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W. E. FLACK

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CONTAINER DISTORTING AND FILLING MACHINE

Filed May 16, 1945

2 Sheets-Sheet 1

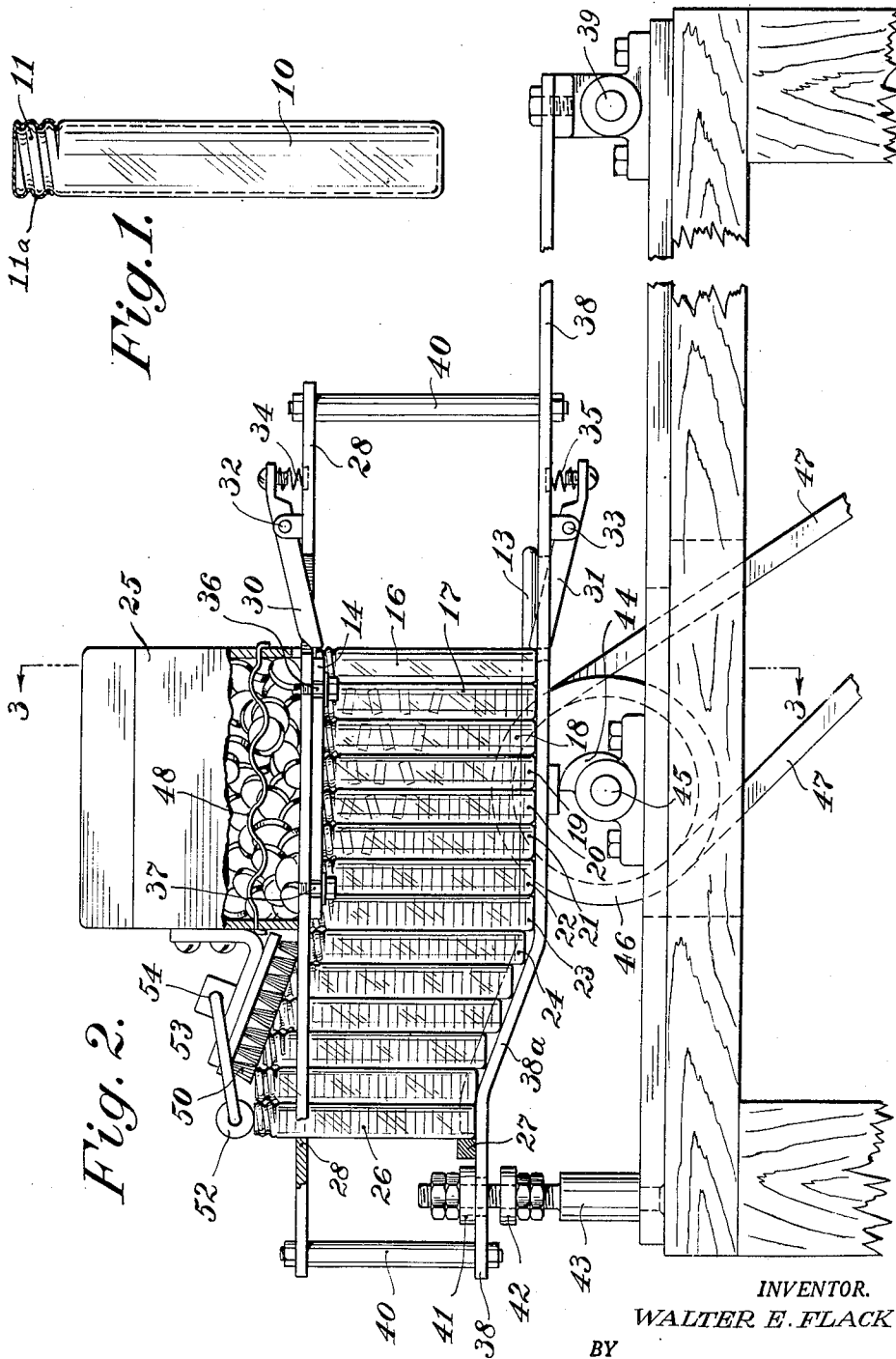


Fig. 1.

Fig. 2.

INVENTOR.
WALTER E. FLACK

BY
Virgil E. Woodcock

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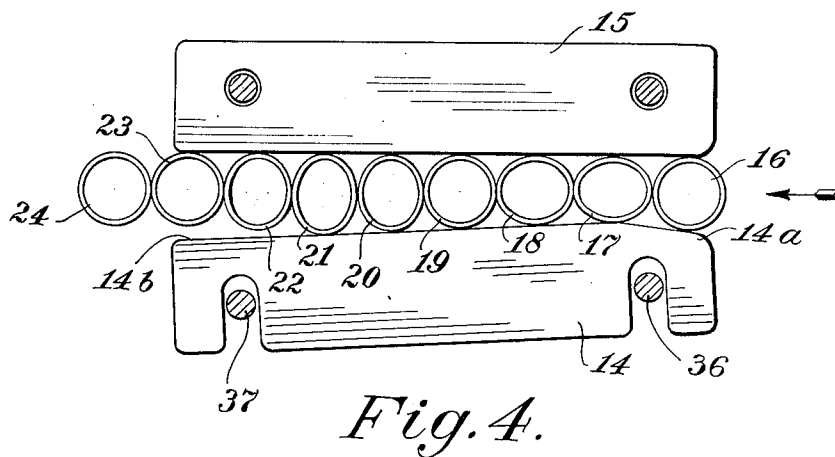


Fig. 4.

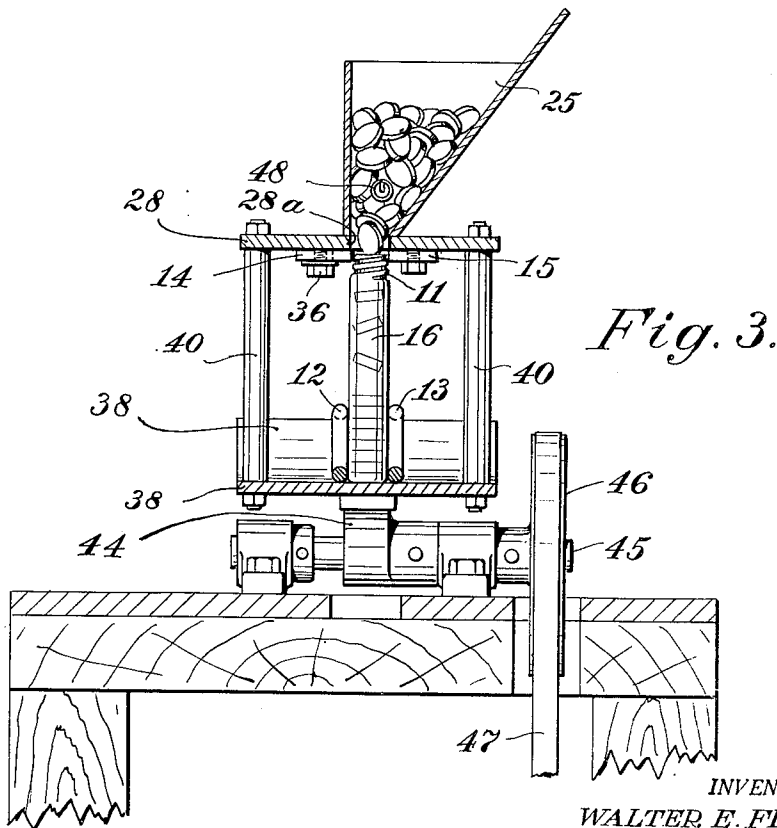


Fig. 3.

INVENTOR.
WALTER E. FLACK
BY
Virgil E. Woodcock

UNITED STATES PATENT OFFICE

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CONTAINER DISTORTING AND FILLING MACHINE

Walter E. Flack, Huntingdon Valley, Pa., assignor
to Stokes and Smith Company, Philadelphia,
Pa., a corporation of Pennsylvania

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10 Claims. (Cl. 226—2)

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This invention is directed to an apparatus for filling flexible-walled containers having threaded open ends which tend to offer opposition to objects to be received by the containers.

Many containers or vials of the flexible-wall type are provided with open ends of reduced diameter. The open end is designed to receive a closure member whose outside dimensions are approximately the same as the body of the container. The cap or closure member does not protrude or extend outwardly away from the outer wall of the container. The outer wall of the cap is substantially in the same plane as that of the outer wall of the body of the container.

In meeting the foregoing requirements with cylindrical containers having screw threads molded into the open ends thereof, there will be a double reduction in the internal diameter of the opening; the reduction equal to the thickness of the side wall of the cap; and the reduction due to the ridges on the inside of the open end which correspond with the roots or valleys of the exterior thread. The reduced size of the open end tends to limit the size of the pills, tablets, and other objects which are to fill the containers. Should objects of reduced size be introduced into the containers, there will be a considerable space between their edges and the walls of the containers. This is undesirable, particularly in the case of pills of a friable nature which in the course of time tend to revert to their powder form because excessive freedom in the vial would hasten the process.

In carrying out the present invention in one form thereof, means are provided for temporarily distorting the shape of the open end of each container to increase a dimension thereof to facilitate entry into the container of objects of substantially the same area and cross-sectional configuration as the body-portion of the container. In this manner, the open end of the container is temporarily elongated so that pills, tablets, and the like, which ordinarily would not be readily received therethrough may quickly fill the container.

Further in accordance with the invention, a plurality of vials or containers are lined up beneath the hopper with guides so disposed as temporarily to distort the open ends first in one direction and then in a different direction so that objects rapidly fill each of the containers.

Heretofore vials of plastic material have been filled with pills at prohibitively low rates where the pills have been of substantially the same size as the threaded open end of the vial. In accordance with the present invention, the rate of filling has been increased from 50 vials per hour to approximately 1800 vials per hour. Not only has there been realized great savings in the filling time but other advantages have also been realized. Objects of approximately the same

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size as the vial bear against the inner wall thereof. There is mutual support. The objects support the wall and the wall supports the objects. The caps or closure members do not, for a given number of vials, increase the required shipping space; more particularly they do not form enlarged ends on the vials or containers. Accordingly, cylindrical containers, in a minimum space, may be packed in mutual self-supporting relationship with surfaces thereof abutting each other.

For a more complete understanding of the invention and for further objects and advantages thereof, reference should now be had to the accompanying description taken in conjunction with the drawings, in which:

Fig. 1 is an elevation of a typical vial or container to which the invention is applicable;

Fig. 2 is a side elevation, with parts broken away, of an apparatus embodying the invention;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2; and

Fig. 4 is a plan view of the vials or containers disposed beneath the hopper of Fig. 2.

Though not limited thereto, my invention has particular application to flexible-wall containers such as the vial 10 of Fig. 1. Containers of transparent or colored plastics have been widely used. The vial 10 is provided with a threaded upper end 11, of reduced diameter. The threads are molded into the container wall which may be of any flexible material. To conserve the required shipping space, the open threaded end with a closure member or cap 11a in place has an overall diameter the same as that of the body-portion of the vial. Objects of the desired size must be forced through the open or threaded end, a method of filling which is not only slow but also may be undesirable from a product-quality viewpoint.

In accordance with the invention, there is provided means for temporarily distorting the upper end of the vial or container 10 to increase a dimension or diameter of the upper end 11. The dimensional change is adequate to insure ready entry into the vial 10 of objects which may be of a size practically as large as the internal diameter of the body-portion of each vial.

In the preferred form of the invention, vials or containers in a single-file row are disposed between a pair of lower guide members 12 and 13, Figs. 2 and 3, carried by a plate 38. A number of the vials (16—23) have their threaded upper ends disposed between upper guide members 14 and 15. One of the upper guide members, for example the guide member 15, Fig. 4, may be provided with a straight surface whereas the guide member 14 is provided with double-inclined surfaces 14a and 14b; that is, the surface 14b is inclined in one direction away from the straight surface of guide 15 while the surface 14a is in-

clined in the opposite direction away from that straight surface. In consequence, a wider opening is provided at the entrance to the guides 14 and 15 for easy insertion therein of a vial or container 16. The threaded end of an adjacent container 17, disposed in the narrower space between the guides 14 and 15, is distorted so that its dimension lengthwise of the guides has been substantially increased. Hence, large flat pills or other similarly shaped objects may readily pass therethrough whereas they might be too large for ready passage through an undistorted opening.

The threaded open end of the next adjacent container 18 is distorted to a lesser degree because of the gradual increase in the width of the space between guide 15 and the surface 14b while the end of the container 19 is not distorted substantially. Each upper end of the vials or containers 20, 21 and 22, however, has a dimension thereof elongated in a different direction. There is a transition from the widened openings in one direction for the vials or containers 17 and 18 to widened openings in a different direction for the vials or containers 20—22.

It will be apparent by inspection of Fig. 2 that the containers 17—22 are all disposed beneath a hopper 25 filled with round, flat objects or tablets. By the time a container moves from a position corresponding with that of the container 17 to a position corresponding with that of the container 22, it will have been substantially filled with tablets. Accordingly, the containers 23 and 24 need not have their open ends distorted.

Though containers or vials may be fed automatically between the guides 12—13 and 14—15, in the illustrated embodiment of the invention they are manually inserted and removed. For example, the illustrated vials 16—24 have been manually inserted between the guides 12—13 and 14—15. The leading vial 26 has its lower end abutting against a stop 27, while the upper part thereof abuts against the end of a slot provided in a plate 28. As shown, this plate also supports the upper guide members 14 and 15. The trailing vial or container 16 is held in place by movable locking members 30 and 31, respectively pivoted at 32 and 33. As shown, their free ends extend through slots in plates 28 and 38 and into abutting engagement with the vial or container 16. The stop members 30 and 31 are biased into their illustrated locking positions by means of compression springs 34 and 35, arranged to bear against the opposite ends thereof. However, when a vial or container is brought between and into engagement with the converging ends of the locking members, the locking member 30 will be rotated in a clockwise direction and the locking member 31 will be rotated in a counterclockwise direction to permit the entry of the container or vial between the guides 12—13 and 14—15.

The distance from the end of the locking member 30 to the end of the slot 28a in plate 28 is important. It is selected so that enough pressure must be exerted in forcing the vial 16 into its illustrated position to produce distortion of the upper ends of vials 20, 21 and 22. The horizontal distance between the end of the locking member 31 and the stop member 27 is preferably the same as between the member 30 and the end of slot 28a.

The pressure required for the insertion of the vial 16 is not unduly great for the reason that the applied pressure produces distortion of only some of the vials, such for example, as vials 20, 21 and 22. The distortion of other of the vials, such as vials 17 and 18, lengthwise of the guides is deter-

mined by the spacing of the guide 14 relative to the guide 15 and not upon the applied pressure. This spacing may be varied to produce distortion of a character best suited to the particular objects to be introduced into the vials. For example, by loosening the fastening screws 36 and 37, the position of the guide 14 relative to the guide 15 may be changed as may be desired.

As the spacing between the guides increases, there is progressively less distortion of the open ends of the vials until that spacing becomes greater than the outside diameter of the open end of a vial. When that occurs, as shown for the vial 20, the pressure lengthwise of the row distorts or elongates the opening in a direction transversely of the guides. With the vials distorted into the various shapes illustrated in Fig. 4, tablets or other objects fall from the hopper 25 rapidly to fill them. This action is aided by mounting the guides 12—13 and 14—15 on a sub-assembly comprising upper plate 28, and a lower plate 38 which, it will be observed, is pivoted at 39. Suitable posts 40 have been provided rigidly to support the plates 28 and 38. The free end of the plate 38 is restrained for limited movement by means of bumper elements 41 and 42 carried by a post 43.

The sub-assembly as a whole is subjected to vibration or fast reciprocation by means of a cam 44, carried by a shaft 45, driven by any suitable means as indicated by the pulley 46 and a driving belt 47. The vibration of the sub-assembly including the hopper and its contained objects or pills, and the vials or containers to be filled, insures rapid and efficient filling thereof.

To prevent jamming of the pills or objects within the hopper 25, it has been found desirable to include a helical wire 48 disposed adjacent the lower end thereof. This helical wire or spring 48 assists in securing a smooth flow of the pills or objects down the hopper and into the vials. As already mentioned, an operator may, in accordance with my invention, comfortably fill 1800 vials or more per hour.

A brush 50 disposed at an angle above the guides not only serves to level off or strip from the threaded openings any objects or tablets which may protrude therefrom in excess of the capacity of the vial or container, but it also forces the last protruding tablet down into the threaded end, thus insuring that every vial is filled to its maximum capacity. The brush 50, with its series of relatively stiff bristles, is inclined at approximately the same angle as the sloping portion 38a of the plate 38. Thus, at the left-hand end of the machine, as viewed in Fig. 2, the vials or containers in moving up the inclined portion 38a engage the brush 50 and eventually raise the threaded ends thereof to positions where they may be readily grasped by the operator for easy removal thereof. As shown, a light-weight roller 52, carried by an arm 53 pivoted at 54, may engage the tablets or objects in the leading vial 26 until such time as it is removed.

In normal operation, the operator removes the vial 26 by grasping its upper end and lifting it upwardly from the slot 28a of plate 28. At the same time, the operator brings another vial into position between the movable locking members 30 and 31. As above described, this vial is moved into the position of vial 16 as soon as vial 26 has been removed. The output of the machine is limited only by the speed with which an operator may remove and insert vials or containers. If outputs materially higher than 1800 filled vials or

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containers per hour should be desired, the machine, including the hopper 25 and the guide plates, may be lengthened so that more vials with their threaded ends distorted may be disposed beneath the hopper 25. In other words, the filling of a vial requires that it be under the hopper for a given length of time. If it should be moved across the hopper at a higher speed, the hopper must be lengthened so that each vial will be beneath it for the requisite period of time.

Now that the principles of the invention have been fully set forth, it will be understood that the guides 14 and 15 may be positioned so that all of the vials are distorted in one direction, preferably lengthwise of the guides. The preferred operation is to change the shape of a number of the round open ends to ellipses whose major axes are parallel to the guides 14 and 15 while the shapes of the round open ends of an additional number of the vials to ellipses whose major axes are normal to, or transverse of, the guides.

When each vial is filled with objects of slightly greater diameter than the open end thereof, the objects are retained therein, even in the absence of the cap. This avoids accidental spilling of the contents. Should an open vial be dropped, the tablets or objects will not fall therefrom, yet they may be easily and readily removed by slightly squeezing the open ends thereof again to procure selective enlargement of that open end. When the vials are of transparent material the contents may be seen. Hence, there is a considerable sales advantage in having them filled to capacity. The customer can be sure he is not being short-changed.

While a preferred embodiment of the invention has been described, it will be understood that other modifications may be made without departing from the true spirit and scope of the appended claims.

What is claimed is:

1. Means for filling a flexible-walled container having an open end of predetermined normal shape, comprising a pair of guide members defining a path for movement therebetween of said container, said members at one location being spaced one from the other a distance such as to produce temporary distortion of said open end to increase a dimension thereof in one direction, and at another location being spaced apart a greater distance to permit distortion of said open end in another direction, means for applying a force on said container to distort it in said last-named direction, and a hopper disposed above said guides for feeding objects into the temporarily distorted end of a container.

2. Means for filling flexible-walled containers having round, open ends provided with threads which reduce the internal diameter thereof, comprising guides for the lower ends of a row of such containers which extends horizontally for a substantial distance and then is inclined upwardly, guides for the upper ends of said containers which at one location are spaced one from the other a distance to produce distortion in one direction of said threaded ends, said upper guides in a different location being spaced farther apart to permit distortion of said threaded ends in a different direction, means for maintaining said row of containers under a pressure directed longitudinally of said row so that said upper ends of certain of said containers are distorted in one direction while the upper ends of other containers are distorted in a different direction, and means for in-

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roducing objects into the distorted open ends of said containers.

3. Means for filling flexible-walled containers having open ends of slightly smaller diameter than the body portions thereof, comprising upper and lower guides between which a plurality of the containers may be disposed in a row, a stop disposed at one end of said row, at least one movable stop disposed at the other end of said row, the spacing between said stops at the opposite ends of said row being less than the product of the reduced diameter of an open end of a container multiplied by the number of containers in said row, said upper guides having a spacing over a part of their length less than the diameter of one of said open ends to distort each open end into an oval having its major axis lengthwise of said upper guides, said upper guides along a further part of their lengths having a spacing greater than the diameter of one of said open ends for distortion by the stops of said open ends into an oval having the major axis thereof disposed transversely of said upper guides, said lower guides having a uniform spacing between said stops, the removal of a container from said row and the addition of a container to said row, respectively, relieving said distorting pressure on said containers lengthwise of said guides and requiring application of pressure lengthwise of said guides, and a hopper disposed above a substantial number of said containers in the regions where said distortions occur for feeding objects into the distorted ends.

4. A system for filling resilient-walled containers having open ends of reduced diameter slightly less than the body portions comprising a hopper having an elongated discharge opening, spaced guides for aligning a row of containers below said discharge opening, and relatively movable stops disposed at opposite ends of said row and spaced less than the product of the number of containers in the row times said reduced diameter, said guides having for successive regions of their length spacings respectively lesser and greater than said reduced diameter, said guides and stops coacting with said containers as pushed along below said discharge opening to distort their open ends to ovals whose major diameter is greater than said body portions and which major diameter angularly shifts as each container passes from one to the other of said regions.

5. Means for filling a flexible-walled container having an open end of predetermined normal shape, comprising a pair of guide members defining a path for movement therebetween of the open end of said container, said members at one location being spaced one from the other a distance such as to produce temporary distortion of said open end and to increase a dimension thereof in a first direction and at another location being spaced apart a greater distance to permit distortion of said open end in a second direction, structure for applying a force longitudinally of said members to said open end to distort it in said second direction, the temporary distortion of said open end in said first direction and then in said second direction facilitating entry into said container of objects of substantially the same area and cross-sectional configuration as said predetermined normal shape, and means for introducing said objects into said distorted open end quickly to fill the container.

6. In a system of filling flexible-walled containers, each having an open end of a predetermined normal shape, the combination of elon-

gated guiding means having surfaces at one location spaced one from the other a distance for temporarily distorting the shape of the open ends when a plurality of said containers is placed in a row therebetween and when moved along said surfaces to facilitate entry into each container of objects of substantially the same area and cross-sectional configuration as said shape and at another location having a wider spacing to permit distortion of said open ends in another direction, means for producing a distortion in said last-named direction upon each successive insertion of a container in the row, and means for simultaneously introducing the objects into a plurality of the differently distorted ends to fill the containers as they move along said surfaces.

7. Means for filling flexible-walled containers, each having an open end of predetermined normal shape and of reduced internal diameter, comprising upper and lower guides for holding a plurality of containers in a row, a stop disposed at one end of a row for engagement by a container, at least one movable stop disposed at the opposite end of said row and operable out of engagement with the adjacent container of said row during the insertion of a container between said guides, said upper guides at one location being spaced one from the other a distance such as to produce temporary distortion of said open ends and to increase a dimension thereof in one direction and at another location being spaced apart a greater distance to permit distortion of said open ends in another direction, said stops being spaced longitudinally of said guides a distance such that each successive insertion of a container in said row applies a force longitudinally of said guides to said open ends and produces a distortion thereof in said other direction, the temporary distortion of said open ends first in one direction and then in the other direction facilitating entry into said containers of objects of substantially the same area and cross-sectional configuration as said predetermined normal shape, and means for introducing said objects into said distorted open ends quickly to fill the containers.

8. Means for filling flexible-walled containers having open ends threaded to receive a closure of reduced diameter in the region of said threads, comprising upper and lower guides for holding a plurality of containers in a row, a stop disposed at one end of said row, movable stops disposed at the opposite end of said row and operable out of engagement with the adjacent container by the insertion of a further container between said guides, said upper guides being disposed one to the other to provide a spacing which gradually increases from near one end of said row to the opposite end thereof temporarily thereby to provide for distortion of the threaded ends of said containers inserted therebetween in one direction and then to permit distortion of said threaded ends in another direction, said stops being spaced one from the other a distance which produces distortion of the threaded ends of said containers in said other direction upon each successive insertion of a container in said row, the temporary distortion first in one direction and then in another direction facilitating entry into each container of objects of at least the same area and cross-sectional configuration as the open ends thereof, means for introducing said objects into distorted open ends to fill said containers during passage from one step to the others, and means

for mounting said guides and said containers for vibration during the filling thereof.

9. Means for filling flexible-walled containers having open ends threaded to receive closure members and of reduced diameter in the region of said threads, comprising upper and lower guides for holding a plurality of containers in a row, a stop disposed at one end of said row, movable stops disposed at the opposite end of said row and operable out of engagement with the adjacent container by the insertion of a further container between said guides, said upper guides being disposed one to the other to provide a spacing which gradually increases from near one end to the opposite end thereof thereby to provide for distortion of the threaded ends of said containers inserted therebetween in one direction and then to permit distortion of said threaded ends in another direction, said stops being spaced one from the other a distance requiring a second distortion of the threaded ends upon successive insertions in said row, the distortion first in one direction and then in another direction facilitating entry into each container of objects of at least the same area and cross-sectional dimension as the threaded ends thereof, and a hopper disposed above a substantial number of said containers in the region where said distortions occur for feeding objects into the distorted ends thereof.

10. Means for filling flexible-walled containers having open ends threaded to receive closure members and of reduced diameter in the region of said threads, comprising upper and lower guides for holding a plurality of containers in a row, a stop disposed at one end of said row, movable stops disposed at the opposite end of said row, said upper guides being disposed one to the other to provide a spacing which gradually increases from near one end to the opposite end thereof temporarily thereby first to provide for distortion of the threaded ends of said containers inserted therebetween in one direction to facilitate entry into each container of objects of substantially the same area and cross-sectional configuration as the open ends thereof and then to permit distortion of said threaded ends in another direction, said stops being spaced one from the other a distance which results in a force on said threaded ends longitudinally of said guides to distort them in said other direction upon successive insertions of containers in said row, a hopper disposed above a substantial number of said containers in the regions where distortions occur for feeding objects into the distorted ends thereof, and means for vibrating said containers and said hopper quickly to fill said containers.

WALTER E. FLACK.

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