United States Patent

[11] 3,576,275

[72] Inventor **Floyd V. Bookout**
Long Grove, Ill.

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[73] Assignee **Rock-Ola Manufacturing Corporation**
Chicago, Ill.

[54] **CUP-HANDLING MECHANISM**
7 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **221/11,**
221/104, 221/105, 221/222
[51] **Int. Cl.** **G07f 11/00**
[50] **Field of Search** 221/11,
104, 105, 110, 221—223

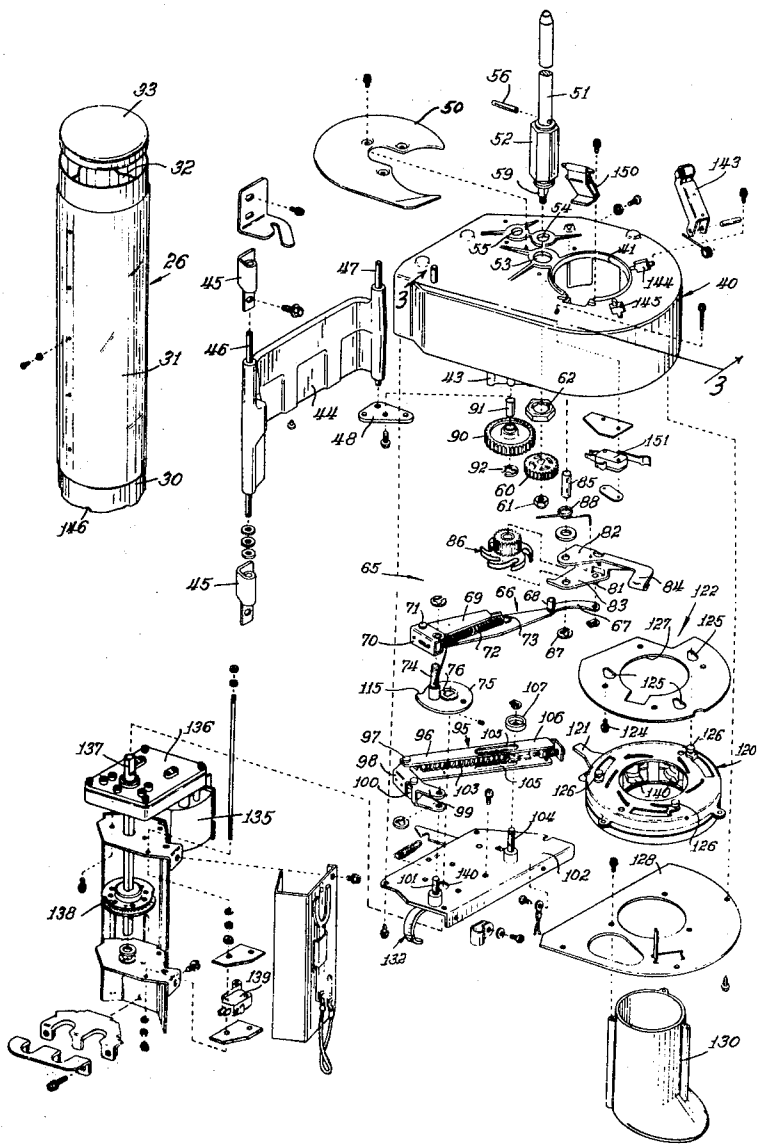
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Primary Examiner—Joseph R. Leclair
Assistant Examiner—Steven E. Lipman
Attorney—Davis, Lucas, Brewer & Brugman

ABSTRACT: A power-actuated assembly for automatically dispensing paper cups and periodically indexing a rotatable magazine to locate columns of stored cups in dispensing position, including a linkage system for selectively activating cup drop means operable to remove individual cups from an overdisposed stack thereof, and a secondary linkage system for automatically indexing the magazine to locate the cup stacks over the cup drop means; the assembly having an interchangeable drive system productive of selected magazine indexing movements whereby to accommodate storage magazines of different capacities.

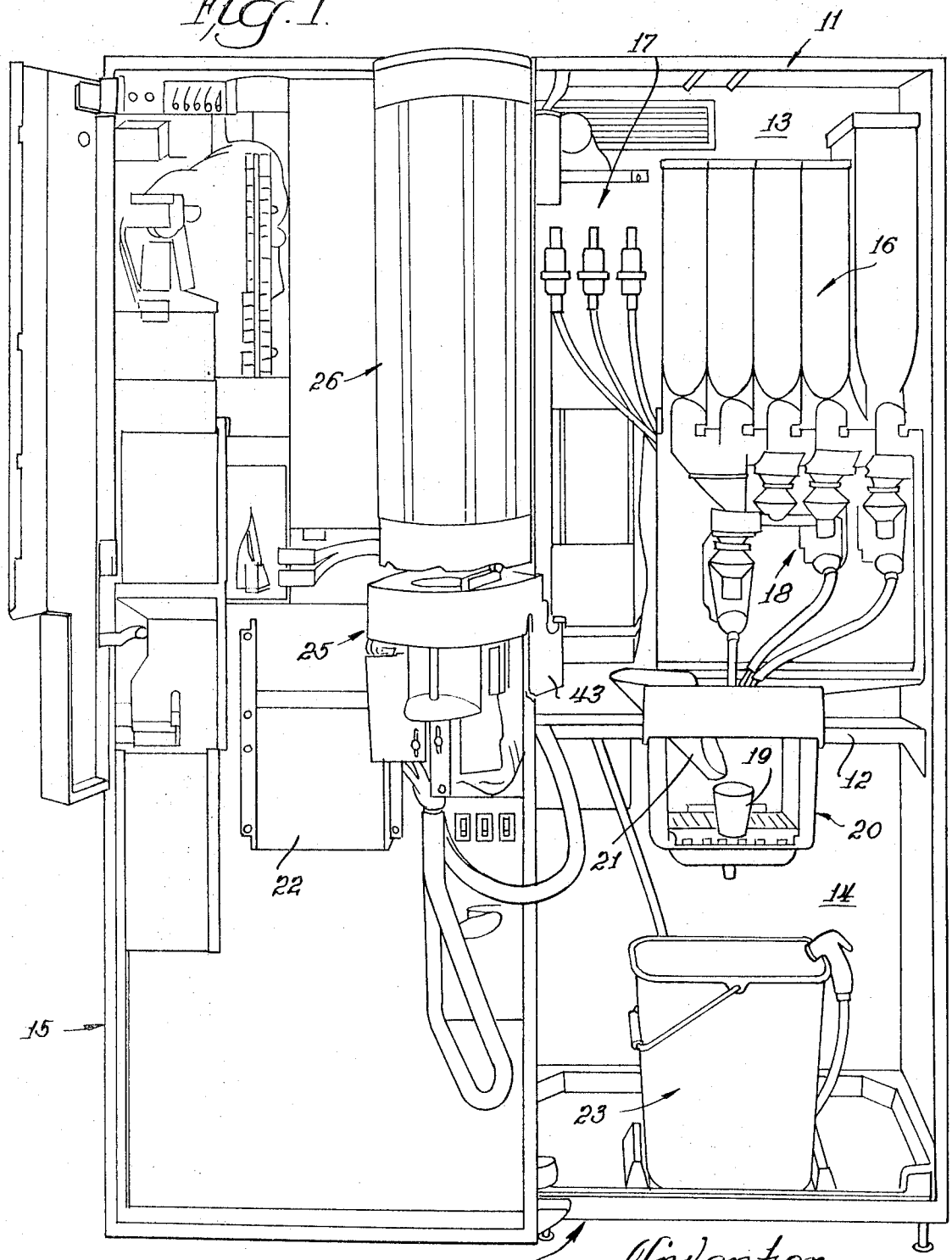


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SHEET 1 OF 7

Fig. 1



Inventor
Floyd V. Bookout
By Davis, Lucas, Brewer & Brugman Attys.

Fig. 2.

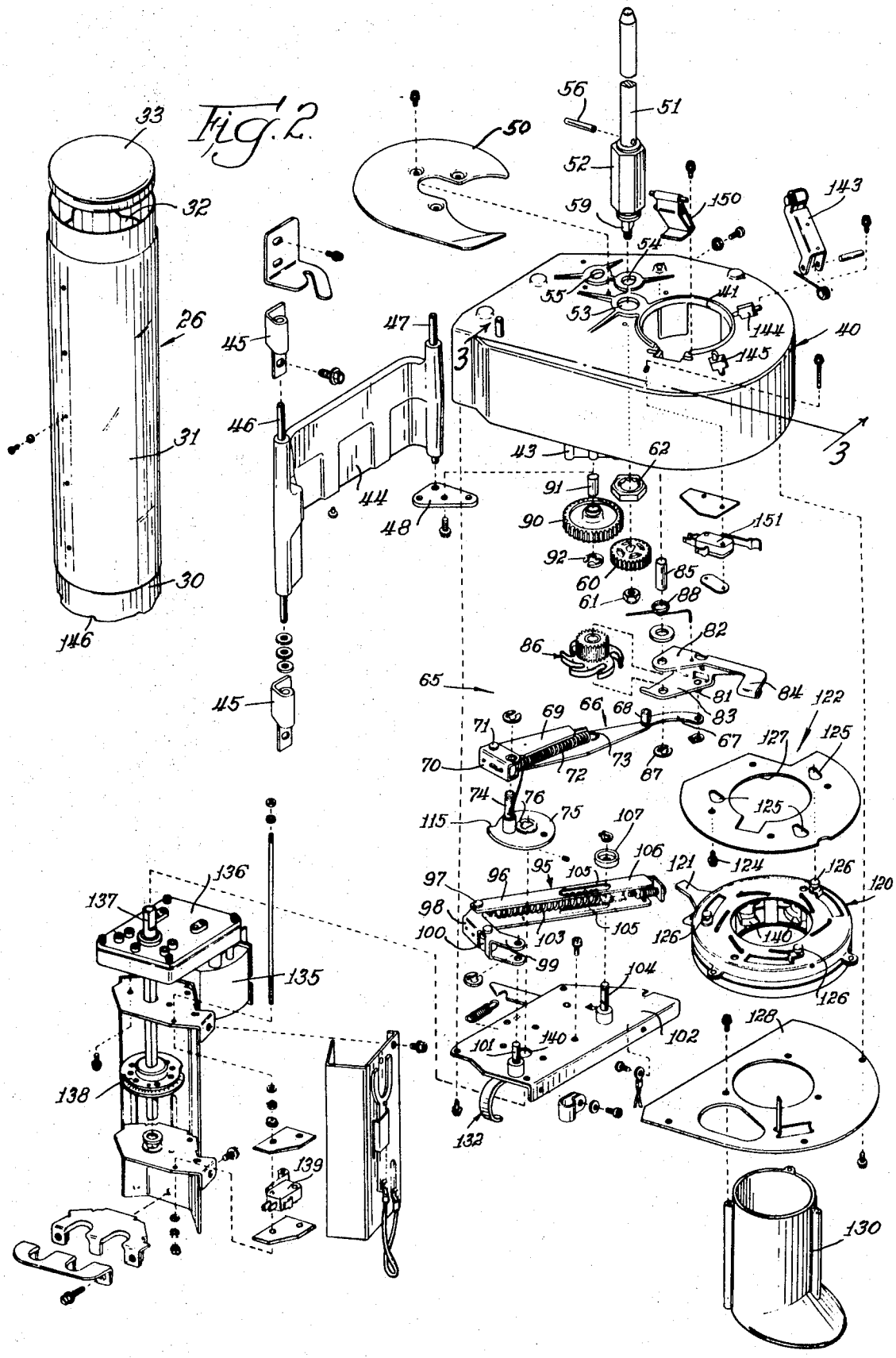
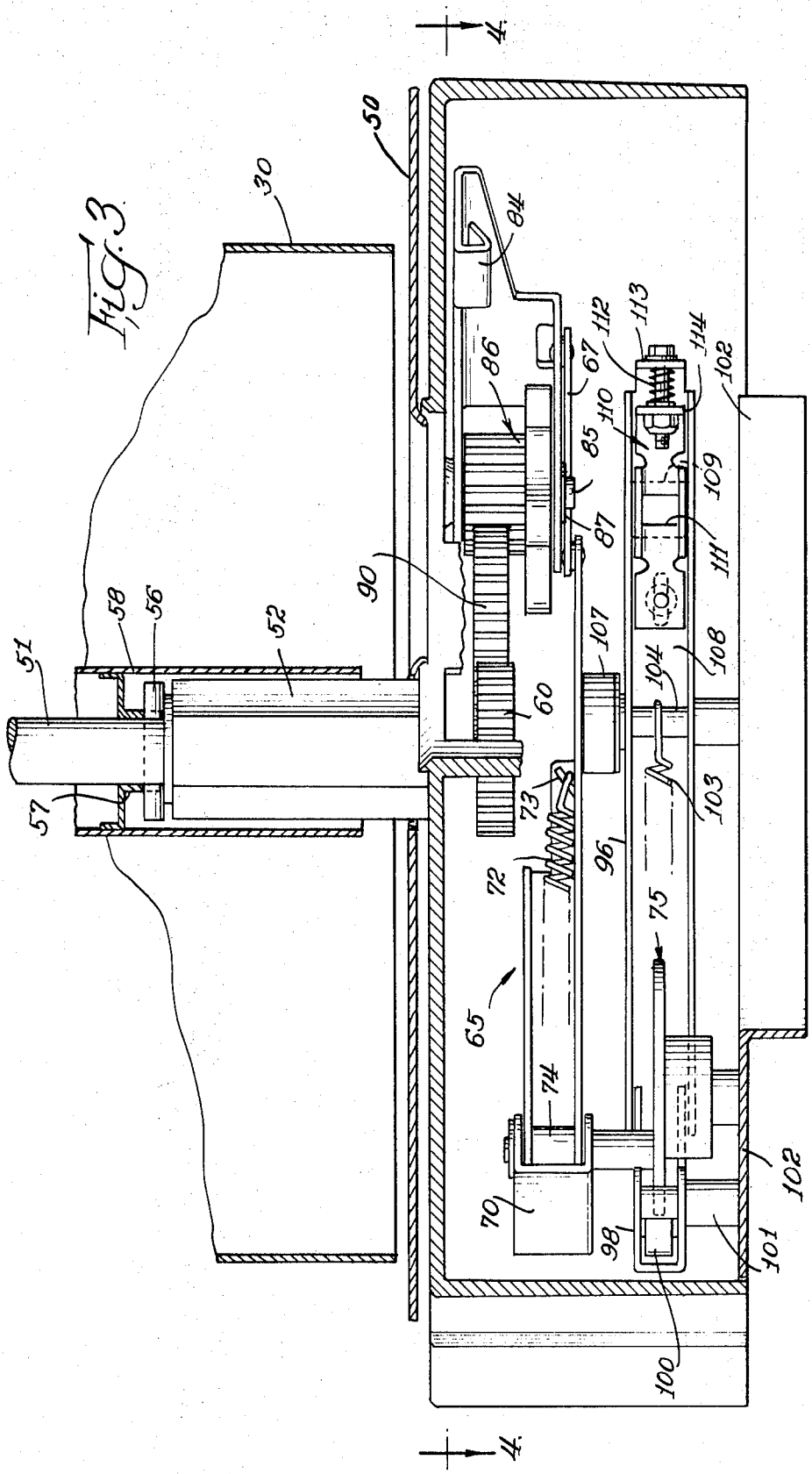

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Fig. 3


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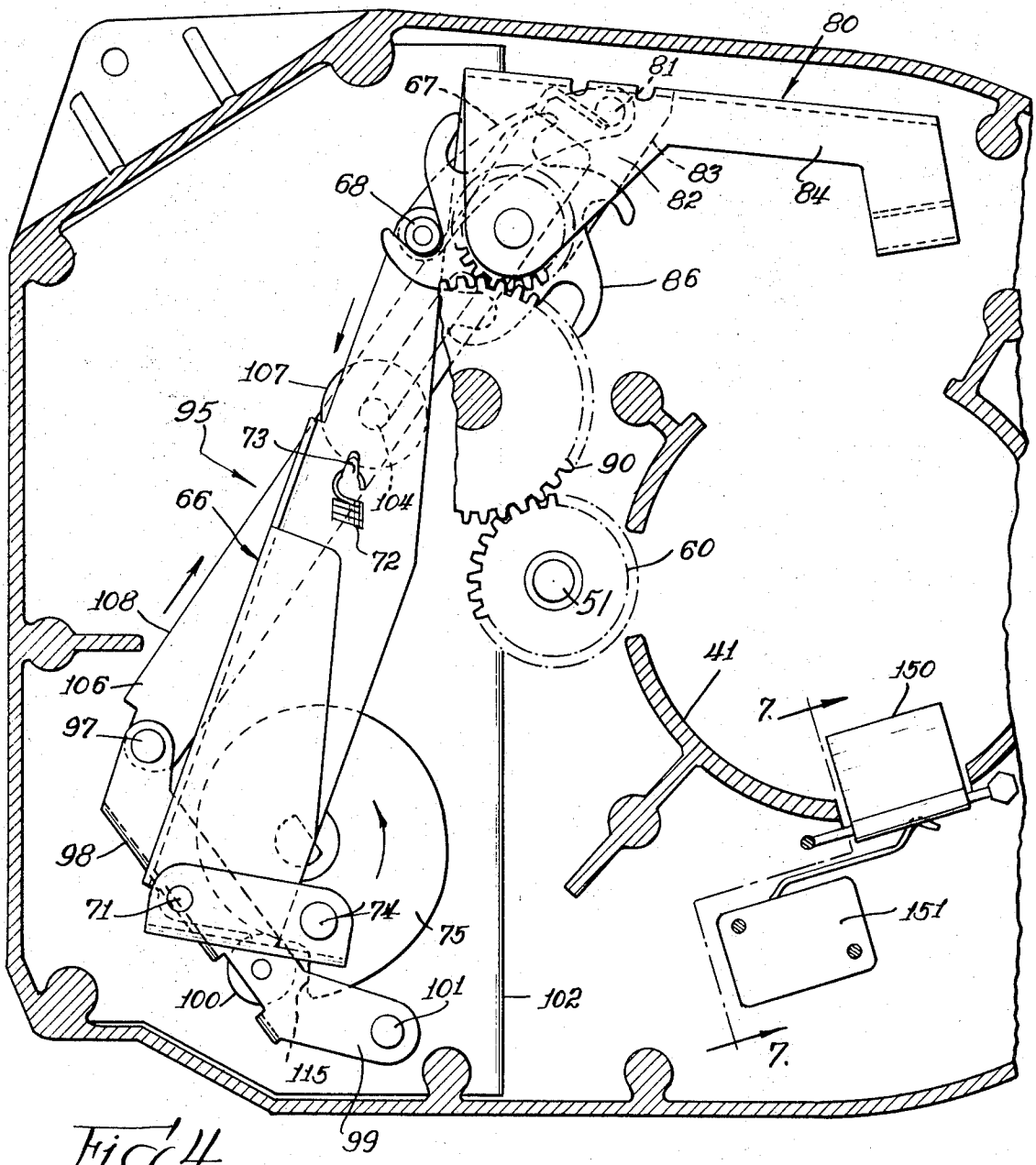

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Fig. 4

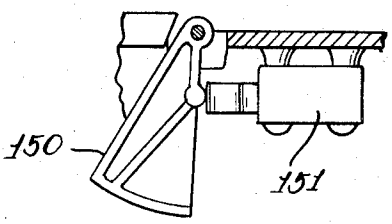

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Fig. 7

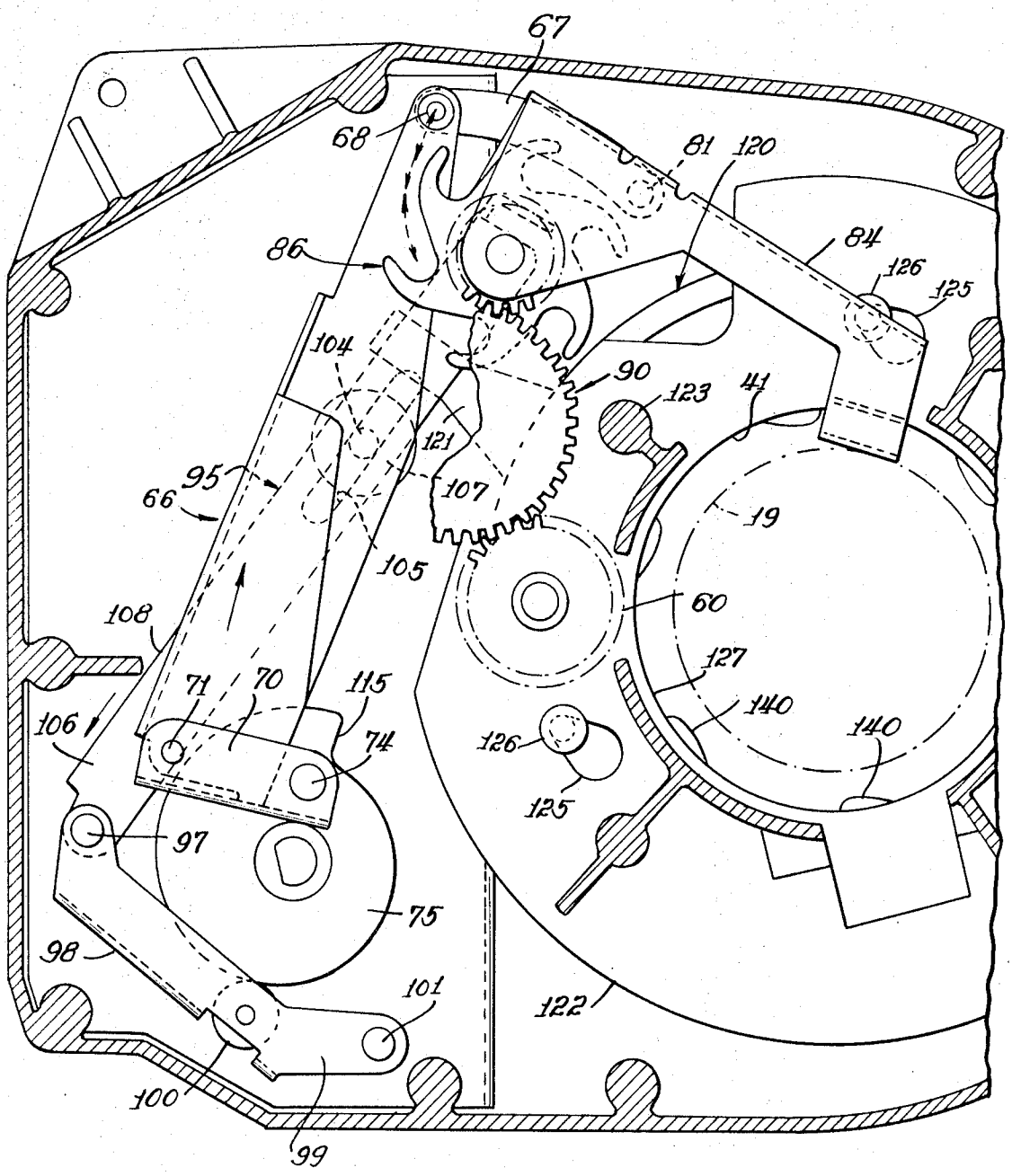

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Fig. 5.

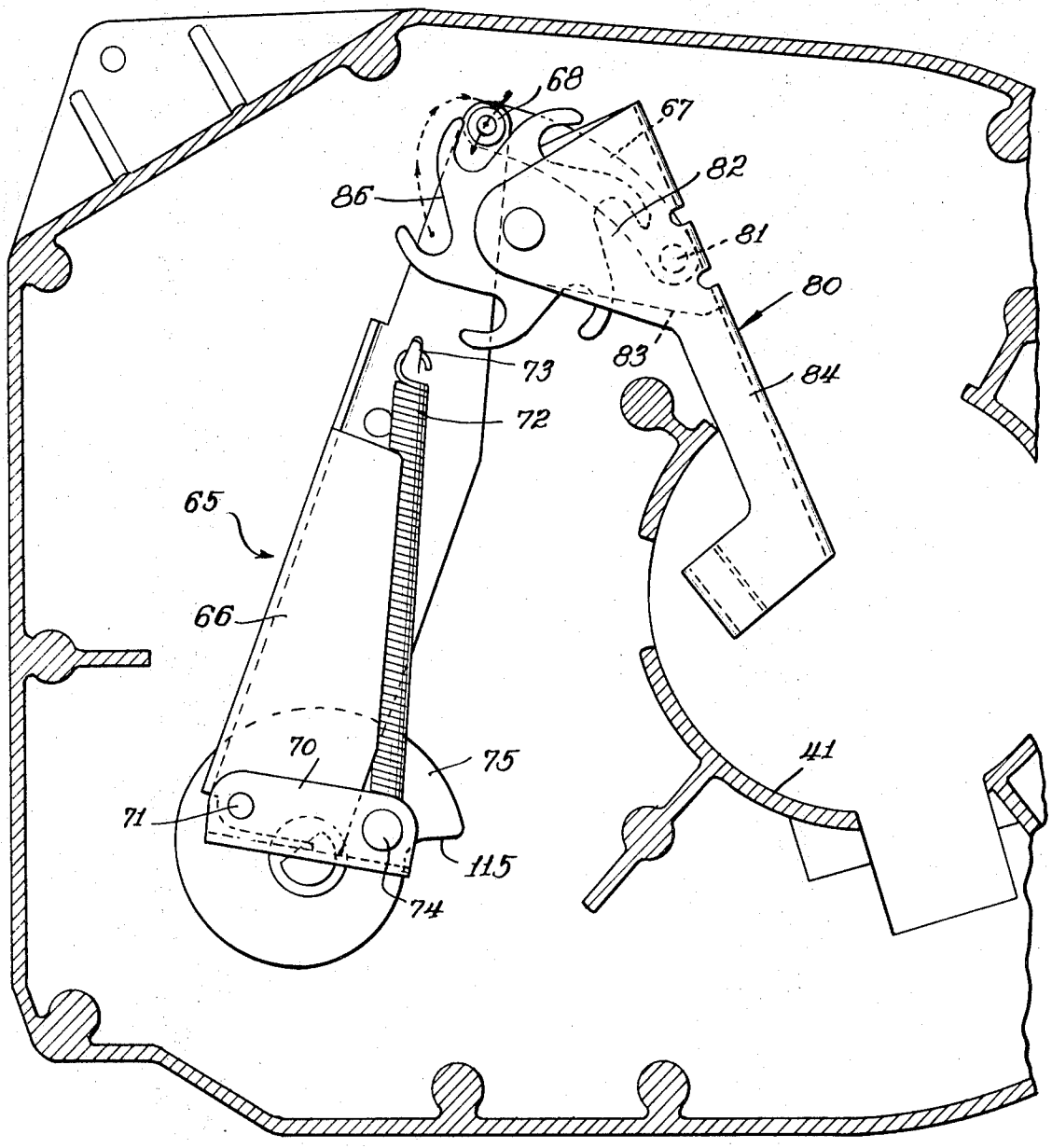


Fig. 6.

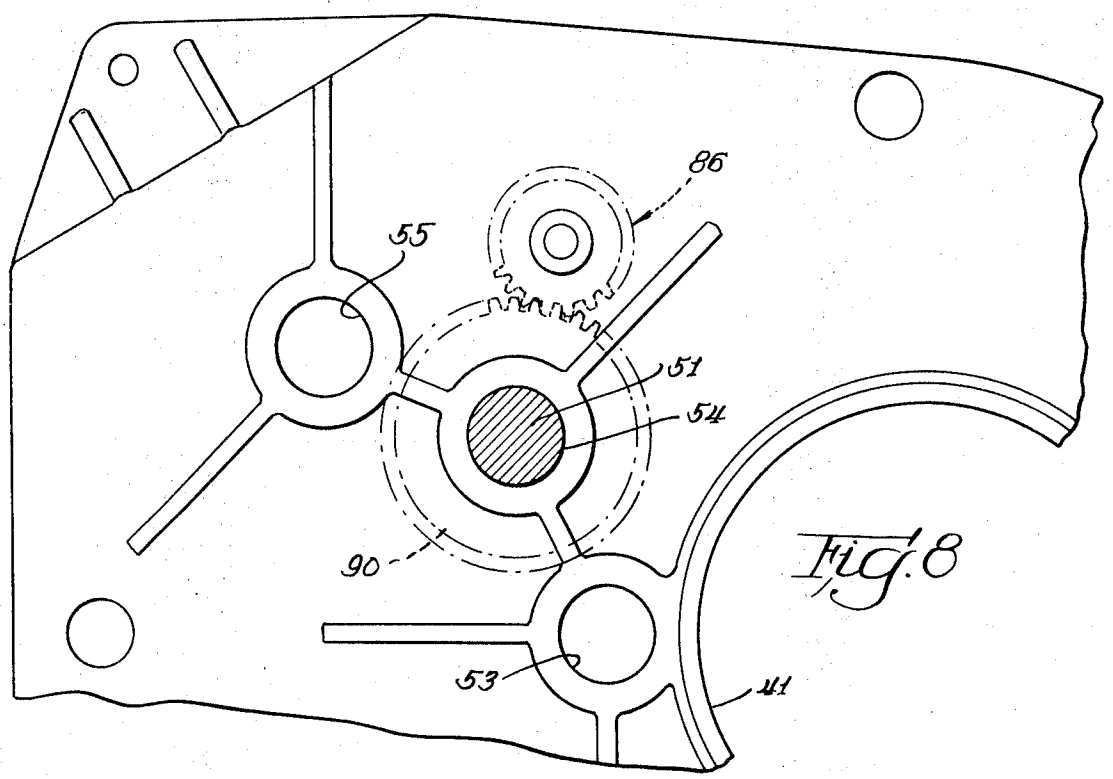


Fig. 8

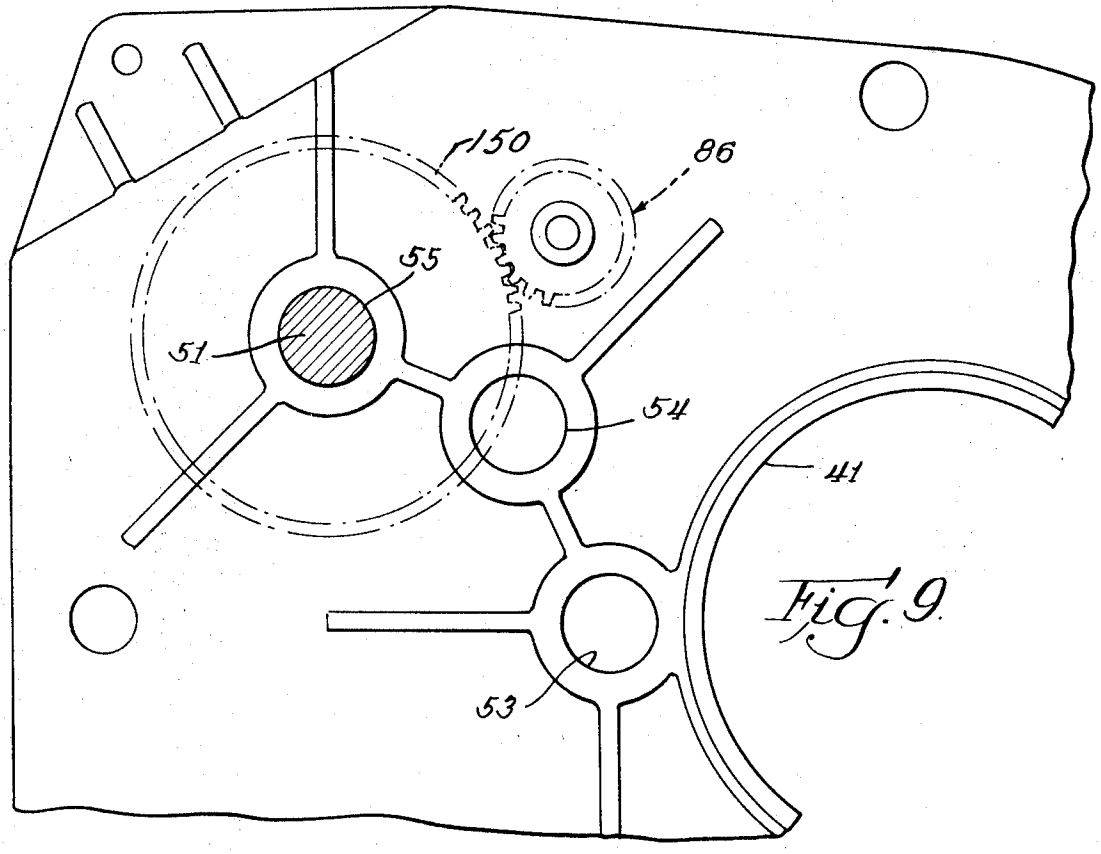


Fig. 9

CUP-HANDLING MECHANISM

BACKGROUND OF THE INVENTION

This invention relates generally to automatic vending machines utilizing paper cups and the like and is particularly directed to improved means for handling such cups and the storage means therefor.

The vending machine art has heretofore developed automatic cup dispensing means in which a rotatably driven magazine is provided with a plurality of vertical compartments for storing cups in separate stacks. The magazine is periodically indexed to successively position each stack of cups registeringly over a cup drop mechanism which in turn operatively strips individual cups from the lower end of the stack and delivers the same to a drink-vending stage in response to customer demand. Typical of such developments of the prior art is the mechanism set forth in U.S. Pat. No. 2,925,196 of Feb. 16, 1960, while one of the more prominently utilized cup drop mechanisms is disclosed in U.S. Pat. No. 3,071,292 of Jan. 1, 1963.

While the above-mentioned prior developments have been generally satisfactory for their intended purposes, certain limitations and deficiencies in their use and operation have demonstrated a need for improvements therein. One of the more glaring shortcomings in such prior devices, for example, lies in the flexibility of a given size dispensing mechanism to alter the magazine indexing cycle and magazine travel per indexing cycle. Thus, if it were desired to replace a four column storage magazine with a six or nine column magazine according to prior teachings, for example, it has been necessary to engineer a mechanism tailored to the particular number of storage columns and magazine size involved. Therefore, in effect, prior known dispensing mechanisms, of the order hereinabove referred to, have been deficient in providing a single cup-dispensing and magazine-indexing mechanism capable of accommodating different size storage magazines. This limitation has resulted in costly manufacturing and inventory practice and has markedly limited the utility and flexibility of a given vending machine design.

The present invention overcomes the above-indicated shortcomings of the prior art and provides improved mechanisms for automatically delivering individual cups from storage and for automatically indexing a storage magazine through various indexing movements to accommodate different size storage magazines.

In brief, this invention contemplates a centrally driven rotatable magazine, of generally cylindrical configuration, containing a plurality of vertical compartments for storing cups. A single electric motor drives a bank of electrical controls for automatically cycling an improved and simplified mechanism for actuating a conventional cup drop mechanism. A secondary linkage system both senses the presence of cups in a position for dispensing by the cup drop mechanism and activates drive means which are periodically conditioned for magazine indexing operation. The housing for the mechanism and the drive means for the magazine indexing function are such as to permit selected interpositioning and arrangement of the elements whereby to effect selective semirotational indexing movements of the magazine.

It is an important object of this invention to provide improved and simplified mechanisms for dispensing cups in automatic vending machines.

An additional object of this invention is to provide improved cup-dispensing mechanisms, as aforesaid, having an inbuilt capability for effecting a range of indexing movements of cup storage means associated therewith.

A still further object of this invention is to provide improvements in cup handling mechanisms for use in automatic vending machines which are demonstrative of improved manufacturing economies, dependability of operation and flexibility in cup storage capacity.

Having thus described the present invention, the above and further objects, features and advantages thereof will appear

from the following detailed description of a preferred embodiment of its several features, illustrated in the accompanying drawings.

IN THE DRAWINGS:

FIG. 1 is a front elevational view of an automatic vending machine embodying the mechanism of this invention;

FIG. 2 is an exploded perspective view showing elements and arrangement of parts according to this invention;

FIG. 3 is a cross-sectional view taken substantially along vantage line 3–3 of FIG. 2, looking in the direction of the arrows thereon, and illustrating the assembled linkage and drive systems combined in accordance with this invention;

FIG. 4 is a cross-sectional view looking downwardly from vantage line 4–4 of FIG. 3 showing a first operational positioning of assembled elements;

FIG. 5 is another cross-sectional view taken from the same vantage line as FIG. 4 and illustrating the positioning of elements in a second operational position;

FIG. 6 is a cross-sectional view similar to FIGS. 4 and 5 with parts removed to illustrate the mechanism for indexing the magazine;

FIG. 7 is a partial cross-sectional view taken substantially along vantage line 7–7 of FIG. 4 and looking in the direction of the arrows thereon;

FIG. 8 is a partial cross-sectional view from the same vantage line as FIG. 4, showing a first alternate drive assembly for indexing the storage magazine; and

FIG. 9 is another partial cross-sectional view, similar to FIG. 8, showing a second alternate drive assembly for indexing the storage magazine.

Regarding the general features of the present invention as disclosed in the illustrated embodiment, reference is made to FIG. 1 showing the normal operational context of the improved mechanism hereof, employed in a mixed-drink vending machine. As shown, vending machine **10** comprises an upright cabinet **11** of generally rectangular parallelepiped configuration, having a hollow cabinet interior separated by a horizontal shelf **12**, into an upper compartment **13** and a lower compartment **14**. The front wall portion of the cabinet is in the form of a hingedly movable door **15** which supports the usual coin receiving and drink selector mechanisms on its inner face. When shut door **15** serves to enclose the interior of the cabinet **11** and when opened, provides convenient access thereto for maintenance purposes.

The upper cabinet compartment **13** houses dry ingredient storage means **16**, liquid ingredient storage means **17**, ingredient mixing means **18** and attendant mechanisms. Liquid and dry ingredients are admixed by the means **18** and delivered by gravity to a paper or plastic cup **19** deposited on a vending stage **20** via a delivery chute **21**. Convenient access to a cup on stage **20** is provided by door means **22** located in the front door panel **15** directly opposite stage **20**. In this latter regard it will be noted that the vending stage **20** is located in the lower cabinet compartment **14** beneath the shelf **12** and immediately above an overflow bucket **23**. Cups are delivered to the chute means **21** from the dispensing mechanism **25** according to this invention (illustrated in FIG. 1 in a swung out or access position) such being hingedly mounted for such purpose. Mechanism **25** is associated with an overdisposed multicompartment cup storage magazine **26** movable with the mechanism **25** to a position within the upper cabinet compartment **13** for operation. Inasmuch as the vending machine and its means for storing, measuring delivering and mixing ingredients to form potable beverages as well as the means for delivering cups to the vending stage constitute no part of the present invention other than to provide a preferred context of use, further reference and description thereof is deemed unnecessary herein.

Turning now to the cup-handling and dispensing mechanism according to this invention, particular reference is made to FIGS. 1 and 2 of the drawings. As previously indicated,

mechanism 25 is cooperatively associated with an overdisposed cup storage magazine 26, the latter of which includes a rotatably driven cylindrical indexing turret, indicated generally by numeral 30; a preferably transparent cylindrical outer shield or wrapper 31 mounted coaxially with and extending above the turret 30, internal compartment separator means 32 surrounded by wrapper 31 and dividing the interior thereof into a plurality of vertical cup storage columns, usually 4, 6 or 9 in number, and a cover member 33 removably mounted over the open top of wrapper 31 to provide easy access for loading cups in the interior storage columns. The particular illustrated structure and configuration of the magazine means 26 are generally according to known practice in the art except for the driving connection thereof with mechanism 25, as will be described later herein.

Mounted immediately beneath the indexing turret 30 is the dispensing mechanism 25 comprising various elements, illustrated in the exploded perspective of FIG. 2, which are combined in an operative manner as best shown in FIGS. 3—9. While the operation of mechanism 25 will be described in detail hereinafter, suffice it to say at this juncture, that mechanism 25 operates to automatically strip or drop cups, one at a time, from the lower end of a stack of cups positioned thereover and deposit the same in the delivery chute 21 for presenting such cups at the vending stage 20 in response to initiation of a particular vending cycle according to customer demand. Additionally, mechanism 25 periodically operates automatically to index magazine 26 and thereby position a column of cups in position for the above-mentioned cup drop and delivery functions. This takes place at a predetermined condition as sensed by mechanism 25 and basically involving the absence of an adequate cup supply in cup dispensing position.

As shown best in FIG. 2 mechanism 25 includes an open bottom housing 40 having a cup drop opening 41 in the upper wall 42 thereof. A hinge bracket portion 43 is provided at one corner of housing 40 to cooperate with a pivot arm assembly 44 including pivot hinge brackets 45–45 for holding pivot pin 46 and a parallel disposed hinge pin 47 held in position by plate 48. Pin 46 is attached to the cabinet 11, while hinge pin 47 is attached to housing 40. Principally, the hinging mount of the housing 40 permits the dispensing mechanism and magazine to be operatively positioned within cabinet 11 or swung outwardly as pictured in FIG. 1 to provide convenient access thereto for purposes of repair and resupply of cups in the magazine means 26. This feature also provides access to the liquid storage means 17 and adjacent mechanisms located in the upper compartment 13 of the cabinet.

A cup-loading and guide plate 50 is attached to the upper wall 42 of the housing 40 about the cup-drop opening 41 therein, while a magazine drive shaft 51 having a thrust bearing 52 assembled coaxially about the lower end thereof is adapted to be mounted in one of three alternate mounting openings 53, 54 and 55 formed through the upper wall of housing 40. A drive pin 56 extends transversely through shaft 51 immediately adjacent the upper end of thrust bearing 52 for engaging a cooperating slot 57 formed in the axial core structure of the magazine means 26 and more particularly in hub member 58 at the lower end of dividers 32 (see FIG. 3), thereby providing driving connection between the magazine means and drive shaft 51. The described driving connection for the magazine means permits the latter to be axially withdrawn and removed from the upper end of the shaft 51 as required.

A reduced diameter portion 59 is formed at the lower end of shaft 51 with a flattened land or surface on one side thereof to extend through the upper wall 42 of the housing and protrude therebeneath for connection with a drive gear 60 held in place by a threaded nut 61 (see FIG. 3). It will be noted that gear 60 is positioned coaxially below a larger locknut 62 which threadingly engages a threaded portion formed for that purpose at the lower end of the thrust-bearing assembly 52 whereby the latter is locked to the upper wall of the housing 40 in assembly.

As previously mentioned, shaft 51 and its thrust bearing are adapted to be located in any one of the three openings 53—55, as will be amplified in greater detail hereinafter. In brief, however, the particular location selected for shaft 51 depends on the indexing cycle and selected indexing movement for magazine means 26 as dictated by the driving activity of a turret indexing mechanism comprising a first linkage system or assembly 65 (see FIG. 6) as will now be described.

As best shown in FIG. 2 of the drawings the individual elements comprising assembly 65 are set forth with the same being shown in organized relationship in FIGS. 3 and 6 in particular. Referring first to FIG. 2, assembly 65 comprises a turret indexing arm 66 of a generally elongated configuration having pivot link 67 pivotally joined to one end thereof by pivot post 68. The arm 66 is folded over along one edge to provide a substantially U-shaped housing portion providing a platform 69 paralleling the plane of the main body of arm 66. A breakaway connector link 70 of generally U-shaped cross-sectional configuration is pivotally attached at one end to the outer end of the arm 66 by pin means 71, which extends through the platform 69, the main body of the arm 66, and the outer end of link 70 permitting the latter to pivot about the axis of pin 71. A spring means 72 has one end anchored to the link 70 and its opposite end to an ear 73 struck upwardly from the main body of arm 66. This spring serves to resiliently tension the connector link 70 in close abutting engagement against the adjacent end of arm 66 while permitting relative movement therebetween in the event arm 66 becomes jammed in operation. The opposite end of link 70 is formed with a pair of registeringly aligned openings receptive of a cylindrical crank pin 74 projecting upwardly of an underlying actuator disc cam 75, of which more will appear later herein. It will be noted that pin 74 is eccentrically located with respect to the rotational axis or hub portion 76 of the cam 75, so as to impart cranking movement to arm 66 in response to rotation of the cam.

The outer end of the pivot link 67, which is not pivotally joined to arm 66 by post 68, is joined to a sensor arm 80 by pivot connector 81. The sensor arm 80 has a main body of substantially U-shaped cross section comprising parallel spaced ear portions 82 and 83 the latter of which is adapted to engage the pivot post 68. A sensing finger 84 extends outwardly from one end of the arm 80 and the portions 82 and 83 thereof are formed with registeringly aligned openings receptive of a mounting stub shaft 85 which coaxially and rotatably maintains a combination drive gear and ratchet 86 between the ear portions. Shaft 85 has its upper end press fitted into the upper wall 42 of the housing 40 and both the sensor arm 80 and combined gear and ratchet 86 are coaxially locked thereto, by ring 87. A torsion spring 88 is also mounted about shaft 85 and engages the housing 40 and the upper ear portion 82 in a manner to bias the sensor arm normally toward the cup-drop opening 41, or clockwise, when viewed from above (see FIG. 5).

Rotational driving of the gear and ratchet member 85 is effected periodically in response to rotation of cam 75 and the oscillating motion imparted thereby to indexing arm 66. More particularly the post 68 is aligned to engage successive teeth of the ratchet wheel of member 85 thereby rotating the latter under certain condition. Briefly, in normal circumstance with cups in the drop opening 41, the outer end of finger 84 of the sensor arm 80 is moved from its FIG. 4 position to its FIG. 5 position. Under these operational conditions post 68 moves in and out of the same tooth of the ratchet wheel in response to the oscillating movements of arm 66. Thus the ratchet wheel remains stationary. However, when there is no cup at opening 41 for the sensing finger to engage, the latter moves across opening 41 as illustrated in FIG. 6 moving post 68 into the next ratchet tooth with arcuate clockwise movement of arm 66. Consequently on the return stroke of arm 66, post 68 is aligned to pick up the next or succeeding tooth of the ratchet wheel, and thereby rotatably drives member 86 to index the magazine turret.

Driving connection between the gear portion of member 86 and drive gear 60 associated with the turret indexing shaft 51 is brought about in the FIG. 4—6 embodiment by an intervening idler gear 90 mounted on the lower end of a supporting spindle 91 depending from the upper inside wall of the housing 40; gear 90 being held to spindle 91 by lockring 92 or the like. With this arrangement, rotational driving of the gear and ratchet member 86 effects rotational driving of the intermediate idler 90 thereby to rotatably drive gear 60 and the turret-engaging spindle shaft 51 to which the cup storage magazine is coupled. It will be recognized in this regard, that the arcuate indexing movement of the magazine depends on the partial rotation of shaft 51 which in turn is dependent on the ratio between gears 86 and 60. Within certain geometric limits, dictated by the location of the rotational axes for gears 60 and 86, this ratio may be selectively varied. As previously mentioned, such selective flexibility is fully contemplated herein, principally by changing the location of shaft 51 (the axis for gear 60) and the ratio between the drive gear 60 and the ratchet gear member 86, as will be amplified hereinafter (see FIGS. 8 and 9).

Also mounted within the interior of housing 40 and located immediately below the turret-indexing assembly hereinabove described, is a second linkage system or assembly, indicated generally by numeral 95 (FIG. 2) and comprising a rectilinear arm member 96 of substantially U-shaped cross section pivotally joined at one end by pin means 97 to a cam follower link 98 also of U-shaped cross section. Link 98 is distinguished by parallel spaced planar arm portions 99, 99 rotatably mounting a cylindrical cam following roller 100 therebetween. The outer ends of the arm portions 99, 99 are provided with registeringly aligned openings receptive of a cylindrical mounting pin 101 projecting upwardly from an underlying motor-mounting plate 102 which is adapted to be attached to and across one end of the open bottom of housing 40 (see FIG. 5). Thus link 98 pivots about post 101 while the cylindrical roller 100 engages the edge of the cam member 75 in assembly.

Extending along the open interior of the arm 96 is an extension spring 103 anchored at one end to the pivot pin 97 and having the opposite end thereof anchored about an upwardly projecting mounting post 104 fixed to the motor-mounting plate 102. Post 104 extends upwardly through a pair of the elongated slotted openings 105 registeringly aligned and formed in opposite planar wall portions 106, 106 of the arm 96. A slide button 107 is mounted over the upper end of post 104 outwardly of the arm 96 to maintain spaced relationship and provide a guiding bearing surface between the arm 96 and the over-disposed turret-indexing arm 66 (see FIG. 3).

The backwall 108 of arm 96, which extends integrally between the parallel wall portions 106, 106 thereof, is provided with an opening 109 adjacent the elongated slotted openings 105. A slide plate 110 having an opening 111 therein, is slidably mounted over opening 109; sliding adjustment thereof being provided by screw and spring means 112 cooperating between a pair of parallel spaced ears 113 and 114 respectively associated with the outer end of arm 96 and slide plate 110 (see FIG. 3). Adjustment of plate 110 serves to adjustably locate opening 111 for reasons which will appear presently.

From the above description it will be appreciated that in response to the rotational activity of the cam 75 the roller 100 follows the periphery of the cam and thereby serves to oscillate the arm 96 rectilinearly relative to the mounting bolt 104; the latter of which rides in the opposing slotted openings 105, 105. In so moving the extension spring 103 is tensioned as the cam follower 100 moves away from post 104. When roller 100 moves over or past a node portion 115 of cam 75 the tension of spring 103 serves to effect a quick rectilinear return movement of the arm 96 in a direction away from the cam means 75.

The above-described rectilinear reciprocating motion of the arm 96 is employed to drive a cup-drop ring assembly, indicated generally at 120, in accordance with the aforementioned U.S. Pat. No. 3,071,292. Driving connection between assembly 120 and arm 96 is effected by virtue of an operating tail portion 121 of assembly 120 which extends into the adjustable opening in the slide plate 110, as above described and is therefore moved with arm 96. The drop ring assembly 120 is suspended beneath a mounting ring or plate 122 therefor affixed to mounting posts 123, 123 formed integrally with the cast housing 40 and depending into the hollow interior thereof adjacent the periphery of the cup-drop opening 41. Mounting screws 124 (see FIG. 2) are employed to fasten the plate 122 to such posts. It will be noted that plate 122 is formed with three key hole openings 125, 125, each of which is adapted to receive the enlarged head and lock with the body of an upstanding mounting stud 126 on the drop ring assembly 120 as taught in the aforesaid U.S. Pat. No. 3,071,292.

Plate 122 also contains a large central opening 127 which aligns registeringly with the central opening of the drop ring assembly 120 and cup-drop opening 41, in assembly, for the passage of cups therethrough. A cover plate 128 fits beneath the drop ring assembly 120 to cover over the open bottom of housing 40 and to support a chute like cup guide 130 therebeneath. Guide 130 aligns with the upper end of delivery chute means 21 leading to the vending stage 20 when the dispensing mechanism and magazine are swung inwardly to their housed condition within the upper chamber 13 of the cabinet. To this latter purpose the motor mounting plate 102 is equipped with a latch mechanism indicated generally by numeral 132 (FIG. 2) which is engageable with a suitable keeper (not shown) within the cabinet for holding mechanism 25 in its cup-dispensing position over the vending stage.

From the above description it will be recognized that initiation and activation of the two linkage systems or assemblies 65 and 95 described and comprising the turret indexing arm 66 with its associated linkages, and the cup-drop actuating arm 96, depends on rotational activity of cam means 75. As shown best in FIGS. 1 and 2 of the drawings, mounted immediately beneath and attached to the underside of the motor-mounting plate 102, is a single drive motor 135 for driving a gear reduction drive means 136 which rotatably drives a cam shaft 137 at reduced speeds. Shaft 137 is elongated and extends below the drive means 136 to support and rotate a plurality of cycle cams 138, each of which is associated with a micro switch 139 for controlling various electrical cycles and functions of the vending machine.

The upper end of shaft 137, as shown best in FIG. 2, is formed with a flattened area on one side and extends upwardly through an opening 140 in the motor-mounting plate 128. It is on this shaft 137 that cam means 75 is mounted, the latter having a mounting hub portion 76, hereinabove mentioned, formed with an opening flattened along one side to lock with the upper end of shaft 137 for positive driving engagement and connection therebetween. Thus in response to periodic operation of the motor means 135, the cam shaft 137 is rotatably driven to rotatably cycle the cam means 75. In response to the rotational movement of the cam means 75, the turret indexing arm 66 is activated with a cranking motion about the eccentric mounting pin 74 while the cup-drop actuating arm 96 is reciprocated with a rectilinear movement by the following activity of cam follower roller 100 along the periphery or cam profile of cam means 75.

Having thus described the various elements and assemblies combined in the mechanism 25 and the associated cup storage magazine 26, the particulars of operation therefor, will now be set forth.

Those familiar with the art understand that when magazine means 26 is indexed to a position whereat a stack of cups is aligned over opening 41, the cups drop gravitationally downward and lodge in the upper end of the cup drop mechanism 120, which has a plurality of semirotational dispensing fingers 140 adapted to engage the rim of the lowermost cup disposed therein. Upon initiation of a vending cycle by the customer, motor means 135 is energized, rotating cam

means **75** and causing the linkage assembly **95** to reciprocate through its cycle in response to the engagement of the roller **100** with the periphery of cam means **75**. The resulting reciprocating movement of arm **96** with which the tail member or portion **121** of the cup drop mechanism is engaged, causes such tail portion to oscillate, producing responsive rotating activity of the synchronously movable cup engaging fingers **140**. This action successfully strips away the lowermost cup of the cup stack and gravitationally drops the same into the cup guide **130** for delivery to the vending stage, all in accordance with teachings of the aforementioned U.S. Pat. No. 3,071,292.

Meanwhile, also in response to rotational activity of cam means **75**, the magazine indexing system **65**, particularly the indexing arm **66** thereof, oscillates arcuately in the manner heretofore described, to effectively move the sensing finger **84** from its FIG. **4** position toward opening **41**, whereat the outer end of such finger engages a cup depending through opening **41** (see FIG. **5**). As a result, inward radial movement of the sensing finger or arm **84** is arrested against the side of the engaged cup causing the pivot post **68** associated therewith to return to the identically same tooth of the ratchet wheel previously engaged thereby. This action therefore, avoids rotation of the combined gear and ratchet wheel member **86** and consequently, the magazine means **26** in not indexed.

Eventually, of course, the cups in the stack indexed over opening **41** are depleted to the point where the cup sensing finger **84** is capable of moving across opening **41**, due to the absence of a cup in its path of movement (see FIG. **6**). It should be noted, however, that in this circumstance, several cups normally remain in the cup drop mechanism **120** beneath the path of movement for arm **84**. This accommodates the dispensing of cups during rotational indexing cycle of the magazine means **26**.

Whenever the cup-sensing arm **84** moves across opening **41**, as illustrated best in FIG. **6** of the drawings, the pivot post **68** associated therewith is shifted laterally and arcuately with arm **66**, sufficiently to engage the next succeeding tooth of the ratchet wheel portion of member **86** during the return stroke of arm **66**. Thus the ratchet and gear member **86** is rotatably driven to correspondingly drive shaft **51**, resulting in the indexing movement of the magazine means.

In the particular magazine means illustrated in FIGS. **3** to **6** of the drawings, having four cup storage columns, the total indexing movement between cup stack positions is one-fourth of the magazine circumference or, that is, 90°. In the indexing mechanism illustrated, however, it takes two indexing movements of the gear and ratchet wheel member **86** to effect full indexing movement to the magazine means **26**. Consequently, the indexing motion imparted to shaft **51** for each rotational movement of the gear and ratchet **84** is 45° in the four column magazine situation as illustrated. This occurs each time the sensing arm **84** is permitted to move across the cup-drop opening **41**.

At the end of each complete indexing cycle for the magazine means **26**, a spring-actuated detent roller assembly **143**, mounted in one of the openings **144** or **145** of the housing **40** pops upwardly to engage a notch **146** provided in the lower rim or skirt of the turret assembly **30** associated with the magazine means. Such engagement of the detent roller with a notch **146** effectively prevents reverse or backward rotational movement of the magazine means while allowing the latter to advance in an indexing direction as required. It should also be recognized that the initiation of each indexing cycle for the magazine means depends on the initiation of a drink-vending cycle by the customer, according to conventional practice.

With particular reference to FIGS. **4** and **7** of the drawings, it will be noted that a "sold out" lever **150** is pivotally mounted adjacent the periphery of the cup-drop opening **41** of housing **40**, normally depending inwardly of such periphery in the absence of cups therein. A microswitch **151** is mounted immediately adjacent the lever **150** and is normally "open" when the lever **150** is in its non engaged position, as illustrated in FIG. **4**. In the presence of cups in the opening **41**, the lever **150** is depressed, closing switch **151** and appropriate electrical circuitry, interlocked with the motor means **135**, conditions the latter for electrical energization in response to initiation of a vending cycle. If for any reason, a new supply of cups is not indexed over opening **41** and dropped therethrough by the time the "sold out" lever **150** is released from its engagement with cups over the cup-drop mechanism **120**, motor means **135** is electrically isolated and remains deenergized until the failure of the cup supply is rectified, as by recharging the magazine.

It will be recalled that one of the outstanding features of the present invention resides in the ability of the described mechanism to be readily adapted for various magazine-indexing movements in order to accommodate magazines having varying capacities. To that end, reference is now made to FIGS. **8** and **9** of the drawings wherein alternate means for driving the magazine are illustrated.

In FIG. **8** of the drawings a first alternate driving arrangement between the drive gear portion of the combination ratchet and drive gear member **86** and shaft **51** is illustrated. In essence as therein shown, the magazine drive shaft **51** is mounted in a first alternate position opening **54** of the housing to accommodate a six position or six column storage magazine. In this arrangement the previously described idler gear **90**, as shown in FIGS. **4** and **5**, for example, is mounted on shaft **51** and engaged directly with the combination ratchet and drive gear member **86**. The previously described drive gear **68** is eliminated in this setup.

The ratio between gears **86** and **90** is one to two, and under this arrangement the direction of rotation for shaft **51** is reversed from that produced by the assembly of FIGS. **4** and **5**. With this arrangement, each indexing movement of gear **86** produces a 15° indexing shift of the magazine with two such indexing shifts producing a total indexing movement of 30° for the magazine for each complete cycle of a six column magazine.

Due to the fact that the diameter of the six column magazine is somewhat different than the four column magazine **26** illustrated in FIG. **2**, for example, the detent roller assembly **143** is positioned in its alternate opening **145** in a manner to prevent reverse rotational movement of the six column magazine.

In FIG. **9**, a second alternative driving arrangement is illustrated to accommodate a nine column storage magazine. In this alternate arrangement the turret-indexing shaft **51** is mounted in opening **55** of the housing **40** and an alternate drive gear **150** is affixed to the lower end of shaft **51** in direct driving engagement with the combination drive gear and sprocket member **86**. The ratio between gears **86** and **150** is one to three, so that each indexing shift of the magazine in response to the indexing engagement of each tooth of the ratchet gear member **86** produces an effective arcuate movement of the magazine in the order of 20°. Again, since there are two such shifts required per indexing cycle, the total movement for each indexing cycle of the nine column magazine comprises 40°. For the nine column magazine the detent means **143** remains in the alternate opening **145**, utilized with the six column magazine hereinabove described.

From the foregoing it is believed that those familiar with the art will readily recognize and appreciate the novel concepts and features of the present invention which mark the same as an advancement over the prior art. Additionally, while the present invention has been described in relation to a particular preferred embodiment, shown in the accompanying drawings, it is to be understood that the same is susceptible to numerous changes, modifications and substitutions of equivalents without departing from the spirit and scope of this invention. Consequently, it is intended that this invention be unlimited by the foregoing, except as may appear in the following appended claims.

I claim:

1. In a vending machine utilizing disposable cups stored in vertical stacks carried by a magazine indexable to successive positions for aligning cups over an underdisposed cup drop, the combination comprising: reciprocating linkage means for operating the cup drop whereby to strip individual cups from a stack thereof positioned over the cup drop, an oscillatable mechanism including sensing means operable to sense the presence or absence of cups over said cup drop, drive gear and ratchet means adjacent said sensing means and rotatable about a fixed axis, a single cam means operable to reciprocate said linkage means and oscillate said mechanism in response to rotation thereof, a single motor means for rotatably driving said cam means, shaft means coaxial of the magazine for rotatably supporting and indexing the latter, periodically actuated drive means between said shaft means and said drive gear and ratchet means for effecting selected indexing movements of the magazine means in response to rotation of said drive gear and ratchet means, and means on said sensing means engageable with said ratchet means for effecting rotation of the latter during each oscillating cycle of said mechanism in which the absence of cups over the cup drop is sensed by said sensing means.

2. The combination of claim 1 wherein said drive means comprises interchangeable gear means, and means for mounting said shaft means at selected locations with respect to said fixed axis of said gear and ratchet means.

3. The combination of claim 1 and means on said shaft means for detachably coupling the magazine thereto.

4. The combination of claim 1 and a housing about said linkage means, said mechanism and said cup drop; said housing having an opening registeringly aligned with said cup drop, and detent means for maintaining the magazine in successive indexed positions whereat cups are aligned over the cup drop.

5. The combination of claim 4 and electrical switch means mounted adjacent the periphery of said opening and operable to electrically isolate said motor means in the absence of a supply of cups over the cup drop.

6. In an automatic vending machine utilizing disposable cups carried in stacked columns within a rotatable magazine means adapted to be indexed periodically to position cups in dispensing position over an underdisposed cup drop mechanism, improved means for operating the cup drop mechanism and selectively indexing said magazine means comprising: a fist linkage assembly rectilinearly reciprocal for operating said cup drop mechanism, a second linkage assembly, oscillatably operable during each operating cycle of said first assembly and independently thereof to actuate cup-sensing means for determining the presence or absence of cups in dispensing position over the cup drop mechanism, a single rotatably driven cam means having a peripheral contour for positively reciprocating said first linkage assembly and having eccentric means for positively oscillating said second linkage assembly in response to periodic energization of electrical motor means coupled thereto, drive means associated with said second linkage assembly and periodically actuated by the same whenever said sensing means determines the absence of cups in said dispensing position, and means interconnecting said drive means and magazine means whereby to rotatably index the latter through selectively varied arcuate increments whereby to effect a selected number of indexed movements of the magazine means for each rotational cycle thereof.

7. In an automatic vending machine, a rotatable magazine for storing disposable cups in plural vertical stacks, a cup drop mechanism for stripping individual cups from the lower end of a stack positioned thereover, and a mechanism for selectively actuating said magazine and cup drop mechanism comprising: a housing, a drive shaft, means for rotatably mounting said shaft at selected locations on one wall of said housing, said shaft having an end portion insertable coaxially into the lower end of said magazine and having detachable connection therewith; means for mounting the cup drop mechanism within said housing in alignment with a cup drop opening formed in said one wall thereof, a single rotatable cam means mounted in said housing and having a peripheral cam profile, a first linkage assembly having cam follower means engaged with said profile and rectilinearly reciprocal in response to rotation of said cam means, means interconnecting said first linkage assembly with the cup drop mechanism for periodically actuating the latter in response to each reciprocating cycle of said first linkage assembly, a second linkage assembly eccentrically coupled to said cam means and oscillatably driven in response to rotation of the latter, including pivotal sensing means arcuately movable along a path intersecting the axis of said opening, said sensing means being movable across said opening in the absence of cups positioned over said cup drop mechanism and being arrested adjacent the periphery of said opening in the presence of cups over said cup drop mechanism; drive gear and ratchet means mounted on a fixed rotational axis definitive of the pivotal axis of said sensing means and periodically engageable by means on the latter in response to the rotational cycling of said cam means; said means on said sensing means effecting rotational movement of said gear and ratchet means whenever said sensing means moves across said opening; and means selectively arranged between said gear and ratchet means and said drive shaft in accordance with the selected location of the latter to effect rotational movement of said shaft in selectively varied increments in response to uniform rotational movement of said gear and ratchet means whereby said magazine means may be indexed between a selected number of stations for each rotational cycle thereof.