pective radial ejector arms 60 and article recesses 26 are in identical angular positions and the arms are positioned for movement through the respective slots 55 in the bottom of the chute, and the slots 38 in the transparent window panel 38.

It is desirable to provide each dispensing element 22 with means for adjusting the depth of its article recess 26 for use with articles of varying sizes or thicknesses.

To this end, the article recesses 26 extend for the entire axial length of each dispensing element segment 22A and 22B and open through the axial ends thereof. The circumferentially opposed sidewalks of each such recess are provided with pairs of relatively opposed slots 72 in different radial locations to receive the opposite edges of a false bottom or spacer plate 74, which may be inserted into and removed from the slots through the opposite axial ends thereof.

As earlier indicated, the several dispensing units U of each magazine D are constructed in similar manner, though they may differ in the proportions of certain of their parts. For instance, the length of the chutes 24 of the respective units may be varied in the manner shown in the drawings in order to best adapt them for reception within the predetermined interior space available within the dispensing compartment. Normally, the larger or thicker articles will be stored in and dispensed from the lower chutes, whereas the somewhat smaller articles will be dispensed from the upper chutes.

In the preferred embodiment, the uppermost unit is adapted for the dispensing of quite small articles or packages, such as packages of chewing gum, mints, lozenges, or the like, of small size. Consequently, the dispensing element 22 thereof and its associated dispensing opening 56 through the opaque panel 30 may be of somewhat decreased axial extent relative to the other dispensing elements and their associated openings. However, aside from such differences in proportions, the several units are preferably similar in their construction and made of operation.

From a quite broad standpoint, it is not essential that the articles be fed through the chutes by gravity means, as in the preferred embodiment, since obviously the use of spring loaded followers or the like is by no means precluded for feeding the articles lengthwise of the respective chutes and into engagement with the abutments 84 at their respective ends. However, where the chutes are inclined or of sloping disposition to rely upon gravity for the articles feeding function, it has been found that the degree of the chute tilt or inclination is critical, if the optimum results are to be attained. In particular, it has been found that the optimum degree of tilt is 51° from the vertical and that if this is varied appreciably, for instance, if it is changed to 45°, malfunctioning will become more frequent. Thus, generally speaking, the critical range for optimum operation is from 45° to 55° from the vertical. If the chute is tilted further from the vertical so as to more nearly approach a horizontal position, then the gravity feeding action will not be as positive or as reliable under all circumstances. It has been found necessary to support product weight partially by the magazine chute back wall to prevent the product stored in the chute from compressing and thereby damaging the articles held for dispensing. On the other hand, if the chute is placed in a more nearly vertical position, the pressure of the stack of articles upon the lowermost article about to be dispensed, will have an undue retarding or frictional restraining effect which is more likely to produce malfunctioning than would otherwise be the case.

As has been described earlier, in each magazine a plurality of dispensing units U are carried by the mounting plate 44, which is supported for sliding movement outwardly through the open front of the cabinet 10 to make the several dispensing units U thus available for reloading and servicing as desired. It is undesirable to withdraw more than a single such magazine at a time, due to the risk of displacing the center of gravity of the machine sufficiently that it may tip over, and also due to the fact that the several withdrawn magazines will so obstruct each other as to interfere with the reloading and servicing of at least one of them.

For the purpose of permitting the withdrawal of but a single magazine at a time, there is provided a suitable slide bar 51 (FIGS. 7, 8 and 9) which extends transversely and is slidably in a traverse direction across the front of the cabinet. This bar 51 is provided with a series of notches 51' spaced apart at distances different than the spacing between relatively adjoining mounting plates 44. The portion of the bar 51 in which these notches are formed normally extends in front of the ends of the upper slides 46 of each mounting plate 44, all as is shown in some detail in FIGS. 7, 8 and 9. Thus, unless one of the notches 51' is positioned in alignment with the slide of a given magazine, that magazine is barred from withdrawal. Because the spacings between the notches are different than the spacings between the slides 46, only one notch at a time may be aligned with a given slide 46.

In the embodiment here illustrated, the upper track 47 on which the slide 46 is supported for movement, is suspended in spaced relation below the transverse upper frame member 55 of the cabinet 10 by means of relatively spaced pins or connectors 55a. The slide bar 51 which is of Z shape in cross-section, has its lower horizontal flange or web slotted as at 55b (see FIGURE 7) to permit transverse sliding movement of the bar 51 as required to position only one of the notches 51' in alignment with the slide 46 of a selective magazine.

OPERATION OF THE MACHINE

In the operation of the dispensing machines as above described, the chute 24 for each unit is initially filled or loaded with a supply of articles P as for instance, candy bars, cigarettes, chewing gum or any of various articles of merchandise to be dispensed. Normally, the articles will be placed in individual containers, though this will not be essential in all cases. In initially loading the machine, an article corresponding to those in the chute of any dispensing unit can be manually placed in the display recess of the dispensing element or that selection can be operated to position the first article in display and dispensing position. With the respective units fully loaded and operative, and with the front door 12 of the dispensing compartment closed and locked, the machine is in readiness for operation.

A customer by inspection of the articles on display through the various windows 38 in the front opaque panels 30, determines the particular articles to be purchased. He then inserts coin in the necessary amount through the slots 42 in the front of the cabinet 10 and actuates the particular selector switch 28 corresponding in designation to the particular dispensing unit and article selected by him.

The insertion of the coins through the slots 42 into the coin control mechanism M will have energized the master circuit in conventional manner, and subsequent actuation of the particular selector button or switch 28 will have energized the motor 20 for the selected dispensing unit to cause same to drive the dispensing element of said unit through a complete operative cycle. In the initial portion of such cycle, the article displayed in the article recess of said wheel is delivered by gravity or other means therefrom on to the subjacent deflector plate 34 and thence through the dispensing opening 56 and the dispensing passage 36 into the delivery receptacle B, where it may be retrieved by the purchaser through the receptacle door 16.

It is important that in the specific arrangement of the article chute 24 and its associated dispensing element 22 as above described, the entire weight of the article stack within the chute is supported jointly by the bottom and the back wall of the chute in a manner such that
SOLID MATERIAL FLOW DIVIDER
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ABSTRACT OF THE DISCLOSURE
A solid material flow divider and method for dividing a flow of solid particles into a plurality of separate streams. The flow divider effects its separation by centrifugal delivery, by a rotated free-edged disc or the like, toward predetermined arcs of the circumference of the disc. The disc or flow receiving member is rotated about a generally upright axis and may have associated with it, if desired, for unitary movement with it, a hopper or other means for directing a flow of particles to the axial area of the upper side of the disc.

SUMMARY OF THE INVENTION
This invention relates to a solid material flow divider structure and method in which a stream of solid particles is delivered to a dividing structure or into a dividing zone, and is there split centrifugally into a plurality of flows or streams or bodies. A primary purpose is to divide a flow or stream of solid particles into a plurality of streams which may, if desired, be delivered to different conveyors or to different storage areas or to separate containers, or to different points of use.

Another purpose is to provide a solid stream divider or stream splitter mechanism and method in which a preferably circular table member or disc is rotated about an upright axis, with the flow of particles to be divided being directed adjacent the axial area of the disc top for centrifugal delivery over the free edge of the disc.

Another purpose is to provide an improved centrifugal feed member or disc with associated material guiding means.

Another purpose is to provide a flow dividing or splitting method and apparatus of maximum simplicity of structure and of operation.

Another purpose is to provide a solid stream or flow divider and dividing method in which an erratic or non-concentric flow of material to the divider or dividing zone is adequately handled, and in which the divider or dividing zone will accept a flooded feed condition and still maintain a high degree of uniformity in separation.

Other purposes will appear from time to time in the course of the following specification, claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS
The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

FIG. 1 is a schematic plan view, with visible parts dotted in; and

FIG. 2 is a more or less schematic section on the line 2—2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT
Referring to the drawings, I provide a centrifugal disc or rotatable free-edged delivery or feed splitting member, generally indicated at I. It may be suitably mounted to be rotated by and in unison with a suitable shaft 2 which may rotate in any suitably supported bearings 3 and 4, the shaft 2, and thus the axis of the delivery member or disc 1, being generally upright, the disc having a clear upper surface. Adjacent the upper end of the shaft is a disc supporting plate 5 upon which rests the delivery member or disc 1. This delivery member or disc 1 may be held downwardly against the plate 5 for unitary movement with the shaft 2, for example, by a washer 6 and nut or screw-head 7, the details of the attachment being not of themselves critical, provided that the disc 1 is held for suitable rotation in unison with the shaft 2.

A centering cone 8, which may, for example, be of cast aluminum, is mounted upon and rotates with the disc or feed splitting member 1, and may be held in position by screws or other suitable means in the axial location in which it is illustrated in FIG. 2, upon the upper surface of the disc 1. Guiding the stream of material to be split downwardly along the axial area of the rotating assembly above described is a centering hopper or cone 15 which is shown as mounted on and rotating with the disc 1. It may be adjustably supported, for example, on mounting rods 16 extending upwardly from the plate 1, the upper ends of which may be screw-threaded, as at 17, adjustably to receive the hopper 15. The details of adjustment are not critical. For example, adjusting nuts may be mounted on the screw-threaded portions of the rods 16, which support suitable lugs 18 extending outwardly from the upper outer edge of the centering cone or hopper 15.

As will be clear from FIG. 2, the centering hopper or cone 15 preferably completely underlies the entire cross-section of the delivery of the below described guide wall or tube 34, where it can receive erratic or eccentric flow from above. The hopper or cone 15 may have a substantial clearance, at its upper end, as shown in FIG. 2, to permit overflow, and may also have a substantial clearance from the centering cone 8, as also shown in FIG. 2, to accept maximum feed.

The above described structure may be supported in any suitable way, the details of which are not critical. For example, a motor and lower bearing mounting bracket, generally indicated as 20, may be used, which has outer upright end portions 21 connected by a generally horizontal bottom transverse member 22. The top flange 21a extends outwardly from each of the upright or end members 21. Secured to one of the members 21 is illustrated a drive assembly which may include a motor 23 and a drive unit 23a, which is effective to drive a pulley 24, connected, for example, by a belt 25, to a driven pulley 26 mounted to rotate with and to drive the centrifugal delivery member shaft 2. The lower bearing 24 may rest in any suitable support 4a on the upper surface of the transverse bracket member 22, the bracket member being apertured to permit the lower end of the shaft 2 to extend downwardly through the aperture 33 and into the rotating centering cone or hopper 15, for delivery to the axial area of
A dispensing unit comprising a generally vertical article delivery chute having a bottom for supporting a stack of similarly dimensioned articles within the chute; said chute being formed with a forwardly directed article dispensing opening above its bottom proportioned to permit forward passage therethrough of but a single article at a time from the bottom of said stack of articles; a dispensing element supported for rotation about a horizontal axis beneath said bottom, said bottom being formed with a slot opening through its forward edge transversely to the rotational axis of said dispensing element; said element being formed with a plurality of relatively angularly spaced radially outwardly directed recesses each proportioned for reception of but a single article, said dispensing element normally being at rest in a predetermined display position in which one said recess is located adjacent but forwardly of the said chute, and another relatively adjoining recess is located rearwardly of said chute; automatic indexing means connected to said dispensing element for rotating it in a given direction through a predetermined angular movement equal to the angular spacing between the centers of said recesses and wherein said one recess first moves forwardly and downwardly to discharge an article therefrom, while said other recess moves upwardly and beneath the bottom of said chute and then is brought to rest automatically in its said predetermined display position; an ejector arm projecting radially from said dispensing element adjacent the rear edge of each article recess to engage and eject the lowermost article from said stack through said dispensing opening for reception in said article recess.

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central cone 8 of the disc 1, and, of course, of the upper surface of the disc 1. The user, therefore, can decide how many split streams he wishes, and what volumes he wishes to divide out by the arrangement he makes of the fixed circumferential hoppers 37. In the particular drawings herein four such hoppers are shown, and each receives the centrifugal delivery over a 90-degree arc of the edge of the disc 1. It will be understood that the number of the hoppers or receiving means may be varied, and, also, that they need not necessarily all receive the discharge from a uniform arc of the free edge of the disc 1. However, a natural and useful use of the device is to split the parent stream into a multiple of smaller streams, these smaller streams being, as in the structure shown, of generally like volume.

The structure is embodied in a compact frame or sub-frame, which may be mounted on any suitable supports, in any desired relation to whatever conveying or feed means are employed to deliver the initial stream to the aperture 33. The rotating disc and the fixed receiving hoppers are directly associated, and a confining splitter chamber 31 prevents unintended spillage. While I have described the members 37 as individual hoppers, it will be understood that they may be combined in a single structure as, in fact, they are shown in the drawings, which may be described as a four-way hopper for delivering the four streams which result from the use of the structure herein shown.

I claim:

1. The method of dividing a stream of particles which includes delivering the stream to a centering zone, and therein centering the stream by rotating and inwardly directing the particles in a circular path about the central fixed vertical axis of the centering zone, and then delivering the centered stream to a zone of outward feed from said axis, and therein imparting centrifugal movement to the particles of said stream for outward discharge into a plurality of circumferentially arranged zones of reception, and directing the particles from each such zone of reception to a predetermined separate zone of disposal.

2. The method of claim 1 and including the step of discharging overflow particles from the centering zone by centrifugal force outwardly into said zones of reception.

3. The method of claim 1 characterized in that the zones of reception are substantially equally spaced from the upright axis.

4. The method of claim 1 characterized in that the outward centrifugal discharge of the particles is unimpeded.

5. In a divider for dividing a stream of particles, a centrifugal feed distributor including a rotary table having an upper, generally horizontal surface and a free circumferential edge, means for rotating the table about an upright, generally centrally located fixed axis at a speed effective to impart a centrifugal movement of the particles outwardly over its free edge, stream centering means positioned above the rotary table and mounted for movement therewith about said fixed axis and adapted axially to center the stream of particles delivered downwardly toward the rotary table by combined centrifugal and gravitational forces, and means for receiving and segregating the particles which escape over predetermined arcs of said free table edge.

6. The structure of claim 5 characterized by the inclusion of a downsput generally axially aligned with the rotary table, and a centering hopper positioned below and underlying said downsput, said hopper being formed and adapted to direct particles inwardly and downwardly toward the axis of the rotating table.

7. The structure of claim 5 characterized by the inclusion of a downsput generally axially aligned with the rotary table, and a centering hopper positioned below and underlying the entire area of said downsput and mounted for rotation with said table, said hopper being formed and adapted to direct particles inwardly and downwardly toward the axis of the rotating table, the upper edge of said centering hopper being spaced downwardly from the lower end of the downsput, whereby to permit spillage in the event of overfeed, the upper edge of the hopper being positioned substantially within the periphery of the table and being substantially coaxial with the axis of the table, whereby such spillage may be received upon the upper surface of the table for centrifugal delivery over the edge thereof.

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