

# United States Patent

[11] 3,591,045

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[54] **HELICAL COIL VENDING MACHINE**  
10 Claims, 9 Drawing Figs.

[52] U.S. Cl. .... 221/75

[51] Int. Cl. .... G07f 11/00

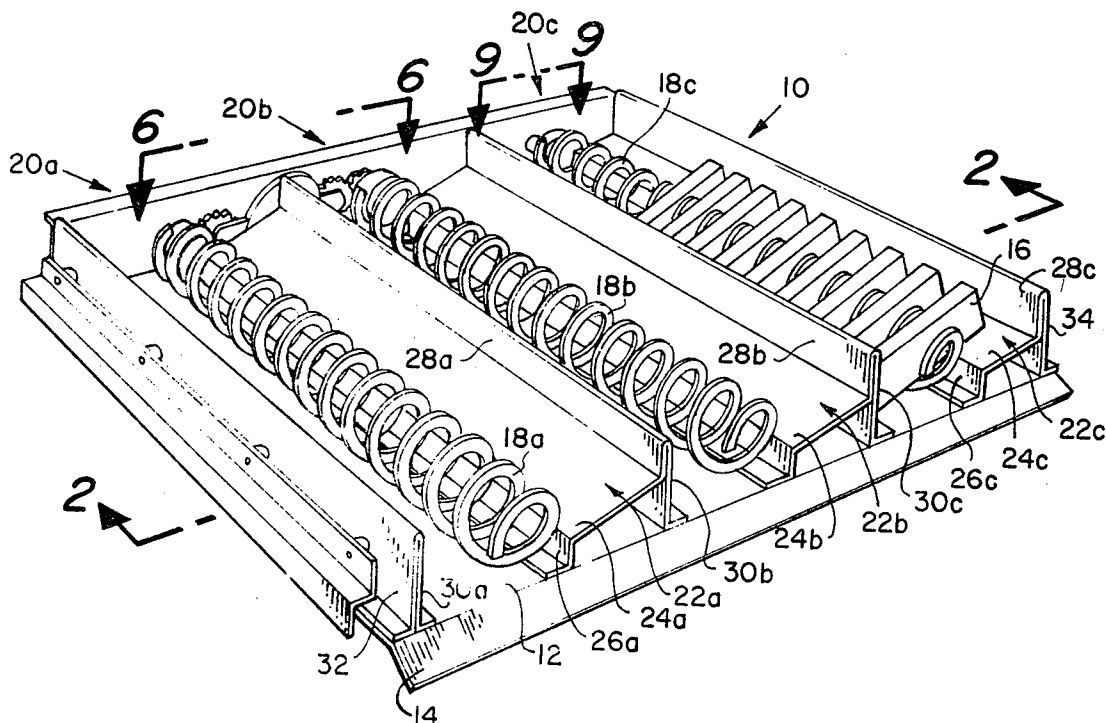
[50] Field of Search ..... 221/75

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**ABSTRACT:** Improved dispensing shelves for cabinet-type vending machines having a plurality of helical feeder coils for advancing articles interposed between the convolutions of the coils to a delivery opening. The articles are supported on sloping supports having a lower front edge terminating in a downward step immediately adjacent one side of a cooperating coil. Guide rails disposed from and adjacent the opposite side of cooperating coils maintain various sized article in engagement with the coils. Single coil driver mechanisms rotate individual coils on selective activation and additional double coil drive mechanism for discrete pairs of coils connected in tandem operate the paired coils in an alternating manner from a single activating signal.



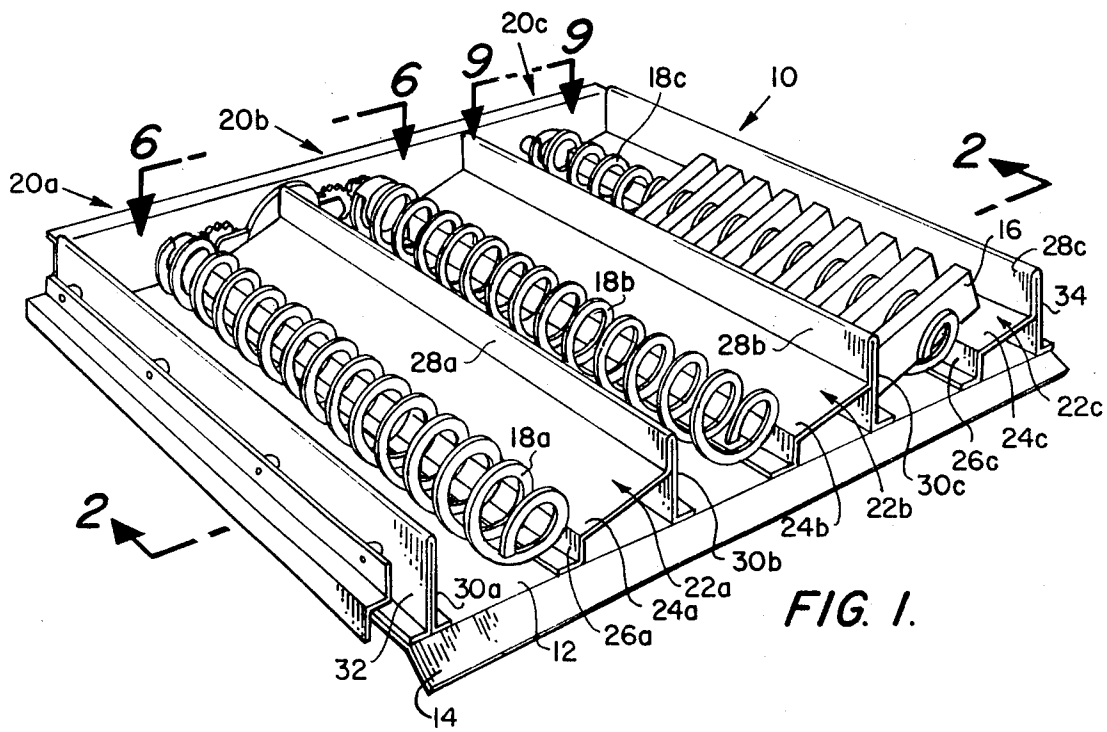


FIG. 1.

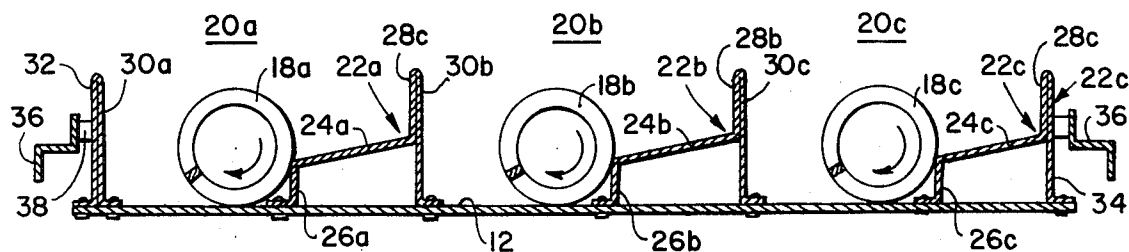


FIG. 2.

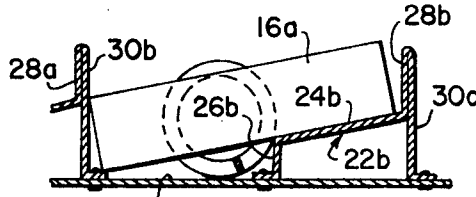


FIG. 3.

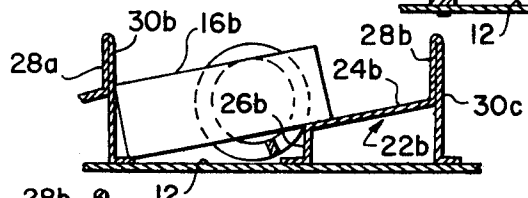


FIG. 4.

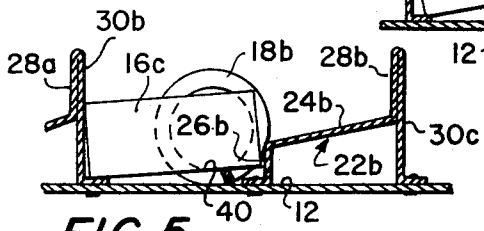


FIG. 5.

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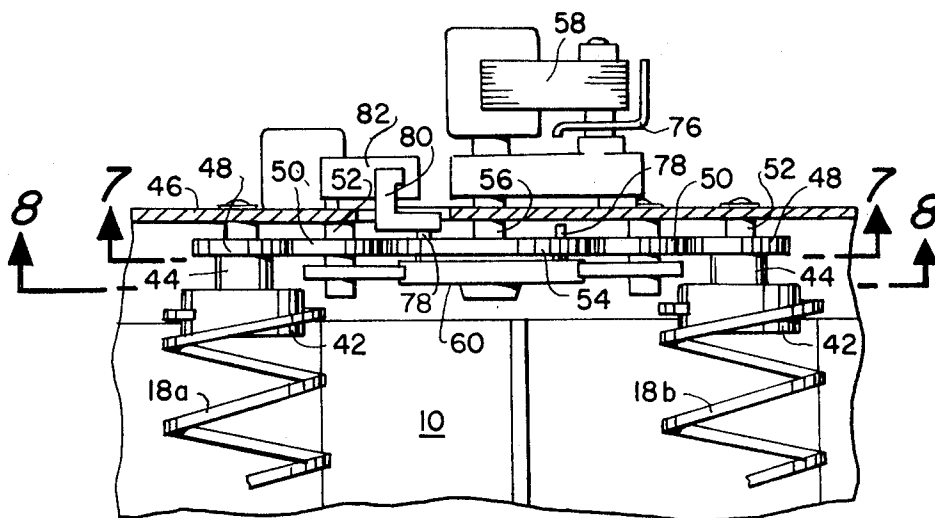


FIG. 6.

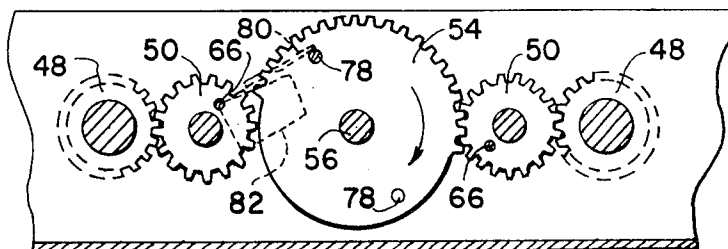


FIG. 7.

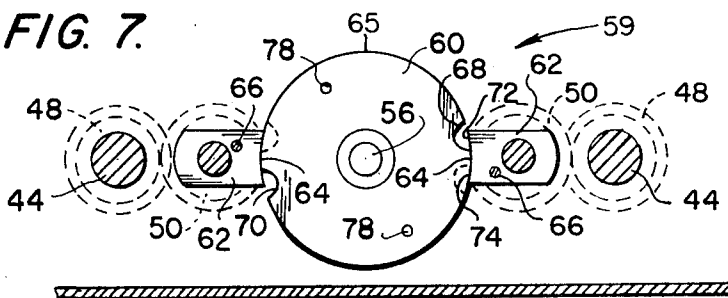


FIG. 8.

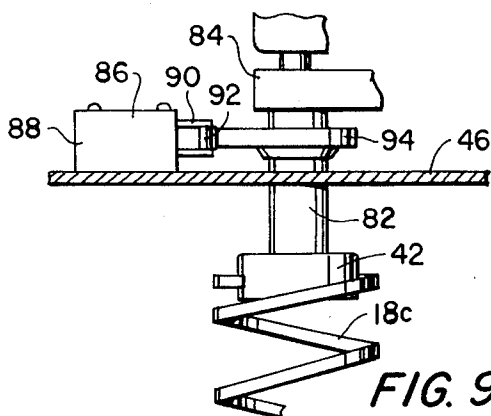


FIG. 9.

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## HELICAL COIL VENDING MACHINE

### BACKGROUND OF THE INVENTION

Cabinet-type vending machines employing helical coils to selectively dispense numerous types of articles and packaged goods such as candies, nuts and the like are old in the art. Vending machines have been widely employed to eliminate the costs of personally vending inexpensive articles. To maintain a low labor overhead it is imperative that the machines be efficient, economical, and easy to service and load.

Recent efforts in the art of helical coil type vending machines have been typified by the requirement of some type of positive confining means for the coils employed therein. These confining means have taken many forms. Some employ troughs which confine the coil to either side. Others employ internal guides which extend within the coil, and still others employ both troughs and internal guides. They all require a relatively complicated shelf and/or guide construction and, most generally, require some type of adjustable guide for the article being vended. This art is to be contrasted to the present invention which employs what might be termed a "free floating" feeder coil and a gravity responsive supporting arrangement of the article being vended which alleviates the necessity for adjustable article guides.

Articles customarily sold in vending machines come in a variety of sizes and packages. The vending machines must therefore be readily adaptable to dispense this variety without unnecessary sacrifices in capacity and efficiency. Stocking different sized articles in a single helical feeder coil has created certain problems. Adjustable guide settings customarily employed to keep specific sized articles in engagement with the coil may not be suitable for articles of different size. Thus, variety stocking is inhibited and articles in a coil of one type, often must be completely exhausted before stocking a new line. The overall capacity of the machine is thereby greatly reduced. The present invention relates to an improved arrangement of the feeder coils and article guides to obtain a maximum dispensing efficiency for a helical coil-type vending machine.

### SUMMARY OF THE INVENTION

The cabinet-type vending machine employing a plurality of helical coils as the dispensing mechanism is relatively simple in operating principle. Articles to be dispensed are interposed in the convolutions of a helical feeder coil. Upon activation, the coil is rotated advancing the articles toward the end of the coil and directing the foremost article to a delivery opening. Customarily a single delivery opening is located beneath the coils which are mounted above the opening on one or more shelves. The foremost article is advanced to the lip of the shelf from which it freely drops under the influence of gravity and is guided by a chute to the delivery opening where it may be removed by the customer.

Coil rotation is activated by a pull knob, push button or other type selector in cooperation with a coin operated control mechanism, such that only the coil containing the article desired is rotated to dispense the article to the delivery opening.

The coils are rotatably supported on shelves and preferably positioned normal to a front viewing panel in the vending machine permitting the foremost article in each coil to be readily visible to the customer. The customer is thereby assured that he will receive the very article he perceives.

To permit the articles to freely drop to the delivery opening, the shelves are spaced from the front viewing panel thereby providing a gap through which the articles may fall. Access to the shelves for stocking purposes may be either from the front or back. Usually it is more convenient to have the vending machine load from the front. The front panel of the vending machine, including the viewing panel, may be hinged to the remaining body of the machine in cabinet fashion. To provide

full access to the coils for loading, each shelf is slidably mounted in the vending machine to fully expose the coils when the shelf is drawn forward.

Articles of merchandise are placed between each convolution of the helical coils. For full utilization of the capacity of a vending machine, the coils may be varied in pitch to accommodate the maximum number of articles of a particular width. In this manner a greater number of thin articles may be contained by a coil of narrow pitch than by one of unnecessarily wide pitch. The coils must therefore be fixed to a drive mechanism in a manner that facilitates simple exchangeability when the vending machine is serviced and loaded.

The improved shelf disclosed herein provides a novel manner of supporting the articles of merchandise in the convolutions of the feeder coils. The articles are stocked on a sloping support which is positioned immediately adjacent and parallel to one side of a cooperating feeder coil. The support slopes toward the coil and terminates in an abrupt step against which the coil slidably contacts. Spaced from the opposite side of the feeder coil is a parallel stop rail which keeps the articles in constant engagement with the coil. In this manner guides which must be adjusted to accommodate variable length articles are completely eliminated. Any article, within the wide range provided by the sloping shelf, will remain in self-maintained contact with the coil. Since no adjustments need be made for different length articles, more than one sized articles may be loaded in a single coil. This is particularly advantageous when one type article is nearly exhausted when the machine is serviced, and it is desired that a different type article be added in the empty convolution slots of the partially exhausted coil.

The improved shelf also includes as an optional element, a tandem operated pair of coils. Often a particularly popular item is stocked in more than one coil. To prevent one coil from becoming exhausted before a companion coil in which the identical article is stocked, the two coils are adjacently positioned and operated in an alternating fashion from single activating signals. Thus, upon activation of the selector by the customer, a single drive motor operates a tandem drive mechanism to advance and dispense an article from the coil which was not previously activated. This tandem operation continues, alternating from one coil to the other, until both coils exhaust their respective articles at essentially the same time.

As in the tandem connected coils, each independent coil completes only a single revolution for each article dispensed. Conventional control mechanisms or circuits are included in the vending machines of the above types to coordinate the customer selection with the coil rotation to insure that only the single rotation of a coil occurs for each coin controlled actuation and to further insure that exhausted coils are not activated with an accompanying coin less to the customer.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the helical coil feeder shelf.

FIG. 2 is a sectional view taken on the lines 2-2 in FIG. 1.

FIG. 3 is a partial view of FIG. 2 showing an exemplar of an article to be dispensed.

FIG. 4 is a partial view of FIG. 2 showing a second exemplar of an article to be dispensed.

FIG. 5 is a partial view of FIG. 2 showing a third exemplar of an article to be dispensed.

FIG. 6 is a partial sectional view taken on the lines 6-6 in FIG. 1.

FIG. 7 is a partial sectional view taken on the lines 7-7 of FIG. 6.

FIG. 8 is a partial sectional view taken on the lines 8-8 of FIG. 6.

FIG. 9 is a partial sectional view of the drive mechanism for a single coil taken on the lines 9-9 of FIG. 1.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, a three coil, article carrying shelf 10 is shown. The shelf comprises only one of many integral components in a convention coil-type vending machine (not shown). The shelf 10 comprises a flat base plate 12 having a front discharge lip 14 from which a vended article, designated 16 in FIG. 1, will drop to a delivery opening (not shown) for retrieval by a customer. Slidably supported on the flat base plate 12 are three helical feeder coils 18a, 18b, 18c. While the number and manner of operation of the coils on each shelf may be varied, the embodiment in FIG. 1 discloses two helical feeder coils 18a and 18b operated in tandem and one helical feeder coil 18c operated independently. The drive mechanism for the particular coils will be discussed hereinafter.

Essentially, each coil forms the principal element of a coil unit which is comprised of certain cooperating components for dispensing stored articles. For example, coil unit 20a comprises in addition to coil 18a, a sloping article support 22a, having a sloping support surface 24a, a downward step 26a at the lower edge of the support surface and a vertical rim 28a at the upper edge of the support surface. Coil unit 20a also includes a guide rail 30a located on the opposite side of the coil from the article support 22a.

The sloping article support 22a is fixed to the base plate 12 and longitudinally aligned with the helical feeder coil 18a. The integral flat sloping support surface 24a slopes downwardly toward the adjacent feeder coil 18a ending abruptly in the downward step 26a which is positioned immediately adjacent one side of the coil 18a. The vertical rim 28a on the upper edge of the sloping support surface 24a separates adjacent coil units and insures confinement of articles to their proper feeder coils. The support surface 24a, step 26a and rim 28a parallels the entire length of the coil.

The particular construction of the article support 22a is shown in greater detail in FIG. 2. The feeder coil 18a, when actuated, rotates in a clockwise manner as indicated in FIG. 2, biasing the coil to a position in slidable engagement with the downward step 26a of the article support. This action may be more broadly described as a rotating in a tangential direction away from the article support at the point of slidable contact of the coil with the shelf or base plate.

On the other side of the feeder coil 18a, the stationary guide rail 28a fixed to the base plate 12 in spaced parallel relationship to the coil 18b.

Articles to be dispensed are placed between successive convolutions of the helical feeder coil is illustrated for article exemplars 16 in coil unit 20c of FIG. 1. The articles placed in coil 18c are here barlike in form and are placed on edge and supported at one end on the support surface 24c and at the other end on the base plate 12. The articles are maintained in alignment by a guide rail 30c which restricts article movement transverse to the axis of the coil 18c. The angle of slope of the article support 22c need only be sufficiently great to inhibit lateral drifting of the article and maintain the end of the articles 16 against the guide rail 30c through the influence of gravity. The angle of slope is coordinated with the distance from the downward step 26c to the guide rail such that articles resting on the article support will rest flatly on the sloping support surface as illustrated in FIG. 3.

The guide rail 30c that maintains the alignment of articles 16 contained by coil 24c also integrally forms the vertical rim 28b for the sloping article support 22b of coil unit 20b. Similarly, guide rail 30b for the center coil unit 20b integrally forms the vertical rim 29a in coil unit 20a.

The guide rail 30a in coil unit 20a is mounted along the edge of the shelf and thereby concurrently provides a side panel 32 for the shelf 10. The vertical rim 28c of the sloping support surface 29c is extended to provide an integral side panel 34 along the other edge of the shelf.

Attached to each of the two side panels 32 and 34 is a slide rail 36 which is mounted on cylindrical spacers 38. Each slide

rail 36 is engageable with a cooperating rail (not shown) mounted in the vending machine enabling the shelf to slide outward for access to the coils during loading and servicing.

Referring to FIGS. 3, 4 and 5, the center coil unit 20b is shown stocked with three different sized articles designated 16a, 16b and 16c, respectively. The three articles are shown to schematically demonstrate the various sized items which may be loaded in the coil units without any change in the positioning of guide rails. The longest article 16a in FIG. 3 utilizes the entire breadth of the sloping support surface 24b when placed between successive convolutions of the helical feeder coil 18b.

An article of medium length 16b, such as that shown in FIG. 4, utilizes only a portion of the support surface 24b. The slope of the article support 22b prevents the article from drifting and maintains the article against the guide rail 30b.

Small articles such as article 16c shown in FIG. 5 position between the step 26b of the article support 22b and the guide rail 30b and rest in part upon the inner bottom portion 40 of the feeder coil 13b and in part upon the base plate 12.

The drive mechanisms for the helical feeder coils are shown in FIGS. 6, 7, 8 and 9. As stated hereinbefore, feeder coils 18a and 18b are operated in tandem. Referring to FIG. 6, feeder coils 18a and 18b are each shown attached to a cylindrical mounting block 42. The mounting blocks 42 are each fixed to one end of a shaft 44 which at its opposite end is connected to a back panel 46 of the shelf 10. Fixed at an intermediary point on each shaft 44 is an end gear 48 which when driven rotates each of the coils in a clockwise manner. Each of the end gears 48 forms the drive transmittal gear of a gear train having five gears. Two intermediary idle gears 50, engaging, respectively, the two end gears 48, are included in the gear train to obtain the necessary spacing required between the adjacent coil units 20a and 20b. The idle gears 50 are each fixed to a rotatable shaft 52 mounted to the back panel 46.

A drive gear 54 is mounted between and engageable with the two idle gears 50. The center gear is mounted on a drive shaft 56 which extends through the back panel 46 to an electric drive motor 58. The arrangement of the gear train is clearly illustrated in FIG. 7. The center gear 54 contains gear teeth on only one half of its circumference. The remaining half of the gear is contoured to clear the teeth of the adjacent idle gears 50. When constructed in this manner, the center gear 54 will engage only one of the idle gears 50 at any given time. The gear ratio between the center gear 54 and gears 48 is 1 to 2. Therefore, a half revolution of the center gear will rotate the end gear engaged a full revolution. As the center gear contains teeth on only half its circumference, a full revolution of the center gear will alternately rotate one end gear a full revolution, and the other end gear a full revolution. Correspondingly, coil 18a of coil unit 20a will advance and dispense an article in alternating fashion with coil 18b of coil unit 20b.

In order to lock in a static position the idle gear that is not engaged with the center gear 54, a locking mechanism 59 is incorporated into the gear train. The locking mechanism is illustrated in the sectional view of FIG. 8 and comprises, in part, a circular wheel 60 fixed to the end of the drive shaft 56 as illustrated in FIG. 6. In addition, fixed to the end of the shaft 52 for each of the idle gears 50, is an arm 62 having an end 64 contoured to the circumferential edge 65 of the circular wheel 60. The arm 62 is fixed relative to each idler gear 50 by a pin 66 which is inserted through the arm 62 and threaded into the face of the idle gear 50.

Two small semicircular notches 68 and 70, respectively, are diametrically cut in the circumferential edge 65 of the circular wheel 60. One notch 68 is cut at a position on the wheel opposite the leading teeth on the center gear 54, and the other notch 70 is cut at a position on the wheel opposite a point on the center gear 54 just subsequent the trailing teeth on the center gear 54.

Examining the operation of the locking mechanism for coil unit 20b, when the center gear 54 engages the idle gear 50, as

shown in FIGS. 7 and 8, the trailing edge of the arm 62 herein designated 72 is able to pivot into the clearance provided by the semicircular notch, in this instance notch 68. The idle gear and attached arm 62 are thereby permitted to freely rotate in unison. When the idle gear 50 completes a full revolution, the leading edge of the arm, herein designated 74, pivots into the clearance provided by the other semicircular notch 70. In this latter instance, the trailing edge 72 of the arm slidably engages the circumferential edge 65 of the wheel 60 and the arm 62, and the attached idle gear 50 is thereby prevented from further rotation. The contoured end 64 of the arm continues to slidably engage the circumferential edge 65 of the wheel locking the idle gear in position until the center gear and attached wheel complete a half revolution. At this point the leading teeth of the center gear again engage the teeth of the idle gear to rotate the idle gear and attached arm which again will clear the circular wheel for a complete revolution.

In a similar manner the idle gear 50 and attached arm 62 on the other side of the center gear 54 for coil unit 20a alternately rotates and locks in a stationary position. This operation, however, is 180° out of phase with the operation of the idle gear for coil unit 20b.

The tandem drive mechanism for feeder coils 18a and 18b are operated from an activating signal initiated by a customer selection. The customer may indicate his selection by pulling a knob, pushing a button or operating any other mechanical selector incorporated in the vending machine. There may exist either one or two selectors for the two tandem operated coils 18a and 18b. In either embodiment a signal activates a relay 76 at the drive motor 58. The drive motor initiates rotation of the center gear 54 until a pin 78 contacts a lever 80 extending from a microswitch 82 and deactivates the drive motor. As a half revolution of the center gear will cause a single article carried in one of the coils to be dispensed, it is necessary that two pins 78 extend from the center gear at diametrically opposed positions as shown in FIG. 6. The pins also extend through the circular wheel 60 to insure that the center gear and the circular wheel maintain a fixed alignment with one another.

Referring to FIG. 9, a drive mechanism for coil 18c, operated individually, is disclosed. As in the tandem operated coils, coil 18c is attached to the cylindrical mounting block 42 which is fixed at the end of a drive shaft 82. The drive shaft 82 extends through the back panel 46 of the shelf to an electric drive motor 84. The motor is activated by a customer selection and is deactivated by a cam operated microswitch 86 when the coil completes a full revolution. The microswitch comprises a base 88 with a reciprocating extension 90 at the end of which is attached a roller 92. The roller 92 engages a cam 94, fixed to the drive shaft 82. After a full rotation the enlarged portion 96 of the cam pushes the extension into the base deactivating the motor.

From the foregoing detailed description, it is believed apparent that the present invention provides an arrangement wherein helical feeder coils may be employed to vend articles of different lengths without the necessity of adjustment. It should be understood, however, that coils of different pitch may be employed to dispense articles of different thicknesses. The open character of the shelf and the coil guide and supporting structure thereon facilitates the ready interchange of the coils, since the coils are fully exposed and only connected to the shelves through means of the cylindrical mounting blocks 42. To remove a coil, it is simply necessary to disconnect its mounting block 42 from the drive shaft 44 thereof. Any suitable type of quick disconnect device may be employed to facilitate this operation.

I claim:

1. A vending machine having article selectors and an article carrying shelf slidably supporting at least one helical feeder coil between the convolutions of which articles are advanced to the edge of the shelf to drop to a delivery station when a drive mechanism connected to the coil is activated by customer selection, wherein the improvement comprises:

- a. an article support mounted on the shelf to one side of and in generally parallel relationship to the helical feeder coil, said support being adapted to slidably support variously sized articles placed thereon in engagement with the helical feeder coil and terminating in a downwardly extending surface, immediately adjacent, said one side of the helical feeder coil, said coil, when activated, rotating in a manner that is tangentially directed away from said article support at the point of contact of the coil with said shelf;
- b. a guide rail mounted on the shelf in generally parallel relationship to the helical feeder coil to the side thereof opposite said one side to restrict the articles from drifting laterally relative to the axis of the helical coil.
2. In a vending machine having article selectors and an article carrying shelf mounted within said machine from which articles are individually dropped from the shelf to a delivery station below upon customer selection, the improvement wherein the article carrying shelf comprises:
  - a. a base plate;
  - b. at least one helical feeder coil supported by said base plate and free to rotate thereon;
  - c. a sloping article support mounted on said base plate to one side of and in generally parallel relationship to the helical feeder coil, said support having a support surface downwardly directed toward one side of the feeder coil and an abrupt downward step immediately adjacent the coil whereby the coil slidably engages the top edge of said step when rotated in a manner tangentially directed away from the article support at the point of slidable contact of the coil with the base plate;
  - d. a guide rail mounted on said base plate to the side of the coil opposite said one side to maintain articles placed between the convolutions of the coil and slidably supported by the article support and base plate in continuous engagement with the coil until dispensed;
  - e. drive means connected to one end of said coil for discrete rotation of said coil when activated.
3. The apparatus of claim 2 wherein the drive means comprises an electrical drive motor mounted to said base plate and electrically activated by an article selector.
4. In a vending machine having a front viewing panel, article selectors, and a delivery opening below said viewing panel, an improved article carrying shelf received in said vending machine above said delivery opening and spaced from said front viewing panel comprising:
  - a. a flat base plate having a front downwardly directed lip spaced from said viewing panel to permit dispensed articles to drop between the base plate and viewing panel to the delivery opening;
  - b. at least one helical feeder coil carried by said base plate for advancing articles interposed between the coils forward to the front lip of the base plate;
  - c. a longitudinally extending guide rail mounted on the base plate spatially disposed and the running adjacent one side of said coil;
  - d. a sloping article support fixed to the base plate and having an edge terminating in a downward step immediately adjacent the opposite side of said coil to slidably support variously sized articles in engagement with the coils;
  - e. drive means attached to one end of said coil to impart discrete rotation of said coil upon activation by customer selection, said rotation being tangentially directed away from the article support at the point of slidable contact of the coil with the base plate.
5. A vending machine having article selectors and at least one article carrying shelf slidably supporting at least two helical feeder coils between the convolutions of which articles are advanced to the edge of the shelf to drop to a delivery station upon activation of the coils by a customer selection wherein the improvement comprises a tandem operated drive mechanism having an electrical drive motor electrically activated by at least one article selector and transmission means

connecting the drive motor to a first and a second helical feeder coil for alternately:

- a. rotating the first coil a full revolution and simultaneously locking the second coil, when said drive motor is activated by a customer selection; and
- b. locking said first coil and simultaneously rotating the second coil a full revolution upon activation of said drive motor by a subsequent customer selection;

the alternate operation of the coils to continue upon each customer activation of the drive motor until the articles in both coils are exhausted.

6. The apparatus of claim 5 wherein the transmission means comprises:

- a. a drive shaft extending from said drive motor;
- b. a center gear fixed to said drive shaft having gear teeth on one-half its circumference;
- c. a circular wheel fixed to said drive shaft and axially aligned with said center gear, said wheel having two diametrically opposed notches cut in the circumferential edge thereof;
- d. a pair of freely rotating idle gears, each gear engageable with the gear teeth of the center gear at diametrically opposite points of engagement;
- e. an arm having an end contoured to the circumferential edge of said circular wheel connected to each of said idle gears, each arm in cooperation with the two notches on said circular wheel being alternately engageable with the circumferential edge of said wheel to lock said arm and said idle gear, and rotatable with said idle gear when said gear is engaging the gear teeth of the center gear;
- f. first and second end gears, the first end gear fixed to the end of the first helical feeder coil and engaged with one of the idle gears, and the second end gear fixed to the end of the second helical feeder coil and engaged with the other idle gear;
- g. switching means to deactivate the drive motor upon completion of each one-half revolution of the center gear.

7. In a vending machine having article selectors and at least one article carrying shelf mounted within said machine from which articles are individually dropped to a delivery station below upon customer selection, the improvement wherein the article carrying shelf comprises:

- a. a base plate;
- b. at least two coil units each unit having:
  1. a helical feeder coil supported by said base plate and free to rotate thereon;
  2. a sloping article support mounted on said base plate to one side of and in generally parallel relationship to said helical feeder coil, said support having a support surface downwardly directed toward one side of said feeder coil and an abrupt downward step immediately adjacent the coil whereby the coil slidably engages the top edge of said step when rotated in a manner tangentially directed away from the article support at the point of slidable contact of the coil with the base plate;
  3. a guide rail mounted on said base plate to the side of the coil opposite said one side to maintain articles placed between the convolutions of the coil in a condition slidably supported by the article support and base plate and in continuous engagement with the coil until dispensed;
- c. drive means connected to one end of each coil in said coil units for discrete rotation of each coil upon selective actuation.

8. The apparatus of claim 7 wherein the drive means comprises:

- a. at least one electrical drive motor having a shaft con-

nected to the end of one of said helical feeder coils and electrically connected for activation by an article selector;

- b. a cam fixed to the drive shaft and rotatable therewith;
- c. a cam operated switch engageable with said cam and electrically connected to said drive motor to deactivate said drive motor after completing a single revolution.
- d. at least one electrical drive motor electrically activated by at least one article selector, said drive motor having transmission means connecting the drive motor to a first and a second helical feeder coil for alternately:
  1. rotating the first coil a full revolution, and simultaneously locking the second coil when said drive motor is activated by a discrete customer selection; and
  2. locking said first coil and simultaneously rotating the second coil a full revolution upon a subsequent discrete customer selection;

the alternate operation of the coils to continue upon each customer activation of the associated drive motor until the articles in both coils are exhausted.

9. The apparatus of claim 8 wherein the transmission means comprises:

- a. a drive shaft extending from the associated drive motor;
- b. a center gear fixed to said drive shaft having gear teeth on one-half its circumference;
- c. a circular wheel fixed to said drive shaft and axially aligned with said center gear, said wheel having two diametrically opposed notches cut in the circumferential edge thereof;
- d. a pair of freely rotating idle gears, each gear engageable with the gear teeth of the center gear at diametrically opposite points of engagement;
- e. an arm having an end contoured to the circumferential edge of said circular wheel connected to each of said idle gears, each arm in cooperation with the two notches on said circular wheel being alternately engageable with the circumferential edge of said wheel to lock said arm and said idle gear, and rotatable with said idle gear when said gear is engaging the gear teeth of the center gear;
- f. first and second gears, the first end gear fixed to the end of the first helical feeder coil and engaged with one of the idle gears, and the second end gear fixed to the end of the second helical feeder coil and engaged with the other idle gear;
- g. switching means to deactivate the drive motor upon completion of each one-half revolution of the center gear.

10. A vending machine shelf for use in combination with a helical feeder coil, said shelf comprising:

- a. a generally flat surface slidably supporting the coil thereon;
- b. a longitudinally extending support mounted on end extending upwardly from the surface to one side of the coil in generally parallel relationship thereto, said support being disposed to provide a barrier against which the coil may ride to maintain a predetermined orientation on the surface and adapted to support an article received between the convolutions of the coil in an inclined relationship relative to the surface with one end of the article supported on the support and the other supported on the surface; and
- c. a guide rail mounted on the surface in a spaced generally parallel relationship to the coil to the side thereof opposite said one side, said rail being adapted to slidably engage the shelf supported end of an article received between the convolutions of the coil to restrict the article from drifting relative to the axis of the coil in a direction toward the rail.