Sept. 12, 1967 K. BOFINGER 3,340,668

APPARATUS FOR AND METHOD OF HERMETICALLY SEALING A PACKAGE

Filed Sept. 28, 1964 3 Sheets-Sheet 1

FIG. 2

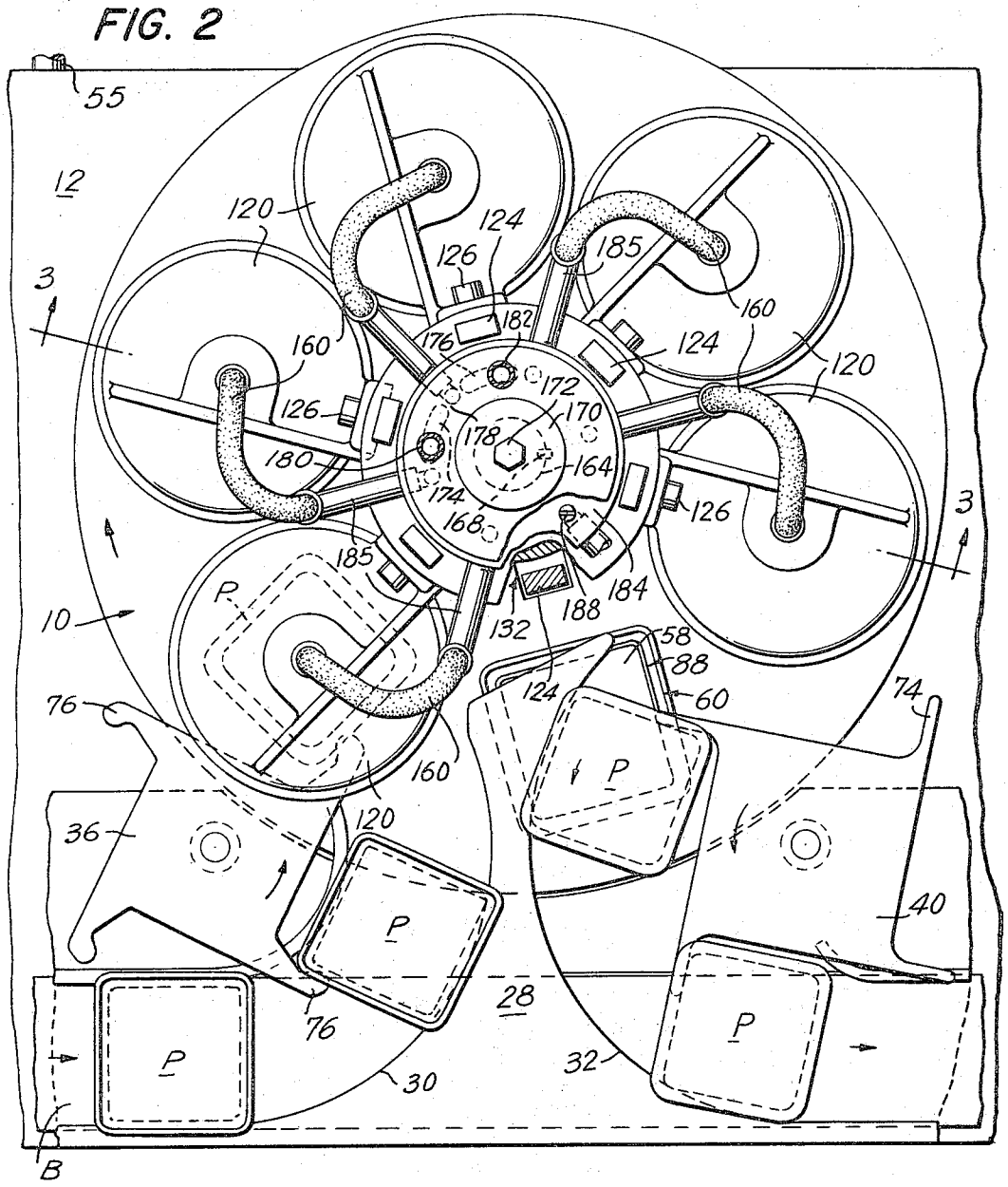
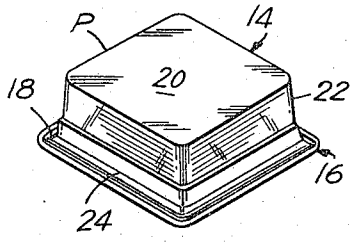


FIG. 1



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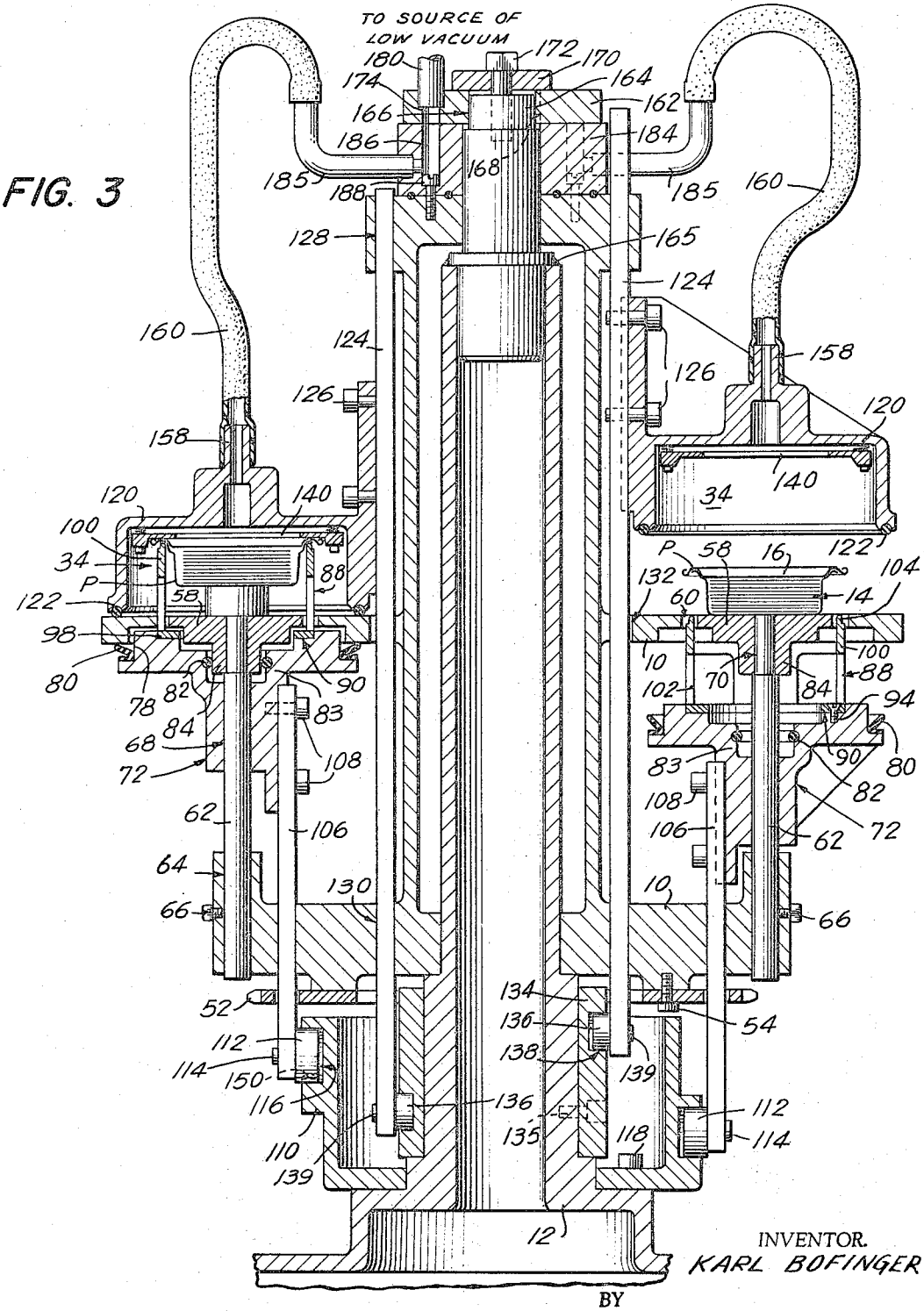
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APPARATUS FOR AND METHOD OF HERMETICALLY SEALING A PACKAGE

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FIG. 3



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FIG. 4

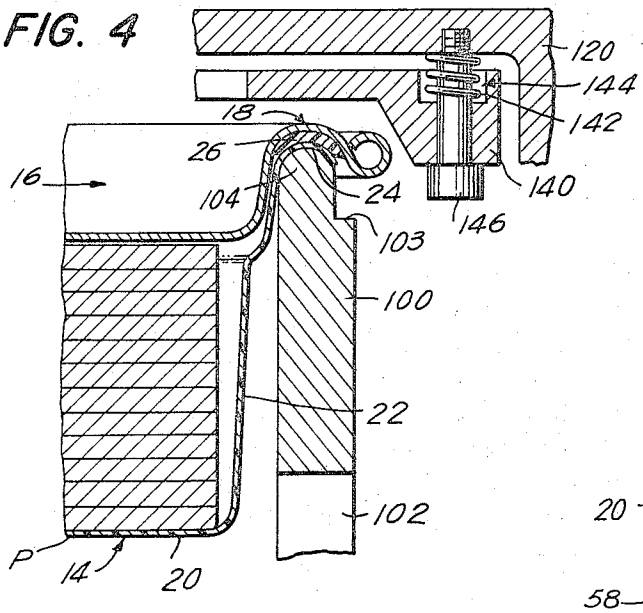


FIG. 6

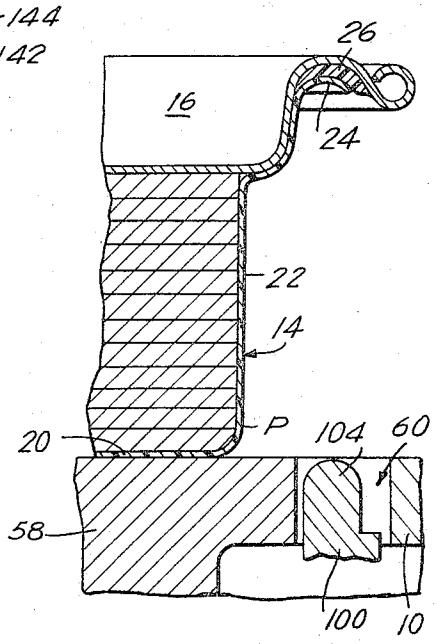


FIG. 5

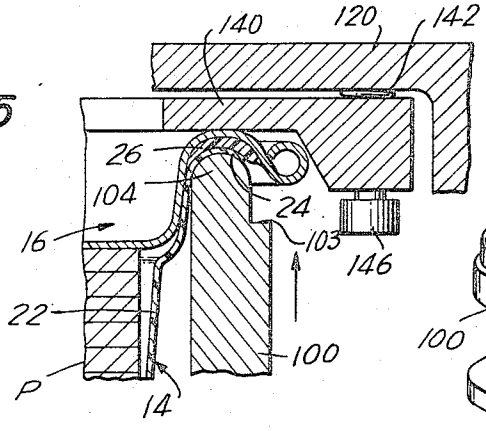


FIG. 7

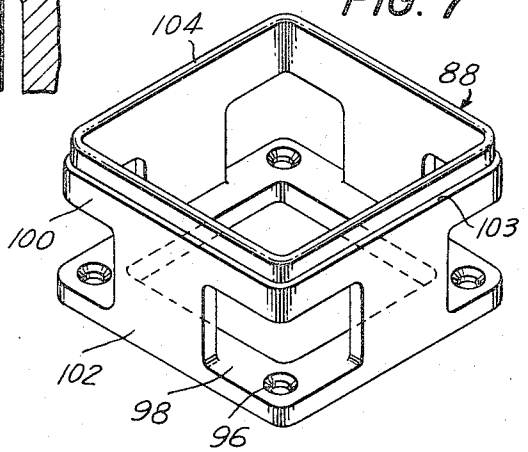
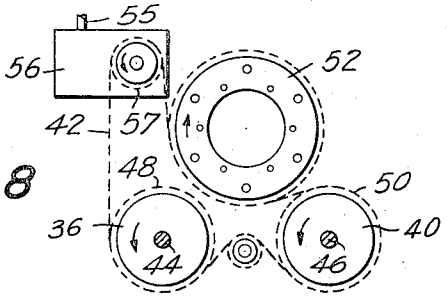


FIG. 8



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United States Patent Office 3,340,668 Patented Sept. 12, 1967

3,340,668

APPARATUS FOR AND METHOD OF HERMETICALLY SEALING A PACKAGE

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Filed Sept. 28, 1964, Ser. No. 399,554
20 Claims. (Cl. 53—22)

The present invention relates to a method of and apparatus for sealing packages. It has particular reference to a vacuum-forming and a closing operation for hermetically sealing a flexible plastic cover to a rigid-like metallic base by subjecting the base and cover to vacuumized conditions and forcing the cover and base into frictional engagement, whereby the package is maintained in a sealed disposition largely by atmospheric pressure.

While methods and apparatus for vacuumizing and closing containers are well known, such methods and apparatus are incapable of vacuumizing and closing a package which comprises a rigid-like base and a plastic cover maintained in an hermetically sealed disposition with said base by atmospheric pressure. An example of such a container is illustrated in U.S. Patent No. 3,087,823. This package comprises a rectangular base and a rectangular plastic cover. The periphery of the rectangular cover is recessed and sealing compound is positioned within the recess to provide an hermetic seal between the plastic cover and the metallic base when the periphery of the cover is forced into the sealing compound.

The employment of known methods and apparatus for closing and sealing containers is, from a practical or commercial standpoint, limited to containers which are closed by heat sealing, conventional single or double seaming operations or threaded connections located between a container body and a cover therefor. Containers closed in this manner do not present, during the closing and sealing operations, the problems presented by a container which is closed by forcing the package elements into frictional engagement under a vacuumized condition. The package is thereafter maintained in an hermetically sealed disposition by atmospheric pressure.

It is therefore an object of the present invention to provide a method of sealing a container which is maintained in a sealed condition largely by atmospheric pressure.

Another object is to provide a method of closing a container by forcing the cover and base elements of a container together to form a frictional engagement therebetween while the elements are maintained under vacuum.

Yet another object is to provide an apparatus for effecting the closing steps of the instant invention.

An additional object is to provide a container closing machine in which a package is readily closed and vacuumized in an efficient manner.

A further object is to provide a container-closing machine which feeds packages to be closed therein gently and without disturbing the desired arrangement of the package elements.

Numerous other objects and advantages of the instant invention will be apparent as it is better understood from the following description which, taken in conjunction with the accompanying drawings, discloses a preferred embodiment thereof.

The above objects are accomplished by locating a plastic cover, in an inverted position, on a moving belt, filling the plastic cover with a suitable product, closing the open end of the cover with a sealing compound-lined metal base, directing the package to a rotary turret table, forming a vacuum chamber by positioning reciprocated sealing members against the upper and lower surfaces of the turret table, subjecting the vacuum chamber to low and high vacuum sources, forcing the cover and base into frictional engagement to form an hermetic seal while the package is subjected to the higher vacuum source and removing the package from the vacuum chamber after breaking the vacuum, whereby the atmospheric pressure acting on the cover and base in cooperation with the sealing compound maintains the package in an hermetically sealed disposition.

Referring to the drawings:

FIG. 1 is a perspective view of the hermetically sealed container after its discharge from the packaging machine;

FIG. 2 is a plan view of the packaging machine;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary sectional view of the package, the sealing head and the package support member, illustrating the package before it is closed and hermetically sealed;

FIG. 5 is a fragmentary sectional view of the package, the sealing head and the package support element, illustrating the package in its closed and hermetically sealed condition;

FIG. 6 is a fragmentary sectional view of the turret table, the blister support member and the package, illustrating the positions of the plastic cover and the cover support member after the package has been removed from the vacuum chamber;

FIG. 7 is a perspective view of the package support member; and

FIG. 8 is a schematic driving diagram for the turret table and the wheels which supply and remove the package from the turret table.

As a preferred or exemplary embodiment of the instant invention, the drawings illustrate a conveyor belt B which supplies packages P to a turret table **10**. The turret table is supported on a stationary support frame **12**. The conveyor belt B may be supported and driven by any well-known means (not shown). The package P comprises a plastic cover **14** and a substantially rigid rectangular base **16** within which a peripheral recess **18** is formed. The cover **14** comprises a flat rectangular panel **20** and a depending wall **22**. The lower extremity of the depending wall **22** is provided with a peripheral flange **24** which, when the package is closed, contacts a sealing compound **26** located within the peripheral recess **18** of the metallic base **16**.

To facilitate the filling of the subject packages, the plastic covers **14** are placed, in spaced relation, on the belt B in an inverted position, i.e. with the panel **20** contacting the belt. As the inverted plastic covers **14** approach the turret table **10**, the plastic covers are partially filled with a product either by hand or by an appropriate filling machine. The peripheral recess **18** of the metallic base **16** is lined with suitable sealing compound **26**, after which the base is loosely placed over the peripheral flange **24** of the plastic cover **14**.

The packages P are directed to and from the turret table **10** by a guide plate **28** which contacts the depending wall **22** and extends across the belt B and terminates along the inner surface of the turret table **10**. Any suitable support means (not shown) may be employed to maintain the guide plate **28** in the illustrated position. The guide plate **28** is provided with curved surfaces **30** and **32**, which extend vertically a distance slightly less than the height of the depending wall **22** of the plastic cover **14**. This relationship prevents contact between the curved surface **30** and the metallic base **16** and thereby insures the proper location of the base **16** relative to the plastic cover **14** as each package is directed onto the turret table **10**.

The turret table **10** and reciprocated sealing members, described in detail hereinafter, cooperate to form six

vacuum chambers 34 which receive the packages P from the belt B, via the guide plate 28 and a feed wheel 36. The rotation of the feed wheel 36 and the rotation of the turret table 10 is timed to insure the arrival of the package P as the vacuum-forming members pass the feed wheel 36. In order to discharge the sealed packages P from the turret table 10 as the packages are forced along the curved surface 32, a discharge wheel 40 is positioned between the turret table and the belt B and also rotated in timed relation with the turret table. Such timing is insured by driving the turret table 10, the feed wheel 36 and the discharge wheel 40 with a common chain 42 (FIG. 8) via suitable sprockets. The feed wheel 36 and the discharge wheel 40 are respectively attached to shafts 44 and 46 in any well-known manner. A sprocket wheel 48 is attached to the shaft 44 and a sprocket wheel 50 is attached to shaft 46. The turret table 10 is driven by a sprocket wheel 52 (FIG. 3) attached to the bottom of the turret by screws 54. A drive shaft 55 supplies power to a transmission 56 which drives the chain 42 via an output sprocket 57. The ratio of the diameter of the turret sprocket 52 to the diameter of either the sprockets 48 or 50 is 1.5:1.

The packages P are supported within the periphery of the turret table 10, in annular relation, by six rectangular support discs 58 located within rectangular apertures 60. Each rectangular support disc 58 is adjustably supported within the aperture 60 by a vertical shaft 62. The lower end of the shaft 62 is positioned within an aperture 64 located at the base of the turret and adjustably secured therewithin by set screws 66. The shaft 62 extends through an aperture 68 located within a support platform generally designated 72, described in detail hereinafter, and terminates within an aperture 70 located at the center of the support disc 58. The upper end of the vertical shaft 62 is attached to the support disc 58 by any suitable means (not shown).

As each sealed package P approaches, for discharge, the leading edge of the curved surface 32, it is partially removed from the support disc 58 by the curved surface, whereupon, a radially extending finger 74 of the discharge wheel 40 contacts the trailing portion of the depending wall 22 and discharges the sealed package P from the turret table 10. One of the fingers 76 of the feed wheel 36 similarly cooperates with the curved surface 30 to force an unsealed package onto the vacated support disc 58.

As previously stated, the preferred embodiment of the packaging machine is provided with six vacuum chambers 34 to effect an hermetic sealing of the instant packages P. The following-described packaging machine is limited to one of such vacuum chambers. However, it is understood that each vacuum chamber is constructed and operated in the manner described hereinafter and that the number of vacuum chambers may be varied. The bottom of the turret table 10 is sealed to close the vacuum chamber 34 by sealing rings attached to the reciprocating support platform 72. The periphery of the support platform 72 is provided with an annular recess 78 within which a sealing ring 80 is attached in any suitable manner. A second seal 82 is carried within an annular recess 84 formed within a cylindrical wall 83 of the support platform 72. The seal 82 cooperates with a cylindrical neck 84 of the support panel 58 to form an airtight seal therebetween. When the support platform 72 is reciprocated upwardly to an extended position, the sealing ring 80 is positioned against the lower surface of the turret table 10 and the sealing ring 82 is simultaneously positioned along the cylindrical neck 84, whereby two concurrent airtight seals are maintained below the turret table 10 when the vacuum chamber 34 is successively communicated with two vacuum sources, as will be more fully explained hereinafter.

As the support platform 72 is reciprocated to its extended position, the plastic cover 14 and the metallic base 16 are elevated from the support disc 58 to a sealing position by a package support member generally designated 88. The support member 88 is positioned within an annular recess 90 of the support platform 72 and attached therewithin by screws 94 which project through apertures 96 located within a rectangular base 98 of the support member. As shown in FIG. 7, the support member 88 also comprises an imperforate vertical extending wall 100 and four connecting walls 102 formed integrally with the rectangular base 98 and the wall 100. The vertical wall 100 is located along the periphery of the support disc 58. The upper periphery of the vertical wall 100 is recessed to form an inwardly extending shoulder 103, thereby allowing the remaining portion of the vertical wall to be disposed within the flange 24 of the plastic cover. To provide maximum contact along the flange 24, and therefore a maximum sealing area, the upper end of the vertical wall 100 is curved at 104.

The support platform 72 and a cover support member 88 are moved from a retracted position (right side of FIG. 3) to an extended or actuated position (left side of FIG. 3) by push rods 106 which are attached to the support platforms 72 by bolts 108. The push rods 106 are actuated by an annular cam groove 116 in the peripheral surface of stationary ring 110 which effects the desired movement of the support platform via a cam roller 112 secured to the lower end of the push rod 106 by a pin 114. The ring 110 is provided with an integral base through which suitable bolts 118 extend to secure the ring to the support frame 12.

To form an airtight vacuum chamber 34, the inner surface of the turret table 10 is also periodically sealed, above the support platform 72, by a reciprocating bell-shaped sealing head 120. To effect such a seal, the open end of the sealing head 120 is recessed and an O-ring 122 is attached therewithin. To effect reciprocation of the sealing head 120, a push rod 124 is attached to the sealing head by bolts 126. The turret is provided with apertures 128 and 130, through which the push rods 124 extend to provide support for the push rods. An enlarged aperture 132 is formed in the turret table to allow the push rods 124 to extend therethrough without contact. A stationary member 134 is secured to the support frame 12 by bolts 135 to provide the desired movement of the sealing head 120. An annular cam groove or surface 138 is provided within the periphery of the member 134. A cam roller 136, positioned within the cam surface 138, provides reciprocation of the push rods 124 and is connected to the lower end of the push rod by a pin 139.

From the above description, it will be noted that the turret table 10, the sealing head 120 and the support platform 72 co-act to form an airtight vacuum chamber 34. The packages P are supported within the vacuum chambers 34 by the support disc 58 which is located parallel to the upper surface of the turret table 10. This construction allows the loosely supported base 16 and the cover 14 to be placed on the turret table 10 and removed therefrom without excessive movement. Additionally, the vertical wall 100 of the package support member 88 automatically positions the cover 14 since the vertical wall 100 is larger than the depending wall 22 of the cover. As the vertical wall 100 is displaced upwardly to position the package in the sealing position, the vertical wall 100 slides along the depending wall 22 and properly positions the package before it is lifted from the support disc 58.

As previously discussed, the package P is moved from the support disc 58 to a sealing position, within the sealing head 120, by the vertical wall 100 of the package support member 88. During this movement, the sealing head 120 is also moved to form an airtight seal above the turret table 10. The sealed vacuum chamber 34 formed by these movements communicates with low and high vacuum sources, as will be explained hereinafter. Package P is moved from the support disc 58 to a position approximately $\frac{3}{16}$ in. below a pressure plate 140 (FIGS. 4

and 5) biased away from the inside, upper surface of the sealing head **120** by a plurality of springs **142** located within recesses **144** found within the upper surface of the plate **140** and retained therein by bolts **146**. This arrangement permits vacuumizing the package P. After the package P has been carried in this position through the low and high vacuums, the package support **88** moves up an additional ¼ in. so that the metal base **16**, gasketing compound **26** and flange **24** are tightly compressed by the springs **142** under the plate **140**, thereby displacing the compound **26** to form an hermetic seal. To effect the additional ¼ in. upward movement of the support **88**, the ring **110** is provided on its lower surface with a bump or raised portion **150** indicated in dotted lines in FIG. 3. The bump **150** is located about 75° toward the back of the view shown in FIG. 3, just before the sealing head **120** moves out of communication with the high vacuum source.

The upper end of the sealing head **120** also includes an apertured cylindrical neck **158** to which a hose **160** is attached to communicate two vacuum sources with the vacuum chamber **34**. To provide two vacuum sources during the closing and sealing of the package P, the vacuum chamber **34** is successively subjected to low and high sources as the turret table **10** is rotated. In order to supply such vacuums, a stationary valve plate **162** is attached to the upper end of the support frame **12**. The valve plate **162** is fixedly mounted on a shaft **164** which extends through the stationary valve plate, a rotary valve plate, described hereinafter, and the turret. The shaft **164** terminates in the upper hollow extremity of the support frame **12**. The shaft **164** is attached to the frame **12** by a weld **165**. The upper periphery of the shaft **164** is provided with an annular recess **166** and a slot within which a key **168** is inserted. The key **168** also extends in a slot formed within the valve plate **162**. A bolt **172**, attached to the upper end of the shaft **164**, forces a washer **170** against the stationary valve plate **162** to provide adjustment of the stationary valve plate relative to the rotary valve.

The stationary valve plate **162** is provided with two spaced arcuate chambers **174** and **176** located on opposite sides of a land **178**. A low vacuum source is supplied to the arcuate chamber **174** by a pipe **180** and a similar pipe **182** supplies a high vacuum source to the arcuate chamber **176**. A rotary valve plate **184**, located immediately below the stationary valve plate **162**, is provided with an L-shaped passage **186** which communicates successively with the spaced arcuate chambers **174**, the land **178** and the arcuate chamber **176** during rotation of the rotary valve plate. The rotary valve plate **184** is attached to the upper end of the turret by screws **188**.

The above-described valve construction provides the L-shaped passages **186** with a low vacuum as the L-shaped passages communicate with the arcuate chamber **174**. Immediately thereafter the L-shaped passage **186** passes under the land **178**, thereby blocking communication between the vacuum chamber **34** and the arcuate chamber **174**. As the L-shaped passage **186** moves beyond the land **178**, communication between the L-shaped passage and a high vacuum source is established by arcuate chamber **176**.

These vacuum sources are transmitted from the L-shaped passage to the vacuum chamber **34** by a pipe **185**, positioned within and suitably attached within the L-shaped passages, and the flexible hose **160**. From the above description, it is obvious that while the package P is supported within the sealed vacuum chamber **34** by the package support member **88**, the vacuum chamber is successively placed in communication with a low vacuum source **174**, a land **178** and a high vacuum source **176**. This operation insures, in an efficient manner, a high vacuum within the vacuum chamber **34** when the package is ultimately forced closed and an hermetic seal is simultaneously effected.

The above-described apparatus effects an hermetic sealing of the packages P in the following manner. The belt B is driven at a linear velocity of 75 feet per minute and the turret table is rotated approximately at 16⅔ revolutions per minute for an output of 100 packages per minute. The plastic covers **14** are located on the moving belt B in inverted spaced relationship and partially filled with a food product such as sliced cheese or bologna. The peripheral annular recess **18** of the metal base **16** is filled with the sealing compound **26**, after which the metal base is loosely placed over the periphery of the plastic cover **14**. The feed wheel **36**, rotated in timed relationship with the belt B and the turret table **10**, contacts the trailing portion of the plastic cover **14** and forces the plastic cover along guide surface **30** to thereby locate the plastic cover on the support disc **58** located within the periphery of the turret table **10**. While the turret table **10** is rotated approximately 60 degrees, the support platform **72** and the sealing head **120** are reciprocated to a sealed position to form an air tight vacuum chamber **34**. During this reciprocation, the package **P** is lifted from the support disc **58** to a sealing position by a package support member **88**, carried by the support platform. The package support member **88** including the vertical wall **100** contacts the peripheral flange **24** of the plastic cover **14** to lift the package from the support disc **58**.

While the support platform **72** and the sealing head **120** are maintained in sealing engagement with the turret table **10**, the vacuum chamber **34** is subjected to a low vacuum source of 25" of Hg as the L-shaped passage **186** of the rotary valve **184** passes under the arcuate chamber **174** formed by the stationary valve **162**. The package P is partially vacuumized by the low vacuum as the turret table **10** is rotated for approximately 48 degrees, whereupon communication between the low vacuum source and the vacuum chamber **34** is broken as the L-shaped passage **186** communicates with the land **178** formed on the lower surface of the stationary valve **162** for 10 degrees. The vacuum chamber **34** is then subjected to a high vacuum source of 28" of Hg for approximately 48° as the L-shaped passage **186** communicates with the port **176**. While the vacuum chamber **34** is subjected to the high vacuum source, the package P is completely vacuumized.

Immediately before communication between the L-shaped passage **186** and the arcuate passage **176** is broken, the package support **88** is moved up to the final position where the springs on the plate **140** are compressed and thereby displace the sealing compound **26** between the base **16** and the cover flange **24** to form a hermetic seal.

After sealing the package the vacuum is broken and the sealing head **120** and the support platform **72** are retracted in opposite directions as the turret table is further rotated to allow the hermetically sealed package P to be withdrawn from the turret table **10**. During this rotation, the vertical wall **100** is displaced below the upper surface of the turret table **10** to allow the curved surface **32** of guide plate **28** to sweep the hermetically sealed package from the support disc **58**. The discharge wheel forces the hermetically sealed package along the curved surface **32** and discharges the package on the moving belt B.

After breaking the vacuum, atmospheric pressure acting on the periphery of the wall **22** forces the wall against the metallic base **16** and against the product contained within the cover **14**. As illustrated in FIG. 6, the force exerted by the atmospheric pressure and the sealing compound **26** co-act to form an hermetically sealed package.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the steps of the method described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing the material advantages, the method and apparatus hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A method of sealing a package comprising the steps of:
placing a first and second package element on a table in superimposed relation;
forming an air-tight vacuum chamber for said package elements of two relatively movable sealing members located on opposite sides of said table;
communicating a vacuum source to said chamber;
forcing said container package elements into sealing engagement by one of said relatively movable sealing members while said vacuum chamber is in communication with said vacuum source; and
removing said package from said vacuum chamber after discontinuing said vacuum.

2. The method of sealing a package as set forth in claim 1 wherein said chamber is placed in communication with two sources of vacuum of increasing intensity and said package is sealed while said chamber is in communication with the higher vacuum source.

3. The method of sealing a package as set forth in claim 2 wherein the first package element is supported within the vacuum chamber and the second package element is moved upwardly to seal the package.

4. A method of sealing a package comprising the steps of:
placing a container base and cover therefor on a rotary table in superposed relation;
forming an air-tight vacuum chamber for said base and cover by two movable sealing members located on opposite sides of said rotary table;
communicating at least one vacuum source to said chamber;
forcing said container base and cover into sealing engagement by one of said movable sealing members while said vacuum chamber is in communication with said vacuum source; and
removing said package from said vacuum chamber after discontinuing said vacuum.

5. The method as set forth in claim 4 wherein said vacuum chamber is successively communicated with low and high vacuum sources and said package is sealed while the chamber is in communication with said high vacuum source.

6. A packaging machine for vacuumizing and closing a package comprising:
a turret table;
a feed mechanism for supply package elements to said turret table;
first and second sealing elements located on opposite sides of said turret table, movable toward one another to provide a vacuum chamber for said package elements;
means for communicating at least one vacuum source with said vacuum chamber; and
actuation means operatively connected with said sealing elements for effecting relative movement between said package elements while said vacuum chamber is under vacuumized conditions whereby the package elements are forced into frictional engagement to close and seal said package.

7. A packaging machine as set forth in claim 6 wherein said first sealing element includes a package element support member to elevate one of said package elements into said frictional engagement with said other package element.

8. A packaging machine as set forth in claim 7 wherein said support member is elevated by a cam.

9. A packaging machine as set forth in claim 8 wherein said second sealing element is located above the turret table and includes a spring-biased plate to force said package elements into said frictional engagement.

10. A packaging machine as set forth in claim 6 wherein two vacuum sources of increasing intensity are successively communicated with said vacuum chamber by valve means and by conduits located between said valve means and said second sealing element.

11. A packaging machine as set forth in claim 10 wherein said relative movement occurs while said vacuum chamber is communicated with the higher vacuum source.

12. A packaging machine as set forth in claim 10 wherein said valve means comprises an apertured rotary valve and a stationary valve plate having slots communicating with apertures in said rotary valve.

13. A packaging machine as set forth in claim 10 wherein stationary cams effect reciprocating movement of said sealing elements.

14. In a rotary packaging machine having a turret table on which a plastic cover and a rigid base are placed in superposed relation comprising in combination:
at least one support disc located within a recess of the turret table and adapted to receive said plastic cover;
first and second sealing members located on opposite sides of said turret table reciprocally movable to provide a seal radially outwardly of the support disc during a portion of the turret table rotation;
actuation means operatively connected to said sealing members to provide said reciprocation of the sealing members into engagement with said table to form a vacuum chamber;
vacuum-forming means for communicating a vacuum to said vacuum chamber; and
means for forcing the plastic cover into frictional engagement with the rigid base when the vacuum chamber is communicated with the vacuum source.

15. A rotary packaging machine as set forth in claim 13 wherein the plastic cover and the rigid base are elevated from the support disc to a closing position within said vacuum chamber by a vertical wall supported by said first sealing member.

16. A rotary packaging machine as set forth in claim 14 wherein said plastic cover and said rigid base are closed by means contacting said first sealing member, whereby a peripheral recess of said rigid base is forced into frictional engagement with the periphery of the plastic container.

17. A rotary packaging machine as set forth in claim 15 wherein the vertical wall is positioned below the upper surface of the turret table by a stationary cam as the plastic cover and the base are supplied to and discharged from the support disc.

18. A rotary packaging machine as set forth in claim 17 wherein the vertical wall is positioned between the periphery of the support disc and an aperture in the turret table.

19. A rotary packaging machine as set forth in claim 18 wherein the support disc is supported by the turret table and the upper surface of the support disc is positioned parallel with the upper surface of the turret table.

20. A rotary packaging machine as set forth in claim 19 including a guide plate for directing packages to and from the support disc.

References Cited

UNITED STATES PATENTS

789,699	5/1905	Lorenz	53—108
2,227,190	12/1940	Kronquest	53—112
2,684,777	7/1954	Danzin et al.	53—9 X
3,220,153	11/1965	Cormack et al.	53—112 X

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