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3,244,304

TRAY DUMPING MECHANISM

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FIG. 2

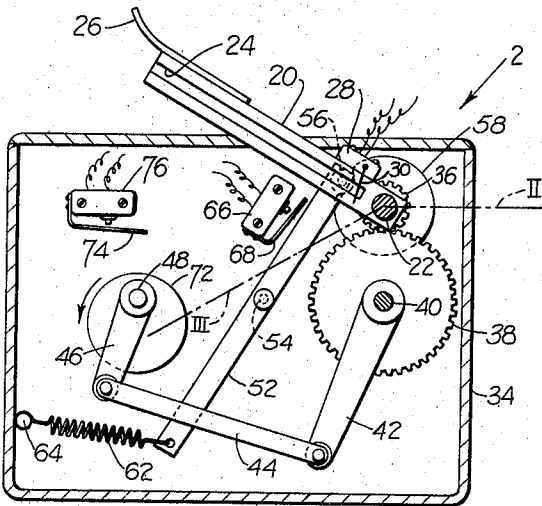


FIG. 4

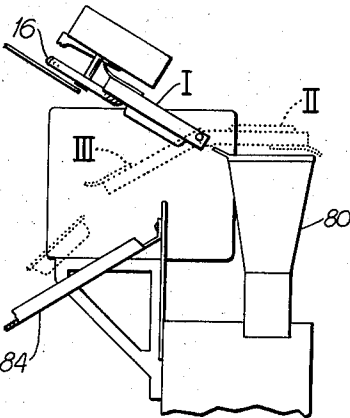
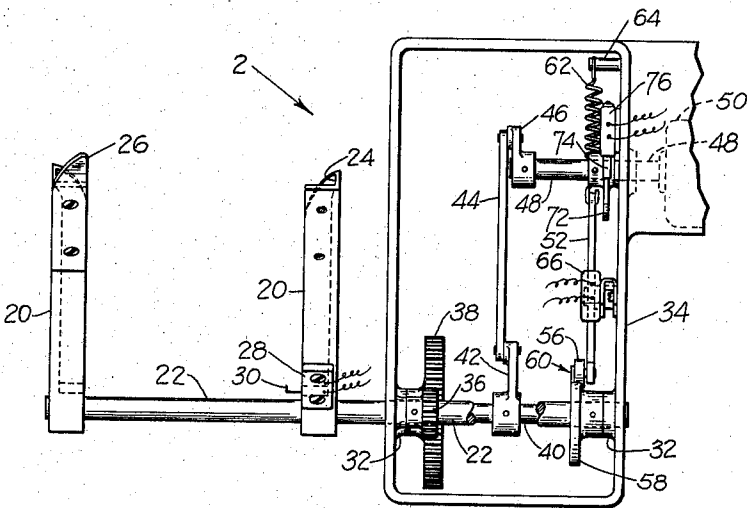


FIG. 3



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FIG. 6

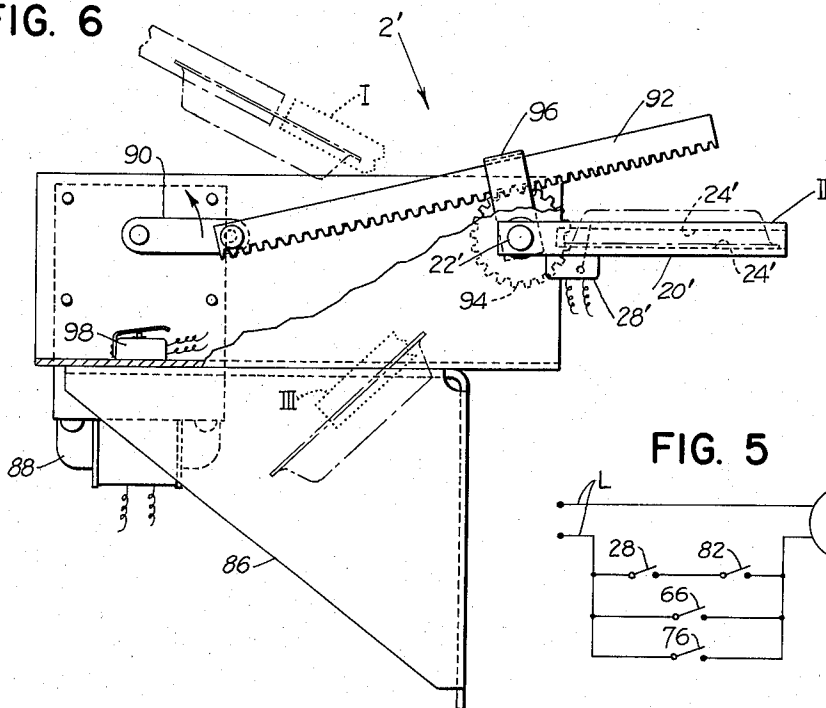


FIG. 5

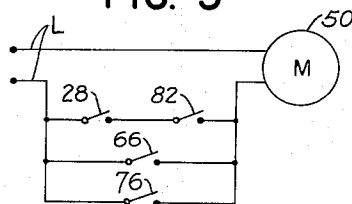


FIG. 7

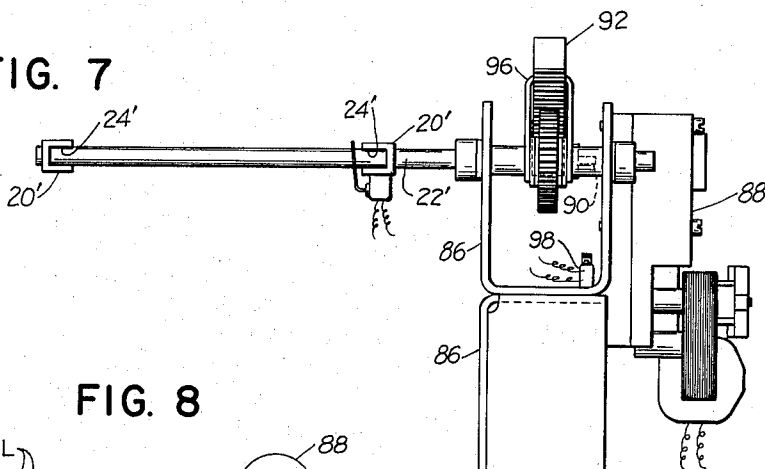
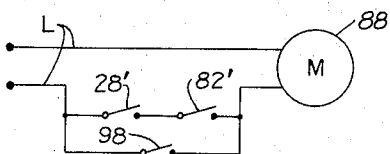


FIG. 8



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TRAY DUMPING MECHANISM

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5 Claims. (Cl. 214-314)

This invention comprises a basically new form of apparatus which is especially adapted for the handling and emptying of trays or similar containers.

Although the apparatus disclosed herein has been developed primarily for the handling of food in disposable or reuseable trays, as will become evident hereafter it is not necessarily limited to such use. It is the principal object of this invention to provide apparatus capable of receiving at one location an open tray having contents such as food and overturning the tray above receiving apparatus into which the contents are to be transferred, after which the tray is to be discarded at another location.

It is a further object of the invention to attain this principal object in the form of apparatus which is of very simple, dependable and easily maintained construction.

Briefly, in accordance with the specifically disclosed embodiments of this invention these objects are attained by apparatus comprising essentially a pair of spaced, parallel arms adapted to grasp the edges of a tray and rotatable as a unit between tray receiving, tray emptying and tray discarding positions, and a drive means for effecting these controlled movements. In rotating from an initial tray receiving position to a tray emptying position, the arms turn over the tray so that its contents fall into receiving apparatus. The arms then reverse and rotate to a downwardly inclined position in which the tray falls from between the arms to an appropriate receiver, whereafter the arms return to their initial position in readiness to receive the next tray to be emptied. As disclosed hereafter, this apparatus has features whereby its operation is synchronized with movements of receiving apparatus such as a rotary deep fat fryer having individual compartments into which food portions are dropped.

Further objects, advantages and details of the invention will become apparent from the following description read in conjunction with the accompanying drawings in which:

FIGURE 1 is a plan view of a completely automated system in which apparatus according to the present invention is employed to transfer food portions in trays from dispensers to deep fat frying apparatus;

FIGURE 2 is a side elevation of a first embodiment of this invention;

FIGURE 3 is a plan view of the apparatus shown in FIGURE 2;

FIGURE 4 is a schematic illustration of the three positions through which the rotary tray receiving structure moves in the course of a cycle of operation;

FIGURE 5 is a wiring diagram of the control circuit for the apparatus shown in FIGURES 1 to 4;

FIGURE 6 is a side elevation of a second embodiment of the invention;

FIGURE 7 is an end view of the structure shown in FIGURE 6; and

FIGURE 8 is a wiring diagram of the control circuit for the apparatus shown in FIGURES 6 and 7.

The environment for which the present invention has been particularly developed is shown in FIGURE 1 and comprises an entire automated system for storing a variety of uncooked foods, dispensing individual portions of food, cooking such portions in a deep fat fryer, and placing the cooked portions on trays for conveyance to a food order receiving station. The tray handling and emptying apparatus in accordance with this invention is generally indicated at 2, and functions to receive a tray T contain-

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ing an individual portion of food and overturn the tray to drop the food into receiving apparatus comprising an automatic rotary deep fat fryer 4. Though the fryer 4 itself forms no part of the present invention, for a full description thereof reference may be had to the copending application of Soussloff et al., Serial No. 83,984, filed December 22, 1961, now abandoned and entitled "Rotary Compartmented Material Treating Unit." After it has been fully cooked in the fryer 4, each portion of food is discharged into a plate or tray which has been delivered to a conveyor 6 by an automatic dispensing mechanism which is generally indicated at 8. The storage of trays T of uncooked food portions and the dispensing of these trays individually upon demand is performed by a group of units which are generally indicated at 10. These units 10 typically accommodate a selection of uncooked foods such as fish, poultry, potatoes and onion rings, and upon receiving a demand signal for an order of a particular food a designated unit will deliver it onto a downwardly inclined table 12 having conveyors 14 leading to a central delivery point. At this central point each tray is advanced by a pair of counter-rotating wheels 16 into the mechanism 2.

The mechanism 2 comprises essentially a rotary structure adapted to manipulate a tray T by grasping the edge portions thereof. Specifically, there is provided a pair of spaced, parallel arms 20 which extend radially in fixed relation from a rotatable shaft 22. Arms 20 are provided with mutually inwardly facing channels or grooves 24 extending lengthwise thereof and adapted to accept in loosely fitting relation the opposite side edges or flanges of a tray T. When the arms 20 are in the rest position shown in FIGURES 2, 3, and 4, the grooves 24 are in alignment with these horizontally directed flanges or edges of the tray which, because of the liberal clearance in the grooves 24, easily is slid inwardly to a fully seated position. Various guide means as indicated at 26 may be provided if desired. When a tray has fully entered the arms 20 to the extent permitted by the lower ends of grooves 24, it displaces the actuator 30 of a microswitch 28, the function of which will be explained hereafter in connection with operation of the control circuit.

Shaft 22 is journaled in bearings 32 provided in the walls of a housing 34. Rotation of shaft 22 is effected through a pinion and a meshing gear 38 which is affixed to a shaft 40, also journaled in the walls of housing 34. Shaft 40, in turn is oscillated by means of an arm 42 which is connected to a crank 43 by means of a link 44. Crank 46 is rotated by the output shaft 48 of an electric motor 50. Thus it will be seen that a single rotation of motor 50, which is of the slow speed type (e.g. approximately 10 r.p.m.), will effect a back and forth oscillation of arm 42, which in turn will effect the following movements of arms 20: (a) from a position I to a position II, (b) from position II in a counter-clockwise direction to a position III, and (c) from position III in a clockwise direction back to the initial position I.

A bar 52 is rockable about a central pivot 54 and carries at its upper end a freely rotatable cam follower roller 56 which rides on the periphery of a cam 58 having a single depression or detent at a starting position indicated at 60. Bar 52 is urged in a clockwise direction by a tension spring 62 connected between its lower end and a fixed stud 64. Thus the spring 62 serves to urge roller 56 into engagement with cam 58 which effects an action tending to resist movement of the arms 20 away from the initial position indicated at I. A normally open switch 66 is mounted in back of the upper portion of bar 52 and has an actuating element 68 adapted to be engaged thereby when cam 58 is rotated to lift the roller 56 out of detent 60. Thus the switch 66 is open when arms 20 assume the position shown in FIGURES 2 and

4 but is closed during movement of the arms in either direction to any other position.

An eccentric cam 72 is keyed to shaft 48 and operates the actuating element 74 of a normally open switch 76. The function of cam 72 is such that after arm 20 have moved clockwise from position I to position II and arms 20 are in reverse movement toward position III, it closes switch 76 as the arms 20 are passing through position I. The function of switch 76 will be more fully explained hereafter in connection with operation of the control circuit.

When the arms 20 are in position II a tray T held therein is directly above the open top 78 of a chute 80 leading into the fryer 4. As disclosed in said Soussloff et al. patent application identified above, the fryer 4 has a plurality of circumferentially arranged separate compartments each adapted to convey a single portion of food through the hot cooking fat or other oil, and it is desirable to synchronize the operation of the mechanism 2 with the arrival of one of these compartments opposite chute 80. As more fully discussed hereafter, the operation of mechanism 2 is conditioned upon the actuation of a switch 82 which indicates that a compartment in the rotary fryer is passing the chute 80. Switch 82 is positioned to be actuated by one of the radial vanes 128 which separate these compartments.

Referring to FIGURE 4, when the arms 20 are in position III, a tray will fall out of the grooves 24 of its own accord and for the purpose of guiding these discarded trays into a receptacle there is provided a guide plate 84.

Referring to FIGURE 5, motor 50 can be activated through the closure of either switch 76 or switch 66, or through the simultaneous closing of both switch 28 and 82. At the beginning of a cycle of operation all of the switches are open. When a tray T is delivered between the arms 20 and closes switch 28, the motor 50 will not necessarily start immediately, but will start only as the switch 82 is also closed by the movement of a compartment into position beneath the chute 80. When both switches 28 and 82 are closed, the motor 50 will turn crank 46 in a counter-clockwise direction as viewed in FIGURE 2 and through the gearing 36 and 38 the arms 20 will be driven in a clockwise direction toward position II. As this rotation of the arms 20 begins, the cam follower roller 56 is lifted from detent 60 and switch 66 is closed by the displacement of bar 52, which serves to continue the operation of motor 50 even though switch 82 subsequently will be opened. As crank 46 completes approximately one quarter of a revolution the arms 20 will pass through position II and begin to return, in the course of which the contents of the tray will fall through the chute 80 into the aligned compartment of the fryer 4. As crank 46 begins to approach a point of completion of about one half revolution the arms 20 will have returned to position I and switch 68 momentarily will open as roller 56 drops into detent 60. However, concurrently therewith the high portion of eccentric cam 72 has been brought into position to engage the actuating element 74 and close switch 76 to maintain the operation of motor 50 despite the momentary opening of switch 66. Thus, this continued operation of motor 50 will move arms 20 in a counter-clockwise direction toward position III and then back to position I. As this return movement takes place the eccentric cam 72 releases switch 76, which then opens, and when arms 20 reach position I the dropping of roller 56 into detent 60 opens switch 66 and interrupts the operation of motor 50. A single cycle of operation has now been completed.

An alternative form of mechanism for moving the mechanism between positions I, II, and III is disclosed in FIGURES 6, 7, and 8. The structure of the arms 20' having the grooves 24', and being mounted on shaft 22', is essentially identical to the corresponding structure in FIGURES 1 to 5, and arms 20' also are moved to the

same positions I, II, and III as previously described. The driving mechanism in the second embodiment is supported on a simple framework 86 having a low speed driving motor 88 mounted thereon. The output shaft of motor 88 carries a crank 90 which is pivotally connected to the end of a gear rack 92. Rack 92 meshes with a pinion 94 that is keyed to the shaft 22', a yoke 96 being provided to maintain the rack 92 in mesh with pinion 94. The end of arm 90 is engageable with a switch 98 to open the same when the mechanism is in the rest position I. When the mechanism is in any other position the crank 90 is disengaged from switch 98, which then is in its normally open position. A switch 28' is actuated in exactly the same manner as the previously described switch 28.

Referring to FIGURE 8, switches 28' and 82' (the switch 82' corresponding identically to previously-mentioned switch 82) are in series with motor 88, and when they are closed simultaneously the operation of motor 88 will be initiated. As the beginning of the cycle of operation the switch 98 is open. Following the closing of switch 28' by the delivery of a tray between the arms 20' and the closing of switch 82' by the registering of a fryer compartment with chute 80, the motor 88 begins to operate and switch 98 closes due to movement of crank 90 in a counter-clockwise direction. This operation of motor 88 will continue until crank 90 has completed one revolution and again opens switch 98. As crank 90 rotates to slightly more than 90 degrees the arms 20' move from position I to position II. Through approximately the next 180 degrees of rotation the arms 20' are rotated from position II in a counter-clockwise direction to position III. Finally, and after approximately the last 90 degrees of rotation of crank 90, the arms 20' are returned from position III to position I.

It will be understood that various departures from the specifically disclosed embodiments of the invention may be effected without departing from the scope thereof as defined by the following claims:

What is claimed is:

1. Apparatus for emptying a tray or the like comprising a pair of pivoted spaced members incorporating means to grasp the opposite side edges of said tray, motion resisting means to position and retain said members in a starting position and coordinated therewith a cycle switch which functions to maintain motive power through a cycle of movement of said arms so long as said motion resisting means is overcome, means operated in response to motion of said spaced members to actuate said cycle switch, said motion resisting means normally positioning said members in a starting position to receive said tray in an upright position, drive means to move said members through a cycle including movement from said starting position through a path first to overturn said tray at a second position, then to swing back a third position wherein said tray falls from said grasping means and then to return to said starting position, and means operable to momentarily overcome said motion resisting means and thereby activate said cycle switch.

2. Apparatus for emptying a tray or the like comprising a pair of pivoted spaced arms having parallel, mutually inwardly facing grooves adapted to accept the parallel side edges of a tray, a rotatable cam provided with a peripheral depression arranged in fixed relationship with said spaced arms and mounted for rotation on a common shaft with said arms, a pivotal bar provided at one end thereof with a cam follower, spring means acting on said bar urging the follower into engagement with said cam, a cycle switch which maintains power so long as said cam follower is not positioned in said cam depression, means operated in response to motion of said spaced arms to actuate said cycle switch drive means normally placing said arms in a rest position wherein a tray received therein is in an upright position, said

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drive means being operable to move said arms in an arcuate path to a second position to overturn the tray, then reverse and swing back to a third position wherein said arms are directed downwardly to release said tray by gravity, and then to return to said starting position, and control means for initiating a cycle of operation of said drive means through said arcuate path in a single cycle of operation by displacing said cam follower from the peripheral depression and closing said cycle switch.

3. In combination, a materials treating apparatus having individual moving compartments and apparatus, synchronized with the movement of said compartments, for emptying the contents of trays or the like into said compartments, said treating apparatus having a stationary location at which said contents are delivered in the course of being emptied into one of said moving compartments, and said tray-emptying apparatus comprising a pair of pivoted spaced members rotatably mounted adjacent said location for movement through a cycle including movement from a first position then to swing back to a tray-emptying second position above said location and then to a tray-receiving first position at the side of said location, said members incorporating means for loosely grasping the opposite side edges of a tray in an upright position when the members are in said first position, motion resisting means to position and retain said members in the starting position and a cycle switch coordinately associated with said members which function to maintain motive power through the cycle so long as said motion resisting means is overcome, means operated in response to motion of said spaced members to actuate said cycle switch, drive means for moving said members between said positions, said drive means including means responsive to reception of a tray by said members to initiate operation by displacing said motion resisting means and thereby closing said cycle switch and initiating operation of said drive means only when one of said compartments has moved into position opposite said location.

4. In the combination according to claim 3, said members being rotatable to a third position below said tray-receiving position, at which third position a tray will fall freely from said grasping means, said drive means being operable in a cycle of operation to move said members

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from said first to second to third position and then return to said first position.

5. An apparatus for emptying trays or the like comprising a pair of pivoted spaced arms incorporating means to grasp the opposite side edges of said tray, a rotatable cam provided with a peripheral depression arranged in fixed relationship with said spaced arms and mounted for rotation on a common shaft with said arms, a pivotal bar provided at one end thereof with a cam follower, spring means acting on said bar urging the follower into engagement with said cam, a cycle switch which maintains power so long as said cam follower is not positioned in said cam depression, means normally positioning said arms in a starting position to receive said tray in an upright position, drive means to move said arms through a cycle including movement from said starting position wherein said follower is positioned in the depression in the cam through a path, first to overturn said tray at a second position, then to swing back a third position wherein said tray falls from said grasping means, and then to return to said starting position, means to initiate operation of the cycle by momentarily overcoming said motion resisting means by displacing said cam follower from the cam depression and thereby activating said cycle switch, and means operated in response to motion of said spaced arms to actuate said cycle switch.

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