on the cutting edge 24 and between the guides 36. The forward mounting shaft arrangement 47 is slidably mounted in the U-shaped bearing mounts 36 to enable movement of the tractor assembly 46 forward with the rotating blade, so that the distance between the hold-down tractor and pressure fingers, and the rotating blade remain constant, regardless of the angular position of the blade. If some means is not permitted for movement of the hold-down tractor assembly with the rotating blade, slippage will occur and the desired bias slicing of the bacon slabs cannot be effectively controlled.

Referring now to FIG. 5, a partial perspective rearward view of FIG. 4 is illustrated for purposes of showing the tractor arrangement and drive means, and together with FIGS. 6 and 7, illustrate a preferred means for accomplishing the feeder drive for the bacon slabs in all the angular displaced blade positions. The lower tractor feed 40 is rotatably mounted and driven about shaft means 48 supported in frame 49 in base member 10. The lower tractor feed comprises a multiplicity of parallel transverse cleat elements 50, rotatably mounted about drive sprockets fixedly mounted to forward shaft means 48 and rearward means not shown. In a similar manner, the hold-down tractor assembly 46 comprising the two parallel tracks, each having a plurality of parallel transverse cleat elements 51 rotatably mounted about drive sprockets not shown. The drive sprockets being fixedly and rotatably mounted to the forward mounting shaft 47 and rearward mounting and drive shaft 52. Illustrated in FIG. 5 is the endless sprocket chain 53 on which is attached the transverse cleat elements 51. The chain 53 is engaged by the sprocket wheels mounted on shafts 52 and 47. The endless sprocket chain assemblies on which the transverse cleat elements are attached are the same for both the hold-down tractor assembly and the lower tractor feed assembly. The forward mounting shaft 47 is retained and slidably mounted in U-shaped bearing mounts 36, the shaft is shown in the tilt forward position. A rigid beam member 54 and beam extension 55 supports the forward shaft member 47 and maintains the distance between the rearward drive shaft means 52 and forward shaft 57 which is additionally supported by the extension 56 engaging the slotted portion of the extension 55. This rigid arrangement permits the movement of the hold-down tractor assembly forward to the tilt for-

ward position and rearward to the vertical position in a uniform manner.

The frame side wall guide **57** contains a cut out portion **58** permitting the slidable movement of the hold-down tractor assembly **46** in the direction of arrows **59,** while the blade assembly moves through an angular arc of at least 50° about the pivot point formed by the studs **30.**

Referring now additionally to FIGS. **6** and **7,** the feed drive arrangement in connection with the angular displacement of the rotary blade assembly will be described. A hydraulic motor **60** connected in a standard manner by the input-output connections illustrated, to a hydraulic pump, is mounted by means **61** to the base top **21.** One type of hydraulic motor which would be suitable for a drive of the type illustrated and described would be a hydraulic motor number L–37816 (the Albright-Nell Company). The hydraulic fluid source coupled to the hydraulic motor would be standard and well known in the art and does not form a part of the invention. The hydraulic motor **60** is connected by a flexible coupling **62** to a gear reduction **63** which is also mounted to top base member **21.** The Boston gear speed reducer, type number 321AT–15–J3 for example, is coupled by another flexible coupling **64** to the pivot gear drive assembly **65** by shaft **66.** Shaft **66** is rotatably mounted in support bars **67,68.** Fixedly mounted on shaft **66** is drive gear **69** and the lower tractor conveyor drive sprocket wheel **70.** The lower driven sprocket **70** engages the lower sprocket chain link **71** and drives sprocket wheel **72** mounted on shaft means **48** of the lower tractor feed **40.** Pivot gear **73** meshes with gear **69** and is mounted on shaft **74.** Mounting shaft **74** are pivot supports **75,76** which are pivotably mounted about shaft **66.** Top plate **77** connects pivot support **75,76,** and additionally mounted on shaft **74** is the hold-down conveyor drive sprocket wheel **78.** Drive sprocket **78** engages the hold-down sprocket chain **79** and imparts motion to the hold-down tractor assembly **46** through drive sprocket wheel **80** mounted to drive shaft means **52.** The adjustable tension sprocket wheel **81** engages sprocket chain **72.**

A yoke member **82** connects the pivot gear assembly **65** and the drive shaft assembly **52** as illustrated. In addition, a tension spring **83** coupled to the top plate **77** and a spring support arm **84** by means **85** to maintain a predetermined amount of tension and insure proper mesh between pivot gear **73** and drive gear **69** during all movement of the hold-down tractor assembly. The pivot gear assembly arrangement enables pivot gear **73** to move about the circumference of drive gear **69** to enable the hold-down tractor assembly **46** to be displaced in the direction of arrows **59** and adjust with the tilt of the rotary slicing blade from a vertical first position as illustrated in FIG. **2** to an angularly displaced or tilt forward position as illustrated in FIGS. **1** and **3,** while retaining the predetermined distance between the rotating blade hold-down tractor assembly and the cutting blade.

While we have described above the principles of our invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the objects thereof and in the accompanying claims.

We claim:

1. Slicing apparatus comprising in combination:
- a support frame and cutting anvil;
- a rotating slicer blade assembly pivotally mounted on said frame;
- means coupled to the blade assembly for angularly displacing said blade assembly forwardly of said cutting anvil from a first cutting position to a second cutting position; and
- means for feeding a slab of material to be sliced across said anvil and into the path of the rotating blade of said assembly in the second cutting position.

2. A machine for slicing a slab of bacon or the like, comprising the combination of:
- rotary cutter means displaceably mounted on a support means;
- feeder means to advance said slab across a cutting anvil toward the cutting plane of said rotary cutter means; and
- means connected to said cutter means for angularly displacing said cutter means from one position in which the cutting plane is perpendicular to said slab, to another position angularly displaced forwardly from the perpendicular plane and in which said slab is cut on a bias.

3. The machine combination of claim **2** wherein said other position is determined by the height dimension of said slab, and said angular displacing means includes means for retaining said cutter means in said other position during slicing of said slab.

4. Apparatus for slicing slabs of bacon or the like comprising in combination:
- a support frame;
- a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;
- means for angularly displacing said assembly and retaining the assembly in a selected position which permits slicing of the slabs on a bias in the selected position;
- means for advancing said slabs through the path of said blade in the angular displaced and selected position;
- means for driving said advancing means;
- a cutting anvil mounted on said frame; and
- guide means mounted on said cutting anvil through which said slab is moved forward into the path of said cutting blade.

5. The apparatus of claim **4** wherein the distance between the foremost point of said cutting anvil and the cutting edge of said blade is substantially constant for at least 50° of angular displacement from the vertical position of said blade.

6. Apparatus for slicing slabs of bacon or the like comprising in combination:
- a support frame;
- a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;
- a slicer drive means mounted on said slicer assembly;
- means coupling said drive means to said rotary blade;
- means for angularly displacing said assembly and retaining the assembly in a selected position which permits slicing of the slabs on a bias in the selected position;

means for advancing said slabs through the path of said blade in the angular displaced and selected position; and

means for driving said advancing means.

7. Apparatus for slicing slabs of bacon or the like comprising in combination:

a support frame;

a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;

means for angularly displacing said assembly and retaining the assembly in a selected position which permits slicing of the slabs on a bias in the selected position;

means for advancing said slabs through the path of said blade in the angular displaced and selected position;

means for driving said advancing means; and

said angular displacing means includes

a counter balance assembly coupled to said slicer assembly,

a motor drive means, and

coupling means connecting said motor drive means to said counter balance, whereby the motor drive means controls the position of said slicer assembly through positioning of said counter balance assembly.

8. Apparatus for slicing slabs of bacon or the like comprising in combination:

a support frame;

a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;

means for angularly displacing said assembly and retaining the assembly in a selected position which permits slicing of the slabs on a bias in the selected position;

means for advancing said slabs through the path of said blade in the angular displaced and selected position including a pair of tractor feeds; and

means for driving said advancing means including

means for driving said tractor feeds so that said slabs are moved forward between said pair in a uniform manner into the cutting path of said blade.

9. Apparatus for slicing slabs of bacon or the like comprising in combination:

a support frame;

a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;

means for angularly displacing said assembly and retaining the assembly in a selected position which permits slicing of the slabs on a bias in the selected position;

means for advancing said slabs through the path of said blade in the angular displaced and selected position including

a lower tractor feed;

a hold-down tractor feed means; and

means for driving said advancing means including

means for driving said feed and feed means so that the slabs are conveyed between said feed and feed means into the cutting path of said blade.

10. The apparatus of claim **9** wherein said hold-down tractor feed means includes

a pair of tractor means rotatably mounted about a forward and rearward shaft, one of which is driven; and

means for rigidly connecting said forward and rearward shafts.

11. The apparatus of claim **10** wherein said forward shaft is slidably mounted in said slicer assembly.

12. The apparatus of claim **11** wherein said forward shaft includes pressure finger means for applying pressure on said slab to facilitate the cutting by said rotating blade.

13. Apparatus for slicing slabs of bacon or the like comprising in combination:

a support frame;

a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;

means for angularly displacing said assembly and retaining the assembly in a selected position which permits slicing of the slabs on a bias in the selected position;

means for advancing said slabs through the path of said blade in the angular displaced and selected position;

means for driving said advancing means; and

said means for driving include

a driven pivotal gear assembly, and

means coupling said gear assembly to said advancing means.

14. The apparatus of claim **13** including

hydraulic motor means coupled by gear and coupling means to said pivotal assembly.

15. The apparatus of claim **13** including in said pivotal gear assembly

a driven gear and a pivotal gear movable on the circumference of said driven gear in accordance with the displacement of said slicer assembly.

16. The apparatus of claim **15** including means for maintaining a predetermined tension on said pivotal gear.

17. Apparatus for slicing slabs of bacon comprising in combination:

a support frame;

a slicer assembly pivotally mounted on said frame, and a rotary slicing blade positioned in said assembly for cutting slabs conveyed through the cutting path of said blade;

means for angularly displacing said assembly and retaining the assembly in a position which permits slicing of slabs on a predetermined bias;

means for advancing said slabs through the path of said blade in the angular displaced position;

means for driving said advancing means in the angular displaced position;

said slicer assembly including

a slicer drive means mounted on said slicer assembly, and

means coupling said drive means to said rotary blade,

said angular displacing means includes

a counter balance assembly coupled to said slicer assembly,

a motor drive means, and

coupling means connecting said motor drive means to said counter balance, whereby the motor drive means positions said slicer assembly,

said means for advancing including

a lower tractor feed, and

a hold-down tractor feed means,

said hold-down tractor feed means includes

a pair of tractor means rotatably mounted about a forward and rearward shaft, one of which is driven, and

said means for driving include

a driven pivotal gear assembly, and

means coupling said gear assembly to said advancing means.

* * * * *