May 26, 1959 G. F. ERICKSON 2,888,167

CUP DISPENSER

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FIG. 1.

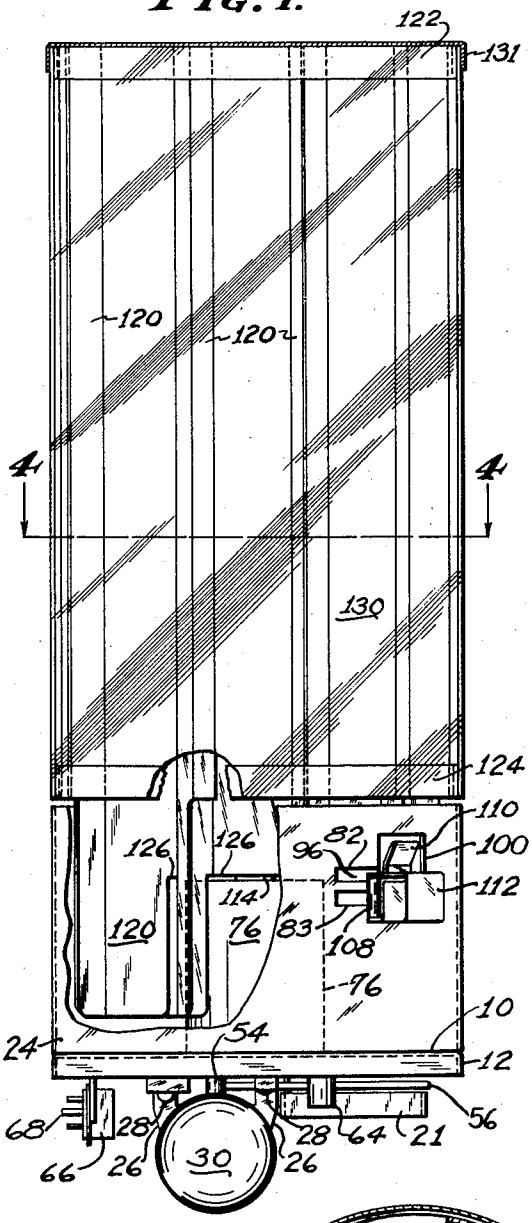
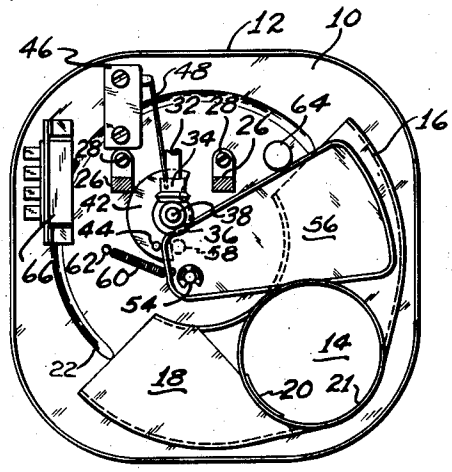


FIG. 2.



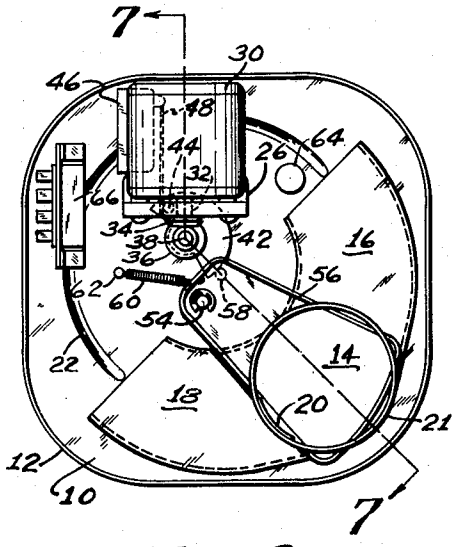


FIG. 3.

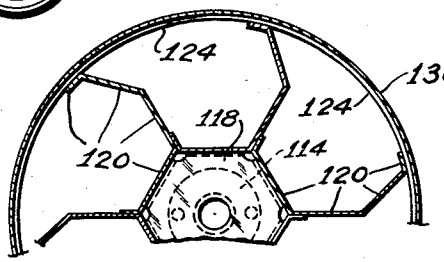


FIG. 4.

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CUP DISPENSER

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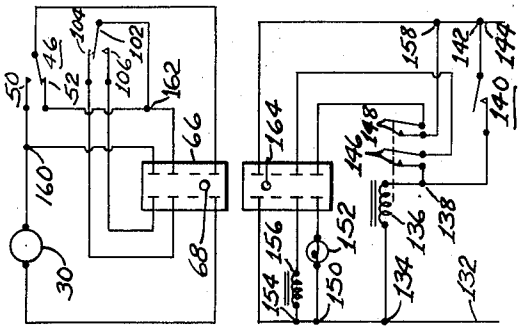


FIG. 9.

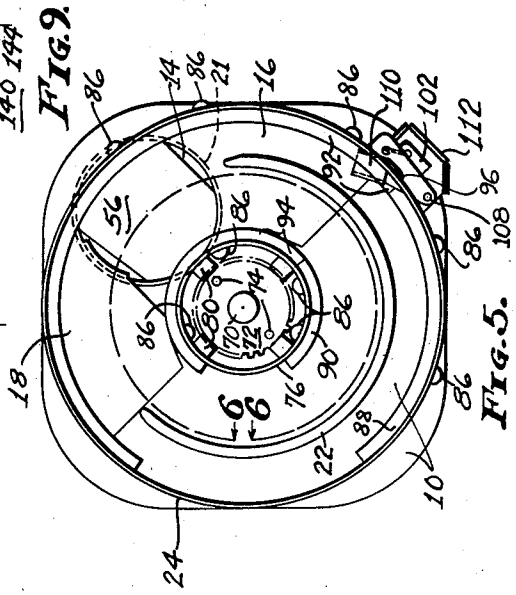


FIG. 5.

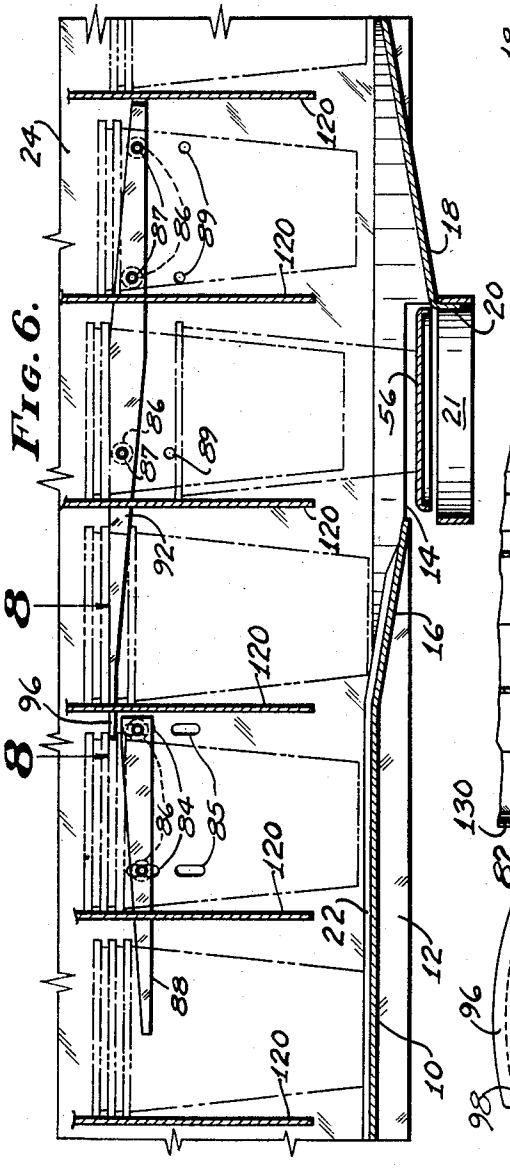


FIG. 6.

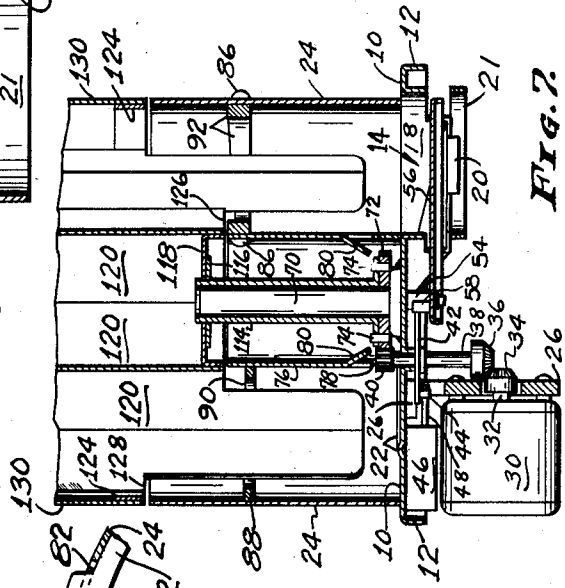


FIG. 7.

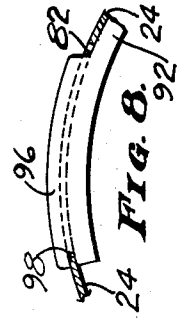


FIG. 8.

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2,888,167

CUP DISPENSER

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Application May 21, 1954, Serial No. 431,401

19 Claims. (Cl. 221—113)

This invention relates to improvements in coin separators. More particularly, this invention relates to improvements in cup dispensers that are used in coin-operated vending machines.

It is therefore an object of the present invention to provide an improved cup dispenser for use in coin-operated vending machines.

A number of different vending machines have been developed that can vend a cup of milk, coffee, carbonated beverage or the like when a coin of pre-determined denomination is inserted in those machines. In such vending machines, a cup must be provided to receive the fluid to be dispensed, and it is desirable that the cup be placed in position automatically. The automatic placement of the cups avoids loss of the fluid through inattention or inexperience of the customer. Accordingly, it has become desirable to provide cup dispensers which can store cups and which can automatically separate one of the cups from the store of cups and deliver that cup to the filling position in the vending machine. A number of such cup dispensers have been proposed, and some of them have been built. Several of those cup dispensers have been unduly expensive, others would tend to jam if the cups were not made absolutely uniform, and still others would permit the customer to reach into the vending machine and take an extra cup. For these reasons, prior cup dispensers are objectionable. The present invention obviates these objections by providing a cup dispenser which is inexpensive, which is resistant to jamming, and which prevents "robbing" of cups. It is therefore an object of the present invention to provide a cup dispenser that is inexpensive, resistant to jamming, and prevents "robbing" of cups.

The cup dispenser provided by the present invention has a rotatable turret with a number of circumferentially-spaced recesses in which stacks of cups can be held. The stacks of cups will rest upon a base for a part of their travel, as the turret rotates, but those stacks of cups will be raised upwardly to a cup-separating station or position. The stacks of cups will be raised upwardly to that station by cams which underlie the projecting rims of the lowermost cups of the stacks of cups, and which will support those cups and the cups thereabove. By supporting the cups on the cams, the cup dispenser of the present invention does not have to rely upon the vertical dimensions of the cups. Consequently, any variations in the heights of the cups cannot lead to jamming of the cup dispenser. It is therefore an object of the present invention to provide a cup dispenser with cams which underlie the projecting rims of the lowermost cups in the stacks of cups and which raise the lowermost cups and the cups thereabove to a separating position.

To assure maximum efficiency in separating the lowermost cups from the rest of the cups in the stacks of cups, a pair of cams should be provided that have thin, feathered leading edges. However, such leading edges

can be unsubstantial and can be bent readily. Any such bending of those leading edges would impair or even destroy the efficiency of separation of the cup dispenser; yet it is difficult to support such leading edges. The present invention makes it possible to provide thin, feathered edges on the leading edges of cams by providing radially-extending broad faces at those leading edges, and by disposing those broad faces in slots in stationary walls of the cup dispensers. Moreover, the present invention provides notches in those broad faces which can engage the ends of the slots and thus be held against lateral movement. The slots will thus coact with the broad faces and the notches therein to hold the cams against vertical and horizontal movement. Thus the leading edges of the cams are positively confined and held against bending even though those edges are thin and feathered.

At the cup-separating position or station, the lowermost cup in any stack of cups will continue to be supported by the first pair of cams. The next higher cup, and the cups thereabove, will move along the surfaces of the second pair of cams until they reach the downwardly inclined trailing edges of those cams and are lowered down to the cup-supporting base. Thereafter the stacks of cups will move along that base until they reach the leading edges of the first pair of cams. The downward inclination of the trailing edges of the second pair of cams is desirable because it avoids a sudden dropping of the stacks of cups, which would tend to wedge the cups tightly into each other and would tend to reduce the gaps between the projecting rims of those cups. Moreover, the downward inclination of those trailing edges of the second pair of cams avoids the creation of undue stresses and strains in the cups and thereby avoids the creation of leaks in those cups. It is therefore an object of the preesnt invention to provide a pair of cams that receive the next higher cups of stacks of cups and lowers those cups and the cups thereabove downwardly to the cup-supporting base of the cup dispenser.

The first pair of cams terminates shortly after the separation point or station, and permits the lowermost cups in the stacks of cups to move to a discharge opening. This discharge opening will be spanned by the second pair of cams; and that pair of cams will carry the next higher cups and the cups thereabove over the discharge opening. It is therefore an object of the present invention to provide a discharge opening which is disposed rearwardly of the trailing edges of a first pair of cams and which is spanned by a second pair of cams.

The base of the cup dispenser inclines downwardly toward the discharge opening and then inclines upwardly away from the discharge opening. In this way, the cup dispenser assures a smooth and gentle path for cups which are presented to the discharge opening but are unable, for some reason, to pass through that discharge opening. The trailing edges of the second pair of cams terminate at a sufficient distance from the base so cups can move upwardly from the discharge opening and not strike the trailing edges of that second pair of cams. It is therefore an object of the present invention to provide downwardly inclined portions on the base of a cup dispenser which are directed toward the discharge opening of that dispenser, and to provide upwardly inclined portions that extend away from that discharge opening and that are spaced below the trailing edges of the second pair of cams a distance greater than the height of a cup.

The discharge opening of the cup dispenser provided by the present invention has a closure or door therefor. This closure is important because it keeps customers of the

vending machine from reaching up through the delivery opening of the vending machine and grasping cups that are still held by the cup dispenser. Such grasping of cups is objectionable because the removal of a cup can deny the next customer the fluid products he desires, because there will be no cup to receive those fluid products. Where the operator or owner of a vending machine uses very hot water in making coffee, and where he uses inexpensive cups, those cups will tend to leak. In recognition of this, customers sometimes try to grasp additional cups to telescope under their cups and catch the leaking coffee. However, the taking of the additional cups can cause the coffee for the subsequent customers to be lost; there being no cups for that coffee. As a result, the closure or door provided by the present invention is important since it protects the subsequent customers. It is therefore an object of the present invention to provide a discharge opening for a cup dispenser with a door or closure therefor.

The discharge opening is normally covered by the closure or door. This door will support a cup that has been freed from the trailing edges of the first pair of cams. Such a cup will be placed on the closure near the end of a cycle of the cup dispenser, and the closure or door will open almost immediately after the start of the next cycle. This makes it possible to assure prompt and immediate delivery of a cup to the filling station or position and thus assure adequate and complete time for filling the cup. It is therefore an object of the present invention to provide a closure or door for the discharge opening of a cup dispenser, and to have that door receive a cup near the end of a cycle of the cup dispenser and to deliver that cup immediately after the start of the next succeeding cycle.

By having the closure, the present invention avoids all need of a precise cycling of the motor that drives the cup dispenser. The cup-holding turret of the cup dispenser can be stopped several degrees on either side of its "homing" position without any impairment of the operation of the cup dispenser. However, without the door or closure, it would be necessary to stop the turret precisely at the "homing" position; and this is not easy since all motors tend to coast somewhat. By having the closure, the present invention avoids all need of friction brakes, dynamic brakes or other precise "homing" apparatus.

The cup dispenser provided by the present invention is equipped with a switch which will provide an indication that the supply of cups has fallen below a predetermined level. This switch is disposed adjacent the separating point or station, and this is desirable since the lowermost cup of each stack of cups is positively confined at that point. If the switch were disposed at another point in the cup dispenser the limited number of cups in the cup dispenser, at the time the switch was supposed to operate, might be so light in weight that the switch could cause them to ride up and over the switch actuator instead of moving that actuator. It must be remembered that the cups are provided with frusto-conical configurations that will serve as inclined planes. Any tendency of the cups to ride up and over the switch actuator instead of moving that actuator is objectionable since it could cause the switch to indicate that the level of cups was too low when that level was actually adequate; and it would, in effect, reduce the capacity of the cup dispenser. Any such tendency is obviated in the cup dispenser of the present invention by having the switch disposed adjacent the separating point or station; since the lowermost cup of each stack of cups is positively held against accidental upward or downward movement at that point. Consequently, the cups cannot be moved upwardly by the switch actuator; instead they will move that switch actuator and give a true indication of the cup level.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing and accompanying description a preferred embodiment of the present invention is shown and described but it is to be understood that the drawing and accompanying description are for the purpose of illustration only and do not limit the invention and that the invention will be defined by the appended claims.

In the drawing,

Fig. 1 is a partially broken-away front elevational view of a cup dispenser that is made in accordance with the principles and teachings of the present invention,

Fig. 2 is a bottom view of the cup dispenser of Fig. 1 with the motor thereof removed, and it shows the door or closure thereof in open position,

Fig. 3 is a bottom view of the cup dispenser of Fig. 1 and it shows the door or closure in opening-covering position,

Fig. 4 is a sectional view in plan of a portion of the turret of the cup dispenser of Fig. 1, and it is taken along the plane indicated by the line 4—4 in Fig. 1,

Fig. 5 is a plan view of the cup dispenser of Fig. 1 after the turret has been removed,

Fig. 6 is a elevational view, partially in section, of the cup dispenser as that cup dispenser has been rolled out and developed, and that view is taken along the curved surface indicated by the line 6—6 in Fig. 5,

Fig. 7 is a sectional view in elevation of the cup dispenser of Fig. 1, and it is taken along the broken plane indicated by the line 7—7 of Fig. 3,

Fig. 8 is an enlarged view of the leading edge of one of the cams of the cup dispenser and of the wall that supports that edge, and,

Fig. 9 is a schematic diagram of an electrical circuit that can be used with the cup dispenser of the present invention.

Referring to the drawing in detail, the numeral 10 denotes the base of a cup dispenser that is made in accordance with the principles and teachings of the present invention. That base is generally rectangular in plan, but the corners thereof are smoothly rounded and are arcuate. A skirt 12 depends downwardly from the base 10 and it stiffens that base. The skirt 12 will have openings, not shown, formed in it, and those openings will receive screws or bolts that will secure the base to the structure of the vending machine with which the cup dispenser is used.

A discharge opening 14 is formed in the base 10, and that discharge opening has a generally circular configuration. The base 10 has a downwardly inclined portion 16 which is adjacent the discharge opening 14 and inclines downwardly toward that opening. The base 10 has an upwardly inclined portion 18 which is adjacent the discharge opening 14 and which inclines upwardly from that opening. The lowermost portion of the upwardly inclined portion 18 of the base 10 is disposed below the level of the lowermost portion of the downwardly inclined portion 16 of the base 10. An ear 20 is formed on the lowermost portion of the upwardly inclined portion 18 of the base 10 and that ear depends vertically downwardly from that lowermost portion of the upwardly inclined portion 18. A ring 21 is secured to the ear 20, and that ring is in register with and is disposed a short distance below the discharge opening 14.

An arcuate ridge 22 is formed on the upper surface of the base 10. This ridge extends from the uppermost portion of the upwardly inclined portion 18 of the base 10 to the downwardly inclined portion 16 of the base 10. In fact, that ridge extends into the downwardly inclined portion 16 of the base 10 and extends to a point adjacent the discharge opening 14. The primary purpose of the arcuate ridge 22 is to provide a smooth, substantially friction-free surface on which the bottoms of cups can rest. That ridge will also have the further result of stiffening the base 10.

The numeral 24 denotes a cylindrical wall that is secured to the upper surface of the base 10. This cylin-

drical wall extends upwardly from the upper surface of the base 10, and it is concentric with the arcuate ridge 22. The wall 24 is continuous and provides a complete circular enclosure adjacent the upper surface of the base 10.

The numeral 26 denotes a mounting bracket which is secured to the bottom surface of the base 10 by screws 28. The mounting bracket 26 supports an electric motor 30 below the bottom surface of the base 10. This motor has a shaft 32, and that shaft carries a bevel gear 34 at the outer end thereof. The bevel gear 34 meshes with a bevel gear 36 on a vertically directed shaft 38. The vertically directed shaft 38 extends upwardly through an opening in the base 10, and it carries a pinion 40 on its upper end. The pinion 40 is disposed above the level of the top surface of the base 10.

A semi-circular cam 42 is secured to the shaft 38. Rotation of the shaft 38 will cause rotation of the cam 42 about a vertical axis. The cam 42 has a pin 44 thereon, and that pin extends downwardly from the lower face of that cam. A switch 46 is mounted adjacent the underface of the base 10, and that switch has an actuator 48. The actuator 48 is movable into and out of the path of the pin 44 carried on the cam 42. Hence, rotation of the cam 42 with the shaft 38 will cause the pin 44 on that cam to strike the switch actuator 48. The switch 46 has two fixed contacts 50 and 52 that are spaced apart and are selectively engaged by the movable contact of that switch.

The numeral 54 denotes a pivot which is mounted on the lower surface of the base 10 and that depends downwardly from that base. A closure 56 is mounted on the pivot 54 for rotation relative to that pivot. The closure 56 has the general configuration of a frusto-triangle, and the smaller end of that closure is secured to the pivot 54. The larger end of the closure 56 is movable into and out of registry with the discharge opening 14, and that end of the closure 56 is able to substantially underlie and close that opening. A pin 58 is provided on the closure 56, and that pin extends upwardly from the upper surface of that closure. The pin 58 is movable into and out of the path of the cam 42, and hence rotation of the cam 42 about the shaft 38 will cause movement of the closure 56. A spring 60 of helical configuration has one end thereof hooked through an opening, not shown, in the skirt of the closure 56, and it has its other end hooked around a stud 62 which is secured to the bottom of the base 10. The stud 62 depends downwardly from the lower surface of the base 10 and it is spaced from the pivot 54 for the closure 56. A resilient stop 64, of rubber or the like, is secured to the base 10. That stop depends downwardly from the lower surface of the base 10 and it is disposed in the path of the closure 56. Hence, the closure 56 can engage and be held against further movement by the downward depending resilient stop 64.

The numeral 66 denotes the male portion of a Jones plug. This plug has a number of electrical contacts and it has an aligning pin 68. The electrical contacts of the male portion 66 of the Jones plug are connected to the motor 30 and the switch 46 as indicated particularly in Fig. 9.

The numeral 70 denotes a vertically directed shaft with a horizontally directed flange thereon. The flange of the shaft 70 is secured to the upper surface of the base 10, and the shaft 70 is concentric with the ridge 22 and with the cylindrical wall 24. The flange of the shaft 70 may be secured to the base 10 by welding, or other suitable means.

A spur gear 72 is provided with an opening at the center thereof which permits that gear to telescope downwardly over the shaft 70 and to rest on the flange of that shaft. There will be sufficient tolerance between the inner diameter of the opening in the spur gear 72 and the outer diameter of the shaft 70 to permit free and

ready rotation of the spur gear 72 relative to the shaft 70. The teeth on the spur gear 72 will mesh with the teeth of the pinion 40, and the pinion 40 will drive the spur gear 72. Two pins 74 are carried by the spur gear 72, and those pins extend upwardly beyond the upper surface of that gear.

A cylinder 76 is fixedly secured to the base 10. That cylinder extends upwardly from the upper surface of the base 10, and it is concentric with the shaft 70, the ridge 22, and the cylindrical wall 24. The cylinder 76 has a much smaller diameter than the ridge 22 or the cylindrical wall 24, and the height of that cylinder is less than the cylindrical wall 24. An opening 78 is provided in the wall of the cylinder 76 adjacent the pinion 40 to permit the pinion to rotate freely without striking that wall. Inwardly bent portions 80 are provided on the cylinder 76, and those portions are springy retainers for the spur gear 72. The portions 80 extend inwardly beyond the root diameter of the spur gear 72 and thus they will prevent movement of the spur gear 72 upwardly along the shaft 70. However, those portions 80 can be bent outwardly by the spur gear 72 when that gear is initially telescoped downwardly along the shaft 70 into engagement with the flange of that shaft.

The numeral 82 denotes an elongated, horizontally directed, circumferentially extending slot 82 in the cylindrical wall 24. The numeral 83 denotes a similar slot in the cylindrical wall 24, but the slot 83 is spaced a short distance below the level of the slot 82. The numeral 84 denotes vertically directed slots in the cylindrical wall 24. The slots 84 are spaced circumferentially on the surface of that wall. The numeral 85 denotes similar vertically extending slots in the cylindrical wall 24, but the slots 85 are spaced a short distance below the slots 84. Screws 86 will extend through the slots 84 or the slots 85 and will seat in an arcuate cam 88. This cam is formed so its geometric center is the geometric center of the shaft 70, and the outer face of the cam 88 will be complementary to the inner surface of the cylindrical wall 24. A similar set of vertically directed slots, not shown, is provided in the cylinder 76, and those slots can receive screws 86 which seat in an arcuate cam 90. That cam has, as its geometric center, the geometric center of the shaft 70; and the inner surface of that cam is complementary to the outer surface of the cylinder 76. The cams 88 and 90 will be in register with each other and will have the same angular length. However, because of the greater radius of the cam 88, the linear length of the cam 88 is greater than the linear length of the cam 90. The cams 88 and 90 can be held by the upper set of slots or can be held by the lower set of slots. In addition, the cams 88 and 90 can be moved upwardly or downwardly to a limited extent while held by either set of slots. Thus, it is possible to attain precise adjustment of the vertical position of the arcuate cams 88 and 90.

The numeral 87 denotes a plurality of holes in the cylindrical wall 24, and the numeral 89 denotes a similar set of holes in that cylindrical wall. The holes 87 and the holes 89 are spaced circumferentially along the surface of the cylindrical wall 24, and the holes 89 are disposed below the level of the holes 87. These holes can receive screws 86 which will seat in the arcuate cam 92. That cam will have, as its geometric center, the geometric center of the shaft 70. The outer surface of the cam 92 will be complementary to the inner surface of the cylindrical wall 24. An arcuate cam 94 is mounted by screws 86 in a similar set of openings in the cylinder 76. The inner face of the arcuate cam 94 is complementary to the outer face of the cylinder 76. The cams 92 and 94 will be held in register with each other and they will have the same angular length. Because of the greater radius of the cam 92, the actual length of that cam will be greater than the length of the cam 94. The openings or holes 87 and 89 will preferably be just slightly

larger than the shanks of the screws 86; and consequently the holes 87 and 89 will hold the cam 92 fixed. Similar dimensioning of the holes that support the cam 94 will be provided. The slots 82 and 83 will be in register with the holes 87 and 89 respectively. Those slots will receive the radially extending broadened end of the cam 92. That broadened end is denoted by the numeral 96, and it has a notch 98 therein. The notch 98 will receive and telescope on opposite sides of the end wall of the slot 82 or 83, as the case may be. The engagement between the broadened end of the cam 92 and the slots 82 or 83 will provide full and adequate reinforcement and support for that end of the cam. The innermost portion of that broadened end of the cam 92 is tapered and feathered to a very narrow edge. Such an edge would be unable to resist bending if it were not for the reinforcement provided by the broadened end 96 of the cam 92 and by the engagement between the notch 98 and the end of the slot 82 or 83.

The numeral 100 denotes an opening in the cylindrical wall 24. That opening is adjacent the trailing edges of the slots 82 and 83 in that cylindrical wall. A switch 102 is disposed adjacent the opening 100 and that switch has a fixed contact 104 and a second fixed contact 106. The movable contact of the switch 102 can selectively engage the fixed contacts 104 and 106. A pivot 108 is mounted adjacent the opening 100 in the cylindrical wall 24, and a cup-engaging actuator 110 is secured to that pivot. The actuator 110 is biased inwardly through the opening 100 but can be moved outwardly relative to that opening by cups which are within the cylindrical wall 24. When the cup-engaging actuator 110 is disposed within the opening 100, the movable contact of the switch 102 engages the fixed contact 104 of that switch. When the actuator 110 is held in its outward position, as by being engaged by a cup within the cylindrical wall 24, the movable contact of the switch 102 will be in engagement with the fixed contact 106 of that switch. A fixed guard 112 is mounted on the cylindrical wall 24, and it protects the switch 102 and the actuator 110 from injury or abuse by nearby objects.

A flanged sleeve 114 is provided that can telescope over the shaft 70. Sufficient clearance will be provided between the inner surface of the sleeve 114 and the outer surface of the shaft 70 to permit free and ready rotation of the sleeve 114 relative to the stationary shaft 70. However, the sleeve 114 will fit the shaft 70 closely enough to avoid undue "play." A flange 116 is secured to the upper end of the sleeve 114, and a polygonal plate 118 is welded to the disc 116. The plate 118 will preferably have either six or ten faces. A plurality of elongated plates 120 are secured to the faces of the polygonal plate 118. The number of plates 120 will correspond exactly to the number of faces of the plate 118.

Each of the plates 120 has four vertical bend lines. These lines define a narrow securing flange which extends outwardly from a face of the plate 118 at an angle, a wide securing face which is suitably welded to one of the faces of the plate 118, a V-shaped driving surface that is generally radially-directed of the sleeve 114, and a second narrow securing flange. When the securing faces of the various elongated plates 120 are welded to the faces of the plate 118, they define the inner wall of a turret for the cup dispenser. The V-shaped driving surfaces of the plates 120 provide the cup-receiving and cup-driving surfaces of that turret, and the first securing flanges are welded to the V-shaped driving surfaces of those plates and the second securing flanges are welded to top ring 122 and bottom ring 124. The elongated plates 120, the polygonal plate 118, the top ring 122 and the bottom ring 124 form a light weight but balanced turret for the cup dispenser. At sheet of transparent plastic 130 is secured to the second securing flanges of the plates 120 and to the top ring 122 and the bottom ring 124. This sheet of plastic will exclude dirt and dust but will permit the operator to determine the number of cups in the turret. The sheet of plastic 130 can be secured to the second flanges and to the rings 122 and 124 in several ways. One acceptable way is to draw the free ends of the sheet together, overlap them adjacent a second securing flange of an elongated plate 120, and then bolt a securing strip so it holds those free ends against separation.

The first flanges and the securing walls of the plates 120 are cut away as indicated by the numeral 126. The second flanges are cut away as indicated by the numeral 128. The first securing flanges and the securing walls of the plate 120 thus extend below the lower ends of the second flanges of those plates. The V-shaped walls of the plates 120 extend below the level of the securing flanges and the securing wall and extend below the top of the cylinder 76 and of the cylindrical wall 24. However, the bottoms of the V-shaped walls of the elongated plates 120 terminate short of the base 10.

A cover 131 is provided for the turret of the cup dispenser of the present invention. That cover has a downwardly directed skirt which telescopes over the top ring 122 of that turret. A handle or an opening will be provided on the cover 131 to facilitate its ready grasping by the operator.

The numeral 132 denotes an electric lead that can be connected to one side of a line which will be suitably connected to a source of power. The lead 132 extends to a junction 134, and a relay 136 is disposed between the junction 134 and the junction 138. A coin switch 140 is disposed between the junction 138 and the junction 142, and a lead 144 extends from the junction 142 to the other side of the line which can be connected to the said source of power. The relay 136 has two sets of relay contacts, 146 and 148. A junction 150 is adjacent the junction 134, and a lamp 152 is adjacent the junction 150. This lamp will be mounted on the vending machine and will illumine a sign which indicates that the vending machine is empty. A junction 154 is adjacent the junction 150, and an electromagnet 156 is adjacent the junction 154. The electromagnet 156 will be mounted in the vending machine adjacent the coin passage thereof. That electromagnet will normally be energized to hold a coin-rejecting finger out of that passageway; but will, when de-energized, permit that finger to enter that passageway to reject coins. A junction 158 is adjacent the junction 142 and a junction 160 is adjacent the motor 30. A junction 162 is adjacent the switch 102. The numeral 164 denotes a recess in the female portion of the Jones plug which will coact with the pin 68 to assure positive alignment of the male and female portions of that Jones plug. The male portion 66 of the Jones plug, the motor 30, the switch 46 and the switch 102 will be mounted on the cup dispenser. The female portion of the Jones plug, the lamp 152, the electromagnet 156, the relay 136, and the coin switch 140 will be mounted on the coin-operated vending machine. The Jones plug facilitates the assembly and disassembly of the cup dispenser with the vending machine.

The arcuate cams 88 and 90 are disposed with their leading edges below the level of the trailing edges thereof; and those leading edges are disposed below the level of the projecting rim of the lowermost cup of any stack, of the stacks of cups, held by the turret. The arcuate cams 88 and 90 will lie in the path of the projecting rims of the cups and will raise the stacks of cups upwardly, as indicated particularly in Fig. 6. The leading edges of the arcuate cams 92 and 94 overlie, and are spaced a short distance above, the trailing edges of the arcuate cams 88 and 90. The vertical distance between the lower face of the leading edge of the cam 92 and the upper face of the trailing edge of the cam 88, and the corresponding distance between the lower face of the leading edge of the cam 94 and the upper face of the trailing edge of the

cam 90, is adjusted to accommodate the projecting rim of just one cup at a time. This is done by loosening the screws 86 and moving the cams 88 and 92 relative to the vertically-elongated openings 84 or 85, and thus moving those cams relative to the cams 92 and 94. As a result, only the projecting rim of the lowermost cup can pass below the leading edges of the cams 92 and 94, and the projecting rim of the next higher cup will pass above the leading edges of the cams 92 and 94.

The vertical positions of the cams 92 and 94 are fixed by the openings 87 or 89 in the cylindrical wall 24 and by corresponding openings in the cylinder 76, as well as by the slots 82 or 83 in the cylindrical wall 24. Hence, while the cams 92 and 94 can be set in two different vertical positions, they will be closely confined to either of those positions. Consequently, the vertical adjustability of the cams 88 and 90 makes it possible to attain the desired spacing between the leading edges of the cams 92 and 94 and the trailing edges of the cams 88 and 90. Once this spacing has been attained, the screws 86 are tightened to positively lock the cams 88 and 90 against vertical movement.

The trailing edges of the cams 92 and 94 are disposed below the level of the leading edges of those cams. Moreover, those trailing edges of the cams 92 and 94 are below the level of the trailing edges of the cams 88 and 90. The cams 92 and 94 span the discharge opening 14.

In the operation of the cup dispenser provided by the present invention, the lid 131 is removed, and a number of cups are dropped down into the recesses of the turret. These cups will either rest upon the ridge 22 of the base 10 or will rest upon the arcuate cams 88 and 90 or 92 and 94. During the loading period, the motor 30 will be de-energized and the turret will be stationary. The operator will be able to determine the number of cups in each recess of the turret because the plastic sheet 130 is transparent. Once the recesses of the turret have been filled with cups, the lid 131 can be restored. The cups will engage the actuator 110 of the switch 102 and will hold the movable contact of that switch in engagement with the fixed contact 104. Where this is done, current will flow through the lead 144, through junction 142, through junction 158, through the Jones plug, through the movable contact and the fixed contact 52 of switch 46, through the junction 162, through the movable contact of the switch 102, through the fixed contact 104, through the Jones plug to the electromagnet 156, and then successively through the junctions 154, 150 and 134 to the lead 132. The flow of this current will energize the electromagnet and cause the withdrawal of the coin-rejecting finger from the said coin passageway. Consequently, when a customer deposits a coin, that coin will be able to reach and close the switch 140.

Thereupon, current will flow from the lead 144, through the junction 142, through the switch 140, through the junction 138, through the relay coil 136 and past the junction 134 to the lead 132. The flow of this current will energize the relay coil 136 and will close the contacts 146 and 148 of that relay. Thereafter, current will flow from the lead 144, through the junction 142, through the junction 158, through the contacts 148, through the Jones plug, through the junction 160, through the motor 30, and then through the Jones plug to the junction 154, and thence through the junctions 150 and 134 to the lead 132. The flow of this current will energize the motor 30 and will start the motor shaft 32 rotating. This rotation will cause the vertical shaft 38 to rotate, thereby starting the rotation of the turret and the rotation of the cam 42. The closing of the relay contacts 146 will complete a circuit which extends from the lead 144, through the junctions 142 and 158, through the Jones plug, through the movable contact of the cam-operated switch 46, through the fixed contact 52 of that switch, through the junction 162, through the Jones plug, through the relay contacts 146, through the junction 138, through the relay coil 136 and through the junction 134 to the lead 132. This flow of current will hold the relay coil 136 energized even though the coin switch 140 opens immediately after the coin which closed it passes to the coin box. This holding circuit is desirable since the cam-operated switch 46 may not be be actuated as quickly as the coin will free the switch 140; and thus, that holding circuit will keep the relay contacts 148 closed and thus keep the motor 30 running until the switch 46 has been actuated.

After the motor 30 has rotated long enough to cause the cam 42 to free the movable contact of the switch 46 for movement into engagement with the fixed contact 50 of that switch, current will flow from the lead 144 through the junctions 142 and 158, through the Jones plug, through the movable contact of the switch 46, through the fixed contact 50 of that switch, through the junction 160, through the motor 30, through the Jones plug, and thence through the junctions 154, 150 and 134 to the lead 132. This current will continue to flow until the cam 42 re-engages the switch actuator 48 and shifts the movable contact of the switch 46 to the position shown in Fig. 9, thereby interrupting the flow of current to the motor 30. At the time the cam 42 moved out of engagement with the actuator 48 of the switch 46, and thereby permitted the movable contact of that switch to engage the fixed contact 50, the circuit to the relay coil 136 was broken at the fixed contact 52; and immediately thereafter the contacts 146 and 148 opened. This is desirable because it breaks the circuit of the electromagnet 156 at the relay contacts 146, thereby permitting the coin-rejecting finger to enter the passageway to reject further coins; and it also makes the continued rotation of the motor 30 dependent upon switch 46, so the subsequent engagement of cam 42 with the actuator 48 of that switch will break the circuit of that motor. When the cam 42 again engages the switch actuator 48, the movable contact of switch 46 will again move into engagement with fixed contact 52, thereby halting the motor 30 and re-energizing the electromagnet 156 through switches 46 and 102.

In this cycle of the motor, the sleeve 114, and the turret mounted thereon, rotates an angular distance corresponding to one of the recesses of the turret. Where the turret has six recesses, the turret will rotate sixty degrees during one cycle. Where the turret has ten recesses, the turret will rotate thirty-six degrees during one cycle of the motor 30. Thus, the turret will be "stepped around" as the motor is cycled by the insertion of coins of the predetermined size.

Where, as in the drawing, the cup dispenser accommodates six stacks of cups, each stack of cups will rest on the ridge 22 for two cycles of the motor, will be supported on the cams 88 and 90 for one cycle, and will be supported on the cams 92 and 94 for the other three cycles of that motor. As indicated particularly in Fig. 6, one stack of cups will have the projecting rim of the lowermost cup thereof overlying but out of engagement with the leading edges of the cams 88 and 90 at the start of the first cycle. During that first cycle, that stack will be moved to the right, as viewed in Fig. 6, until the projecting rim of that lowermost cup engages and is raised upwardly by the cams 88 and 90; and as that cup moves upwardly the rest of the cups in that stack will do likewise. At the end of that first cycle, the bottom of that lowermost cup will be held above and out of engagement with the ridge 22. During the second cycle, the rim of the lowermost cup will be moved through the space between the trailing edges of cams 88 and 90 and the leading edges of cams 92 and 94; and the rim of the next higher cup will be moved into position above the cams 92 and 94. The leading edges of the cams 92 and 94 are feathered, as by having the upper and lower faces thereof tapered, to facilitate such movement. That next higher cup, and the rest of the cups in that stack will be supported on the cams 92 and 94, and the lowermost cup will be supported by the ridge 22. During the third cycle, that next higher

cup and the rest of the cups in that stack ride along on the upper surfaces of the cams 92 and 94, and the lowermost cup is moved along the ridge 22 until it rests on the closure 56, that lowermost cup reaching the closure 56 during the last half of the third cycle. During the fourth cycle, the closure 56 opens and lets the lowermost cup fall to the filling station, and the rest of the cups are moved onto the downwardly inclined faces of the cams 92 and 94. That next higher cup, which now becomes the lowermost cup of that stack, will have the bottom thereof held above the level of the ridge 22. During the fifth cycle, that next higher cup, and the rest of the cups in that stack, will be moved beyond the trailing edges of the cams 92 and 94, and will rest on the ridge 22. During the sixth cycle, that stack of cups will be moved along, on the ridge 22, until it is adjacent the leading edges of the cams 88 and 90. Each stack of cups will pass successively through these six cycles; and at each cycle of the motor 30, a cup will be freed by the closure 56.

During each cycle of the motor 30, the closure 56 will be pulled to open position by the helical spring 60, as indicated particularly by Fig. 2. The cam 42 need only rotate a very few degrees to free the pin 58 and thus free the closure 56 for rotation in a counter clockwise direction. Consequently, the closure 56 moves to open position at the very beginning of each cycle of the motor 30. That closure will remain in open position for approximately one half of the total cycle of the motor 30, because the cam 42 is semi-circular, and because that cam makes one full revolution for every cycle of the motor 30. As the closure 56 opens, the lowermost cup, of the stack in register with that closure, falls downwardly through the ring 21 and is conducted to the filling position, not shown, in the vending machine. As one half of the cycle of the motor 30 is being completed, the closure 56 will move into register with, and close the discharge opening 14. Thereafter the lowermost cup of the succeeding stack of cups will leave the lower end of the inclined portion 16 and come to rest on the closure 56. In this way, a cup is always available for prompt delivery to the filling station at the start of each cycle.

The cams 92 and 94 have downwardly inclined surfaces on the under sides thereof at points spaced rearwardly of the leading edges thereof. Those surfaces will force the lowermost cups downwardly toward the closure 56. In most instances, the lowermost cups will drop freely to that closure, but if such a cup tends to cling to the next higher cup, it will be eased downwardly by those surfaces.

If, through some defect in the manufacture of the cups, or through heavy-handed insertion of cups in the turret, one or more cups is forced downwardly below the cams 92 and 94 and does not fall through the discharge opening 14 when the closure 56 opens, that cup or cups will be moved along by the V-shaped driving surfaces of the plates 120 and will work their way up the upwardly inclined portion 18 of the base 10. The distance between the inclined portion 18 of the base 10 and the trailing edges of the cams 92 and 94 will be such that the cup or cups can move upwardly onto the ridge 22 without jamming against the trailing edges of the cams 92 and 94.

As a stack of cups moves past the separating station and into the position which it occupies at the end of the second cycle, the next higher cup of that stack of cups, and some of the other cups thereabove, will engage the actuator 110 of the switch 102. When that cup engages that actuator, the movable contact of that switch will be moved into, and held in, engagement with the fixed contact 104. Consequently, the fixed contact 106 of the switch 102 will be inactive, and current will not be able to flow through the "empty" lamp 152. During the third cycle, that next higher cup and the cups thereabove, will be moved out of engagement with the actuator 110; and thereupon the movable contact of the switch 102 will move into engagement with the fixed contact 106. However, this does not happen until after the holding circuit of the relay coil 136 has been broken by the movement of the movable contact of switch 46 out of engagement with the fixed contact 52; and therefore, at the time the movable contact of switch 102 engages contact 106, the circuit between the "empty" lamp 152 and the contact 106 is open at the relay contacts 146. Consequently, the "empty" lamp 152 will not become illumined during the third cycle when the movable contact of switch 102 first engages fixed contact 106. That lamp will, however, become illumined at the end of that cycle unless there is a next higher cup in the next succeeding stack to engage the actuator 110 and move the movable contact of switch 102 away from contact 106; because there would then be a complete circuit from lead 144, through junctions 142 and 158, through the Jones plug, through the movable contact and the fixed contact 52 of switch 46, through junction 162, through the movable contact and the fixed contact 106 of switch 102, through the Jones plug, through the lamp 152, and thence through the junction 134 to the lead 132. Of course, if there is a next higher cup, and other cups thereabove, in the succeeding stack, that cup, and the cups thereabove, will engage the actuator 110 and move the movable contact of switch 102 out of engagement with contact 106 before the cam 42 moves the movable contact of switch 46 into engagement with contact 52; thereby avoiding the illumining of the lamp 152. Only when a next succeeding stack of cups does not have a next higher cup will the "empty" lamp 152 be energized. At that same time, the electromagnet 156 will be de-energized because its circuit will be open at contact 104 of switch 102; and it will permit the coin-rejecting finger to enter the coin passageway and reject coins. Thus the customer is warned by the lamp 152 that the vending machine is empty; and his money is returned to him if he overlooks or ignores the warning.

The stacks of cups are successively moved into and out of engagement with the actuator 110 of the switch 102. When the stacks of cups are out of engagement with that actuator, the cups above the next higher cup are free to work their way downwardly in the recesses of the turret. This alternate engagement and disengagement of the stacks of cups and the actuator 110 is desirable because it avoids a situation where the switch actuator could hold the cups against gravitationally-induced downward movement.

The trailing edges of the cams 92 and 94 are disposed below the level of the leading edges of those cams. Moreover, those trailing edges of the cams 92 and 94 are disposed below the level of the trailing edges of the cams 88 and 90. The cams 92 and 94 span the discharge opening 14.

The closure 56 is pulled to open position by the spring 60 and is forced into closed position by the cam 42. This is desirable since it will keep a customer from reaching up and grasping the closure 56 and forcing it to open position. When the cam 42 moves out of engagement with the pin 58 on the closure 56, the spring 60 will rapidly pull the closure 56 toward the stop 64. That stop will cushion, and then halt, the rapid movement of the closure 56. Thereafter, when the cam 42 re-engages the pin 58, it will force the closure 56 back to closed position and will hold it closed until the next cycle of the motor 30.

The turret of the cup dispenser can be lifted off as a unit for full and complete cleaning and sanitation. All that need be done is to grasp the turret and lift it upwardly; the sleeve 114 telescoping freely out of engagement with the shaft 70 and out of engagement with the pins 74 of the gear 72. Once the turret has been removed, the rest of the cup dispenser is fully exposed for cleaning and washing.

The cam 42 acts upon the pin 58 of the closure 56 and also acts upon the switch actuator 48. Thus, the cam 42 constitutes a positive and definite correlator and inter-

relator between the closure 56 and the switch 46. As a result, that cam can provide positive assurance that the motor will stop in a position where it will release the closure 56 almost immediately after the start of the next cycle. This assures prompt opening of the closure 56, and thus assures prompt delivery of the cup during the early part of the cycle of the vending machine.

The cams 88 and 90 and the cams 92 and 94 can be set at different levels to accommodate cups of different heights. Moreover, wide cams 88 and 90, and 92 and 94, can be used for small diameter cups while narrow cams can be used for large diameter cups. Thus, by the proper selection of cams, and by the proper positioning of the cams, the cup dispenser of the present invention can accommodate and separate cups of different heights and different diameters. Specifically, where wide cams are set in the lower of the two vertical positions, the cup dispenser can accommodate and dispense short, relatively small-diameter cups. If cups of the same general height, but of slightly larger diameter are to be used with the cup dispenser, either the cams 88 and 92 or the cams 90 and 94 will be replaced with wider cams.

The resulting combination of wide and narrow cams will support the larger-diameter cups. If cups of that same general height, but of still larger diameter, are to be used; the remaining wide cams are replaced by narrow cams. Those narrow cams will then accommodate those cups. A similar use of four wide cams, four narrow cams and two wide and two narrow cams can be had where the cams are set in the upper of the two vertically spaced positions. As a result, it is possible for the cup dispenser provided by the present invention to accommodate six individually different sizes of cups.

As a matter of fact, the present cup dispenser can accommodate cups that are slightly smaller or slightly larger than the said six sizes. The fact that the cup dispenser moves the cups away from the base 10, before the cups reach the separating station, is very important in that regard.

The specific arrangement of the cup separating cams shown in the drawing is particularly useful. However, a similar result could be attained by disposing the cams 88 and 90 with their upper surfaces horizontal and by inclining the floor of the base 10 downwardly from a point closely adjacent the leading edges of the cams 88 and 90. Instead of lifting the stacks of cups upwardly and away from the base 10, the base 10 would incline downwardly away from the cams 88 and 90. In either case, the cups, of the stacks of cups, would be supported on the cams 88 and 90, rather than on the base 10, as those stacks of cups reached the separating station. Hence in both instances, jamming due to variations in the heights of the cups is minimized or obviated.

Whereas the drawing and accompanying description have shown and described a preferred embodiment of the present invention, it should be apparent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof.

What I claim is:

1. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said came being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of the trailing edges of the cams of the first said pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams, said cams of said second pair of cams extending forwardly of and rearwardly of said discharge opening, said supporting surface having inclined areas that are disposed forwardly and rearwardly of said discharge opening and are inclined toward said discharge opening, a closure for said discharge opening that selectively covers and uncovers said discharge opening, an actuator for said closure, said actuator being operated by said power source, a switch that is adjacent the leading edges of one of the cams of said second pair of cams and has an actuator that is biased into the circular path through which said stacks of cups are moved by said cup-moving surfaces, and a signal controlled by said switch, said power source having a cycle wherein said turret is rotated through an angle corresponding to one stack of cups and wherein said closure is moved to uncover said discharge opening and then to cover said discharge opening, and wherein the actuator of said switch enters the circular path through which said stacks of cups are moved by said cup-moving surfaces, said cup dispenser separating one lowermost cup from a stack of cups during a cycle of said power source, and moving said separated cup into register with said closure at the end of said cycle, said closure moving to uncover said discharge opening at the beginning of each cycle of said power source and moving to cover said discharge opening before the end of each cycle of said power source.

2. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret

relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adacent said supporting surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of the trailing edges of the cams of the first said pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams, said cams of said second pair of cams extending forwardly of and rearwardly of said discharge opening, said supporting surface having inclined areas that are disposed forwardly and rearwardly of said discharge opening and are inclined toward said discharge opening.

3. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of the trailing edges of the cams of the first said pair of cams, said cams of said second pair of cams being disposed below the level of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams, said cams of said second pair of cams extending forwardly of and rearwardly of said discharge opening.

4. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second

pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of the trailing edges of the cams of the first said pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams.

5. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supported surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portion of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of the trailing edges of the cams of the first said pair of cams, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of said second pair of cams extending forwardly of and rearwardly of said discharge opening.

6. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second pair of cams, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams.

7. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams

being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams.

8. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams.

9. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surfaces, a pair of cams that are mounted adjacent said supporting surface, said cams being arcuate, said cams being spaced apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being spaced apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams.

10. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed

rearwardly of the trailing edges of the cams of the first said pair of cams.

11. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a stationary cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret relative to said supporting surface, a power source that rotates said turret relative to said supporting surface about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates relative to supporting surface, a pair of cams that are mounted adjacent said supporting surface, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups whenever said lowermost cups of said stacks of cups are resting upon said supporting surface, and a second pair of cams that are mounted adjacent said supporting surface, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams.

12. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret, a power source that rotates said turret about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates, a pair of cams, said cams being arcuate, said cams being concentric with said pivot for said turret, said cams being spaced radially apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said trailing edges of said cams being disposed above the level of said leading edges of said cams, said leading edges of said cams being disposed below the level of the projecting rims of said lowermost cups of said stacks of cups, and a second pair of cams, said cams of said second pair of cams being arcuate, said cams of said second pair of cams being concentric with said pivot for said turret and with the cams of said first pair of cams, said cams of said second pair of cams being spaced radially apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said trailing edges of the cams of said second pair of cams being disposed below the level of the leading edges of the cams of said second pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of the trailing edges of the cams of the first said pair of cams, said trailing edges of the cams of said second pair of cams being disposed below the level of said lowermost cups of said stacks of cups, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams, a discharge opening disposed rearwardly of the trailing edges of the cams of the first said pair of cams, said cams of said second pair of cams extending forwardly of and rearwardly of said discharge opening.

13. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a cup-supporting surface, a turret with a plurality of stack-receiving recesses therein, a pivot for said turret that permits rotation of said turret, a power source that rotates said turret about said pivot, cup-moving surfaces on said turret to move said stacks of cups in a circular path as said turret rotates, a support adjacent said cup-supporting surface a pair of cams mounted on said support, said cams being spaced apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said cams being inclined relative to and diverging from said cup-supporting surface and engaging the rims of said lowermost cups of said stacks of cups to raise said lowermost cups up out of engagement with said cup-supporting surface, and a second pair of cams mounted on said support, said cams of said second pair of cams being spaced apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges and trailing edges, said leading edges of the cams of said second pair of cams overlying the trailing edges of the cams of the first said pair of cams and being spaced above said trailing edges of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the trailing edges of the cams of the first said pair of cams and to pass below the leading edges of the cams of said second pair of cams.

14. A cup dispenser that holds a plurality of stacks of cups and that successively separates the lowermost cups of said stacks of cups from the said stacks of cups and that comprises a cup-supporting surface cup-moving surfaces that can be moved to move said stacks of cups along a predetermined path, a power source that moves said cup-moving surfaces along said predetermined path and thereby moves said stacks of cups along said predetermined path, a pair of cams spaced at opposite sides of said predetermined path, said cams being spaced apart to accommodate the lower portions of the lowermost cups of said stacks of cups but to receive and support the projecting rims of said lowermost cups of said stacks of cups, said cams having leading edges and trailing edges, said cams being inclined relative to said cup-supporting surface and engaging the rims of said lowermost cups of said stacks of cups to raise said lowermost cups up out of engagement with said cup-supporting surface, and a second pair of cams, said cams of said second pair of cams being spaced apart to accommodate the lower portions of the next-to-the-bottom cups of said stacks of cups but to receive and support the projecting rims of said next-to-the-bottom cups of said stacks of cups, said cams of said second pair of cams having leading edges

and trailing edges, said leading edges of the cams of said second pair of cams overlying rearwardly spaced portions of the cams of the first said pair of cams and being spaced above said portions of the cams of the first said pair of cams a distance greater than the thickness of the projecting rim of one of the cups of said stacks of cups to permit the projecting rims of said lowermost cups of said stacks of cups to pass above the cams of the first said pair of cams and to pass below the cams of said second pair of cams, the trailing edges of the cams of said second pair of cams extending rearwardly of the trailing edges of the cams of the first said pair of cams.

15. In a cup dispenser that holds stacks of cups and that separates the lowermost cup of one of said stacks of cups from said one stack of cups and that includes cup-separating surfaces that are disposed adjacent the sides of said lowermost cup and that selectively overlie the rim of said lowermost cup and underlie the rim of the next-to-the-bottom cup of said one stack of cups and that respond to relative movement between themselves and said one stack of cups to separate said lowermost cup from said one stack of cups, a surface below the level of said one stack of cups that has a discharge opening toward which said lowermost cup moves after it is separated from said one stack of cups by said cup-separating surfaces, said cup-separating surfaces being adjacent and above the level of said discharge opening and directing the separated lowermost cup toward said discharge opening, and a power source that has a cycle of operation and that moves said cup-separating surfaces and said one stack of cups relative to each other during said cycle of operation to separate said lowermost cup from said next-to-the-bottom cup, the improvement which comprises a support adjacent said discharge opening, a closure for said discharge opening that is confined by said support, said closure being movable into and out of register with said discharge opening, said closure being dimensioned relative to said discharge opening to block the passage of said lowermost cup through said discharge opening whenever said closure is in register with said discharge opening, said closure being movable into register with said discharge opening to hold and support said lowermost cup, said closure being movable out of register with said discharge opening to permit the movement of said lowermost cup through said discharge opening, and a motion-imparting element that is driven by said power source and that moves during said cycle of operation of said power source to move said closure, said motion-imparting element and said power source being interlocked to effect movement of said closure out of register with said discharge opening at the beginning of each cycle of operation of said power source and to effect movement of said closure into register with said discharge opening prior to the end of said cycle of operation of said power source and to thereafter hold said closure in register with said discharge opening until the beginning of the next succeeding cycle of operation of said power source, whereby said closure holds and supports said lowermost cup for a period of time beginning prior to the end of one cycle of operation of said power source and ending after the beginning of the next succeeding cycle of operation of said power source.

16. In a cup dispenser that holds stacks of cups and that separates the lowermost cup of one of said stacks of cups from said one stack of cups and that includes cup-separating surfaces that are disposed adjacent the sides of said lowermost cup and that selectively overlie the rim of said lowermost cup and underlie the rim of the next-to-the-bottom cup of said one stack of cups and that respond to relative movement between themselves and said one stack of cups to separate said lowermost cup from said one stack of cups, a surface below the level of said one stack of cups that has a discharge opening toward which said lowermost cup moves after it is separated from said one stack of cups by said cup-separating surfaces, said cup-separating surfaces being adjacent and above the level of said discharge opening and directing the separated lowermost cup toward said discharge opening, and a power source that has a cycle of operation and that moves said cup-separating surfaces and said one stack of cups relative to each other during said cycle of operation to separate said lowermost cup from said next-to-the-bottom cup, the improvement which comprises a pivot that is adjacent to and has its axis parallel to the axis of said discharge opening, a closure for said discharge opening that is mounted on said pivot and rotates about said pivot into and out of register with said discharge opening, said closure being dimensioned relative to said discharge opening to block the passage of said lowermost cup through said discharge opening whenever said closure is in register with said discharge opening, said closure being rotatable into register with said discharge opening to hold and support said lowermost cup, said closure being rotatable out of register with said discharge opening to permit the movement of said lowermost cup through said discharge opening, a motion-imparting element that is driven by said power source and that moves during said cycle of operation of said power source to rotate said closure in one direction, and a spring biasing said closure for rotation in the opposite direction, said motion-imparting element and said power source and said spring coacting to effect rotation of said closure out of register with said discharge opening at the beginning of each cycle of operation of said power source and to effect rotation of said closure into register with said discharge opening prior to the end of said cycle of operation of said power source and to thereafter hold said closure in register with said discharge opening until the beginning of the next succeeding cycle of operation of said power source, whereby said closure holds and supports said lowermost cup for a period of time beginning prior to the end of one cycle of operation of said power source and ending after the beginning of the next succeeding cycle of operation of said power source.

17. In a cup dispenser that holds stacks of cups and that separates the lowermost cup of one of said stacks of cups from said one stack of cups and that includes cup-separating surfaces that are disposed adjacent the sides of said lowermost cup and that selectively overlie the rim of said lowermost cup and underlie the rim of the next-to-the-bottom cup of said one stack of cups and that respond to relative movement between themselves and said one stack of cups to separate said lowermost cup from said one stack of cups, a surface below the level of said one stack of cups that has a discharge opening toward which said lowermost cup moves after it is separated from said one stack of cups by said cup-separating surfaces, said cup-separating surfaces being adjacent and above the level of said discharge opening and directing the separated lowermost cup toward said discharge opening, and a power source that has a cycle of operation and that moves said cup-separating surfaces and said one stack of cups relative to each other during said cycle of operation to separate said lowermost cup from said next-to-the-bottom cup, the improvement which comprises a support adjacent said discharge opening, a closure for said discharge opening that is confined by said support said closure being movable into and out of register with said discharge opening, said closure being dimensioned relative to said discharge opening to block the passage of said lowermost cup through said discharge opening whenever said closure is in register with said discharge opening, said closure being movable into register with said discharge opening to hold and support said lowermost cup, said closure being movable out of register with said discharge opening to permit the movement of said lowermost cup through said discharge opening, and a motion-imparting element that is driven by said power source and that moves during said cycle of opera-

tion of said power source to move said closure, said motion-imparting element and said power source coacting to effect movement of said closure into register with said discharge opening prior to the end of said cycle of operation of said power source, said power source thereafter causing said separating surfaces and said one stack of cups to move relative to each other to move said lowermost cup toward said closure, whereby said closure can hold and support said lowermost cup, said power source and said motion-imparting element effecting movement of said closure out of register with said discharge opening at the beginning of the next succeeding cycle of said power source to permit said lowermost cup to fall through said discharge opening promptly after the start of said next succeeding cycle of said power source.

18. In a cup dispenser that holds stacks of cups and that separates the lowermost cup of one of said stacks of cups from said one stack of cups and that includes cup-separating surfaces that are disposed adjacent the sides of said lowermost cup and that selectively overlie the rim of said lowermost cup and underlie the rim of the next-to-the-bottom cup of said one stack of cups and that respond to relative movement between themselves and said stack of cups to separate said lowermost cup from said one stack of cups, a surface below the level of said one stack of cups that has a discharge opening toward which said lowermost cup moves after it is separated from said one stack of cups by said cup-separating surfaces, said cup-separating surfaces being adjacent and above the level of said discharge opening and directing the separated lowermost cup toward said discharge opening, and a motor that has a cycle of operation and that moves said cup-separating surfaces and said one stack of cups relative to each other during said cycle of operation to separate said lowermost cup from said next-to-the-bottom cup, the improvement which comprises a support adjacent said discharge opening, a closure for said discharge opening that is confined by said support, said closure being movable into and out of register with said discharge opening, said closure being dimensioned relative to said discharge opening to block the passage of said lowermost cup through said discharge opening whenever said closure is in register with said discharge opening, said closure being movable into register with said discharge opening to hold and support said lowermost cup, said closure being movable out of register with said discharge opening to permit the movement of said lowermost cup through said discharge opening, a cam that is operable by said motor and moves during said cycle of operation of said motor to move said closure in one direction, and a spring biasing said closure for movement in the opposite direction, said cam having an abrupt change of surface to permit prompt and full movement of said closure away from said discharge opening by said spring, said cam and motor presenting said abrupt change of surface to said closure at the beginning of each cycle of operation of said motor and effecting movement of said closure into register with said discharge opening prior to the end of said cycle of operation of said motor and thereafter holding said closure in register with said discharge opening until the beginning of the next succeeding cycle of operation of said motor, whereby said closure holds and supports said lowermost cup for a period of time beginning prior to the end of one cycle of operation of said motor and ending after the beginning of the next succeeding cycle of operation of said motor.

19. In a cup dispenser that holds stacks of cups and that separates the lowermost cup of one of said stacks of cups from said one stack of cups and that includes cup-separating surfaces that are disposed adjacent the sides of said lowermost cup and that selectively overlie the rim of said lowermost cup and underlie the rim of the next-to-the-bottom cup of said one stack of cups and that respond to relative movement between themselves and said stack of cups to separate said lowermost cup from said one stack of cups, a surface below the level of said one stack of cups that has a discharge opening toward which said lowermost cup moves after it is separated from said one stack of cups by said cup-separating surfaces, said cup separating surfaces being adjacent and above the level of said discharge opening and directing the separated lowermost cup toward said discharge opening, and a motor that has a cycle of operation and that moves said cup-separating surfaces and said one stack of cups relative to each other during said cycle of operation to separate said lowermost cup from said next-to-the-bottom cup, the improvement which comprises a support adjacent said discharge opening, a closure for said discharge opening that is confined by said support, said closure being movable into and out of register with said discharge opening, said closure being dimensioned relative to said discharge opening to block the passage of said lowermost cup through said discharge opening whenever said closure is in register with said discharge openings, said closure being movable into register with said discharge opening to hold and support said lowermost cup, said closure being movable out of register with said discharge opening to permit the movement of said lowermost cup through said discharge opening, a motion-imparting element that is driven during said cycle of operation of said motor to move said closure, a linkage between said motor and said motion-imparting element, and a second linkage between said motor and said cup-separating surfaces, said motion-imparting element and said motor and the first said linkage coacting to move said closure into register with said discharge opening before the end of a cycle of operation of said motor and to subsequently hold said closure in register with said discharge opening until the start of the next succeeding cycle of operation of said motor, said motor and said second linkage moving said cup-separating surfaces and said one stack of cups relative to each other to separate said lowermost cup before the end of the first said cycle of operation of said motor but after said motor and motion-imparting element and the first said linkage have moved said closure into register with said discharge opening, said motor and motion-imparting element and the first said linkage moving said closure out of register with said discharge opening at the start of said next succeeding cycle of operation of said motor to permit prompt movement of said lowermost cup through said discharge opening.

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