Nov. 27, 1956 L. C. DENEHIE ET AL 2,771,836

CORN POPPING MACHINE

Filed March 31, 1951 14 Sheets-Sheet 1

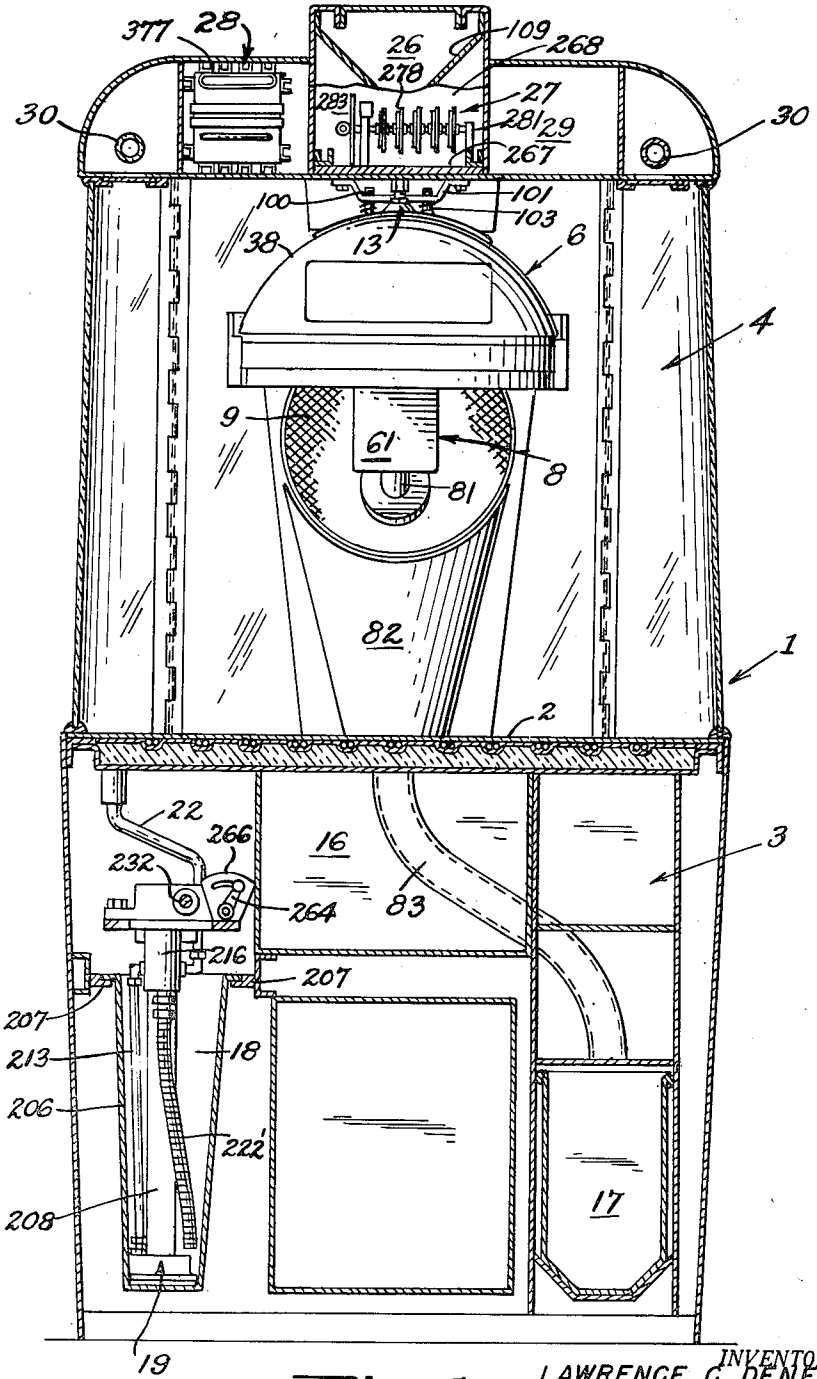


Fig. 1.

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CORN POPPING MACHINE

Filed March 31, 1951 14 Sheets-Sheet 2

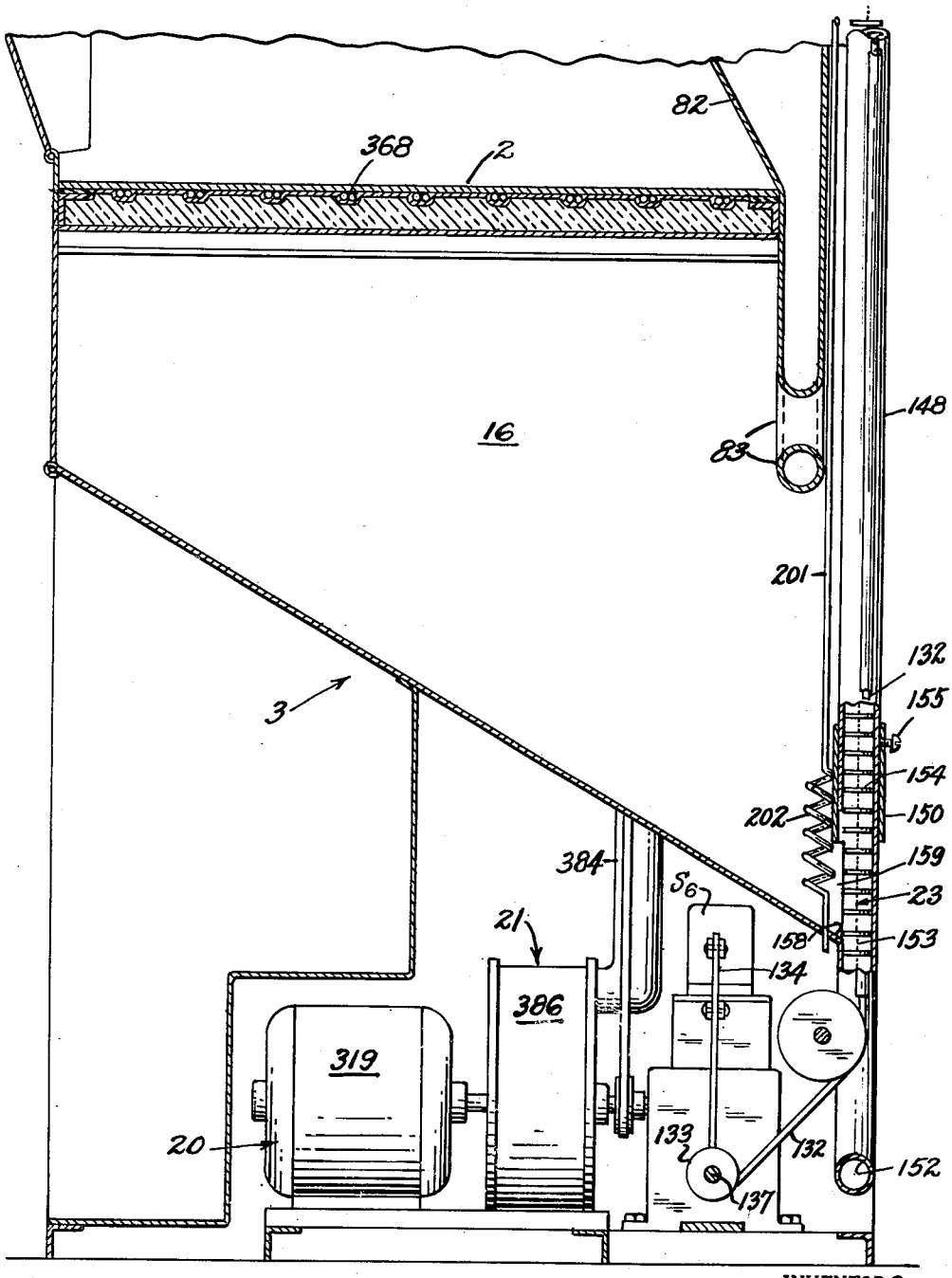


Fig. 2.

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CORN POPPING MACHINE

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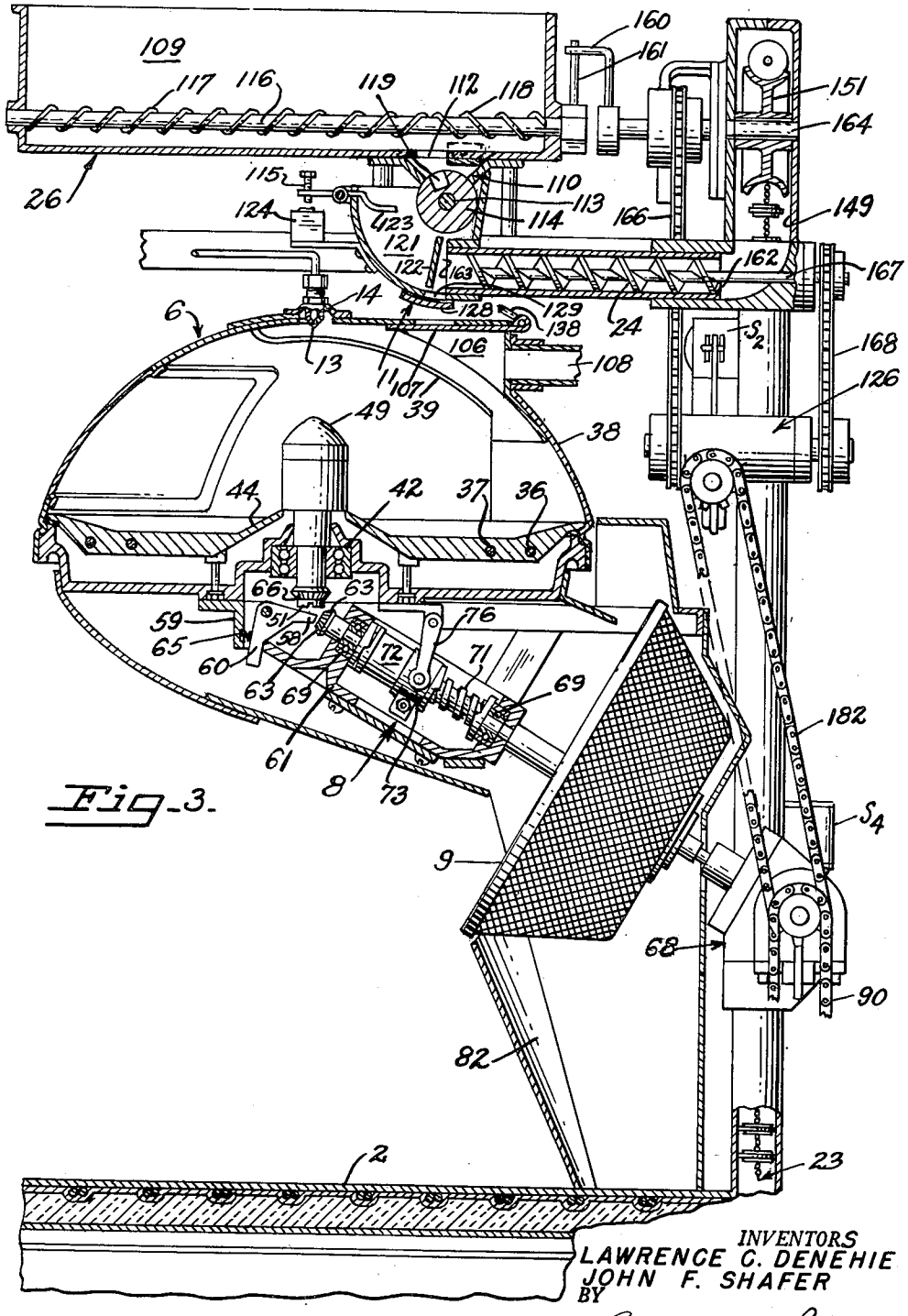


Fig. 3.

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CORN POPPING MACHINE

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Fig. 4.

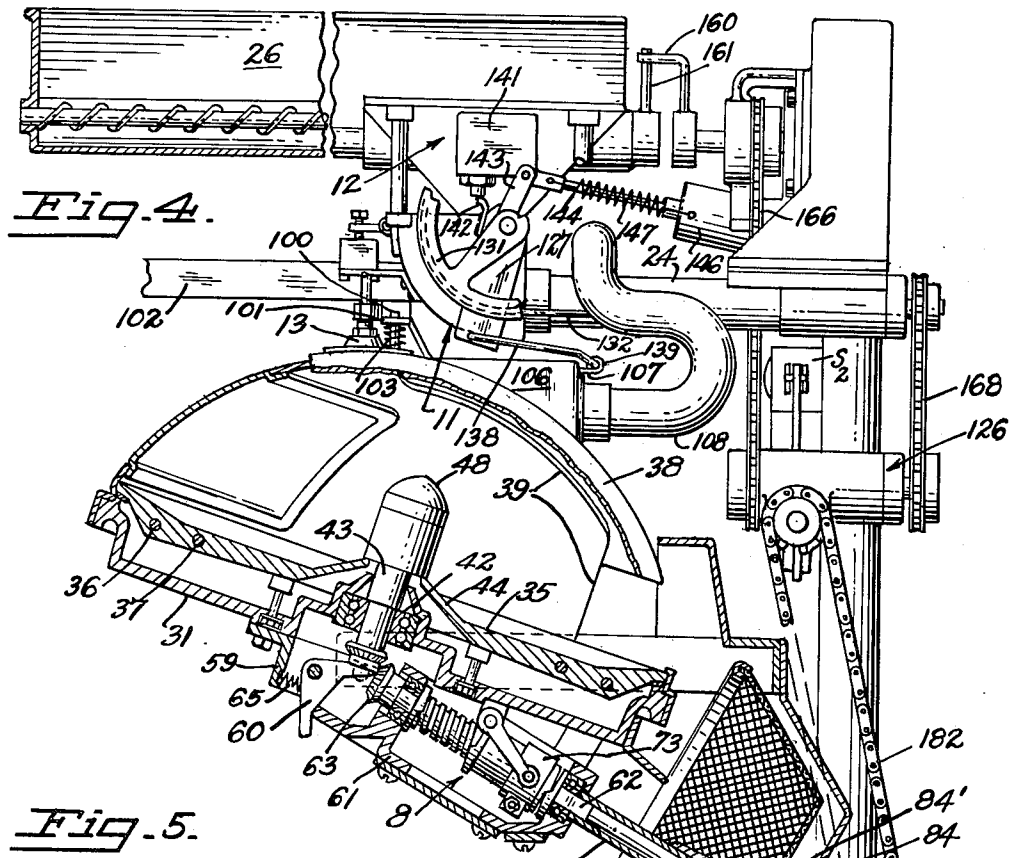
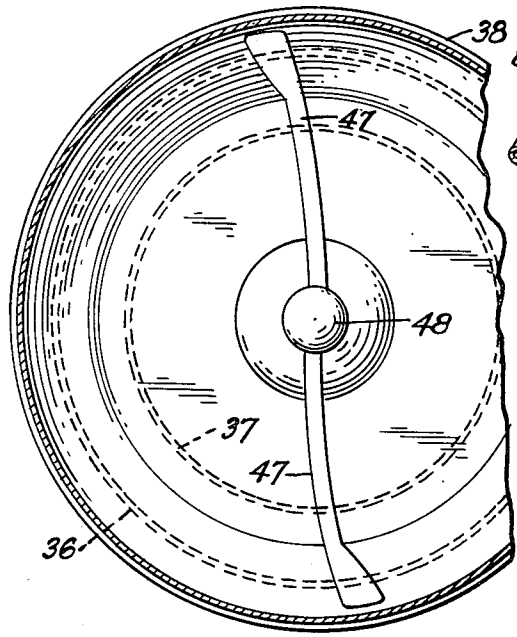


Fig. 5.



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Fig. 6.

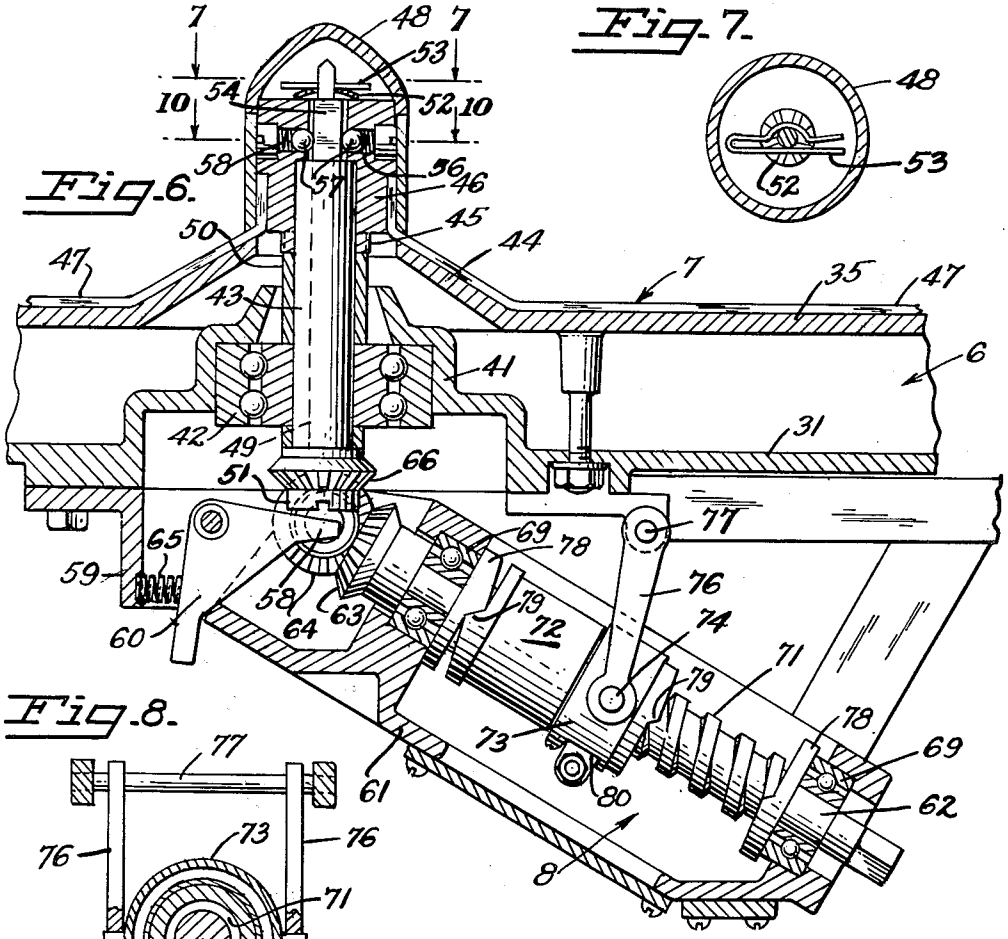


Fig. 7.

Fig. 8.

Fig. 9.

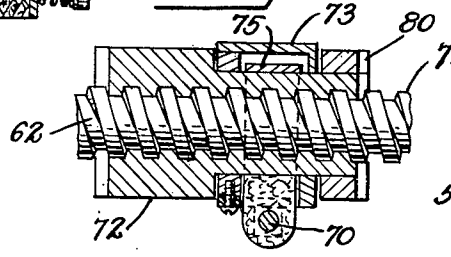


Fig. 10.

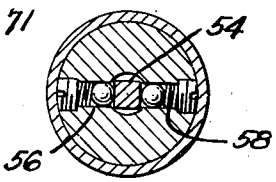
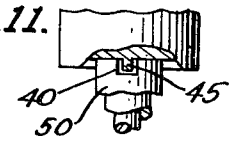


Fig. 11.



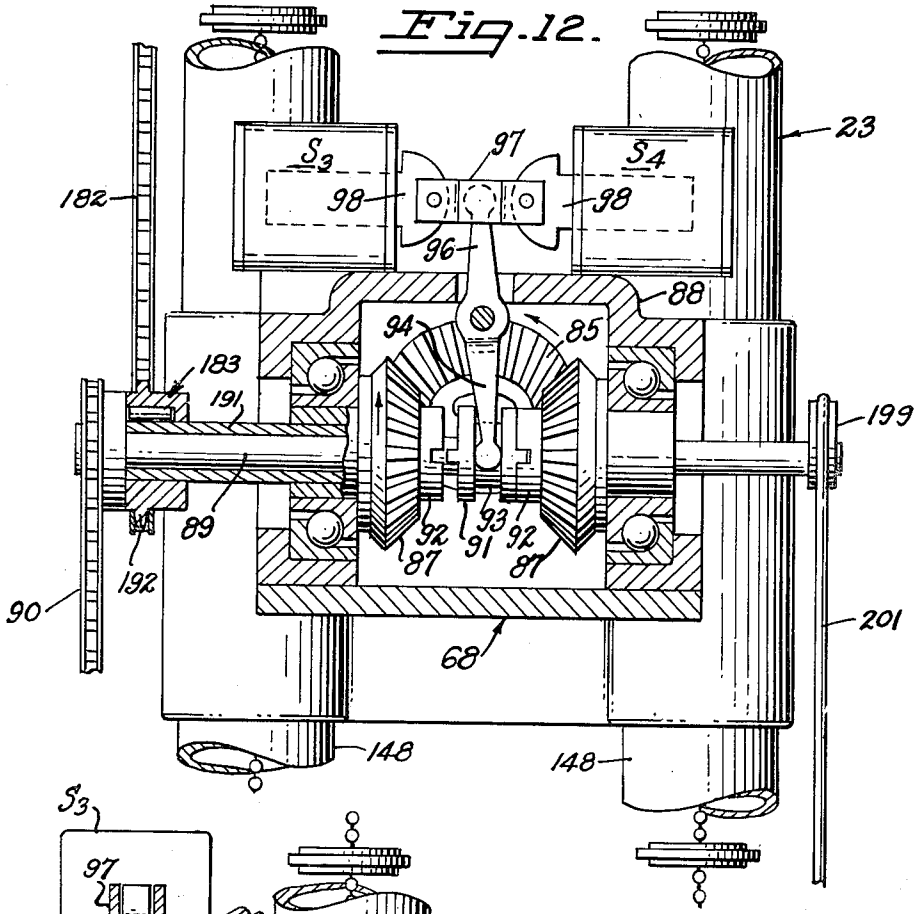
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CORN POPPING MACHINE

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Fig. 12.



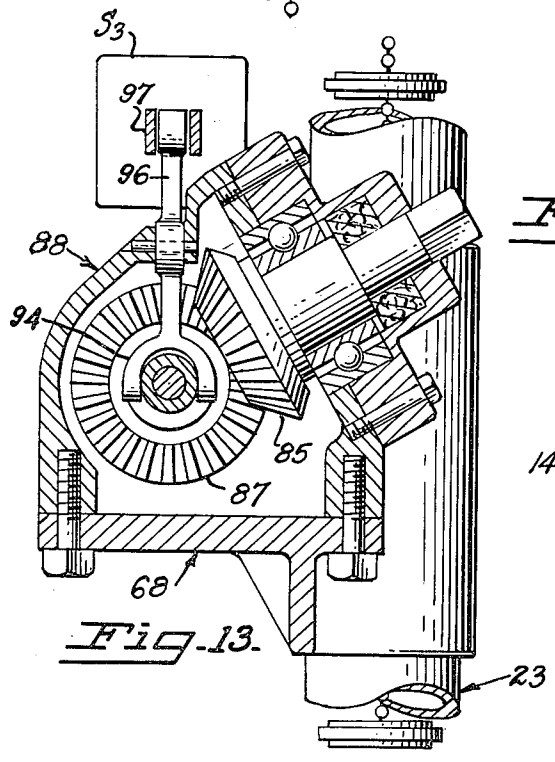
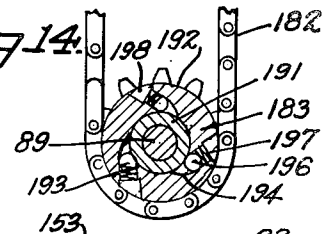


Fig. 13.

Fig. 14.



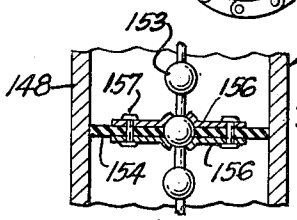


Fig. 15.

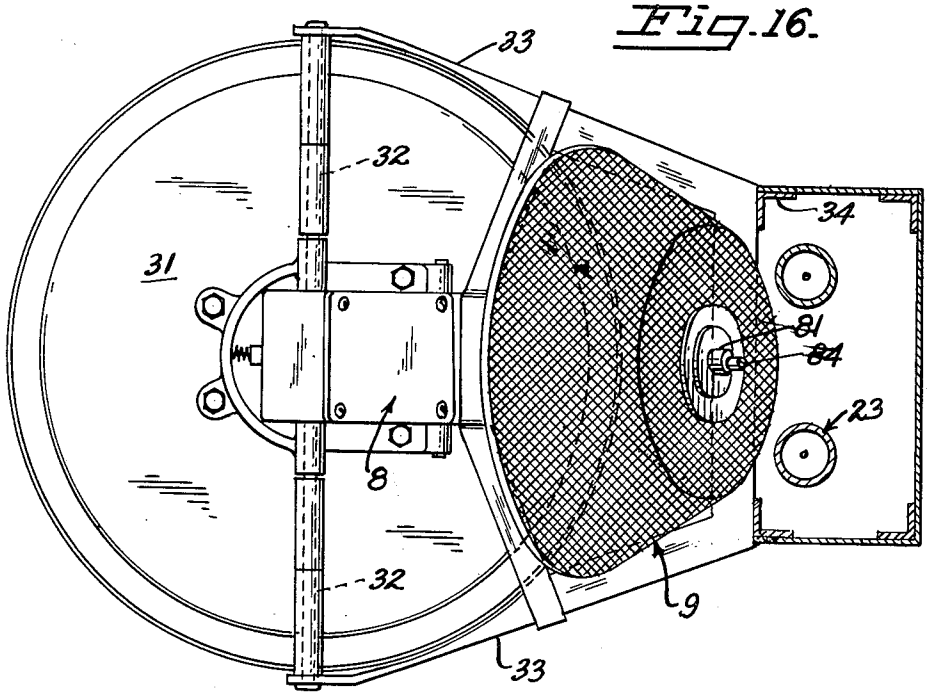
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Nov. 27, 1956 L. C. DENEHIE ET AL 2,771,836

CORN POPPING MACHINE

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Fig. 16.



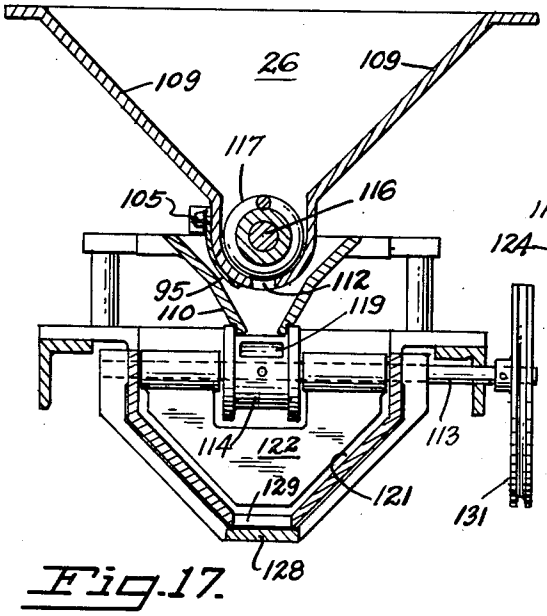


Fig. 17.

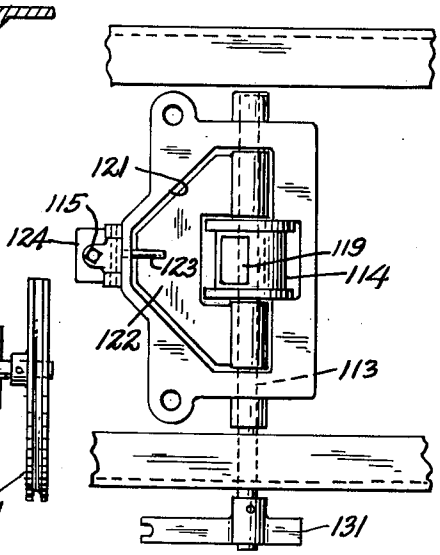


Fig. 18.

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Fig. 19.

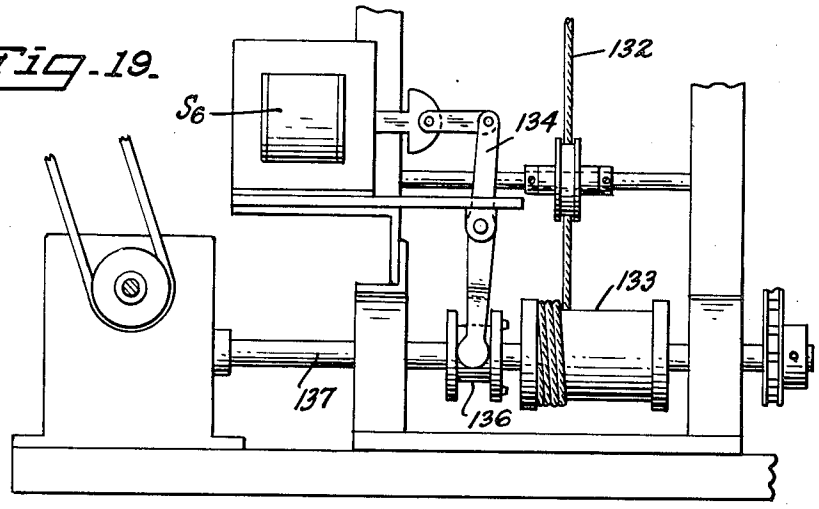
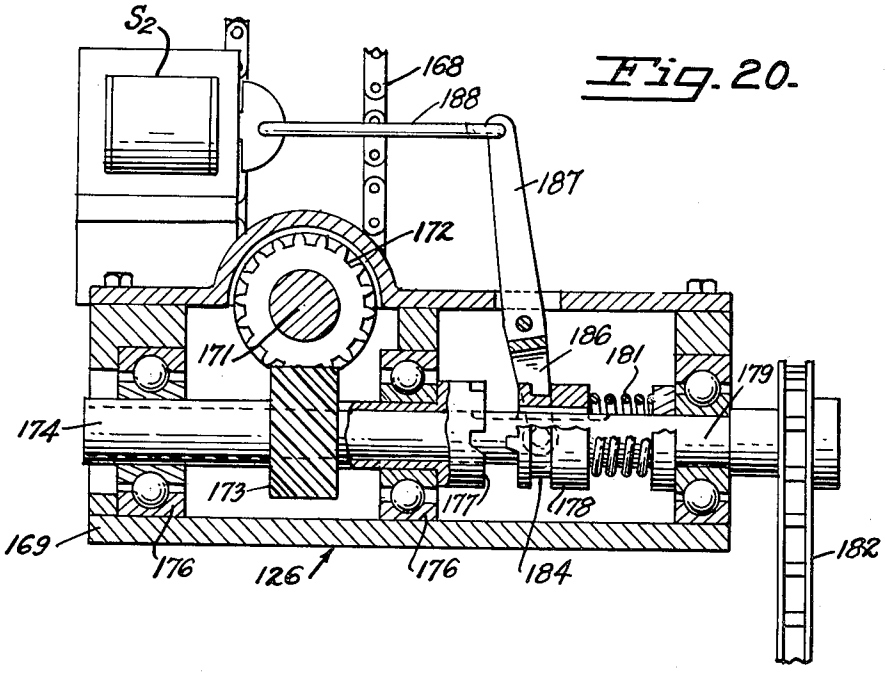


Fig. 20.



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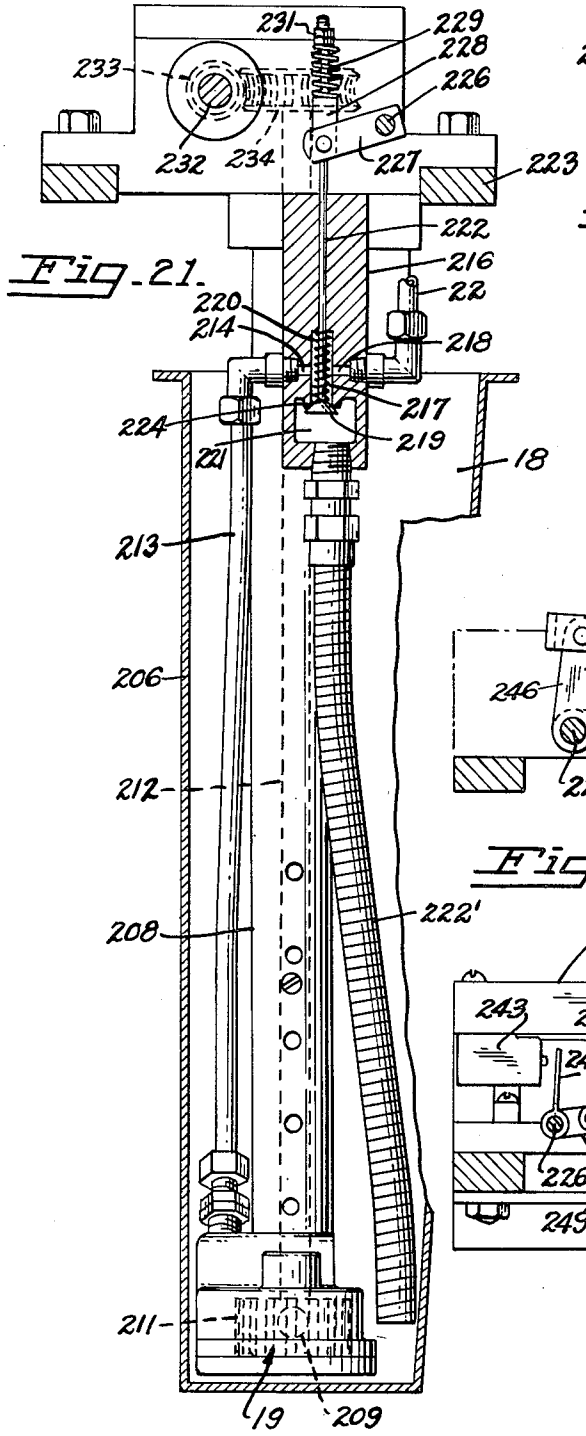


Fig. 21.

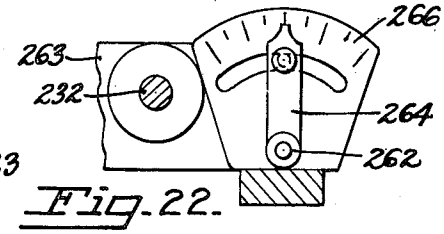


Fig. 22.

Fig. 23.

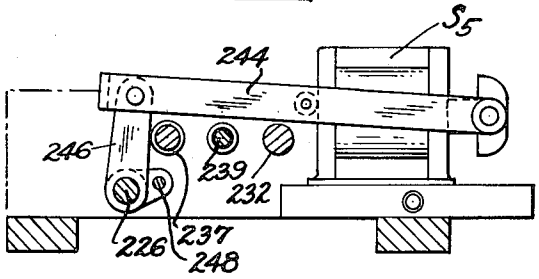
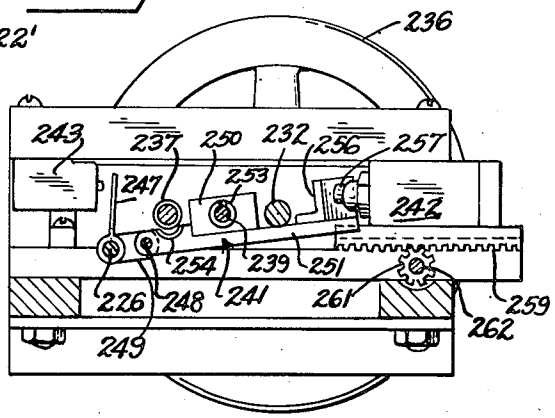


Fig. 24



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CORN POPPING MACHINE

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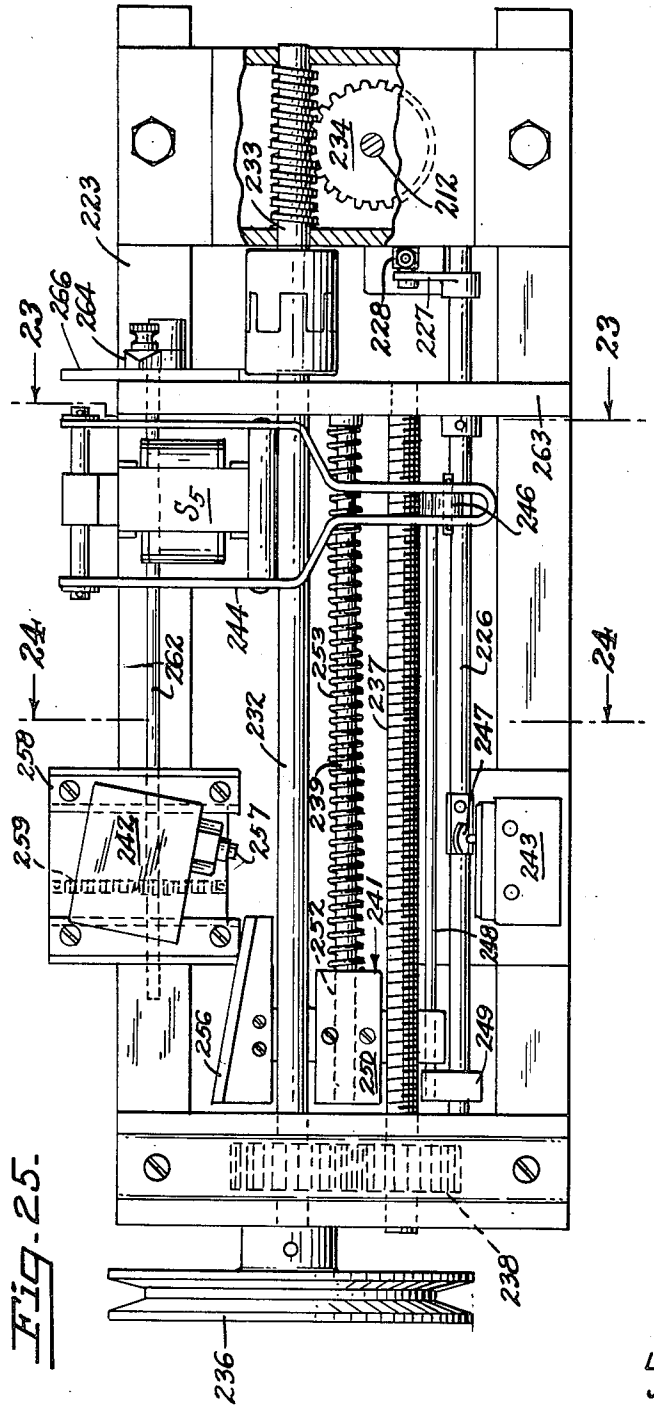


Fig. 25.

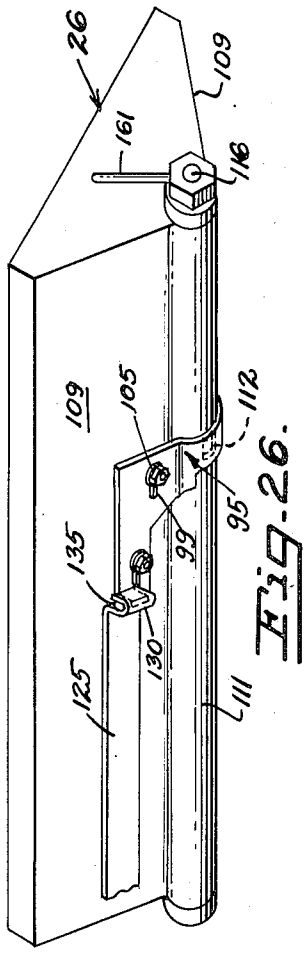


Fig. 26.

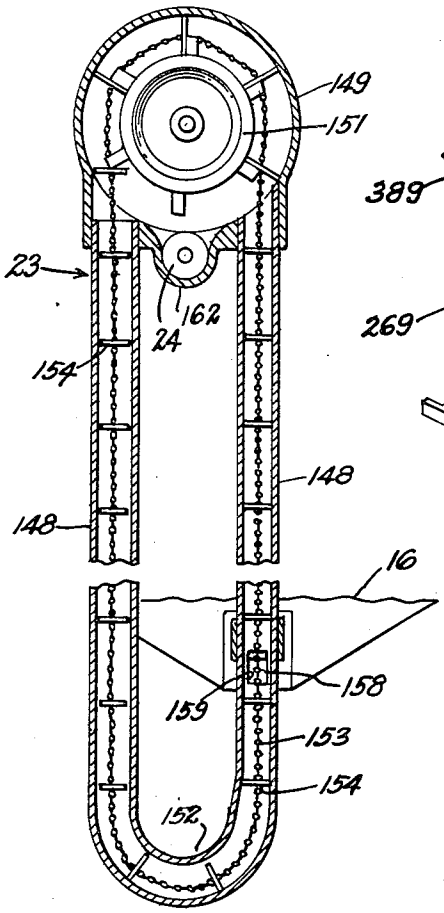
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CORN POPPING MACHINE

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Fig. 27.



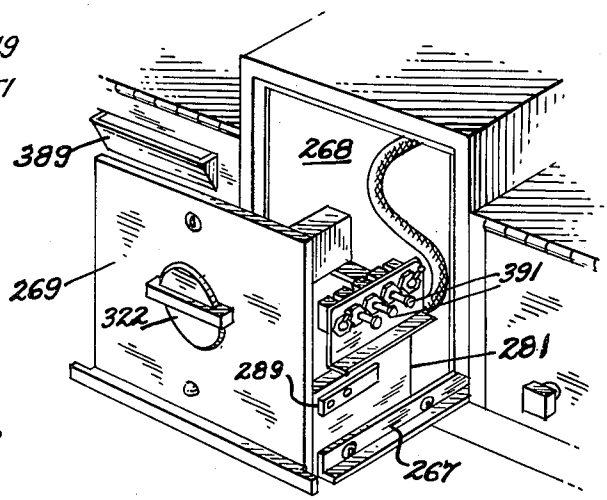


Fig. 28.

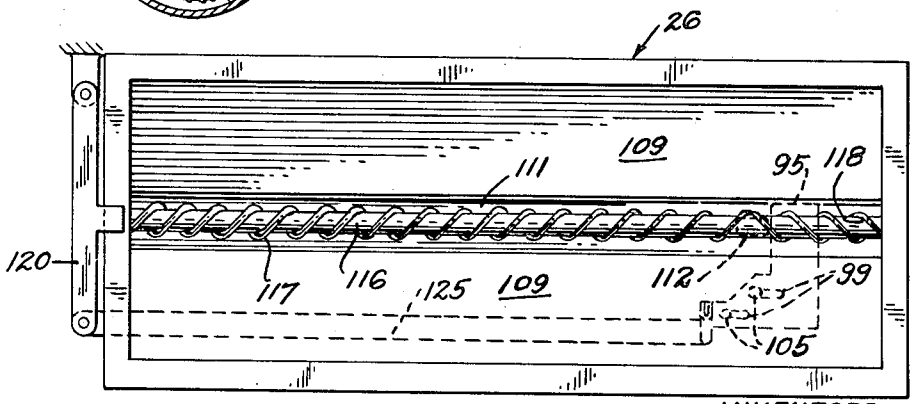


Fig. 29.

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CORN POPPING MACHINE

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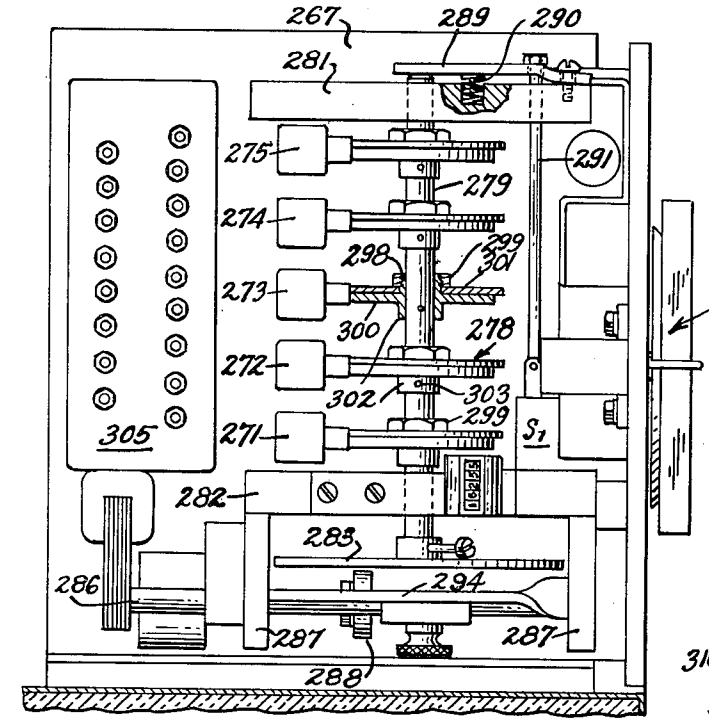


Fig. 30.

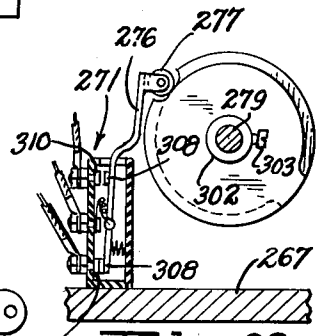


Fig. 32.

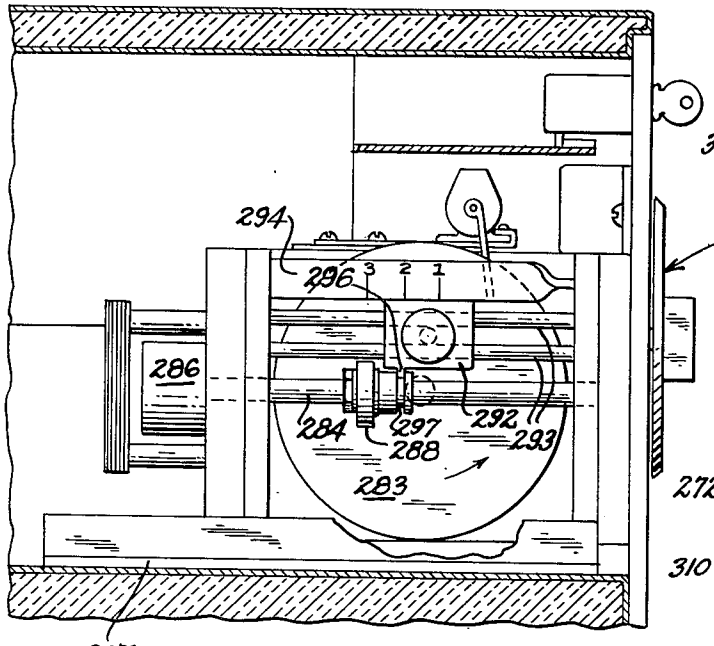


Fig. 31.

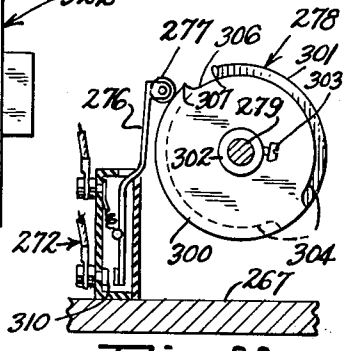


Fig. 33.

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CORN POPPING MACHINE

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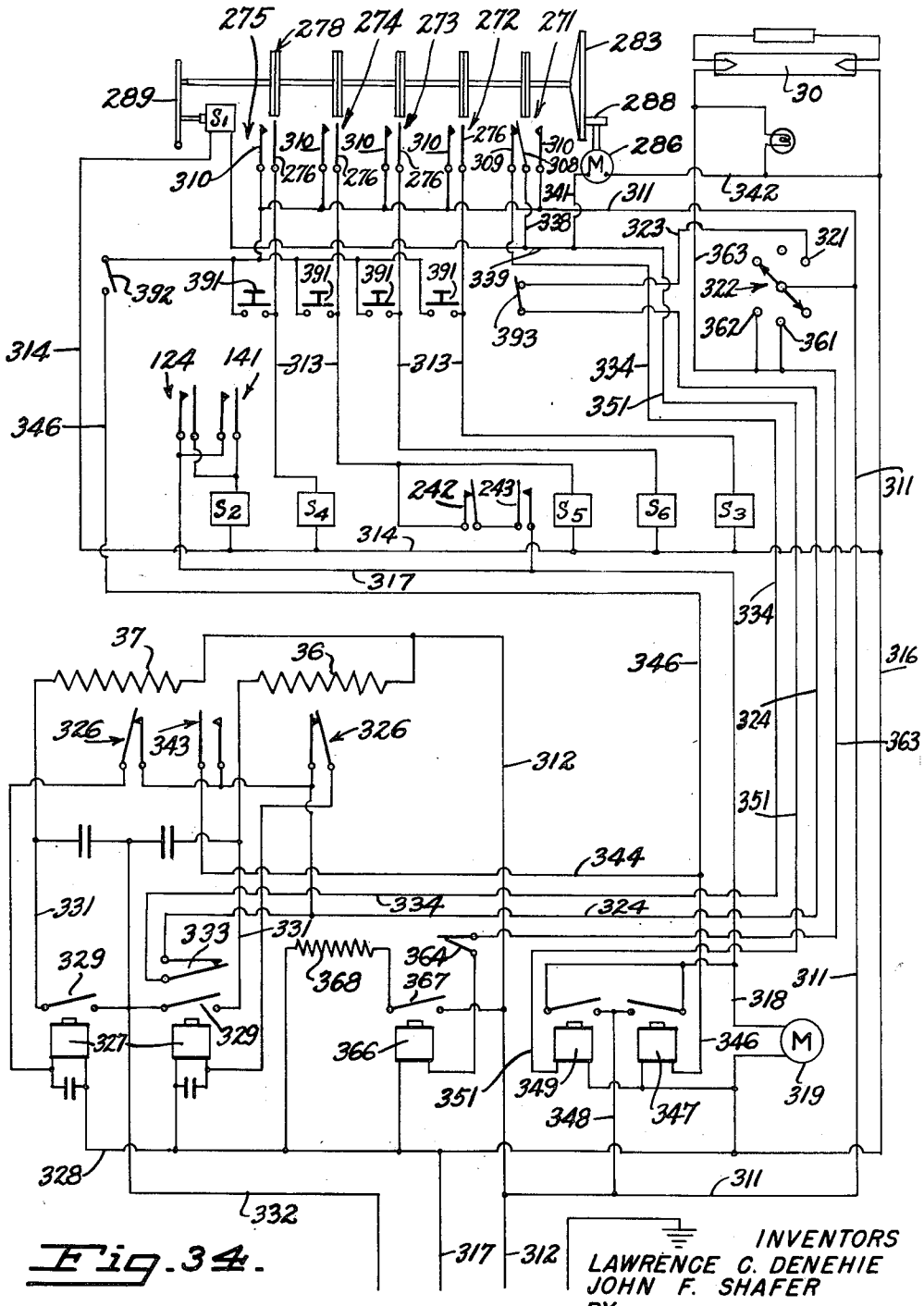


Fig. 34.

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CORN POPPING MACHINE

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Fig. 35.

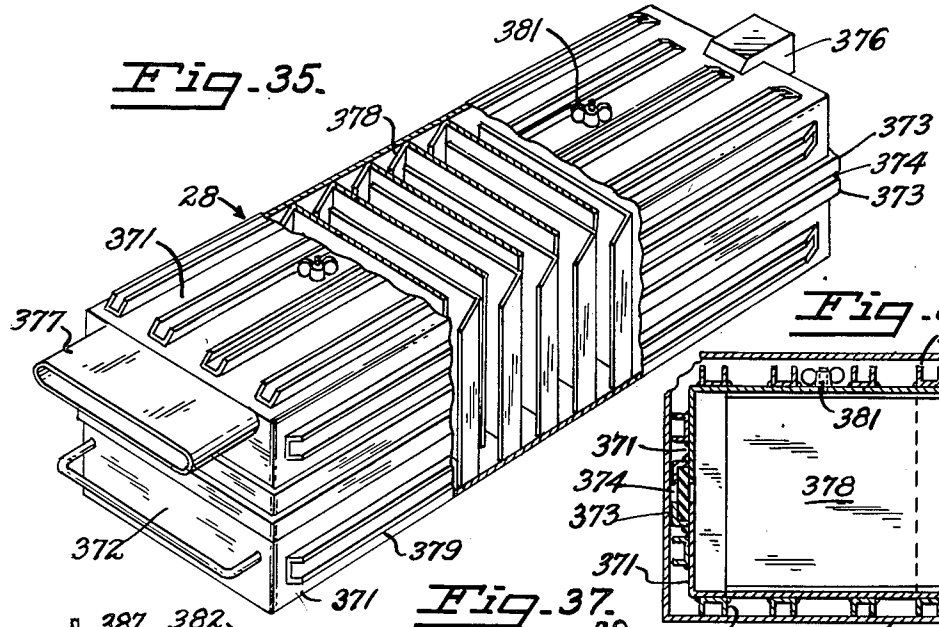


Fig. 36.

Fig. 37.

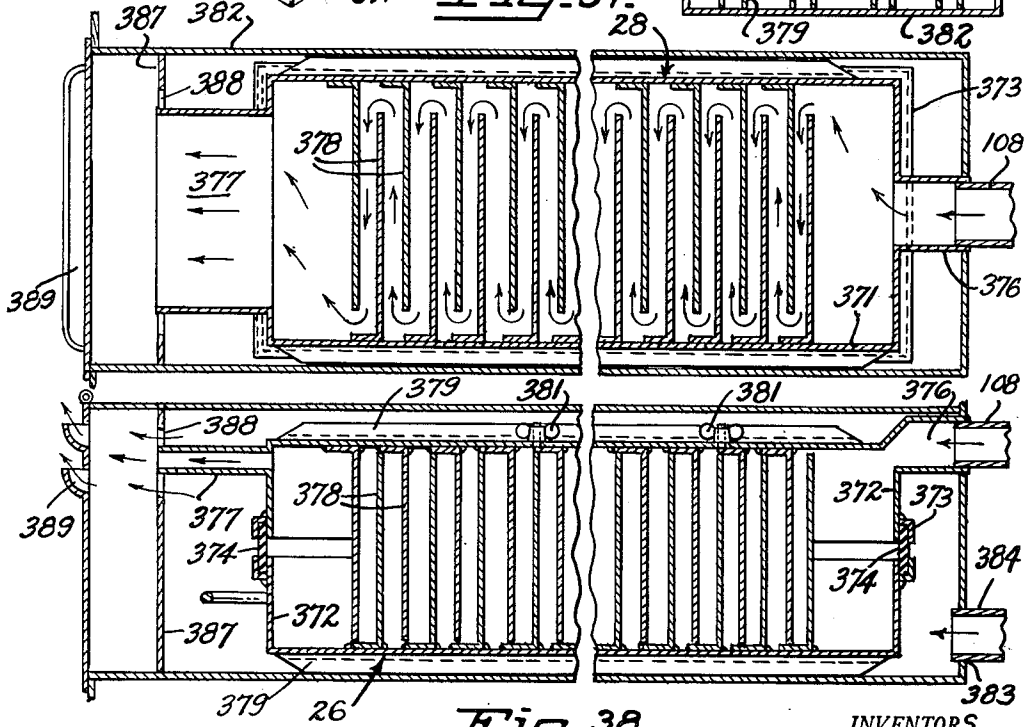


Fig. 38.

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United States Patent Office 2,771,836 Patented Nov. 27, 1956

2,771,836

CORN POPPING MACHINE

Lawrence C. Denehie, Hayward, and John F. Shafer, San Francisco, Calif.

Application March 31, 1951, Serial No. 220,090

27 Claims. (Cl. 99—238.4)

This invention relates to a corn popping machine.

The primary object of this invention is to provide a machine wherein the corn, the seasoning and the salt are fed into a popping chamber in measured quantities automatically and in a recurring selectively predetermined and accurately controlled cycle so as to pop the corn uniformly irrespective of the quality or moisture content of the corn; said machine operating entirely automatically according to its initial setting or adjustment.

Another object of the invention is to provide a corn popping machine in which the corn is fed in predetermined quantity into a tiltable closed popping chamber, and seasoning and salt in accurately measured quantities are introduced together with the corn into said chamber, and wherein the period of popping is predetermined according to the quality of the corn for fully popping all the corn in said chamber, and wherein the said chamber is automatically tilted to eject the popped corn into a separator for discharge of the popped corn unto a heated platform for dispensing, and for separately discharging the unpopped kernels into a separate collector.

Another object of the invention is to provide a synchronizing control device for a corn popping machine of the character described in combination with a heated popping chamber so that the cycle of popping operation is prevented from starting until and unless the popping chamber is at a predetermined suitable heat for efficient popping; said control device operating the various mechanisms of the machine in coordinated sequence for conveying the corn in predetermined quantity to the chamber and introducing salt and seasoning into the chamber simultaneously with the corn, and for tilting said chamber after a predetermined popping period for discharging the popped corn therefrom, and then returning the popping chamber to its initial position and then repeating the cycle of operation again.

Another object of this invention is to provide a corn popping machine in a compact unit, wherein beneath a heated dispensing table are provided separate containers for the corn, for the discarded unpopped kernels, for seasoning and storage, and above said dispensing table are provided a tiltable closed popping chamber with a rotatable agitator, a rotating screen to receive the popped corn from the tilted popping chamber and deliver it unto said table, a measured corn feeder into said chamber, a seasoning injector on said chamber, a measured salt dumper coacting with said corn feeder; means being provided to elevate and convey the corn from the corn container to said corn feeder, and to pump the seasoning to said ejector in accurately measured quantities, and to return unpopped kernels from said screen to the discard container, and finally all the mechanisms being coordinated by a selective electric control device into a predetermined cycle of operation for measuring and introducing the corn, seasoning and salt into said chamber, to pop the corn in said chamber uniformly for a predetermined period, and then tilt the chamber for dumping the popped corn into said screen, and then to repeat said

cycle each time automatically, and for preventing said devices from operating whenever the chamber temperature is below the optimum popping heat, and upon stopping the machine, to complete the last cycle before all the devices cease operation.

Another object of this invention is to provide a closed corn popping chamber and means to tilt the chamber after a predetermined popping period so as to uncover an outlet thereon for discharging the popped corn toward a dispensing surface, agitating means in said chamber being selectively rotated in opposite directions, a device actuated by the tilting of said chamber reversing the rotation of the agitator and imparting intermittent vibration for the emptying of the chamber, means being provided for introducing measured quantities of corn, seasoning and salt into the chamber everytime the chamber is returned from its tilted position to its initial position, which means are rendered inoperative by the tilting of the chamber.

Another object of the invention is to provide a corn popping chamber substantially in the form of a dome, the bottom of which contains electric heating elements so arranged as to heat the entire bottom uniformly, and a device being actuated according to the temperature of said bottom to keep open the operating circuit of the corn popping machine at all times when said temperature is below the selected optimum heat for corn popping, thereby to accomplish full and complete popping of each batch of corn to its maximum volume and with minimum waste; control means being provided to complete a current cycle irrespective of the temperature variation so as to allow the emptying of the chamber each time before the machine is stopped.

Another object of the invention is to provide a corn feed and conveying device to convey the corn in separate batches to a measuring unit adapted to cause the stopping of the corn conveyor after a predetermined quantity of corn is deposited therein, and then to actuate a device for dumping the measured quantity of corn into a popping chamber, and also to actuate devices for introducing into the chamber seasoning and salt in synchronism with the corn; the said device measuring another batch of corn and salt while the previous quantity is popped within said chamber; said corn dumping device and said seasoning injector and salt feeder being actuated in preadjusted synchronism and automatically upon the return of the chamber from the discharged position into the popping position.

Another object of the invention is to provide an adjustable, selective, seasoning supply device for a corn popping machine which injects an accurately determined amount of seasoning into said chamber every time a measured quantity of corn is introduced in said chamber.

Another object of this invention is to provide a salt supply device operated in synchronism with the corn measuring and feeding device to introduce a measured quantity of salt into the corn popping chamber together with the corn.

Another object of the invention is to provide an electric circuit control unit for the corn popping machine which can be preset for a selected cycle of operation for determining the cycle as well as the period of corn popping, quickly and easily and which is operative only while the corn popping chamber is at optimum heat for popping, and which, before any stopping of the operation of the corn popping machine allows the completion of the immediate cycle for popping and discharging the corn then in the popping chamber.

Another object of the invention is to provide a separating screen rotating with the agitator of the corn popping chamber and receiving the popped corn when said chamber is tilted so as to discharge the popped corn onto

a heated surface, and to allow the separation of unpopped kernels, chaff and hulls into a passage for separate collection thereby providing pure popped corn on the dispensing table.

Another object of the invention is to provide a fume filter for conducting vaporized seasoning from the corn popping machine and circulating the vaporized seasoning and steam in cooled passages so as to precipitate steam and condense the vaporized seasoning in the trap, and thereby to purify the exhaust from the corn popping machine, and to obviate the damaging effects of the exhaust waste.

We are aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of the construction thereof without departing from the scope of the present invention as set forth in the following specification, and as defined in the following claims; hence we do not limit our invention to the exact arrangements and combinations of the said device and parts as described in the said specification nor do we confine ourselves to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

With the foregoing and other objects in view, which will be made manifest in the following detailed description reference is had to the accompanying drawings for the illustrative embodiment of the invention, wherein:

Fig. 1 is a sectional front view of our corn popping machine.

Fig. 2 is a sectional side view of the lower portion of our machine.

Fig. 3 is a partly sectional view of the upper portion of our machine showing the popping chamber in upright position.

Fig. 4 is a partly sectional view of the upper part of our machine showing the popping chamber tilted.

Fig. 5 is a fragmental, sectional plan view of the popping chamber showing the relative location of the chamber agitator.

Fig. 6 is a fragmental sectional view of the driving, tilting and agitating mechanism of the popping chamber.

Fig. 7 is a sectional view taken through the lines 7—7 of Fig. 6.

Fig. 8 is a cross-sectional detail view through the travelling sleeve and its connection to the tilting arms.

Fig. 9 is a longitudinal sectional view through the travelling sleeve of the chamber tilting mechanism.

Fig. 10 is a cross-sectional detail view of the chamber agitator head taken through the lines 10—10 of Fig. 6.

Fig. 11 is a fragmental partly sectional detail view showing the driving connection to the chamber agitator head.

Fig. 12 is a partly sectional, fragmental view of the selective transmission mechanism to the agitator driving and tilting mechanism.

Fig. 13 is a partly sectional side view of said selective transmission mechanism.

Fig. 14 is a fragmental sectional detail view of the slip drive connection between the selective transmission and the sprocket and chain of the conveyor drive clutch mechanism.

Fig. 15 is a fragmental, sectional detail view of the vertical corn conveyor in its tube.

Fig. 16 is a bottom plan view of the separator and the popping chamber and its support.

Fig. 17 is a sectional view of the salt conveying and the salt measuring and corn measuring devices.

Fig. 18 is a top plan view of the salt measuring and corn measuring devices.

Fig. 19 is a detail view of the solenoid controlled hoist device for opening the dumping gate of the corn measuring device and of the chamber hopper.

Fig. 20 is a partly sectional view of the solenoid controlled clutch device for the corn conveyor drive mechanism.

Fig. 21 is a partly sectional view of the seasoning pump and its controls.

Fig. 22 is a partly sectional detail view of the microswitch adjusting device for the pump control mechanism.

Fig. 23 is a sectional side view of the pump control mechanism showing the solenoid, the section being taken approximately through the lines 23—23 of Fig. 25.

Fig. 24 is a sectional side view of the pump control mechanism, the section being taken on the lines 24—24 of Fig. 25.

Fig. 25 is a top plan view, partly in section of the pump control mechanism.

Fig. 26 is a perspective detail view of the salt container and its closure.

Fig. 27 is a sectional view of the vertical corn conveyor.

Fig. 28 is a perspective view of the electrical control device and panel.

Fig. 29 is a top plan view of the salt container and conveyor.

Fig. 30 is a plan view of the electric presetting and control device of our corn popping machine.

Fig. 31 is a side view of said presetting and control device in its compartment.

Fig. 32 is a detail view of the cycle switch and its cam.

Fig. 33 is a detail view of another control switch and its cam partly in section.

Fig. 34 is a wiring diagram of the electrical controls of our corn popping machine.

Fig. 35 is a perspective detail view of our air filter device, partly in section.

Fig. 36 is a cross sectional view of the air filter device.

Fig. 37 is a longitudinal sectional plan view of the air filter device, and

Fig. 38 is a longitudinal sectional side view of the air filter device.

In the illustrative embodiment of our corn popping machine we make use of a casing **1** divided by a heated dispensing table **2** into a lower compartment **3** and an upper compartment **4**, which latter is preferably made in part or whole transparent. The rear of the upper compartment is formed into suitable doors.

In the upper compartment **4** is tiltably supported a closed heated popping chamber **6** in which works an agitator **7**. A driving and tilting mechanism **8** extends at an incline forwardly and upwardly with respect to the back of the upper compartment **4**. A rotating separator **9** is supported on and is rotated by said driving mechanism **8** in such relation to said chamber **6** as to receive the popped corn when said chamber **6** is tilted.

Above the chamber **6** are a corn measuring and feeding device **11** and a salt measuring and feeding device **12**. A seasoning injector **13** is held in a hood **14** and above the dome-like chamber **6** so as to inject seasoning into said chamber **6** when the chamber **6** is in its initial popping position.

Below the heated table **2**, in the lower compartment **3**, are a corn bin **16**, a discarded kernel bin **17**, a seasoning container **18** with a pump device **19** therein, a prime driving device **20** and an air circulating device **21**.

A heated conduit **22** conducts seasoning from the pump device **19** to the seasoning injector **13**. A vertical conveyor device **23** carries corn from the corn bin **16**, in individual, separate quantities, to a horizontal conveyor **24** which latter transfers the corn to the corn measuring and feeding device **11**.

On the center of the top of the upper compartment **3** is a salt container **26**. In front of the salt container **26** is the electric presetting and control mechanism **27**. On said top alongside the salt container **26** is an air filter and trap **28** and along the other side of the salt container **26** is a suitable storage space **29**. Suitable lights **30** in said top illuminate the top of said casing **1**.

The popping chamber **6** includes a base **31** which is

generally circular and is pivoted on an axle 32 supported on opposite trunnions 33 extending from the skeleton frame 34. The popping chamber 6 is thus tiltable downwardly toward the separator 9. On this base 31 is a chamber bottom 35 suitably heated to maintain uniform popping temperature throughout the entire surface of the bottom 35. In the present illustration a pair of separate heating coils 36 and 37 are imbedded in the bottom 35 in spaced generally concentric arrangement. The amperages of the heating coils 36 and 37 differ in proportion to the respective areas to be heated by the respective coils. For instance in the herein illustration the outer coil 36 heating a relatively larger area is designed for 1750W, while the inner coil 37 is for 1000 W, thus preventing overheating or underheating at any part of the popping surface of the chamber bottom 35. Suitable thermostatic circuit breakers in each heater coil circuit maintain the coils at said constant optimum temperature thus preventing burning of oil or corn although corn is left in the chamber until completely popped.

A generally semi-spherical dome 38 is suitably mounted on the outer periphery of the bottom 35 and defines the popping chamber 6 above said bottom 35. A portion of said dome 38 under the hood 14 is cut away to form an elongated and downwardly widening opening 39 which serves both as intake and outlet for the popping chamber 6 in its upright and tilted positions respectively.

In the center of the base 31 is a vertical bearing hub 41 in which is a suitable ball thrust bearing 42 on a tubular stem 43, driven by the driving device 8. The top of the stem 43 extends through a hub 44 of the heater bottom 35. On the top of the stem 43 is held a head 46 supporting the agitator 7, which includes agitator arms 47 extending from said head 46. Each agitator arm 47 follows the contour of the bottom surface and is slightly curved. The outer portion of the bottom 35 is inclined upwardly and the outer ends of the agitator arms 47 are correspondingly inclined to urge the corn back toward the middle of the chamber 6. A hollow cap 48 covers the agitator head 46, so that said head and agitator arms rotate together with the tubular stem 43. The head 46 is drivingly interlocked with the stem 43 for instance by the ears 45 shown in Fig. 11, extended into loose keepers 40 in a collar 50 pressed or otherwise fixed on to the stem 43.

A shaft 49 extends through the tubular stem 43. The lower end of the shaft 49 has a slotted head 51, and the upper end of the shaft 49 has a spring washer 52 held by a suitable cotter pin 53 under said hollow cap 48 to hold the agitator head in place on the tubular stem. The upper end 54 of the shaft 49 is squared or of polygonal cross section. The agitator head 46 has four radial holes 56 extending from the periphery to the center. In each hole 56 is a ball 57 pressed by a coil spring 58 against the adjacent side of the square end 54 of the shaft 49. Normally the shaft 49 rotates together with the agitator unit 7. In the tilted position of the chamber 6 the slot of the head 51 of the shaft 49 is engaged by a suitable pawl 58 and the shaft 49 is held against rotation, causing the balls 57 to ride around the square end 54 of the shaft 49, thereby causing a forceful intermittent vibration or jerk of the agitator every time the balls 57 are snapped back from the corners to the flat sides of the square end 54. Thus the agitator 7 also shakes the corn in the tilted chamber 6 to shake the popped corn from the bottom and out of the chamber 6.

The driving and tilting mechanism 8 is supported on an inclined substantially U-shaped bracket 61 beneath the chamber 6. A drive shaft 62 is journalled in said bracket 61. A bevel gear 63 on the upper and inner end of the drive shaft 62 is in mesh with a transmission gear 64 which latter in turn is journalled on the axle 32 and is in mesh with a driven bevel gear 66 on the lower end of the tubular agitator stem 43. The lower outer end of the drive shaft 62 is connected through a removable separator shaft 67 and suitable coupling to a selective transmission 68 for rotation selectively in either direction.

The portion of the drive shaft 62 between the bearings 69 of the bracket 61 has worm threads 71 thereon. A threaded traveling sleeve 72 is on the threaded portion of the drive shaft 62. On the sleeve 72 is a suitable yoke band 73 on opposite pins 74 of which are journalled the lower ends of a pair of links 76. The upper ends of the links 76 are pivoted on a transverse bar 77 fixed on the underside of the base 31 of the chamber 6. When the drive shaft 62 is rotated in contra clockwise direction viewing Fig. 6 then the sleeve 72 is shifted up against the upper end of the bracket 61 and thus holds the links 76 and the chamber 6 in upright position. When the rotation of the drive shaft 62 is reversed to clockwise direction viewing Fig. 6, then the sleeve 72 is shifted to the lower end of the bracket 61 and pulls the links 76 downwardly and tilts the chamber 6 around said axle 32 toward the separator 9. The bracket 61 is held stationary on suitable supports extended from the skeleton frame of the machine.

The pawl 58 is pivoted in a collar 59 on the underside of the base 31 of the chamber 6. The axis of the pawl pivot is parallel with the axle 32. The pawl 58 has a downward arm 60. A coil spring 65 between the collar 59 and the pawl arm 60 normally urges the pawl arm 60 against the adjacent upper edge of the bracket 61 so as to urge the pawl 58 upwardly toward the notched shaft head 51. Thus as the chamber 6 is tilted downwardly the arm 60 and the pawl 58 are allowed to turn under the force of the spring 65 so as to engage the pawl 58 with the notch in the shaft head 51 for holding the shaft 49 against rotation, resulting in the jerking intermittent vibration of the agitator to assist in the ejection of the popped corn from the tilted chamber 6.

At each end of the bearing bracket 61 and on the drive shaft 62 is a stop plate 78 engageable by an interlocking lug 79 on the adjacent end of the travelling sleeve 72. The respective lugs 79 and stop plates 78 are arranged directionally so as to engage at the upper end of the bracket 61 when the drive shaft 62 rotates in contra clockwise direction viewing Fig. 6 to resist upward travel of the sleeve 72 and thus maintain the popping chamber 6 at its initial level popping position, and to engage at the lower end when the drive shaft 62 rotates in clockwise direction viewing Fig. 6, to resist downward travel of the sleeve 72 maintaining the popping chamber 6 at its tilted discharge position. The yoke band 73 is on a reduced portion of the travelling sleeve 72 and is spaced therefrom between fixed shoulders. A suitable brake band 75 is between the yoke band 73 and the sleeve 72 and is held by spring pressed bolt 70 on its parallel spaced ears with such friction that the brake band 75 prevents rotation of the sleeve 72 while the sleeve 72 travels on the worm threads 71, but allows the sleeve 72 to rotate with the worm threads 71 and with the drive shaft 62 as a unit when engaged with either of the rotatable stop plates 78. A slot 80 in the bottom of the yoke band 73 accommodates the ears of the brake band and stops its turning.

The separator shaft 67 is a tubular shaft with a passage of rectangular cross-section in its upper end for engagement with the correspondingly squared end of the drive shaft 62. On this tubular shaft 67 is mounted the hub sleeve 81 of the conical screen basket like separator 9. The orifices through the sides of the separator 9 retain popped corn but the unpopped kernels, chaff or hull drop through them. The open end of the basket separator 9 faces at an angle upwardly toward the popping chamber 6 so that when the chamber 6 is tilted the popped corn drops from its opening 39 into the separator 9. The separator 9 rotates with the tubular shaft 67 and the popped corn works its way over the edge of the separator 9 and then drops down onto the dispensing table 2. A hopper 82 and chute 83 receive and conduct

the separated unpopped kernels and chaff or hull into the discard bin 17 below the table 2.

Into the lower end of the separator shaft 67 telescopes a coupling shaft 84 suitably connected to the driven gear 85 of the selective transmission 68. A cross pin 84' extends through the hub sleeve 81 and through an elongated slot 84'' in the coupling shaft 84 to allow the driving and shifting of the sleeve 81. A coil spring 86 in the tubular separator shaft 67 bears against said coupling shaft 84 and against a fixed plug or shoulder in said tubular shaft 67 to hold the latter in engagement with the drive shaft 62. The separator 9 is removable by telescoping the tubular shaft 67 down on the coupling shaft 84 until the top clears the drive shaft 62.

The selective transmission 68 as shown in Figs. 12 and 13 includes a pair of opposite bevel gears 87 journalled in a gear housing 88 and floating on a transmission shaft 89, which latter is connected by a sprocket and chain transmission 90 to a suitable drive mechanism of the device. A two way slide clutch 91 is slidably keyed on the transmission shaft 89 between the floating gears 87, each of which latter has an engagement hub 92 thereon to be interlocked with the clutch 91 when the latter is shifted against it. The clutch 91 has a groove 93 about its middle portion engaged by a yoke 94 on the end of a shift lever 96. This lever 96 is pivoted on the gear housing 88 intermediate its ends. The outer end of the shift lever 96 is engaged in a cross head 97 which latter is connected to the opposite armatures 98 of electromagnets or solenoids S3 and S4. According to the energization of one or the other electromagnet the transmission shaft 89 is coupled to the respective floating gear 87, to impart rotation to the drive gear 85 in the selected direction for tilting the popping chamber 6 or for returning said chamber 6 to its initial upright position respectively.

The hood 14 is in the form of a spherical segment snugly fitting over the curvature of the popping dome 38 so that the dome 38 may be slid under the hood 14 to its tilted position and back to its initial position. In said initial upright position of the chamber 6 the opening 39 is completely covered by the hood 14. The opening 39 extends from about the center of the top of the dome 38 to one side of the rim of the chamber bottom 34 in the direction of the separator 9. The hood 14, therefore, extends somewhat beyond the center of the dome top and then down to the rim of the chamber bottom in the initial position of the chamber 6. The hood 14 is slidably guided on pins 100 extended from an overhead bracket 101 which latter is supported on side bars 102 of the machine frame. Coil springs 103 around the guide pins 100 press the hood 14 onto the top of the chamber dome 38.

The injector or spray nozzle 13 for the seasoning is mounted on the hood 14 about opposite the top center of the dome 38 and opposite the adjacent or top end of the opening 39. The hood 14 has formed on its top a hopper 106 also above the opening 39. A sliding plate 107 normally covers the top of the hopper 106, but it is slidable to uncover the hopper 106 for the introduction of corn and salt from the corn and salt measuring and feeding devices 11 and 12, under which latter the hopper 106 is located.

The hopper 106 has a fume conduit 108 leading from its end to the filter device 28 to conduct the fumes from the popping chamber 6 to said air filter 28 for purifying the exhaust.

The corn measuring device 11 and the salt measuring device 12 are working together for the simultaneous introduction of corn and salt into the hopper 106.

The salt container 26 has downwardly inclined side walls 109, which converge into a conveyor trough 111. The trough 111 has an outlet 112 spaced above the hopper 106. Under the outlet 112 is a salt hopper 110, the lower opening of which conforms to the upper circumference of a salt measuring spool 114 on a shaft 113. A conveyor shaft 116 is journalled longitudinally in the trough 111 and has thereon oppositely working conveyor screws 117 and 118 respectively to convey salt from the opposite ends of the salt container 26 to said outlet 112.

An arcuate closure plate 95 is held by slidable slots 99 on screws 105 on the outside of the salt container 26 so as to be slidable over and off the outlet 112. In order to automatically cover and uncover the salt outlet 112 when the container 26 is respectively removed from or inserted into the frame of the machine, a locking lever 120 is pivoted at one end of the frame and has a catch thereof extended over the adjacent end of the salt container 26 to prevent removal. A bar 125 is slidable on the machine frame along the same side of the salt container 26 on which the sliding slots 99 and screws 105 of the closure plate 95 are located. This bar 125 extends upwardly at its outer end and is pivoted to the free end of the locking lever 120. The inner end of this bar 125 is formed into a hook 130 facing toward and receiving a projection 135 from the adjacent end of the closure plate 95 as shown in Figs. 26 and 29. The locking lever 120 is pulled away from the end of the container 26 to release the container 26 for removal, and it pulls the side bar 125, and the closure plate 95 therewith into outlet covering position. Thus whenever the container 26 is lifted out of the frame, its outlet 112 is covered. After the container 26 is replaced in the frame and the locking lever 120 is pushed over the container 26, it pushes the side bar 125 inwardly and thus pushes the closure plate 95 beyond the outlet 112, leaving said outlet 112 open.

The cylindrical spool 114 has a measuring pocket 119 in its periphery which is filled with salt when it is in its position facing upwardly toward the salt trough 111 and into the salt filled hopper 110. This pocket 119 dumps the measured quantity of salt when turned downwardly opposite said intake hopper 106.

A corn measuring chamber 121 is suitably supported on the frame of the machine and the transverse spool shaft 113 is journalled in said corn measuring chamber. The bottom of this corn measuring chamber 121 is arcuate and is generally concentric with said spool 114. On the transverse spool shaft 113 is journalled freely swingably an actuator plate 122 arranged in a plane generally radial to the axis of said transverse spool shaft 113. The horizontal corn conveyor 24 feeds the corn into said corn measuring chamber 121 and against said pendulous plate 122, so that as the corn measuring chamber is being filled the corn lifts the plate 122. When the plate 122 reaches a position corresponding to the desired measured quantity of corn kernels, it pushes up the end of a switch lever 123 of a normally open micro-switch 124 so as to close said micro-switch 124 and thereby actuate a solenoid S2 to disconnect the conveyor drive clutch mechanism 126 and stop the corn feed conveyors 23 and 24. The measured amount of corn is preadjusted by means of a set screw 115 in the outer end of the switch lever 123 so that the setting of the setscrew 115 determines the degree of downward travel of the outer end of the switch lever 123 for closing the micro-switch 124. The inner end of the switch lever 123 is bent downwardly into the path of the plate 122 to be engaged by the plate 122 considerably below the top of the measuring chamber 121.

On the salt spool shaft 113 is also fixed a U-shaped gate support 127, which straddles the outside of the corn measuring chamber 121 and extends across the bottom thereof. The support 127 holds a gate 128 over an outlet opening 129 in the bottom of the corn measuring chamber 121. The spool shaft 113 is turned by a sector 131 fixed on an end of the spool shaft 113. A suitable line such as a cable 132 is secured to said sector 131 and is wound on a suitable drum 133, as shown in Fig. 19. When a solenoid S6 is energized by the control mechanism 27 it turns a clutch lever 134 to shift a clutch 136 on a main drive shaft 137 into engagement

with the drum 133 for winding the cable 132 and pulling it so that the sector 131 is pulled and turned for turning the spool shaft 113 in contra clockwise direction viewing Fig. 4. This turns the salt spool 114 so that its pocket 119 dumps the salt downwardly, and also moves the gate 128 away from the outlet 129. The gate 128 is connetced by a link 138 to the outer end 139 of the sliding plate 107 on the hopper 106, so that as the gate 128 is swung open it pushes the sliding plate 107 to uncover the hopper 106 substantially simultaneously, preferably slightly in advance of the uncovering of the outlet 129 so as to allow the dropping of the corn and salt from the measuring chamber 121 through the hopper 106 into the popping chamber 6. The swinging plate 122 assists in emptying the measuring chamber 121.

As the lowering of the acuator plate 122 releases the switch lever 123, the resilient micro-switch 124 returns to circuit opening position. In order to prevent the resuming of the operation of the corn conveyors 23 and 24 until after the measuring chamber 121 is completely emptied and all the moving parts are returned to the initial measuring position, another normally closed micro-switch 141 is provided above the spool shaft 113. A finger 142 on the gate support 127 presses against and holds open this second micro-switch 141 whenever the measuring gate 128 is closed. But whenever the gate 128 is opened, the finger 142 is removed from said second micro-switch 141 and permits it to close. This second micro-switch 141 is interconnected in the circuit of the solenoid S2 so as to close that circuit and hold the conveyor drive clutch mechanism 126 inoperative, even after the actuator plate 122 begins its downward movement, and at all times while the gate 128 is open. Therefore, the corn feeding conveyors 23 and 24 remain inoperative until after the gate 128 is closed, and the hopper plate 107 is pulled back to cover the hopper. An ear 143 on the top of the gate support 127 is engaged by a plunger 144 slidably held in a boss 146 on the machine frame. A coil spring 147 anchored on said boss 146 pulls the plunger 144 to turn the gate support 127 in a clockwise direction viewing Fig. 4, thereby turning the spool shaft 113 for returning the salt spool 114 and sector 131, and the gate 128, and slide plate 107 into said initial position. Thus the second micro-switch 141 is opened and the clutch solenoid S2 is de-energized and the conveyor drive clutch mechanism 126 is again engaged for driving said vertical and horizontal corn conveyors 23 and 24 to feed corn into said corn measuring chamber 121.

The vertical conveyor mechanism 23 is in a pair of parallel vertical tubes 148 which are connected to form a journal casing 149 at the upper end for accommodating a sprocket wheel 151 and also for forming a chamber above the intake end of the horizontal conveyor. The lower ends of the tubes 148 are connected by a curved tube 152. Around the sprocket wheel 151 and through the tubes 148 and 151 extends a flexible conveyor which is formed by an articulated line such as a chain 153 formed of balls connected by pivoted links, and a series of equally spaced flexible discs 154, supported on suitably spaced balls by securing discs 156 held on the opposite sides of the flexible discs 154 by suitable rivets 157. The diameter of the securing disc 156 is smaller than the flexible disc 154 so as to leave a circumferential margin sufficiently flexible to pass over kernels of corn that may wedge between the disc periphery and the tubes.

The flexible conveyor moves upwardly in one tube and downwardly in the other tube. The tube guiding the conveyor upward passes by the bottom outlet 158 of the corn bin and has an inlet opening 159 along its side facing within said bin outlet 158. The kernels of corn thus flow into the pockets formed between the discs 154 and are carried upwardly thereby in separate comparatively small batches. These pockets above the bin outlet 158 are confined by the tube 148. A sleeve 150 is slidable on the upward tube and over the inlet opening 159 so as to adjust the length of the tube inlet opening 159, which in turn determines the amount of kernels entering into the spaces between the discs of the conveyor. A clamp screw 155 clamps the sleeve 150 in any adjusted position.

The corn in the upper chamber drops down into a horizontal tube 162 which latter contains the horizontal screw conveyor 24 and leads into the inlet 163 of the measuring chamber 121 between the salt spool 114 and measuring chamber outlet 129. The bottom of this top conveyor chamber 149 is dished toward and into said horizontal conveyor tube 162.

The conveyors 23 and 24 are driven in synchronism. The sprocket wheel 151 has its shaft 164 extended to the outside of the casing 149. A suitable sprocket and chain transmission 166 connects this shaft 164 to the conveyor drive clutch mechanism 126. The shaft 167 of the horizontal screw conveyor 24 is extended through the wall of the chamber 149 and is connected by a suitable sprocket and chain transmission 168 also to said drive clutch mechanism 126. An extension on the end of the sprocket shaft 164 has a bent drive pin 160 which abuts against a driven pin 161 on the projecting end of the salt conveyor shaft 116 to drive the latter together with the corn conveyors.

This conveyor clutch mechanism as shown in Fig. 3 and Fig. 20 includes a casing 169 in which is journalled a shaft 171 which has a gear 172 thereon and to the opposite ends of which are connected the sprocket and chain transmissions 166 and 168 respectively of the vertical and horizontal conveyors 23 and 24. The gear 172 is in mesh with a drive gear 173 on a drive tube 174 which latter is supported in journals 176 transversely below the first shaft 171. On the drive tube 174 is fixed a clutch plate 177. A clutch collar 178 is slidable on a drive shaft 179 which latter rotates within the drive tube 174. A coil spring 181 normally urges the clutch collar 178 into engagement with the clutch plate 177 so as to transmit rotation from the drive shaft 179 to the drive tube 174 and to the conveyors 23 and 24. The drive shaft 179 is rotated by a suitable chain and sprocket transmission 182 which latter is connected by a one way slip sprocket 183 to the transmission shaft 89 of the agitator and separator drive mechanism so that when the separator drive is reversed for tilting the popping chamber no rotation is transmitted through said slip sprocket 183 to the conveyor drives.

The clutch collar 178 has a groove 184 around it to accommodate a suitable shift yoke 186 of a shift lever 187 which is pivoted on the casing 169. The outer end of the shift lever 187 is connected by a link 188 to the armature of the solenoid S2 which latter when energized shifts the clutch collar to disengaged position as shown in Fig. 20, thus rendering the conveyors 23 and 24 inoperative.

The drive shaft 179 of the conveyor drive clutch mechanism 126 is driven by the sprocket and chain transmission 182, which latter is driven by the transmission shaft 89 of the agitator drive transmission shown in Fig. 12. On the end of the transmission shaft 89 adjacent the chain and sprocket transmission 90 is a sleeve 191 fixed on the hub of the adjacent reversing gear 87. On this sleeve 191 is a one way slip sprocket 192 which forms the lower end of the sprocket and chain transmission 182 leading to the conveyor drive clutch mechanism 126. The slip sprocket 192 has three passages 193 which extend generally tangentially to the sleeve 191, and terminate in a curved tapered end 194. In each passage 193 is a ball 196 pressed by a coil spring 197 against said sleeve 191. A plug 198 in the outer end of each passage 193 bears against the coil spring 197. When the sleeve 191 is rotated in clockwise direction viewing Fig. 14, the agitator is operating in the upright popping position of the chamber 6, and the sleeve 191 wedges the balls 196 into the inner tapering ends of the

passages 193 and thus rotates the sprocket 192 and transmits rotation to the conveyor drive clutch mechanism 126. When the shift lever 96 is shifted by the solenoid S4 to couple the shaft 89 to the bevel gear 87 of the sleeve 191 for reversing the rotation of the gear 84 and of the agitator mechanism and for tilting the chamber 6 into ejecting position, then the rotation of the sleeve 191 is reversed with that of the adjacent gear 87 to clockwise direction viewing Fig. 14, thus pushing the clutch balls 196 away so that the sleeve 191 slips within the sprocket 192 without transmitting rotation thereto. Conseqeuntly the operation of both conveyors 23 and 24 is stopped every time the chamber 6 is tilted.

On the free end of the shaft 89 is an eccentric crank 199 from which extends an agitator rod 201 along the adjacent conveyor tube 148. The rod 201 is bent and offset so that its helically bent lower end 202 is in the outlet 158 of the corn bin 16 and opposite and alongside the conveyor inlet opening 159. As the shaft 89 rotates, through the eccentric crank 199, it reciprocates the agitator rod 201 the lower end of which stirs the kernels of the corn in the bin 16 at the conveyor inlet opening 159 and facilitates flow of corn into the vertical conveyor.

The seasoning pump and control 19 are located in the lower compartment 3. A container 206 is removably supported on frame flanges 207 and contains so called seasoning, usually coconut oil or the like. Within this container 206 is supported a tube 208. On the lower end of this tube 208 is a suitable gear pump 211, not shown in detail, and driven by a vertical pump shaft 212, shown on Fig. 21. An outlet conduit 213 conducts the pumped seasoning to an intake port 214 of a valve body 216. The bottom casing of the pump has an inlet port 209 as shown in broken lines in said Fig. 21, provided with a suitable strainer not shown. The intake port 214 of the valve body leads into a valve chamber 217. An outlet port 218 of said chamber 217 is connected to the suitably heated seasoning conduit 22 which conducts the seasoning to the injector 13 in the hood 14.

The valve chamber 217 is closed at its bottom by a bypass valve 219 which when open bypasses the seasoning from the valve chamber 217 into a bypass chamber 221 and out through a return conduit 222' into the container 206. Normally the bypass valve 219 is open so that the pumped oil is bypassed and recirculated. The bypass valve 219 is closed for a predetermined period once during each cycle of popping operation of the machine to allow a predetermined amount of seasoning to be pumped to the injector 13 and into the popping chamber 6. For the purpose of controlling the valve 219, its valve stem 222 extends through the valve body 216 vertically to an overhead frame 223. The valve 219 is below its valve seat 224 so that it is closed when it is pulled up.

On the overhead frame 223 is journalled an oscillating shaft 226 on which is a crank arm 227, the outer end of which latter is pivoted on a collar 228 slidable on the valve stem 222. A coil spring 229 around the upper end of the valve stem 222 above said collar 228 and bearing against stop nuts 231 normally urges the collar 228 downwardly. The valve 219 remains open by action of a coil spring 220 bearing against the valve 219 downwardly. When the oscillating shaft 226 is rocked so as to swing the crank arm 227 upwardly, the valve stem 222 is pulled up to close the valve 219 and allow seasoning to pass to the injector 13.

The amount of seasoning injected depends on the period for which the valve 219 is held closed. This is determined by the mechanism shown in Figs. 22 to 25 inclusive.

On the overhead frame 223 is journalled a drive shaft 232 made, in this illustration, in a pair of sections suitably coupled together. The shaft section 233 adjacent the pump shaft 212 has worm threads thereon for driving a gear 234 fastened on the pump shaft 212. On the outer end of the other section of the shaft 232 is a suitable pulley 236 for transmission connection with the prime motor of the machine.

Between the oscillating shaft 226 and the drive shaft 232 and parallel therewith is journalled a screw shaft 237 driven by transmission gearing 238 from the drive shaft 232. Between the screw shaft 237 and the drive shaft 232 and parallel therewith is a fixed guide rod 239 mounted on the overhead frame 223. On the guide rod 239 is guided a traveler circuit breaker 241. On the overhead frame 223 and along said shafts are arranged a solenoid S5 and a normally resiliently closed microswitch 242 along one side of the drive shaft 232, and a microswitch 243 adjacent the oscillating shaft 226 normally held open in the initial position of said oscillating shaft 226. The solenoid S5 has on its armature a yoke lever 244 which extends across and above said shafts and is pivotally connected to an arm 246 on the oscillating shaft 226 so as to rock said oscillating shaft 226 in a clockwise direction viewing Fig. 21, when the solenoid S5 is energized. Another arm 247 on said oscillating shaft 226 is normally or initially held spaced from the adjacent microswitch 243 so as to leave the latter open, but it closes the switch 243 when the oscillating shaft 226 is rocked by the energized solenoid S5 for closing the bypass valve 219.

A guide bar 248 is mounted on a lever arm 249 on the oscillating shaft 226. On this guide bar 248 is slidably supported an end of the base 251 of the travelling circuit breaker 241. A block 250 on middle of said base 251 has a hole 252 therein slidable on the central guide rod 239. A coil spring 253 around said guide rod 239 normally urges the traveler circuit breaker to an initial position away from the first microswitch 242. In the top of the base 251 is a semicircular threaded recess 254 which fits over the lower half of the screw shaft 237 so that when the oscillating shaft 226 is oscillated in contra clockwise direction viewing Fig. 24 to pull up the bypass valve 219, the lever arm 249 also pulls up the adjacent end of the base 251 and engages said threaded recess 254 with the rotating screw shaft 237, which latter advances the traveler circuit breaker 241 toward the first microswitch 242. A flange 256 on the end of the base 251 adjacent said first microswitch 242 is arranged to converge in the direction of said microswitch 242 and toward the drive shaft 232, so that it abuts the button 257 of the microswitch 242 at a preadjusted lateral spacing from the path of said traveling circuit breaker 241.

As it is shown in the wiring diagram in Fig. 34, the solenoid S5 is momentarily energized by the presetting and control device 27 at a predetermined moment of the cycle of popping operation. The opposite microswitch 243 is shunted across the solenoid control circuit so as to hold the solenoid circuit closed and energized after the solenoid rocked the oscillating shaft 226. The bypass valve 219 is held closed and seasoning is pumped to the injector 13 until said solenoid circuit is broken again. The first microswitch 242 is connected in series with said opposite microswitch 243 in said circuit and is normally closed, but when the flange 256 of the traveler circuit breaker 241 pushes the button 257, the microswitch 243 is opened breaking said solenoid circuit. The solenoid S5 is thus de-energized, the valve spring 220 pushes the valve and crank 227 down and rocks the oscillating shaft 226 back to its initial position. This moves the base 251 away from the screw shaft 237 and allows the coil spring 253 to return the traveler circuit breaker 241 to its initial position. The period of time elapsed during the travel of said circuit breaker 241 from said initial position to said microswitch button 257 determines accurately the quantity of seasoning pumped to the injector 13.

For adjusting this quantity the timing microswitch 242 is adjustable laterally at right angles to the path of movement of said traveling circuit breaker 241. This adjustment is accomplished by supporting the frame 258 of

the timing microswitch 242 slidably transversely of the overhead frame 223 and providing a rack 259 on the bottom of said switch frame 258 extending at right angles to the axis of the drive shaft 232. A gear 261 is engaged with said rack 259. An adjusting shaft 262 extends from the gear longitudinally of the overhead frame 223 and through an end wall 263 of the frame 223. On the outer end of the adjusting shaft 262 is an adjusting lever 264 which swings over a scale quadrant 266 which latter is graduated to indicate amounts of seasoning as shown in Fig. 22. As the adjusting lever 264 is turned to a selected position, it turns the adjusting shaft 262 and the gear 261 thereon, and thereby shifts the timing microswitch 242 into the selected relation to the traveler flange 256. The length of time of each operation of the seasoning pump, and therefore the amount of seasoning injected into the chamber 6 is thus predetermined by this relative position of the timing microswitch 242 to the traveler flange 256.

The cycle of operation of the various devices of the machine and the cycle of popping is accurately predetermined by the automatic presetting and control device 27 shown in Figs. 30 to 33 and in the wiring diagram in Fig. 34. On the top of the machine is a control frame base 267 which is slidably resting in the top control compartment 268 and is normally locked in position by a front cover plate 269 fixed at right angles to the front of the control frame base 267. On this control frame base 267 and between a pair of spaced vertical and parallel brackets are mounted a series of five resilient control switches 271, 272, 273, 274 and 275. An arm 276 of each of said switches has a roller 277 on its outer end and is resiliently urged against the periphery of an adjacent circuit breaker cam 278 so as to keep the respective switches open and closed according to the adjustment of the rotating cams 278. The cams 278 are fixed on a cam shaft 279 which is slidably journalled in spaced brackets 281 and 282 near its opposite ends. On one end of the cam shaft 279 is a friction drive disk 283. Parallel with the horizontal diameter of the disc 283 is a drive shaft 284 extended from a suitable electric motor 286, which is journalled in cross brackets 287. On the drive shaft 284 is fixed a friction wheel 288 for frictional drive engagement with the face of the drive disk 283.

At the opposite end of the cam shaft 279 is a clutch lever 289 which is pivoted at an end thereof on the bracket 281. A connecting rod 291 connects the lever 289 to the armature of a solenoid S1 so that it pulls the clutch lever 289 against the adjacent end of the cam shaft 279 when the solenoid S1 is energized. The lever is urged back to its initial position by a suitable spring 290. The lever 289 pushes the slidable cam shaft 279 so as to press the disk 283 against the rotating friction wheel 288 for rotating the cam shaft 279.

For adjustment of speed of cam rotation, the friction wheel 288 is slidably keyed on the drive shaft 284. A sliding block 292 is guided on rods 293 under a scale bar 294. A lug 296 extends from the sliding block 292 into a circumferential groove 297 in the hub of the friction wheel 288 so as to shift the friction wheel 288 along its drive shaft 284 radially with respect to the disk 283. Thus the speed of rotation of the cams 278 and the time of popping is preset by the sliding of the sliding block 292 and of the friction wheel 288 therewith to the position corresponding to the desired ratio.

Each circuit breaker cam is preferably made of a pair of generally circular disks 300 and 301. The hub 302 of one of the disks 300 of each pair is held in place on the cam shaft 279 by a set screw 303, so that it can be set in angularly selected positions with respect to the adjacent disk 300. A threaded hub 298 extends from each disk 300 oppositely to the first hub 302, and the second disk 301 is held in place thereon by a lock nut 299. The periphery of each disk 300 and 301 is cut back so as to form concentric arcuate recesses 304 through about half of said periphery. The relative angular adjustment of the adjacent disks 300 and 301 predetermines the length of a dwell 306 formed between spaced shoulders 307 at the ends of the individual peripheral recesses 304 as shown in Figs. 32 and 33. The follower roller 277 of each circuit breaker is of sufficient width to overlap the peripheries of both adjacent disks 300 and 301 so that the roller 277 will dip into the peripheral cam dwell 306 only where the individual disk recesses 304 overlap. Other times the roller 277 rides on the larger outer cam periphery. The cam dwells 306 of the series of cams 278 are angularly offset with respect to one another to determine a desired sequence of circuit operation. The length of each cam dwell 306 determines the period during which the respective circuit is actuated.

The first control switch 271 is for keeping an operating circuit closed up to the completion of a cycle, hence it is termed a cycle switch. A contact 308 on the switch arm 276 is contacted with a fixed contact 309 when the roller 277 of the cycle switch 271 dips into the cam dwell 306. Another contact 308 switches the arm over to another fixed contact 310 when the roller 277 rides on the high cam periphery and the switch arm 276 is lifted.

The other terminal switches 272, 273, 274 and 275 are normally held open, and are closed only at relative intervals when their rollers 277 dip into the respective cam dwells 306.

A suitable terminal block 305 is provided in said control unit for suitable electrical connections indicated in the wiring diagram shown in Fig. 34.

The fixed terminal 310 of each switch 271, 272, 273, 274 and 275 is connected in parallel to line 311 which leads to a supply line 312. The movable terminals or arm contacts 276 of each of the switches 272, 273, 274 and 275 are connected by lines 313 respectively to the chamber leveling solenoid S3, the hoist drum clutch solenoid S6 for pulling the corn feed gate, to the pump bypass closing solenoid S5, and to the chamber tilting solenoid S4. All the solenoids are connected to a line 314 which in turn connects through a feed line 316 to the other main line 317 preferably for 110 volts.

The order of popping operation is thus preset by the respective cams 278. The chamber leveling switch 272 is closed first to energize the solenoid S3 and to hold the lever 96, as shown in Fig. 12, so as to rotate the drive shaft 62 in contra clockwise direction viewing Fig. 6 and thus hold the chamber 6 in the initial upright or level popping position, during the time the switch 272 is held closed by its cam 278.

The next following cams 278 opposite the feed gate opening switch 273 and the pump bypass closing switch 274, are so adjusted so as to close said switches 273 and 274 respectively as soon as the cycle begins or as soon as the chamber 6 reaches its upright position, thus energizing repectively the gate hoist clutch solenoid S6 and the pump bypass actuating solenoid S5 so that the corn and seasoning are fed and injected into the chamber 6 nearly simultaneously. The cam dwells 306 of the cams 278 opposite said last switches 273 and 274 are shorter circumferentially than the cam dwell 306 opposite the leveling switch 272 so that the solenoids S5 and S6 are energized just long enough to feed the corn and seasoning into said chamber 6, and their switches 273 and 274 are opened while the chamber 6 remains in upright popping position as determined by the arcuate length of the cam dwell 306 opposite the leveling switch 272, and by the speed of rotation of the cam shaft 279.

Just as the cam 278 opens the leveling switch 272, the tilting cam 278 at the other end of the camshaft 279 has its angular dwell 306 in position to close the chamber tilting switch 275 and thereby to energize the other solenoid S4 at the selective transmission 68 for reversing the rotation of the drive shaft 62 and thereby tilting the chamber 6 into the discharge position as heretofore described.

The solenoid S2 of the conveyor drive clutch mechanism 126 is also connected to the solenoid line 314 and then in series with the gate actuated normally open micro switch 141, and the normally open measuring micro switch 124 to a connecting line 317 and a drive motor line 318 so as to be charged only when the motor line 318 is closed.

The operation of the device is dependent on the operation of the main drive motor 319 of the driving device 21 and of the cycle or timing motor 286, the operations of which latter are in turn made primarily dependent upon the proper popping temperature of the heating elements 36 and 37 of the popping chamber 6. For this purpose electricity is conducted through an operative terminal 321 of the main switch 322 and lead 323, then through line 324 to a terminal of a normally closed thermoswitch 326 at each heating coil 36 and 37. The other terminal of each thermoswitch 326 is connected in series to an electromagnetic relay 327 each of which latter is connected by a line 328 to the supply line 317. Each relay 327 closes a normally open switch 329 to close the respective heating circuit lines 331 leading from the terminals of the heating coils 36 and 37 and to connect them to a 220 volt supply line 332. The other terminals of the heating coils 36 and 37 are connected directly to the other supply line 312.

A circuit breaker 333 is connected between the line 324 and a return line 334, which latter leads to the fixed terminal 309 of the cycle switch 271, which latter controls the cycle motor 286 through its movable contacts 308 and short line 338 connected to line 339. A line 341 leads from line 339 to a terminal of the cycle motor 286. The other terminal of the cycle motor 286 is connected by a line 342 to the feed line 316.

The circuit breaker 333 is part of one of the relay controlled heating switches 329 so as to operate oppositely to the relay switch 329, namely when the heating thermoswitches 326 are closed so as to energize the magnets 327 and closes the heating switches 329, the circuit breaker 333 is open so as to prevent the starting of the clock motor 286. After the coils 36 and 37 reached popping heat and the thermoswitches 326 open to open the heating switches 329, then the circuit breaker 333 is closed to allow operation of the timing motor 286. Consequently the timing motor 286 and the controlled mechanism of the popping machine cannot be started unless and until the chamber 6 is at proper popping temperature.

The main motor 319 is also dependent on the popping heat in the chamber 6. A normally open thermoswitch 343 in said chamber 6 receives current from line 324, but has its other terminal connected by lines 344 and 346 to the electromagnet of a normally open magnetic motor switch 347. The normally open thermoswitch 343 is so adjusted that it is closed by the heat just before the heating coils 36 and 37 reach the temperature at which the heating current is shut off. The closing of the normally open thermoswitch 343 energizes and closes the magnetic motor switch 347, which latter closes the circuit through line 348 between the main motor 319 and the feed line 311. The other terminal of the main motor 319 is connected to the other feed line 316 parallel with the other circuits. This arrangement renders the main motor 319 inoperative whenever the temperature in the chamber 6 lowers below the optimum popping temperature.

The cycle switch 271 is so arranged as to coact with its cam to keep both motors operating until the current cycle is completed, but as soon as the roller 277 of this cycle switch reaches the cam dwell 306 and if at that moment there is no popping heat in the chamber 6, to stop said motor. For this purpose an auxiliary magnetic motor switch 349 is connected in the motor circuit parallel with the first motor switch 347, but the solenoid of the auxiliary switch 349 is connected by a line 351 to the line 339 and the movable contacts 308 of the cycle switch 271. When the movable contacts 308 of the cycle switch 271 are in initial position they connect the motor switch relay circuit through fixed contacts 309, line 334, switch 333 and lines 324 and 323 and through the main switch 322 to the electric current. Thus if the switch 333 is opened because of the lack of popping heat in the chamber 6 the auxiliary motor switch 349 at the end of the current cycle also opens and shuts off the motors to stop the popping operation. During the cycle of operation, however, the movable contacts 308 of the cycle switch 271 are switched over to the other fixed terminal 310 which latter is connected to the direct line 311 to hold both motor circuits closed until the completion of the cycle irrespective of the position of the switch 333 and of the heat in the chamber 6.

The cycle clutch solenoid S1 is also connected to the line 339 to be energized only when the motors are in operation.

The main switch 322 has a pair of circuit closing terminals for the pan or table heater and the lights 30 in circuits independent of the other operating circuits so that the device can be illuminated and popped corn kept warm even after the popping operation is stopped. The terminals 361 and 362 connect to a line 363 which leads to the lights 30, the other terminals of the lights 30 are suitably connected to the supply line 316. The line 363 is also connected to a suitable thermoswitch 364 which is in series with the magnet 366 of a magnetic switch 367, which latter is connected in series with the table heating coil 368 between lines 312 and 317, so as to close the circuit of said table heating coil 368 whenever the dropping of the table temperature below the preset degree causes the closing of the thermoswitch 364.

The filter device 28 includes a pair of longitudinal conduit sections 371, each of generally U-shaped cross section and having end walls 372. Along the edges of each section 371 is formed a sealing channel 373. The sealing channels 373 of the opposite sections 371 face toward one another to retain therein a suitable sealing strip 374, for instance made of hard rubber or similar sealing composition. Thus the sections 371 placed longitudinally complement one another into a closed conduit. The top section 371 has at the top of one end wall 372 an intake spout 376 to which the fume conduit 108 is connected to conduct steam and vaporized seasoning from the popping chamber 6 to the filter. At the top of the other end wall 372 of the upper section 371 is a flat outlet spout 377. Between the inlet spout 376 and outlet spout 377 and across the passage formed by said conduit sections 371 are a plurality of baffles 378 alternately spaced at their ends from the respective opposite section walls. For this purpose a series of alternate spaced baffles 378 are mounted in each conduit section 371 so that the baffles 378 protrude into the other conduit section 371 and are spaced from the opposite wall of the other conduit section 371. This forms a tortuous passage for the flow through the filter conduit.

A plurality of longitudinal channel fins 379 are provided on the outside of all the longitudinal walls of both conduit sections 371 for cooling the walls thereof and thereby to cause the precipitation of all the steam and vaporized seasoning from the air conducted from the popping chamber 6. The sections 371 are detachably held together by suitable bolts and wing nuts 381 for easy separation and cleaning.

The assembled conduit sections are held within a tubular casing 382 closed all around and at its ends. In the end of the casing 382 adjacent the inlet spout 376 is an intake 383, connected by a conduit 384 to a blower or fan 386 driven by the main motor 319. Spaced from the other end of the casing 382 is a partition wall 387 which has in it an elongated restricted air outlet slot 388 surrounding the filter outlet spout 377 so as to produce a venturi effect for drawing air through said outlet spout

377. Louvre openings 389 on the outlet end wall of the casing 382 lead from the outlet chamber formed between said partition wall 387 and the outlet end wall of the casing 382. The cold air passing through the casing 382 impinges on the fins 379 and on the walls of the filter conduit sections 371 so as to continuously cool the same and thus effect precipitation of steam and seasoning vapors. This results in the complete purification of air emitted from the otherwise closed popping chamber 6 and obviates dirt, grease and disagreeable odors otherwise caused by fumes produced in popping machines.

In operation the speed and duration of popping is determined by suitably adjusting the sliding block 292 of the timing transmission relatively to the drive disk 283. The circuit breaker cams 278 are also preadjusted to the relative duration and timing of the operation of the respective controlled devices. This adjustment is varied according to the condition and quality of the corn and according to its moisture content. For setting the machine into operation, the operator turns the main switch 322 so as to bridge the electric current from the line 311 to the table heat and light terminal 362 and to the operating circuit terminal 321. This illuminates the lights 30, heats the table heater coil 368, and through the heater thermoswitches 326 closes the chamber heating magnet switches 329 and 331 for heating the chamber 6 to the predetermined popping temperature. During this period the circuit breaker 333 is held open, hence no further operation takes place until the chamber 6 is heated to a predetermined temperature. At this first predetermined temperature the motor control thermoswitch 343 closes the main motor switch 347 to start the motor 319. The motor 319 drives the fan 386, the gear pump device 19, the selective agitator and separator drive mechanism 86, the corn conveyors 23 and 24 and the salt conveyors 117 and 118 in unison so as to measure corn and salt and get the seasoning ready for the popping operation. When the chamber 6 reaches the next temperature predetermined by the heating thermoswitches 326 the circuit breaker 333 is closed energizing the cycle solenoid S1 and starting the operation of the cams 271 to 275 inclusive, which latter actuate in sequence the respective mechanisms for the popping operation. The cycle switch 271 is switched over to the direct connection to line 311 so as to keep the motors operating and the solenoid S1 energized until a cycle is completed at which time the cam dwell 306 causes the switch 271 to switch back to the heat dependent line 334. The chamber leveling switch 272 holds the chamber 6 in the initial position through the solenoid S3 of the selective transmission device 68.

The gate actuating switch 273 energizes solenoid S6 momentarily to connect the clutch 136 to rotate the hoist drum 133 and pull the cable 132 and open the gate 128 and the hopper plate 107, at the same time to turn the salt spool 114 to dump the salt and corn simultaneously through the hopper 106 into the chamber 6. This energization of the solenoid S6 is momentary and sufficient only for dumping the measured quantity of salt and corn into the chamber 6. The solenoid S6 is held energized by the switch 273 throughout the rest of the cycle. The spring 147 returns the gate 128 and the hopper plate 107 to closed positions. The returned gate 128 opens the top microswitch 141 to deenergize the solenoid S2 and allow the conveyor and drive clutch mechanism 126 to operate the corn conveyors 23 and 24 for refilling the corn measuring chamber 121 until the measuring plate 122 closes the other microswitch 124 to again energize the solenoid S2 and disconnect the conveyor drive.

The seasoning pump switch 274 is closed almost simultaneously with the corn gate switch 273 and energizes the solenoid S5 to rock the oscillating shaft 226 to pull up and close the bypass valve 219 and also to close the normally open microswitch 243 and thus hold the solenoid S5 energized even after its cam switch 274 is opened, and to pump seasoning through the nozzle in a quantity determined by the lateral spacing adjustment of the other normally closed bypass microswitch 242, which latter, when opened by the travelling circuit breaker 241, breaks the circuit of the solenoid S5 and opens the bypass until the next actuation during the next cycle.

The tilting switch 275 is closed by its cam after a predetermined popping period to energize its solenoid S4 in the selective transmission device 68 so as to reverse the rotation of the separator shaft 67 and of the drive or wormshaft 62 and to move the sleeve 72 downwardly, tilt the chamber 6 and hold it in tilted position for a predetermined period to the end of the cycle. This also causes the vibration of the agitator 7 in the chamber 6 for shaking the popped corn out of the chamber 6 and into the rotating separator screen 9 from where the popped corn is discharged unto the heated table 2. After a period predetermined by the relative settings of the cams the tilting switch 275 is opened, the chamber leveling switch 272 is closed and causes the return of the chamber 6 to the initial level position ready for another cycle of operation.

During the above described operation the salt conveyor feeds salt to the measuring device, the corn agitator in the corn bin agitates the corn to cause it to flow into the vertical corn conveyor 23, and the fan or blower 386 blows air through the outer casing 382 and around the filter sections 371 to draw and purify the chamber exhaust. The entire popping operation is fully automatic and accurately timed to the condition of the corn to accomplish full and complete popping at comparatively low constant temperature.

After sufficient amount of popped corn has been accumulated on the heated table 2, the operator turns the main switch 322 so as to disconnect the operating terminal 321 but connect the current through the auxiliary terminal 361 to the illuminating lights 30 and to the table heater control switch 364 so as to keep the machine illuminated and the popped corn warm. By reason of the insulation of the corn bin from heat and its exposure to the intake air circulating to the fan or blower, the corn bin is kept cool and the corn is not dried out therein, thus the storage of a comparatively large volume of corn is permitted, which allows automatic operation for comparatively long periods without readjustments.

Button switches 391 are shunted across the solenoid lines 313 for emergency operation of either of the respective devices as may be needed for servicing or testing. A motor relay switch 392 is provided in line 346 for manual control of the main motor 319 when needed for testing. A manual switch 393 in line 324 is for manual turning off of the chamber heating coil circuit in emergency.

The machine is easily adjusted for various popping conditions and requires only periodic refilling with corn, salt and seasoning, and removal of collected unpopped kernels, otherwise operates continuously, automatically and uniformly.

We claim:

1. In a corn popping machine, a heated dispensing table, a compartment above said table, a substantially closed popping chamber in said compartment, a corn bin below said table, and means to transfer measured quantities of corn from said corn bin into said popping chamber at predetermined intervals, a rotating separator screen between said chamber and said table, a device to rotate said separator screen so as to feed popped corn onto said table, means to conduct particles falling through the screen away from said table, and means selectively actuated by said rotating device for holding the chamber in popping position and for tilting the chamber for dumping the corn into said rotating screen.

2. In a corn popping machine, a heated dispensing table, a compartment above said table, a substantially closed popping chamber in said compartment, a corn bin below said table, and means to transfer measured

quantities of corn from said corn bin into said popping chamber at predetermined intervals, a rotating separator screen below said chamber and above said table with an intake opening facing toward said chamber to receive popped corn from said chamber, a device to rotate said separator screen so as to feed popped corn onto said table, means to conduct particles falling through the screen away from said table, and means selectively actuated by said rotating device for holding the chamber in popping position and for tilting the chamber for dumping the corn into said rotating screen, an agitating device in said chamber to agitate the corn therein, a drive connection between said agitating device and said screen rotating device, said screen rotating device being reversible, a connecting mechanism between said drive connection and said chamber, including a holding and tilting device for causing the chamber to move and to maintain said chamber in popping position during the rotation of said rotating device in one direction and to tilt said chamber toward said screen during the rotation of said rotating device in the reversed direction.

3. In a corn popping machine, a heated dispensing table, a compartment above said table, a substantially closed popping chamber in said compartment, a corn bin below said table, and means to transfer measured quantities of corn from said corn bin into said popping chamber at predetermined intervals, a rotating separator screen below said chamber and above said table with an intake opening facing toward said chamber to receive popped corn from said chamber, a device to rotate said separator screen so as to feed popped corn onto said table, means to conduct particles falling through the screen away from said table, and means selectively actuated by said rotating device for holding the chamber in popping position and for tilting the chamber for dumping the corn into said rotating screen, an agitating device in said chamber to agitate the corn therein, a drive connection between said agitating device and said screen rotating device, said screen rotating device being reversible, a connecting mechanism between said drive connection and said chamber, holding and tilting device for causing the latter to move and to maintain said chamber in popping position during the rotation of said rotating device in one direction and to tilt said chamber toward said screen during the rotation of said rotating device in the reversed direction, and means actuated by the reversed rotation of said agitator to impart intermittent shocks to said agitator and said chamber for freeing the corn from the tilted chamber.

4. In a corn popping machine, a heated dispensing table, a compartment above said table, a substantially closed popping chamber in said compartment, a corn bin below said table, and means to transfer measured quantities of corn from said corn bin into said popping chamber at predetermined intervals, said tranasfer means including a corn measuring and dispensing device, conveyor devices to carry corn to said measuring and dispensing device, and electrical control means actuated by a predetermined amount of corn in said measuring device to render said conveyor device inoperative while said predetermined amount of corn is within said corn measuring device, a dumping gate on said measuring device, means to open said dumping gate at predetermined intervals, and an electrical control device actuated by the opening of said dumping gate to render said corn conveyor device temporarily inoperative until the return of the gate to its closed position.

5. In a corn popping machine, a heated dispensing table, a compartment above said table, a substantially closed popping chamber in said compartment, a corn bin below said table, and means to transfer measured quantities of corn from said corn bin into said popping chamber at predetermined intervals, said popping chamber having a normally covered opening on a side thereof, means to tilt said chamber at predetermined intervals for uncovering said opening and for discharging the popped corn therethrough, a corn measuring device adapted to introduce a measured quantity of corn into said chamber at predetermined intervals, corn conveyors to feed corn to said corn measuring device, and means actuated in synchronism with said tilting means to render said conveyors in operative while said chamber is tilted.

6. In a corn popping device, a substantially closed heated popping chamber, means to tiltably support said chamber, said chamber having openings thereon for the introduction and discharge of corn, a relatively stationary shield covering said openings in the popping position of the chamber, said chamber being in sliding contact with said shield so as to move relatively to said shield, corn feeding and measuring means coacting with said shield for introducing a predetermined quantity of corn into said chamber everytime the chamber is returned to its initial popping position, said discharge opening moving out from under said shield when the chamber is tilted for discharging popped corn therefrom.

7. In a corn popping device, a substantially closed heated popping chamber, means to tiltably support said chamber, said chamber having openings thereon for the introduction and discharge of corn, a relatively stationary shield covering said openings in the popping position of the chamber, said chamber being in sliding contact with said shield so as to move relatively to said shield, corn feeding and measuring means coacting with said shield for introducing a predetermined quantity of corn into said chamber everytime the chamber is returned to its initial popping position, said discharge opening moving out from under said shield when the chamber is tilted for discharging popped corn therefrom, and agitating means in said chamber operating to shake loose the popped corn from said chamber.

8. In a corn popping machine, a substantially closed heated popping chamber, means to tiltably support said chamber from an initial poping position to a discharging position, means to introduce a measured quantity of corn into said chamber everytime it is returned into its initial position, a rotating agitator in said chamber for agitating the corn, a reversible driving mechanism for rotating said agitator selectively in opposite directions, said driving mechanism including a shaft, a traveler element on the shaft adapted to travel in one direction axially of said shaft when said shaft rotates in one direction and travel in opposite direction when the rotation of said shaft is reversed, connecting elements between said traveler element and said chamber for turning said chamber into said initial popping position when said traveler travels in one direction and to tilt said chamber in said discharging position when said traveler travels in the opposite direction, and means to predetermine the stroke of travel of said traveling element in both directions.

9. In a corn popping machine, a substantially closed heated popping chamber, means to tiltably support said chamber from an initial popping position to a discharging position; means to introduce a measured quantity of corn into said chamber every time it is returned into its initial position, a rotating agitator in said chamber for agitating the corn, a reversible driving mechanism for rotating said agitator selectively in opposite directions, and coacting means connecting said driving mechanism to said chamber for moving said chamber to said initial position when said driving mechanism is rotated in one directon and to tilt said chamber to said discharge position when said driving mechanism is rotated in the opposite direction, said chamber having a heated bottom, said agitator including a bearing extended through said bottom, an agitator shaft supported in said bearing, an agitator head on the inner portion of said shaft within said chamber, and agitator arms extended from said head and generally radially along the surface of said chamber bottom, a drive sleeve on said agitator shaft driven by said reversible drive mechanism and drivingly connected to said agitator

head, resiliently yieldable connection between said agitator head and said shaft to rotate said shaft with said head, and a catch device related to said chamber bottom for engaging said shaft and holding it against rotation when said chamber is in tilted position, and means on portion of the shaft at said resiliently yieldable connection to cause intermittent shaking of said agitator as he agitator rides relatively to said stationarily held shaft thereby to loosen and discharge popped corn from the tilted chamber.

10. In a corn popping device, a substantially closed heated popping chamber having openings thereon for the introduction and discharge of corn, means to support said chamber tiltably from an initial popping position to a discharge position, a relatively stationary shield for covering said openings in the initial popping position of said chamber, said discharge opening being uncovered when said chamber is tilted to the discharge position, a corn measuring and feeding device for introducing a measured quantity of corn through said openings, said last mentioned device including a measuring chamber, means to feed corn into said measuring chamber, means to stop said feeding means after a predetermined amount of corn is fed into said measuring chamber, and a gate device on said measuring chamber and on said shield actuated in synchronism for releasing said predetermined amount of corn into said popping chamber.

11. In a corn popping device, a substantially closed heated popping chamber having openings thereon for the introduction and discharge of corn, means to support said chamber tiltably from an initial popping position to a discharge position, a relatively stationary shield for covering said openings in the initial popping position of said chamber, said discharge opening being uncovered when said chamber is tilted to the discharge position, a corn measuring and feeding device for introducing a measured quantity of corn through said openings, said last mentioned device including a corn measuring chamber, means to feed corn into said measuring chamber, a freely swingable element in said measuring chamber being adapted to be lifted by the corn fed into said measuring chamber, means actuated by said swingable element in a predetermined lifted position thereof to stop the feeding of corn into said measuring chamber, and normally closed gate means actuated in synchronism to release the measured corn from said measuring chamber and to introduce it into said popping chamber.

12. In a corn popping device, a substantially closed heated popping chamber having openings thereon for the introduction and discharge of corn, means to support said chamber tiltably from an initial popping position to a discharge position, a relatively stationary shield for covering said openings in the initial popping position of said chamber, said discharge opening being uncovered when said chamber is tilted to the discharge position, a corn measuring and feeding device for introducing a measured quantity of corn through said openings, said last mentioned device including a corn measuring chamber, means to feed corn into said measuring chamber, a freely movable element in said measuring chamber being adapted to be moved in accordance with the quantity of corn in said measuring chamber, electrically controlled mechanism to operate said corn feeding means, a circuit control device operated by said movable element in a predetermined lifted position thereof to actuate said electrically controlled mechanism for stopping the feeding of corn to said measuring chamber, and synchronized gate means on said measuring chamber and on said shield for releasing said measured quantity of corn from said measuring chamber into said popping chamber.

13. In a corn popping device, a substantially closed heated popping chamber having openings thereon for the introduction and discharge of corn, means to support said chamber tiltably from an initial popping position to a discharge position, a relatively stationary shield for covering said openings in the initial popping position of said chamber, said discharge opening being uncovered when said chamber is tilted to the discharge position, a corn measuring and feeding device for introducing a measured quantity of corn through said openings, said last mentioned device including a corn measuring chamber, conveyor means to carry corn to said measuring chamber, transmission means to impart power to said conveyor means, an electrically controlled clutch mechanism to control said transmission means, a freely swingable element in said measuring chamber being lifted by the corn introduced into said measuring chamber, a circuit breaker device connected in series with the electrical control of said clutch mechanism and actuated by said swingable element in a predetermined lifted position thereof to disconnect said transmission means and render said conveyor means inoperative after a predetermined quantity of corn is fed into said measuring chamber, and synchronized gate means for releasing said measured quantity of corn from said measuring chamber into said popping chamber.

14. In a corn popping device, a subtsantially closed heated popping chamber having openings thereon for the introduction and discharge of corn, means to support said chamber tiltably from an initial popping position to a discharge position, a relatively stationary shield for covering said openings in the initial popping position of said chamber, said discharge opening being uncovered when said chamber is tilted to the discharge position, a corn measuring and feeding device for introducing a measured quantity of corn through said openings, said last mentioned device including a corn measuring chamber, conveyor means to carry corn to said measuring chamber, transmission means to impart power to said conveyor means, an electrically controlled clutch mechanism to control said transmission means, a freely swingable element in said measuring chamber being lifted by the corn introduced into said measuring chamber, a circuit breaker device connected in series with the electrical control of said clutch mechanism and actuated by said swingable element in a predetermined lifted position thereof to disconnect said transmission means and render said conveyor means inoperative after a predetermined quantity of corn is fed into said measuring chamber, and coacting gates on said measuring chamber and on said shield for releasing the measured quantity of corn from said measuring chamber into said popping chamber, means to open and close said gates at predetermined intervals, a second circuit breaker device in series with the electrical control of said clutch mechanism and coacting with said gates to keep said transmission means and said conveyor means inoperative while said gates are open and permit operation after said gates are closed.

15. In a corn popping device, a substantially closed heated popping chamber having openings thereon for the introduction and discharge of corn, means to support said chamber tiltably from an initial popping position to a discharge position, a relatively stationary shield for covering said openings in the initial popping position of said chamber, said discharge opening being uncovered when said chamber is tilted to the discharge position, a corn measuring and feeding device for introducing a measured quantity of corn through said openings, said last mentioned device including a measuring chamber, means to feed corn into said measuring chamber, means to stop said feeding means after a predetermined amount of corn is fed into said measuring chamber, and a gate device on said measuring chamber and on said shield actuated in synchronism for releasing said predetermined amount of corn into said popping chamber, and a salt measuring device including a salt hopper, a rotating measuring drum forming the outlet of said hopper and having a measuring pocket for receiving salt from said hopper, said measuring drum being aligned with said measuring chamber to discharge the salt from said pocket into said

measuring chamber, and connecting means between said drum and said gate device for turning said pocket to said measuring chamber substantially in synchronism with the operation of said gate device for simultaneous introduction of the corn and said salt into said popping chamber.

16. In a corn popping machine, a dispensing table, a corn popping device above the table, a corn bin below table, and a conveyor device to carry corn from the bin to said corn popping device, said conveyor device including an endless tubular passage, an outlet at the upper portion of said passage, an endless flexible line in said passage, a plurality of spaced carrier elements on said flexible line extending across said passage and forming carrying compartments therebetween discharging into said outlet, an inlet in the portion of the passage wherein the conveyor moves upwardly adjacent said corn bin, and means to drive said conveyor device, a corn measuring device adapted to introduce intermittently a measured quantity of corn into said popping device, a transfer conveyor leading from the outlet of said tubular passage into said measuring device, and means actuated by a predetermined quantity of corn in said measuring device for stopping the operation of said conveyors.

17. In a corn popping machine, a tiltable corn popping chamber, a conveyor and transfer device to convey and feed corn into said chamber, a mechanism for tilting said chamber after a predetermined period of popping for discharging popped corn therefrom, driving transmission between said tilting mechanism and said conveyor and transfer device, and means to render said driving connection inoperative when said chamber is tilted by said tilting mechanism.

18. In a corn popping machine, a tiltable corn popping chamber, a rotating agitator device in said chamber for agitating the corn therein, a reversible driving mechanism for rotating said agitator device selectively in opposite directions, a tilting mechanism between said chamber and said driving mechanism for normally holding said chamber in popping position and for tilting said chamber when the rotation of said driving mechanism is reversed for discharging popped corn from said chamber, a conveyor and transfer device for carrying corn to said chamber, driving transmission between said agitator driving mechanism and said conveyor and transfer device, and a slip clutch forming part of said driving transmission being adapted to transmit power when said driving mechanism holds said chamber in said popping position and to become inoperative when said driving mechanism is reversed.

19. In a corn popping machine a tiltable popping chamber, an agaitator drive shaft below the chamber for rotating said agaitator, a reversible drive mechanism for selectively rotating said drive shaft in opposite directions, a connecting device between said drive shaft and said chamber for holding said chamber in popping position when said drive shaft is rotated in one direction and to tilt said chamber into discharge position when said drive shaft is rotated in the reversed direction, and a rotating separator screen on said drive shaft and below the discharge position of said chamber adapted to receive popped corn discharged from said chamber.

20. In a corn popping machine a tiltable popping chamber, an agitator drive shaft below the chamber for rotating said agitator, a reversible drive mechanism for selectively rotating said drive shaft in opposite directions, a connecting device between said drive shaft and said chamber for holding said chamber in popping position when said drive shaft is rotated in one direction and to tilt said chamber into discharge position when said drive shaft is rotated in the reversed direction, and a rotating separator screen on said drive shaft and below the discharge position of said chamber adapted to receive popped corn discharged from said chamber, a removable telescoping shaft section forming the portion of said drive shaft for said separator screen, and resiliently yieldable means to urge said telescoping shaft section into driving engagement with the adjacent positions of said drive shaft.

21. In a corn popping machine the combination with a corn popping chamber, and an inlet nozzle for introducing seasoning into said chamber; of a pump, a feed conduit to conduct seasoning from the pump to the inlet nozzle, a bypass valve interconnected in said conduit, resilient means for holding said valve open for normally bypassing the seasoning away from said conduit, and a device for closing said bypass for a preedtermined period for conveying a predetermined amount of seasoning through said conduit and into said nozzle and chamber; said last mentioned device including an actuating element connected to the valve being movable for closing said bypass valve, operating means for moving said actuating element and holding it in valve closing position, and a timing device, operated in synchronism with the pump to discontinue the action of said operating means after a predetermined period to permit the opening of said bypass valve.

22. In a corn popping machine the combination with a corn popping chamber, and an inlet nozzle for introducing seasoning into said chamber; of a pump, a feed conduit to conduct seasoning from the pump to the inlet nozzle, a bypass valve interconnected in said conduit, resilient means for holding said valve open for normally bypassing the seasoning away from said conduit, and a device for closing said bypass for a predetermined period for conveying a predetermined amount of seasoning through said conduit and into said nozzle and chamber; said last mentioned device including a rocking element connected to said valve and being adapted to close said valve when rocked against the action of said resilient means, a solenoid engaging said rocking element and rocking it into valve closing position when said solenoid is energized, a normally closed circuit breaker in series with the electric circuit of said solenoid, a traveler circuit breaker actuator, means to engage and shift said actuator toward said circuit breaker while said rocking element is in valve closing position, adjustably coacting means on said actuator and on said circuit breaker to open said circuit breaker and de-energize said solenoid when said actuator reaches to said circuit breaker, and yieldable means to return said actuator to an initial position away from said circuit breaker when said solenoid is de-energized.

23. In a corn popping machine the combination with a corn popping chamber, and an inlet nozzle for introducing seasoning into said chamber; of a pump, a feed conduit to conduct seasoning from the pump to the inlet nozzle, a bypass valve interconnected in said conduit, resilient means for holding said valve open for normally bypassing the seasoning away from said conduit, and a device for closing said bypass for a predetermined period for conveying a predetermined amount of seasoning through said conduit and into said nozzle and chamber; said last mentioned device including a rocking element connected to said valve and being adapted to close said valve when rocked against the action of said resilient means, a solenoid engaging said rocking element and rocking it into valve closing position when said solenoid is energized, a normally closed circuit breaker in series with the electric circuit of said solenoid, a traveler circuit breaker actuator, means to engage and shift said actuator toward said circuit breaker while said rocking element is in valve closing position, adjustably coacting means on said actuator and on said circuit breaker to open said circuit breaker and de-energize said solenoid when said actuator reaches to said circuit breaker, and yieldable means to return said actuator to an initial position away from said circuit breaker when said solenoid is de-energied, and a normally open circuit breaker in series with said first circuit breaker and closed by the rocking of said rocking element by said solenoid to valve closing

position to keep the solenoid energized until said first circuit breaker is opened.

24. In a corn popping machine the combination with a corn popping chamber, and an inlet nozzle for introducing seasoning into said chamber; of a pump, a feed conduit to conduct seasoning form the pump to the inlet nozzle, a by pass valve interconnected in said conduit, resilient means for holding said valve open for normally by passing the seasoning away from said conduit, and a device for closing said by pass for a predetermined period for conveying a predetermined amount of seasoning through said conduit and into said nozzle and chamber; said last mentioned device including a frame, a transmission shaft journalled on the frame and drivingly connected to said pump, a threaded shaft journalled in the frame and rotated in synchronism with said transmission shaft, a guide parallel with said threaded shaft, a rocking element connected to said by pass valve for closing said valve when rocked against the action of said resilient means, a solenoid, connecting means between the solenoid and said rocking element to rock said element when said solenoid is energized, a normally closed switch in series with said solenoid, a switch actuator traveling on said guide and pivotally connected to said rocking element, a coacting element on said switch actuator for engaging said threaded shaft when said rocking element is rocked to valve closing position so as to move said switch actuator along said guide shaft and toward said switch to engage and open said switch for de-energizing said solenoid, means to adjust the position of said switch relatively to said actuator to predetermine the period of actuator travel up to the opening of said switch, and resilient means to urge said traveler actuator to return to its initial position when released from said threaded shaft.

25. In a corn popping machine the combination with a corn popping chamber, and an inlet nozzle for introducing seasoning into said chamber; of a pump, a feed conduit to conduct seasoning from the pump to the inlet nozzle, a by pass valve interconnected in said conduit, resilient means for holding said valve open for normally by passing the seasoning away from said conduit, and a device for closing said by pass for a predetermined period for conveying a predetermined amount of seasoning though said conduit and into said nozzle and chamber; said last mentioned device including a frame, a transmission shaft journalled on the frame and drivingly connected to said pump, a threaded shaft journalled in the frame and rotated in synchronism with said transmission shaft, a guide parallel with said threaded shaft, a rocking element connected to said by pass valve for closing said valve when rocked against the action of said resilient means, a solenoid, connecting means between the solenoid and said rocking element to rock said element when said solenoid is energized, a normally closed switch in series with said solenoid, a switch actuator traveling on said guide and pivotally connected to said rocking element, a coacting element on said switch actuator for engaging said threaded shaft when said rocking element is rocked to valve closing position so as to move said switch actuator along said guide shaft and toward said switch to engage and open said switch for de-energizing said solenoid, means to adjust the position of said switch relatively to said actuator to predetermine the period of actuator travel up to the opening of said switch, and resilient means to urge said traveler actuator to return to its initial position when released from said threaded shaft, and a second normally open switch in series with said first switch being closed by the rocking element when the latter is rocked into valve closing position to keep the solenoid circuit closed during said travel period.

26. In a corn popping machine, a casing, a heated table dividing the casing into an upper compartment and a lower compartment, a corn bin in the lower compartment, a bin for unpopped kernels in the lower compartment, a seasoning vessel and pumping device in said lower compartment, a heated popping chamber tiltably supported in the upper compartment above said table, said popping chamber having a spherical dome, a stationary shield engaging the top and a side of said dome relatively slidably, said dome having inlet and discharge openings at the top and said side thereof normally covered by said shield, a hopper on said shield opposite said inlet opening, a corn measuring device aligned with said hopper, a gate device connected to said measuring device to release the corn from said measuring device into said hopper and chamber, conveyor means to carry corn from said bin to said measuring device, a salt measuring device, coacting with said corn measuring device and operated by said gate device to dispense a measured quantity of salt through said corn measuring device and said hopper substantially simultaneously with the release of the measured corn by said gate device, a rotating agitator in said chamber, a drive shaft under the chamber drivingly connected to said agitator, a transmission device to transmit rotation to said drive shaft, a selective clutch mechanism to rotate said transmission device in opposite directions, solenoids actuating said selective clutch mechanism, a chamber turning device connected to and operated by said drive shaft for turning said chamber into popping position when the drive shaft is rotated in one direction and for turning the chamber to tilted discharging position when said drive shaft is rotated in reverse direction, a rotating separator screen on said drive shaft between said chamber and said table being inclined upwardly to receive popped corn from the tilted chamber and to feed the popped corn onto said table, a conduit covering the lower portion of the periphery of said separator screen and leading to said bin for the unpopped corn to conduct chaff and unpopped kernels from said screen to said last bin, a seasoning feed nozzle on said shield opposite the top chamber opening, a conduit connecting said seasoning pumping device to said nozzle, means to normally by pass seasoning from said seasoning conduit, a solenoid actuated mechanism to close said by pass means and to pass seasoning through said seasoning conduit for a predetermined period, a conveyor drive transmission, means to drivingly connect said conveyor drive transmission to said selective transmission so as to transmit rotation only when said selective transmission rotates said drive shaft to turn said chamber to popping position and prevent transmission of rotation to said conveyor drive transmission when said shaft rotation is reversed for tilting said chamber, electrical control actuated by a predetermined quantity of corn in said measuring device to stop the operation of said conveyor means, an electrically actuated device to open said gate device, a precipitating filter on said casing, a conduit connecting said shield hopper to said filter to conduct vapor and fumes away from said chamber, forced air circulating means in the lower compartment connected to said filter to pass cooling air therethrough, and adjustable control unit on said casing for controlling the electric circuits of said solenoids and said electrically operated devices, said control unit including a switch for each of the solenoids of the reversible selective transmission, for the solenoid of the seasoning by pass closing mechanism, for the electrical control of the measuring gate device, and a synchronized preset cam device to operate said switches in a predetermined sequence for predetermined periods.

27. In a corn popping machine, a casing, a heated table dividing the casing into an upper compartment and a lower compartment, a corn bin in the lower compartment, a bin for unpopped kernels in the lower compartment, a seasoning vessel and pumping device in said lower compartment, a heated popping chamber tiltably supported in the upper compartment above said table, said popping chamber having a spherical dome, a stationary shield engaging the top and a side of said dome relatively slidably, said dome having inlet and discharge openings at the top and said side thereof normally covered by said

shield, a hopper on said shield opposite said inlet opening, a corn measuring device aligned with said hopper, a gate device connected to said measuring device to release the corn from said measuring device into said hopper and chamber, conveyor means to carry corn from said bin to said measuring device, a salt measuring device coacting with said corn measuring device and operated by said gate device to dispense a measured quantity of salt through said corn measuring device and said hopper substantially simultaneously with the release of the measured corn by said gate device, a rotating agitator in said chamber, a drive shaft under the chamber drivingly connected to said agitator, a transmission device to transmit rotation to said drive shaft, a selective clutch mechanism to rotate said transmission device in opposite directions, solenoids actuating said selective clutch mechanism, a chamber turning device connected to and operated by said drive shaft for turning said chamber into popping position when the drive shaft is rotated in one direction and for turning the chamber to tilted discharging position when said drive shaft is rotated in reverse direction, a rotating separator screen on said drive shaft between said chamber and said table being inclined upwardly to receive popped corn from the tilted chamber and to feed the popped corn onto said table, a conduit covering the lower portion of the periphery of said separator screen and leading to said bin for the unpopped corn to conduct chaff and unpopped kernels from said screen to said last bin, a seasoning feed nozzle on said shield opposite the top chamber opening, a conduit connecting said seasoning pumping device to said nozzle, means to normally by pass seasoning from said seasoning conduit, a solenoid actuated mechanism to close said by pass means and to pass seasoning through said seasoning conduit for a predetermined period, a conveyor drive transmission, means to drivingly connect said conveyor drive transmission to said selective transmission so as to transmit rotation only when said selective transmission rotates said drive shaft to turn said chamber to popping position and prevent transmission of rotation to said conveyor drive transmission when said shaft rotation is reversed for tilting said chamber, electrical control actuated by a predetermined quantity of corn in said measuring device to stop the operation of said conveyor means, an electrically actuated device to open said gate device, a precipitating filter on said casing, a conduit connecting said shield hopper to said filter to conduct vapor and fumes away from said chamber, forced air circulating means in the lower compartment connected to said filter to pass cooling air therethrough, and adjustable control unit on said casing for controlling the electric circuits of said solenoids and said electrically operated devices, said control unit including a switch for each of the solenoids of the reversible selective transmission, for the solenoid of the seasoning by pass closing mechanism, for the electrical control of the measuring gate device, and a synchronized preset cam device to operate said switches in a predetermined sequence for predetermined periods, an electrical heating circuit for maintaining said popping chamber at constant temperature, and means controlled by the temperature in said popping chamber to render said cam device and said electric devices inoperative below a predetermined popping temperature in said chamber; and an auxiliary circuit control closed by the operation of said cam device to keep said cam device and said electric devices operating only while the popping of the corn in said chamber is completed and said popped corn is discharged from said chamber before any stopping of operation.

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