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Brownbill

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[54] MAGAZINE

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[51] Int. Cl.G07f 11/12

[58] Field of Search.....221/11, 104, 119-122,
221/221, 223, 297, 175-189

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Primary Examiner—Samuel F. Coleman

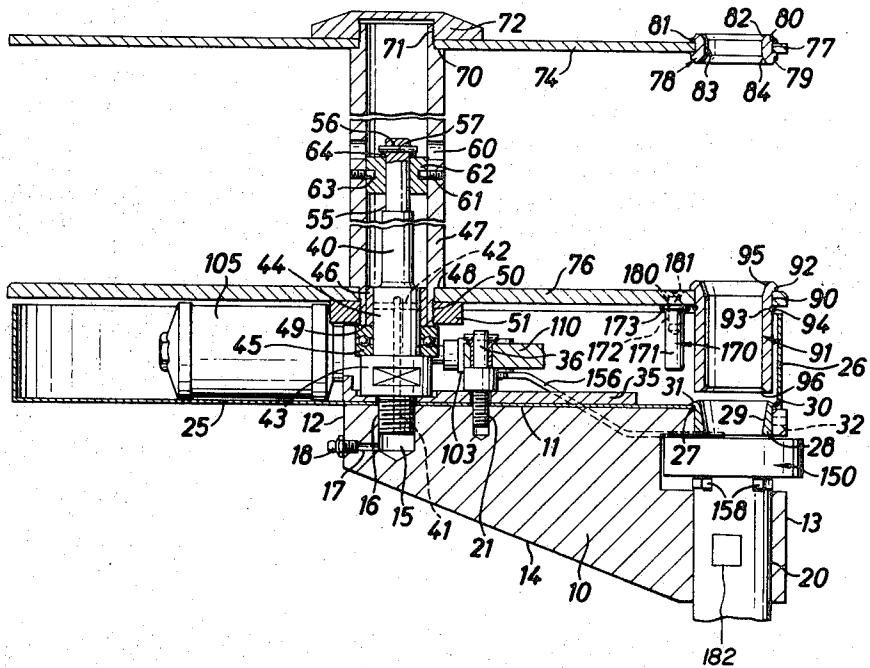
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[57] ABSTRACT

The present invention relates to magazines for dispensing stacks of nesting articles particularly flared or tapered collapsible tubes to an indexing machine and includes magazine storage means for supporting a plurality of stacks of said articles in a dispensing position, indexing means for moving said storage means and sequentially presenting each of said stacks at a dispensing station, sensing means for sensing a passage of the last article in a stack at said dispensing station and lowering means juxtaposed said dispensing station to lower said stack to enter the last article in the preceding stack at a controlled rate.

5 Claims, 4 Drawing Figures



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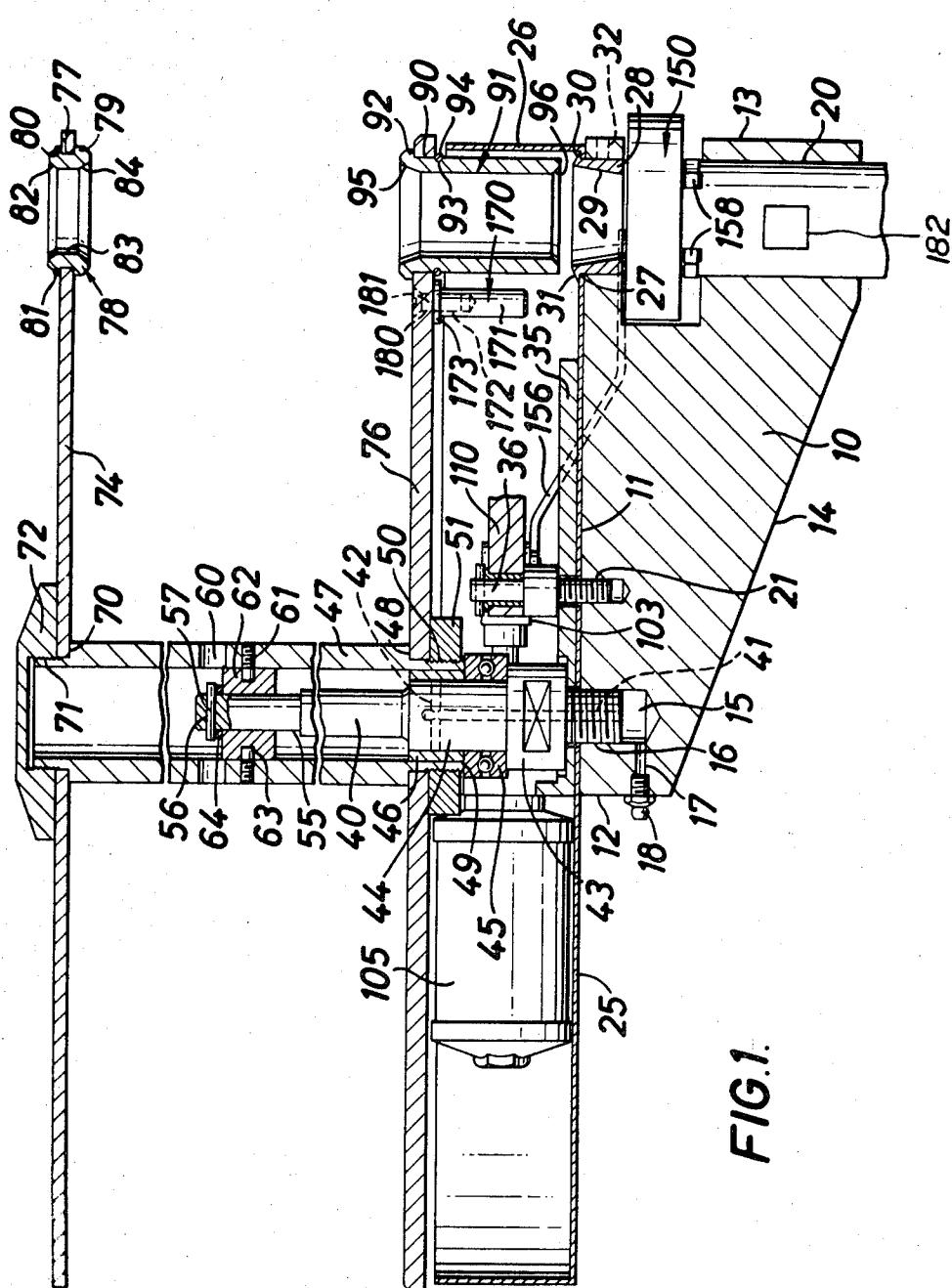
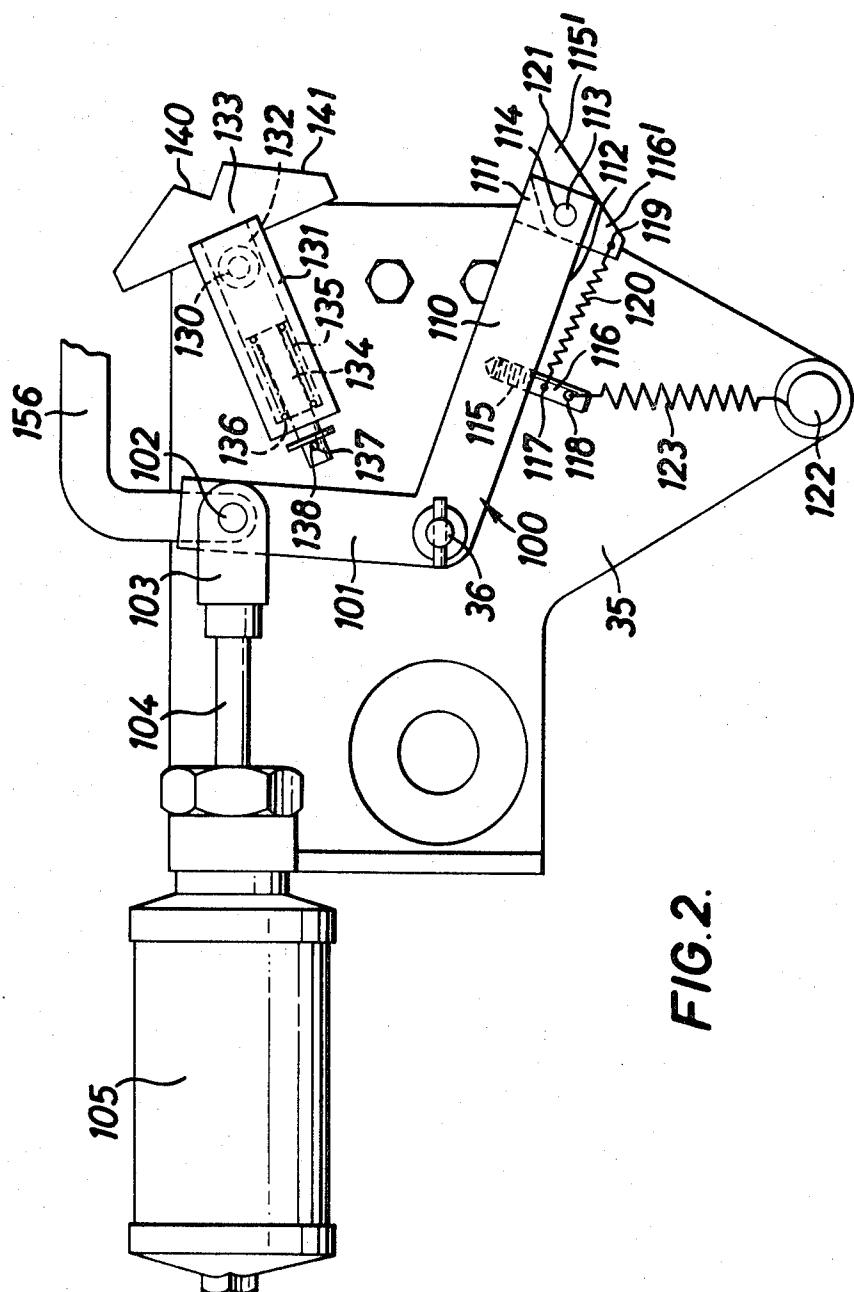


FIG. 1

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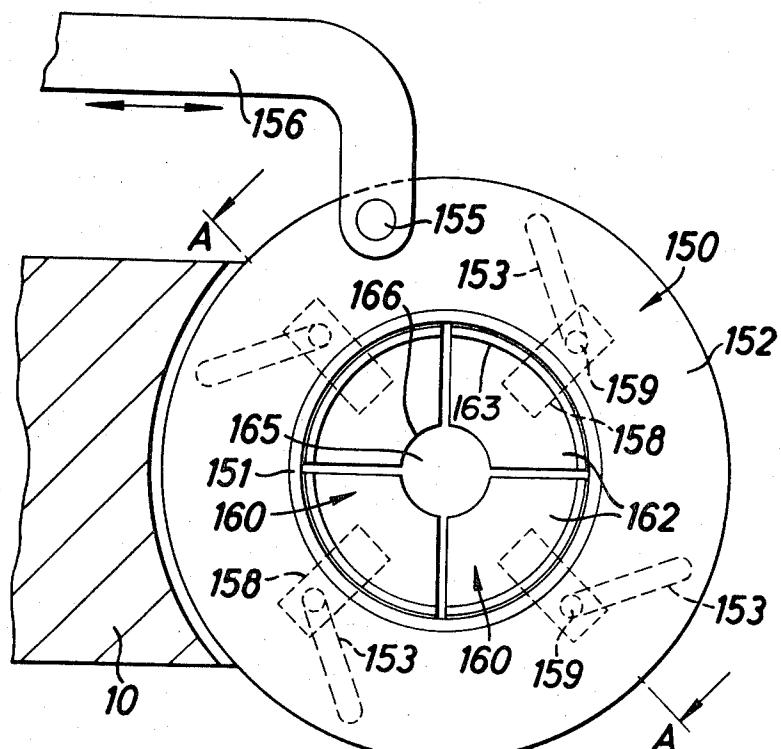


FIG. 3.

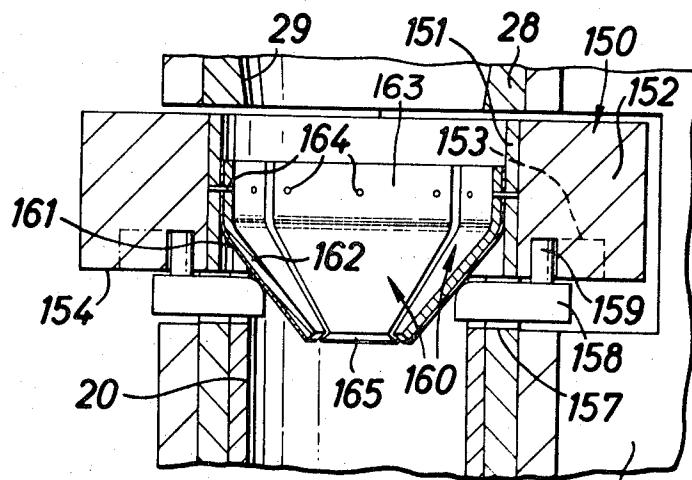


FIG. 4.

MAGAZINE

This invention relates to "magazines" and has particular reference to a magazine for dispensing stacks of nesting articles, typically flared collapsible tubes, to an indexing machine.

Our co-pending application Ser. No. 883,129 now Pat. No. 3690141 describes a dispensing or indexing air process comprising guide means for guiding a sequence of articles to be dispensed, gate means disposed at or towards a dispensing end of the said guide means, said gate means being movable between a dispensing position and a closed position, retaining means juxtaposed said guide means and spaced upstream of said gate means and arranged to retain an article adjacent said retaining means, and control means interconnecting said gate means and said retaining means, the arrangement being such that with the control means in the first position, the gate means is in the dispensing position and the retaining means acts to retain the article adjacent to it, thereby causing or allowing one or more articles between the retaining means and the gate means to be disposed or indexed from the guide means such that with the control means in the second position, the retaining means is rendered inoperative and the gate means is closed thereby permitting the further article or articles to occupy the guide means between said gate means and said retaining means prior to being dispensed therefrom.

It will be appreciated that in commercial use stacks of nesting articles such as stacked cups of frusto-conical section or flared collapsible tubes have to be supplied to the dispensing or indexing apparatus and are stacked by hand. Thus, it is necessary for an operative to lift, from a box of nested containers or articles, a suitable stack and to feed the stack manually to the dispensing apparatus which serves to dispense individual or a given number of articles at each dispensing operation.

According to the present invention, there is provided a magazine for dispensing stacks of nesting articles which magazine comprises a dispensing station, magazine storage means for supporting a plurality of stacks of said articles in a dispensing position, indexing means for moving said magazine storage means and sequentially presenting each of said plurality of stacks at said dispensing station, sensing means for sensing the passage of the last article in a stack at said dispensing station and lowering means arranged to lower said stack to enter the last article in the preceding stack, the arrangement being such that the indexing means moves said storage means to present the next sequential stack of articles at said station in response to the sensing by said sensing means, of the passage of the last article in the preceding stack, whereby the said next stack is lowered and nested into said last article at a controlled rate.

The lowering means may include means for centering the stack so that damage of the last article in the preceding stack may be reduced or avoided during nesting.

The dispensing station may be defined by a dead plate having a feed opening therein, the stacks being arranged to slide over a surface of said plate for presentation at said feed opening. The plate may be disposed substantially horizontally and the stacks may be allowed to pass through the feed opening under gravity.

The magazine storage means may comprise a pair of spaced co-axially disposed discs, each having a plurality of circumferential stack supporting means, the stack supporting means on each disc being in register one with the other, said discs being mounted for rotation with respect to said dead plate, the arrangement being such that each registering pair of stack supporting means serve to support one stack disposed between the disc in an attitude suitable for presentation at said dispensing station. Each stack supporting means may be constituted by a storage opening in the disc which is adapted to support a stack of suitable articles passed therethrough.

The indexing means may comprise a crank having a pawl element arcuately pivotal about the crank part thereof and a plurality of abutment elements provided on said magazine storage means, at least one of said abutment elements corresponding to each stack position on the magazine means, motor means for arcuately pivoting said crank about the pivot to bring the pawl element into contact with said abutment to move the support means to present the next stack to the station and thereafter causing or allowing the crank and pawl element to return to its datum position by pawl action over said abutment.

Spring means may be provided to return the crank to its datum position and the pawl element may be spring loaded to assist passage over the next succeeding abutment on return to its datum position. A spring loaded indexing element may be provided to locate positively with an abutment means and to maintain the magazine storage means and a stack carried thereby in operative relation with the dispensing station.

The motor means may be a pneumatic ram. A restrictor may be included in the air return for said ram to control the rate at which said crank returns to its datum. The lowering means may comprise a feed conduit, a plurality of leaf elements disposed about said conduit, said elements being progressively movable between a closed position in which the conduit is obstructed so that a stack of articles entering said conduit may rest upon said elements, and an open position in which the stack of articles are free to pass said elements, to allow progressive movement of said stack downwardly into nesting relationship with the last article in the preceding stack. The elements may comprise a plurality of petal elements, which together define a downwardly converging frusto cone having an open central orifice so that when dispensing nested tubes, the first tube in the stack enters the conduit and abuts the petal elements when in a closed position with the closure cap of the first tube disposed through the central orifice. The petal elements may comprise a spring steel backing member having a cover layer of rubber or rubber-like material, the spring steel member being biased to a generally open configuration in which tubes disposed within said conduit may pass said petal elements. Actuator means may be provided to move said elements against said spring bias to a closed position. The said actuator means may comprise a plurality of generally radially disposed actuators which are slideable radially of the conduit, to urge said petal elements against the spring loading. The actuators each carry a spigot and are associated with cam ring having oblique trackways each of which accommodates a spigot so that partial rotation of the ring causes a spigot carried

by each actuator to move along said slideway, thereby moving the actuators between an inner and an outer position, the rate of movement of the actuators being determined by the rate of rotational movement of the cam ring.

The cam ring may, in turn, be operated by means of an operating assembly for the indexing means so that as the indexing means returns to a datum position preparatory to advancing the magazine by the next integer, the cam ring is operated to move the actuators outwardly, thereby allowing progressive opening of the petal elements, to permit the first article in a stack progressively to enter the widening aperture defined by the extremities of the petal elements, thereby allowing a gradual lowering of the stack into the last element in the preceding stack.

The following is a description by way of example and with reference to the accompanying informal drawings, of a method of carrying the invention into effect. The invention will be particularly described with reference to the dispensing or indexing of single tubes from a stack of tubes which are flared in the manner described in our copending application, Ser. No. 883,129 now Pat. No. 3,690,141.

IN THE DRAWINGS

FIG. 1 is a section sketch through the apparatus in accordance with the present invention;

FIG. 2 is a plan view of the mechanism of the apparatus of FIG. 1;

FIG. 3 is a plan view of the lowering means of the apparatus;

FIG. 4 is a section on the line A—A of FIG. 3.

The apparatus comprises a support bracket 10 of elongate horizontal section and having an expanded circular portion at each end. The bracket 10 is disposed in a substantially vertical plane and has a substantially horizontal upper surface 11, a relatively short vertical first end 12, and a longer vertical second end 13, the lower edge of bracket 10 being defined by a sloping surface 14. The bracket is provided towards its first end with a blind bore 15 which is threaded at 16 on its inner surface, the bore 15 being substantially co-axial with the expanded circular portion of the first end 12 of the bracket 10 and extending downwardly from the upper surface 11 thereof. A grease conduit 17 extends inwardly from the first edge 12 of the bracket 10 to communicate with the lower extremity of the bore 15, and a grease nipple 18 is provided for the application of grease thereto.

At its second end, the bracket 10 is provided with a dispensing passage 20 of circular cross-section which constitutes the dispensing station of the apparatus of the invention and which is adapted for connection to the guide means of the indexing apparatus forming the subject of copending application, Ser. No. 883,229 now Pat. No. 3,690,141. The upper surface 11 of the bracket 10 is provided intermediate bore 15 and passage 20, with a tapped drilling 21.

The bracket 10 carries and supports on the upper surface 11 a circular dead plate 25 having an upstanding cylindrical flange 26 disposed about the periphery thereof, the dead plate 25 and its associated flange 26 being formed of a matt finished stainless steel. The dead plate 25 has an opening 27 towards the periphery

thereof corresponding and registering with the dispensing passage 20 in bracket 10. The opening 27 is maintained relative to dispensing passage 20 by means of a nylon insert 28 having a substantially cylindrical outer surface and a downwardly converging inner surface 29. The insert 28 is provided towards its upper end with a radially extending peripheral flange 30 which is provided towards its outer extremity with a knife edge chamfer 31 which extends upwardly from the upper surface of the dead plate 25 at an angle of substantially 30° towards the horizontal. The insert 28 is maintained in position by means of a setscrew (not shown) mounted in a tap drilling 32 in the bracket 10.

15 The dead plate 25 carries on its upper surface a support plate 35 and is secured to the bracket by means of a crank pivot 36 which is tapped on its lower surface to screw into the blind drilling 21 and serves to clamp plate 35 to bracket 10 and sandwich the plate 25 20 therebetween.

The blind bore 15 accommodates a vertically disposed elongate support rod 40 which is substantially cylindrical in cross-section. The rod 40 is provided towards its lower end with a tapped external surface 25 adapted to engage with the thread 16 of blind bore 15 to support rod 40 substantially perpendicular to the upper surface of bracket 10 and in fixed relationship therewith. The lower end of rod 40 is provided with an axial grease passage 41 extending upwardly to communicate with a plurality of radially disposed grease passages 42 to distribute grease from nipple 18 via passage 17 to a bearing adjacent thereto. Rod 40 is provided with an expanded portion 43 upwardly of said tapped portion 41 and a bearing accommodating the portion 44 upwardly of expanded portion 43. The annular face defined between expanded portion 43 and bearing portion 44 is adapted to accommodate a lower surface of a ball race bearing 45 which is disposed about bearing accommodated portion 44. Upwardly of bearing 45 there is provided a phosphor bronze bush 46 which is rotatable about external surface of bearing portion 44 and is contiguous grease passage 42 and constitutes the remainder of the bearing assembly.

50 A magazine storage assembly is supported by bearing 45 and bush 46 and comprises a vertically disposed cylindrical distance piece 47 carrying upper and lower indexing or magazine plates 74 and 76 respectively. Distance piece 47 is mounted for rotation about rod 40 and is co-axial therewith. The distance piece 47 is rabbed in its outer surface towards its lower end 48 and the lower annular surface 49 abuts the upper surface of the bearing 45 while the adjacent inner cylindrical surface of the rabbed portion fixedly engages the bronze bush 46, the arrangement being such that the distance piece 47 is capable of rotational movement about rod 40.

55 The lower external surface of the rabbed portion 48 of rod 47 is threaded at 50 and is adapted to fixedly engage a support ring 51 which is also threaded on its inner surface so that ring 51 is rotatable with distance piece 47 about rod 40.

60 Rod 40 has a narrowed upper end 55 and is provided at 56 with a transverse drilling adapted to accommodate a retaining pin 57.

Distance piece 47 extends upwardly of the upper extremity of rod 40 and is provided at a point contiguous with the narrowed end 55 of rod 40 with a pair vertically spaced diametric drillings 60 and 61, the upper drilling 60 being substantially larger than and co-axial with the drilling 56 in the upper end of rod 40 accommodating pin 57 to enable the pin 57 to be inserted or removed from the upper end of rod 40.

The lower drilling 61 is tapped on its inner surface and adapted to receive a setscrew. A bronze bush 62 is disposed about end 55 of the rod 40 to constitute the upper bearing of the distance piece 47 and to maintain distance piece 47 substantially co-axial with rod 40, recesses 63 being provided in bush 62 to accommodate the setscrew disposed in drilling 61 to secure the bush 62 for rotation with distance piece 47 about the narrow end 55 of rod 40. The bearing assembly is completed by means of a washer 64 disposed between bush 62 and retaining pin 57.

The upper end of distance piece 47 is rabbeted in its outer surface to provide an annular face 70 and a narrow portion produced thereby is provided on its outer surface with a thread 71 adapted to receive a suitably threaded cap piece 72. The distance piece 47 supports and separates horizontally disposed upper index plate 74 and lower index plate 76.

The upper index plate 74 is a substantially horizontally disposed disc having a central bore adapted to be accommodated over the upper end of distance piece 47 and to be secured thereto for rotation with said distance piece 47 by means of cap 72. The plate 74 has a plurality of regularly spaced circumferentially disposed circular openings 77, typically 23 in number, each constituting a support for a stack of articles in a manner hereinafter described.

Each opening 77 accommodates a nylon bush 78 having a lower, radially extending, flange 79, the body of bush 78 extending upwardly through openings 77 to stand proud of the upper surface of plate 74. The external surface of nylon bush 78 is provided with an annular groove 80 contiguous the upper surface of plate 74, said groove 80 being adapted to receive a circlip 81 to secure the bush 78 in position in opening 77 of upper index plate 74.

The internal surface of bush 78 is provided with an upper chamfered portion 82, a central cylindrical portion 83 and a lower chamfered portion 84 to provide for easy insertion and passage of a stack of cylindrical nested articles through the bush with minimal risk of damage to the individual articles in the stack.

Lower index plate 76 is secured to the lower end of distance piece 47 by means of threaded annular ring 51 for rotation therewith. Lower index plate 76 is also provided with a plurality of peripheral stack supporting openings 90, typically 23 in number, which are peripherally disposed and regularly spaced above lower index plate 76, the openings 90 being in register with corresponding openings 77 in the upper index plate, the arrangement being such that a stack of nested articles, such as flared toothpaste tubes, can be accommodated and supported in substantially vertical configuration by means of co-operating opening 77 in upper index plate 74 and opening 90 in lower index plate 76.

The opening 90 accommodates a downwardly depending nylon bush 91. The bush is substantially cylindrical and has towards its upper end a radially extending annular flange 92, the lower surface of which flange is adapted to abut with and engage the upper surface of lower index plate 76. The external surface of the bush 91 is provided, contiguous the lower surface of the lower index plate 76 with an annular groove 93 which accommodates a circlip 94 for securing the bush within opening 90 in lower index plate 76.

The bush 91 depends from the lower index plate 76 and terminates in spaced upward relationship with the upper surface of dead plate 25. The inner surface of the bush 91 is substantially cylindrical and is provided with a chamfer 95 at the upper end and a further chamfer 96 at the lower end. The arrangement is such that the passages defined by bushes 78 and 91 can support a nested stack of toothpaste tubes with the screw caps disposed generally downwardly and for supply of these articles to the dispensing apparatus forming the subject of copending application, Ser. No. 883,129 now Pat. No. 3690141.

In the storage position one stack is disposed in and supported by each pair of aligned bushes 78 and 91 in spaced upper and lower index plates 74 and 76 respectively, the stack being supported in vertical configuration by the bushes and index plates. The tube in the stack are disposed cap downwards so that the stack rest on the cap of the lowermost tube in the stack which rests on dead plate 25, so that rotation of the magazine assembly about rod 40 results in sliding of said lowermost cap on the surface of dead plate 25 until presented to the dispensing passage 20 in which case the cap rides up the knife edge chamfer 31 of insert 28 until registration of the stack with the opening defined by insert 28 when the stack move downwardly so that said lower-most tube enters and nests with the uppermost tube of the preceding stack contained by the dispensing apparatus thereby providing a continuous feed of articles to the dispensing apparatus for dispensing or indexing to a position for individual filling of each tube by means of a filling machine of a type known per se.

The bracket 10 is configured at a point below insert 28, to accommodate a lowering assembly indicated generally by reference numeral 150. The lowering assembly 150 comprises a cylindrical support tube 151 having an annular cam ring 152, mounted about the external surface of support tube 151, the arrangement being such that cam ring 152 is capable of limited arcuate movement about support tube 151. The cam ring 152 has four regularly spaced cam tracks 153 each of which is obliquely disposed to a radius in a similar sense extending into the lower surface 154 thereof. The cam ring 152 is provided towards a periphery with a pivot pin 155 which pivotally connects the cam ring 152 with actuating lever 156.

The bracket 10 and associated conduit 20 are provided with four regularly spaced slideways 157 juxtaposed the underside of cam ring 152, said slideways being of rectangular cross section and extending radially of support tube 151, each of said slideways 157 being juxtaposed a corresponding cam track 153 and accomodating a slidable actuator, 158. Each actuator 158 carries on its upper surface and towards its outer

extremity an upstanding spigot 159, which extends into associated cam track 153, the arrangement being such on operating of the actuating lever 156 to rotate cam ring 152 through a small arc about tube 151, causes spigots 159 to travel along cam tracks 153 thereby forcing actuators 158, to move radially inwardly and outwardly with respect to its tube 151.

The support tube carries four regularly spaced petal elements 160, which are shaped from a spring steel strip 161, having a protective coating 162 of rubber or like material. The petal elements are secured to the inner surface of tube 151 by means of arcuate flanges 163 formed integral with elements 160 and a plurality of circumferentially spaced rivets 164. The petal element assembly is formed from a shaped piece of spring steel sheet or strip which is bent cylindrically and inserted into tube 151, so that in the rest position the petal elements 160 are biased outwardly to a substantially cylindrical position against the walls of the support tube 151, and conduit 20. With the actuators 158 in the innermost position, the inner end 158 of each actuator bears against the spring steel strip of the petal element 160, to urge the element inwardly of the cylindrical wall of support tube 151 to obturate partially the passage defined by tube 151 and the inner surface of conduit 20, the arrangement being such that the petal elements together generally define a frustoconical part when in the closed or obturating position. The petal elements 160 are configured towards their inner extremity so that in the obturating position a stack of tubes entering the assembly through bush 28, enters the lowering assembly until the cap of the foremost tube in the stack enters the opening 165 defined by extremities 166 of each of petal members 160 so that the stack of tubes are supported by the shoulders of the first or lowermost tube in the stack bearing against the coating 162 of petal element 160.

In use, operation of the index means to advance the magazine so that the next stack slides across dead plate 25 and enters insert 28 by sliding up chamfered surface 31 thereof, at the same time results in actuation of rod 156 to move cam ring 152 to a position in which each of the actuators is in a position of maximum inward travel so that the petal elements 160 are partially closing tube 151 and conduit 20. Under these circumstances, the tubes pass down from the dead plate so that the cap of the foremost tube is accommodated within the opening 165 and the stack supported by the shoulder of the first tube in the stack resting against the coating 162, on each of petal elements 160. As the indexing apparatus returns at a controlled rate to its datum position, the actuating lever 156 is progressively advanced to rotate cam ring 152, about its axis with respect to tube 151, so that spigots 159 travel along cam tracks 153 to withdraw each of actuators 158 outwardly with respect to the inner surface of tube 151. As a result, and under the action of their spring bias, each petal element 160 gradually opens to provide a progressive lowering of the tubes or articles contained within the conduit, thereby gradually and slowly lowering the stack of articles into nesting relationship with the uppermost tube in the preceding stack which is then dispensed through conduit 20.

The integer motion of the magazine assembly about support rod 40 is provided by indexing means carried on support plate 35.

Referring now to FIG. 2, support plate 35 has an upstanding crank pivot 36 which serves to assist in securing the plate 35 to bracket 10. A crank member 100 is supported and mounted at its crank for rotation about pivot 36. The shorter arm 101 of crank member 100 is provided with a bore carrying a pivot pin 102 which is adapted to engage with the yoke 103 at the extremity of an operating arm 104 of a pneumatic ram 105 supported in suitable operative relation on plate 35, the arrangement being such that in a datum position the operating arm 104 of ram 105 is extended. Pivot pin 102 also serves to connect actuating rod 156 to operating arm 104 of pneumatic ram 105.

The longer arm 110 of the crank member 100 is provided towards its outer end with a bifurcated portion 111. The arms of the bifurcated portion are provided towards rearward surface 112 of arm 110, with a drilling 113 accommodating a pivot pin 114. The pivot pin carries a pawl member 115' for arcuate pivotal motion about pin 114. The pawl member 115' being adapted to extend rearwardly at 116' of the rearward surface 112 of arm 110.

The rearward surface 112 of arm 110 is provided at a point intermediate pivot mounting 36 and the extremity of the longer arm 110 with a blind drilling 115 which is tapped and accommodates a threaded pin 116 having a pair of spaced diametric drillings 117 and 118 respectively.

The rearward portion 116' of pawl element 115' is also provided with a drilling 119. A spring 120 is disposed between drilling 117 in pin 116 and drilling 119 in rearward portion 116' of pawl element 115', the arrangement being such that the pawl element is biased so that pin 121 of the pawl 115' is in the extended position and the pawl 115' is capable of rocking motion about its pivot 114 against the bias of spring 120.

Plate 35 is provided at a point rearwardly of the rearward face 112 of crank arm 110 with an upstanding spigot 122, a spring 123 is disposed between spigot 122 and drilling 118 on pin 116 to bias crank arm 110 to its rearward datum position with ram operating arm 104 extended.

Forward of crank arm 110, there is provided in plate 35 a drilling 130 adapted to accommodate a fixing stud for a horizontal elongate cylinder 131. The cylinder is disposed so that the axis of the cylinder is disposed along a radius extending from the bearing axis of rod 40 and distance piece 47 and thus lies along a radius of the upper and lower indexing plates 74 and 76 respectively and of the dead plate 25. The inner bore of cylinder 131 accommodates a piston 132 having at its forward end with respect to the cylinder 131 a head member 133.

The piston 132 extends approximately half the length of cylinder 131 and terminates in a rearwardly extending portion 134 of the reduced diameter which extends beyond the rear of cylinder 131. A compression spring 135 is located between an annular abutment surface 136 provided inwardly at the rear of cylinder 131 and the annular face defined between piston 132 and reduced portion 134 so as to urge the piston to forward the position.

The rearward extremity of reduced portion 134 extending beyond cylinder 131 is provided with a radial drilling 137 accommodating a pin 138 to limit and

define the extent of forward bias of the piston 132 under the influence of spring 135.

The head 133 is provided at its forward extremity with V-notch 140 adapted to engage with an index pin 170 carried by lower indexing plate 76 and a pair of chamfer surfaces 141 is provided to allow the pin, on rotation of the magazine assembly to ride along surface 141 and to depress head 133 upwardly towards the axis of rotation of the magazine assembly against the loading of spring 135 until the pin is accommodated in the V-notch 140 to locate the pin by virtue of the influence of the loading of spring 135.

Each stack support opening 90 in the lower index plate 76 has an associated index pin 170. The pin is located radially inwardly of the opening, the pin 170 is constituted by a downwardly depending stud 171 having a central tapped blind bore 172 and a radially extending flange 173 at its upper end. A suitable countersunk hole 180 is provided in the lower index plate 76, the stud 171 constituting pin 170 is secured to plate 76 by means of a screw 181 for rotation therewith. The disposition of pin 170 and V-notch 140 is such that on interengagement, a stack supporting opening is aligned with dispensing passage 20.

The air return from pneumatic ram cylinder 105 includes an appropriate restrictor (not shown) so that the rate of return of the indexing assembly to its indexing position can be controlled, thereby controlling the rate of openings of petal actuator 160 of the lowering means and hence the rate at which a stack of articles is lowered into nesting relationship with the preceding stack.

In operation, stacks of nested flared tubes prepared in accordance with our co-pending patent application, Ser. No. 883,129, now Pat. No. 3,690,141 are inserted by hand into the bush 78 in the upper indexing plate and through corresponding bush 91 in the lower indexing plate in respective of a plurality of the twenty three locations about each plate so that stacks of tubes are supported vertically with their caps downwardly so that the cap of the lowermost tube in each stack is abutting and resting on the upper surface of dead plate 25.

One of the stack support openings will be in register with dispensing passage 20 and the stack disposed in said one opening will enter the dispensing passage 20 leading to the dispensing apparatus referred to above. As said stack is used, the uppermost extremity of the uppermost tube in the stack will enter the dispensing passage 20 the passage of this extremity is sensed by means of an appropriate sensing means, diagrammatically shown at 182, such as a microswitch or a photoelectric cell; and causes operation of ram 105. The ram 105 acts to withdraw ram rod 104 and cause the crank 100 to pivot about its pivot axis 36 thereby causing the crank arm 110 with the pawl element 115' carried thereby, to move arcuately forwardly to engage an adjacent pin 170 carried by lower indexing plate 76. At the same time, actuating rod 156 is withdrawn to rotate cam ring 152 counterclockwise (See FIG. 3) to move actuators 158 inwardly thereby urging petal elements 160 inwards against their spring bias toward an obturating position. Continued arcuate forward movement of crank arm 110 in response to the operation of ram 105 causes pin 170 engaged by pawl 115' to be urged arcuately forward about pivot axis of rod 40. At

the same time the pin 170 engaged by the notch 140 of the rotating assembly is urged out of the notch and rides down the chamfered surface of head 133 of the locating assembly and the next contiguous pin is brought, as a result of progressive rotational movement of the lower indexing plate 76 about the axis of rod 40, into engagement with the chamfered portion 141 of head 133 to urge the head inwardly against the spring loading of spring 135 until the next contiguous pin 170 is engaged in the notch 140 to locate the upper and lower indexing plates constituting the magazine assembly in its indexing position.

In this newly indexed position the arm 105 is at the extremity of its throw and the pneumatic pressure supplied to the ram 105 is released. The crank arm 110 is, therefore, urged rearwardly under the influence of spring 123 until the rearward pawl edge of pawl element 115' engages with the next pin 170 rearward of and contiguous the one advanced by contact with pawl element 115', in producing rotation of the upper and lower indexing plate 74 and 76 respectively to the newly indexed position. The rearward movement of crank arm 110 is controlled by means of the restrictor 25 included in the air return of pneumatic cylinder 105, so that control of the rate of lowering of the stack by the lowering means as hereinbefore described can be effected.

The rearward movement of the crank arm 110 causes the pawl surface of pawl element 115' to be urged rearwardly with respect to said next pin 170 and to produce forward rotation of the pawl element 115' about its pivot 114 against the bias of spring 120, until the pawl is disengaged from the said next pin by further rearward movement of crank arm 110 whereupon the pawl element 115' is returned to its datum position under the influence of spring 120, the crank arm and ram assembly being returned to their datum position ready to commence the operating cycle once more.

During movement of the magazine assembly about the axis of rod 40, the stacks of articles supported by aligned pairs of support openings in each of the indexing plates are caused to slide on their caps over the surface of dead plate 25. The next stack to be indexed is caused to slide over plate 25 to engage the knife edge chamfer 31 of insert 28 until the stack is aligned with the axis of dispensing opening 20 whereupon the stack enters the dispensing passage 20 under its weight, so that the lowermost tube in the stack nests into the open end of the uppermost tube in the next preceding stack being fed to the dispensing and indexing apparatus.

It will be appreciated that the apparatus described above provides an automatic and continuous feed of stacked articles to a dispensing apparatus of the kind described in our co-pending patent application Ser. No. 883,129 now U.S. Pat. No. 3,690,141. An operative can take a box of stacked tubes can put the contents of the whole box into the magazine for feeding to the dispensing apparatus. In this way one operative can attend to several magazines instead of the need to have one operative attending to each dispensing apparatus.

I claim:

I claim:

1. A magazine for dispensing stacks of nesting collapsible tubes which magazine comprises a dispensing station, magazine storage means for supporting a plurality

of stacks of nested tubes in a dispensing position, indexing means for moving said magazine storage means to present sequentially each of the plurality of stacks at said dispensing station, sensing means for sensing the passage of the last tube in a stack at said dispensing station, and lowering means arranged to progressively lower a stack at said dispensing station to enter and nest with the last tube in the preceding stack thereat, said lowering means comprising a feed conduit, a plurality of petal elements which together define a downwardly converging frusto cone within said conduit, said elements being movable between a closed position in which said conduit is obstructed so that a stack of tubes entering said conduit rests upon said elements and an open position in which a stack of tubes is free to pass said elements, the movement of said elements being controlled between said closed and open positions to allow progressive movement of a stack downwardly into nesting relationship with the last tube in the preceding stack, actuator means comprising a plurality of generally radially disposed actuators, one for each petal element and each of which is radially slideable with respect to said conduit to urge the corresponding petal element to a closed position, each actuator having an upstanding spigot, and a cam ring juxtaposed said actuators, said cam ring having oblique track ways to accommodate said spigots whereby partial rotation of said ring causes the spigot carried by each actuator to move along its slideway to move said actuators between inner and outer positions.

2. A magazine as claimed in claim 1 wherein the cam ring is operatively connected to the operating assembly of the indexing means whereby as the indexing means

returns to a datum position preparatory to advancing the magazine means by the next integer, said cam ring acts to move the actuators outwardly to allow progressive opening of the petal elements thereby permitting the first article in a stack to enter progressively the widening aperture defined by the extremities of the petal elements to obtain a gradual lowering of the stack into the last tube of the preceding stack.

3. A magazine as claimed in claim 1 wherein the petal elements each comprises a spring steel backing member having a resilient cover layer, the spring steel member being biased to a generally open configuration in which tubes disposed within said conduit pass said petal elements, and whereby the actuator means move said elements against said spring bias to a closed position.

4. A magazine as claimed in claim 2 wherein the indexing means further comprises a crank having a pawl element arcuately pivotal about the crank part thereof and a plurality of abutments provided on said magazine storage means corresponding to the stacked positions of said magazine means, motor means for arcuately pivoting said crank to bring said pawl element into contact with an abutment to move said magazine means to present the next stack to the dispensing station prior to return of said crank to its datum position by pawl action over the next succeeding abutment.

5. A magazine as claimed in claim 4 wherein spring means is provided to return the crank to its datum position and wherein the pawl element is spring loaded to assist the passage over the next succeeding abutment on return of said crank to its datum position.

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