FIG. 21
FIG. 22

- Tilt cam rotates 4° counterclockwise
- Tilt cam rotates 8° clockwise
- Jar head gear in mesh with drive gear
- Jar head table rotates 36°
- Jar head gear unlocked
- Jar head gear in mesh

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ABSTRACT OF THE DISCLOSURE

A machine for slicing pickles into longitudinal slices and for packing the slices into jars in an arrangement comprising a complete sliced pickle surrounded by a ring of pickle slices whose inner surfaces face outwardly, the machine including a means for successively feeding individual pickle slices into a jar and a mechanical means for positioning and holding each successive slice in a fixed position against the wall of said jar until the packing of the jar is complete, and further including a means for slicing a whole pickle into a plurality of slices without separating the slices from each other, and then packing the unseparated slices into the space circumscribed by the outer rim of slices.

The present invention is directed to a new machine whose function it is to automatically slice pickled cucumbers, commonly called pickles, into elongated slices and to then pack the pickle slices into jars in a predetermined arrangement of said slices, all this being performed mechanically, that is: without the pickle slices being handled by manual hands.

It is well known to pack sliced pickles into transparent glass jars with the sliced pickle surfaces, that is, the interior of the pickle, facing outwardly to thereby expose to prospective purchasers of the more appetizing interior of the pickle slices rather than the relatively unattractive exterior pickle outer skin surfaces.

This is commonly accomplished by hand with the use of a primitive jar holder which holds the jar along an inclined axis. The filling is performed by a person with the jar and jar holder located at the edge of a table whose surface is covered with a multitude of scrambled, previously sliced pickle slices. The person grasps a bunch of the pickle slices in his hand, said slices extending lengthwise adjacent to each other, and inserts the bunch of slices into an empty jar. Then, while the jar is slowly rotated about its inclined axis, the person positions one slice at a time already in the jar against the jar wall to form an outer ring of slices, the remaining slices remaining in the middle of the jar and becoming centered therein as a result of the rotation of the jar. Finally, one or more additional slices are inserted into the middle of the jar at random to make a uniform tight pack.

The rising costs of manual labor in this field have, however, reached a critical level relative to the pickle industry and a resolution of the problem of increasing packing costs has become increasingly exorbitant. The present invention, therefore, constitutes a particular resolution of the aforementioned problem through the provision of a machine which continuously receives whole pickles and empty jars and which automatically and entirely mechanically slices the pickles and packs the slices into the jars with the sliced surfaces facing outwardly, said machine finally ramming a center plug which comprises an entire sliced pickle whose slices are not separated from each other, into the jar space defined by the outer rim of pickle slices.

The packing of pickle slices into jars presents a particular problem when the neck of the jar onto which is fitted a removable jar cap is appreciably smaller in diameter than the jar body which holds the pickle slices. It would be relatively simple to design a machine for packing slices into a jar whose neck opening is substantially the same size as the jar body. Such an expedient, however, is commercially impractical because of the increased cost of the correspondingly larger jar caps and also from the consumer's point of view, because of the unwieldiness of caps which are too large to be comfortably gripped by a human hand. It is, therefore, well known in the packing industry to make the neck of a container as small as practicable from a cost point of view as well as from the point of view of consumer acceptability.

This invention, therefore, is especially directed to the packing of pickle slices into jars whose neck opening is considerably smaller than the jar body.

More specifically, the present invention comprises a machine which substantially fully packs five jars in one cycle of operation, each cycle being comprised of a plurality of operations as follows:

(a) In each of nine successive steps of a first operation, an individual whole pickle is cut into five separate slices each slice with an individual pickle being packed into a different one of five jars. At the end of the first operation, therefore, each of the five jars contains five pickle slices, one slice from each of nine different pickles.

(b) In the succeeding operation, each of five whole pickles are simultaneously cut into five slices, and each individual pickle constituted by five slices is then packed as a unit into the middle of each of the five jars respectively. The final result, therefore, is that each of the five jars contains an individual pickle cut into five slices surrounded by nine pickle slices, one from each of nine different pickles.

(c) If necessary, an additional one or two pickle slices will be inserted into the jar by hand in order to bring the jar contents up to specified weight.

The machine which is disclosed herein is adapted to pack pickles in the aforedescribed manner at an accelerated rate and in a more precise manner relative to prior known pickles packing methods, thereby increasing packing efficiency as regards time and cost considerations but also to aesthetic appeal of the final packed product.

The invention will now be described in detail with reference to the accompanying drawings, wherein:

FIGURE 1 is a top plan schematic view showing the relationship between the respective pickle slicers and the associated pickle distribution means;

FIGURE 2 is a cross section through a jar which has been filled with pickles by the machine of this invention;

FIGURE 3 is a side elevational view of the machine with some details omitted for the sake of clarity;

FIGURE 4 is a vertical cross-sectional view taken along line 4-4 of FIGURE 3;

FIGURE 5 is a vertical cross-sectional view of the center slicer and parts adjacent thereto;

FIGURE 6 is a horizontal sectional view taken along line 6-6 of FIGURE 5;

FIGURE 7 is a vertical cross-sectional view showing the center slug slicer and adjacent parts;

FIGURE 8 is a cross-sectional view taken along line 8-8 in FIGURE 7;

FIGURE 9 is a cross-sectional view taken along line 9-9 of FIGURE 7;

FIGURE 10 is a vertical cross-sectional view through a portion of the index wheel and associated bopper device;

FIGURE 11 is a horizontal sectional view taken along line 11-11 in FIGURE 10;
FIGURE 12 is a top plan view of a jar head and a fragment of the jar head turret; FIGURE 13 is a vertical sectional view taken along line 13—13 in FIGURE 12; FIGURE 14 is a horizontal sectional view taken along line 14—14 in FIGURE 13; FIGURE 15 is a vertical cross-sectional view taken along line 15—15 in FIGURE 14; FIGURE 16 is a side elevation view of one of the finger element lifters; FIGURE 17 is a horizontal cross-sectional view taken along line 17—17 in FIGURE 13; FIGURE 18 is a horizontal cross-sectional view taken along line 18—18 in FIGURE 13, and additionally including fragmentary auxiliary side elevation view of the lift cam; FIGURE 19 is a fragmentary vertical elevation view of two of the finger element shafts and their related swing followers;

FIGURE 20 is a vertical sectional view in the same plane as FIGURE 4 but showing only the lower part of the machine enlarged; FIGURES 21, 22, and 23, are respective horizontal sectional views taken along lines 21—21, 22—22, and 23—23, in FIGURE 20; FIGURE 24 is a plan view of the jar turret and the infeed and outfeed star wheels; and, FIGURE 25 is a timing diagram showing the related timing sequence of the various operations of the machine.

In the accompanying drawings like reference numerals are intended to indicate the same parts in the various figures.

In FIGURE 1 it is seen that the machine of this invention comprises a primary distribution ring R which includes thirty-two cups 1, said ring being rotative in a counterclockwise direction in increments of thirty-two steps for each complete revolution thereof. An elevating conveyor E, of known type, carries pickles which have previously been cut to a uniform length, to a loading point above the ring cups 1, at which point timed fingers (not shown) push the pickles successively off the elevating conveyor, said pickles thereby dropping into cups 1 as said ring R rotates in steps past the conveyor. The timed fingers are so operated that they skip a pickle in correspondence to every tenth and every sixteenth cup 1 being in loading position relative to said conveyor. This means that nine cups 1 in succession will each receive a pickle from conveyor E, the tenth cup will remain empty, the next five cups will also receive a pickle and the sixteenth cup will also remain empty, and the loading cycle will begin with the seventeenth cup.

Stated otherwise, one complete revolution of ring R corresponds to two loading cycles of the ring R, each cycle including the loading of a pickle into each of nine cups, leaving the next cup empty, loading the succeeding five cups with a pickle and leaving the next cup (the sixteenth) empty.

The four blank cups in ring R are extra cups which make it possible to pack each jar with up to eleven slices in the outer ring of slices, if desired, depending upon the diameter of the pickles being used. In fact, any number of slices could be packed into the outer ring, for example, twenty slices, simply by redesigning ring R and its related parts to accommodate any particular number of pickles.

The cups in the primary distribution ring R are open at both axial ends thereof; however, the pickles are prevented from falling out from the bottom ends of said cups by means of the stationary supporting plate 9. Ring R, therefore, carries the pickles along in a counterclockwise path with the bottom ends of the pickles resting upon and sliding along the top surface of plate 9 until each pickle P1 to P9, successively, arrives over a center slicer 2 at which point (Station 1) the pickles drop by gravity through an opening in the supporting plate 9 and into the top of the center slicer. Said slicer includes five stationary cutting blades 11 angularly equi-spaced and projecting radially from the slicer central axis. Blades 11 are in the form of flat plates extending downwardly to an appreciable length in the lower end of the slicer so as to vertically guide the pickle slices which have been cut by the upper or cutting edges of said blades. The lower ends of the blades 11, in fact, reach to the inlets or inner radial ends of five stationary chutes 3 which form guide channels extending downwardly and in a radially outward direction relative to the bottom of the center slicer (FIGURES 3 and 4).

As the pickle falls into the center slicer 2, a slicer ram 10 (FIGURE 4) descends to push the pickle downwardly past the upper or cutting edge of blades 11, said pickle being thereby cut into five substantially equi-sized longitudinal slices, the ram 10 then ascending at the completion of its downward stroke. Ram 10 includes a ram head 19 having five slots 20 formed therein into which the blades 11 may slide as the ram descends so that said head may travel all the way down to the bottom edges of said blades 11 in pushing the pickle through the slicer. The ram imparts a downward velocity to the pickle and to the five resulting slices whereby said five slices, after they exit from the slicer, continue to slide along respective ones of the five chutes 3. The central radial axis of each chute 3 substantially bisects the angle between each pair of blades 11. In other words, the channels defined by each chute 3 forms a continuation of a vertical channel formed by two succeeding blades 11.

The ram 10 is power driven as follows. Primarily, a clutch device 82 is drivenly connected to a rotary crank 83 having a shaft which is rotatably supported in stationary bearing means 84. A connecting rod 85 is pivotally connected at one end thereof to the crank 83 and at its other end to a crosshead block 86 which is rectilinearly reciprocable along two stationary guide rods 87. Block 86 in turn is rigidly connected to ram 10. It is seen, therefore, that rotary motion of crank 83 results in rectilinear reciprocation of crosshead 86 and of ram 10 which is connected thereto. Rotary driving force is imparted to crank 83 via clutch 82 which receives its driving force from a power transmission train comprising a series of shafts 81—1 to 81—4 and related bevel gears, said train in turn receiving its driving force from a chain and sprocket assembly 80 which is driven from a not shown power source.

An annular index wheel 4, comprising a plurality of downwardly inclined radial V-grooves 12 evenly distributed along its upper surface, is timed to rotate counterclockwise in steps corresponding to each step rotation of the primary distribution ring R. Each stepwise rotation of the wheel 4 brings a groove 12 into radial alignment with each of the five chutes 3 so that the five pickle slices from a particular pickle simultaneously slide along chutes 3 and into respective ones of grooves 12. A stationary stop ring 5 located circumferentially around wheel 4 prevents the pickle slices from sliding radially outward from grooves 12 excepting when said grooves are radially aligned with either of five openings 13 in ring 5, said openings 13 permitting the pickle slices to slide out of grooves 12 and into respective ones of five jars J. It should be understood, therefore, that during one step of operation of ring R and of wheel 4, one of the five openings P1 to P9, for example, pickles P—1, is cut in slicer 2, into five separate slices, said five slices then simultaneously sliding along respective ones of chutes 3 and into a respective groove 12 which is circumferentially displaced from the openings 13 in step ring 5. During the next operation step, wheel 4 advances to align the five grooves 12, which contain a slice from pickle P—1, with respective ones of openings 13 while simultaneously pickles P—2 is being cut in the slicer and the slices thereof are free to slide into the five grooves 12 which are respectively one step behind openings 13.
Instead of wheel 4 advancing in increments equal to the distance between two succeeding grooves 12, it could also be timed to advance in increments for each step of rotation of ring R. For example, wheel 4 could be timed to advance an increment equal to the distance between three or four succeeding grooves 12 for each step of rotation of ring R. This would mean, with reference to FIGURE 1, that the pickle slices would not be discharged through the first opening for that plane but would be carried by wheel 4 to be discharged through a succeeding opening 13 into a jar.

A further possibility is that of aligning each chute 3 at a different position than that shown in FIGURE 1 relative to the jar axis. For example, each chute 3 is shown in FIGURE 1 as being aligned with a groove 12 which is one step behind (relative to the direction of rotation of wheel 4) the opening 13; instead of this, each chute could be aligned with a groove 12 which is one step ahead of the opening 13, whereby each pickle slice would have to be carried by wheel 4 to an opening 13 which is four grooves away from the chute 3 from which said slice came, before this slice could be packed into a jar.

In any event, at any one time, only five grooves 12 are receiving pickle slices from slicer 2 while another five grooves are discharging previously received pickle slices into the jars. In addition, five grooves could be held with five slices at rest if wheel 4 were timed differently or if chutes 3 were aligned differently than as shown in FIGURE 1.

The just described operation on pickle P-1 comprises one step of the sixteen steps which constitute a complete cycle of the ring R, and the step increments for pickle P-1 is repeated for each of the remaining pickles P-2 to P-9, so that after the completion of a cycle of operation of ring R of each of five jars contains nine pickle slices facing outwardly along the jar inner wall. The tenth step of ring R brings the empty cup B or the tenth slice to a point so that no pickle is cut during this step. During the succeeding five steps of rotation of ring R, that is, steps 11-15, pickles C-1 to C-5, which did not fall into the center slicer because a timed gate closed off the aforementioned opening in support plate 9 while pickles C-1 to C-5 were passing through, will successively arrive at Station II which is no less than ten steps ahead of the slicer position. It should be noted that Station II can be located a greater number of steps ahead of Station I, this being determined by the diameter of ring R which can be varied. Station II could, for example, be diametrically opposite to Station I as is shown in FIGURE 1.

At Station II, pickles C-1 to C-5 will each successively fall through a second opening in support plate 9 and into successive ones of twenty funnel-shaped cups 14 in outside distribution ring 6. Distribution ring 6 rotates either clockwise or counterclockwise in steps each of which corresponds to a successive one of cups 14 being brought into the position of Station II. Specifically, ring 6 is timed to rotate ninety degrees, that is: five steps, in correspondence to pickles C-1 to C-5 successively arriving in a counterclockwise direction at Station II. At the completion of the five steps, that is, after pickle C-5 has dropped at Station II, said outer ring 6 rotates one more step past Station II and then stops. FIGURE 1 shows ring 6 stopped with pickles C-1 to C-5 from the preceding cycle having already been chopped into cups 14. In FIGURE 1, the primary ring cups 14 which contained pickles C-1 to C-5 are empty and ready to be refilled with pickles from the elevating conveyor E. When pickle C-1 arrives at Station II, the empty cup 14 immediately following that containing pickle C-5 will be there ready to receive pickle C-1. After pickle C-1 drops into cup 14, outer ring 6 will begin its five-step clockwise rotation bringing each of cup 14 to 14 to 14 to 14 to 14 to 14 to Station II and will stop with cup 14 remaining at said station and replacing cup 14 as the empty cup until the primary ring cup 14 which previously contained pickle C-1 returns to Station II during the next cycle. Pickles C-1 to C-5 will have fallen into cups 14 to 14, respectively, for each step of rotation of ring R.

FIGURE 6 shows some details of the center slicer 2 and related parts. Primarily, it is seen that a flat spring element 23 projects radially inwardly from the inner wall of the slicer 2 at respective positions between the blades 11. Each spring element is located toward the bottom end of the slicer 2 and serves the function of urging the respective pickle slices radially against the sides of the blades 11 and in centered position relative to the axis of the slicer. In other words, the springs 23 maintain the respective slices vertically parallel to each other and bunched together as closely as possible about the central axis of slicer 2.

Plate 9 is seen to be in the form of a flat annular or flat ring member having an annular recess 92 which opens at the inner edge of plate 9, said recess extending over slicer 2 and being substantially as large as the opening in either cups 1 or slicer 2 whereby a continuous passageway is formed from a cup 1 through plate 9 and into slicer 2. A gate member 7 comprises a flat plate of the same thickness as plate 9 and is arranged to slide within recess 92 in the same plane as the plane in which plate 9 extends. Gate 7 is accurately profiled at one edge thereof in conformity with the circular contour of the closed end of recess 92. Gate 7 is secured to the upper side of arm 94 which is pivotally mounted on the base 90 and is oscillatingly driven by a drive means 95 between positions wherein gate 7 either closes the passageway between cups 1 and slicer 2, or opens it as is shown in FIGURE 6.

It should be noted that when gate 7 is in its closed position, its upper surface forms a smooth continuation of the upper surface of plate 9 so that the center slug picks can slide over said gate without being damaged or damaged by the edges of gate 7 or of plate 9.

At Station II, plate 9 comprises a second opening O (FIGURE 4) which, however, is permanently open and does require a gate. Opening O, therefore, simply is a round hole extending through plate 9.

With regard to the five jars, however, it will be recalled that after pickle P-9 had arrived at Station I and been cut in slicer 2, said jars each contained only nine pickle slices, one from each of pickles P-1 to P-9, said jars still requiring a center slug pick in order to be completely filled. These center slug picks are provided by the outer distribution ring 6 as follows.

With reference to FIGURE 4, it is seen that a stationary slide plate 9', analogous to plate 9, in the form of a flat annular member underlies the cups 14 in a plane immediately adjacent to the bottom of said cups. Since cups 14 are open at both ends, plate 9' serves as a stop to prevent the center slug picks from dropping out of said cups. In operation, therefore, when outer distribution ring 6 rotates carrying therewith the cups 14, the bottom end of pickles which are vertically upstanding in said cups slide along the top surface of plate 9'.

Plate 9' includes five equi-spaced recesses 92' (FIGURE 9) opening at the inner circumferential edge of plate 9' and being large enough to permit the center slug pick to fall therethrough by gravity. A gate 7' comprising a flat plate member of the same thickness as plate 9' is arranged on top of an arm 94' which in turn is pivotingly driven to oscillate between the two positions indicated by the arcuate arrows shown in FIGURE 9 by a drive means 95' whereby gate 7' either opens or closes the recess 92'. The top surface of gate 7' lies in the same plane as the top surface of plate 9' and the width of said gate is such that its peripheral sides fit quite closely adjacent to the sides of recess 92' so that, when the gate is closed, a smooth continuous flat surface is provided with no shoulders which could damage the bottom end of the pickle as it slides over the gate. This same fitting relationship applies to previously described gate 7 and recess 92 in plate 9.
The center slug slicers 8 are pivotally mounted about fixed pivot means at one end of arm 8' which in turn is driven to oscillate between two angular positions as indicated in FIGURE 9, by a drive means 95. There are a total of five center slug assemblies 8, each comprising a slicer 8 driven by its own drive means 95 and a corresponding gate 7' driven by its own drive means 95. The slicer assemblies 8 as well as plate 9' are fixed and do not rotate about the machine axis b-b. As is seen in FIGURE 9, the center slug slicers 8 are analogous to slicer 2 in that slicers 8 also comprise five stationary elongate blades 11' radiating in top view from a common axis along equi-angularly spaced radii. Further, the slicers 8 also comprise inwardly protruding flat springs 23' analogous to springs 23 in the slicer 2.

After pickles C-1 to C-5 have each dropped at Station II into the funnel-shaped cups 14' to 14 and outer ring 6 has come to a stop with its empty cup 14' positioned at Station II, gates 7 open thereby permitting pickles from five of the cups 14 to fall into five equi-angularly arranged slicers 8 which are equi-angularly arranged concentrically relative to the axis b-b of the slicer 2 and over which are aligned five respective ones of said cups 14. After the opening of gates 7, the slicers 8 swing inwardly into alignment with the vertical centerlines of five respective ones of the cups 14 (not shown in FIGURE 1) which have five jars along the radii V. In this regard, it should now be noted that the jars heads shown in FIGURE 1 hold the jars in tilted position along the respective jar tilt axes which are shown in FIGURE 1 as extending along radii T, so that the jars may receive the pickle slices falling radially outwardly from the cups 14; however, after the jars have received the nine pickle slices these jars heads tip the jars to a vertical position and simultaneously move them circumferentially relative to axis b-b until the jars are aligned on the vertical axes which are shown in FIGURE 1 as being aligned along radii V. Simultaneously, five jars heads which were positioned along radii V and contain empty jars, also move circumferentially relative to axis b-b until they assume positions along the radii T. In other words, five jar heads along radii T switch positions with five jar heads along radii V. Therefore, after the jars have shifted from positions along radii T to positions along radii V, the slicers 8 swing inwardly into vertical alignment therewith and air cylinders 95 drive Rams 94 downwardly through the slicers 8, thereby resulting in the center slug pickles each being cut into five sliver pickles 8 by being separated from each other, and then pushed downwardly into the middle of the respective jars. A packing cycle is thereby completed with five jars each being filled with fourteen pickle slices, nine in an outer ring surrounding five in the middle.

FIGURE 2 shows the machine packed jar with the outer ring slices 'p' representing, for example, one slice from each of pickles P-1 to P-9 and the center slug C-1 representing the complete pickle C-1 cut into five slices.

After the jars have been filled according to FIGURE 2, they are removed from the five vertical jar heads and empty jars are loaded therein by a jar-loading means which is to be described. Also, the center slug slicers 8 swing outwardly into alignment positions along the rotational arc of cups 14 while the other five jar heads position empty jars along the radii T whereby another operational cycle may begin. After the packed jars of FIGURE 2 have moved so as to be removed from the pickles 8 and one or two slices may be packed thereinto by hand if needed in order to provide a tight pack and to bring the jar up to weight.

The mechanism whereby the jars are held in pickles-loading position and whereby the cut pickles are packed thereinto will now be described in detail.

In FIGURE 4, which shows the machine in vertical cross section, line a-a denotes the centerline of the primary distribution ring R while line b-b denotes the centerline of the center slicer 2 and of the index wheel 4 as well as the axis about which ten jar heads 15 are angularly distributed. As already described, five jar heads each hold a single position for picking up and successively picking up pickle slices from index wheel 4, and subsequently they shift to a vertical position for receiving the center slug pickle from center slug slicer 8. At any one time, however, five jar heads are in tilted position while five other jar heads are in vertical position, each vertical jar head being part of a group of successively tilted jar heads. In other words, a vertical head is followed by a tilted head which is then followed by a vertical head, etc., the angle between the axes of any two succeeding heads being 36°. In the tilted position the jar is held at a slightly greater angle to the horizontal than the angle formed by the index wheel groove 12 relative to the horizontal. For example, in the preferred embodiment as shown in FIGURE 10 the jar is held at an angle 'x' of twenty-four degrees to the horizontal while the groove 12 forms an angle 'y' of approximately twenty-two degrees to the horizontal. This difference in angles results in the pickle slices dropping into place against the jar inner wall in a more reliable and more uniform manner after they are ejected from the grooves 12. Furthermore, as is shown in FIGURE 11, the radial axis of groove 12 in a horizontal plane extends at an angle 'y' which is (not shown in FIGURE 1) which has the same angle 'y' along which the jar axis extends. The pickle slice therefore enters the jar along the axis 'x' slightly to the side of the vertical plane in which lies the jar axis. This assures the proper filling of the pickle slice into place against the jar wall. In this regard, it should be noted that the pickle slices enter the jar by traveling longitudinally therefore successively along axis 'x' and then the slice falls perpendicularly away from axis 'y' towards the jar wall. The angle 'y' shown in FIGURE 11 as well as the difference between angles 'x' and 'y' shown in FIGURE 10, combine with each other to assure a proper falling into place of each slice against the jar wall.

The ejection of said slices out of grooves 12 is effected by means of five bopper devices each of which comprises a push rod 16 (FIGURE 10) which is aligned for reciprocating movement along each of five grooves 12 while said grooves are aligned with openings 13 in stop rings 17. The rods 16 comprise a push head 17 at one end thereof for abutting against one end of the pickle slices and a gear rack 18 along their upper surface, said rack engaging a gear sector 19 which in turn is oscillatingly driven by a turnbuckle 19a for engaging each other.

The gear sector 19 is pivotally mounted about a fixed pivot axis and is rigidly attached to arm 22 one end of which is pivotally attached to one link 20 of linkage means 26, said means 26 comprising two axially coextensive link elements whose length is adjustable by means of a buckle or sleeve which threadedly receives the end of at least one of the two link elements. The other link element 20a is, in turn, pivotally connected to one end of an oscillating means 25 which in turn is drivingly connected to the machine power drive means. Said drive means is timed so as to perform a driving action upon rod 16 as each groove 12 comes into alignment with opening 13 and to immediately thereafter perform a return movement to retract rod 16 from said groove so as to permit the index wheel 4 to advance another step. The driving means for rod 16 drives said rod at a predetermined linear speed so as to pick up, on additional pickles from one of the pickles 8 cut out from grooves 12 and all the way into jars J. This linear speed is very important and should be in the range of 130 to 180 feet per minute. Too high a speed would result in bouncing of the slice back off the jar bottom wall.

FIGURES 9, 10, and 11 show the drive arrangement whereby the respective rods 16 are all driven coincidentally. Primarily, referring back to FIGURE 4, it is seen that a power drive originates at the sprocket wheel assembly 80 and continues through shafts 81-2, 81-3 to 81-4, and then through second sprocket assembly 82a.
and to a vertical shaft 102 to whose end is keyed a bopper cam 103. Referring now to FIGURES 10 and 11, it is seen that cam 103 is a disk having a continuous cam groove 104 formed in one radial face thereof. Means 25 comprises a cam follower pin 105 which is mounted intermediate the ends of an elongate arm 107 one end of which is pivoted about fixed pivot pin 106 and the other end of which is pivotally connected to one end of link means 20. Pin 106 is fixedly mounted in a stationary part of the machine frame F which extends in a plane above the bopper cam 103. Arm 107 is stepped along its length so that successive lengthwise portions thereof are offset from each other, this being a matter of design expediency in view of the arrangement of parts. Pin 105 rides in groove 104, and said cam groove is such that cam 103 rotates in one direction a complete revolution, pin 25 and arm 107 pivot back and forth about pin 106, this resulting in a corresponding oscillation of link means 20 and of gear sector 19 which finally reciprocates bopper rod 16.

The machine comprises five bopper rods 16 and five gear sectors 19 respectively associated therewith; however, the machine comprises only on link means 20 and one bopper cam 103 connected as shown in FIGURE 11 to the five gear sectors. The link means 20 is connected directly to the arm 22 of only a first of the five gear sectors 19 and the gear sectors, in turn, are connected to each other by a universal coupling means means between the arms of each of the five gear sectors so that there are five coupling means 108 arranged in a generally circular pattern and serving to transmit driving force from the first gear sector to the other four sectors whereby they all perform identical movements simultaneously.

After the first pickle slice comes to rest in jar J, said slice is held in a particular position therein against the jar wall and the jar rotates one step after receiving each of the pickle slices with each said slice being held in fixed position in said jar. In this manner, in succession, the pickle slices are held in the jar along a fixed radial position relative to the jar itself. The jar must rotate after receiving each slice in order to permit each successive slice to assume a position along a preceding slice. It is seen, therefore, that as the jar rotates, the pickle slices are carried in a circular motion with some of the slices eventually being positioned vertically above the hollow middle portion of the jar.

With reference to FIGURE 13, it is seen that the jar head 15 comprises a circular jar holder sleeve 26 open at both axial ends thereof. A jar J is inserted upwardly into the 26 until its upper shoulder 14 abuts against a resilient jam ring 27 which is located between sleeve 26 and the jar head ring gear 32. In this position, the upper open end 7 of the jar protrudes slightly from the upper end of the ring gear 32. Four metallic balls 28, which protrude radially inwardly through circumferentially spaced openings in sleeve 26, act as supports against the bottom of the jar and thereby prevent its falling out of said sleeve 26, said balls being displaceable radially outwardly against the urging of resilient means 29 to permit the jar to be loaded into or removed from the sleeve 26. Sleeve 26 is in turn rotatably mounted in fixed cylindrical bearing 30 while the upper end of sleeve 26 is fixedly attached by means of screws 31 to the ring gear 32, said gear comprising gear teeth 33 along its outer rim and being thereby drivingly connected to drive gear wheel 34 (FIGURE 4) which, in turn, is driven by the machine main motor. It is seen that the ring gear 32 drives sleeve 26 in rotation within jar head bearing 30, and that jar J rotates with said sleeve since said jar is firmly held relative to the sleeve by virtue of balls 28 and jam ring 27 pressing the jar between themselves.

With jar J thus held firmly by rotatable sleeve 26 in the manner shown in FIGURE 4, a pickle slice successively emerges from center slicer 2, then slide along chute 3 and into grooves 12 whereupon they are ejected by rod 16 into the tilted jar J which rotates one step after receiving each pickle slice. In this regard, a very important feature of the invention resides in the means whereby each of the nine pickle slices is made to remain in place in a circular pattern against the inner wall of the jar without falling or otherwise becoming displaced as the jar rotates.

With reference to FIGURES 12 and 13, it is seen that the jar head includes eleven holding fingers 35 arranged in a circle which is concentric with the jar axis. Each of said fingers is substantially L-shaped with one leg 35' thereof extending into the jar parallel to its axis and to a distance of about two-thirds of the depth thereof while said jar is in pickle-loading position in the jar head. The other leg 35" of each finger 35 extends substantially perpendicularly to leg 35' and is fixedly attached to one end of a pivot shaft 36, there being eleven such shafts pivotally mounted at one end thereof in bearings 37 which are arranged in a circle in ring gear 32. The other ends of shafts 36 are pivotally mounted in bearings 37' which are axially aligned with corresponding ones of bearings 37 and are arranged in a lower support ring 32' which is fixedly attached in axially spaced relationship relative to the ring gear 32 by means of spacer tie rods 38. Lower support ring 32' is rotatably mounted on the outer circumferential surface of bearing member 30 so that the ring gear 32 and lower support ring 32' are integrally rotatable together relative to said bearing member.

A lift return coil spring 39 is partially compressed between the lower surface of ring gear 32 and a stop ring 40 which is fixedly mounted on shaft 36, said spring thereby urging said shaft axially downwardly, that is, in a direction whereby finger legs 35" are moved toward the bottom of the pickle jar. Shafts 36 are, however, axially displaceable within bearings 37 and 37' displacement in an upward direction being yieldingly resisted by spring 39 and displacement in a downward direction being limited by lifter means as follows.

An annular head mounting plate 44 is fixedly attached to bearing member 30 in axially spaced position relative to lower support ring 32'. Plate 44 fixedly carries a cam ring 45 along its upper radial surface, said cam ring having an upper cam contour in axial height. Lower support ring 32' carries a cam follower or lifter roller means 46 which includes a roller 47 in rolling contact between the lower end of each shaft 36 and cam surface 45' so that variations in the height of surface 45' produce corresponding axial displacement in shafts 36 as said shafts are rotated about the lower axis pursuant to rotation of ring gear 32. Each roller (FIGURE 16) is rotatably mounted between the arms of a double armed forked bracket 120, said bracket in turn being pivotally mounted in a lug 122 which extends rigidly from a mounting plate 121, said plate being secured to the lower surface of lower support ring 32'.

With reference to FIGURE 12, it is seen that the fingers are pivotally biased in a counterclockwise direction, that is, in a direction whereby finger legs 35' are urged outwardly relative to the jar axis, by springs 41 attached to finger legs 35" and to fixed points on the ring gear 32. Said fingers are pivotable in a clockwise direction against the urging of springs 41 by virtue of swing follower elements 42, one of which is fixedly mounted on each of shafts 36 between bearings 37 and 37', respectively sliding over each of the front and back cams 43 and 43' which, in turn, are fixedly attached at circumferentially spaced apart locations on the outer surface of bearing member 30. The counterclockwise pivoting of the fingers is limited by stop members 48 which extend rigidly from the top surface of ring gear 32 and abut against one side of said fingers.

In summary, therefore, fingers 35 are pivotable and also axially displaceable relative to the jar axis in cor-
The actuation of the fingers will now be described with reference to an actual pickle-loading operation and with particular reference to FIGURES 12-16 wherein the successive pickle slices will be referred to as P-1 to P-10 and the fingers 35 are denoted f-1 to f-11, respectively. Assumed at the start of the operation the jar is empty and that the first pickle slice, P-1, is to be inserted therein, the two fingers f-1 and f-2 must be pivoted clockwise, that is: radially inward relative to the jar wall to the dash line positions shown in FIGURE 12 so as to make room for said first slice P-1. Finger f-11, on the other hand, must remain stationary in order to provide a solid support surface for one side of the first pickle slice. Since the finger portions 35° are all in the same plane, clockwise pivoting of fingers f-1 and f-2 would result in their horizontal portions 35° abutting against portion 35° on finger f-3 unless said fingers f-1 and f-2 were simultaneously lifted so that their portions 35° could pivot above the plane of portion 35° on finger f-3. For this reason, therefore, the fingers f-1 and f-2 are first lifted, pursuant to the rollers 47 of fingers f-1 and f-2 rolling along the elevated portion of cam surface 45°, and while so lifted they pivot clockwise pursuant to swing followers 42 sliding respectively along the front and back cams 43 and 52. While this is occurring to fingers f-1 and f-2, all the other fingers remain in their position as shown in FIGURES 12 and 13. With the fingers f-1 and f-2 being held in the dash-line positions as shown in FIGURE 12, the pickle slice P-1 is then ejected into the jar with the slice thereof coming to rest against stationary finger f-11 and ring gear 42 then rotates one step clockwise, and in so doing, the shaft 36 of fingers f-1 and f-2 pivot counterclockwise pursuant to swing followers 42 sliding along the back side of cams 43 and simultaneously said fingers also lower pursuant to the corresponding rollers 47 rolling along a lowered portion of cam surface 45°. The finger f-11 thereby pressed against the skin side of slice P-1 and together with finger f-11 holds said slice firmly in a fixed permanent position against the jar wall.

When the ring gear 33 has completed its one step of rotation, the swing followers for fingers f-2 and f-3 will be in the same positions as those shown in FIGURE 14 for the swing followers of fingers f-7 and f-8, that is: followers 42 are riding along back cam 43 and followers 42 will be riding along front cam 43, and the packaging slice P-2 is then performed as described above for slice P-1, and the procedure is then repeated for the remaining slices. For example, when slice P-7 is to be packed into the jar, the swing followers 42 and 42 for fingers f-7 and f-8 will respectively be in the positions shown in FIGURE 14, and after slice P-7 enters the jar, ring gear 33 will rotate one step whereby finger f-7 will pivot counterclockwise, as follower 42 moves away from back cam 43, to thereby come against the skin side of slice P-7, and together with finger f-6 it will hold slice P-7 firmly against the jar wall. Finger f-8 will, during this one step rotation of ring gear 33, pivot counterclockwise and descend in the jar as follower 42 moves away from front cam 43 and towards back cam 43, and then repivot clockwise and lift again as its swing follower 42 then contacts back cam 43, the ring gear 33 then stopping while the swing followers of fingers f-8 and f-9 are in the same positions shown respectively for the swing followers of fingers f-7 and f-8 in FIGURE 14.

With reference to FIGURES 12 and 14, it is seen that when any one slice is to be received in the jar, at least two fingers must move away from their normal positions in order to provide an unobstructed space for that slice to be able to fall into place against the jar wall. For example, in FIGURE 14, the radial portion 35° of finger f-6 is seen to extend directly across the position which slice P-7 finally assumes in the jar; therefore, in order for slice P-7 to avoid hitting against finger f-6 after slice P-7 has entered the jar and is falling towards the jar wall, it is necessary that said slice be substantially along the jar central axis and then fall into place against the jar wall with said slice P-7 then being pushed over to its own final packed position as shown in FIGURE 14 by finger f-7 when this pivots counterclockwise. The point is, however, that depending upon the size of pickles being used, the space between succeeding fingers may be such that two fingers must be pivoted clockwise out of the way in order to provide sufficient unobstructed space for one pickle slice to fall against the jar wall.

It should here be noted that finger f-11 has no need to ever lift or to pivot and, therefore, its related shaft 36 is not provided with any lifter means 46 or with any follower means 42. Furthermore, it should be noted that finger f-1 should pivot out of the way of an incoming pickle slice only once, that is: for slice P-1, since after slice P-1 has entered the jar, finger f-1 must assume a gripping position relative to this first slice and maintain that position while all the succeeding slices enter the jar. On the other hand, fingers f-2 to f-10 must pivot out of the way twice, once for a preceding slice and once for the slice whose number corresponds to that of the finger; for example: finger f-2 must pivot out of the way for pickle slices P-1 and P-2; finger f-3 must pivot out of the way for slices P-3 and P-4, etc.

Finger f-1, therefore, is provided with a special swing follower 42 and a special lifter means 46 which are respectively modified relative to the swing followers 42 and the lifter means 46 of the other fingers f-2 to f-10. Specifically, the swing follower 42 of the first swing f-1 is shorter in height (FIGURE 19) than the other followers in order to permit follower 42 to pass under the front cam 43 without coming into contact therewith. Furthermore, the lift cam surface 45° is configured so as to raise finger f-1 only in correspondence to its swing follower 42 contacting the back cam while the other fingers f-2 to f-10 are lifted and maintained lifted during the entire time that their corresponding swing followers traverse the circumferential distance from the front cam to the back cam.

In order to bring this about, the lift cam surface 45° includes a split elevated sector extending along the arc s-s (FIGURE 18), said sector including an elevated portion H and a low portion L. At point t, the low portion L also becomes elevated to the height of portion H and from point t to c the sector of cam surface 45° is uniformly elevated to the height of portion H across its entire radial extent. The sector extending between points c and s, going clockwise in FIGURE 18, is of a uniform height, lower than the elevated portion H and the sector t-c.

The rollers 47 of the lift means 46 of each finger f-2 to f-10 roll along the central circumferential axis of the cam ring surface 45° and they are of a width whereby they are unaffected by lower portion L since said rollers can simply roll along an elevated portion H while a portion thereof overhangs the lower portion L between points s and t. The roller 47 for finger f-1, on the other hand, is of a narrower width, about one half that of the other rollers so that it can roll along on portion L without overlapping the adjacent portion H. Further, the pivot arm 120° which supports roller 47 from the support plate 121 is offset to hold roller 47 to one side of the circumferential dividing line shown in FIGURE 14.

In summary, therefore, the roller 47 rolls along on the outer rim of surface 45° whereby said roller by-passes elevated portion H. Since elevated portion H corresponds to the elevated portion related to the front cam, roller 47 remains unlifted while passing said front cam and only lifts at point t when corresponding to the elevated portion related to the back cam.

Finger f-10 is included as part of the group of fingers in the event that the diameter of the whole pickles which...
are being cut is small enough that it is possible to pack ten slices into each jar. In this case, the size (that is, in radial cross section as shown in FIGURE 12) of each pickle slice would be such that only one finger at a time need pivot out of the way in order to permit each slice to fall into place against the jar wall. In other words, the fact that finger f-11 does not pivot, since it must hold slice P-1, would not obstruct a tenth slice P-10 from falling into place against the jar wall.

In order to assure that each pickle slice is firmly and positively pushed into a seated position against the jar wall, each of the pivoted fingers f-1 to f-10 includes an L-shaped bracket member 110. Figure 12 shows to followers 42, one end 116 of each bracket member sliding along adjacent to the inner face of an outer ring cam 111 which in turn is fixedly mounted on each jar head 15 by means of a bracket 44 which is rigidly connected to jar head plate 44 and supports ring cam 111 at the height of back cam 43 with said cam 111 circumscribing the shafts 36. The inner face of the ring cam 111 is concentric with the jar head axis and includes two recesses 113 which extend circumferentially along the direction of rotation of the gear 32 from locations corresponding to the location of each of the two back cams 43. The purpose of the recess 113 is to permit the fingers to pivot out of the way of the respective incoming pickle slices. On the other hand, the purpose of the non-recessed portion 115 of the ring cam 111 is to assure that each finger firmly pushes each slice into its proper position against the jar wall. In other words, the concentric non-recessed portion 115 of cam 111 forces each finger to pivot back to the same extent whereby the vertical finger portions 35 will lie substantially along a circle even while pressing against pickle slices. While the return springs 41 are also intended to serve this same purpose, the springs cannot assure that the fingers will all pivot back to the same extent since the various slices may not all fall into place in an identical manner with the result that the fingers would not form a substantially perfect circle after the slices are seated against the jar wall. The importance of having the fingers all pivot back to the same extent relates to the subsequent passing of the center slug pickles at which time, if the fingers did not circumscribe a circle, the opening, the center slug pickle might be obstructed thereby.

FIGURE 14 shows a small clearance existing between the outer ends 116 of the brackets 110 and the cam surface 115 of the cam 111 with holding pickle slices against the jar wall. In practice, therefore, cam surface 115 permits a slight variation in the position of the fingers relative to each other, said variation corresponding to the extent of said clearance.

Relative to FIGURES 13 and 14 it should be noted that the finger elements are limited to the extent to which they can pivot counterclockwise by not only by the pickle slices themselves but also by virtue of the fact that the surface of followers 42 abuts against the outer surface of bearing 38 and slides therealong. It is necessary to provide a pivot limit means, such as the surface of bearing 38, for the finger elements so that the largest circle circumscribing by said finger elements is still small enough to permit the neck portion f of the jar to fit over said finger elements when an empty jar is loaded into the jar head 15.

The means whereby the jar heads receive empty jars from their vertical position said jars along their tilt position, and finally whereby the filled jars are removed from the jar heads, will now be described.

With reference to FIGURE 4, ten jar heads 15 are circumferentially distributed concentrically b-b on a jar head turret plate 49 which is rotatively mounted on the machine about axis b-b. The jar heads 15 are each pivotally mounted about pivot pins 59 which are mounted on plate 49 and whose axes are tangent to a circle whose center lies on axis b-b. Stated otherwise, jar heads 15 are each pivotable on plate 49 between a position whereby the jar head axis x-x is parallel to axis b-b and a position where axis x-x extends intersect axis b-b.

At any one time, five of the jar heads, spaced 72° apart from each other, are positioned vertically while the other five jar heads are inclined. Turret plate 49 performs an oscillating motion along a 36° arc in order to reverse the positions of the respective groups of jar heads so that during one 36° swing of said plate five jar heads containing empty jars are revolved about axis b-b, from their vertical to their tilt stations while simultaneously the other five jar heads containing jars which have been packed with an outer ring of pickle slices are revolved from their tilt to their vertical stations at which they will be packed with the center slug pickles. After these last-mentioned jars receive the center slug pickles they are removed from the jar heads at the vertical stations and replaced by empty jars. The turret plate 49 then swings 36° in the opposite direction to its previous swing thereby bringing the empty jars to the tilt stations and the partially filled jars to the vertical stations for receiving the center slug pickles.

A link arm 51 extends rigidly from a jar head cradle 44 which is rigid with the head mounting plate 44, said arm 51 being pivotally connected at one end thereof to the outer end of an adjustable length tie rod 52, the inner end of which is pivotally connected to a follower 53 which rides in continuous groove 54 in the radial surface of a tilt cam 55. Tilt cam 55 is rotatively mounted relative to the machine axis b-b for a purpose which is to be explained later; however, tilt cam 55 remains stationary while turret plate 49 rotates whereby follower 53 and link 52 will be displaced along a radial path in accordance with the configuration of groove 54, this, in turn, determining the pivoting of jar head 15 about fixed pin 50. It is seen, therefore, that each jar head 15 is carried by plate 49 and has a circular arc of 36° about axis b-b and that also each jar head is gradually pivoted from a vertical position to its tilted position relative to said axis b-b simultaneously as the plate 49 is rotating. When the jar heads have been carried by plate 49 to a point substantially in radial alignment with the respective openings 13 in ring 5, circular arcs of jar heads stops together with the jar head which is now almost fully tilted excepting for a slight further amount of tilt which is required to engage the ring gear teeth 33 with teeth 34' of gear wheel 34.

In this regard, it should be noted that the purpose in stopping the turret plate 49 and consequently the tilting of the jar head before the teeth 33 engage with teeth 34' is to avoid having said teeth interengage while turret plate 49 is still rotating. If interengagement of the respective teeth were attempted while plate 49 were still rotating, the crests of the teeth would necessarily abut against each other since teeth 33 would be moving about axis b-b relative to the then stationary teeth 34'.

Therefore, turret plate 49 is stopped in its rotation about axis b-b with jar head 15 tilted to a position where its teeth 33 are almost engaging teeth 34', and it is now necessary to bring about the engagement of these teeth without rotating turret plate 49 any further. This last-mentioned operation is effected by means of control cam 66. As is seen in FIGURE 4, control cam 66 is located parallel to and below tilt cam 55 and is rotatable about axis C-C which is parallel to axis b-b. The diameter of control cam 66 is about one-half that of tilt cam 55 so that the axis C-C of cam 66 is substantially midway between axis b-b and the outer periphery of cam 66.

With reference to FIGURE 22, it is seen that control cam 66 comprises a continuous groove 67 in its upper radial face, said groove comprising a pair of long arcuate slots K-D' and K'-D' of constant radius relative to axis C-C, and respective arcs from D to K and from D' to K'. A follower 68 extends fixedly in an axial direction from the lower side of tilt cam 55 at a point...
displaced from axis b—b, said follower riding in control cam groove 67.

When the control cam 66 rotates with either of the constant radius taps sliding along follower 68, the tilt cam 55 is unaffected, however, when one of the tap portions D to K or D' to K' slides past said follower, there is exerted a radially directed force against the follower, which force is transferred into rotation of the tilt cam 55. A radial force in an outward direction, such as when the follower 68 passes from a smaller radius portion of groove 67 to a larger radius portion thereof, results in rotation of the tilt cam opposite to the rotation of the control cam, while an inwardly directed force against the follower, such as when the follower passes from a larger radius portion to a smaller radius portion of the groove results in rotation of the tilt cam in the same direction with the control cam. This operating relationship is understandable from FIGURE 21 which shows the relationship between the two cams. It is seen therein that as control cam 66 rotates clockwise and as follower 68 passes from a smaller radius portion to larger radius portion of groove 67, said follower is urged radially away from the center of rotation c—c of the control cam 66. In order for the distance between c—c and 68 to increase, follower 68 must rotate counterclockwise about the rotational center b—b of tilt cam 55 since if follower 68 were to rotate clockwise, it would come nearer to center c—c rather than move further away therefrom. This same principle applies in reverse when follower 68 is to pass from a larger radius portion of groove 67 to a smaller radius portion thereof. That is, the follower must rotate clockwise about b—b in order to come closer to axis c—c.

It is seen, therefore, that rotation of tilt cam 55 can still be effected notwithstanding the fact that turret plate 49 is stopped. In other words, while there is no rotational movement of either teeth 33 or 34, there may be engaged or disengaged relative to each other simply through the operation of control cam 66 since said control cam is timed to operate and to produce a slight rotation of tilt cam 55 while the turret plate 49 is stopped. The importance of this additional rotation of tilt cam 55 has already been explained with reference to bringing about the engagement of said teeth 33 and 34. An analogous situation exists when it is desired to disengage said teeth after the jar has received the nine pickle slices and it is time to tilt the jar head 15 back to a vertical position while also rotating the jar head in its tilt axis position to its vertical axis position about axis b—b.

In this last-mentioned instance, gear wheel 34 is stationary and if turret plate 49 were rotated while the respective teeth were still engaged, there would occur a stripping tendency between said teeth because rotation of turret plate 49 necessarily produces rotation of the jar heads about axis b—b. Therefore, after the jar has received the nine pickle slices and the gear wheel 34 stops, and before the turret plate 49 begins to rotate, the control cam 66 rotates to an extent which is sufficient to bring about disengagement of teeth 33 from teeth 34' ; thereafter, the turret plate 49 begins to rotate and completes the tilting of the jar head 15 to a vertical position while simultaneously rotating said jar head along a circular arc about axis b—b.

The interrelationship between the control cam 66 and the tilt cam 55 is extremely important. Referring to FIGURE 21, it is seen that the continuous tilt cam groove 54 comprises five identical consecutive tracts defining a total of five peaks located along the equi-spaced radii V and five wells located along equi-spaced radii T; said peaks and wells being alternately positioned relative to each other and each forming a respective concentric group ing relative to axis b—b. Each tract could be considered as constituting the groove portion extending between any two successive ones of the V radii or between two successive ones of the T radii.

Each of the ten tilt cam followers 53 which respectively are associated with an individual one of the ten jar heads 15, all ride in the groove 54 at the same time, being equi-spaced from each other. At the instant depicted in FIGURE 21 the jar heads which are associated with the followers which are aligned along the V radii, that is, the followers situated at the peaks of the cam groove, are all in identical movement or vertical centerline axes, while those jar heads which are associated with the followers sitting in the cam groove wells, that is, along the T radii, are in fully tilted position along the tilt centerline axes. In other words, the cam groove peaks correspond to the jar heads being in vertical position while the cam groove wells correspond to the jar heads being in fully tilted position.

The continuous control cam groove 67, on the other hand, comprises two identical tracts (FIGURE 22) which merge into each other at their opposite ends along diameter D—D'. Starting from diameter D as a common reference point and moving clockwise therefrom along the bottom one of the control cam tracts, the tract comprises an unlocking tap of 10° from D to E, a table movement tap of 40° from E to G, a locking tap of 10° from G to K, and finally a neutral tap of 114° from K to D.

The taper of the tunnel 57 which varies in radial distance from axis c—c while the neutral tap K to D' is concentric relative to said axis. It follows, therefore, that when the control cam 66 rotates with the neutral tap K—D' sliding past follower 68, no movement is imparted to the tilt cam by said control cam and, in fact, said control cam actually serves to hold the tilt cam stationary while follower 68 is being passed by tap K to D'. On the other hand, when control cam 66 rotates with the tap D—K sliding past the follower 68, the tilt cam is rotated by said control cam as follows.

The alignment of the follower 68 at point D corresponds to the moment at which the packing of the outer ring of slices into the five tilted jar heads which are located along the tilt centerline axes has been completed and said five jar heads are ready to be disengaged from the drive gear 34. At this point, said drive gear is stopped. As has previously been explained, in order to tilt the five jar heads from their tilted positions to their vertical positions, it is necessary to rotate the jar head turret 49 about axis b—b whereby the tilt cam followers 53 would slide from the wells to the peaks in the tilt cam groove 54. If, however, the turret 59 were to begin to rotate while the jar head ring gear 32 are still engaged with the drive gear 34, the respective teeth on the gear would be subjected to a stripping action due to the relative movement between gears 32 and 34, the latter being stationary. In order to avoid this stripping action, therefore, it is necessary to tilt the jar heads out of engagement with drive gear 34 without rotating turret 59, and this is accomplished by virtue of the tap D—E sliding past the control cam follower 68. At point D, the respective gear teeth 33 and 34' begin to unlock and at point E they are fully unlocked from each other. As the follower 68 is passed by tap D to E, the tilt cam 55 is moved 4° counterclockwise (FIGURE 21) and this is what causes the tilting of the jar heads without having to rotate the turret 59.

As said follower 68 is passed by cam groove tap E to G in the control cam groove 67, the turret 59 performs its 36° swing to position the five tilted jar heads along respective vertical centerline axes while simultaneously five other jar heads containing empty jars are positioned along their respective centerline axes to tilt centerline axes. Also, while the follower 68 is being passed by tap E to G, the tilt cam 55 is rotated 8° clockwise. With reference to FIGURE 21, therefore, and considering the tilt cam groove peak aligned along radius V—V, first, this peak was displaced 4° counterclockwise from radius V—V when follower 68 was passed by tap D to E, and subsequently this same peak is displaced 8° clockwise when said follower is passed by tap E to G; therefore, when follower 68 is at point G, the
peak in question will be aligned along a radius displaced 4° clockwise from radius V–1, and all the other peaks and the wells will correspondingly be displaced 4° clockwise from their positions which they hold in FIGURE 21. What this means is that when the follower 68 is at point G on the follower cam 66, five jar heads will have arrived at the positions of their tilt centerlines and will be tilted to a point just before that at which the jar head ring gears 32 begin to mesh with the drive gear 34. At this point, the turret 59 is stopped since it has performed its full 36° swing and it is now necessary to complete the tilting of the five jar heads, in order to mesh gears 32 with 34, without, however, rotating said turret 59. The reason for this as previously indicated is to avoid any stripping action on the respective gears 32 and 34 which would occur if the meshing occurred while turret 59 were still rotating, it being kept in mind that gear 34 is stationary while the tilting is occurring.

The completion of the tilting, therefore, is accomplished by virtue of follower 68 being passed by tap G to K of the control cam groove 67, during which time the cam is rotated 4° counterclockwise so that all the peaks and wells of tilt cam groove 54 return to positions of alignment with the respective radii V and T (FIGURE 21) which positions they occupied when the follower 68 was at point D. The sequence of D to K is reversed in the other tract from D′ to K′. That is, tap D′ to E′ corresponds to tap G to K, tap E′ to G′ corresponds to tap G to E, and tap G′ and K′ corresponds to tap E to D. Stated otherwise, when groove portion D′ to E′ slides past follower 68, the tilt cam 55 is rotated 4° clockwise; when groove portion E′ to G′ slides past the follower, the tilt cam is rotated 8° counterclockwise; and when groove portion G′ to K′ slides past said follower, the tilt cam is rotated 4° clockwise. Tap neutral K′ to D′ is concentric with neutral tap K to D′ and no movement of the tilt cam occurs while these neutral taps are sliding past the follower 68.

Instead of dividing the control cam groove 67 into two tracts whereby for each complete revolution of cam 66 the tilt cam undergoes two cycles of oscillation, that is: once along taps D to K and once along taps D′ to K′, said control cam groove could alternatively include only one tract such as D to K whereby for complete revolution of cam 66, the tilt cam would undergo only one cycle of oscillation. In such an event, the timing of the control cam relative to the turret 59 would have to be correspondingly adjusted. Furthermore, the second set of taps D′ to K′ need not be reversed relative to taps D to K.

The control cam 66 includes four arcuate slots 66 through which extend bolt means for securing said cam onto the top of shaft 120, the slots allowing for circumferential movement of said cam.

The oscillating movements of the jar head turret 49 in order to shift the jar heads from their tilt centerline positions to their vertical centerline positions and vice versa, and the movements of control cam 66 in order to move tilt cam 55 while the jar head turret is stationary are correlated to each other by the following drive arrangement.

Primarily, power is transmitted from shaft 81–1 through bevel gears B–1 and a worm shaft "w" to a vertical shaft 120 which extends through support bracket 124 and is rigidly connected to gear wheel 118. Gear wheel 118 meshes with wheel 119 which is integrally formed on oscillating cam 117, said cam including a cam groove 121 in one radial surface of the cam shaft 66. As the cam shaft 66 revolves upwardly past gear 118 up to the control cam 66 which is driven by said shaft. A follower 123 which rides in groove 121 is connected to a gear sector 125 whereby rotation of cam 117 causes said gear sector 125 to oscillate between positions 144 degrees apart from each other, said sector in turn meshing with a gear wheel 126 which is rigidly connected to the short link 127 of a reduction link oscillating arm assembly comprising short link 127 and long link 128 (FIGURE 23) said links being pivotally interconnected at 129. Large link 128 is rigidly connected at one end thereof to the bottom axial end of a sleeve 129 (FIGURE 4) which is rotatable about axis b–b, said sleeve being bolted at its upper axial end to jar head turret 49. It is seen, therefore, that rotation of shaft 120 results in rotation of control cam 66 correlated with oscillation of turret 49 since shaft 120 drives cam 66 while simultaneously gear wheel 118, which is rigidly connected with said same shaft, shaft 66 is a series of elements which produce oscillation of turret 49.

The gear sector 125, gear 126, and links 127 and 128 are so proportioned relative to each other that a 144 degree swing of sector 125 results in a 36° swing of sleeve 129 which is connected to one end of long link 128.

It will be noted relative to the foregoing explanation, that sleeve 129 as well as oscillating cam 117 and turret 49 are all coaxially but freely mounted relative to the central drive shaft 81a which extends along axis b–b and which extends upwardly to drive index wheel 4 as well as gear 110 and drive gear 34.

Empty jars are brought into alignment below the jar heads, while the latter are in vertical position, by a jar turret 56 which includes openings 57 each one of which is concentric with the axis of a respective jar, said openings being configured to permit passage therethrough of a cup-shaped portion of a cup-shaped reduction link oscillating arm assembly comprising short link 127 and long link 128.

The machine comprises five center slug ram assemblies
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95 at fixed locations concentrically arranged about axis b—b, each assembly being in alignment with one of the vertical axes VCL along which the packing of the center slug pickles occurs. Each assembly 94 includes a stationary cylinder 96 within which a ram 94 is vertically reciprocably moveable. A ram head 94' is mounted on the bottom end of ram 94 and is especially configured (see FIGURES 7 and 8) to be able to move down into slice 11 to past the bottom ends of slicer blades 11' as well as the bottom ends of the slicer flat springs 23'.

For this purpose, ram head 94' is formed with five radial slots 97 (FIGURE 8) into which the blades 11' may enter while the head descends past the blades, and said head 94' includes circumferential recesses 98 which receive the flat springs 23'. It should be noted that the five flat springs 23' serve to maintain the five center slug pickle slices bunched together and centered about the central axis of slicer 8 and jar J; however, as the ram head 94' descends further and further, it progressively spreads the springs 23' apart so that eventually the springs 23 completely release the pickle, this occurring when most of the pickle length is already within jar J and centered therein by the outer ring of nine pickle slices.

With reference to FIGURE 4, it is seen that ram 94 includes a tri-member 99 fixedly attached along the length of said ram and arranged to actuate a control device 136 which stops the downward movement of the ram and returns it to its upward position. Control device 136 is adjustable so as to vary the lowermost point to which ram head 94' descends.

After the empty jar has been loaded into the jar head rotation of turret plate 49 and the action of the cam groove 54 in tilt cam 55 drive said head to its tilt position at which point ring gear teeth 33' are aligned to engage teeth 34' on gear wheel 34 as previously explained.

It should be noted that while the jar head is in vertical position, ring gear 32 is locked against any rotation by means of locking lever 61 which is pivotally mounted on pin 62 whose axis is fixed relative to the jar head. Pin 62 is mounted in sandwich 44 which extends rigidly from cradle 44'. Lever 61 includes a locking tooth 63 which lockingly engages an appropriate recess in lower support ring 32' so that said ring 32' and its associated elements 32 and 26 cannot rotate while tooth 63 is engaged in said recess. A flat spring 64' is attached to a rigid portion of the jar head and extends along lever 61 to bias it towards its locking position relative to ring 32'.

When the jar head is in its tilt position of FIGURE 4, lever 61 is released from its locking position by virtue of one end thereof abutting against release element 64 which forms part of the fixed portion of the machine.

The jar turret 56 comprises a flat ring 83 and a ring gear 83' attached to the underside of ring 83, said turret being concentrically rotatable about axis b—b by means of a plurality of rollers 67 and 70 which are distributed along the inner circumferential extent of the turret. Rollers 67 are mounted on the turret itself for rotation about horizontal axes, these rollers rolling along the top surface of a stationary circular rail 71 which is fixedly mounted on the machine frame. Rollers 70, on the other hand, are mounted on turret 56 for rotation about vertical axes and for rolling engagement along the outer side wall of rail 71.

With reference to FIGURE 24, the jar turret 56 is seen to be divided into twenty-five jar holding slots or sectors each slot being defined by an axially upwardly extending semi-circular wall 73 and by an opening 57 in ring 83, each wall 73 being concentric with opening 57. Empty jars are fed onto ring 83 by means of infeed star wheel 74 while full jars are removed from turret 56 by means of discharge star wheel 75.

The infeeding and unloading operations relative to turret 56 are as follows.

Empty jars are fed onto infeed platform 76, located beneath the infeed star wheel 74, by a known feeding means. Infeed star wheel 74 rotates counterclockwise and thereby causes the empty jars to pass along the infeed star wheel and into the respective slots on the turret 56. A stationary boundary wall 77 serves to maintain the empty jars within the five respective concave recesses 78 in the outer periphery of the infeed star wheel 74. When a recess 78 is centrally aligned along a radius line connecting the center of turret 56 with the center of infeed star wheel 74, the jar contained within that recess will be positioned in a slot on turret 56, the turret rotating clockwise and thereby carrying that jar away from the wheel 74 and along the top surface of ring 83.

The jar turret 56, divided into a total of twenty-five slots according to the following repetitive rotational cycle: it rotates the equivalent of five slots, then dwells, it then rotates the equivalent of one slot and dwells again, and then successively repeats this cycle. At particular dwell times, five empty jars simultaneously are removed from the turret 56 and loaded into respective ones of the five jar heads 15 by the jar-loading means 89. Said five jars are removed from the five slots which are axially aligned along the centerlines of the jar head vertical positions, these centerlines being denoted CLV in FIGURE 10.

The five jar heads 15, each holding an empty jar, are then revolved about axis b—b from their vertical centerline position to their tilt centerline position while simultaneously they are tilted about the axis of pins 50. The tilt centerlines are denoted in FIGURE 10 by CLT. While in their positions along centerlines CLT the five jars are each simultaneously filled with nine pickle slices from the index wheel 4. After each jar has received nine pickle slices from the index wheel, the jar heads 15 are tilted back to their vertical positions while simultaneously the jar head turret 49 is advanced to position the respective jar heads along those vertical centerlines CLV which follow the tilt centerlines along the rotational direction of said turret 56. At this last-mentioned point, the jars are each filled with a sliced center slug pickle each from one of the five center slug slicer assemblies 5. The five completely filled jars are then pulled out of the respective jar heads by suction head 58 and received in respective slots on the jar turret 56. Said jar turret 56, in turn, carries the filled jars to the discharge star wheel 75 which comprises six concave recesses 79 in its periphery conforming to the outer periphery of the jars, each filled jar being received within a one of the recesses and being carried along therein and onto the surface of discharge platform 81 from which it is removed by any convenient unloading means. Stationary boundary wall 80 serves to laterally guide the jars off the turret 49 and along discharge platform 81 while said jars being advanced by the discharged star wheel along an arcuate path about the axis of the discharge star wheel.

After a completely filled jar has been deposited on the jar turret 56, this turret advances one step and thereby places a succeeding empty jar beneath the empty jar heads 15, this empty jar then being pushed upwardly into the jar head by suction head 58. The respective jar heads 15 then advance from their vertical centerline positions to the following tilt centerline positions and the jar-filling cycle continues as before.

Regarding the relationship between the infeed star wheel 74 and the number of sectors (twenty-five) on the jar turret 56, it should be noted that the infeed star wheel is divided into six equal sectors, five of which comprise the concave recesses 78 and the sixth of which comprises a filled-in portion 82. For each complete revolution of infeed star wheel 74, five empty jars are fed onto five successive slots of the jar turret 56 and the sixth slot turret receives no jar from the star wheel filled-in portion 82. This means that every sixth slot on the jar turret 56 remains empty while the succeeding five slots receive jars therein.

The jar turret 56 is timed and correlated relative to the remainder of the machine to operate as follows.
When the jar heads 15 are located along the vertical position centerlines CLV-1 and CLV-2 (FIGURE 10), it is seen that there are a total of six slots S-1 to S-6 between these first two centerlines. Slot S-6 contains no jar because this slot corresponds to filled-in portion 82 of the infeed star wheel 74. Slots S-1 to S-5 each contain a jar from the star wheel; however, slot S-1 is empty because its jar was removed and loaded into the jar head corresponding to CLV-1 when slot S-1 was positioned along CLV-1. Therefore, slots S-2 to S-6 are empty while slots S-2 to S-5 each contain an empty jar. In this condition, therefore, slots S-1 and S-6 are each ready to receive a filled jar from the respective jar heads which correspond to centerlines CLV-2 and CLV-1. After this occurs, the turrets 56 advances one slot so that slot S-2 along CLV-2 and slot S-7 assume a position along CLV-1, slots S-2 and S-7 each containing an empty jar. The empty jars in slots S-2 and S-7 are then loaded into the jar head corresponding to S-2 to S-7, and the infeed star wheel 74 that is rotateably mounted about said sleeve 137 which is rotatably mounted about said sleeve. An outer sleeve 129 is also rotatably mounted about the outer sleeve member 130, said outer sleeve 129 being bolted to the jar head turrets 49 and also rotatably carrying the tilt cam 55 on its outer surface.

FIGURE 25 is a timing diagram which shows the operational timing relationship between various of the machine's moving elements. The outermost ring 131 relates to the operation of the index wheel 4 and of the jar head turrets 49. The remaining parts of this diagram are self-explanatory.

Returning to FIGURE 2, it is noted that a sizeable space is shown as being left over in the jar after nine pickles slices have been packed therein. This situation will depend upon the size of the pickles being used. In some cases, it may be possible to pack ten slices or more into the outer ring. A tenth slice could be packed by the disclosed embodiment of the machine and a final additional slice or two could be packed by hand, as previously mentioned.

FIGURE 23 shows the drive arrangement for driving a bank or rotary cans 133 which are housed in a control cam box 134. As previously described, the power drive originates from a power source and is transmitted through shaft 81-1, through bevel gear combination B-1 to a worm 'w' which drives a worm wheel rigidly connected to shaft 120. Shaft 120 drives a second bevel gear combination B-2 off which is driven a cam drive shaft 134 which, in turn, drives the cans 133. The cans 133 actuate electrical microswitches which act through the electrical conduits 135 to control the actuation of various parts of the machine. For example, the reciprocations of the suction cup 58 as well as the drawing and releasing of vacuum in said cup (FIGURE 4) are controlled by timed sequence by electrical devices which are actuated by the microswitches in the can box 134. Furthermore, the various gates (FIGURES 6 and 9), the pivoting of the center slug slider, and the reciprocations of the respective slider rams can be controlled to occur in proper timed sequence relative to other operations of the machine, as set forth in the cans 133.
invention are presented by way of illustration only and are not intended to be limited by the scope of the claimed invention, it being intended that the claims originally submitted herein as well as those which may be submitted by way of amendment apply to all not disclosed modifications, substitutions, and changes of any type which are obvious or well within the purview of one skilled in the art.

What is claimed is:

1. A machine for automatically packing longitudinal pickle slices into a jar in a predetermined arrangement, comprising: a first packing means for successively packing individual pickle slices into a jar, a mechanical finger means for positioning and holding each slice in a fixed position adjacent to the jar inner surface to form a ring of slices thereagainst, a second packing means for packing a complete longitudinally sliced pickle while maintaining the slices thereof unseparated from each other, into the jar in the space circumscribed by said ring of slices.

2. The machine of claim 1, including a jar head means for holding a jar in a packaging position and for rotating a jar about its own longitudinal axis while said first packing means is packing slices successively into the jar, said first packing means packing each successive slice along a fixed feed axis into the jar, said finger means positioning each successive slice adjacent to a preceding slice against the jar inner surface and holding same in fixed position thereagainst while the jar rotates.

3. The machine of claim 2, said finger means comprising a plurality of finger elements which are respectively associated with individual ones of said successive slices, said finger elements each including an elongate portion extending into a jar from the open end thereof for a major portion of the depth of the jar, the elongate portions being arranged concentrically relative to the jar axis and parallel to one another, respective ones of the finger elements being pivotable relative to the jar, and said finger elements being rotatable together with the jar about its axis.

4. The machine of claim 2, said jar head means being adapted to hold a jar in a tilted position for receiving the successive pickle slices, said first packing means being adapted to feed each pickle slice along an inclined axis into the jar, said jar head means being adapted to tilt the jar to a tilted position for receiving a complete pickle slice from said second packing means, said second packing means being adapted to feed a complete sliced pickle vertically into the jar.

5. The machine of claim 2, said jar head means being adapted to hold a jar with its longitudinal central axis inclined relative to a horizontal plane, said first packing means being arranged to feed each successive slice along said feed axis which is inclined relative to said horizontal plane to a greater extent than is the jar central axis.

6. The machine of claim 1, said first packing means including a hopper device for imparting a velocity to each slice as it enters the jar.

7. The machine of claim 6, wherein said hopper device is adapted to impart a velocity of between 130 and 180 feet per minute to each successive pickle slice and wherein the difference in the inclination of the jar axis and said feed axis is in the order of two degrees.

8. The machine of claim 6, said feed axis being horizontally displaced from the vertical plane in which lies the jar central axis.

9. The machine of claim 7, said feed axis being horizontally displaced from the vertical plane in which lies the jar central axis.

10. The machine of claim 1, including a plurality of jar head means each for holding a respective jar, a first slicing means for successively slicing each of individual pickles into a number of longitudinal slices equal to the number of said jar head means, said first packing means being adapted to receive all the slices cut from a single pickle and simultaneously distribute the slices one to each jar held by said jar head means whereby each jar successively receives only one slice from each of a plurality of pickles, and including a plurality of said second packing means each one of said jar head means, said second packing means comprising a center slug slicing means for slicing a respective whole center slug pickle into a plural number of longitudinal slices and for packing said center slug pickle with the slices thereof held together into a respective one of the jars, said center slug slicing means all being operable simultaneously.

11. The machine of claim 10, including a primary distribution means for successively feeding individual whole pickles to said first slicing means and a second distribution means for simultaneously feeding a whole pickle to each of said center slug slicing means.

12. The machine of claim 10, wherein said jar head means are all mounted on a jar head turret which is rotatable about the vertical axis of said first slicing means, said jar head means being tiltable on said turret between respective vertical and tilt centerline axes which axis respectively correspond to a jar being held vertically or inclined relative to the vertical axis of said first slicing means, said first packing means being adapted to simultaneously feed a plurality of pickle slice seach along a respective fixed feed axis radiating from the vertical axis of the first slicing means in a downwardly inclined direction therefrom, said second packing means being adapted to simultaneously pack a sliced center slug pickle into each of the respective jars held by said jar head means along a respective vertical centerline axis, said tilt and vertical centerline axes being fixed relative to the vertical centerline of said first slicing means and being symmetrically distributed therearound in alternating succession, said turret being rotatable about the vertical axis of said first slicing means to simultaneously move said jar head means from positions along either of said centerline axes to positions along the others of said centerline axes.

13. The machine of claim 12, including a rocker arm means associated with each said jar head means, a tilt cam in the form of a disc having a cam groove in one radial face thereof, a follower means riding in said groove and connected to said rocker arm means whereby rotation of said turret and consequent displacement of said jar head means between said centerline positions thereof is accomplished by simultaneous tilting of all said jar head means between vertical and tilted positions.

14. The machine of claim 13, including a jar head gear wheel on each of said said jar head means for rotating a jar about the longitudinal axis of each said jar head means, a drive gear wheel coaxially mounted with said turret, said jar head gear wheels all being simultaneously engageable with said drive gear wheel when said said jar head means are in fully tilted position along the tilt centerline, for rotating said tilt cam to a limited extent while said turret is stationary whereby said jar head means are tiltable by virtue of said follower means riding in the tilt cam groove to an extent corresponding substantially to the depth of the teeth on said jar head gear wheels.

15. The machine of claim 14, wherein the means for rotating the tilt cam comprise a control cam in the form of a rotatable disc arranged parallel to said tilt cam and having a cam groove in one radial face thereof and a follower means in this groove and connected to said tilt cam whereby rotation of the control cam results in a slight rotation of the tilt cam to the control cam being rotatable independently of the turret.

16. A machine for automatically packing longitudinal pickle slices simultaneously into a plurality of jars in a predetermined arrangement in each jar, comprising: a first packing means for simultaneously and repetitively packing a plurality of pickle slices into each jar to form a ring of a complete pickle against the jar inner surface, and a second packing means for packing said longitudinally sliced center slug pickle into the space circumscribed by said ring of slices, said first packing means comprising a center slicer for successively slicing individual pickles.
into a plurality of longitudinal slices, a first feeding means for feeding whole pickles one at a time to said slicer, a distribution means for simultaneously distributing the plurality of slices of an individual pickle received from said slicer to each of a corresponding number of jars, said second packing means comprising a plurality of center slug slicers, one for each jar which is being simultaneously packed, a second feeding means for simultaneously feeding a whole center slug pickle to each of said center slug slicers.

17. The machine of claim 16, wherein said center slicer extends along a vertical axis and is adapted to receive a whole pickle vertically therein at its top end and to discharge it as a plurality of longitudinally slices from its bottom end, and said distribution means comprises a plurality of guide means radiating symmetrically and in a downwardly inclined direction from the bottom end of said center slicer, a jar holding means for holding a plurality of jars each in packing position along a tilt axis at the outer radial end of a respective one of said guide means whereby each pickle is guided by each guide means from the bottom end of said center slicer in a downwardly inclined direction radially outward of the vertical axis of the center slicer and finally discharged from the guide means along an inclined direction into a respective one of a plurality of jars which are inclined to receive pickles radially inwardly of said center slicer symmetrically arranged around said vertical axis with each center slug slicer being intermediate of two succeeding tilt axes, said center slug slicers extending vertically and each being adapted to receive a whole pickle into its top end and to discharge it as a complete sliced pickle from its bottom end, said jar holding means being rotatable about the vertical axis of said center slicer to alternately position a plurality of jars either along said tilt axes from the end of said guide means or along vertical axes beneath said center slug slicers, and means to tilt jars between vertical and tilted positions in correspondence to said jars holding means rotating.

18. The machine of claim 17, wherein said distribution means comprises a plurality of fixed chutes radiating from the bottom end of said center slicer in a downwardly inclined direction, the radial axis of each chute extending along a radially disposed axis of two succeeding tilt axes, said chute having an annular index wheel having a series of radial grooves in its upper face, said wheel being rotatable about the vertical axis of said center slicer whereby respective ones of said chutes are alignable with each respective one of said chutes and subsequently alignable with respective jars which are positioned along successive tilt axes.

19. The machine of claim 18, said grooves being open at both radial perimeters of said annular wheel, and including a fixed stop ring surrounding said wheel and serving as a radial abutment at the outer end of said grooves, a plurality of recesses in said stop ring for permitting pickle slices to pass therethrough and into respective ones of jars positioned along said tilt axes.

20. The machine of claim 19, including a hopper means for pushing a pickle slice radially out of respective ones of said grooves and into respective jars aligned along said tilt axes.

21. The machine of claim 16, wherein said first feeding means comprises a primary distribution ring including a plurality of cups arranged successively in a circle along parallel vertical axes, said ring being rotatable about a vertical axis parallel to that of the center slicer, said ring having a diameter whereby said cups are successively aligned above said center slicer, the location of said center slicer defining a Station I, said second feeding means comprising an outer distribution ring having a plurality of cups radially disposed symmetrically along parallel vertical axes, said outer ring being rotatable coaxially with the vertical axis of said center slicer and said ring having a diameter whereby the outer ring cups and the primary ring cups are successively vertically aligned with each other at a Station II which is disposed from Station I, a closure means at the lower end of said primary ring cups for preventing pickles from falling through said primary ring cups, an openable gate means in said closure means at Station I for permitting pickles in selected ones of said primary ring cups to pass into said center slicer and for preventing pickles in others of said primary ring cups from falling into said center slicer, an opening means in said closure means at Station II to permit pickles in said primary ring cups to fall into the outer ring cups, said center slug slicers being positionable below said outer ring along the circle defined by the outer ring cups, an outer ring closure means for preventing pickles from falling out of the bottom end of said outer ring cups, an openable gate means in the outer ring closure means for permitting pickles in selected ones of said outer ring cups to fall into said center slug slicers.

22. The machine of claim 21, wherein said center slug slicers are each pivotable about respective fixed pivot axes which are parallel to the vertical axis of the center slicer, said center slug slicers being pivotable between a first position of alignment with the circle defined by said outer ring cups and a second position radially displaced from the radial limits of said outer ring, a center slug ram means for each center slug vertically aligned symmetrically rotated between said center slug slicer at its said second position.

23. The machine of claim 16, wherein each said center slug slicer comprises a vertically extending cylinder open at both ends thereof and a plurality of stationary cutting blades extending along a portion of the length of said cylinder and radiating symmetrically from the vertical axis thereof, a flat spring attached to the wall of said cylinder between each pair of blades and protruding towards the cylinder vertical axis, each said spring being radially outwardly bendable by pickle slices passing vertically between successive ones of said blades, a ram means for pushing a whole pickle downwardly through said cylinder and out of the bottom end thereof, said flat springs serving to maintain the pickle slices bunched together coaxially with the vertical axis of said cylinder.

24. The machine of claim 17, wherein said center slicer comprises a vertically extending cylinder open at both ends thereof, a plurality of stationary cutting blades extending along a portion of the length of said cylinder and radiating symmetrically from the vertical axis thereof, each two successive blades defining a vertical V-shaped channel aligned with a respective one of said chutes, a flat spring attached to the wall of said cylinder between each pair of blades and protruding towards the cylinder vertical axis, each spring being resilient bendable radially outwardly by pickle slices passing vertically between successive ones of said blades, a ram means for pushing a whole pickle downwardly through said cylinder and out of the bottom end thereof.

25. The machine of claim 21, wherein said closure means for said primary ring cups and that for said outer ring cups each comprises a flat annular platform extending continuously in a plane immediately beneath the lower ends of the respective cups, each platform including suitable openings therein for permitting pickles to pass therethrough, the openings which are associated with said gate means being arcuate in plan view and opening at one radial edge of the platform, the respective gate means comprising a flat plate which in plan view coincides with the configuration of the corresponding recess and fits closely between the edges thereof, the top surface of said plate being co-planar with the top surface of said platform, said plate being pivoted about a fixed vertical axis to either tilt into the corresponding recess or be radially withdrawn therefrom.

26. The machine of claim 21, wherein said primary distribution ring comprises a total of thirty-two cups and
said outer ring comprises a total of twenty cups, and including a pickle supply means for depositing whole pickles into said cups in a sequence of two cycles for each complete revolution of said primary ring, each cycle consisting of nine successive primary ring cups receiving a pickle, the tenth cup receiving no pickle, the succeeding five cups each receiving a pickle and the sixteenth cup receiving no pickle, said gate means at Station II being timed to operate whereby each of the nine successive pickles are permitted to pass into said center slicer and whereby each of the five successive pickles are prevented from passing into said center slicer, said outer distribution ring being timed to rotate in steps whereby each of the five successive cups thereon successively are aligned at Station II in correspondence to each of the five successive primary ring cups which contain the group of five pickles being aligned at Station II, said center slug slicers being symmetrically arranged along said outer ring a distance of five cups apart from each other.

27. The machine of claim 26, wherein the first center slug slicer in the direction of rotation of the outer ring is located a distance of four cups from Station II, said outer ring being timed to rotate in successive cycles while stopping between each cycle, each outer ring cycle consisting of said outer ring beginning to rotate after the first of the five pickles has passed through Station II and then continuing to rotate until the sixth following outer ring cup is aligned at Station II, said sixth cup receiving no pickle until a second group of five pickles is carried over Station II by the primary ring.

28. The machine of claim 26, wherein Station II is located at least ten primary ring cups away from Station I in the direction of rotation of said primary ring.

29. A machine for automatically packing longitudinally pickled slice in a uniform arrangement simultaneously into a plurality of jars, comprising: a first packing means for packing a series of slices one at a time simultaneously into a plurality of jars to form a ring of slices along each jar wall, a second packing means for packing a complete longitudinally sliced center piece plug into the jar space circumscribed by said ring of slices, a jar head for holding each jar in packing position along a tilt axis for slices to be packed by said first packing means and along a vertical axis for said center plug to be packed by said second packing means, each jar head comprising a sleeve member open at both ends for receiving a jar thereinto through the bottom end and for receiving pickle slices thereinto through the top end, said sleeve member being rotatable about the jar head axis, means for holding a jar securely in and fixedly relative to said sleeve member whereby the jar is rotatable together with said sleeve member, a plurality of finger elements mounted on each jar head and each including an elongate portion extending parallel to the jar head axis for holding pickle slices against the wall of a jar, each of said finger elements being individually pivotable about a respective vertical axis, said finger elements being rotatable about the jar head vertical axis together with said sleeve member, a swing cam means for pivoting individual ones of said finger elements pursuant to rotation of said sleeve member.

30. The machine of claim 29, each said finger element including an arm portion extending transversely to the axis of said jar head from the upper end of said finger element elongate portions, said arm portions each being secured on a finger element pivot shaft, respective ones of said shafts being axially displaceable relative to said finger element pivot shaft, the roller associated with said second finger element shaft being adapted to roll only within the radial limits of said second track and all other rollers being adapted to roll at least over a portion of the radial extent of said first track, said first track and said second segment of said second track being axially elevated relative to the remainder of said cam surface, the
circumferential extent of said first track corresponding to the circumferential locations of said front and back cams combined, the circumferential extent of said second track corresponding to the location of said back cam, and the circumferential extent of said first segment corresponding to the location of said front cam, whereby said second finger element is neither lifted nor pivoted in correspondence to its passing the location of said front cam.

33. A machine for automatically packing longitudinal pickles slices in a uniform arrangement simultaneously into a plurality of jars, comprising: a plurality of jar heads symmetrically mounted on a jar head turret which is rotatable about a central vertical axis, a first packing means for simultaneously feeding a plurality of pickle slices each substantially along a tilt centerline axis, a second packing means for feeding a plurality of complete center slug pickles along respective vertical centerline axes parallel to said central vertical axis, said jar heads being pivotable on said turret between tilt positions for receiving pickle slices from said first packing means and vertical positions for receiving center slug pickles from said second packing means, said tilt and vertical centerline axes being circumferentially intermediate each other symmetrically about said central vertical axis, said turret being rotatable to successively position said jar heads along said tilt and vertical centerline axes, tilting means for tilting said jar heads pursuant to rotation of said turret, at any one time said tilting means acting to tilt the half total number of jar heads to a tilted position and the other jar heads to a vertical position, a jar turret coaxially rotatably mounted with said jar head turret and below same, said jar turret comprising a flat circular platform circumferentially divided into a number of jar carrying sectors, an infeed means for feeding empty jars onto said platform, an outfeed means for unloading jars from said platform, an opening in each sector of said platform smaller than the base of a jar which is carried thereon, a plurality of reciprocable jar loading members each mounted below said jar turret for reciprocation along a respective one of said vertical centerline axes and through respective ones of said platform openings, each of said jar loading members being upwardly reciprocable to carry a jar from on said platform to its uppermost position in said jar head.

37. The machine of claim 36, including a number of said second packing means equal to the total number of jar heads, said first packing means being adapted to simultaneously feed a number of pickle slices equal to the total number of jar heads.

38. The machine of claim 37, said second packing means each comprising a center slug slicer and a ram for pushing a whole pickle vertically down through the slicer and onto a jar held in a jar head, the rams and the jar loading members being timed whereby said loading members bear against the bottoms of respective jars in said jar heads while said rams are pushing a center slug pickle into the respective jars.

39. The machine of claim 38, said jar loading members being timed to descend at the completion of the downward stroke of the rams, gripping means on said loading members for gripping the bottom of a jar whereby a jar is pulled down outwardly of the jar head by the descending loading member.

40. The machine of claim 39, wherein said gripping means comprises a suction cup mounted at the top end of a rod, a vacuum means connected to said cup, a drive means for reciprocating said rod.

41. The machine of claim 36, including a total of ten jar heads and five of said second packaging means, said first packaging means being adapted to simultaneously feed a pickle slice to each of five jar heads each one positioned along a respective tilt centerline axis and said second packaging means being adapted to simultaneously pack a center slug pickle into each of five other jar heads each one positioned along a respective vertical centerline axis, and including a total of five of said jar loading members which are simultaneously operable with each other to insert five jars at a time into five jar heads and subsequently to remove five jars at a time from five jar heads, said jar turret being divided into a total of twenty-five sectors, the jar turret including a total of six sectors between any two successive vertical centerlines and being timed to rotate in a repetitive sequence of steps as follows, each step corresponding to the distance between two successive sectors: step, advance one step, stop, advance five steps, the infeed means being timed to operate in the same sequence of steps and being adapted to load empty jars onto said jar turret in a repetitive pattern consisting of five jars in succession being loaded onto successive ones of the jar turret sectors and each sixth sector being left empty, the infeed means loading jars onto said jar turret along a radius of said jar turret located one sector ahead of the first vertical centerline axis relative to the direction of rotation of said jar turret.

42. The machine of claim 41, said infeed means comprising an infeed star wheel circumferentially divided into a total of six sectors each being radially alignable with a jar turret sector pursuant to rotation of said jar turret and said star wheel, said star wheel being adapted to receive jars only into each of five successive sectors with the sector by the sixth sector receiving no jar, said star wheel being rotatable about an axis parallel to the rotational axis of said jar turret and in a direction opposite thereto in order to load said jars onto the jar turret sectors.

43. A machine for automatically packing longitudinal pickle slices in a uniform arrangement simultaneously into a plurality of jars, said machine comprising: a jar head turret, a drive gear and a tilt cam, all being coaxially mounted in respective parallel planes about a main axis, a plurality of jar heads mounted on said jar head turret and circumferentially disposed about said main axis, a first packing means for feeding longitudinal pickle slices simultaneously into each of a plurality of jar heads along respective feed axes which are inclined relative to said main axis, a second packing means for feeding pickles simultaneously into a plurality of jar heads along respective feed axes parallel to said main axis, said inclined axes being circumferentially spaced apart from said parallel axes, said jar heads being tiltable on said jar head turret between tilted and parallel positions relative to said main axis to receive pickles from said first and second packing means respectively, each jar head including a ring gear connected to a jar holding means being rotatable about the jar head axis, said ring gear meshing with said drive gear when the jar head is in said tilted position, said jar head turret being rotatable about said main axis, to thereby carry said jar heads into circumferential positions corresponding to either said inclined axes or said parallel axes, a follower means associated with said jar heads and with said tilt cam for tilting said jar heads in correspondence to rotation of said jar head turret.

44. The machine of claim 43, including holding means to hold said tilt cam stationary while saidjar rotate, said tilt cam being arranged to tilt said jar heads to an extent less than the angle between said parallel and tilt positions thereof in correspondence to said turret rotating the full circumferential distance between said tilt and parallel axes, a means for rotating said tilt cam while said turret is stationary in order to tilt said jar heads amount equal to the difference between said angle and said extent.

45. The machine of claim 44, wherein the last-mentioned means and said holding means comprise a control cam and a control cam follower connected to said tilt cam, said control cam and tilt cam comprising respective discs arranged parallel to each other and to said turret, said control cam being timed to rotate while said
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31 turret is stationary, said control cam controlling the rotation of said tilt cam.

46. The machine of claim 45, wherein said tilted cam includes a continuous cam groove in one radial face thereof, said groove including a plurality of identical tracts, a tilt cam follower associated with each tract and with a corresponding one of said tilt heads, said control cam comprising a cam groove in one radial face thereof, said control cam follower fixedly connected to said tilt cam and riding in said control cam groove.

47. The machine of claim 45, wherein said inclined axes are each circumferentially distributed relative to said main axis intermediate of two successive vertical axes and wherein said cam follower riding in this groove, said arm assembly comprising an elongate arm pivotally mounted at one end thereof coaxially with said jack head turret and operatively associated at its other end with said oscillating cam follower whereby said elongate arm is pivotally driven about the jack head turret axis pursuant to movements of said oscillating cam follower, said one end of said elongate arm being drivenly connected to said jack head turret, a rotary drive means for rotating said oscillating cam in one direction and for simultaneously rotating said control cam in one direction.

48. The machine of claim 46, wherein said rotary drive means comprises a drive shaft rotatable mounted about an axis parallel to the axis of said jack head turret, a gear means drivingly connecting said shaft with said oscillating cam, said shaft being drivingly connected to said control cam whereby rotative power transmitted to said shaft is simultaneously transmitted therethrough to said oscillating cam and to said control cam.

50. The machine of claim 48, wherein said arm assembly comprises a pair of elongate arms pivotally interconnected at respective ends thereof, a first of said arms being the one mentioned in claim 46, the second of said arms being pivotally mounted at one end thereof about a fixed axis and being drivenly connected at said one end thereof to a gear sector, said gear sector being pivotally mounted and being connected to said oscillating cam follower whereby relative rotation of said oscillating cam in one direction is translated into oscillatory movement of said gear sector about its fixed pivot axis and corresponding pivotal movement of said second arm about its fixed pivot axis.

51. The machine of claim 50, wherein said gear sector includes an arcuate closed ended slot extending along a circumferential extent thereof, said oscillating cam follower riding in said closed slot and being adapted to transmit driving force to said sector upon abutting against either end of said slot, said sector being stationary while said oscillating cam follower is positioned intermediate the closed ends of said slot.

52. The machine of claim 50, wherein said first arm is substantially longer than said second arm whereby said first arm is pivoted by said second arm about the jack head turret axis to a smaller angular extent than the angular extent to which said second arm pivots about its fixed axis.

53. The machine of claim 52, wherein the angular distance between any of said inclined feed axes and an immediately following vertical feed axis is 36° and wherein said oscillating cam groove is controlled with said gear sector whereby said sector is oscillatable along an arc of 144°, the lengths of said first and second arms being such that for the degree of swing imparted to said second arm about its fixed pivot axis by said sector pivot said first arm pivots 36° about the axis of said jack head turret.

54. The machine of claim 52, wherein said sector is rigidly connected to said second arm coaxially therewith whereby said second arm pivots about its fixed pivot axis to the same extent as said sector pivots about the same axis.

55. The machine of claim 46, said control cam being mounted for rotation about a control cam axis which is parallel to but displaced from the tilt cam axis, said control cam groove defining a path of varying radial distance from the control cam rotational axis whereby rotation of said control cam relative to said control cam follower results in forces being imparted to said control cam follower in a radial direction relative to the control cam axis, said control cam follower being concentrically rotatable about the tilt cam axis by virtue of said control cam being mounted at a fixed point on said tilt cam.

56. The machine of claim 55, wherein said control cam groove defines a plurality of successive parts extending circumferentially in successive relative to control cam axis, a first of said parts extending in an inclined radial direction, a second of said parts extending in a direction from said first part and in an inclined radial direction opposite to that of the first part, and a third of said parts extending in succession from said second parts and in an inclined radial direction the same as said first part, said first and said third parts extending an equal distance in a radial direction relative to the axis of said control cam and said second part extending between the distance of either said first or third parts in a radial direction relative to the control cam axis.

57. The machine of claim 56, wherein said jack head turret is timed to be stationary while said control cam follower is located along said first and third parts and wherein said jack head turret is timed to rotate while said control cam follower is located along said second part.

58. The machine of claim 56, wherein said first and third parts extend radially to an extent whereby said tilt cam follower is rotated four degrees in one direction relative to the tilt cam axis pursuant to said tilt cam follower being acted upon by the full extent of said first and third parts, and wherein said second part extends radially to an extent whereby said tilt cam follower is rotated eight degrees in one direction pursuant to said tilt cam follower being acted upon by the full extent of said second part.

59. The machine of claim 56, wherein said control cam is rotatable in a single direction, said control cam groove including a fourth track which is concentric with the control cam axis and extends in succession from the end of said third track.

60. The machine of claim 59, wherein said control cam groove is divided into two complete circumferentially successive tracts which merge into each other to form a continuous groove, each tract including the aforementioned four parts whereby for each complete revolution of said control cam, said tilt cam follower is subjected to two complete cycles of actuation by said control cam.

61. The machine of claim 60, wherein the fourth track of each tract interconnects the third track of each tract with the first track of the other track.

References Cited

UNITED STATES PATENTS

2,053,238 9/1936 Dulaney 53—23 X
2,092,763 9/1937 Le Frank 53—23
2,092,773 9/1937 Nordquist 53—123

(Other references on following page)
3,461,646

33

UNITED STATES PATENTS

2,092,786 9/1937 Taylor 53—23
3,119,215 1/1964 Polk 53—36
3,136,103 6/1964 Farmer 53—23 X
3,245,806 4/1966 Miller 53—35 X 5

34

FOREIGN PATENTS

1,056,529 4/1959 Germany.
WAYNE A. MORSE, Jr., Primary Examiner
U.S. Cl. X.R.
53—142, 151, 159, 253