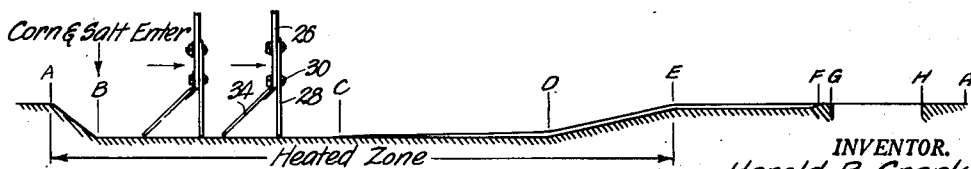
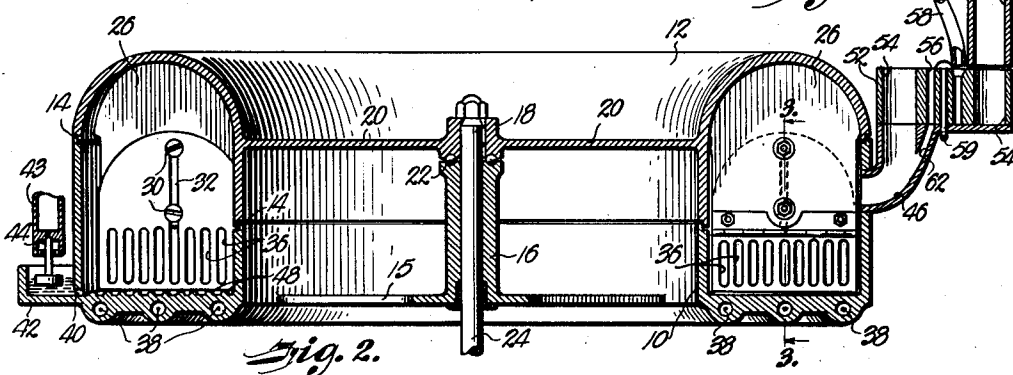
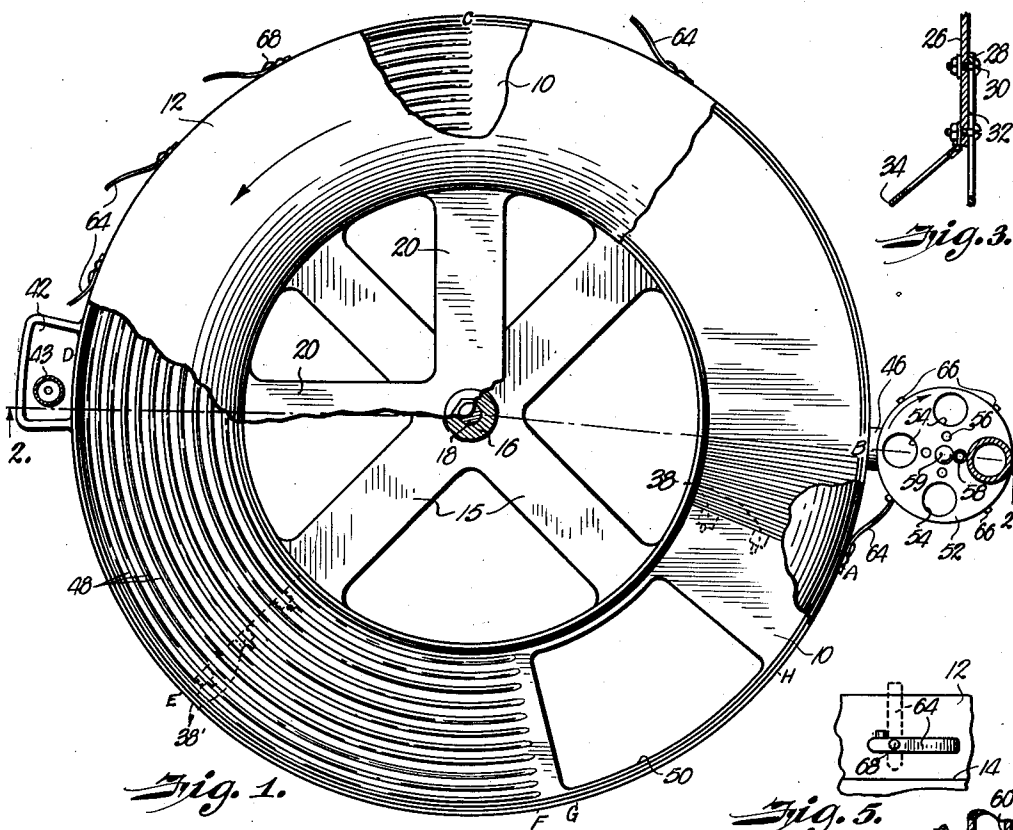


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H. R. CRANK
POPPING OF CORN

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POPPING OF CORN

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1

The present invention relates in general to the popping of corn and it deals more particularly with automatic apparatus for performing the popping operation on a more or less continuous basis.

Broadly speaking, it is the object of the invention to provide an improved automatic corn popping machine which is comparatively simple yet durable in construction, which is economical to manufacture and operate, and which is very efficient and trouble-free in operation.

Another object is to provide an automatic machine of this character adapted to deliver fresh uniformly popped, properly seasoned corn at any desired rate in order to meet varying demands; according to one feature of the invention the rate of output of the machine may be varied over a wide range with no change whatever in the uniformity of popping.

Another object of this invention is to provide a machine wherein the raw kernels are heated in hot oil or a like material to induce popping and properly season the product, the kernels being removed from the seasoning material when popped, however, to prevent undue soaking thereof.

An important feature of the invention resides in the means provided for automatically introducing raw corn into the popping chamber at the desired rate; another feature resides in the introduction of salt or the like with the corn.

Other and further objects together with the novel features of construction will appear in the course of the following description of the invention.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals are employed to indicate like parts of the various views:

Fig. 1 is a plan view of my corn popping machine with parts broken away for purposes of illustration.

Fig. 2 is a vertical cross section taken along lines 2—2 of Fig. 1 in the direction of the arrows.

Fig. 3 is a vertical cross section taken along lines 3—3 of Fig. 2 in the direction of the arrows.

Fig. 4 is a developed view schematically illustrating the profile of the bottom of the popper, a pair of the corn propelling members also being shown, and

Fig. 5 is a fragmentary elevational view of one of the spring pawls for actuating the charging mechanism of the popper.

Referring more particularly to the drawings,

2

my apparatus has a stationary annular trough or channel 10 in which the popping operation is performed. This may be supported in any suitable fashion, the supporting base having been omitted from the drawings in the interest of simplicity inasmuch as its construction forms no part of the present invention.

Over the pan and forming a cover therefor, is an inverted annular trough or channel 12. The downwardly extending side walls of the latter channel register with the upstanding side walls of trough 10, the two units thus being complementary to one another and together comprising a substantially enclosed annular chamber or passageway the roof of which is arched or vaulted as may best be seen in Fig. 2. It will be noted that staggered lap joints 14 are provided between the upper and lower members, the joint in the inner wall being at a lower level than the one in the outer wall.

Encircled by the chamber just described and immovably secured to pan 10 by means of radial arms 15 is a stationary central post 16; this post carries the weight of cover 12 through the medium of hub 18 and radial arms 20, the hub being supported on end bearings 22 and being keyed to a vertical shaft 24 for rotation by a suitable source of power connected to the lower end of the shaft.

The inside of the annular chamber is divided into a series of compartments by vertical partitions 26 rigidly affixed to cover 12 at uniform circumferential intervals. The partitions do not reach the floor of the chamber but each has an extension plate 28 adapted to slide along the bottom of the pan as the cover slowly turns about its central pivot. The extension plates are loosely secured to their respective partition members by screws 30 passing through the elongated central slot 32 whereby the extensions may move up and down to accommodate themselves to variations in the elevation of the pan bottom.

Each partition also has an inclined gate 34 hinged to its lower margin and adapted to trail behind the partition as the latter advances relative to the pan. Preferably the space interval between adjacent partitions is such that the trailing edge of one gate is only a short distance ahead of the vertical extension on the next partition as they travel around the pan bottom. Members 28 and 34 contain a series of parallel slots 36 as shown in Figs. 2 and 3.

Referring to Fig. 1, the cover turns in a counter-clockwise direction as indicated by the arrows, whereby the partitions travel successively

past the points or stations identified by the letters A, B, C, etc. These points correspond respectively to the similarly lettered points or stations on the profile view in Fig. 4. It will be noted that the bottom of pan 10 slopes downwardly from A to B and then is substantially level from B to D; from D to E it slopes upwardly and then again remains substantially level from E back to A.

The depressed region through which the partitions travel in moving from A to E forms a shallow basin or well in which the popping action takes place. This region is heated by electrical resistance elements 38 cast into the bottom of the pan; the ends 38' of the elements are indicated by dotted lines in Fig. 1.

Oil or other suitable liquid seasoning is introduced into the aforementioned well through an aperture 40 which communicates with a small basin 42 on the outside of the pan 10. The seasoning reaches the latter basin through pipe 43 from a reservoir, not shown, a float valve 44 being provided at the lower end of the pipe to maintain the liquid at a predetermined level in the basin. This keeps the bottom of the popping well from B to D covered with oil to a predetermined depth at all times.

Raw pop corn introduced into the popping chamber at 46, as will be explained presently, is swept or pushed slowly ahead by the partitions 26 and their extension plates 28. Advancing along the heated bottom of the well, the kernels are covered with the liquid seasoning and brought rather quickly to popping temperature.

As the popping progresses the expanded kernels fill more and more of the space between adjacent partitions 26 and consequently ride up on the trailing gate 34. In other words the raw kernels for the most part travel in the narrow gap between the trailing edge of a gate 34 and the forward face of the next following plate 28 as they are pushed along the bottom of the well by the latter; upon popping they accumulate in the space above gate 34 which assists in keeping the major proportion of the popped kernels above the surface of the oil bed in the bottom of the well.

Lifting of the popped kernels out of the oil also is assisted by circumferential ribs 48 which begin at C and increase gradually in height through the balance of the travel of the kernels. At 50 there is an aperture in the bottom of pan 10 through which the popped corn can drop out into a suitable receiving vessel or container, not shown.

The apparatus for supplying raw corn and salt to my machine is shown on the right hand side of Figs. 1 and 2. It comprises a rotary magazine 52 having large holes or pockets 54 for the corn and smaller holes or pockets 56 for the salt. Above the magazine are two ducts 58 and 60 whose lower extremities are adapted to register with a pair of the holes as shown; although not illustrated in the drawings, it will be understood that duct 58 communicates at its upper end with a hopper containing a supply of salt while duct 60 is similarly connected to a hopper containing the supply of raw corn, whereby the pockets immediately below the ducts always are kept full of salt and corn respectively.

As the magazine is turned in a clockwise direction (Fig. 1) about its central pivot pin 59, the large holes 54 are brought, one after another, into register with chute 46 so that each in turn looses its charge of corn through the chute into

the popping chamber of the machine. In the same fashion the salt is discharged from the smaller holes 56 as they pass over duct 62. The latter duct communicates with chute 56, it being apparent that each charge of corn entering the popper is accompanied by a charge of salt. Also it will be clear that as one pair of holes in the magazine lose their contents in this fashion, the diametrically opposite pair are filled from supply ducts 58 and 60.

Rotation of the magazine is effected by spring pawls 64 on the cover 12, which engage radially projecting lugs or dogs 66 on the magazine. It is thought that the mode of operation of the machine will be evident from the foregoing description. Assuming that cover 12, driven by a source of power connected to the lower end of shaft 24, is rotating slowly in the direction indicated by the arrow in Fig. 1, each pawl 64 in turn engages one of the dogs 66 and advances the magazine through 90°. Preferably there are as many pawls around cover 12 as there are partitions 26 inside the cover, the pawls being so disposed in relation to the partitions as to cause a charge of raw corn and salt to be delivered between each pair of partitions passing chute 46. Uniform measured charges thus are introduced into the popper at intervals in timed relationship to the advance of the partitions.

As previously described, the raw corn is immediately introduced into the oil in the popping well, thereupon being heated so that it pops as it travels along the pan 10, and finally is dumped through the aperture 50 into a receiving vessel therebelow. In other words, as the cover turns, raw corn is introduced almost continuously at 46 and popped corn issues almost continuously at 50. The proper amount of salt always is added with the corn, and the proper amount of oil or liquid seasoning always is maintained in the popping zone by means of supply line 42 and float valve 43.

The rate at which cover 12 turns must, of course, be so correlated with the heat supplied to the bottom of the pan by the electrical resistance elements 38 that the time of travel of the corn from inlet 46 to outlet 50 insures complete popping of the kernels without burning. Either the heat or the speed of the shaft 24, or both, may be made variable in known fashion in order to adjust the machine to the varying popping characteristics of different kinds of corn, it being understood that when the machine has been set to obtain optimum results with a given lot of raw corn the setting is not thereafter changed.

Referring to Fig. 5 it will be seen that each of the spring pawls 64 may be pivoted about its securing pin 68 to assume an upright position, shown dotted. Thus turned, the pawls will clear lugs 66 and accordingly will not advance the magazine 52. This feature is of utility in the event that the full capacity of the machine is not needed to supply the demand for popped corn. For example, by turning up alternate ones of the pawls, the magazine will be caused to introduce raw corn not between every pair of partitions but only between alternate pairs; although the cover continues to rotate at the optimum speed for most satisfactory popping, the corn then will be delivered at half the rate at which it would be delivered if all the pawls remained in operative position. Assuming that the machine has eighteen partitions, it can, by selective adjustment of the pawls 64, be made to deliver through aperture 50 eighteen charges of

5

popped corn per revolution, or any lesser number of charges down to one per revolution; and whether the machine is used at full capacity or at only part capacity, the corn delivered will be popped in a predetermined uniform manner.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinbefore set forth together with other advantages which are obvious and which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the appended claims.

Inasmuch as various embodiments of the invention may be made without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limited sense.

Having thus described the invention, I claim:

1. In a corn popping machine, an annular trough having an aperture at a particular point in its bottom, a lid covering the open top of the trough, means advancing the lid in a circular path relative to the trough while maintaining the lid in trough-covering position, an inlet through which raw corn is introduced into the trough, downwardly extending vanes on the lid adapted to engage the corn and advance same relative the bottom of the trough toward said aperture, and means for applying heat to the corn during at least a part of its travel to said aperture from said inlet whereby the corn is popped when it reaches the aperture.

2. A machine as in claim 1 including a container for the raw corn, a dispenser associated with the container to dispense the corn a predetermined amount at a time into said inlet, and means for actuating said dispenser periodically in timed relationship to the advance of the lid relative said trough.

3. A machine as in claim 2 wherein said dispenser has means for dispensing a predetermined amount of seasoning into said inlet with each charge of corn.

4. A machine as in claim 1 wherein the bottom of said trough has corrugations running parallel to the side walls of the trough.

5. A machine as in claim 1 wherein the bottom of said trough is on different levels, the lower level comprising a well through which the corn travels on route to said aperture from said inlet, and means for maintaining a bed of liquid seasoning in said well.

6. A machine as in claim 1 wherein the bottom of said trough is on different levels, the lower level comprising a well through which the corn travels on route to said aperture from said inlet, a source of liquid seasoning connected to the well, and a float valve controlling the flow of seasoning from said source to said well to maintain seasoning in the well at a predetermined depth at all times.

7. In a corn popping machine, a trough adapted to receive liquid seasoning, the bottom of the trough at one end being inclined upwardly so it emerges from the seasoning and terminates at a level above the surface of the seasoning, a series of vertical partitions subdividing the trough along its length, the lower edge of each partition being spaced above the bottom of the trough, carriage means for supporting the partitions and advancing them in a fixed horizontal path along the

6

trough, each said partition having slidably mounted thereon for vertical movement an extension partition whose lower edge travels along the bottom of the trough as said carriage means advances the partitions, means for introducing the raw corn into said trough at a point remote from said one end, whereby it is propelled by said partitions and extensions along the trough toward said one end and then up said inclined bottom, and means for applying heat to the corn as it advances thereby to pop same.

8. A machine as in claim 7 wherein each said partition has hinged to its lower edge a downwardly and rearwardly inclined gate whose trailing edge drags along the bottom of the trough as the partition advances.

9. A machine as in claim 7 wherein said partition extensions are upright perforate plates.

10. A machine as in claim 7 wherein the bottom of the trough has corrugations paralleling the side wall of the trough, said corrugations beginning at a point under the surface of the seasoning, continuing up the inclined portion of the bottom and ending above the level of said surface.

11. In a corn popping machine, a trough adapted to receive liquid seasoning, the bottom of the trough at one end being inclined upwardly so it emerges from the seasoning and terminates above the surface of the seasoning, an endless series of vanes, mechanism for advancing the vanes one after another axially of the trough toward said one end thereof while maintaining each vane upright with its lower edge moving along the bottom of the trough, each vane having a downwardly and rearwardly inclined gate whose trailing edge travels along the bottom of the trough a short distance ahead of the next succeeding vane of the series.

12. A machine as in claim 11 wherein all of said vanes and gates are perforate plates.

13. In a corn popping machine, a trough adapted to receive liquid seasoning, the bottom of the trough at one end being inclined upwardly so it emerges from the seasoning and terminates above the surface of the seasoning, an endless series of vanes, mechanism for advancing the vanes one after another axially of the trough toward said one end thereof while maintaining each vane upright with its lower edge moving along the bottom of the trough, an inlet for raw corn at a point remote from said one end of the trough, a dispenser intermittently actuated by said mechanism and effective upon each actuation to introduce a charge of raw corn into the trough through said inlet, and means for varying the frequency of actuation of said dispenser relative the speed of said vane advancing mechanism whereby said dispenser at times introduces a charge of raw corn between each pair of vanes passing said inlet and at other times introduces a charge only between selected pairs of said vanes.

14. In a corn popping machine, a trough adapted to receive liquid seasoning, the bottom of the trough at one end being inclined upwardly so it emerges from the seasoning and terminates above the surface of the seasoning, an endless series of vanes, mechanism for advancing the vanes one after another axially of the trough toward said one end thereof while maintaining each vane upright with its lower edge moving along the bottom of the trough, an inlet for raw corn at a point remote from said one end of the trough, selectively operable devices for marking any desired ones of said vanes, and means controlled by said devices for introducing a charge of raw

7

corn into the trough through said inlet as each marked vane reaches a predetermined position relative the inlet.

15. In a corn popping machine, a housing forming an elongated passageway enclosed on all sides, said passageway having an inlet for raw corn, conveyor means in said passageway including a plurality of transverse partitions positioned at longitudinally spaced intervals along the passageway and subdividing same along its length into a series of compartments, mechanism driving said conveyor means to advance said compartments past said inlet and along said passageway in continuous succession, selectively operable devices for marking any desired ones of said compartments, and means controlled by said devices to introduce a charge of raw corn into said passageway through said inlet as each marked compartment passes said inlet.

16. In a corn popping machine, a housing forming an elongated passageway, said passageway having an inlet for raw corn, conveyor means in said passageway subdividing same along its length into a series of compartments, mechanism driving said conveyor means to advance said compartments past said inlet and along said passageway in continuous succession, a dispenser intermittently actuated by said conveyor and effective upon each actuation to introduce a charge of raw corn into said passageway through said inlet, and means between the conveyor and dispenser for varying the frequency of actuation of said dispenser relative the speed of said conveyor whereby said dispenser at times introduces a charge of raw corn into each compartment as it passes said inlet and other times introduces a charge only into certain selected ones of said compartments.

17. A corn popping machine as in claim 16 having auxiliary dispenser means synchronized with said raw corn dispenser to operate at the same frequency, said last means effective upon each operation to introduce a charge of salt into said passageway.

18. In a corn popping machine, a trough, means for heating the bottom of the trough, partition means subdividing the trough along its length into a series of compartments, the bottom of the trough forming the bottom of each compartment, and each compartment having downwardly converging walls whereby its horizontal cross-sectional area is smaller at the bottom than at the top, means for advancing said partition means lengthwise of said trough, and means for introducing raw corn into said compartments as they pass a particular point in the trough whereby the corn is popped as they advance.

19. A corn popping machine as in claim 18 adapted to contain a shallow bed of liquid seasoning in said trough and wherein the bottom of the trough is corrugated.

20. In a corn popping machine, a trough adapted to receive liquid seasoning, means for heating the bottom of the trough, means for introducing raw corn into the trough and advancing same along the trough whereby it is popped as it progresses, the floor of the trough supporting the corn being corrugated, the corrugations substantially paralleling the direction of travel of the corn and the valleys between the crests of said corrugations being too small to permit any substantial part of a popped kernel from extending below the crests of the corrugations, and the crests of the corrugations being inclined upwardly in the direction of movement of the corn so

8

they emerge from the seasoning and terminate above the surface thereof.

21. A machine as in claim 20 wherein the vertical depth of the corrugations increases in the direction of movement of the corn.

22. In a corn popping machine, a generally horizontal annular trough having a bottom and concentric inner and outer side walls, a rotor turning about a vertical axis concentric with said side walls, a plurality of circumferentially spaced upright partitions in said trough subdividing same into a series of compartments of substantially uniform size, said partitions carried on said rotor whereby they advance in a circular path along said trough, the trough having a fixed inlet past which each partition in turn travels as the rotor turns, and a fixed outlet past which each partition travels after it has advanced a predetermined distance beyond said inlet, a dispenser operable to introduce raw corn into said trough through said inlet, mechanism controlled by said rotor for actuating said dispenser intermittently, said mechanism including means for varying the frequency of actuation of said dispenser relative to the speed of the rotor whereby said dispenser at times introduces a charge of raw corn between each pair of partitions passing said inlet and at other times introduces a charge only between selected pairs of said partitions, and means for applying heat to said corn as it is propelled along the trough from said inlet to said outlet by the partitions.

23. A corn popping machine as in claim 22 wherein said inlet and outlet are positioned close together in such relationship that each partition reaches the inlet substantially immediately after passing said outlet, whereby the corn entering the trough through said inlet travels along the trough nearly 360° before reaching said outlet.

24. A corn popping machine as in claim 22 wherein the bottom of said trough has a depressed section intermediate said inlet and said outlet forming a well for receiving liquid seasoning, said partitions being vertically movable on said rotor whereby their lower edges ride along the bottom of the well as they travel through the trough, said well terminating short of said outlet and the bottom thereof at said terminus being inclined upwardly in the direction of movement of the partitions so it emerges from the seasoning.

25. In a corn popping machine, a stationary generally horizontal annular trough having a bottom and concentric inner and outer side walls, a rotor turning about a vertical axis concentric with said side walls, a plurality of circumferentially spaced upright partitions in said trough subdividing same into a series of compartments of substantially uniform size, said partitions being carried by and vertically movable on said rotor whereby they advance in a circular path along said trough with their lower edges riding along the bottom of the trough as they advance, said bottom being at different levels in two regions of the trough through which the partitions pass successively and sloping upwardly in the direction of movement of the partitions from the lower level to the higher level whereby the partitions ride up said slope in advancing along said trough, the bottom of the trough at said lower level forming with the walls of the trough a well adapted to receive liquid seasoning, means for maintaining the level of the seasoning in said well below said higher level of the bottom of the trough, means for introducing raw corn into said trough between successive partitions substantially

at the point where said partitions enter said well whereby the corn is propelled by the partitions through said well and up said slope into the portion of the trough having its bottom at said higher level, said last portion of the trough having a discharge opening through which the corn is adapted to drop from the trough, and means for applying heat to said corn as it advances through said well and up said slope.

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REFERENCES CITED

The following references are of record in the file of this patent:

15

UNITED STATES PATENTS

Number	Name	Date
1,009,924	Moore	Nov. 28, 1911
1,341,748	Jacobs	June 1, 1920
1,431,438	Beier	Oct. 10, 1922
1,747,503	Carpenter	Feb. 18, 1930
1,890,737	Leweke	Dec. 13, 1932
1,938,863	Ruch	Dec. 12, 1933
2,147,335	De Fazi	Feb. 14, 1939
2,319,561	Scharsch	May 18, 1943