Feb. 24, 1948. H. THOMAS 2,436,703

BREAD SLICING MACHINE HAVING MULTIPLE RECIPROCATING BLADES WITH A GUARD

Filed Feb. 19, 1944 3 Sheets-Sheet 1

Fig. 1

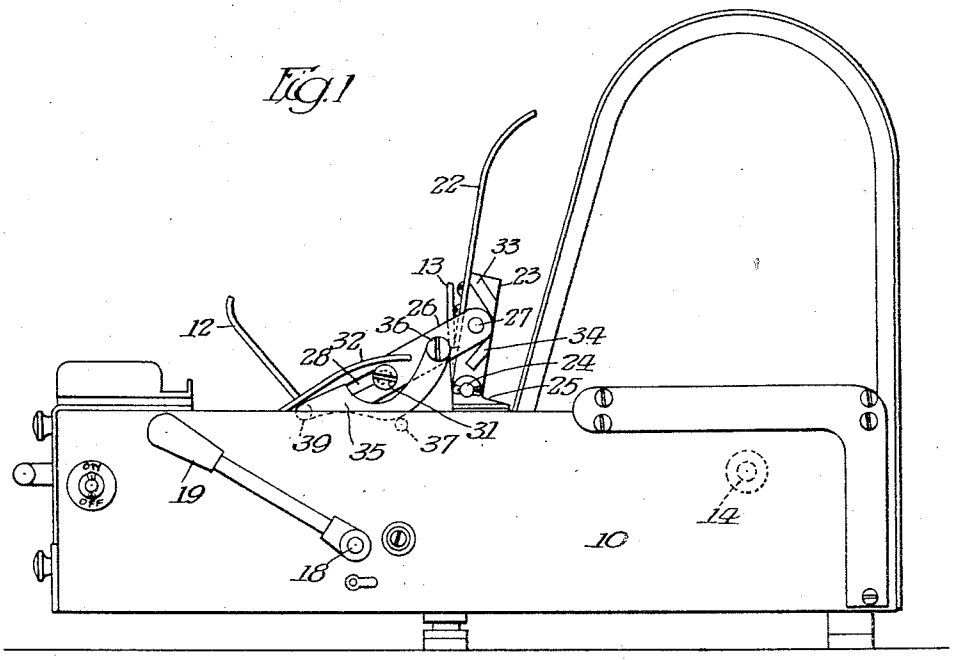


Fig. 2

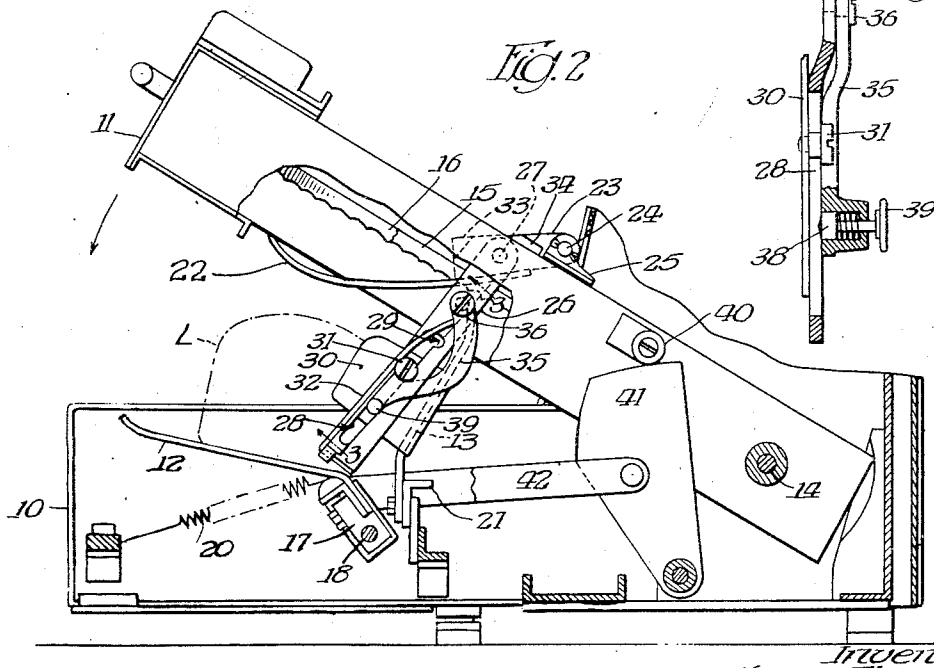


Fig. 3

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Fig. 4

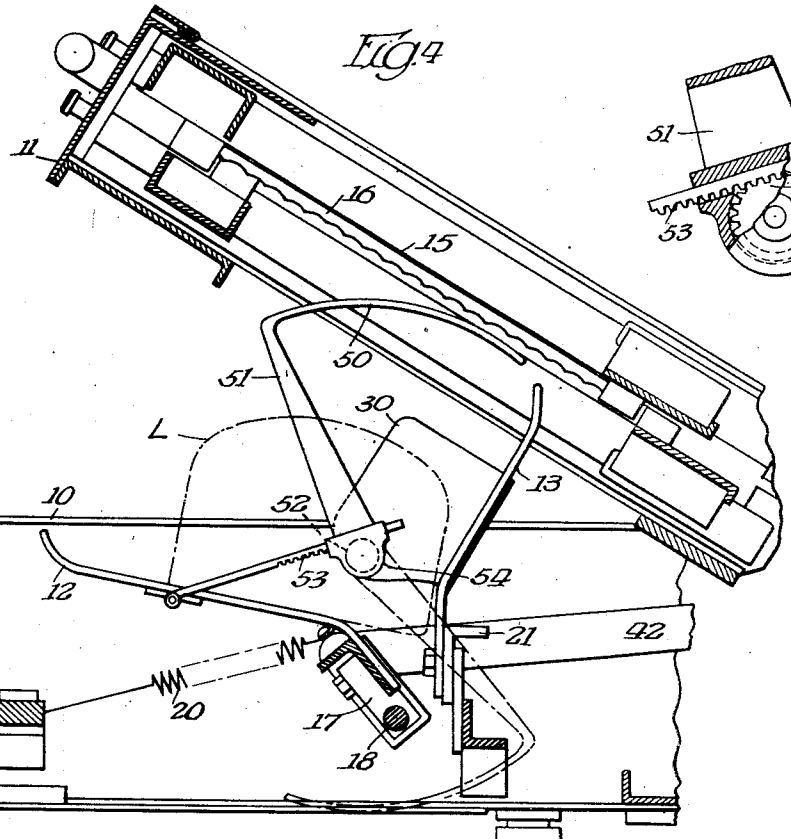
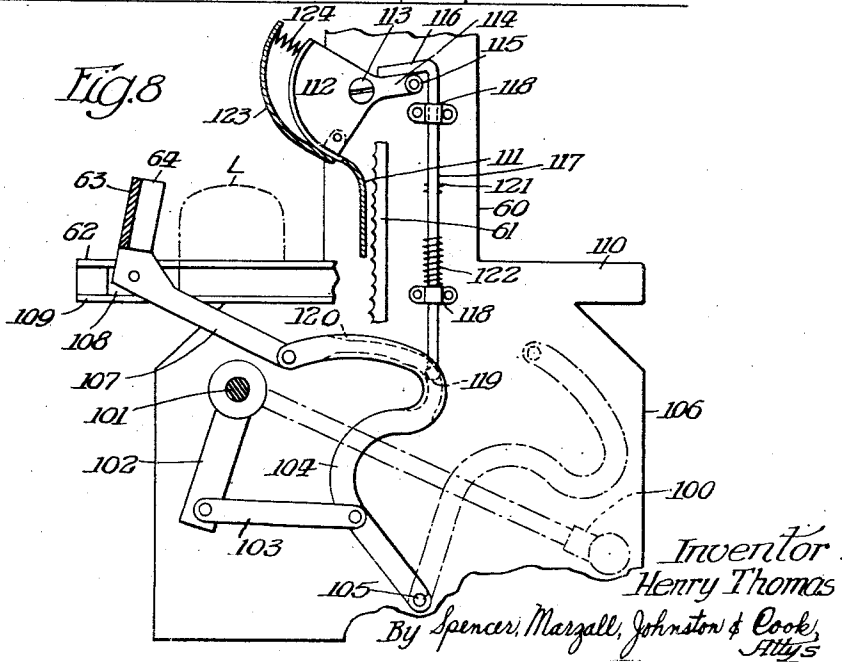


Fig. 5

Fig. 8



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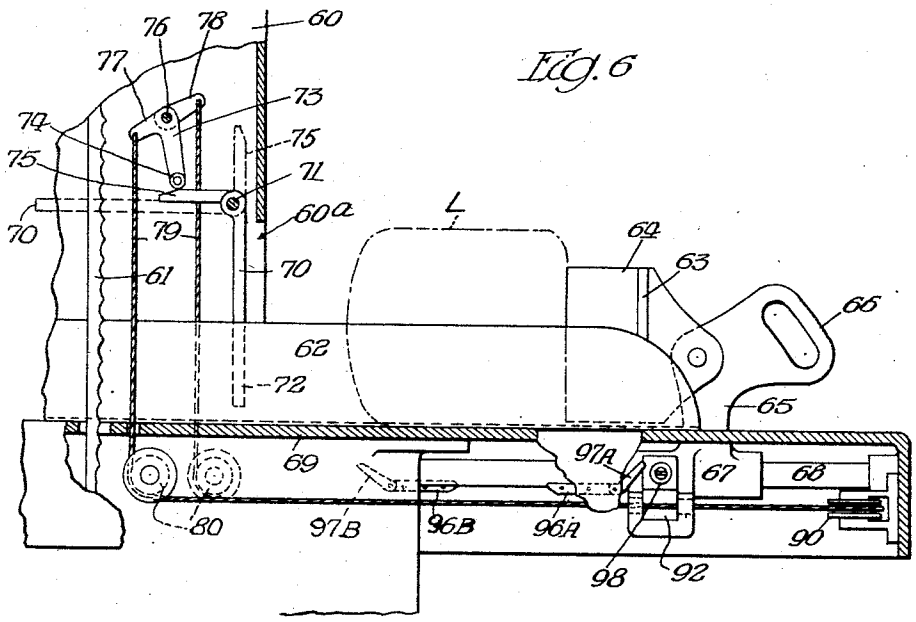


FIG. 6

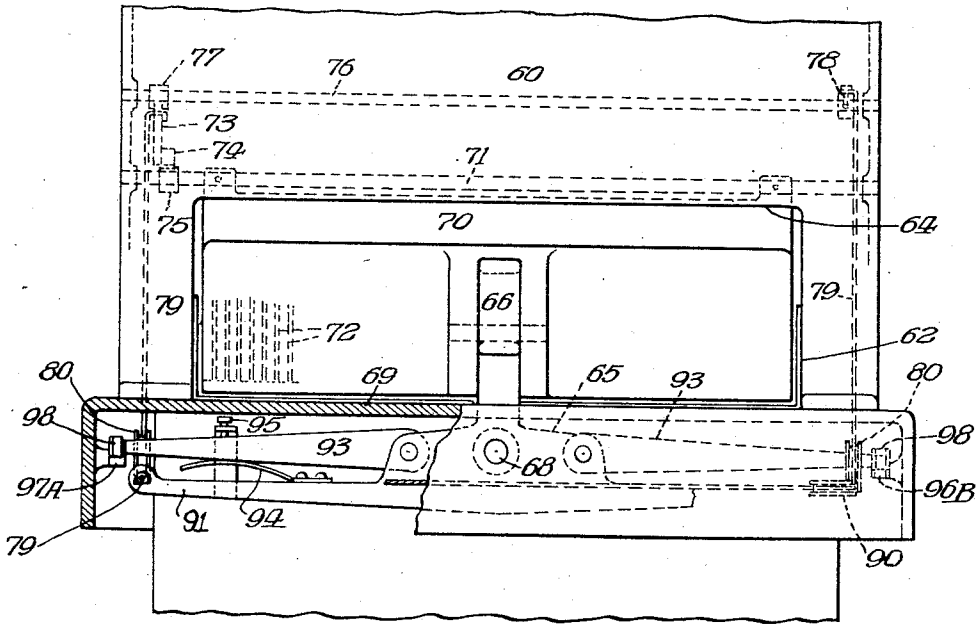


FIG. 7

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UNITED STATES PATENT OFFICE

2,436,703

BREAD SLICING MACHINE HAVING MULTIPLE RECIPROCATING BLADES, WITH A GUARD

Henry Thomas, Chingford, England, assignor to U. S. Slicing Machine Company, La Porte, Ind., a corporation of Indiana

Application February 19, 1944, Serial No. 523,016
In Great Britain March 23, 1943

8 Claims. (Cl. 146—151)

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This invention relates to slicing machines in general, and particularly to machines for slicing bread. More specifically the invention relates to substance slicing machines wherein knife assemblies reciprocate in opposite directions for severing the substance into a plurality of slices when the substance has passed through the knife assemblies.

Machines of the type stated ordinarily have no safety means to prevent damage or injury by physical contact with the knife cutting edges during the loading and unloading operations of the machine. Usually the knives are mounted in a frame or housing which has an opening for the entrance of the substance, and in some instances the machine may be provided with an opposite opening for the exit of the slices. As the edges of the knives face the entrance opening it is desirable that persons who operate the machine should be prevented as far as practicable, and more especially when performing the work of loading the machine with the substance to be sliced, from having access through the entrance to the zone where the knives are located. As the entrance opening usually will be masked by the substance and/or its support sufficiently to prevent the entry of a person's hand while the machine is actually cutting the substance, the present invention overcomes the inherent disadvantages of conventional machines.

The primary object of the present invention is the provision of improved guard means for the entrance opening of the machine during the times the opening is unmasked by the substance or its support while the main components of the machine occupy the position in which the machine is loaded with the substance to be sliced.

A further object of the present invention is the provision of a new and novel knife guard so positioned that when slicing motion of the machine is stopped and the main components are positioned to receive the substance to be sliced, the guard will be positioned to mask the knives, but when the slicing motion of the machine is started, the guard will be moved to a non-obstructive position.

Another object of the invention is the provision of a slicing machine which is provided with a novel guard arrangement to protect the user from injury by masking the knives during the machine loading position, there being releasable means in some instances to lock the guard in position to prevent accidental release of the guard.

A still further object is the provision of a knife guard to guard or mask the cutting edges of the knife and to clamp the substance during the cutting operation.

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Another object is to provide a knife guard which may be operatively connected to a support so that when the support is moved between loading and slicing positions, the guard will be moved from a knife-guarding position to a non-obstructive position.

Numerous other objects and advantages will be apparent throughout the progress of the following specification.

The accompanying drawings illustrate certain selected embodiments of the invention and the views therein are as follows:

Fig. 1 is a detail side elevational view of one form of slicing machine and embodying the invention;

Fig. 2 is a detail longitudinal sectional view of the machine shown in Fig. 1 with one of the components shown in raised position;

Fig. 3 is a detail sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a detail sectional view similar to Fig. 2 but showing a modified form of knife guard;

Fig. 5 is an end elevational view of some of the mechanism shown in Fig. 4, parts being broken away for the sake of clearness;

Fig. 6 is a detail longitudinal sectional view of another form of slicing machine and embodying the invention;

Fig. 7 is an elevational view of the machine shown in Fig. 6, parts being broken away for the sake of clearness; and

Fig. 8 is a diagrammatic or schematic view of another form of slicing machine and embodying the invention.

A machine of the kind to which embodiments of the present invention are applied according to Figs. 1 to 3 and Figs. 4 and 5 is shown and described in United States Letters Patent No. 2,315,767, issued April 6, 1943, and assigned to the present assignee. Therefore, reference shall be made herein only to those parts of the machine with which parts according to the present invention are directly concerned.

The machine shown in Figs. 1 and 2 includes a supporting base or frame 10, a knife frame 11 and a loaf supporting tray 12, 13.

The knife frame 11 is pivoted at 14 to the base and can be raised manually or by power from its lowered position shown in Fig. 1 to its raised position shown in Fig. 2. Springs (not shown) are provided to assist manual lifting of the frame. The knife frame 11 is provided with two coplanar sets of knives 15, 16 which are spaced apart a

slice-thickness, and these knives are simultaneously reciprocated in opposite directions to perform the cutting operation during descent of the frame.

The components 12, 13 of the loaf tray are both comb-like members, which are angularly disposed with respect to each other. The member 12 is secured to cranks 17, of which there is one at each side of the machine. These cranks are secured to a shaft 18 which is turnable by a handle 19 against the pull of a spring 20. The member 13, Fig. 4, is rigidly secured to a fixed anchorage bar 21.

Means are also provided to hold the loaf L steady in the tray 12, 13 during the early portion of the slicing operation and until the knives have partly sliced the loaf; and in the construction illustrated by Figs. 1 to 3 the said holding means is made to function also as a knife guard according to the present invention.

The combined holding means and knife guard comprises another comb-like member 22 whose fingers are long enough to mask the lower opening of the frame 11, as Fig. 2 shows, which opening the loaf occupies in the slicing operation. The member 22 extends throughout the length of the loaf tray. At each end it has an arm 23, and these arms are pivotally mounted upon a shaft 24 which is journalled in brackets 25 on the knife frame. Links 26 are pivotally connected at 27 to the arms 23. Each of these links has a long slot 28, at the upper end of which there is an offset portion 29. Plates 30 are rigidly attached to the ends of the comb-like member 13. A pin 31 on each of these plates operates in the adjacent slot 28. Each of the links 26 has a spring 32, the upper end of which engages the adjacent pin 31. Each of the arms 23 has a lug 33 to engage the adjacent link 26 and another lug 34 is provided on each arm 23 to engage the knife-frame in order to support the comb-like member 22 in its lowest position (see Fig. 2). The slot 28, with its portion 29, and the pin 31 and spring 32 constitute a lost-motion device in the two-part linkage 23, 26 between the knife frame 11 and the anchorage plates 30 on the base 10, and the manner in which said device functions will be described hereinafter.

Means are provided to lock the comb-like member 22 against displacement so that it will exercise its function as a knife guard while the guard is in its knife-guarding position. The means acts also to release the guard whenever the knives are descending upon the loaf, at which stage the loaf L blocks the opening that leads through the bottom of the knife-frame to the knives. The guard-locking means comprise locking hooks 35, one at each side of the machine, each of said hooks being pivotally attached at 36 to the adjacent link 26 so as to enter into locking engagement with the respective pin 31, which acts as a stationary stop. Each hook, Fig. 1, cooperates with another stop 37 on the base 10. Each hook has a spring-plunger 38, Fig. 3, which is engageable with the long slot 28 to hold the hook in the locking position. The spring-plunger 38 has a finger-knob 39 by which it can be withdrawn at will from engagement with the slot 28 in order to render the member 22 displaceable from its knife-guarding position.

In operation of the machine, assuming that the parts are in their out-of-use position shown in Fig. 1, the knife frame 11 is raised (either by hand or power) until rollers 40 on the frame move clear of cams 41 on the base, at which point the

cams 41 are pulled through links 42 by the springs 20 into the frame-supporting position, as shown in Fig. 2. The machine is now set to receive a loaf to be sliced, the knife frame 11 and the loaf support 12, 13 being fully separated. In this position of the knife frame, each linkage 23 is extended to the maximum angle permitted by the lugs 33, 34; the respective pin 31 occupies a place in the slot 28 spaced from the offset recess 29; and the respective locking hook 35 engages the pin 31, being held in place by the spring-plunger 38 engaging the slot. When putting the loaf in the tray 12, 13, should the hand of the operator come towards the knives 15, 16, the hand can not pass the knife-guard 22; and if the hand presses upward, the knife-guard will not give way, being locked for the time being by the locking hooks 35 against upward displacement.

Should the operator have to slice a loaf so large that it must enter the knife frame before the machine can be set to perform the slicing operation, the operator may withdraw each spring-plunger 38, whereupon each locking hook 35 may be displaced clear of the pin 31 to rest against its stop 37.

When the loaf is put on the tray 12, 13, the operator initiates the slicing operation by raising the hand lever 19, which action uptilts the comb-like member 12 and pushes the cams 41 from below the rollers 40. The knife frame descends, and the knives are reciprocated. The links 26 begin to move under the pressure of the descending knife frame and the hooks 35 (assuming them not to be displaced by the operator from the locking position) leave the pins 31. Therefore, the knife-guard 22 is free to rise under the upward pressure firstly of the loaf and latterly of the individual slices, until at a later stage in the descent of the knife frame the knife-guard swings beyond the slice tops into the Fig. 1 position. Thus, throughout the early part of the slicing operation the slices are held by the fingers of the knife-guard which therefore functions as a top clamp.

In the event that the operator has released the knife-guard to permit accommodation of an extra large loaf, the locking hooks 35 are automatically returned to the locking position in relation to the links 26 by the stops 37, under the constraint of which the spring-plungers 38 are forced again into engagement with the slots 28 as the knife frame descends into its lowermost position.

The construction shown in Figs. 4 and 5 has the knife-guard functioning solely as a guard and not also as a top clamp. Therefore, the guard does not require to be made to pass through the inter-knife spaces, but is made simply as a metal sheet 50 which masks the knives 15, 16 when the knife-frame 11 is raised for the loading of the tray 12, 13. The sheet 50 is arcuate, being supported at its ends by arms 51, of which one is shown in the drawing. The arms 51 are each journaled on the adjacent plate 30, the boss of each arm 51 having a pinion 52 which meshes with a rack 53. The rack 53 is pivotally connected at one end to the adjacent end of the comb-like tray member 12 and is guided at the other end through a sleeve on the casing 54 of the pinion. The arrangement is such that the position of the guard 50 is determined by the position of the tray member 12. When the member 12 is lowered on completion of the ascent of the knife-frame 11, the guard is swung upwards into its guarding position. When the tray mem-

ber 12 is uptilted by the operator's action of starting the machine following each tray-loading operation, the guard is swung downwardly into a non-obstructive position, as shown in dot-dash lines in Fig. 4.

The invention illustrated in Figs. 6 and 7 is applied to a slicing machine having a stationary housing 60 in which one or two sets of knives 61 reciprocate in a vertical plane. The knives are spaced apart to the extent of a slice thickness. The substance support consists of a channel-section tray 62 and a pusher 63. The tray 62 is horizontal and leads through the housing by way of an entrance opening 60A therein. The tray continues through a similar exit opening (not shown) at the opposite side of the housing and functions there as a slice receiver. The pusher 63 is formed with forwardly projecting fingers 64 adapted to pass into the inter-knife spaces during the slicing action. The pusher 63 is pivotally attached to an assembly 65 provided with a hand grip 66 and with a guide bearing 67 which is slidable on a horizontal guide bar 68 secured within the machine base 69.

A machine of the kind shown in Figs. 6 and 7 has the pusher withdrawn fully from the housing, and when a loaf L is placed in front of the pusher upon the tray 62, the pusher is advanced by the operator sufficiently to force the loaf firstly, and the slices thereafter, through the housing to the slice receiver at the opposite side. Thereafter the pusher is withdrawn in readiness for another loading operation.

The machine is equipped with a kife-guard which closes the entrance 60A so long as the pusher 63 is withdrawn from the housing, Figs. 6 and 7. The guard consists of a plate 70 which is pivoted on top, at 71, to the housing. The plate 72 extends across the width of the tray 62 and is formed throughout its length with fingers 72 adapted to enter the inter-knife spaces. A few of the fingers 72 are shown in Fig. 7. In the passage of a loaf through the housing, the loaf engages the guard plate 70 and pushes it out of the way. However, the fingers 72 continue to rest upon the slices in their passage between the knives and therefore act then as a top clamp. When the loaf has completely passed through the housing, the plate 70 drops by its weight against the pusher teeth 64 and on withdrawal of the pusher eventually adopts the pendulous position in which it is shown in Fig. 6.

The knife-guard, Figs. 6 and 7, is provided with a locking device which serves to prevent displacement of the guard from the opening 60A; for example, by the operator when loading the tray 62. The locking device comprises a lever arm 73 which has a roller 74 that co-operates with an arm 75 on the guard-plate 70. The lever 73 is secured to a fulcrum-shaft 76 which has arms 77, 78 respectively at opposite sides of the housing. To the arms 77, 78 there are secured the ends of a light flexible cable 79. This cable extends downwardly from the locking device to two guide rollers 80 at opposite sides of the base, then horizontally to the end of the base 69 beyond the furthermost limit of the pusher plate's withdrawal, and finally across said end, the cable being guided there by rollers 90. The cable extends through opposite ends of a double arm 91 forming a part of the guided pusher assembly 65. Each end of the double arm 91 is fitted with a gripper 92 through which the cable 79 passes. Each gripper 92 is normally open under spring pressure. The assembly 65 is provided with two pivotally mounted arms 93 which are pressed upwardly by springs 94 towards adjustable limit stops 95. When either arm 93 is depressed it engages the respective gripper 92 and forces that gripper to clamp the cable 79. The arms 93 co-operate with mechanical switch devices at opposite sides of the base 69. One of these devices consists of a cam 96A and a pawl 97A, Fig. 6, which is normally uptilted under spring pressure but which can be depressed. The other switch device comprises a cam 96B and a pawl 97B, being similar to the switch device already described but, as Fig. 6, shows, being directed oppositely and being set more closely to the housing 60. These switch devices co-operate with rollers 98 provided at the ends of the arms 93.

Assuming that the pusher 63 is fully withdrawn and the tray 62 is loaded with a loaf L, as shown in Fig. 6, the locking arm 73 depends almost vertically and engages the arm 75, so that the guard plate 70 can not be displaced. When the operator advances the pusher 63, the roller 98 at one side of the machine engages the cam 97A and is depressed thereby, being held depressed throughout the passage of the roller under the cam 96A. During such passage the gripper 92 at that side of the machine is forced by the adjacent arm 93 to clamp the cable 79, with the result that the locking arm 73 is swung (clockwise as seen in Fig. 6) away from the arm 75. Accordingly, the advancing loaf L on contacting the guard-plate 70 pushes it out of the way, and the slicing operation proceeds without obstruction from the locking device. On the return of the pusher by the operator, a point is reached at which the pusher leaves the entrance 60A. At that point the plate 70 hangs vertically but is unlocked. Then the pawl 97B is engaged by the roller 98 at that side of the machine. The roller is depressed by the pawl and remains depressed throughout its passage under the cam 96B. During such passage of the roller, the gripper 92 at that side of the machine clamps the cable 79 with the result that the locking arm 73 is returned to its locking position in engagement with the arm 75. The guard remains locked in this manner until the next forward movement of the pusher.

It has been described how each roller 98 is acted upon by the respective switch device in one direction of that roller's motion. Each roller 98 rides idly on top of the respective cam 96A or 96B during the return motion and depresses the pawl 97A or 97B out of its way. Each switch device, therefore, exercises only a one-way action on the co-operating roller 98.

The locking arm 73 may be provided with stops to limit its movement in both directions, and the roller 98 may be made of resilient material to allow slip of the cable when the arm is against a stop.

The slicing machine shown diagrammatically in Fig. 8 illustrates the invention applied to a slicing machine having a stationary housing 60. One or two sets of knives 61 reciprocate in the base and a substance-supporting tray 62 leads to the housing 60. A pusher 63 formed with projecting teeth 64 is adapted to push a loaf L through the housing for slicing by the knives. The pusher 63 is operated by a hand lever 100, which is secured to a cross-shaft 101. Each end of the cross-shaft 101 has an arm 102 connected thereto by means of a link-and-lever mechanism to opposite ends of the pusher. Each link-and-lever mechanism comprises a link 103, a lever 104 which is fulcrumed at 105 to the base 106 and

the top of which is sickle shaped, and an arm 107 on the pusher, this arm being pivotally connected to the sickle shaped top. There is a complete link-and-lever mechanism at each side of the slicing machine base 106. The pusher 63 is pivotally attached to a slide-block 108 which is slidable in a channel guide 109 on top of which the tray 62 is provided. The tray 62 leads to a slice-receiver 110 at the opposite side of the casing 60. In operation of the machine, assuming that the pusher 63 is fully withdrawn, the tray 62 is loaded and the hand-lever 100 is raised. The pusher 63 therefore is advanced to force the loaf L through the housing to be sliced therein, the slices passing from the housing to the slice-receiver 110.

The machine, Fig. 8, is equipped with a knife-guard 111 which extends across the entrance side of the housing and is supported at each end by a plate 112 pivotally supported at 113 on the adjacent side of the housing. One of the plates 112 has an arm 114 which co-operates with a locking device. This device comprises the overturned head 116 of a slide-rod 117 supported in bearings 118 on the adjacent side of the housing 60. The foot of the rod 117 consists of a projection 119 adapted to enter a channel cam 120 formed in the sickle-shaped top of the lever 104. The rod 117 has a stop 121 which limits upward movement of the rod under the pressure of a spring 122.

The guard-supporting plate 112 at each side of the machine, Fig. 8, also supports the ends of a curved plate 123 constituting a top clamp. The plate 123 is pivotally attached to each supporting plate 112 and is pressed therefrom by a spring 124. The guard 111 and the top plate 123 would be formed with fingers insofar as necessary for entry into the inter-knife spaces.

The guard, its locking device and the top clamp, as shown in Fig. 8, operate as follows: When the hand lever 100 is raised to advance the pusher 63, the lever 104 is swung to the right (as viewed in Fig. 8) into the position in which it is shown in dot-dash lines. Accordingly, the rod 117 is caused to slide upwardly in its bearings until the stop 121 reaches the upper bearing 118 at which stage the cam 120 passes from the projection 119. In this motion of the rod 117, the locking restraint is withdrawn from the guard-supporting plates 112 with the result that the entire structure 111, 112 and 123 swings about the pivots 113, the fingers of guard 111 passing between the knives out of the way of the oncoming loaf L. The spring-loaded top clamp 123 however moves into the path of the top of the loaf with the result that it clamps the top of the slices as they pass between the knives.

The pusher 63, Fig. 8, is returned by depressing the hand lever 100. By this action, the cam 120 returns into engagement with the projection 119 and lowers the rod 117 into the position in which it positively holds the guard 111 in the guarding position.

Changes may be made in the form, construction and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

The invention is hereby claimed as follows:

1. A slicing machine comprising a knife-frame, in which a number of knives are reciprocably arranged and are spaced a slice-thickness apart, a base in relation to which the knife-frame can be raised to provide a substance-receiving space between it and the base, a substance-support

mounted on the base and formed comb-like with substance-engaging fingers adapted to pass through the inter-knife spaces, a knife-guard supported by the knife-frame and extending below the knives when the knife-frame is uptilted, a locking member acting to prevent withdrawal of said guard, and an operative connection between the said guard and the base serving to unlock said guard when said frame descends to perform a slicing stroke.

2. A slicing machine as claimed in claim 1 wherein the knife-frame and the base are interconnected by a two-part linkage, one part of which carries the knife-guard and the other part of which carries the locking member, and wherein said member is engageable with a stationary stop.

3. A slicing machine as claimed in claim 1 wherein means are provided for rendering the locking member inactive at will when in its operative setting, said means being displaceable into a non-locking position to permit withdrawal of the knife-guard.

4. A slicing machine as claimed in claim 1 in which the knife-guard embodies a comb-like portion disposed to engage and clamp the substance before and after being sliced.

5. A slicing machine comprising a housing, a number of knives reciprocably arranged in the housing and spaced a slice thickness apart, a substance-supporting tray leading to an entrance in the housing, a pusher for pushing the substance through the entrance for slicing in the housing by the knives, a knife guard at the entrance, means moving said guard between a guarding position between the pusher and the knives and a non-obstructive position, a locking device to prevent displacement of the guard from the guarding position while the pusher is withdrawn from the entrance, and means whereby the said locking device will be responsive in its operation to the operation of said pusher.

6. A bread slicer comprising a housing having an opening, a plurality of cutting knives arranged in the housing across the opening and spaced a slice-distance apart, means to operate said knives to effect a slicing operation, a loaf support to support a loaf to be sliced, a guard member masking the opening to prevent accidental contact with the knives prior to the slicing operation, said guard member comprising a plurality of fingers adapted to pass into the spaces between the knives, an arm on said guard member, a pivotally mounted locking member to lockingly maintain the guard member in locked position, a pusher to push a loaf through the knives, and means controlled by the position of the pusher to operate the locking member to either locked or unlocked position.

7. A slicing machine embodying a housing, a number of knives reciprocably arranged in the housing and spaced a slice thickness apart, a substance supporting tray leading to an entrance in the housing, a pusher for pushing the substance through the entrance for slicing in the housing by the knives, a knife guard at the entrance, means moving said guard between a guarding position between the pusher and the knives and a non-obstructive position, a locking device to prevent displacement of the guard from the guarding position while the pusher is withdrawn from the entrance, and means connecting the locking device to the pusher, for displacement thereby to lock and unlock the knife guard, by means of devices one of which is actuated early

in the advance of the pusher and the other of which is actuated when the pusher is being withdrawn from the housing.

8. A slicing machine embodying a housing, a number of knives reciprocably arranged in the housing and spaced a slice thickness apart, a substance supporting tray leading to an entrance in the housing, a pusher for pushing the substance through the entrance for slicing in the housing by the knives, a knife guard at the entrance, means moving said guard between a guarding position between the pusher and the knives and a non-obstructive position, a locking device to prevent displacement of the guard from the guarding position while the pusher is withdrawn from the entrance, and means connecting the locking mechanism with the pusher, said connecting means operating that when actuated

to advance the pusher the locking device will be rendered inactive.

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