May 29, 1934. H. THOMAS 1,960,931

GUARD FOR SLICING MACHINES

Filed April 9, 1931 6 Sheets-Sheet 1

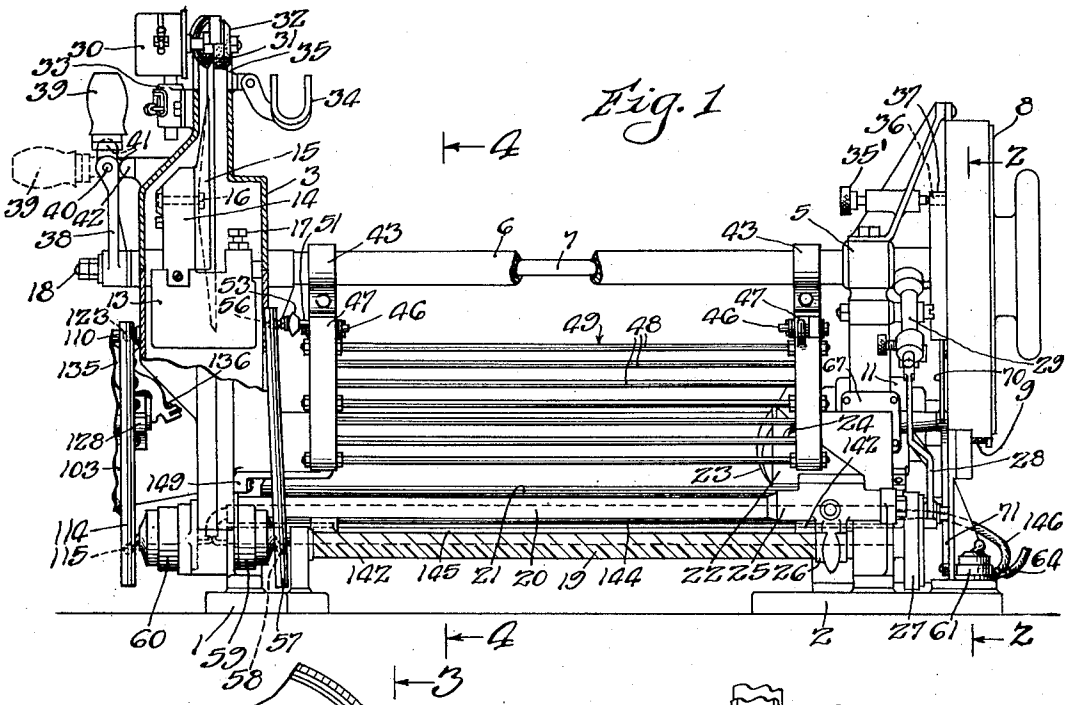


Fig. 1

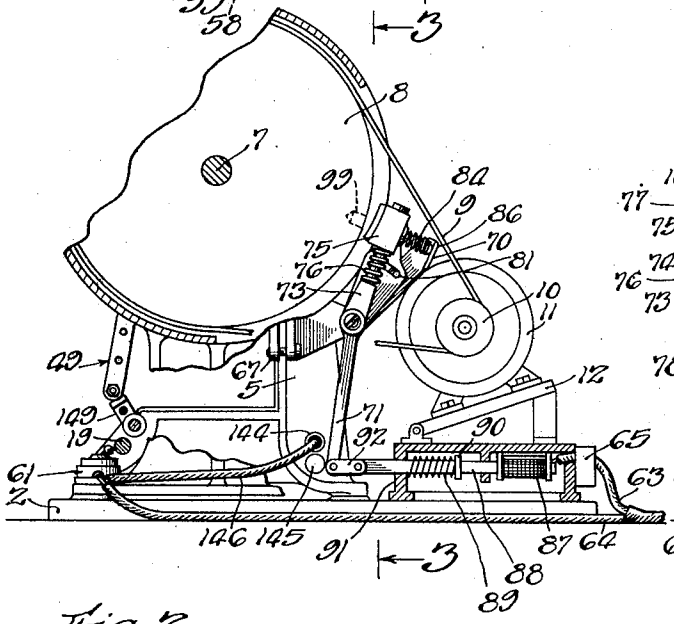


Fig. 2

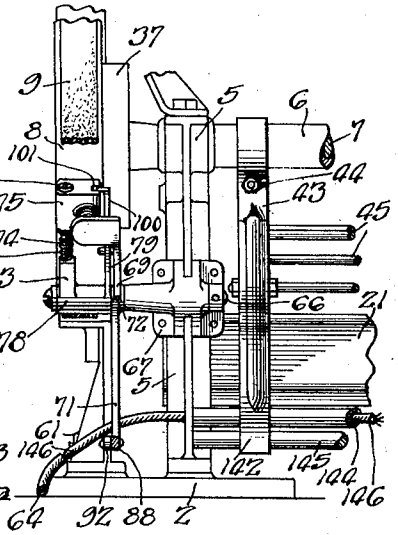


Fig. 3

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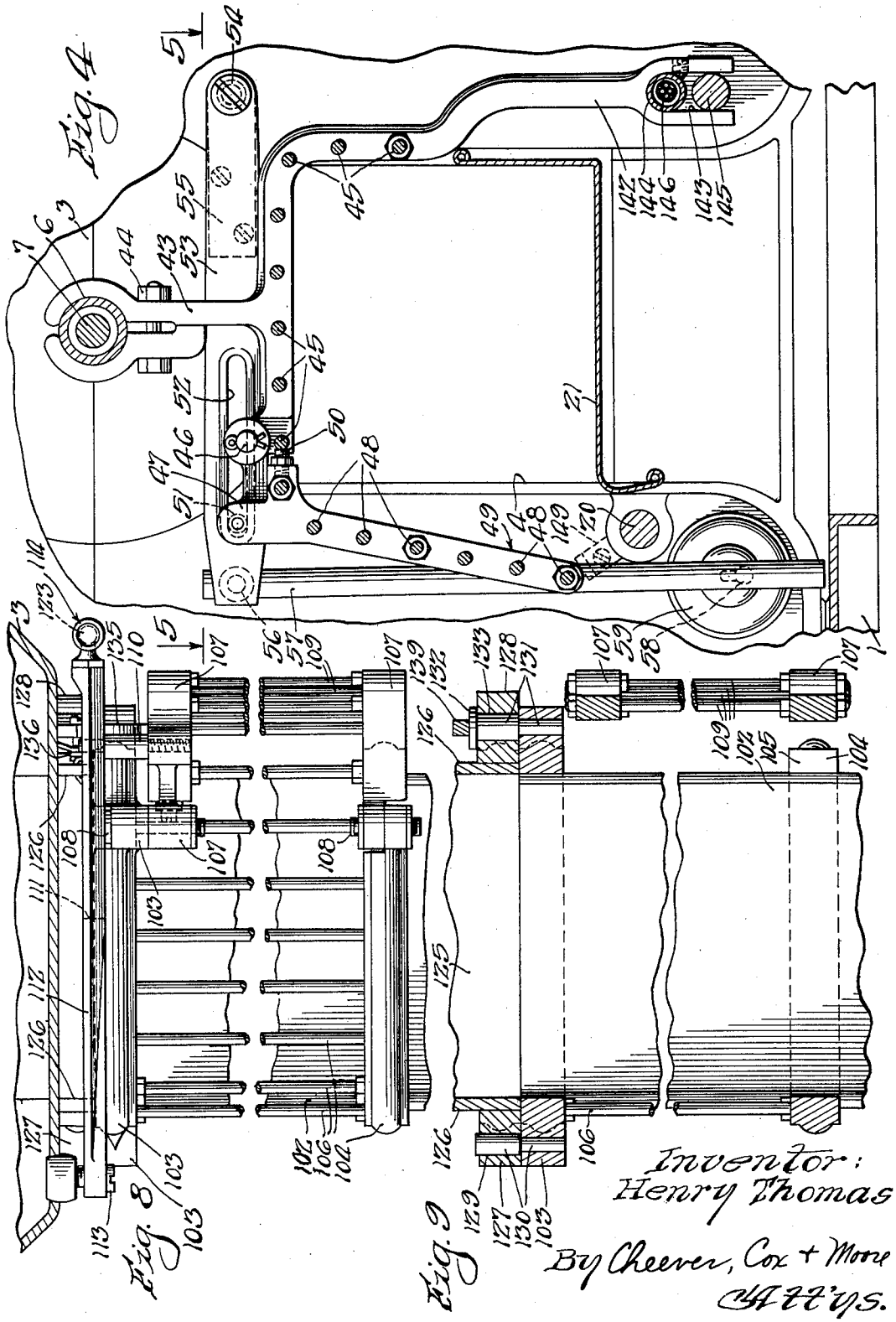


Fig. 4

Fig. 8

Fig. 9

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GUARD FOR SLICING MACHINES

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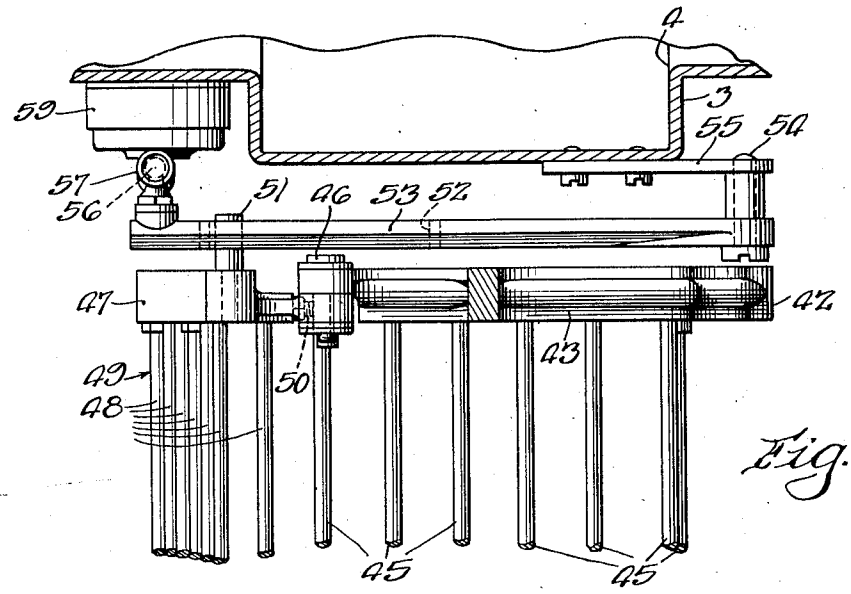


Fig. 5.

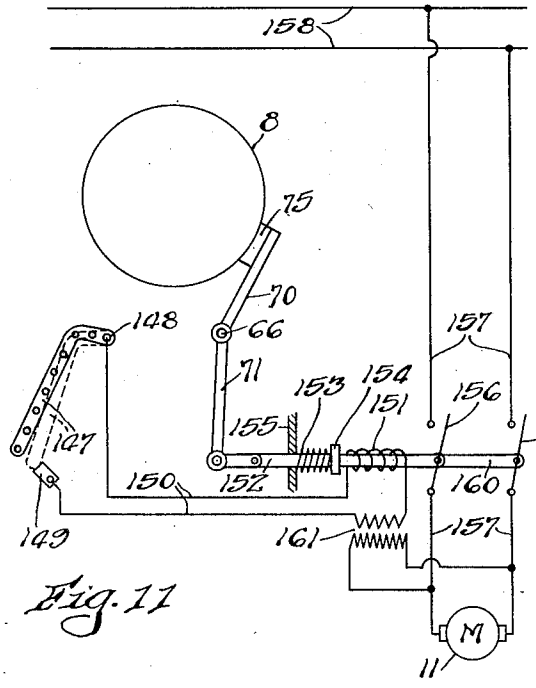


Fig. 11

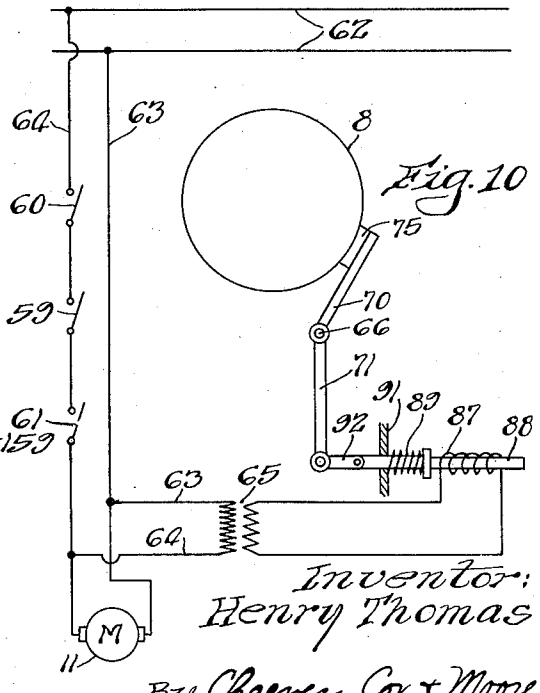


Fig. 10

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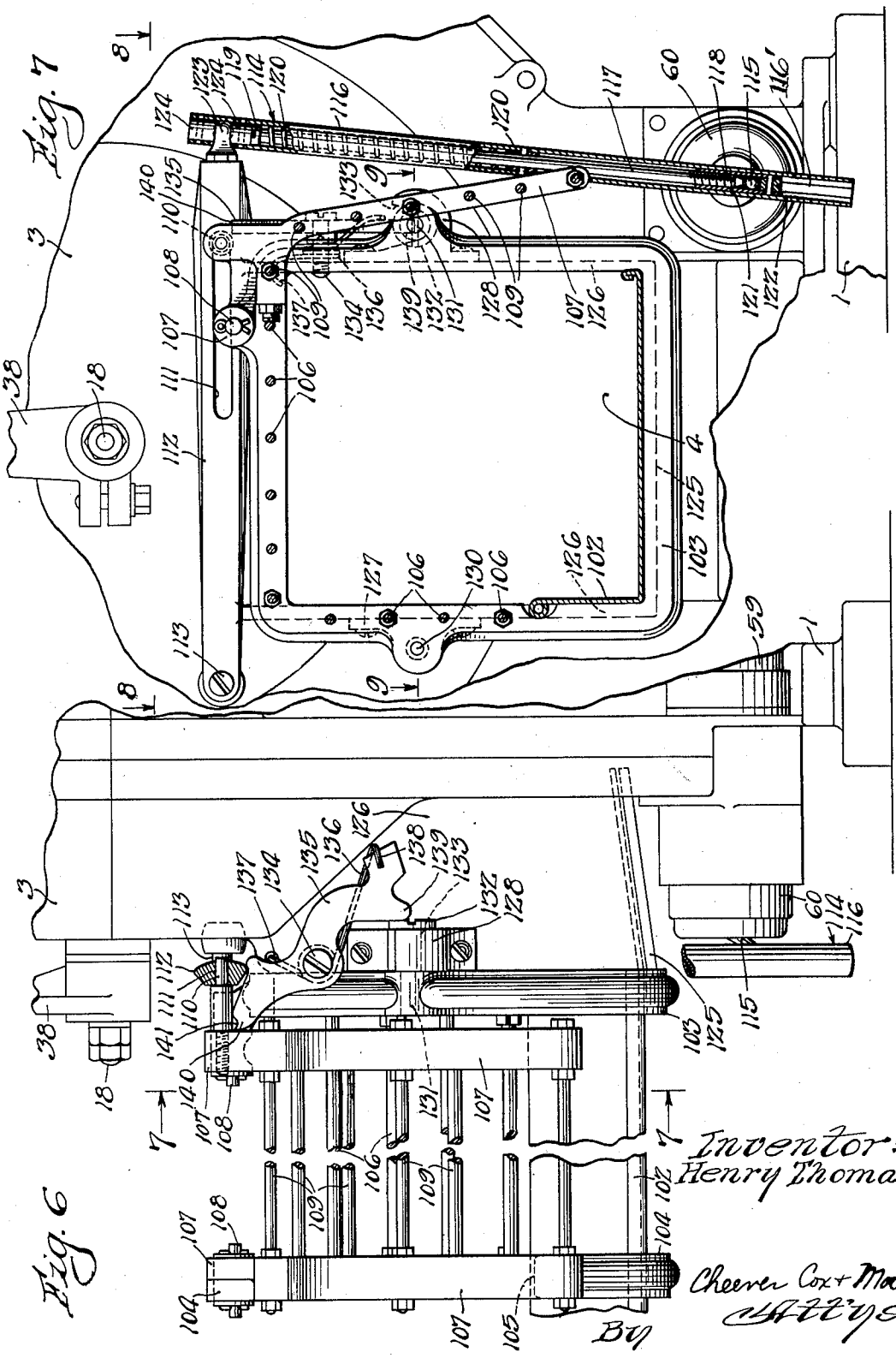


Fig. 7

Fig. 6

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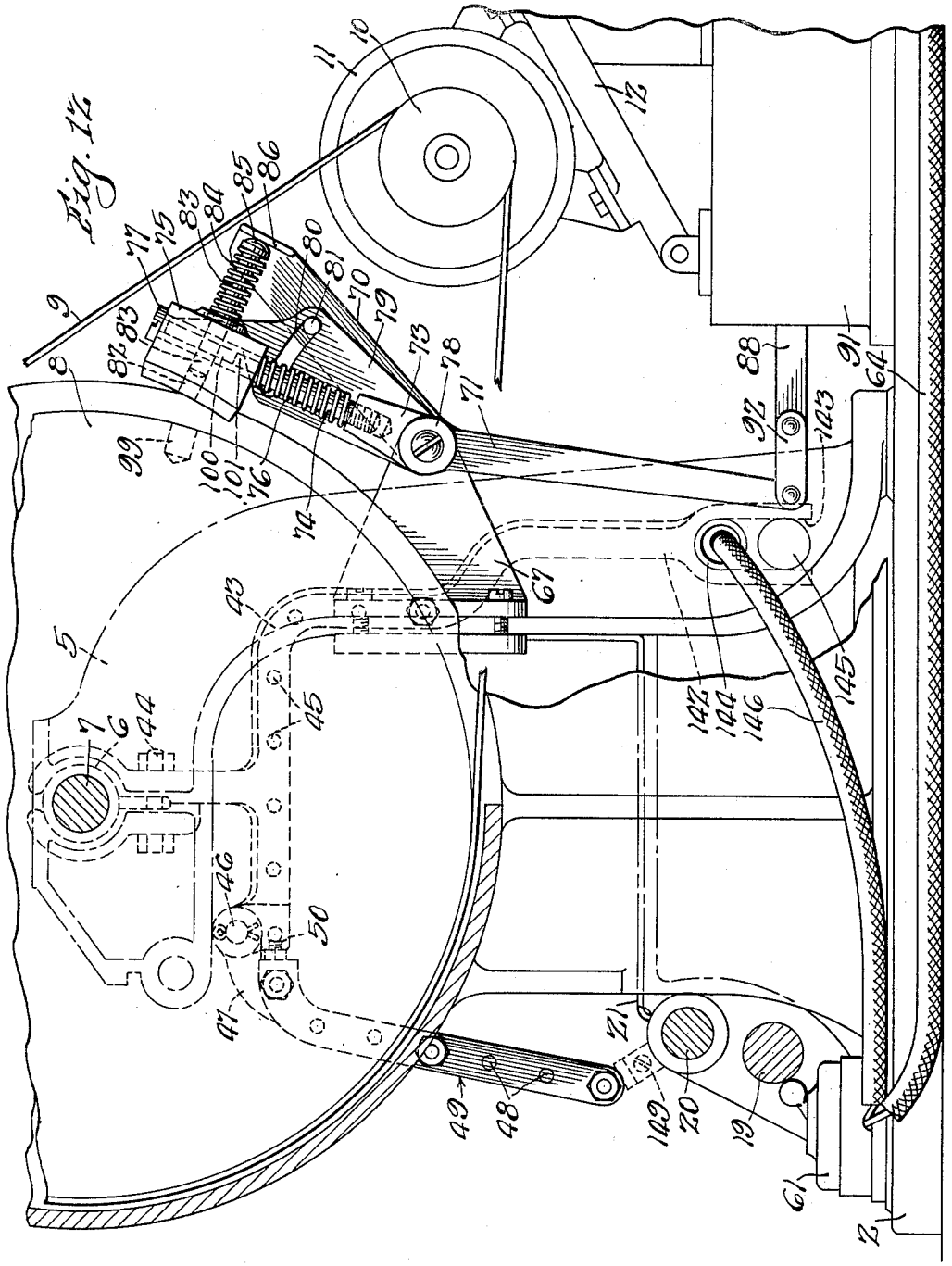
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GUARD FOR SLICING MACHINES

Filed April 9, 1931 6 Sheets-Sheet 5

Fig. 12.



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GUARD FOR SLICING MACHINES

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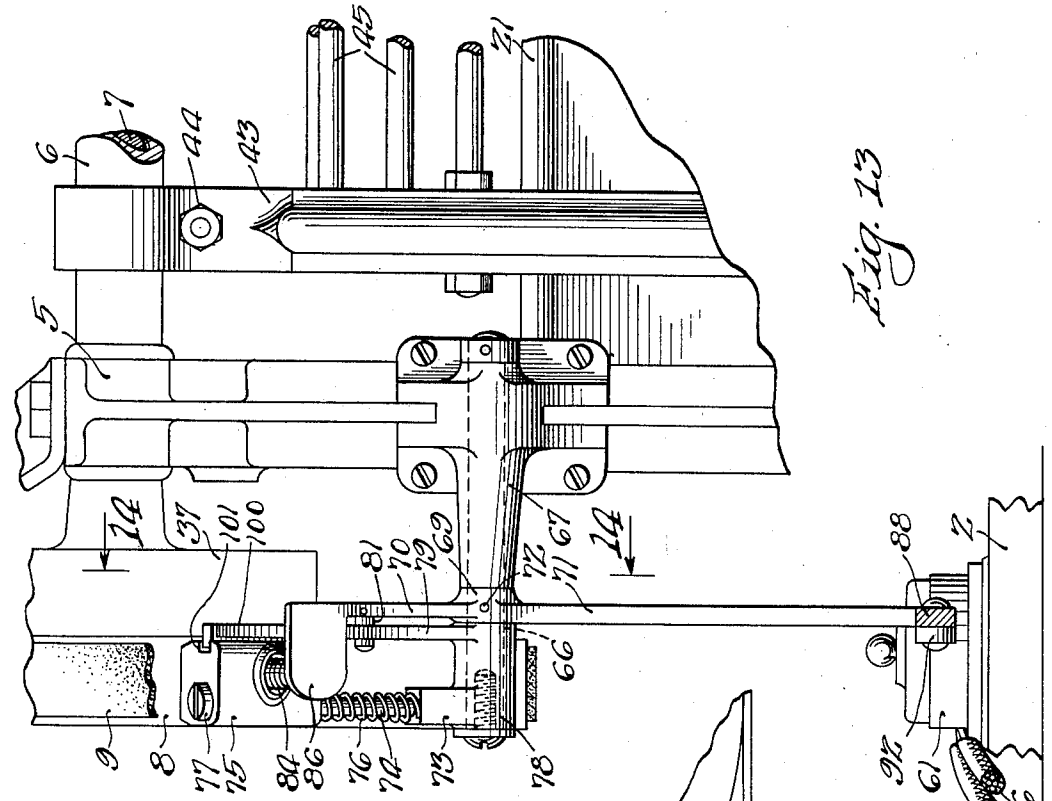


Fig. 13

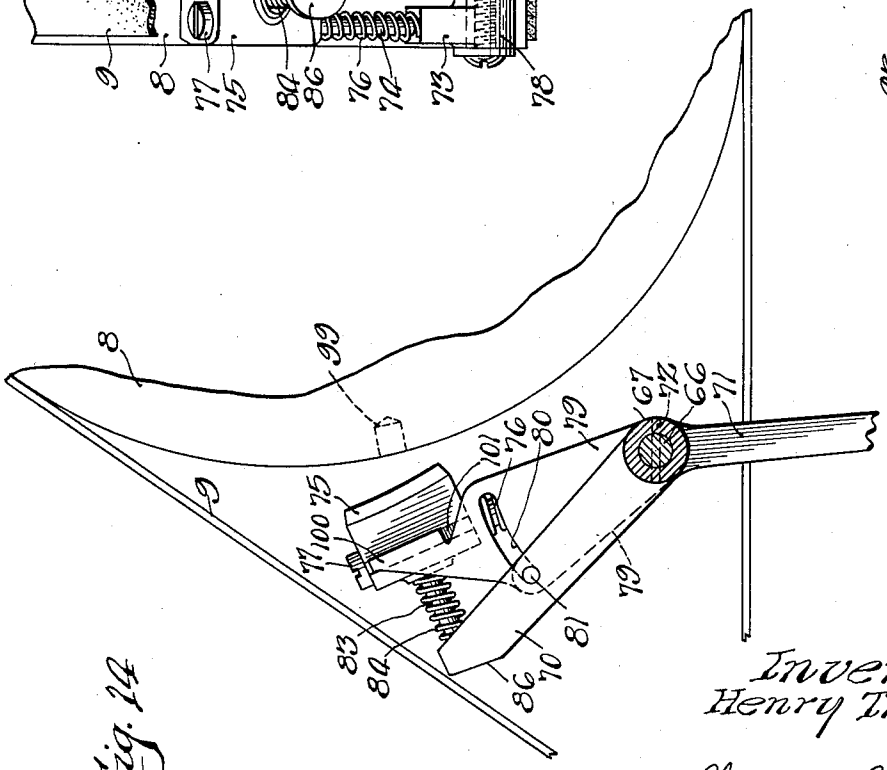


Fig. 14

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Patented May 29, 1934 1,960,931

UNITED STATES PATENT OFFICE

1,960,931

GUARD FOR SLICING MACHINES

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

Application April 9, 1931, Serial No. 528,793
In Great Britain April 9, 1930

9 Claims. (Cl. 146—101)

The present invention relates to slicing machines and particularly to work guards which protect the operator from injury by the slicing knife during its rotation. The present invention is adapted particularly for use with power driven slicing machines in which the knife is travelling at a rapid rate and usually about an axis eccentric to its own axis of rotation in addition to rotating about its own axis. It is very apparent that if the operator places his hand in a position to be cut by such a knife that irreparable damage will be done before the machine can be stopped.

One object of this invention is to arrange guards over the substance support and also over the slice receiving trough so that the operator cannot accidentally bring his hands into a dangerous position with respect to the knives when the guards are in place.

Another object of this invention resides in providing means automatically operable upon movement of either of the guards to inoperative position for turning off the power which drives the knife and, if desired, providing means for slowing down the knife at a more rapid rate than would ordinarily occur when the power is shut off. In this manner the knife is brought to rest during the movement of the guard to an inoperative position and there is very little chance that the operator will put his hand in a dangerous position with respect to the knife until after the knife has been brought to rest.

A more specific object of this invention resides in bringing the knife to rest within its casing at a point where the same is not exposed to view, it being obvious that the casing in which the knife rotates must be provided with an opening through which the substance can be fed, and if the knife comes to rest adjacent this opening the operator may sustain slight injury by placing his hands too close to the knife. Of course, with the knife stopped, no great amount of damage can be done but it is preferable that the knife be stopped in the upper part of the casing where it cannot injure the operator.

Another object of this invention is to control by suitable electrical means, manually operated, the turning off of the power means and applying a braking means for slowing down the rotation of the knife if and when either of the guards are moved toward an inoperative position.

A still further object of this invention resides in providing a brake for slowing down the rotation of the knife after the power has been turned off, this brake being controlled magnetically and automatically whenever one of the guards is moved to an inoperative position.

Other objects of this invention will appear hereinafter as the description thereof proceeds, the novel features, arrangements and combinations being clearly set forth in the appended claims.

In the drawings:

Fig. 1 is a side elevational view of a machine embodying my invention with the casing for the knife shown in cross section for the purpose of illustrating the manner in which the knife is arranged therein, and is supported for rotation.

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

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

Fig. 4 is a section taken substantially along the line 4—4 of Fig. 1.

Fig. 5 is a section taken substantially along the line 5—5 of Fig. 4.

Fig. 6 is a front elevational view of the guard for the slice receiver looking in the same direction as in Fig. 1.

Fig. 7 is a section taken along the line 7—7 of Fig. 6.

Fig. 8 is a plan view of the mechanism shown in Fig. 6.

Fig. 9 is a cross section taken along the line 9—9 of Fig. 7.

Fig. 10 is a diagrammatic view of the wiring system which controls the operation of the motor and brake when either of the guards is moved to inoperative positions with the construction as shown in Figs. 1 to 9 inclusive.

Fig. 11 is a diagrammatic view of the electrical system used with a modified construction of my apparatus.

Fig. 12 is an end elevation of the mechanism looking from the right in Fig. 1, this view being an enlarged view of a portion of the mechanism illustrated in Fig. 2.

Fig. 13 is a rear elevational view of the braking mechanism shown in Fig. 12, and

Fig. 14 is a section taken along the line 14—14 of Fig. 13.

The slicing machine illustrated in the drawings comprising the base members 1 and 2 which support the frame work of the slicing machine. The base member 1 supports the casing 3 which is formed of a plurality of parts and has an opening indicated at 4 in Fig. 4 through which the substance to be sliced is passed in order that the same may be cut by the slicing knife which is arranged within the housing.

The base 2 supports an upwardly extending

bracket 5, which bracket and the housing 3 support a tubular casing 6 in which is rotatably mounted the shaft 7. The shaft 7 at one end thereof, carries a flywheel 8 about which is trained a belt 9. The belt 9 is also trained over the pulley 10 on the rotor shaft of the motor 11 so that rotation of the motor will rotate the flywheel 8 and shaft 7. The motor is mounted on an adjustable bracket 12. The other end of the shaft 7 supports a casting 13 which carries an arm 14, this arm being adapted to carry a knife 15 rotatable about the axis of the shaft 16 upon which it is mounted. The casting 13 is secured to the shaft 7 by means of the set screw 17. The knife 15 rotates about the axis 16 by means of a chain which is trained over a sprocket on the shaft 16 and over a sprocket secured to the shaft 18 which is arranged coaxially with the shaft 7 and assists the shaft 7 in supporting the shaft 16 during its rotation.

When the shaft 7 is driven by the motor, the knife 15 will rotate about its own axis and also about the axis 7 in a manner which is more fully described in the patent to Stukart, No. 1,557,393, granted October 20, 1925, except that the knife is driven by means of a chain instead of by gears as in that patent. The chain drive that is adapted to be used with this invention is similar to that illustrated in the co-pending application of Arthur Ahrndt, Serial No. 332,790 filed January 16, 1929. However, my invention is not limited to a chain drive, as the gear drive of Stukart may be used as well. The present invention is in reality not limited to the particular drive for the knife, but has a special advantage in a machine provided with a knife having the orbital movement which has been described and which is more fully discussed in the aforesaid patent and the aforesaid application.

Means is provided for feeding the substance past the cutting plane of the knife so that successive slices will be cut therefrom. This means, as shown in the drawings, is more or less conventional, being more fully shown in the aforesaid patent and application, and comprises a feed screw 19 rotatably mounted in the base members 1 and 2, a guide rod 20, a substance supporting trough 21, and a feed member 22 which has the prongs 23 pivoted at 24 so that the same may be moved into one end of the loaf of bread to be sliced and hold the loaf against the feed member 22 while the same is fed toward the cutting plane of the knife. The guide rod 20 has a bearing member 25 slidable therealong and secured rigidly to the feed member 22. The bearing member 25 also has a feed nut 26 secured thereto which engages the feed screw 19.

The feed screw 19 is given an intermittent movement of rotation by means of a suitable free-wheel 27 connected by the crank 28 to an oscillating arm 29 more fully described in the aforementioned application of Arthur Ahrndt. The feed mechanism is such that as the shaft 7 is given one complete rotation the substance is fed forwardly toward the cutting plane of the knife, the thickness of the slice to be cut. The feed screw is preferably at rest during the passage of the knife through the substance being cut.

Knives used in machines of this character require frequent sharpening in order to keep the same in proper condition and accordingly I provide a knife grinding mechanism indicated generally by the reference numeral 30 and having the grinding wheel 31 and burr removing wheel 32 rotatably mounted thereon. The grinding unit 30 is mounted on a bracket 33 secured to the casing 3 and is adapted in one position of adjustment to occupy the position illustrated in Fig. 1, viz: with the grinders in operative engagement with the edge of the slicing knife.

In Fig. 1 I have shown the grinders in operative position and I have also shown a cover 34 which normally closes the opening 35 in the upper part of the casing 3 and prevents injury to the operator when the grinders have been moved to an inoperative position to one side of the casing. This construction is quite well known to those skilled in the art to which this invention pertains. In order to rotate the knife for sharpening the shaft 7 is preferably locked positively in a position such that the knife is in the upper part of the casing 3. The means provided for this purpose comprises a locking bolt 35' adapted to enter an opening 36 in the cam 37, which cam 37 also is provided with a groove which co-operates with the cam roller secured to the arm 29 and causes oscillation of the arm 29 for the purpose of feeding the feed screw as before described. This means is more fully described in the previous patent and application referred to above.

In order to rotate the knife for grinding, I provide a crank 38 secured to the shaft 18 and provided with a handle 39 pivoted to the crank at 40 and normally in the full line position indicated in Fig. 1 with the lug 41 thereon arranged between spaced lugs 42 on casing 3 in order that the shaft 18 will remain stationary when the slicing operation is taking place, as otherwise the knife would not rotate positively about its own axis. When the shaft 18 remains stationary the sprocket thereon (above referred to) causes the chain trained therearound and around the sprocket on the shaft 16, to rotate the shaft 16 about its axis and thereby impart rotation to the knife 15. In order to release the crank for the sharpening operation it is only necessary to pivot the handle 39 about its pivot 40 into the dotted line position shown in Fig. 1. This movement of the handle causes the lug 41 to be moved out from between the spaced lug 42 and permits the operator to turn the crank by means of the handle.

The construction so far described is covered by previous applications and patents of applicant's assignees and does not form a part of this invention except in the relations which will hereinafter be pointed out and claimed. I will now proceed to describe the novel features of this invention.

Referring more particularly to Figs. 1 and 4 it will be noted that there are a pair of split brackets 43 secured to the tubular casing by means of the clamping bolts 44 and these split brackets 43 have a plurality of rods 45 extending longitudinally of the machine for preventing the operator from having access to the substance on the support 21 from the top and from the rear thereof, as is best seen in Fig. 1. It is necessary, however, that the operator be permitted to have access to the substance support in order to position the substance to be sliced thereon and for this reason there is pivoted to the brackets 43 at 46, the members 47 which in turn carry a plurality of parallel rods 48 forming a guard which normally hangs down in front of the substance support and prevents the operator from having access thereto and prevents the operator from bringing his hands into a dangerous position with respect to the knife. The lowermost position of the front guard which I will hereinafter refer to generally by reference numeral 49, is limited in its downward

movement by an adjustable stop 50 secured thereto and abutting against one of the rods 45.

The guard 49 is provided with a pin 51 operating within a slot 52 in an arm 53 pivoted at 54 to a bracket 55 on the casing 3. The arm 53 is also pivoted at 56 to an extensible link 57, the details of which will be more fully described hereinafter in connection with the guard for the slice receiver. The extensible link 57 is operatively connected to the toggle 58 of the electrical switch 59. The switch 59 is connected in the power circuit of the motor and so arranged that the power to the motor will be cut off whenever the switch 59 is in its "off" position. There are two other switches 60 and 61 (see Fig. 1) which are also in the power circuit to the motor and all three of these switches 59, 60 and 61 must be in their "on" position in order that the motor may be operated. The switch 61 is a master switch manually controlled by the operator for turning off the power to the motor even when the guard for the substance support and the guard for the slice receiver are in operative positions.

In Fig. 10 I have shown a diagrammatic arrangement of the electrical means for controlling the motor and for controlling a brake which will presently be described, which brake acts on the periphery of the flywheel 8 to stop the rotation of the knife when the power to the motor has been cut off. The power circuit is indicated by the reference numeral 62 which power circuit has the leads 63 and 64 leading to the motor 11, the switches 61, 59 and 60 being interposed in one of the leads. It is obvious that whenever any one of the switches 59, 60 or 61 is in an inoperative position the motor will not operate. Therefore it is necessary that all switches be in operative position in order for the slicing machine to function. A transformer 65 connected to the power circuit and rendered inoperative when the circuit to the motor is broken, normally induces a magnetic pull in the solenoid 87 which is of a low voltage type, which solenoid surrounds the rod 88 and exerts a pull on the rod to the left as viewed in Fig. 10 or as viewed in Fig. 2. A spring 89 surrounding the rod 88 and abutting against a collar 90 secured to the rod 88 normally urges the rod to the right by its engagement with the collar 90 and the casing 91 in which the solenoid is arranged. The rod 88 is connected by a link 92 to one arm 71 of a bell crank, the other arm of the bell crank being indicated by the reference numeral 70. The bell crank is mounted on a shaft 66 and rotatable in a bearing bracket 67 secured to the bracket 5. The bell crank is referred to generally by the reference numeral 69 and is secured to the shaft 66 by means of the pin 72.

An arm 73 rotatably mounted on the shaft 66 carries a rod 74 extending radially of the shaft 66. A brake shoe 75 is slidably mounted on the rod 74 and a spring 76 surrounds the rod and abuts against the arm 73 and brake shoe 75 to urge the brake shoe 75 upwardly against the head of the screw 77 secured to the end of the rod 76.

The bearing 78 which carries the arm 73 also has the plate-like arm 79 extending radially from the shaft 66 and this is provided with a slot 80 in which a pin 81 on the arm 70 is adapted to operate. The brake shoe 75 is provided with a bore 82 arranged transversely to the opening in which the rod 74 is slidable and a bolt 83 slides in the bore 82 and is normally held in the position illustrated in Fig. 12 by a spring 84 which surrounds the bolt and abuts against the brake shoe 75 and the head 85 of the bolt. The outward movement of the bolt is limited by a lug 86 on the arm 70. The periphery of the flywheel 8 is provided with a recess 99 for the reception of the bolt 83 when the bell crank 69 is rotated in a counter-clockwise direction as viewed in Fig. 12. The arm 79 is provided with a tongue 100 which operates within a slot 101 in the side of the brake shoe for a purpose which will appear presently.

The operation of the mechanism so far described is as follows: The operator grasps the guard 49 and moves the same to an inoperative position. In so doing he turns off the switch 59 through the intermediary of the link 57 operatively connected to the guard and to the switch in the manner previously referred to. It is assumed that prior to the movement of the guard to its inoperative position all of the switches 59, 60 and 61 were closed and the motor running. The movement of the guard 49 to an inoperative position, of course, causes a break in the power circuit and the motor will cease to rotate the knife. Since the circuit to the motor has been broken, that to the transformer is also broken and the solenoid 87 will be de-energized, thereby permitting the spring 89 (see particularly Figs. 2 and 10) to move the rod 88 to the right and rotate the bell crank 69 in a counter-clockwise direction.

This motion of the crank brings the brake shoe 75 into engagement with the periphery of the flywheel 8 thereby slowing down the motion of the flywheel at a more rapid rate than would ordinarily occur if no decelerating means were provided. Continued movement of the bell crank under the influence of the spring causes the lug 86 to move the bolt 83 against the action of the spring 84 through the bore 82 into engagement with the periphery of the flywheel. As soon as the recess 99 in the periphery of the flywheel comes into a position to receive the bolt 83, the latter will enter the recess and as a result, the flywheel will be locked positively against rotation. The position at which the flywheel is brought to rest is preferably that illustrated in Fig. 1 in which the knife is in the knife grinding position and out of a position where an operator could be injured thereby. The shock of suddenly stopping the flywheel 7 by means of the bolt 83 is taken up by the spring 76 which permits the shoe 75 to slide along the bolt 74, but which gradually absorbs the energy which causes the flywheel 8 to rotate. The tongue and groove connection 100—101 also permits this sliding movement of the brake shoe and forms an additional support for the other side of the brake shoe and thereby prevents rotation of the brake shoe about the rod 74.

In order to start the operation of the machine the switches 59, 60 and 61 must be closed. In order that this may occur, the guards which are connected to the switches 59 and 60 must be in their operative position and the operator must make sure that the master switch 61 is also turned on. As soon as all three switches are in closed or "on" position the motor will rotate and the solenoid 87 will be energized, thereby drawing the brake away from the flywheel and permitting the functioning of the machine in the manner which has previously been described.

It is obvious that the sliding bolt 83 is not necessary to this invention and therefore may be done away with as the brake 75 will operate without the necessity of using the bolt 83. Whenever the sliding bolt 83 is not used, the brake shoe may be mounted rigidly upon the arm 73 instead of slidably and the other unnecessary parts of the

mechanism shown in these figures can be done away with.

I will now proceed to describe the guard which guards the slice receiver, this guard being one which is quite similar to that for the substance support and operates in substantially the same manner, except that provision is made for operating the switch 60 whenever the guard for the slice receiver is removed from the slicing machine. As is quite obvious from an inspection of Fig. 1, the guard would prevent the operation of the crank 38 when it is desired to use the crank for the purpose of sharpening the knife. It therefore is quite necessary that the guard be bodily moved to an inoperative position either by pivoting away from its operating position or by removing the same as a whole by means which will now be described.

The guard for the slice receiver is best illustrated in Figs. 6, 7, 8 and 9. In these views the slice receiving trough is indicated by the reference numeral 102 to which are secured the brackets 103 and 104 which are preferably castings. The bracket 103 is a substantially closed figure as illustrated in Fig. 7 and is of substantially the same size as the opening 4 in the casing 3. The bracket 104 extends along the bottom of the slice receiver 102 and along the rear side thereof, as well as over the top. However, it terminates at a relatively low position on the forward side as indicated by the dotted line 105 in Fig. 6. Rods 106 are arranged longitudinally of the slice receiver and are connected to the brackets 103 and 104. These prevent access to the slice receiver by the operator from a position above or to the rear of the slice receiver. On the brackets 103 and 104 there are pivoted the arms 107 at 108 and bars 109 are secured to each of the arms 107 which form a front guard which may be pivoted to an inoperative position to permit the operator to have access to the slices which have been cut by the slicing knife.

The arm 107 which is pivoted at 108 to bracket 103 is also provided with a pin 110 which operates within a slot 111 in an arm 112 pivoted at 113 to the casing 3. Therefore, as with the guard for the substance support, the free end of the arm 112 is moved upwardly whenever the guard is moved upwardly about its pivot 108. The outer free end of the arm is operatively connected by means of an extensible link 114 to the toggle 115 of the switch 60. This link 114 is constructed the same as the link 57 and is extensible for the purpose of permitting lost motion to occur after the switch 115 has been moved as much as permitted by this construction. The extensible link comprises an outer casing 116 in which there is slidable a rod 117 which has one end 118 thereof adapted to abut against the toggle 115. This rod is provided with a head 119 and a spring 120 surrounds the rod 117 and abuts against the head 119 and the sleeve 120 secured to the inner periphery of the casing 116. The end 118 of the rod is screw threaded in the sleeve 121 and an abutment member 122 is also secured to the sleeve 121 so that the sleeve moves bodily with the rod 117 whenever the latter is moved. The arm 112 has a spherical head 123 provided at its free end and this spherical head is arranged between abutments 124 secured to the tubular outer casing 116.

The outer casing 116 is provided with a slot 116' to permit the tube 116 to move relative to the toggle 115, and also to facilitate the assembly of the tube over the toggle.

When the arm 112 is moved upward, the casing 116 is carried upward therewith and due to the spring 112 the head 119 is kept in engagement with the abutment 124 until the toggle 115 has been moved to the "off" position for the switch 60. Continued upward movement of the arm 112 will not move the toggle 115 and the spring 120 will be compressed in order to permit the outer casing 116 to slide upward relative to the rod 117.

It is obvious therefore that if either the guard for the substance support or the guard for the slice receiver be moved to an inoperative position one of the switches necessary to complete the circuit to the motor will be thrown to an "off" position and the slicing machine knife will be stopped, thereby protecting the operator. Whenever the guards are moved back to their operative positions and the master switch 61 is "on", then the motor will operate and the slices may be cut in the usual manner.

Means must be provided for turning off the power to the motor whenever the guard for the slice receiver or whenever the slice receiver and its guard are bodily removed from the slicing machine. This means is also shown in Figs. 6, 7, 8 and 9.

The casing 3 is provided with the lower slice supporting member 125 and upwardly extending side flanges 126. To the latter there are secured the bearings 127 and 128, bearing 127 being provided with a bore 129 for the reception of a pin 130 secured to the bracket 103 as best illustrated in Fig. 9. The pin 130 is freely slidable longitudinally in the bore 129 when such movement is permitted. The bracket 103 is also provided with a pin 131 which has a head 132 thereon. The pin 131 is adapted to rest within the open-sided recess 133 illustrated best perhaps in Fig. 7. The enlarged head of the pin 132 prevents the removal of the pin 131 from the open-sided recess 133 except by movement in an upward direction. In other words, by pivoting the bracket 103 about the pin 130 the pin 131 may be moved free of the bearing 128 and out of the recess 133 after which a movement of the bracket 103 in a direction longitudinal of the pins 130 and 131 will enable one to entirely detach the bracket 103 and consequently the slice receiving trough 102 from the slicing machine.

This is undoubtedly a very simple method of detachably mounting the trough upon the casing 3 of the slicing machine, but of course, it is necessary when removing the slice receiver to provide means which will automatically cause the switch 60 to be turned to its "off" position so that the motor will be turned off and the brake applied. It is obvious that when the bracket 103 is pivoted in order to remove the pin 131 from the recess 133 the arm 112 will move upwardly since the pin 110 moves bodily upwardly with the bracket 103. This movement of the pin 110 of course will move the switch to its "off" position in the manner previously described and if the arm 112 can be retained in its upward position and prevented from accidentally being moved downwardly, the desired protection for the operator will result, for with the switch 60 in its "off" position the machine cannot operate.

Pivoted to the front flange 126 at 134 is a lever 135 best illustrated in Fig. 6. Surrounding the pivot 134 is a coil spring 136 having one end 137 thereof in a suitable recess in the flange 126 and the other end 138 thereof engaging one end of the lever 135 and bearing on that end to rotate the lever 135 in a clockwise direction about its

pivot 134. The lever 135 is provided with a projection 139 which normally engages the head 132 of the bolt 131 when the slice receiver is in its operative position. This normally prevents the rotation of the lever 135 about its pivot.

When the slice receiver is removed from the slicing machine the first movement of the pin 131 out of the recess 133 causes the arm 112 to be moved upwardly to turn off the switch 60. The head of the bolt 132 slides along the adjacent face of the lever 135 until the head is free from the recess 133 and the bolt may be moved longitudinally so that the slice receiver may be removed entirely from the machine. As soon as the bolt 131 is moved out of its position the spring 136 may rotate in a clockwise direction and bring the upper end 140 of the lever 135 under the arm 112 to hold the arm 112 in its upper position, a recess 141 being provided to receive the underside of the lever 112 and hold the lever against downward movement. Since the lever 112 is prevented from moving downwardly it is obvious that the switch 60 cannot be operated accidentally.

In Fig. 4 it will be noted that in order to form an additional brace for the split brackets 43 there are provided extensions 142 having U-shaped recesses 143 therein which extend over the hollow tubular rod 144 and the solid rod 145. The latter forms a brace for connecting the end members of the frame of the slicing machine. The tubular member 144 forms a housing for the cable 146 which runs from the switch 61 to the switches 59 and 60.

The operation of this device is quite obvious. The movement of either of the guards to an inoperative position will cause a break in the motor circuit and as a result, the motor will be stopped and the brake applied as referred to particularly in connection with the diagram shown in Fig. 10. It is obvious that other changes may be made in the specific arrangement used for turning off the motor, but the embodiment shown is sufficient to illustrate one form of my invention.

In Fig. 11 I have illustrated a modified arrangement for breaking the motor circuit and stopping the rotation of the knife. This arrangement is somewhat the same as in Fig. 10 but differs therefrom in that the whole operation is automatically electrically controlled and it is not necessary to provide links such as the links 52 and 114. In this modification the guard for the substance support or the guard for the slice receiver is indicated by the reference numeral 147 pivoted at 148 and it will be understood that the guard is pivoted the same as in the modification which has been described, or in any other suitable manner. An electrical contact 149 is provided on the frame of the machine, or at any other suitable place to be contacted by the guard 147 when in its operative position. The guard and the contact 149 are connected by leads 150 to a solenoid 151 in which there is arranged a rod 152. This rod is normally spring-pressed to the right by means of a spring 153 abutting against collar 154 and a rigid abutment 155 similar to the abutment 91 which is a part of the casing for enclosing this mechanism. The right hand end of the rod 152 is pivoted to a switch 156 which switch is normally adapted to close the circuit to the motor 11. The circuit to the motor includes the leads 157 which are tapped off the main power circuit 158. The motor circuit is also provided with a master switch 159 which corresponds to the switch 61 shown in Figs. 1 to 10 inclusive. When the switches 159 and 156 are closed, it is obvious that the motor will operate, but when either of these switches 159 or 156 is open the motor cannot operate, and accordingly the knife will not rotate.

The master switch 159 and the switch 156 may be connected together so that when one is open the other will also be open, or the two switches may be combined as one switch so that after the motor has been stopped the circuit may be closed manually, for it is obvious that the mere movement of the master switch to its closed position would not complete the circuit to the motor and unless some means were provided for moving the switch 156 to its operative position there would be no way for starting the motor or for energizing the solenoid 151. In the drawings I have indicated the switches 156 and 159 as being connected by the link 160 but it is obvious that other methods may be used for tying the switches together in such a manner that both will be closed simultaneously. As already stated, it would not be necessary to have a separate switch 159 as means could be provided for manually closing the switch 156 and the device would operate equally well.

When the switches 156 and 159 are closed manually they will not remain in this position due to the strength of the spring 153 unless the operator holds the switch, or unless the solenoid 151 is energized. Therefore when the guard 147 is in its dotted line position shown in Fig. 11 the circuit to the solenoid is closed and if the operator manually closes the switches 159 and 156 the solenoid will be energized and the motor will be rotated. As soon as the current passes through the solenoid the rod 152 is drawn to the left and the brake is held out of operative position with respect to the flywheel and the switch 156 and switch 159 will remain closed.

The solenoid circuit is provided with the transformer 161. The arrangement in Fig. 11 may be adapted for use with two guards instead of one. That is, the guard for the substance support and the guard for the slice receiver may be arranged in series with each other similar to the switches 59, 60 and 61 in Fig. 10 so that whenever either of the guards is moved to an inoperative position the circuit will be broken and the slicing knife will be stoped. Or, if desired, only one guard may be provided with the circuit breaking means shown in Fig. 11 and the other guard be mechanically connected therewith so that when one guard is moved to an inoperative position the other guard is also moved to an inoperative position, thereby insuring that the circuit will be broken whenever either guard is grasped by the operator and moved to its inoperative position.

It is obvious that other arrangements could be provided for accomplishing the results disclosed in this application, and therefore I do not wish to be limited except in the manner set forth in the appended claims.

Having thus fully described my invention, what I claim as new and desire to obtain by Letters Patent is:

1. In a slicing machine, the combination with a knife movable along a predetermined path, said knife having a slicing position and a knife sharpening position, a casing for enclosing said knife except at its slicing position and at its knife grinding position, a cover for said knife at its knife grinding position, a guard for preventing access to said knife at its slicing position, a motor for driving said knife, an electrically operated

brake automatically operable for stopping rotation of said knife shortly after said motor is rendered inoperative, and means for automatically stopping said knife in its knife grinding position whenever said motor is rendered inoperative.

2. In a slicing machine, the combination with a substance support, of a slice receiver, a knife movable along a fixed path for slicing substances upon said support, a motor for driving said knife, a guard for said slice receiver to prevent access to said knife at its slicing position, said slice receiver and guard being removably mounted on said slicing machine, means automatically operable upon removal of said slice receiver out of its operative position on said slicing machine for rendering said motor inoperative, and a magnetically controlled brake automatically operable for stopping rotation of said knife after said motor is rendered inoperative.

3. A device as claimed in claim 2 in which a means is provided for automatically locking said knife in a position remote from its slicing position when the rotation of said knife is stopped by said brake.

4. In a slicing machine, the combination with a knife movable along a predetermined path, a casing substantially enclosing said knife during its movement along said path except at a slicing position, means for feeding a substance toward the cutting plane of said knife at its slicing position, a motor for driving said knife along its path, a brake automatically actuated for retarding the rotation of said knife when said motor is rendered inoperative, a power circuit for driving said motor, and a plurality of control elements for controlling said circuit, a plurality of guards for preventing access to said knife at its slicing position, operative connections between said guards and said control device, said operative connections being such that when any of said guards are moved to an inoperative position the control device connected thereto will render said power circuit for driving said motor inoperative.

5. A device as claimed in claim 4 in which one of said control devices is a master control device for rendering said power circuit operative or inoperative to drive said motor, and in which there are operative connections between said master control device and the control devices connected to said guards, said connections being such that said master control device is rendered ineffectual to complete said power circuit except when said guards are in operative positions.

6. A slicing machine comprising a rotatable knife, a motor for rotating said knife, a power circuit for said motor including three switches connected in series with said circuit, a pair of guards for operatively guarding said slicing knife so that an operator is protected from said knife when said guards are in operative positions, an operative connection between one of said guards and one of said switches, an operative connection between the other of said guards and another of said switches, said last two mentioned switches being actuated by their respective guards when the latter are moved toward inoperative positions for rendering said power circuit inoperative, and a connection between said third switch and the other of said switches acting as a master control for said circuit whereby said circuit may be rendered inoperative while said guards are in their operative positions with respect to said knife but being incapable of rendering said circuit operative when either of said guards is in an inoperative position.

7. In a slicing machine, the combination with a slicing knife movable in a predetermined path for severing slices from a substance, a support for the substance to be sliced, a casing over said knife to completely enclose said knife as it moves along its path of travel except at the slicing position, a guard over said substance support and adjacent to said slicing position for preventing access to said knife at said slicing position while said guard is in operative position, said guard being movable to an inoperative position to enable the operator to place the substance to be sliced on said support and to permit access to said knife at said slicing position, a motor for driving said knife, a brake for stopping rotation of said knife, an electrically operated means for controlling the movement of said brake, and interconnecting means between said electrically controlled means, said motor, and said guard so arranged as to render said motor inoperative to drive said knife when said guard is moved to an inoperative position and for substantially simultaneously operating said electrically controlled means for moving said brake into operative position to stop the rotation of said knife.

8. In a slicing machine, the combination with a slicing knife, a casing in which said slicing knife is mounted for bodily movement along a predetermined path, an opening in said casing through which the substance to be sliced is moved, a substance support on one side of said opening, a slice receiver on the opposite side of said opening for receiving slices as they are cut by said knife, a guard movably mounted over said support, a second guard movably mounted over said slice receiver, a motor for driving said knife, a power circuit for actuating said motor, a pair of control elements for rendering said motor circuit operative and inoperative, one of said control elements being connected to one of said guards and the other of said control elements being connected to the other of said guards, and interconnecting means between said control elements and said motor whereby when either of said guards is moved to an inoperative position, its respective control element will render said power circuit inoperative, each of said control elements comprising a switch arranged in series with the other of said control elements in said power circuit, said switches being closed when said guards are in operative position and being open when said guards are in inoperative position.

9. In a slicing machine, the combination with a slicing knife, of a casing for said knife for substantially enclosing the same during its movement along its path of travel but being open at one position to permit the substance to be sliced to be fed into engagement with said knife and having an opening through which slices which are formed are discharged, a support adjacent one side of the opening in said casing, a guard over said support for normally preventing access to said opening whereby the operator of said slicing machine is protected, a power means for driving said knife, a control device for rendering said power means inoperative to drive said knife, a connection between said guard and said control device operable to move said control device to a position such that the same renders said power circuit inoperative whenever said guard is moved to an inoperative position, said support being detachably mounted

on said casing, a toggle member, means for urging said toggle member in a direction to move said control device to a position to render said power means inoperative, means carried by said support for holding said toggle inoperative while said support is mounted in operative position with relation to said casing, said last mentioned means being rendered inoperative when said support is removed from operative position with respect to said casing, whereby said toggle urges said control device into a position such that said power means is rendered inoperative and positively holds said control device in that position until said support is again placed in an operative position with respect to said casing.

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