April 5, 1960 H. A. BARNBY 2,931,147

METHOD AND APPARATUS FOR EXCLUDING AIR IN PACKAGING POWDERED MATERIALS

Filed July 3, 1956 4 Sheets-Sheet 1

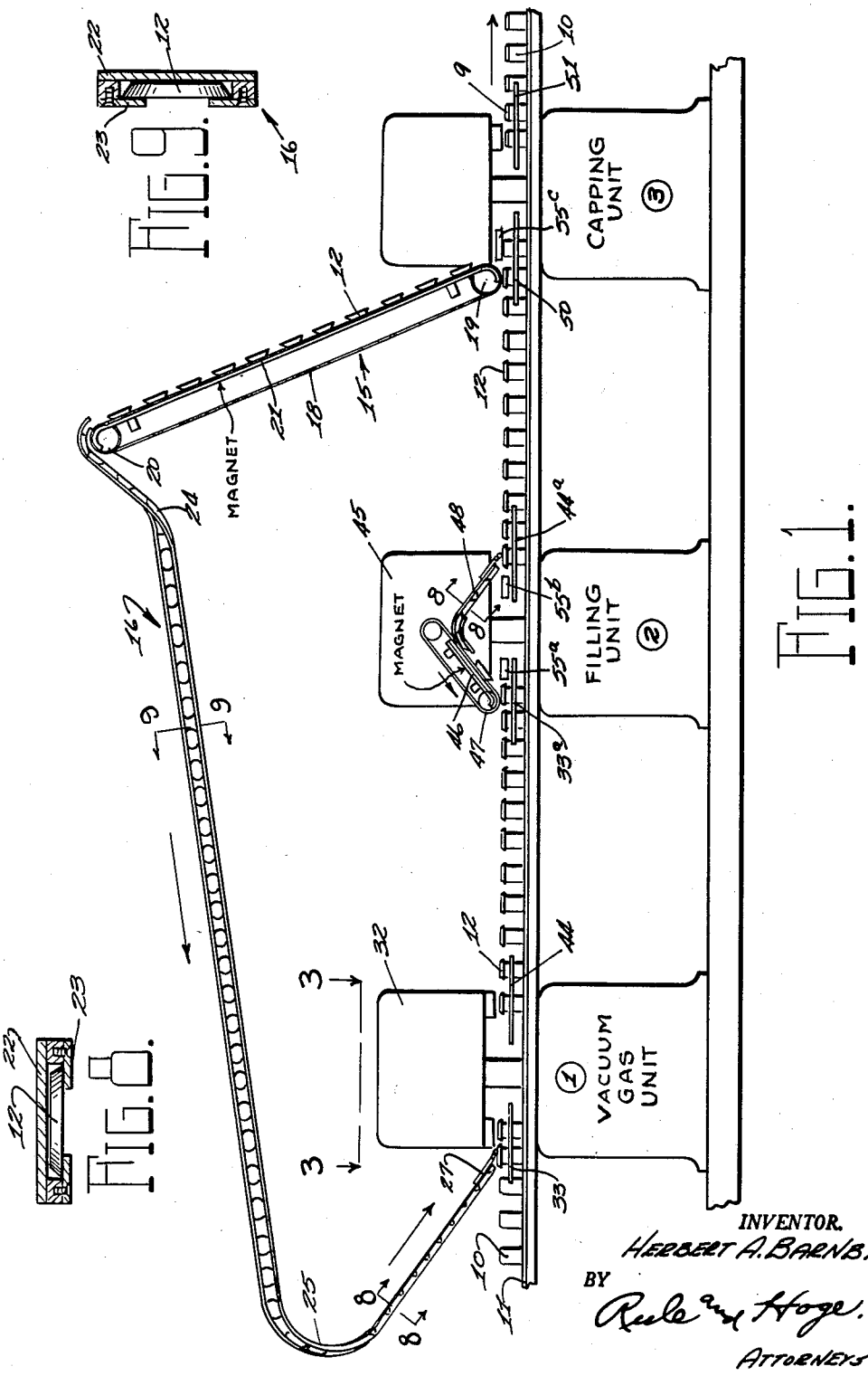


FIG. 1.

FIG. 9.

FIG. 6.

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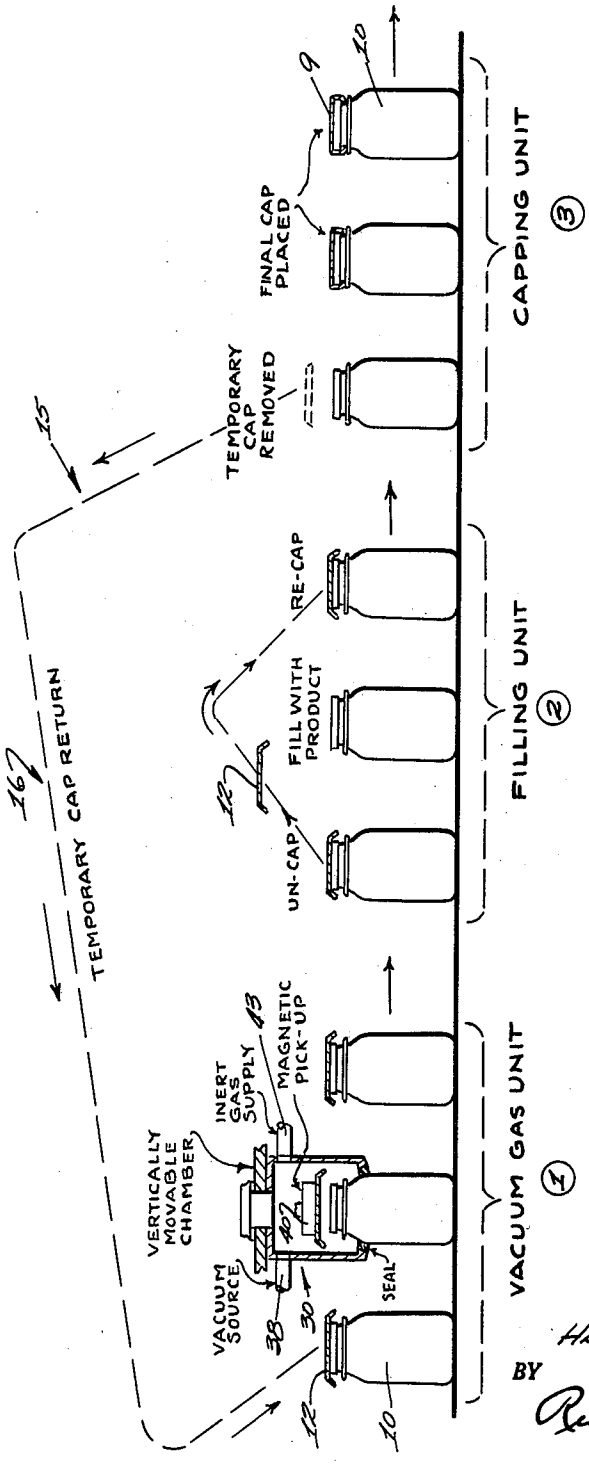


FIG. 2.

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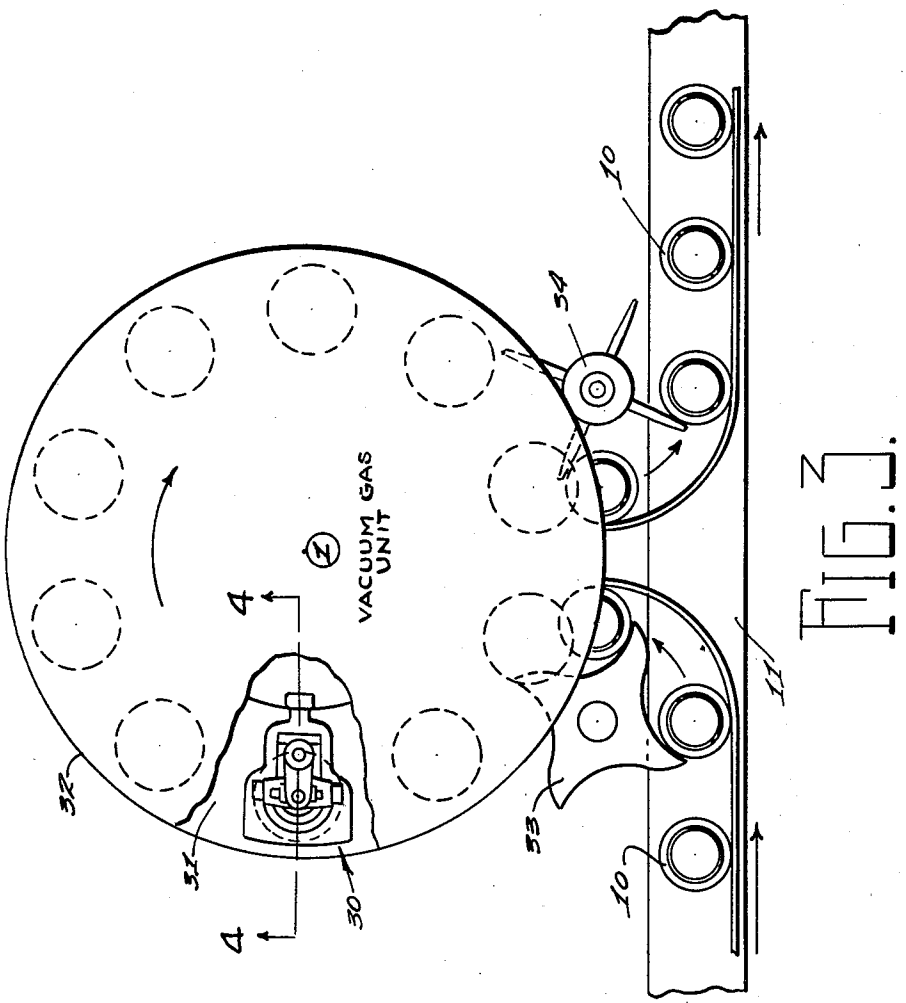


FIG. 2

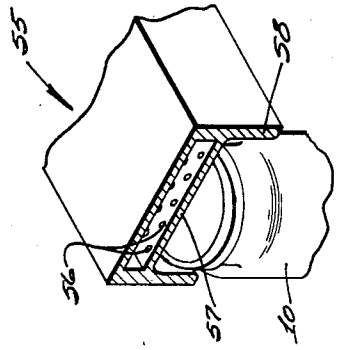


FIG. 10

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FIG. 4.

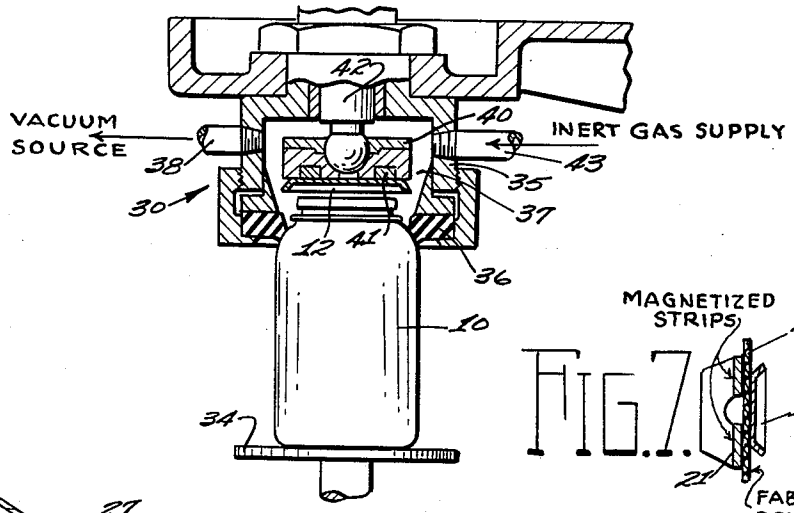


FIG. 7.

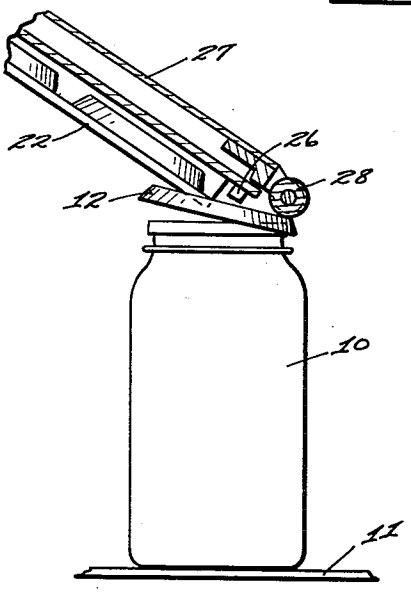


FIG. 5.

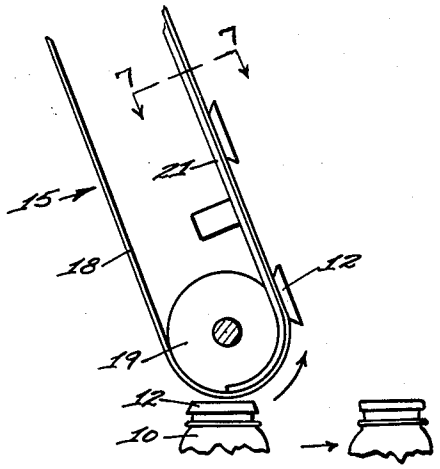


FIG. 6.

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United States Patent Office 2,931,147
Patented Apr. 5, 1960

2,931,147

METHOD AND APPARATUS FOR EXCLUDING AIR IN PACKAGING POWDERED MATERIALS

Herbert A. Barnby, Toledo, Ohio, assignor to Owens-Illinois Glass Company, a corporation of Ohio

Application July 3, 1956, Serial No. 595,705

5 Claims. (Cl. 53—22)

My invention relates to methods and means for packaging powdered or comminuted materials and particularly to a novel method by which air is replaced by an inert gas in packaging finely divided products. The conventional method of removing air or oxygen from such materials in the packaging operations consists in filling the container with material to be packaged, vacuumizing the filled container, and thereafter introducing an inert gas. Such method is necessarily slow in order to prevent the powdered material from being drawn out with the air when subjected to a vacuum and is inadequate and impracticable for use at desired commercial speeds for packaging most dry powders.

A primary object of the present invention is to overcome this objection and provide a method by which the containers may be filled in rapid succession, such method including means for replacing the air with an inert gas during the packaging process.

The invention as herein illustrated is used in filling glass jars or hollow containers with a powdered product, the air being replaced by an inert gas such as nitrogen or carbon dioxide.

In practicing the invention the jars or other containers in which the powdered material is to be packaged are placed on an endless conveyor and cover caps are placed loosely on the containers. As the containers are carried forward on the conveyors they are first brought to a vacuumizing and gas filling unit which includes means for lifting the cover cap from each container, vacuumizing the empty container, releasing the vacuum by introducing an inert gas and then replacing the temporary cover cap loosely on the container. The container is then returned to the conveyor and advances to a filling unit where the temporary cover is again removed, the container filled with the powdered product and the temporary cover replaced loosely on the filled container. The filled containers are carried by the conveyor from the filling unit to a capping unit where the temporary covers are removed and permanent covers applied and sealed to the filled containers. The temporary cover caps, which are removed as the containers enter the capping unit, are returned into position for reuse by applying them to succeeding containers approaching the vacuumizing and gas filling unit. The method further provides for shielding, baffling, or flooding the open end portion of the container with an inert gas while the cover is lifted for introducing the filling material, and also while the temporary cover cap is being replaced by a sealing cap, thus preventing reentrance of air into the containers.

Referring to the accompanying drawings:

Fig. 1 is a diagrammatic view of a preferred form of apparatus for practicing the method;

Fig. 2 is a schematic view or flow sheet indicating the successive steps employed in the method;

Fig. 3 is a plan view, partly diagrammatic and with parts broken away, showing the unit for vacuumizing the containers and filling them with an inert gas;

Fig. 4 is a fragmentary, part sectional, elevation of the vacuumizing and gas filling means;

Fig. 5 is a detail view showing the method by which the temporary cover caps are transferred from a chute to the jars on the conveyor;

Fig. 6 is a fragmentary view showing the manner in which the temporary cover caps are withdraw from the filled containers;

Fig. 7 is a section at the line 7—7 on Fig. 6;

Fig. 8 is a cross section of a cap chute as indicated by the section lines 8—8 on Fig. 1;

Fig. 9 is a section at the line 9—9 on Fig. 1; and

Fig. 10 is a perspective view of a device for shielding or flooding the uncapped containers with an inert gas.

Referring to Fig. 1, the containers 10, here shown as jars, are placed on a horizontal traveling conveyor 11 which may be driven continuously, thereby bringing the jars in succession to the stations 1, 2, and 3. At station 1 the jars are temporarily removed from the conveyor, vacuumized, and filled with an inert gas. Temporary cover caps 12 are placed loosely on the jars as they are brought to station 1 and are temporarily lifted from the jars for the vacuumizing and gas filling operations and then replaced loosely on the jars, as presently described. The gas filled jars are then returned to the conveyor 11 and are carried thereby to the filling station 2 where the caps 12 are again removed and the jars filled with the powdered product which is being packaged and the caps again placed on the jars.

When the filled jars with the caps loose thereon reach the capping station 3 the caps 12 are again removed from the jars, and permanent caps 9 are applied and sealed to the filled containers. The temporary closure caps 12 when removed from the jars at the capping station 3 are returned for reuse at station 1 by means of a return conveyor 15 and chute 16.

The conveyor 15 (Figs. 1, 6 and 7) comprises an endless conveyor belt 18 trained over lower and upper pulleys 19 and 20 respectively. A magnetized plate 21, which forms a backing or support for the upwardly traveling reach of the conveyor belt, operates to withdraw the caps 12 from the jars and holds the caps on the conveyor belt so that they are carried upwardly to and over the pulley 20 at which point are caps are transferred to the chute 16. This chute, as shown in Fig. 9, comprises a backing plate or strip 22, against which the top surfaces of the caps 12 bear, and guide rails 23 which overhang the rims of the caps and hold them on the chute. Each cap 12 as it reaches the upper end of the conveyor 15 is transferred to the chute 16 and thus released from the conveyor belt.

The caps as they enter the chute 16 are in an inverted position and during their passage through the chute are turned over so that they may be placed in upright position on the empty jars. For this purpose the chute 16 is formed with a bend or twist 24 a short distance beyond the conveyor 15 by which the backing strip 22 is turned into an upright plane, permitting the caps to roll down the chute by gravity to another bend or twist 25 in the chute which completes the turnover of the caps to the inclined position shown in Fig. 5. Each cap is arrested at the lower end of the chute by a stop lug 26 on a spring arm 27, with the cap in the path of the empty jars, so that each jar pulls a cap off the chute. A roll 28 on the arm 27 insures the cap being moved to a horizontal position on the jar.

The vacuumizing and gas filling mechanism at station 1 includes a plurality of units or assemblies 30 (Figs. 3 and 4) mounted on a carriage 31 for rotation about a vertical axis, said units being contained within a casing 32. The jars 10 are transferred from the conveyor 11 to a position beneath the path of the units 30 by a star

wheel 33. Each jar as it is carried beneath the hood 32 is positioned on a supporting disk or pad 34, with the jar beneath and in register with a head 35 forming a part of the unit 30. The pad 34 may then be lifted to bring the jar into sealing contact with the sealing ring 36. The head 35 is formed with a vacuum chamber 37 from which the air is exhausted through a vacuum pipe 38, thereby vacuumizing the jar. Before the vacuum is drawn the cap 12 is lifted a short distance above the jar by a clutch 40 in which a permanent magnet or magnets 41 are mounted. The clutch is carried on a stem 42 which is lowered to bring the magnets into contact with the cap and then raised for lifting the cap which is held by the magnets.

After the jar is vacuumized an inert gas, for example, nitrogen or carbon dioxide, is introduced through a pipe 43 into the chamber 37 and into the vacuumized jar. In this manner the greater portion of the air is withdrawn from the jar and replaced by the inert gas. If an objectionable percentage of air is still retained in the jar this vacuumizing and refilling process is repeated one or more times, thus virtually eliminating all of the air. The vacuumizing mechanism as herein shown is substantially the same as that disclosed in the patent to Hohl et al. 2,506,363, May 2, 1950, Vacuum Sealing Machine, to which patent reference may be had for a more detailed disclosure of the mechanisms involved and their mode of operation.

The carriage 31 is rotated clockwise about its axis so that each unit 30 and connected jar 10 are brought to a transfer position at which a star wheel 44 transfers the jar on to the conveyor 11. The gas filled jar is then carried by the conveyor 11 to the filling unit at station 2 where the jar is transferred to a filling position beneath the filling machine 45 which may be of usual or well-known construction. Star wheels 33^a, 44^a, similar to the star wheels 33, 44, transfer the jars from the conveyor 11 to the filling position and back to the conveyor. As each jar reaches the filling station and immediately before it is transferred to filling position the cap 12 is lifted off the jar by a magnetic plate 46 operating through a traveling belt conveyor 47. The construction and operation of the magnet and conveyor may be substantially the same as of the magnet 21 and conveyor 18 as shown and above described. The conveyor 47 carries the caps upward to an inclined chute 48 which may be substantially similar in construction to the chute 16. The caps move down the chute 48 by gravity and are again placed on the jars which have been filled at the filling station 2.

The filled jars with the temporary caps loosely seated thereon are carried forward on the conveyor 11 to the capping station 3 at which the caps are removed and returned by the conveyor 15 and chute 16 as above described. The filled jar with the temporary cap removed therefrom is then transferred by means of a star wheel 50 to a filling position beneath the capping machine which may be of conventional or well-known construction and operation. The capping machine applies and seals to the jar a permanent closure cap 9. The sealed jar is then returned by the star wheel 51 to the conveyor 11.

In order to prevent the entrance of air into the containers when the temporary closure caps 12 are lifted, after the containers have been filled with an inert gas, shielding and flooding devices 55 (Fig. 10) are provided. As shown the device 55 is in the form of a channel through which an inert gas such as CO_2 flows along the path of the open end portion of the container. The floor 57 of this device is provided with a multiplicity of perforations 56 distributed thereover through which jets of the inert gas are ejected into the zone of the container mouth. Side strips 58 extend downward from the floor 57 and form therewith an inverted channel through wihch the open tops of the containers are carried. In this manner the mouth of an unsealed container is shielded and flooded with the inert gas, virtually preventing the entrance of any air into the open container. One such shielding device is provided at the position 55^a (Fig. 1), at the point at which the temporary cap 12 is removed from the container at the filling station, said device protecting the open container prior to its being filled with the powdered material. A second device 55 at the position 55^b again floods and shields the container from outside air until the temporary cap has been replaced. When the temporary cap is again removed at the capping station a third shielding device at position 55^c protects against entrance of air until the container is sealed by its permanent cap 9.

The shielding and flooding devices 55 may be of a construction and mode of operation known in the prior art as illustrated and described, for example, in the patent to Hohl et al. 2,620,111, December 2, 1952, Method and Apparatus for Sealing Containers. The capping machine at station 3 may also be the same as illustrated and described in said Patent 2,620,111.

Modifications may be resorted to within the spirit and scope of my invention.

I claim:

1. The method of packaging a comminuted or powdered product which comprises transporting a container to a vacuumizing station, a filling station and a capping station, vacuumizing the container and filling it with an inert gas at said vacuumizing station, applying a closure cap to the open mouth of the gas filled container at the vacuumizing station and thereby maintaining the container closed during its travel to the filling station, removing said cap from the gas filled container at the filling station and introducing the powdered product to fill the container, again applying a previously removed cap to the container and thereby maintaining it closed during its transfer to the capping station, and closing and sealing the filled container at the capping station.

2. The method of packaging a powdered material in impervious containers, which method comprises conveying a multiplicity of the containers in succession to a vacuumizing station, from the vacuumizing station to a filling station and from the filling station to a capping station, vacuumizing each container at the vacuumizing station and filling the vacuumizing container with an inert gas, placing a temporary cover cap loosely on the gas filled container at the vacuumizing station, removing the temporary cap from the container when it reaches the said filling station, filling the container with the powdered product at the filling station, replacing the temporary cap on the filled container at said filling station and maintaining the filled container closed by said cap during transit to the capping station, removing the temporary cap at the capping station, closing and sealing the container with a permanent cap at the capping station, and returning the temporary caps and placing them on succeeding containers as the latter are brought to the vacuumizing station.

3. Packaging apparatus comprising a horizontally traveling conveyor extending toward and beyond a filling station and by which containers with caps loosely seated thereon are carried to the filling station and after being filled at said station are conveyed away therefrom, means for removing the caps from the containers as they reach the filling station, said means including an upwardly and forwardly inclined magnetic plate, a conveyor belt running over said plate with the belt between the plate and the caps, said plate being in position to draw the loose covers off the containers as the latter are brought to the filling station, the conveyor being operable to carry the covers upwardly and forwardly to the upper end of said plate, and a forwardly and downwardly inclined chute positioned to receive the caps released from the inclined conveyor belt and guide them downwardly into position to be placed on the containers which have been filled at

said station and returned to the horizontal traveling conveyor.

4. Packaging apparatus comprising the combination of a horizontally traveling conveyor by which a multiplicity of containers carried on the conveyor and spaced at short intervals lengthwise thereof, are carried through a pluarlity of stations positioned and spaced apart along the conveyor, including a vacuumizing station, filling station and a capping station, a multiplicity of caps for closing the containers, means for vacuumizing the containers and filling them with an inert gas at the vacuumizing station, means at the filling station for filling the containers with a powdered product, means for applying said caps in succession to the containers entering the vacuumizing station, means at the vacuumizing station for lifting the caps and thereby opening the containers and maintaining them open during the vacuumizing and gas filling operation and thereafter returning the caps loosely to the containers, thereby closing the gas filled containers and maintaining them closed during their transit from the vacuumizing station to the filling station, means for lifting the caps from the containers as they enter the filling station, means for returning the caps to the containers and replacing them loosely thereon after the containers have been filled at the filling station and maintaining the caps on the containers during their transit from the filling station to the capping station, means at the capping station for removing the caps in succession from the containers, and means for returning the caps from the capping station to the vacuumizing station, whereby all of the caps

are carried repeatedly through a cycle for temporarily closing the containers and maintaining them closed during their travel between said stations, and in which each cap repeatedly closes a container during each cycle.

5. The combination set forth in claim 4, the means for returning the caps from the capping station to the vacuumizing station including an endless belt conveyor extending upwardly from the capping station, means for holding the caps to said endless conveyor, and an inclined chute extending from the said endless conveyor to the vacuumizing station through which the caps are guided and carried downward by gravity to the vacuumizing station.

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