BACON SLICER HAVING AUTOMATIC FEED ADJUSTMENT

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The present invention relates to equipment for feeding and slicing materials, particularly food materials such as bacon, pressed meats, hams, cheeses and the like, and wherein the sliced product is to be prepared in packages of substantially equal weight having a substantially equal number of slices on a mass production basis.

More particularly, the invention relates to machines of the type indicated in which the bacon or other product which has been previously cut to a generally rectangular slab which is to be automatically sliced transversely of the slab and packaged, and wherein the machine automatically controls the weight of each slice and package of slices so as to require a minimum amount of manual control and correction to obtain the desired uniformity of the packaged product.

A machine of the character described is illustrated and described in a copending U.S. patent application, Serial No. 566,451, filed Feb. 20, 1936, by the applicant and Thomas Waugh, now Patent No. 3,010,499.

A principal object of this invention is to improve the slice thickness controls associated with a machine of the type shown in the said application. The apparatus shown in the application is equipped with means for automatically controlling the feed of the bacon slab to a constant speed slicer whereby the thickness of the bacon slices cut from the slab by the slicer is also controlled. Included in the control means are gauging fingers or feelers which follow the contour of the slab, being raised by thicker portions and dropping to follow the contour of depressions in the slab underneath. The change in thickness of the slab at the several gauging points is integrated through computors connected like single trees or whiffle trees in form and referred to hereinafter as whiffle trees. Responsive to an increase in composite thickness, of the bacon slab, the controller decreases the speed of the slab toward the constant speed slicing blade so that relatively thin slices are cut from the thicker slab blocks. Similarly, relatively thick slices are cut from a narrower slab portion detected by the finger feelers. The result is that all of the slices are of substantially equal weight. It of course will be understood that the feed rather than the cutter may be operated at uniform speed in which event the speed of the cutter is to be regulated by the controller responsive to the gauge fingers so as to maintain uniform slice weight.

The present invention provides improved gauging equipment which gauges a plurality of surfaces concurrently and integrates the readings of the several surfaces.

More particularly, the invention provides equipment with which to gauge horizontal and vertical surfaces concurrently and control the feed of the bacon slab or other articles responsive to changes in the cross section thereof.

The invention also provides equipment of the character indicated with which to gauge opposite sides of a slab and to regulate slicing of the slab responsive to changes in the gauged surfaces.

More particularly, the present invention provides equipment for gauging the bottom and side surfaces of the bacon slab or the like.

A net increase in thickness of the slab determined by the integrated reading of several gauge points operates the controller to decrease the speed of the bacon slab so that a thinner bacon slice is cut from the thicker slab and so that the weight of successive slices remains constant.

It should be understood that the above identified objects and advantages are illustrative and that modifications applicable to automatic handling of many types of materials other than bacon and the like are contemplated.

Moreover, numerous additional objects and advantages will be apparent from the following description of an illustrative embodiment of the invention, the scope of which is defined by the appended claims, and the description of which is made with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of gauge, feed and control apparatus embodying the present invention;
FIG. 2 is a sectional view taken on line 2—2 of FIG. 3 of a side gauge portion of the apparatus shown in FIG. 1;
FIG. 3 is an enlarged front elevation view of the side gauge portion of the machine as viewed from the right of FIG. 1;
FIG. 4 is a side elevation view of the central portion of the machine as seen from line 4—4 in FIG. 5;
FIG. 5 is a view similar to FIG. 1 of a modified embodiment of the invention; and
FIG. 6 is a perspective view taken generally from beneath FIG. 5.

General Description

FIG. 1 illustrates mechanism, generally designated S, which includes a feeding ram or pusher 10 for intermittently advancing or feeding a bacon slab B or the like on a table or support 11 to slicing position relative to a slicer knife 13.

The speed of the ram 10 is regulated by control mechanism C which includes sensing means comprising a plurality of scanning fingers 16 that gauge changes in size of the bacon slab B, and the control mechanism operates automatically to vary the speed of the ram 10 to compensate for changes in the cross-section of the slab B, whereby to maintain the weight of each slice and group of slices as closely as possible to a preselected value.

More specifically, a slice thickness controller 17 is included in the control mechanism and is responsive in part to the integrated movements of the fingers 16 and regulates the speed of a piston motor 18 which may be referred to as power advancing means and which advances the bacon slab ram or pusher 10 toward the slicer knife 13. The piston in the said motor is connected with the ram 10 to advance the slab toward the knife 13 as the piston moves from right to left.

In the embodiment illustrated in FIG. 1, the control mechanism C has four vertically movable fingers 16 that contact the top surface of the bacon slab B adjacent the slicing knife 13. A fifth finger or gauging lever 54 which is laterally movable contacts side 19 of the slab opposite side which is held in engagement with guide wall 20 of the table 11.

The ram or pusher 10 is supported on the table 11 and includes a channeled portion 12 which straddles the guide wall 20 and guides the movement of the pusher 10 longitudinally on the table. The pusher 10 may include a group of pointed fingers or grippers (not shown) which swing downwardly and grip the bacon slab B during forward movement of the pusher 10 and pivot upward and release the slab when the pusher is retracted.

By means of the control mechanism C, the pusher 10 feeds the bacon slab B to the cutting knife 13 at a preselected rate which is infinitely variable so that slice thickness may be controlled at any thickness and weight and at any desired number of slices to the pound.
Controlling the Number of Slices Per Group or Package

The control mechanism C includes a tank or reservoir and a hydraulic pump and pressure regulator (not shown) with which to preselect and maintain a constant discharge pressure in a supply pipe 21 from the reservoir so that a constant pressure is maintained in line 21 despite flow changes effected by changes in load on the motor 18.

As shown in FIG. 1, the constant pressure line 21 is connected to the inlet of a solenoid actuated two-way valve 22 having two outlet lines 23 and 24, the line 23 being connected to the piston or hydraulic motor 18, and the line 24 being connected to the supply tank or drain.

The valve 22 controls the feed of the ram 10 and its solenoid may be operated manually or automatically, as by a counter (not shown), that counts the revolutions of the slicer blade 13 and sets the valve 22 to discharge through the line 23 into the hydraulic motor 18 whereby to advance the ram 10 for a selected number of revolutions of the blade 13, as for example 20. Then, the valve 22 is shifted to discharge through the line 24 so that the ram is stationary for a selected number of revolutions (16 for example) of the blade as disclosed in the aforementioned patent application, Serial No. 566,451.

In the batch, slices of bacon may be assembled in groups of a preselected number of slices for packaging with a preselected time lapse and spacing between successive groups.

In summary, then the bacon may be sliced in successive individual packaging assemblies, each having the same number of slices which may be regularly preselected. More particularly, the bacon feeding ram 10 is alternately advanced and stopped in timed relation to the revolutions of the slicer blade 13 by alternating the solenoid valve 22 between its ram-advancing and ram-stationary positions.

Controlling the Slice Weight

When the valve 22 is supplying pressure fluid through line 23 to advance the ram 10, the discharge fluid from the motor 18 is directed through a line 26 to a controller valve 20 which throttles and retards the rate of discharge of the hydraulic fluid from the motor 18 and thereby regulates the speed of the ram 10 relative to the revolutions of the slicer blade 13 and consequently the thickness and weight of the bacon slices.

The control mechanism C automatically controls the forward speed of the feed ram 10 and the consequent thickness of the bacon slices cut from the slab B by the blade 13 responsive to variations in size and shape of the bacon slab B adjacent the slicer blade.

The motion transmitting means utilized to transmit motion from the sensing means 46 and 47 to the controller 17 responsive to changes detected by the fingers 50 and 54 in the shape of the slab B. The motion transmitting means utilized to transmit motion from the sensing means 46 and 54 to coordinate their movements in adjusting the said valve or control means may hereinafter be referred to as compensating means.

Valve shaft 31 is raised or lowered responsive to those changes so that the effective size of the throttling orifice 32 formed by the overlapping portions of the orifice 33 in the holder 34 and the orifice 34 in the valve housing is varied automatically. The change in the size of the orifice 32 increases or decreases the resistance offered by the valve 30 to the discharge of pressure fluid from the ram motor 18 thereby increasing or decreasing the speed of the ram 10 and consequently the thickness of the bacon slices to compensate for changes in the size of the bacon slab.

Located in parallel with and by-passing the valve orifice 32 in the controller 17 is a manually adjustable valve 35 for regulating the discharge of fluid from the ram motor 18. Most of the discharge from the motor 18 is through the valve 35 which provides for coarse adjustment of the bacon slice thickness. The finer control of thickness is provided automatically by the valve orifice 32.

As shown in FIG. 1, the valve shaft 31 is pivotally supported by a pivot motor 18 which is centrally pivotally supported in the eccentric central portion of a pivot pin 41 carried by an adjustable support 42. The support 42 is secured to the lower end of a jackscrew 45 which may be raised and lowered by a thumb nut 43 so as to raise and lower the pivot support 41 for the lever 40.

Pivotally secured to the other end of the lever 40 by a pin 44 is the center of a whiffle-tree lever 45 to opposite ends of which additional whiffle-tree levers 46 and 47 are pivotally secured midway their ends by studs 48 and 49.

As shown in FIG. 1, the four ends of the whiffle-trees 45 and 47 are connected by individual connecting rods 50 to the rear end of the individual gauging fingers lever 16. The spring 36 acting through the shaft 31, lever 40, and whiffle-trees 45, 46 and 47 draws the connectors 50 upward and pivot the gauging finger ends 52 of the individual fingers 16 to the lowermost positions permitted by engagement of stop 31 on the valve shaft 31 with the housing of the controller 30.

As is apparent from FIG. 1, shaft 51 on which the gauging fingers lever 16 are pivotally mounted, is disposed transversely of the direction of travel of the bacon slab B to the slicer blade so that the several feeler ends 52 engage the slab B at spaced points across its width.

As the slab B moves toward the blade 13, the finger feeler ends 52 follow the contour of the slab, being raised by the other portion of the slab. The change in thickness of the slab at the several gaging points is integrated through the whiffle-trees 45, 46 and 47 so that an increase in composite thickness raises the valve shaft 31 and thereby reduces the controller valve opening 32. Consequently, the resistance to discharge of pressure fluid from the motor 18 is increased and the speed of the ram 10 correspondingly decreased so that a thicker bacon slice is cut from the thicker slab portion detected by the feelers 52. It will be apparent that lesser slab thicknesses and depressions will effect a lowering of the feeler 52 and a corresponding lowering of the valve shaft 31 with a resulting increase in slice thickness. Preferably, the feelers 52 are located as close as possible to the blade 13 so that the setting of the valve shaft 31 affected by the feelers 52 of the gauging fingers 16 is responsive to the portion of the slab used to produce the bacon slab.

In accordance with the present invention, the control valve 30 also is responsive to change in width as well as thickness of the slab. As shown in FIGS. 1–4, the feeler finger identified by reference number 54 is pivotally mounted on a vertical shaft 55 to gauge variations in the width of the slab. The shaft 55 is journaled for both rotary and axial movement in fixed bearing 55A which is supported on a vertical frame plate F forming part of the fixed machine frame indicated generally by the reference F.

Rotatably mounted on the shaft 55 is a crank 56 which is connected by a connecting rod 57 with a crank arm
5 that is secured to the pin 41 on an eccentric portion of which the lever 40 pivots.

The hub of the crank 56 includes a clamping dog 59 which is receivable in a slot 60 in the hub of the feeder arm 54 when the shaft 55 is in the position shown in FIGS. 3 and 4 to which the shaft is yieldingly pressed by compression spring 61. A tension spring 62 yieldably biases the feeder arm 54 clockwise (FIG. 2) into engagement with the side of the eccentric slab B opposite the guide wall 20 (FIG. 1). Similarly, a spring 64 yieldably biases the crank 56 clockwise (FIG. 2). Changes in the width of the bacon slab B vary the position of the arm 54 and effect a corresponding rotation of the eccentric shaft or pin 41 which raises or lowers the lever 40 any of the size of the slab B is effected. Thus clockwise (FIG. 2) movement of the arm 54 responsive to a decrease in the width of the slab B lowers the lever 40 and the valve rod 31 thereby opening the orifice 32 and accelerating the ram motor 18 so that a thicker slice is cut from the narrower portion of the slab and a preselected slice weight is maintained. Conversely, counterclockwise movement of the arm 54 decelerates the ram motor 18 so that a thinner slice is cut.

In order that the control valve 30 may be insensitive and unresponsive to engagement of the gauge feeler 54 with the pusher 10, there preferably is provided, as shown in FIGS. 4, 6 and 7, a feeler lever 65 which pivots on a horizontally disposed stud 66 above the path of the bacon slab B. Normally, the lever 65 hangs in the down position shown in FIG. 4. However, as the pusher 10 approaches the feeler 54, the pusher engages and pivots the lever 65 up so that the lever portion 67 raises the shaft 55 and crank 56 thereby disengaging the clutch dog 59 from the feeler 54.

In order to render the control valve 30 unresponsive to the disengagement of the crank 56 and feeler 54, the crank 56 includes a conical cam portion 68 which, as shown in FIG. 3, holds a pawl 69 out of engagement with a ratchet wheel portion 70 of the crank 56 when the latter engages the side feeler 54. However, when the shaft 55 and crank 56 are raised by the lever 65 responsive to the pusher 10, a spring 71 pivots the pawl 69 into locking engagement with the ratchet 70 and prevents rotation of the shaft 55 and corresponding movement of the connecting rod 57 so long as the clutch dog 59 and feeler 54 are engaged. Thus, when the pusher 10, rather than the slab B, engages the side feeler 54 during the final portion of travel of the slab B to the slicer, there is no corresponding adjustment of the controller 30 responsive to the feeler 54.

Therefore, in accordance with the invention, the gauging of the slab B is affected. Thus, the plurality of surfaces and the gauge readings on the several surfaces are integrated in a single reading of cross section.

The Alternative Form

In the embodiment shown in FIGS. 5 and 6, both the upper and lower surfaces of the bacon slab are gauged. More particularly, the upper surface is gauged with integrating apparatus 74, the components of which are similar to and identified by the reference numbers of the corresponding components heretofore described with reference to FIG. 1. As shown in FIG. 6, the lower surface is gauged with similar apparatus, generally designated 75, the like components of which also are identified by like reference numbers. Thus, the gauge fingers of the gauging apparatus 75 are identified by the reference number 16 and are pivotally supported on a horizontal shaft 51' beneath the table 11. The fingers 16 pivot upwardly through movable cutting means adjacent thereto, pusher means operatively associated with said support to advance bacon and the like into the cutter means, vertically and laterally movable sensing means operatively associated with said support to engage the advancing bacon and the like and including at least one generally vertically movable finger.
engaging the top surface and one generally vertically movable finger engaging the bottom surface of the bacon and the like, a generally laterally movable arm engaging a side surface of the bacon and the like, hydraulic power advancing means operatively connected to said pusher means, control means comprising a valve connected to said pusher means and operable by the hereinafter mentioned compensating means, and compensating means interconnecting said vertical and lateral sensing means and operatively connected to said valve for advancing said pusher means at speeds dependent upon the cross sectional area of a slab of bacon and the like to provide for the production of substantially uniform weight in a uniform number of slices cut from the slab, said compensating means including a lever which at one end is pivotally connected to the valve and which is movably and pivotally supported between its ends, a whiffle tree pivotally connected between its ends to the other end of the lever and which is connected at its ends to the respective fingers, and motion transmitting means including a crank connected between said arm and said lever for pivoting said lever responsive to movement of the arm to effect adjustment of said valve.

4. A machine for slicing bacon and the like which comprises a support having substantially constant speed movable cutter means adjacent thereto, pusher means operatively associated with said support to advance bacon and the like into the cutter means, vertically and laterally movable sensing means operatively associated with said support including a vertically movable means engaging a lateral surface of the advancing bacon and a laterally movable means engaging a vertical surface of the bacon and the like, power means operatively connected to said pusher means, control means connected to said power advancing means, and compensating means interconnecting said vertical and lateral sensing means and operatively connected to said control means for advancing said pusher means at speeds dependent upon the cross sectional area of the slab of bacon and the like to provide for the production of substantially uniform weight in a uniform number of slices of bacon and the like cut from the slab, said compensating means including a lever which at one end is pivotally connected to the control means and at the other end is pivotally connected to the vertically movable sensing means and which is pivoted between its ends for movement in a generally vertical plane, the said compensating means also including motion transmitting means connected between said laterally movable sensing means and the said lever and comprising crank means for pivoting said lever responsive to movement of said laterally movable sensing means to effect adjustment of said control means.

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