

Nov. 16, 1954

H. A. BARNBY ET AL
VACUUM SEALING MACHINE

2,694,516

Filed June 1, 1951

3 Sheets-Sheet 1

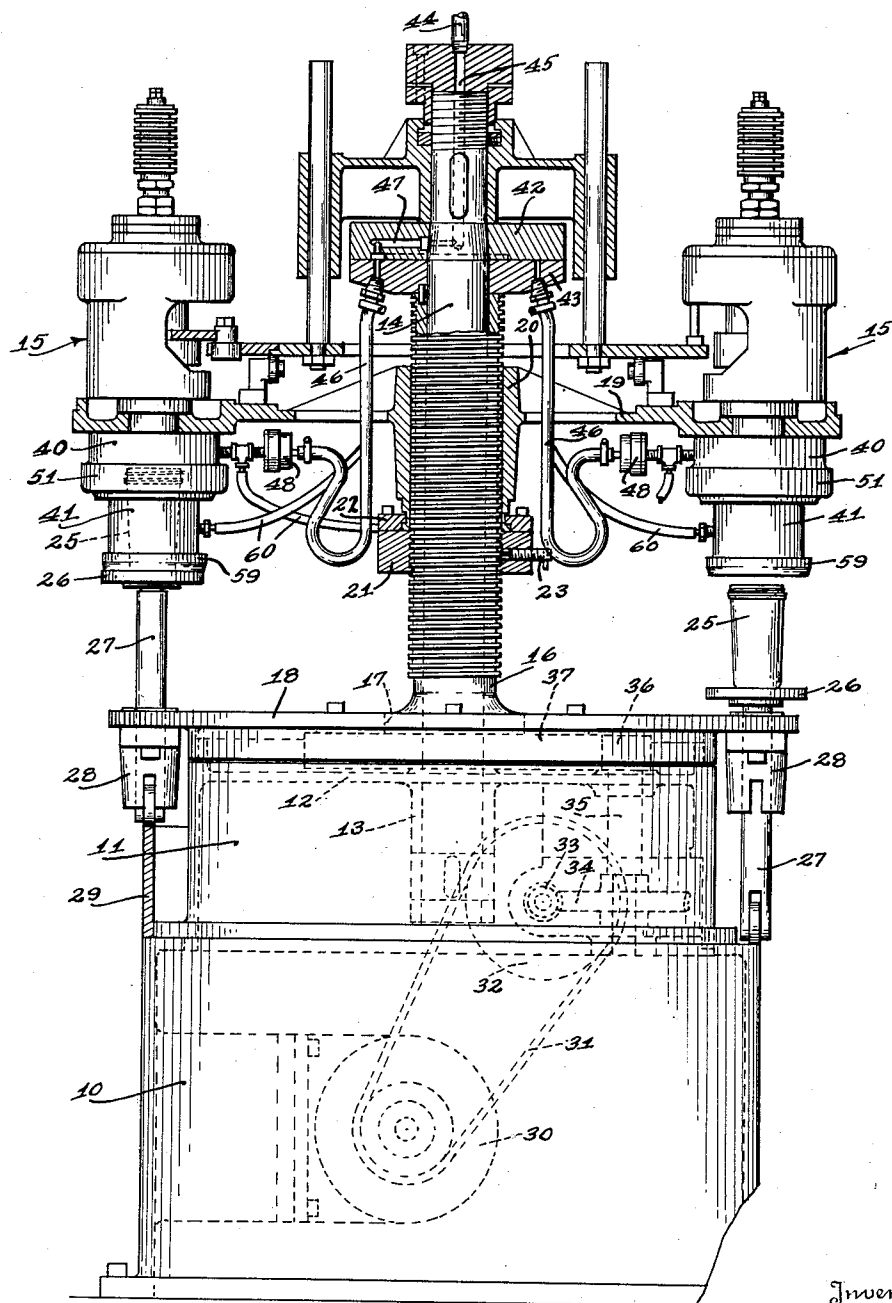


Fig. 1.

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3 Sheets-Sheet 2

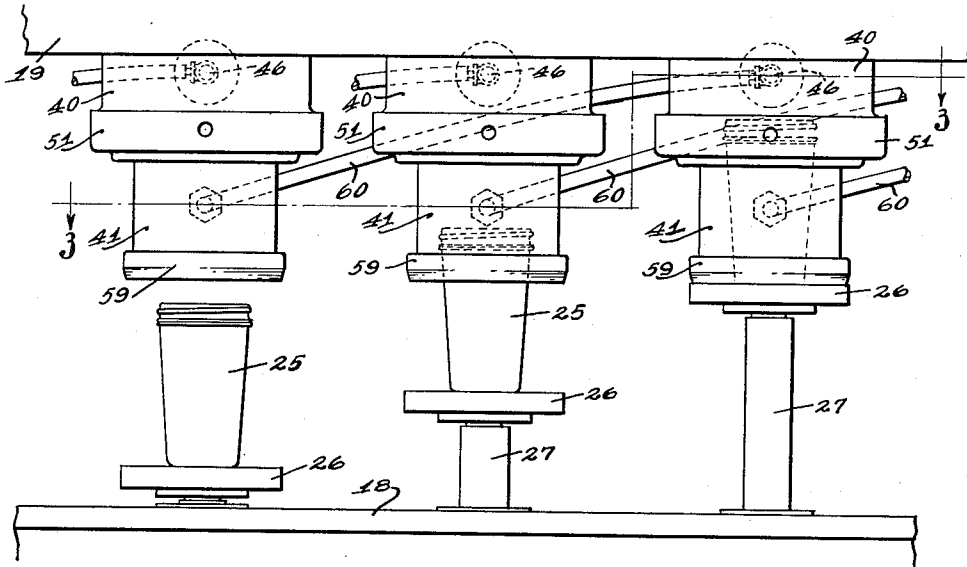


Fig. 2.

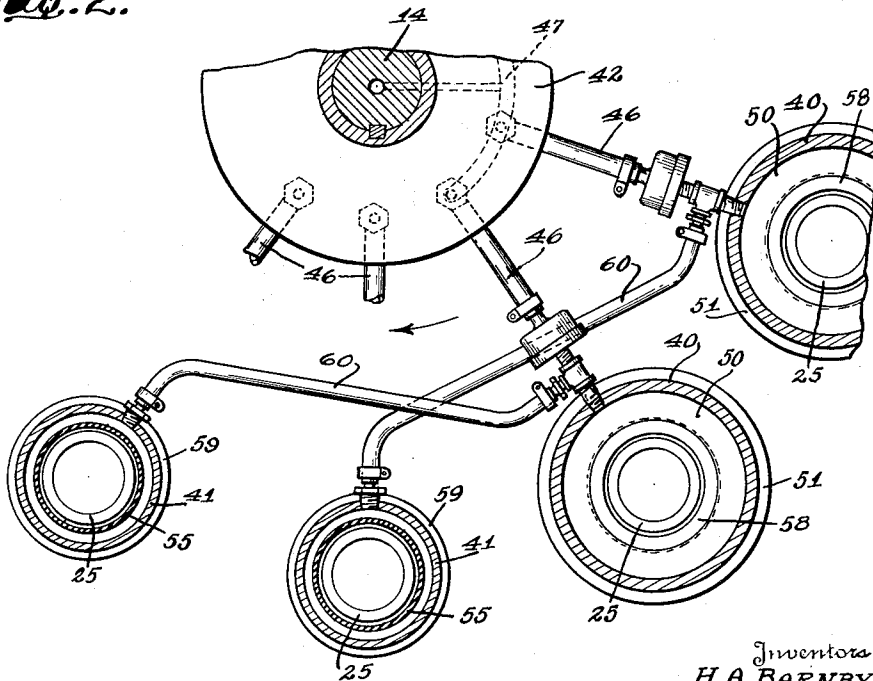


Fig. 3.

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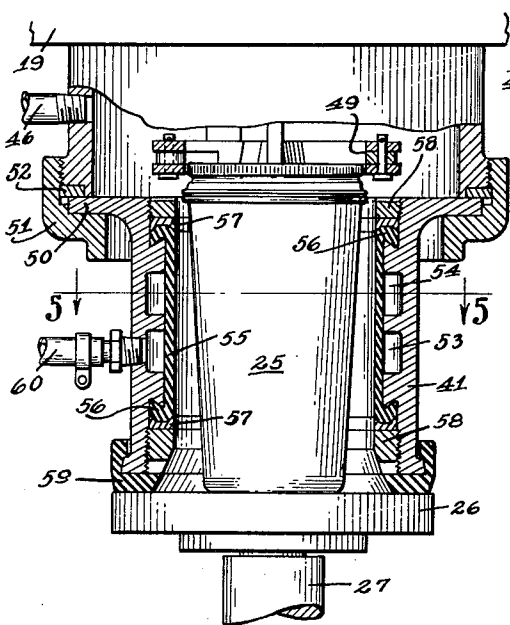


Fig. 4.

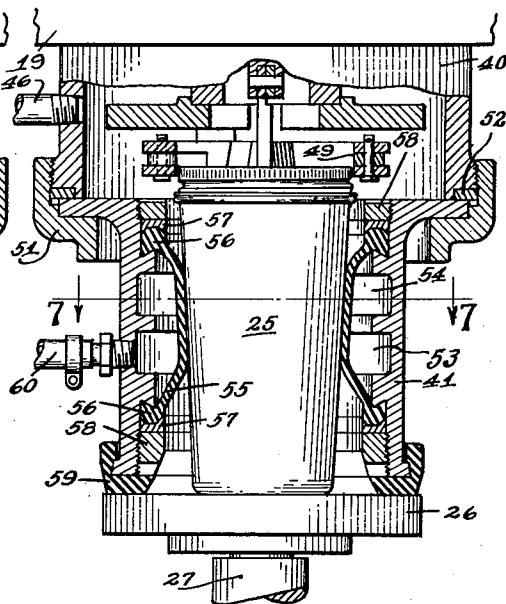


Fig. 6.

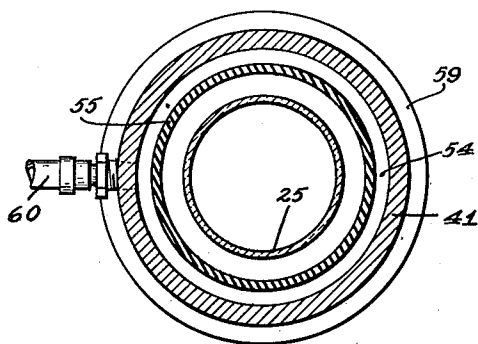


Fig. 5.

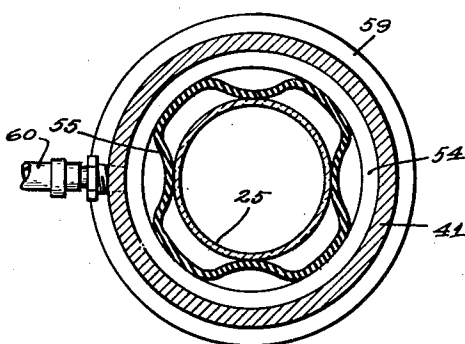


Fig. 7.

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2,694,516

VACUUM SEALING MACHINE

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15 Claims. (Cl. 226—82)

This invention relates to apparatus for vacuumizing and sealing containers. The invention relates particularly to novel means for gripping and centering the containers during vacuumizing and sealing.

Heretofore, considerable difficulty has been encountered in attempts to vacuumize and seal containers which have varying configurations, such as frusto-conical or other tumbler shapes. The apparatus, which is presently designed for use with containers having a shoulder below the open end of the container, utilizes the shoulder to seal a vacuum chamber which encloses the upper end of the container. Because of the sloping sides and absence of shoulders below the open end of the tumbler-shaped containers, it has been impossible to use such apparatus which operates only on the upper part of the container.

It has therefore been necessary to attempt to obtain a vacuum in the sealed container by other methods, for example, by injecting steam which condenses after sealing to create a vacuum. This method has a disadvantage in that it is entirely unsuited for certain products such as peanut butter and the like, and in addition does not create the degree of vacuum desired. Another method which has been attempted is to enclose the entire container in a vacuum chamber wherein it is vacuumized and sealed. This method causes numerous difficulties since no suitable mechanism has heretofore been provided to operate within the vacuum chamber for gripping and centering the container. The problem has been made even more complex where it is desired to apply screw-threaded caps to such containers.

It is an object of this invention to provide a simple and effective means for gripping and centering the containers in the vacuum chamber for subsequent vacuumizing and sealing.

Another object of the invention is to provide such a means which will operate to positively grip and positively release the containers.

Other objects of the invention will appear hereinafter.

Basically, the invention comprises a sleeve made of flexible, elastic, impervious material placed within the vacuum chamber and surrounding the container. When a vacuum is applied to the vacuum chamber, a pressure differential is created between either side of the sleeve causing the sleeve to flex inwardly and grip the container.

Referring to the accompanying drawings:

Fig. 1 is a part sectional elevational view of an apparatus embodying the invention;

Fig. 2 is a fragmentary elevational view showing the vacuumizing and sealing units;

Fig. 3 is a sectional view along the line 3—3 on Fig. 2;

Fig. 4 is a part sectional view of one of the vacuumizing and sealing units prior to vacuumizing;

Fig. 5 is a sectional view at the line 5—5 on Fig. 4;

Fig. 6 is a sectional view similar to Fig. 4, during the vacuumizing; and

Fig. 7 is a sectional view at the line 7—7 on Fig. 6.

The invention in its preferred form as herein described is embodied in a machine of the general type disclosed in the U. S. patent to Hohl et al., No. 2,338,852, January 11, 1944, Vacuum Sealing Machine, comprising a rotating carriage with an annular series of vacuumizing and sealing units mounted thereon, pedestals mounted on the carriage for supporting the containers with caps loosely applied thereto and movable up and down for moving the containers into and out of engagement with the vacuum heads. The present invention is particularly

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adapted for sealing glass containers of the type which have no shoulder in the portions below the neck and therefore cannot be sealed by apparatus which utilizes the shoulder to seal the vacuum chamber.

Referring to Fig. 1, the machine framework comprises a base in the form of a cylindrical housing including a lower section 10 and an upper section 11 of somewhat smaller diameter, bolted thereto. The section 11 includes a cover portion 12 for the housing, provided with a central hub 13 in which a center column or post 14 is supported, the post being journaled for limited rotative movement within the hub 13.

Vacuumizing and sealing units 15 are arranged in an annular series and supported on a carriage which is mounted for rotation about the center column 14. The carriage includes a tubular shaft 16 surrounding the column 14 and formed at its lower end with a flange 17 to which is bolted a platform 18. The carriage also includes an upper platform 19 formed with a hub 20 mounted for up and down adjustment on the tubular shaft 16. Means for supporting the platform 19 and for adjusting it up and down, comprises a bearing 21 having a screw-threaded mounting on the shaft 16 and connected to the hub 20 by a flanged collar 22. The latter prevents up or down movement of the platform 19 independently of the ring 21. A locking screw 23 secures the parts in adjusted position. The sealing units 15 are supported on the upper platform 19 and adjustable up and down to accommodate containers of different sizes.

Containers 25 are supported on pedestals, each comprising a supporting disc 26 attached to a vertical tubular stem 27 mounted for up and down movement in a sleeve 28 secured to the underside of the platform 18. The pedestals are arranged directly beneath and in vertical alignment with the sealing units 15.

The pedestals are supported on a stationary cam track 29 mounted on the machine base and surrounding the upper section 11 thereof. The cam shaft is shaped to lift the discs 26 into engagement with the units 15 thereby entirely enclosing the containers 25 for the vacuumizing and sealing operations and then lowering them to permit removal of the containers.

The carriage is rotated continuously by an electric motor 30 having a driving connection through a belt 31 and pulley 32, with a worm shaft 33, the latter having keyed thereto a worm which drives a worm wheel 34 keyed to a vertical shaft 35. A pinion 36 on the shaft 35 drives a ring gear 37 bolted to the flange 17 and thereby rotates the carriage.

Referring to Fig. 2, each of the vacuumizing and sealing units 15 includes a head 40 and a cylindrical housing 41 which surrounds the container. Each head 40 is connected to a distributor (Fig. 1) which controls the application of a vacuum to the heads. The distributor includes a member 42 in the form of a disc which is normally stationary, having a fixed mounting on the column 14, and a rotatable member 43 therebeneath. The latter is keyed to the tubular shaft 16 for rotation with the carriage. A vacuum pipe 44 connected to any suitable means for exhausting the air, opens into a passageway 45 extending through the column 14 to the distributor. Vacuum pipes 46 individual to the heads 15 are periodically opened to the vacuum line through ports 47 in the member 43. The pipes extend to air filters 48 and thence to the vacuum heads 40.

The apparatus for controlling the degree of vacuum is disclosed in detail in the aforementioned patent to Hohl et al., No. 2,338,852.

Each of the heads 40 also comprises a mechanism including gripping devices 49 (Figs. 4 and 6) for gripping the cap with a predetermined pressure and tightening the cap. This mechanism is also disclosed in detail in the aforementioned patent to Hohl et al.

Suitable mechanism is provided to remove the sealed containers from the apparatus.

This invention relates in particular to the novel construction of the cylindrical housing 41 of the vacuumizing and sealing units 15 which includes means for gripping and centering each container in position for vacuumizing and sealing.

Referring to Figs. 4 and 5, the cylindrical housing 41

which forms the lower portion of the vacuumizing and sealing unit 15 is formed with a top flange 50. The housing is fastened to the head 40 by a sealing ring 51. An airtight seal is insured by a gasket 52.

The housing 41 is formed on its interior surface with annular grooves 53 and 54. A cylindrical sleeve 55 made of flexible, elastic, impervious resilient material such as rubber or plastic is positioned in and makes sealing contact with the interior surface of the housing. The sleeve 55 is formed with annular ridges or lips 56 which lock into the interior of the housing. An airtight seal is insured by gaskets 57 and sealing rings 58.

A large gasket 59 is placed on the lower end of the housing to insure an airtight seal between the disc 26 and the housing 41 when the disc is elevated to contact the bottom of the housing (Figs. 4 and 6).

By the above construction, a means is provided to grasp and center the container in position to be vacuumized and sealed. As shown in Figs. 6 and 7, when the suction is applied to the unit 15, the air which is present in the annular grooves 53 and 54 expands and forces the sleeve 55 to flex inwardly and grip the sides of the container. The resiliency, flexibility and elasticity of the sleeve material permit the sleeve to adapt itself to the configuration of the container, herein shown as frusto-conical.

As shown in Fig. 7, the sleeve flexes inwardly at a multiplicity of equally spaced points to form equally spaced corrugations or nodules which contact and grip the container. The position and size of these nodules may be positively controlled by varying the thickness and consistency of the sleeve, but it should be understood that we have found that the sleeve operates in the manner described without any intentional variation in the thickness or consistency of the sleeve.

Referring to Fig. 3, means is provided to insure the immediate return of the sleeve 55 to its original form and position after vacuumizing and sealing. This includes a by-pass line 60 which connects the annular groove 53 to the vacuum line of the second following unit 15. By such an arrangement, the return of the sleeve 55 is insured since a vacuum is applied to the grooves simultaneously with the application of a vacuum to a unit which follows.

In addition, the by-pass line 60 serves as a means for supplying atmospheric pressure to the annular groove 53 when the second following unit is opened to the atmosphere.

The operation of the apparatus may be summarized as follows. As the carriage rotates, the discs 26 are successively elevated into sealing contact with the gaskets 59 on the bottom of the housing 41. After the contact is made, a vacuum is drawn. Simultaneously the container is gripped by flexing of the sleeve 55 and the gripping devices 49 tighten the cap. As the carriage continues its rotation, the vacuum is dissipated and at the same time a vacuum is applied to the other side of the sleeve 55, namely to the grooves 53 and 54 to insure the release of the container. The disc 26 is then lowered and the sealed container is removed.

The invention has been found to be particularly effective in vacuumizing and sealing containers having no shoulder below the neck such as a tumbler shape, e. g. frusto-conical, and which are sealed with screw caps.

The invention thus provides a simple and effective means for positively gripping the containers during the vacuumizing and sealing operations, and for positively releasing the containers after they are sealed.

Modifications may be resorted to within the spirit and scope of the appended claims.

We claim:

1. An apparatus for vacuumizing and sealing containers comprising a vacuum chamber, a cylindrical sleeve made of flexible impervious material positioned on the interior surface of the chamber, the configuration of the interior surface of the chamber being such that pockets are formed between the sleeve and the interior surface of the chamber, said sleeve being fastened at its extremities to said interior surface to form an airtight seal between opposite sides of the sleeve, means for supplying air under atmospheric pressure to the pockets formed between the sleeve and the interior surface of the chamber, means for sealing the vacuum chamber with a container enclosed therein, means for exhausting air from the vacuum chamber whereby the air in said pockets is caused to expand and force the sleeve to flex inwardly

to grip the container enclosed in the chamber, and means for sealing the container while it is being gripped in the chamber.

2. The apparatus set forth in claim 1, including means for reducing the pressure of air applied to said pockets in order to return the sleeve to its original configuration after the vacuum in the chamber has been dissipated.

3. An apparatus for vacuumizing and sealing containers comprising a vacuum chamber, a ring of impervious resilient material placed on the interior of said chamber to surround a container placed in said chamber, said ring being shaped to form a sealed pocket of air surrounding said container between the chamber and the ring, means for sealing the vacuum chamber and thereby enclosing the container placed in said chamber, means for exhausting the air in said chamber and thereby causing a pressure differential between the pocket and the interior of said chamber, the ring of resilient material being thereby caused to flex inwardly and grip the container, and means for sealing the container while it is being gripped.

4. The combination of a vacuum chamber for vacuumizing containers placed therein, said chamber being formed with an annular groove on the interior surface thereof, a sleeve made of impervious resilient material and positioned on the interior surface of the chamber, said sleeve being attached to the chamber in such a manner that it lies against the surfaces of said chamber adjacent to said groove and air is entrapped in the groove, means for sealing the vacuum chamber and thereby enclosing a container placed therein, means for exhausting air from the vacuum chamber whereby the air entrapped in the groove is caused to expand and force the sleeve inwardly to grip the container enclosed in the chamber.

5. An apparatus for vacuumizing and sealing containers comprising a vacuum chamber having a bottom opening, a pedestal spaced below said chamber and providing a support for an open-mounted container, means for moving the pedestal upward into sealing engagement with the bottom opening thereby enclosing a container placed thereon, said chamber being provided with annular grooves on the interior surface thereof, a sleeve made of impervious resilient material positioned on the interior of said vacuum chamber over said grooves, means for attaching said sleeve to said chamber thereby maintaining said sleeve in contact with the interior of said vacuum chamber and entrapping air in said grooves, means for exhausting air from the vacuum chamber when the pedestal is brought upward into sealing engagement with the bottom opening of the vacuum chamber whereby the air entrapped in the grooves is caused to expand and force the sleeve inwardly to grip the container, and means for sealing a cap to the container while said container is enclosed in the chamber and gripped by the sleeve.

6. The apparatus set forth in claim 5, including means for exhausting the air in the annular grooves after the vacuum in the chamber is dissipated, thereby causing a pressure differential forcing the sleeve to return to its original configuration and release the container.

7. An apparatus for vacuumizing and sealing containers, comprising a carriage mounted for rotation about a vertical axis, a downwardly opening vacuum chamber on the carriage, a support for a container, said support mounted for up and down movement on the carriage and positioned beneath the vacuum chamber, a stationary cam track, means providing operating connections between the cam track and said support for lifting the support as the carriage rotates into sealing engagement with the vacuum chamber thereby enclosing a container thereon, said vacuum chamber being provided with annular grooves on the interior surface thereof, a sleeve made of impervious resilient material and positioned on the interior surface of the vacuum chamber, means for attaching said sleeve to the chamber at points above and below the annular grooves in such a manner that air is entrapped in said grooves, means for exhausting air from the vacuum chamber when the support is lifted into sealing engagement with the vacuum chamber thereby causing the air entrapped in the annular grooves to expand and force the sleeve inwardly to grip the container.

8. The apparatus set forth in claim 7 including means for sealing each container while it is being subjected to a vacuum.

9. The apparatus set forth in claim 7 including means for exhausting the air in the annular grooves after the vacuum in the chamber is dissipated, thereby causing the sleeve to return to its original configuration and release the container.

10. Apparatus for vacuumizing and sealing containers, comprising a vacuum chamber having rigid walls, a gripping device in the form of a sleeve fitted within the said chamber, said sleeve and container walls being shaped to provide an air pocket therebetween, means for sealing the ends of the sleeve to said walls, means for introducing an open container into said vacuum chamber, means for sealing the vacuum chamber with a container enclosed therein, means for exhausting air from the chamber and thereby vacuumizing the container and simultaneously causing a pneumatic pressure differential on opposite surfaces of said sleeve, said sleeve comprising elastic material deformable by said pressure differential and thereby movable into gripping engagement with the container, and means for sealing the container while gripped by said sleeve.

11. The apparatus defined in claim 10, said apparatus including means for dissipating the pressure within the vacuum chamber after the sealing operation, and means for exhausting air from said pocket and thereby reversing the pressure differential on the inner and outer surfaces of said sleeve.

12. An apparatus for vacuumizing and sealing containers comprising a vacuum chamber, means placed within said chamber and cooperating therewith to form an annular sealed pocket of air surrounding a container placed in said chamber, said means comprising flexible resilient walls, means for sealing the vacuum chamber with a container enclosed therein, means for exhausting the air in said chamber and thereby causing a pressure differential between the pocket and the interior of the chamber sufficient to cause the resilient walls to flex inwardly and grip the container, and means for sealing the container while it is being gripped.

13. An apparatus for vacuumizing and sealing containers comprising a vacuum chamber having a bottom opening, a pedestal spaced below said chamber and providing a support for an open mouth container, means for causing relative movement between said chamber and pedestal by which the pedestal is brought into sealing engagement with the bottom opening and thereby enclosing a container placed on the pedestal, said chamber being provided with annular grooves on the interior surface thereof, a sleeve made of impervious resilient material positioned on the interior of said vacuum chamber over said grooves, means for attaching said sleeve to the chamber walls in position to maintain said sleeve in contact with the interior wall surface of the chamber and entrap air in said grooves, means for exhausting air from the vacuum chamber when the pedestal is brought into sealing engagement with the bottom opening of the vacuum chamber whereby the air entrapped in the grooves is caused to expand and force the sleeve inward-

ly to grip the container, and means for sealing a cap to the container while said container is in the chamber.

14. An apparatus for vacuumizing and sealing containers comprising a carriage mounted for rotation about a vertical axis, a downwardly opening vacuum chamber on the carriage, a support for a container, said support and carriage mounted for relative up and down movement for making sealing engagement between the support and vacuum chamber and enclosing a container within the chamber, said vacuum chamber being provided with annular grooves on the interior wall surface thereof, a sleeve made of impervious resilient material and positioned to overlie the interior wall surface of the vacuum chamber, means for attaching said sleeve to the chamber at points above and below the annular grooves in such a manner that air is entrapped in said grooves, means for exhausting air from the vacuum chamber when the pedestal is brought into sealing engagement with the bottom opening of the vacuum chamber and thereby causing the air entrapped in the annular grooves to expand and force the sleeve inwardly to grip the container.

15. An apparatus for vacuumizing and sealing containers comprising a carriage mounted for rotation about a vertical axis, a downwardly opening vacuum chamber on the carriage, a support for a container, said support and carriage mounted for relative up and down movement for making sealing engagement between the support and vacuum chamber and enclosing a container within said chamber, a cylindrical sleeve of flexible impervious material positioned to overlie the interior wall surface of the chamber, the configuration of the said surface being such that pockets are formed between the sleeve and said surface, said sleeve being fastened at its extremities to said interior surface and forming an airtight seal between opposite sides of the sleeve, means for supplying air under atmospheric pressure to the pockets formed between the sleeve and the interior surface of the chamber, means for exhausting air from the vacuum chamber when the pedestal is brought into sealing engagement with the bottom opening of the vacuum chamber whereby air entrapped in said pockets is caused to expand and force the sleeve to flex inwardly and grip the container placed in the chamber, and means for sealing the container while it is gripped in the chamber.

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