

Sept. 20, 1966

R. E. DAVY

3,273,750

FLUID PRESSURE CUP DISPENSER

Filed Feb. 1, 1965

3 Sheets-Sheet 1

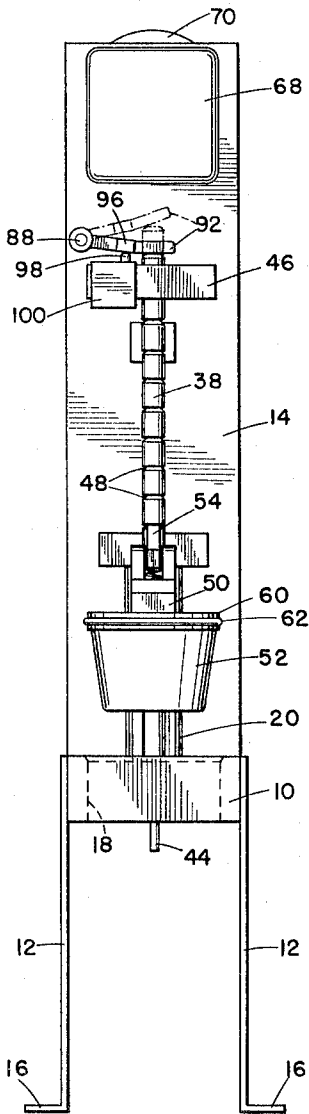


Fig. 1

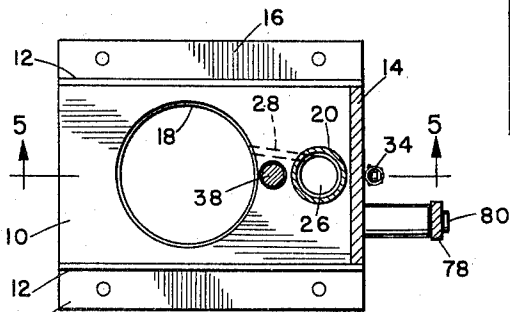


Fig. 3

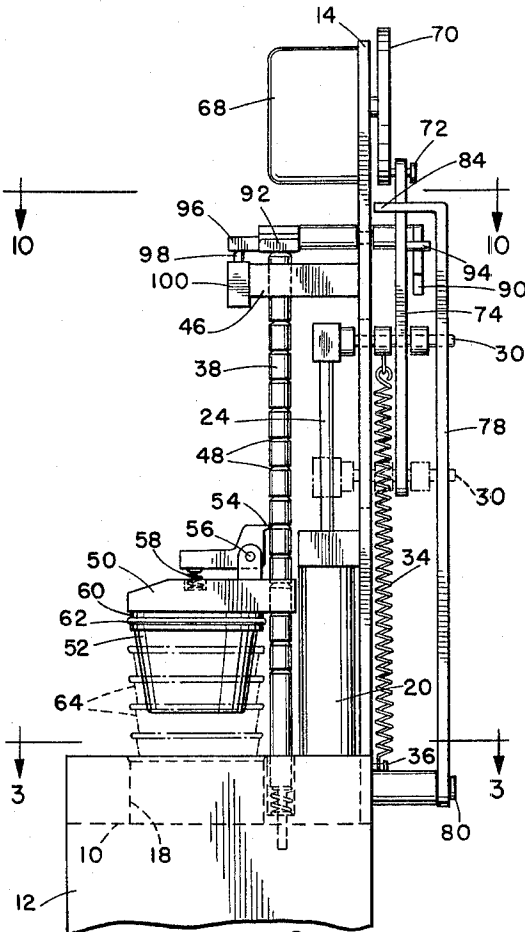


Fig. 2

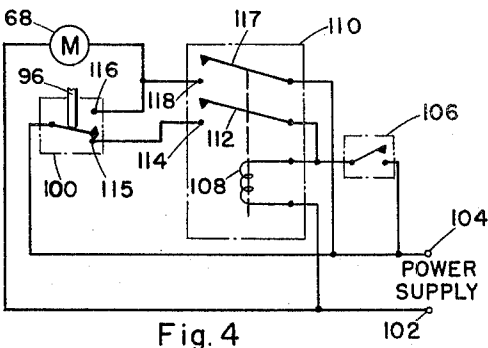


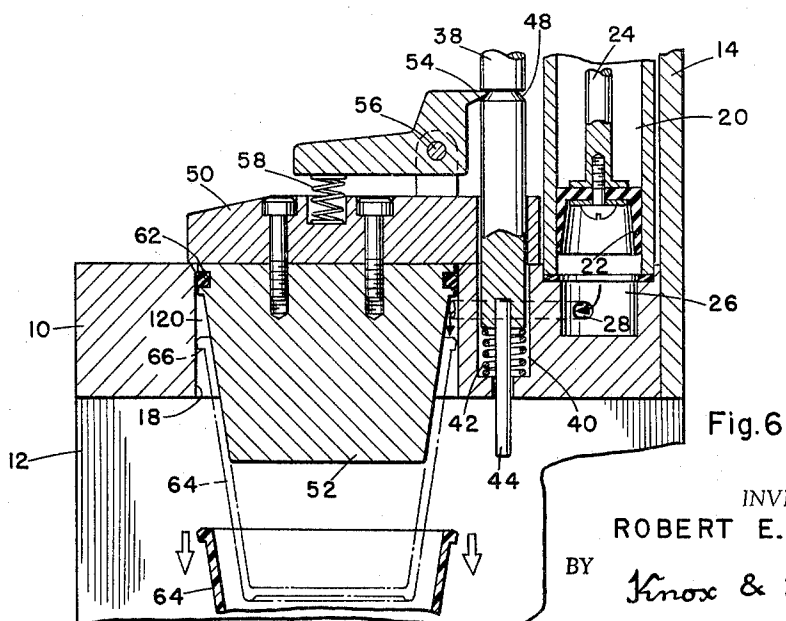
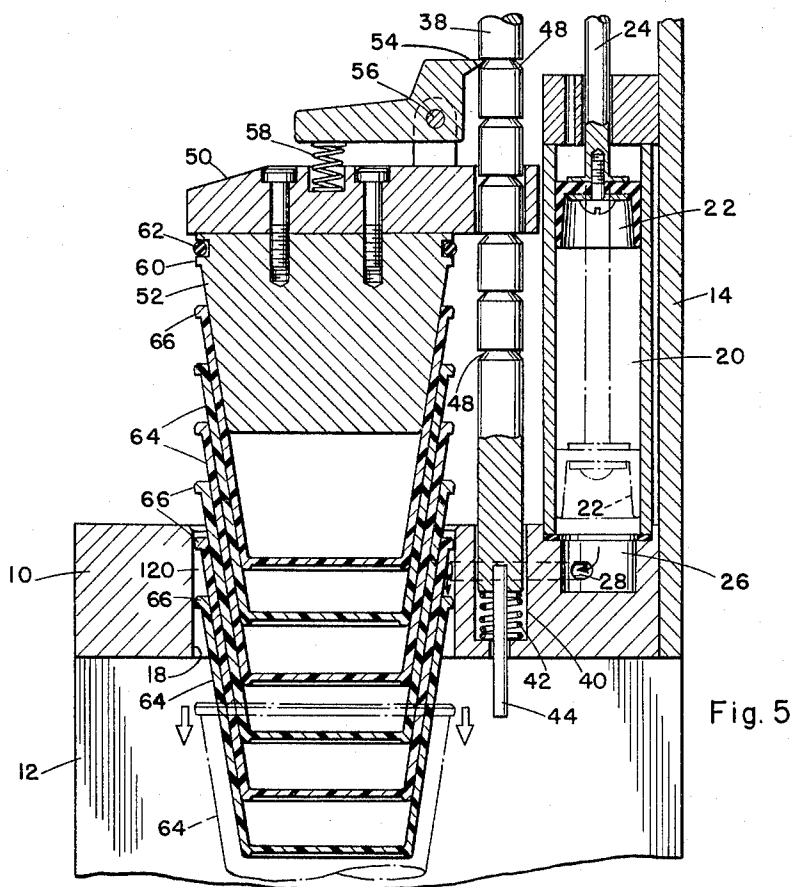
Fig. 4

INVENTOR.
ROBERT E. DAVY

BY *Knox & Knox*

3,273,750

3 Sheets-Sheet 2



BY *Knox & Knox*

Sept. 20, 1966

R. E. DAVY

3,273,750

FLUID PRESSURE CUP DISPENSER

Filed Feb. 1, 1965

3 Sheets-Sheet 3

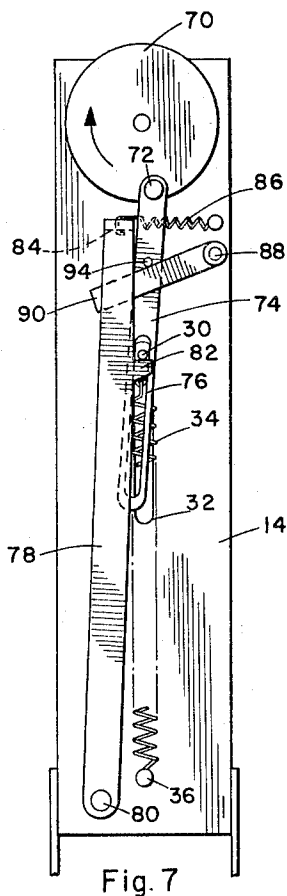


Fig. 7

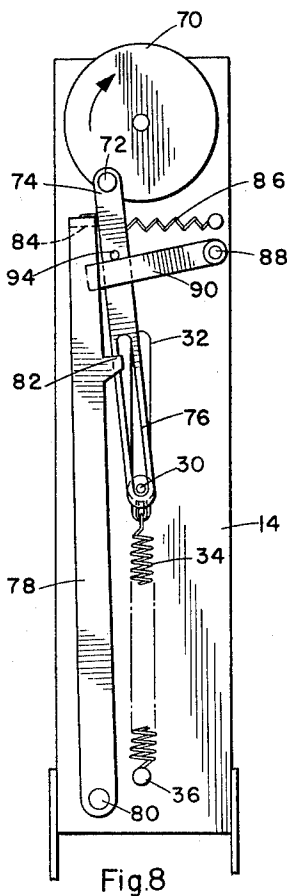


Fig. 8

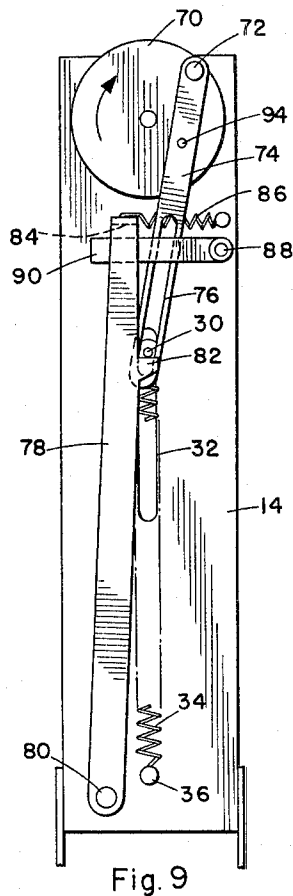


Fig. 9

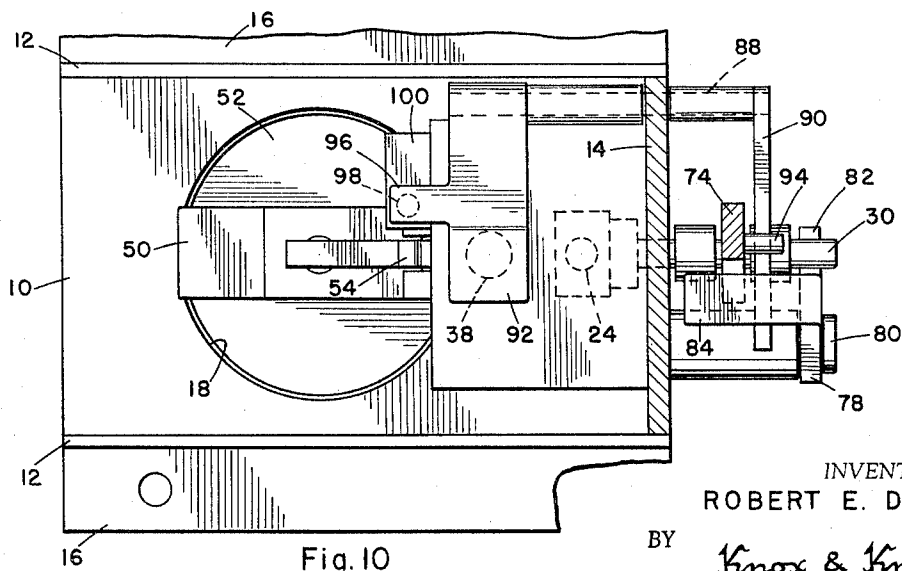


Fig. 10

INVENTOR.
ROBERT E. DAVY
BY
Knox & Knox

1

3,273,750

FLUID PRESSURE CUP DISPENSER
Robert E. Davy, La Mesa, Calif., assignor to
Coroga Co., Anaheim, Calif.
Filed Feb. 1, 1965, Ser. No. 429,507
7 Claims. (Cl. 221-278)

The present invention relates to dispensing machines and more specifically to a cup dispenser.

There are many types of machines presently available for dispensing disposable paper cups, either as independent machines or incorporated into beverage dispensers. Paper cups are usually inserted into a dispensing machine in a stack direct from the package, the machine having claw or arm means which engages the rim of the lowermost cup and separates it from the stack to be ejected. Conventional paper cups are smooth and usually waxed and separate quite easily. A type of disposable cup now in wide-spread use is made of foam plastic material for thermal insulation with hot or cold beverages. The material is of a soft nature and has a rather rough surface, which causes considerable friction between cups in a stack. Since the cups are packed tightly and do not separate easily due to the surface friction, the usual mechanical separation mechanism will crush the rim of a cup and may not even separate a cup successfully. Unless these thermally insulated cups can be dispensed without damage, their use in automatic beverage dispensing machines is impractical.

The primary object of this invention, therefore, is to provide a cup dispenser which will separate and eject an individual cup from a tightly packed stack without mechanical contact with or damage to the cup.

Another object of this invention is to provide a cup dispenser utilizing compressed air to eject a single cup from a cylindrical throat, the rims of the lowermost cups in a stack providing the sealing means in the throat to contain the air and ensure adequate pressure accumulation to eject the cup.

Another object of this invention is to provide a cup dispenser having an operating cycle which includes a timed air pressure pulse to eject a cup, then a precisely indexed advance of the cup stack to ensure accurate positioning of the cups in their sealed relation within the cylindrical throat.

A further object of this invention is to provide a cup dispenser, wherein the cups are advanced by a follower which itself carries a seal to fit into the throat, so that the last cup in a stack can be ejected.

Still another object of this invention is to provide a cup dispenser which is simple, compact and self-contained and can be operated by itself or adapted to a variety of beverage dispensing machines.

In the drawings:

FIGURE 1 is a front elevation view of the machine;

FIGURE 2 is a side elevation view thereof;

FIGURE 3 is a sectional view taken on line 3-3 of FIGURE 2;

FIGURE 4 is a wiring diagram of the machine;

FIGURE 5 is an enlarged fragmentary sectional view taken on line 5-5 of FIGURE 3, showing the cup ejection action;

FIGURE 6 is a sectional view similar to FIGURE 5, showing the ejection of the last cup;

FIGURE 7 is a rear elevation view with the mechanism at rest;

FIGURE 8 is a rear elevation view with the mechanism starting a cycle;

FIGURE 9 is a rear elevation view with the mechanism nearing the end of a cycle; and

2

FIGURE 10 is an enlarged sectional view taken on line 10-10 of FIGURE 2.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawing.

Structure and mechanism

The machine is built on a rigid frame comprising a bed block 10 supported on side plates 12 and having an upright back plate 14. Side plates 12 have feet 16 for attachment to a mounting surface and the side plates and back plate may be reinforced in any suitable manner or attached to adjacent structure of a machine in which the unit is installed. In the bed block 10 is a smooth bored cylindrical throat 18 extending vertically through the block, the diameter of the throat being a close fit for the cups to be dispensed, as hereinafter described. Adjacent the back plate 14 is an upright air cylinder 20 containing a piston 22 with an upwardly extending piston rod 24. The lower end of air cylinder 20 opens into a chamber 26 in the bed block 10, from which an air passage 28 leads to the throat 18. Fixed to the upper end of piston rod 24 is a latch pin 30, which projects through a vertical slot 32 in back plate 14 and is connected to one end of a tension type actuating spring 34, the other end of the spring being anchored to a post 36 in bed block 10, so that piston 22 is biased downwardly for an air compression stroke.

Adjacent the throat 18 is a reciprocable indexing rod 38 vertically slidable in a socket 40 in bed block 10 and being biased upwardly by a lift spring 42, said rod having a guide pin 44 extending below the bed block to maintain alignment. The upper end of indexing rod 38 slides through a head block 46 fixed to the back plate 14, said indexing rod having axially spaced indexing notches 48. Slidably mounted on indexing rod 38 is a horizontal arm 50 carrying a downwardly extending frusto-conical follower plug 52, which is preferably solid and reasonably heavy, and shaped to fit into a cup of the type being handled. On top of arm 50 is a pawl 54 mounted on a hinge 56 and biased by a spring 58 to engage the indexing notches 48, which are cut to allow the indexing rod 38 to rise and slip the pawl, but positively engage said pawl and force follower plug 52 down when the indexing rod descends. The upper end of follower plug 52 has an annular rim 60 in which is an O-ring 62 for a close sealed fit in throat 18.

The cups 64 are made by automatic machinery and are dimensionally constant, the rim diameter being quite accurate, so that a good fit is ensured in throat 18. In any event, the soft nature of the plastic material permits a very slight compression which is desirable to make a reasonably air tight seal in the throat. Also, the cups 64 are automatically stacked for packaging and it has been ascertained that the axial spacing between rims 66 of the cups in a stack is reliably constant. The notches 48 on indexing rod 38 are thus spaced at the same spacing as the stacked cup rims, so that the stack of cups in advanced the proper amount at each cycle, as hereinafter described. The axial length of throat 18 is sufficient for two cups to be held by their rims therein, as in FIGURE 5.

Mounted on the upper end of back plate 14 is a gear motor 68 driving a crank disc 70 disposed at the rear of the back plate. Crank disc 70 has a crank pin 72, to which is pivotally attached a resetting arm 74 extending downwardly therefrom and having a longitudinal slot 76 in which latch pin 30 rides. A latch arm 78, pivotally mounted at its lower end on a pin 80, extends upwardly behind back plate 14 and has a latch lug 82 which engages latch pin 30 and holds the piston 22 in its upper position against the spring 34. Latch arm 78 has a re-

3

lease tongue 84 projecting toward back plate 14 to be engaged by the resetting arm 74 when crank disc 70 turns, said latch arm being biased to the latched position by a return spring 86.

Extending through back plate 14 is a shaft 88 on the rear end of which is fixed an indexing arm 90. Fixed on the forward end of shaft 88 is a pressure foot 92 moving together with indexing arm 90, said pressure foot bearing on the upper end of indexing rod 38. The resetting arm 74 carries an indexing pin 94 which engages and holds down the indexing arm 90 in the static or inoperative position, as in FIGURE 7, thus pressing down the indexing rod 38 against spring 42. Pressure foot 92 has a shut-off arm 96 which engages the button 98 of a shut-off switch 100, mounted on head block 46, and holds the button depressed in the inoperative position.

It should be understood that the mechanism illustrated and the air pressure pulse actuating means are merely examples of operable apparatus and other mechanical movements or drive means may be equally suitable.

Electrical system

As illustrated diagrammatically in FIGURE 4, the motor 68 is connected directly to one terminal 102 of a power supply, the other terminal 104 being coupled through a normally open starting switch 106 to the coil 108 of a relay 110, which in turn is connected to terminal 102, so that closing of the starting switch energizes the relay. Coil 108, at the end connected to switch 106, is also connected to a movable holding contact 112, which, when closed by the relay operation, completes a circuit through a normally open contact 114 connected through the normally open contact 115 of shut-off switch 100, back to terminal 104. Shut-off switch 100 has a normally closed contact 116 connected to motor 68, but is held on the normally open contact 115 in the inoperative position by shut-off arm 96. Terminal 104 is also connected to a relay operated moving contact 117, which closes on a normally open contact 118 connected to motor 68. The starting switch and relay are omitted from the mechanical figures of the drawings, since these can be installed in any convenient positions on the frame, or adjacent structure, or in remote locations.

Operation

The static, or inoperative position of the mechanism is illustrated in FIGURE 7 and in the full line positions of FIGURES 1 and 2. A stack of cups 64 is loaded in the machine with the lowermost cups extending below bed block 10 and the rims 66 of the two lower cups held in throat 18. Air passage 28 opens into throat 18 in the annulus 120 formed between the two cup rims in the throat, as in FIGURE 5. When starting switch 106 is closed, by coin operated or other means, the relay 110 closes and energizes motor 68, also completing a relay holding circuit through contacts 112 and 114 and through the still closed contact 115 of switch 100. Crank disc 70 turns and the resetting arm 74 begins to move laterally across the back plate 14, engaging release tongue 84 and moving the latch arm 78 to the side to release latch pin 30, as in FIGURE 8. Spring 34 then pulls piston rod 24 sharply down, causing piston 22 to expel a pulse of pressurized air through passage 28 into the annulus 120. Since the stack of cups is held down by follower plug 52, the bottom cup of the stack is forcibly ejected downwardly, as indicated in broken line in FIGURE 5.

Continued rotation of crank disc 70 begins to raise the resetting arm 74 and lifts indexing pin 94 from the indexing arm 90. With the pressure foot 92 now free the spring 42 lifts indexing rod 38, as indicated in broken line in FIGURE 1. The weight of follower plug 52 holds itself and the cups in place as the indexing rod 38 slips the pawl 54. At the same time the shut-off switch 100 is released and closes on contact 116 to complete a

4

direct power circuit to motor 68 and de-energize relay 110, only momentary operation of starting switch 106 being necessary to start the operation. Further rotation of crank disc 70 raises the resetting arm 74 and lifts latch pin 30 to pull the piston 22 back to the top of cylinder 20. As the resetting arm swings back the spring 86 pulls latch arm 78 over until lug 82 engages latch pin 30 and locks the piston in the raised position.

Toward the end of one revolution of crank disc 70 the resetting arm descends and pin 94 engages and presses down the indexing arm 90. This depresses pressure foot 92 and forces the indexing rod 38 down, so that pawl 54 is engaged and the follower plug and stack of cups are advanced. Since the advancement of the follower plug 52 only occurs when the pawl 54 is engaged in an indexing notch 48 and is thus always exactly equal to the spacing of the notches, the actual upward motion of indexing rod 38 is not critical. This eliminates the need for precise tolerances in the pressure foot and indexing arm mechanism.

At the end of one complete revolution of crank disc 70, the pressure foot 92 is fully depressed and shut-off arm 96 opens shut-off switch 100, breaking the circuit through contact 116 and stopping the motor 68 to complete the operating cycle. Each time the machine is operated, one cup will be ejected, the remainder of the stack will be accurately advanced and the mechanism all re-set.

When only one cup is left in the machine, subsequent advancement of the indexing mechanism will bring the follower plug 52 into throat 18, with the O-ring 62 providing the upper seal of annulus 120, as in FIGURE 6. Ejection of the last cup can then take place in the normal manner, as described above.

Even with the tight stacking of the cups as used, the sharp discharge of a considerable volume of air into the restricted annulus 120 will break the bottom cup loose. Some of the air penetrates between the two cups in the throat, separating the walls and breaking the frictional grip. The cups are not damaged in any way and are contacted only by the wall of throat 18 and the follower plug 52, which can be of suitable material to meet sanitary regulations.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawings are to be considered as merely illustrative rather than limiting.

I claim:

1. A cup dispenser for dispensing individual cups from a tightly interfitted uniform stack of cups, the structure comprising:

a frame having a cylindrical throat through which the stack of cups passes, said throat being dimensioned so that the rims of the cups are gripped firmly, and an axial length sufficient to hold the rims of at least two of the stacked cups simultaneously whereby a portion of said throat defines, with said rims, a closed annulus;

ejecting means for supplying a pulse of compressed air into said annulus, whereby the cups are separated and one is ejected;

and indexing means for advancing the stack of cups a distance equal to the axial spacing of the cup rims, after each cup is ejected.

2. A cup dispenser according to claim 1, wherein said indexing means includes a follower for insertion into the last cup of a stack to be ejected, said follower having a rim portion to form, along with the rim of the last cup, a closed annulus corresponding to the first mentioned annulus, whereby the last cup can be ejected.

3. A cup dispenser according to claim 2 and including an indexing rod axially slidable substantially parallel to the axis of said throat, said rod having longitudinally

5

spaced notches thereon at spacings corresponding to the axial spacings of cup rims in a stack of cups;

said follower being slidable on said indexing rod and having pawl means engageable with said notches in one direction to advance cups into said throat; and means to reciprocate said indexing rod.

4. A cup dispenser for dispensing individual cups from a tightly interfitted uniform stack of rimmed, substantially frusto-conical cups, the structure comprising:

a frame having a cylindrical throat through which the stack of cups passes, said throat having a diameter in which the rims of the cups are gripped firmly, and an axial length sufficient to hold the rims of at least two cups simultaneously;

a source of compressed air having an air passage communicating with the interior of said throat between the rims of two cups held therein;

means for releasing a pulse of compressed air from said source into said passage and throat to eject a cup;

and means for successively advancing and indexing the stack of cups with the rims of two cups bridging said air passage at each advancement.

5. A cup dispenser according to claim 4, wherein said last mentioned means includes a substantially frusto-conical follower for insertion into the last cup of a stack; an indexing rod on which said follower is slidable, said

6

rod having notches thereon spaced corresponding to the spacing of cup rims in a stack of cups;

pawl means on said follower engageable with said notches in one direction to advance the cups;

and means to reciprocate said indexing rod in timed relation following ejection of each cup.

6. A cup dispenser according to claim 5, wherein said follower has a rim with sealing means thereon to seal in said throat and bridge said air passage together with the last cup of a stack held on the follower.

7. A cup dispenser according to claim 4, wherein said source of compressed air includes a cylinder and a piston in said cylinder biased to eject air therefrom;

latch means engageable with said piston to hold the piston against the bias;

actuating means to disengage said latch means and release said piston;

said actuating means including resetting means connected to said piston to return the piston and re-engage said latch means.

References Cited by the Examiner

UNITED STATES PATENTS

2,738,899	3/1956	Hansen et al.	221—278 X
2,946,480	7/1960	Farber	221—278 X
3,099,120	7/1963	Bruun	221—278 X

SAMUEL F. COLEMAN, *Primary Examiner*.