United States Patent [19]

Amberg

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[54] SHRINK-FILM CAPPING MACHINE

[75] Inventor: **Ralph Gilbert Amberg,** Monticello, Ind.

[73] Assignee: **Owens-Illinois, Inc.,** Toledo, Ohio

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[52] **U.S. Cl.** **53/296,** 53/329

[51] **Int. Cl.** **B65b 7/28**

[58] **Field of Search** 53/296, 297, 298, 329, 42

[56] **References Cited**

UNITED STATES PATENTS

3,507,093	4/1970	Marion	53/296 X
3,501,896	3/1970	Stoeser et al.	53/296 X
3,354,604	11/1967	Amberg et al.	53/42
3,286,437	11/1966	Cole	53/296
3,460,317	8/1969	Carter et al.	53/42 X

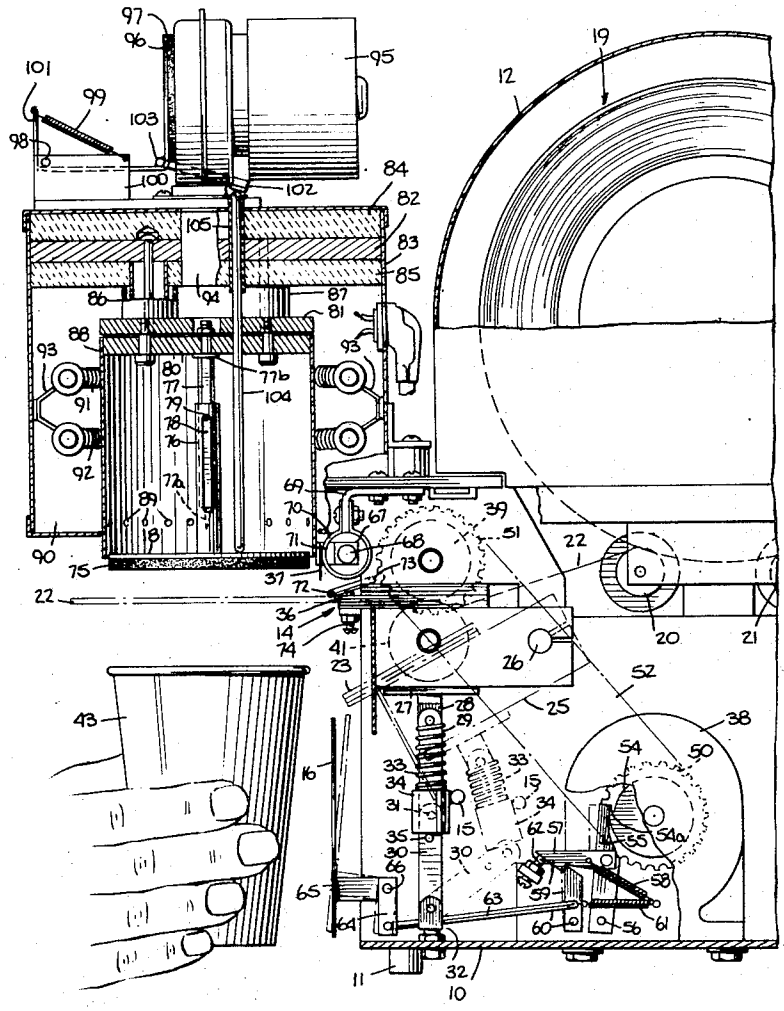
Primary Examiner—Travis S. McGehee

Attorney—Ward, McElhannon, Brooks & Fitzpatrick

[57] **ABSTRACT**

Counter top machine for shrink-film capping of containers in which a capping unit is mounted on a cabinet so that the lower end of the unit is spaced above the counter. The capping unit includes a sealing tube for receiving the upper end of the container as the container is manually moved upwardly and for directing hot air around the edges of the shrink-film closure, the central portion of which is held between a vertically movable plunger plate and the container and the hot air being supplied from a chamber containing electric heating elements and fed by an air valve controlled centrifugal blower, the air valve being actuated by upward movement of the container. A puncturing needle on the plunger punctures the closure and a heated knife on the unit severs the film. The cabinet contains a roll of shrinkable film which is fed in measured amounts by an electric motor drive between corrugated jaws which direct the film beneath the plunger plate, the drive being activated by a manually operable trigger lever located below the jaws. One of the jaws is toggle actuated for initial threading of the film between the jaws.

16 Claims, 6 Drawing Figures



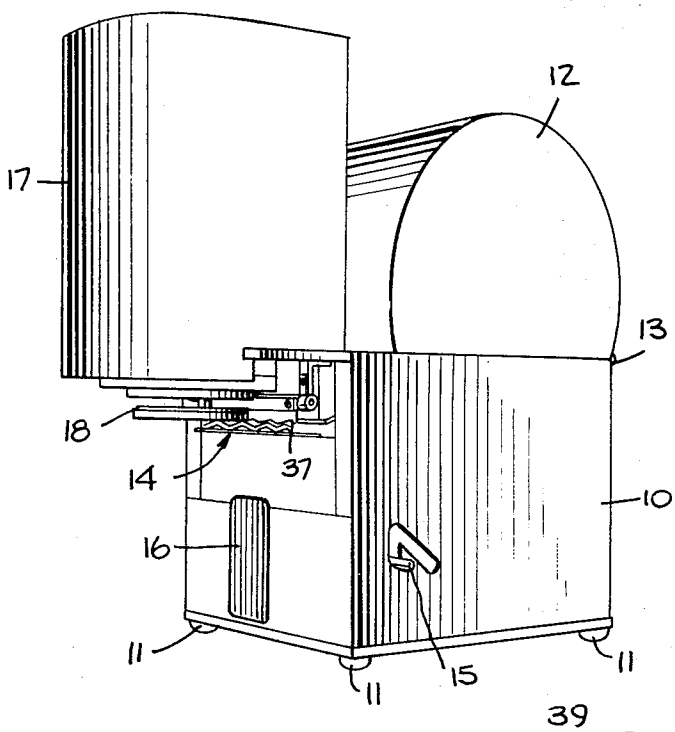


Fig. 1.

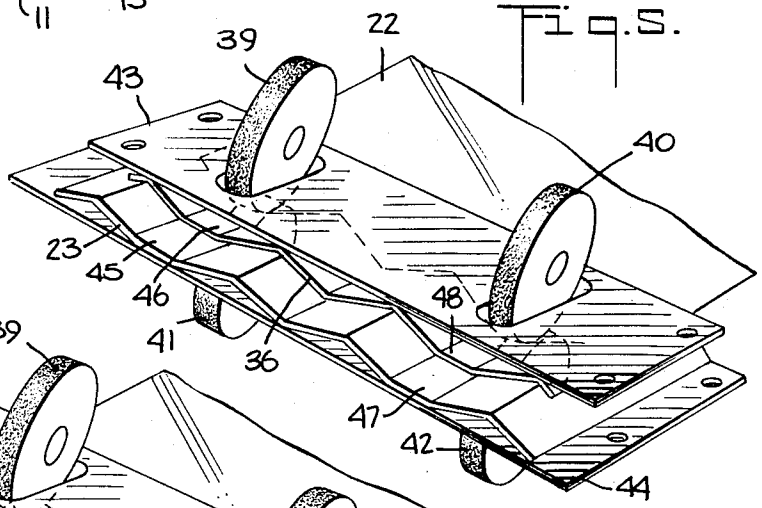


Fig. 5.

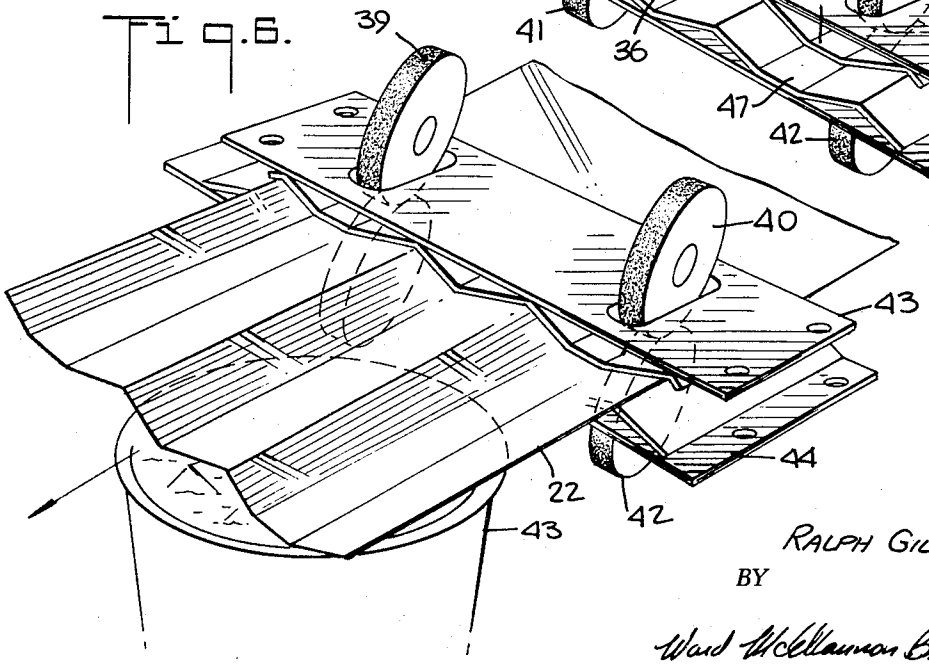
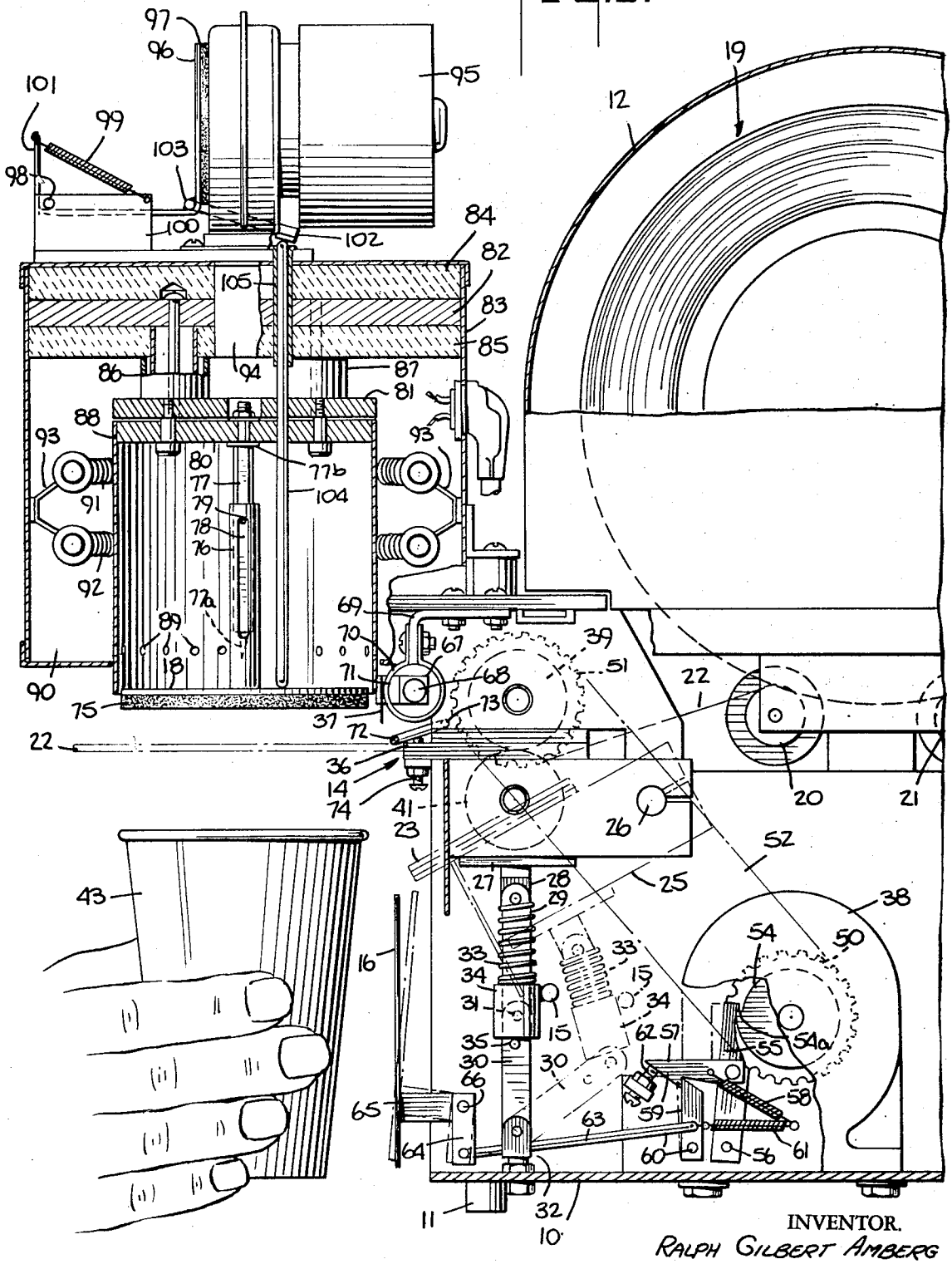


Fig. 6.

INVENTOR.
RALPH GILBERT AMBERG
BY
Ward McElhannon Brooks & Fitzpatrick
ATTORNEYS

Fig. 2.

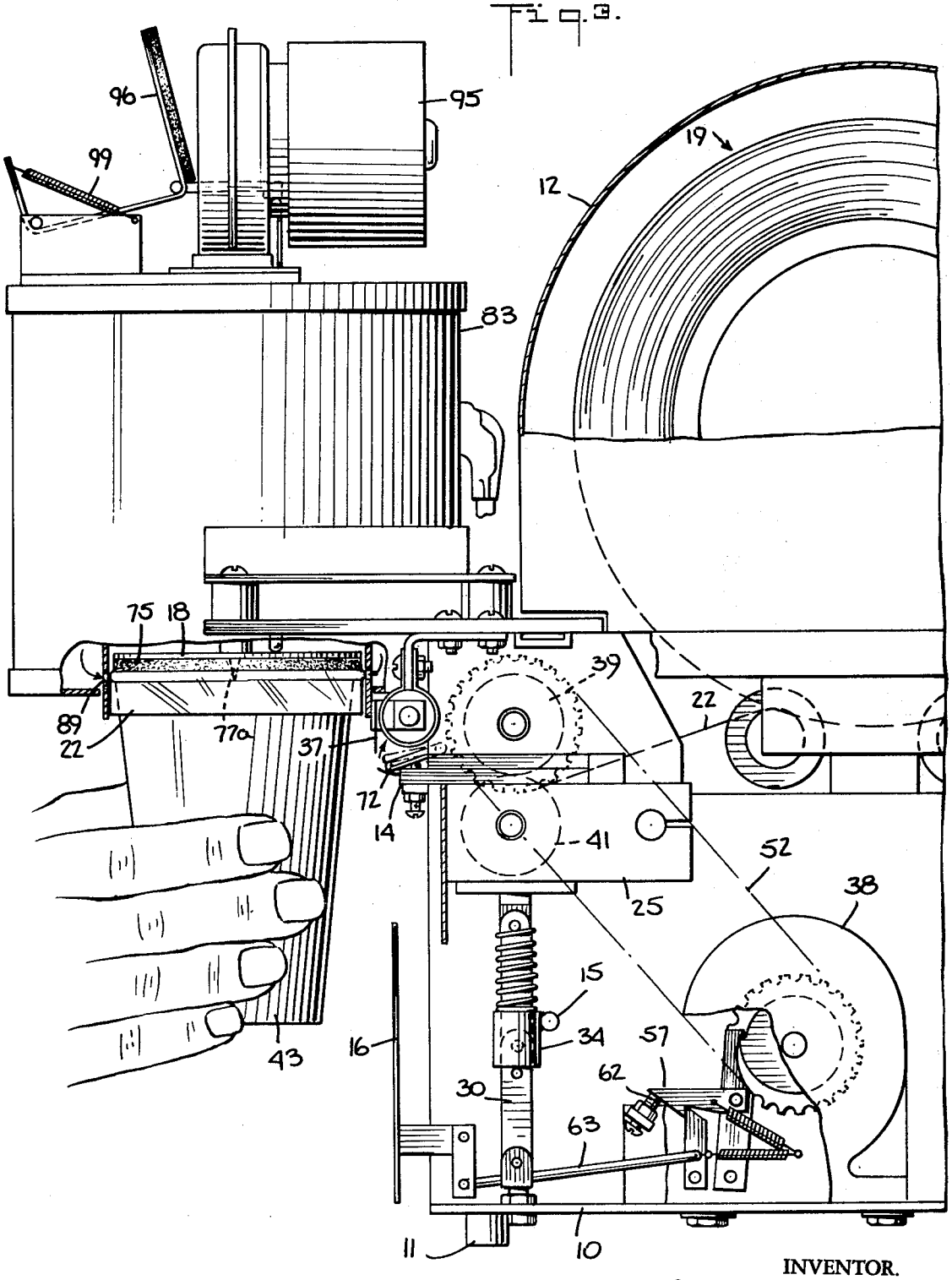


INVENTOR.
RALPH GILBERT AMBERG

BY

Mead McClanahan Brooks & Litzpatrick
ATTORNEYS

Fig. 3.



INVENTOR.
RALPH GILBERT AMBERG

BY

Ward McElhannon Brooks & Fitzpatrick
ATTORNEYS

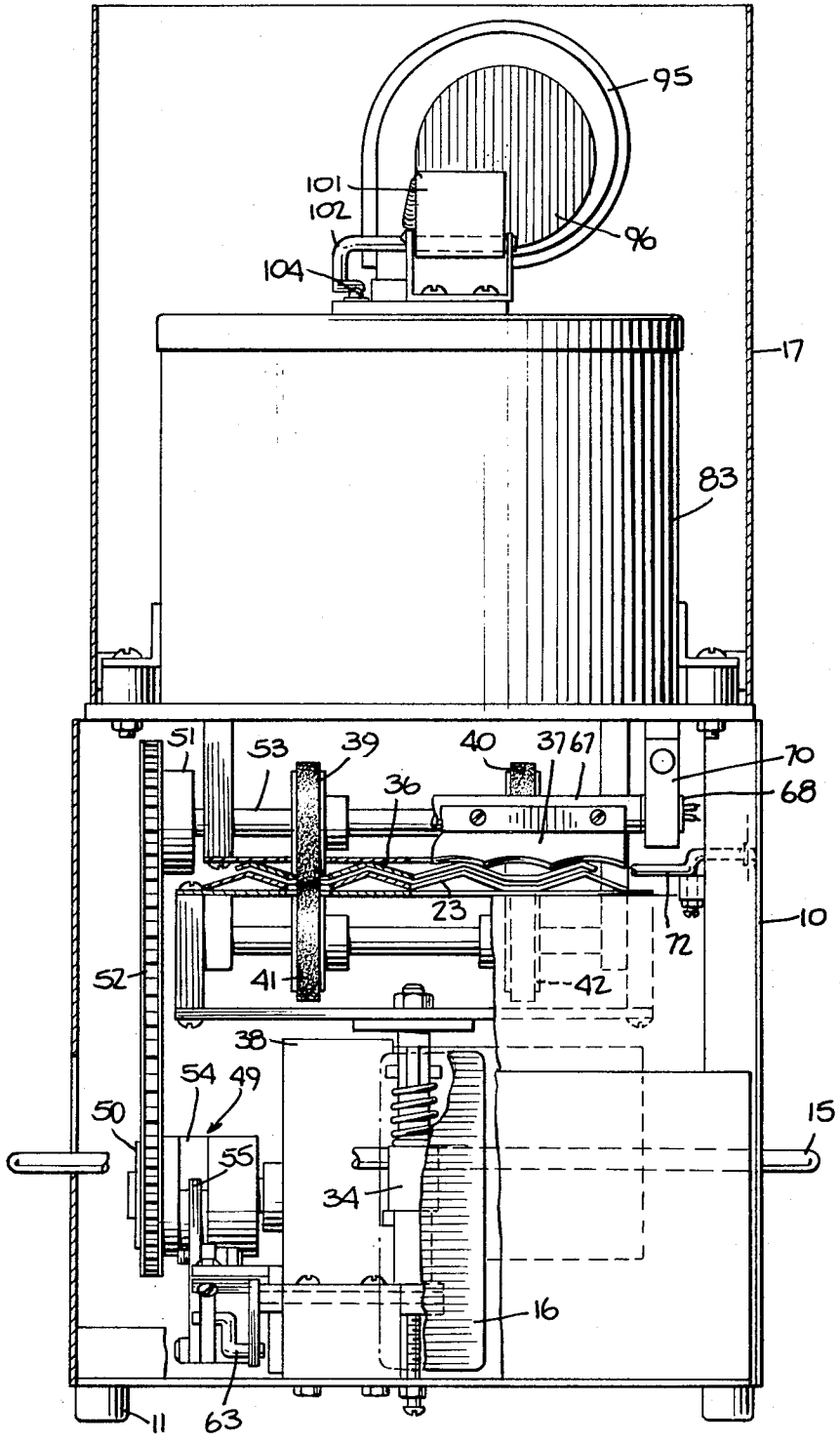


Fig. 4.

INVENTOR.
RALPH GILBERT AMBERG

BY

Ward McElhannon Brooks & Fitzpatrick
ATTORNEYS

SHRINK-FILM CAPPING MACHINE

This invention relates to capping techniques and more particularly to the capping of receptacles, such as paper or plastic receptacles containing comestibles or liquids, with a closure of the shrink-film type.

Containers having shrink-film closures, and methods and apparatus for simultaneously forming and applying shrink-film closures to receptacles are known, being shown and described, for example, in U.S. Pats. Nos. 3,354,604, 3,354,605 and 3,354,614. An over-sized piece of thin and shrinkable sheet material, such as polyethylene, is placed upon and across the receptacle mouth opening whereupon heat is applied to the peripherally extending excess polyethylene sheet material to shrink the same into somewhat bunched or wrinkled contact relation with the periphery of the receptacle while maintaining the central area of the polyethylene in relatively cool condition so that it will not shrink. The resulting closure is relatively elastic in its shrunken edge regions so that it may be easily removed from the receptacles using the fingers to slightly expand the shrunken periphery and slip the closure off the receptacle. It should be noted that such shrink-film closures are not actually bonded to the receptacle.

The present invention contemplates that shrinkfilm closures might be economically and easily formed on paper or plastic receptacles which have been filled with food, liquids, or the like by the merchant within a store where such items are sold over-the-counter.

It is apparent that, if shrink-film type closures are to be used for such purposes, the closure material must be shrunk into tightly fitting relation with the receptacle periphery so that it cannot be dislodged by inadvertent rough handling.

Moreover, it is apparent that such tight fitting shrink-film closure must be very quickly and very easily applied by the merchant if he is to take full advantage of the known economy inherent in the use of such closures. In addition, the machine which he uses to apply the closure must have a capability of accommodating receptacles of various heights and sizes, be relatively inexpensive and be readily loaded with the closure film. Also, the film should be fed automatically and in the correct size to the position where it is applied without requiring that the operator use special care or procedures.

In addition to the foregoing, it is recognized that relatively unskilled persons will be operating the shrink-film capping machine in soft drink stores, delicatessens and other stores, and it is therefore necessary that the machine be rugged, very easily used, maintained and cleaned, and not require sensitive control during operation. Further, the machine should be capable of forming and applying the closures virtually instantaneously, and the time during which heat is applied should not be critical so that an overexposure of the capping film to heat will not mutilate or destroy the same. The present invention provides a shrink-film capping machine which includes all of such desirable features and advantages.

Although the use of an electric heating element adjacent to the portion of the film to be shrunk has certain advantages, such as noise reduction described in said U.S. Pat. No. 3,354,605, nevertheless, I have found that with the apparatus of my invention it is desirable to blow hot air around such portion using an electric heating element and a blower in order to provide satisfactory seals with receptacles having top openings of different sizes, to aid in preventing injury to an operator and to permit hand insertion of the receptacle into the capping head without requiring precise positioning of the receptacle. By the use of a centrifugal blower with a valve on its intake opening which is automatically opened when the receptacle is inserted in the capping head, the noise is kept to a minimum particularly during the time the valve is closed and capping is not being performed.

In the preferred embodiment of the invention, a single capping head unit is mounted on the front of a cabinet which may be placed on a counter. The capping head unit is mounted with its lower end above the base of the cabinet a distance sufficient to permit hand insertion of receptacles of various desired heights which it is desired to cap between such lower end and the counter top and to thereafter raise the receptacle and thereby insert at least the top portion thereof into the capping unit where the closure is heat shrunk.

The capping unit is similar to one of the capping units disclosed in said U.S. Pat. No. 3,354,604 but includes certain modifications. The unit of the invention is stationary and comprises a centrifugal blower at its top with an intake opening having a valve which is operated automatically when a receptacle is inserted in the unit. Air is directed downwardly by the blower into a chamber comprising a pair of spaced electric heating elements and around which the air flows. The chamber surrounds a can-like cylinder or sealing tube having peripherally disposed air outlets adjacent its lower end and encircling a vertically movable plunger carrying a plunger plate with a disk engagable with the closure film. A film puncturing needle is carried by the plunger centrally of the plate to cause puncturing of the closure centrally thereof. A serrated edge, knife blade is mounted adjacent the lower end of the outside wall of the heating chamber and intermediate the plunger plate and the front of the cabinet so as to sever the closure film as the receptacle is inserted into the sealing tube. The knife blade is supported by a bar of good thermal conductivity metal, such as aluminum, which encases a cartridge type electric heater so that the blade is heated evenly and to a temperature which facilitates severing of the film.

The cabinet contains the closure film suitably mounted, and an electric motor for operating a film feed which comprises rollers engagable with the film and rotatable by the motor through a one-turn clutch for feeding a measured amount of film beneath the plunger plate. The clutch drive, and hence, the film feed, is caused by the movement by an operator of a trigger lever at the front of the cabinet. The film is fed out of the cabinet between a pair of closely spaced, matching, corrugated jaws so as to produce rectilinear movement of the film as it leaves the jaws and so as to cause it to assume the proper position beneath the plunger plate in one second or less.

The lower jaw is pivotally mounted, and its position is controlled by a toggle mechanism which permits the jaws to be opened easily for initial placement of the closure film therebetween and to be subsequently closed.

To prepare the machine for operation, a roll of closure film is mounted in the cabinet, the jaws are opened and the forward or leading edge of the film is threaded between the jaws until it is adjacent the cutting edge of the knife blade. The jaws and the cabinet are then closed, and the heating elements, blower and film feed motor are turned on. After the air to be blown around the capping film has reached the correct temperature, a wait of a few minutes, the machine is ready for use.

To close a receptacle, the operator merely actuates the clutch trigger lever at the front of the cabinet, preferably while inserting the receptacle open-end up beneath the plunger plate and in a position lower than the film feed jaws, which causes the film in a measured amount, greater in length than the mouth diameter of the receptacle, to be fed beneath the plunger plate. After the film is so positioned, the operator raises the receptacle and presses the upper end thereof into the sealing tube until it can no longer move upwardly. This causes the receptacle to engage the film and press it against the plunger plate and then move the plunger plate upwardly. At the same time, the knife blade severs the film widthwise and the blower valve is opened so that in the uppermost position of the receptacle, hot air flows around the film edges not covered by the plunger plate, causing such portions of the film to shrink and tightly engage the upper portion of the outer wall of the receptacle in a short period of time, e.g. one to three seconds. The punching needle carried by the plunger produces a centrally disposed puncture in the closure as the receptacle is raised.

After the film has shrunk as described and the receptacle is thereby closed, the operator lowers the receptacle until it is clear of the sealing tube at which time it is removed from the machine which is then ready for receiving and closing the next receptacle. As the receptacle is lowered, the blower valve closes, quieting the blower and stopping, or substantially stopping, the flow of air out of the sealing tube openings.

Various objects, advantages and features of the invention will be more readily apparent from the following detailed description of the presently preferred embodiment thereof, which description should be considered in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of the complete apparatus of the invention;

FIG. 2 is a fragmentary, side elevation view, partly in cross section, of the apparatus illustrated in FIG. 1;

FIG. 3 is a further fragmentary, side elevation view, partly in cross section, of the apparatus illustrated in FIG. 1 and shows the parts thereof in their positions when the capping material is being heated and shrunk around the mouth of the receptacle.

FIG. 4 is a fragmentary, end elevation view, partly in cross section, of the apparatus illustrated in FIG. 1; and

FIGS. 5 and 6 are perspective views of the film feed wheels and feed jaws.

The preferred embodiment of the apparatus of the invention illustrated in FIG. 1 comprises a cabinet 10 having feet 11 for supporting the cabinet on a counter top. The cabinet 10 also comprises a semi-cylindrical cover 12 pivoted at its rear edge 13 to permit the cover 12 to be opened for the insertion of a roll of heat shrinkable film, such as bi-axially oriented, polyethylene film having a thickness of the order of 0.00075 inches. Matching corrugated jaws 14 extend from the front of the cabinet 10 and the heat shrinkable film is fed therebetween as described hereinafter.

A rod 15 extends from the side wall of the cabinet 10 and, as described hereinafter, it is used to open and close guide means in the form of the jaws 14 for the purpose of permitting easy feed of heat shrinkable film therebetween. The feed of the film from the jaws 14 is initiated by operation of a trigger lever or trip arm 16 mounted on the front of the cabinet.

A centrifugal blower, a chamber containing electrical heating elements and a sealing tube, all forming a sealing unit, are contained within a heat shield and cover 17 mounted on the cabinet 10. Plunger means including a plunger plate 18 extends downwardly from the sealing tube, and in its normal position shown in FIG. 1, it is immediately above the heat shrinkable film as it issues from between the jaws 14. The distance between the lower side of the plate 18 and the counter top on which the apparatus rests is selected so as to permit easy insertion of receptacles of various sizes to be sealed between such plate 18 and the counter top.

As shown in FIG. 2 a roll 19 of heat shrinkable film is mounted within the cover 12 and rides on a pair of freely rotatable rolls 20 and 21, the film 22 being fed from the roll 20 to the jaws 14 from which the film 22 issues in corrugated form. To assist in initial feeding of the film 22 between the jaws 14, the lower jaws 23 and an idler wheel 41 are mounted on an arm 25 which is pivotally supported on a shaft 26. The arm 25 and hence, lower jaw 23 and the wheel 41 are held in the positions thereof shown in solid lines by means of a toggle mechanism comprising a plate 27 having a bracket 28 extending therefrom and pivotally connected to an upper leg 29. The upper leg 29 is pivotally connected at one end to one end of a lower leg 30, as at 31, and the lower leg 30 is pivotally connected at its other end to a foot 32 supported from the base of the cabinet 10.

The toggle mechanism also comprises a compression spring 33 surrounding the upper leg 29, which spring bears against a lock 34 in the form of a sleeve closely surrounding the lower end of the upper leg 29 and the upper end of the lower leg 30, but slidable thereon, and the lock 34 is limited in its downward movement by a stop pin 35 on the lower leg 30. The rod 15, also shown in FIG. 1, is secured to the lock 34, such as by welding, and when the rod 15 is manually moved upwardly the lock 34 moves upwardly and spring 33 is compressed. When the lock 34 has been moved upwardly a distance sufficient to substantially clear the end of the lower leg 30, and the rod 15 is moved to the right, the portions of the toggle mechanism assume the positions shown in dot-dash lines in FIG. 2, thereby permitting the lower jaw 23 to assume the position shown in dot-dash lines in FIG. 2. When the toggle mechanism and the lower jaw 23 are in such positions, it is a simple matter to feed the film 22 between the lower jaw 23 and the upper jaw 36 and to position the leading edge thereof adjacent the lower edge of a knife blade 37 which has a length at least as great as the width of the film 22.

Thereafter, the rod 15 is again raised and moved to the left, as viewed in FIG. 2, so that the jaws 23 and 36 are closed, and when the rod 15 is released, the toggle mechanism and the jaws assume the positions shown in

solid lines in FIG. 2, the lock 34 retaining the toggle mechanism and the jaws in such positions.

Referring to FIGS. 2–6, the film 22 is automatically advanced a predetermined amount by means of an electric drive motor 38 connected to a pair of rubber-tired drive wheels 39 and 40. Thus, the rubber-tired wheels 39 and 40 engage the upper surface of the film 22, and the lower rubber-tired, idler wheels 41 and 42 engage the lower surface of the film 22. When the wheels 39 and 40 are rotated in a clockwise direction, as viewed in FIG. 2, the film 22 is fed from right to left as viewed in FIG. 2. The amount of film 22 which is so fed is greater than the diameter of the mouth of the receptacle 43 to be covered, and the width of the film 22 is also greater than the diameter of the mouth of the receptacle 43.

The film 22 is relatively thin and flexible and will bend easily. Accordingly, if one attempted to feed the film into the position between the plunger plate 18 and the receptacle 43 shown in FIG. 2 while keeping the film in flat form, it would be found that the film would not follow a rectilinear path as viewed from the side. Instead, the film would droop or curve downwardly from the jaws 14 as it issues therefrom and therefore, would not assume the desired position. It has been found that if the jaws between which the film 22 is fed are corrugated and preferably are so dimensioned with respect to the width of the film that the edges of the film extend upwardly as they issue from the jaws 14, the film 22 can be caused to follow a rectilinear path and positioned as shown in FIG. 2.

The construction of the jaws 14 is shown in greater detail in FIGS. 5 and 6. As shown therein, the upper jaw 36 has a corrugated form and is supported by a plate 43, and both the upper jaw 36 and the plate 43 have apertures therein permitting the drive wheels 39 and 40 to engage the film 22 as it passes between the jaws. The lower jaw 23 has a mating or matching corrugated form and is supported by a plate 44, both the lower jaw 23 and the supporting plate 44 having apertures therein permitting the idler wheels 41 and 42 to engage the lower surface of the film 22 thereby causing the film 22 to be engaged between the nips of the wheels 39 and 41 and of the wheels 40 and 42. It will be noted that the jaws have flat portions 45–48 intermediate the adjacent angular portions and where the wheels 39–42 engage the film 22.

Preferably, the jaws 23 and 36 are made of metal, and they are spaced apart a distance approximately equal to, or slightly greater than, the thickness of the film 22. As the wheels 39 and 40 rotate, the wheels 41 and 42 also rotate causing the film 22 to move into the position shown in FIG. 6. During such movement, the film 22 assumes the corrugated shape shown in FIG. 6, and the film 22 follows a rectilinear path as it issues from between the jaws 23 and 36. It should also be noted that the shaping of the jaws 23 and 36 is such with respect to the width of the film 22 that the side edge portions of the film 22 are directed upwardly as they leave the jaws.

Referring now to FIGS. 2–4 the electric motor 38, which comprises a conventional speed reduction gear train, is interconnected through a well known type of clutch mechanism 49, a pair of sprockets 50 and 51 and a roller chain 52 with the shaft 53 which drives the wheels 39 and 40. When the apparatus of the invention is energized, the motor 38 operates continuously but the shaft 53 rotates only when the restraining means or cam 54 forming part of the clutch mechanism 49 is released. The cam 54 is normally restrained by a release arm 55 engaging a projection 54*a* on the cam 54, but when the release arm 55 is disengaged from the projection 54*a* by moving it to the left, the cam 54, the sprockets 50 and 51 and hence, the shaft 53 as well as the wheels 39 and 40 will rotate, the cam 54 rotating for only one turn and hence, each time that the release arm 55 is disengaged from the projection 54*a*. Accordingly, the film 22 will be advanced by a fixed, predetermined amount each time that the cam 54 is permitted to rotate.

The release arm 55 is pivotally mounted at 56 and carries a sear 57 pivotally mounted thereon. The sear 57 is urged downwardly and the release arm 55 is urged into engagement with the projection 54*a* by a spring 58. A finger 59 pivotally mounted at 60 engages a projection on the sear 57 and is urged to the right as viewed in FIG. 2 by a spring 61. The relative positions of the sear 57 and the finger 59 may be adjusted by means of a screw 62, a sloping face of the sear 57 engaging the end face of the screw 62 which acts as a stop.

At one end thereof, a trip rod 63 pivotally engages the finger 59, and at the other end thereof it is in pivotal engagement with arm 64. The arm 64 is secured to and moves with an arm 65 which supports the trigger lever or trip arm 16, and both arms 64 and 65 are pivotally mounted at 66.

When the trip arm 16 is manually moved from the position shown in solid lines in FIG. 2 to the position shown in dot-dash lines in FIG. 2, the arm 64 pivots about the point 66 causing the finger 59 to move the sear 57 to the left as viewed in FIG. 2. The sear 57 moves the release arm 55 out of engagement with the projection 54*a* thereby permitting the wheels 39 and 40 to drive the film 22 into the position shown in FIG. 2. As the sear 57 moves to the left it also moves upwardly at its left end because of the engagement of its sloping face with the screw or stop 62, and at a predetermined point in its movement, the projection on the sear 57 will separate from the finger 59 and the sear 57 will ride over the end of the finger 59 due to the force of the spring 58 so that if the trip arm 16 is manually held in the position shown in dot-dash lines in FIG. 2 the release arm 55 will still be permitted to re-engage the cam projection 54*a* and stop it after one revolution. When the trip arm 16 is released, it will assume the position shown in FIG. 2 and cause the finger 59 to engage the projection on the sear 57 and therefore, will be in a position to again release the cam 54 when the trip arm 16 is subsequently operated.

The knife 37 is made of steel and it has a serrated lower edge which is engageable with the film 22 when it is raised as described hereinafter and is mounted on a bar 67 of good thermal conductivity and may, for example, be made of aluminum. The bar 67 contains an electric heater 68, which may, for example, be a conventional cartridge type heater, for heating the knife 37 to a temperature e.g., 325°–340° F, which will facilitate cutting of the film 22. The bar 68 is supported by a pair of brackets such as the bracket 69 which carries a clamp 70 surrounding an insulating bushing 71 which receives the bar 67.

Below the bar **68** is a stripper **72** which is made of heavy wire bent into a U shape and which is freely rotatable about an axis **73**. As described hereinafter the stripper **72** aids in stripping the leading edge of the film **22** from the knife **37** after the film **22** has been severed by the knife **37**, the stripper **72** having a length in a direction perpendicular to the plane of the drawing at least equal to the width of the film **22** and a weight sufficient to strip the film **22** from the knife **37**. The lowermost position of the stripper **72** may be adjusted by the screw **74** which is engagable with a side portion of the stripper **72**, and normally the stripper **72** is positioned so as to rest near the top of the upper jaw **36**.

The plunger plate **18**, which may be made of metal, has a rubber disk **75** secured to the face thereof and is supported by a tubular shaft **76** which has a bore which is circular in cross section and which slidably receives a shaft **77** which is hexagonal in cross section. It has been found that under the conditions where the apparatus of the invention is used, dirt, food and liquids frequently enter into the space between the tubular shaft **76** and the shaft **77**. It has also been found that such dirt, etc., will cause binding of the shaft **76** on the shaft **77** if they have a close fit, such as is the case when the cross sectional shape of the bore of the shaft **76** corresponds closely to the cross sectional shape of the shaft **77**. For example, if the cross sectional shape of the bore is circular and the cross sectional shape of the bore **77** is also circular and the dimensions of both cross sections are approximately equal, then after a period of use binding may occur when it is attempted to slide the shaft **76** with respect to the shaft **77** as described hereinafter. Accordingly, the cross sectional shape of the bore of the shaft **76** is made different from the cross sectional shape of the shaft **77** so that portions of the exterior of the shaft **77** are spaced from portions of the interior of the shaft **76**, and it has been found that satisfactory results are obtained when the cross sectional shape of the bore **76** is circular and the cross sectional shape of the exterior of the shaft **77** is hexagonal as described.

The tubular shaft **76** is provided with a slot **78**, and the shaft **77** has a pin **79** extending therefrom and into the slot **78** in the shaft **76**. The pin **79** and the slot **78** permits the shaft **76** to slide axially of the shaft **77** without substantial rotation of the shaft **76**, and hence, the plunger plate **18**, and also restricts downward movement of the shaft **76** and hence, of the plunger plate **18**.

The shaft **77** is supported from a mounting disk **80** which is secured to a mounting plate **81**. The shaft **77** has an enlargement or washer **77*b*** therearound engagable with the upper end of the shaft **76** when it is moved upwardly. The shaft **77** also has a needle **77*a*** mounted at the lower end thereof and the plate **18** and disk **75** have central apertures therein permitting the needle **77*a*** to pass therethrough when the plate **18** is moved upwardly, the needle **77*a***, puncturing the film closure for purposes well known in the art. Of course, if desired, the needle **77*a*** may be omitted.

The mounting plate **81** is supported by a further mounting plate **82** secured to an outer shell **83**. A pair of disks **84** and **85** of heat insulating material are disposed on opposite sides of the mounting plate **82**, and the mounting plate **81** is spaced from the lower disk **85** by a pair of bushings **86** and **87**.

A sealing tube **88**, preferably made of metal, is secured to the mounting disk **80** and has an inner diameter slightly larger than the diameter of the plunger plate **18**. The tube **88** has a plurality of holes **89** extending through a wall thereof and communicating with the heating chamber **90** surrounding the sealing tube **88**. Such holes **89** permit the flow of hot air from the heating chamber **90** to the surface of the heat shrinkable film on a receptacle to cause shrinking of such film as described hereinafter.

For cleaning purposes, the tube **88** with the disk **80** preferably are secured to the mounting plate **81** so that they may be easily removed as a unit, and they may be secured thereto as described in said U.S. Pat. No. 3,354,604. It will also be noted that in the preferred embodiment, the plate **18** substantially closes the end of the tube **88** when the plate **18** is in its lowermost position thereby restricting the outflow of heated air out of the sealing tube **88** and the heating chamber **90**.

The wall of the sealing tube **88** forms one wall of the heating chamber **90** and the outer shell **83** forms another wall thereof. The heating chamber contains a pair of electric heating elements **91** and **92**, each of which may be a conventional spirally wound coil of resistance wire. The heating elements **91** and **92** are supported by a plurality of brackets **93** supported from the inner surface of the outer shell **83**.

The mounting plate **82** and the disks **84** and **85** are provided with centrally aligned apertures so as to provide an air passageway **94** which communicates at one end with the outlet of a centrifugal blower **95** and which communicates at the other end with the heating chamber **90**. Accordingly, when the blower **95** is permitted to blow air through its outlet the air passes downwardly through the passageway **94** to the upper end of the heating chamber **90**, flows radially outwardly in the space between the mounting plate **81** and the disk **85** and then passes downwardly past the heating elements **91** and **92** where it is heated. After passing the heating elements **91** and **92**, the air flows radially inwardly through the holes **89** in the sealing tube **88**. Accordingly, the air is heated not only by the elements **91** and **92** but also by the heated walls of the outer shell **83** and of the tube **88**.

The centrifugal blower **95**, which in one embodiment of the invention had a rating of 15 c.f.m., operates continuously when the apparatus is energized, but substantially no air is supplied thereby to the heating chamber **90** when a blower valve **96** located at the inlet of the blower **95** is closed.

The valve **96** has a disk **97** secured to the face thereof and may, for example, be made of felt. The disk **97** effectively closes the inlet of the blower **95** when the valve **96** is closed. Valve **96** is pivotally mounted by a shaft **98** and is urged to the closed position by a spring **99** extending between a mounting bracket **100** and an arm **101** forming part of the valve **96**. Accordingly, the valve **96** may be rotated from the closed position shown in FIG. **2** to the opened position shown in FIG. **3**.

A lift arm **102** is secured to the valve **96** at **103**, such as by a welding, and the end of the lift arm **102** is engagable by the upper end of a push rod **104**. The lower end of the push rod **104** rests on the upper surface of the plunger plate **18** so that when the plunger plate **18** is raised, as described hereinafter, the push rod **104** lifts

the arm **102** and opens the valve **96**, the push rod **104** being slidable in a bushing **105** extending through the mounting plate **82** and the disks **84** and **85**.

After a roll **19** of heat shrinkable film has been placed in the apparatus and the film has been threaded between the jaws **23** and **36** as described hereinbefore and after the drive motor **38**, the heating elements **91** and **92**, and the blower **95** have been electrically energized in a conventional manner and a short period of time has elapsed to permit the heating chamber **90** to warm-up, the apparatus of the invention is ready for use. At this point, the drive motor **38** is operating, but the film **22** is not being fed because of the engagement of the release arm **55** with the projection **54***a* on the cam **54**. Also, at this time the motor of the blower **95** is operating but little, if any, air is being delivered to the heating chamber **90** because the valve **96** is closed. Although a centrifugal blower is normally very quiet in operation, any noise normally produced thereby is further reduced by virtue of the fact that the valve **96** is closed which lowers the perceptible noise of the blower **95** and which substantially eliminates noise produced by air flow.

When the operator desires to cap a receptacle **43** the operator moves the trip arm **16** from the position shown in solid lines to the position shown in dot-dash lines in FIG. **2**, either before placing a receptacle **43** in the position shown in FIG. **2**, or while so placing a receptacle **43** in such position. Operation of the trip arm **16** causes release of the cam **54** in the manner heretofore described and causes the film **22** to be fed rapidly, e.g. less than a second, into a position beneath the plunger plate **18** and above the receptacle **43** as shown in FIG. **2**. The operator then raises the receptacle **43** causing the mouth thereof first to engage the under surface of the film **22** and then to press the upper surface of the film **22** against the disk **75** on the plunger plate **18**. The major portion of the film **22** extending from the jaws **14** is then held between the upper rim of the receptacle **43** and the disk **75**.

As the operator continues to raise the receptacle **43**, the plunger plate **18** moves upwardly, the stripper **72** is moved upwardly by the film **22** and the film **22** eventually reaches the cutting edge of the knife **37** which severs the film **22** widthwise. The weight of the stripper **72** causes the film **22** to separate from the knife **37** if any portion thereof happens to stick to the knife **37**, and the stripper **72** returns to its lowermost position shown in FIG. **2**. As the operator continues to raise the receptacle **43** the plunger plate **18** continues to move upwardly until further upward movement thereof is prevented by the engagement of the upper end of the shaft **76** with the enlargement or washer **77b** at the under surface of the mounting disk **80**. At this point, the receptacle **43** is in the position shown in FIG. **3** where the portion of the film **22** extending outwardly from between the disk **75** and the rim of the receptacle **43** is folded downwardly and is exposed to heated air issuing from the holes **89**. During the last portion of the upward movement of the receptacle **43**, the film closure is centrally punctured by the needle **77***a*.

As the plunger plate **18** is moved upwardly, the valve **96** is opened because the push rod **104** is moved upwardly by the plunger plate **18** and operates the lift arm **102**. Accordingly, as shown in FIG. **3** the valve **96** is fully opened when the receptacle **43**, and hence, the plunger plate **18**, have been raised to their uppermost positions. Because the valve **96** is open, the blower **95** delivers air to the heating chamber **90** where it is heated, and such heated air flows through the holes **89** and onto the film **22** folded downwardly around the receptacle **43** causing it to shrink around the upper portion of the receptacle **43** in a well known manner, the required period of exposure of the film **22** to such hot air being relatively short.

The operator then lowers the receptacle **43** which has now been capped, and when the top thereof has reached a position below the lower edge of the sealing tube **88**, the receptacle **43** may be removed from beneath the plunger plate **18**. Thereafter, the apparatus of the invention is ready to receive and cap another receptacle in the manner hereinbefore described.

It will be apparent from the foregoing that the apparatus of the invention is relatively simple to operate and may be used by relatively unskilled personnel. Furthermore, the apparatus caps the receptacles rapidly and with a minimum of effort on the part of the operator. Due to the fact that the blower **95** is not blowing air when the apparatus is not actually capping a receptacle, little, if any, hot air issues from the apparatus when it is not being used for such purposes and the blower noise is kept to a minimum.

It should also be noted that receptacles having many different heights and mouth diameters equal to or less than the diameter of the disk **75** may be capped by the apparatus. Since the shrinking of the film is caused by heated air, it is not necessary that the portion of the film to be shrunk be immediately adjacent the inner wall of the sealing tube **88**.

Although a preferred embodiment of the invention has been illustrated and described, it will be apparent to those skilled in the art that various modifications thereof may be made without departing from the principles of the invention.

What is claimed is:

1. Apparatus for applying a shrink-film type closure to the mouth rim of an open-ended receptacle or the like, said apparatus comprising a cabinet having a base adapted to be mounted on a support; a sealing unit mounted on said cabinet, said unit comprising a sealing tube mounted in a fixed position relative to said cabinet and having an open lower end so disposed above said base and with respect to said cabinet that a receptacle to be closed may be received below said lower end when said cabinet is mounted on said support, vertically movable plunger means adapted to engage said film and movable within said tube from a lower position at said lower end of said tube to an upper position above said lower end, means for supplying heated air to said lower end of said tube, control means interconnecting said plunger means and said means for supplying heated air and operable by said plunger means to permit the supply of heated air to said lower end when said plunger means is in its said upper position and to prevent the supply of heated air to said lower end when said plunger means is in its said lower position; feed means for automatically feeding measured amounts of said film beneath said plunger means, said feed means comprising manually operable means accessible from externally of said cabinet and from adjacent said seal-

ing unit for activating said feed means; said manually operable means being mounted below said plunger means and in spaced relation thereto to permit the feed of said film beneath said plunger means and being mounted in a position in relation to said plunger means where it is engageable by said receptacle as it is positioned beneath said plunger means in preparation for the application of said film closure thereto, whereby said feed means may be energized by engagement of said receptacle therewith prior to movement of said receptacle upwardly to engage the film fed by said feed means and to press said film against said plunger means; and cutting means adjacent said plunger means for cutting said film transversely of the direction of feed thereof.

2. Apparatus for applying a shrink-film type closure to the mouth rim of an open-ended receptacle or the like, said apparatus comprising a cabinet having a base adapted to be mounted on a support; a sealing unit mounted on said cabinet, said unit comprising vertically movable plunger means adapted to engage said film and so mounted in spaced relation with respect to said cabinet and said base that a receptacle to be closed may be received below said plunger means when said cabinet is mounted on said support, a sealing tube mounted in a fixed position relative to said cabinet and above said plunger means and adapted to receive said plunger means as it is moved and to receive the upper portion of said receptacle, said tube having circumferentially extending apertures adjacent the lower end thereof which in a predetermined upper position of said plunger means are below said plunger means, means around said sealing tube forming a heating chamber communicating with said apertures, at least one electric heating element mounted in said chamber and blower means for forcing air into said heating chamber; feed means for feeding measured amounts of said film beneath said plunger means, said feed means comprising guide means mounted on said cabinet adjacent said plunger means for guiding said film beneath said plunger means, film drive means engageable with said film for moving said film through said guide means, motor means for operating said drive means and manually operable means for activating said drive means for a predetermined period of time and thereby causing the feed of a predetermined amount of film beneath said plunger means, said manually operable means being mounted on said cabinet and being accessible from externally of said cabinet and from adjacent said sealing unit and said manually operable means being mounted below said plunger means and in spaced relation thereto to permit the feed of said film beneath said plunger means and being mounted in a position in relation to said plunger means where it is engageable by said receptacle as it is positioned beneath said plunger means in preparation for the application of said film closure thereto, whereby said feed means may be energized by engagement of said receptacle therewith prior to movement of said receptacle upwardly to engage the film fed by said feed means and to press said film against said plunger means; and cutting means disposed intermediate said guide means and said plunger means for cutting said film.

3. Apparatus as set forth in claim 2 wherein said plunger means comprises a plunger plate adapted to extend over the mouth of said receptacle and mounted on a tubular shaft having a bore of a predetermined cross sectional shape, and a fixed shaft mounted within and slidably received in said tubular shaft, said fixed shaft having a cross sectional shape different from that of said bore and having portions of the surface thereof in engagement of the wall of said bore and other portions thereof spaced from the wall of said bore.

4. Apparatus for applying a shrink-film type closure to the mouth rim of an open-ended receptacle or the like, said apparatus comprising a cabinet having a base adapted to be mounted on a support; a sealing unit mounted on said cabinet, said unit comprising vertically movable plunger means adapted to engage said film and so mounted in spaced relation with respect to said cabinet and said base that a receptacle to be closed may be received below said plunger means when said cabinet is mounted on said support, a sealing tube above said plunger means adapted to receive said plunger means as it is moved and to receive the upper portion of said receptacle, said tube having circumferentially extending apertures adjacent the lower end thereof which in a predetermined upper position of said plunger means are below said plunger means, means around said sealing tube forming a heating chamber communicating with said apertures, at least one electric heating element mounted in said chamber, blower means for forcing air into said heating chamber, said blower means comprising a valve for controlling the flow of air into said heating chamber and means interconnecting said valve and said plunger means for closing said valve when said plunger means is in its lowest position and for opening said valve when said plunger means is raised above said position; feed means for feeding measured amounts of said film beneath said plunger means, said feed means comprising guide means mounted on said cabinet adjacent said plunger means for guiding said film beneath said plunger means, film drive means engageable with said film for moving said film through said guide means, motor means for operating said drive means and manually operable means for activating said drive means for a predetermined period of time and thereby causing the feed of a predetermined amount of film beneath said plunger means, said manually operable means being mounted on said cabinet and being accessible from externally of said cabinet and from adjacent said sealing unit; and cutting means disposed intermediate said guide means and said plunger means for cutting said film.

5. Apparatus as set forth in claim 4 wherein said blower means comprises a centrifugal blower having an outlet opening into said heating chamber and having an inlet, said valve comprises cover means movable from a first position in which it covers said inlet to a second position in which said inlet is uncovered and said interconnecting means comprises means movable by said plunger means and connected with said cover means for moving said cover means from said first position to said second position.

6. Apparatus for applying a shrink-film type closure to the mouth rim of an open-ended receptacle or the like, said apparatus comprising a cabinet having a base adapted to be mounted on a support; a sealing unit mounted on said cabinet, said unit comprising verti-

cally movable plunger means adapted to engage said film and so mounted in spaced relation with respect to said cabinet and said base that a receptacle to be closed may be received below said plunger means when said cabinet is mounted on said support, a sealing tube above said plunger means adapted to receive said plunger means as it is moved and to receive the upper portion of said receptacle, said tube having circumferentially extending apertures adjacent the lower end thereof which in a predetermined upper position of said plunger means are below said plunger means, means around said sealing tube forming a heating chamber communicating with said apertures, at least one electric heating element mounted in said chamber, blower means for forcing air into said heating chamber; feed means for feeding measured amounts of said film beneath said plunger means, said feed means comprising guide means mounted on said cabinet adjacent said plunger means for guiding said film beneath said plunger means, said guide means comprising a pair of mating corrugated jaws spaced apart a distance substantially equal to but slightly greater than the thickness of said film for receiving said film therebetween, said corrugations extending in the direction of movement of said film for corrugating said film lengthwise thereof as it passes between said jaws, film drive means engageable with said film for moving said film through said guide means, motor means for operating said drive means and manually operable means for activating said drive means for a predetermined period of time and thereby causing the feed of a predetermined amount of film beneath said plunger means, said manually operable means being mounted on said cabinet and being accessible from externally of said cabinet and from adjacent said sealing unit; and cutting means disposed intermediate said guide means and said plunger means for cutting said film.

7. Apparatus as set forth in claim 6 wherein the width of said jaws is at least equal to the width of said film in corrugated form and said corrugations are shaped to provide upwardly extending portions at the side edges of said film.

8. Apparatus as set forth in claim 6 wherein said jaws have apertures therein and said film drive means comprises wheels extending into said apertures and engagable with said film.

9. Apparatus as set forth in claim 8 wherein said activating means comprises a clutch interconnecting said motor means and said wheels and means for manually operating said clutch for a predetermined period of time.

10. Apparatus as set forth in claim 9 wherein said clutch comprises a restraining member for preventing rotation of said wheels by said motor means and said means for manually operating said clutch comprises a movable release arm for engaging and restraining said restraining member in a first position thereof and releasing said member in a second position thereof to permit rotation of said wheels by said motor means, means for urging said release arm into said first position, manually operable trip means exteriorly of said cabinet, and means interconnecting said trip means and said release arm for moving it to said second position comprising a finger operable by said trip means, separable means connecting said finger with said release arm and means for separating said separable means after predetermined movement of said finger.

11. Apparatus as set forth in claim 10 wherein said separable means comprises a sear pivotally mounted on said release arm, having a sloping face and having a projection thereon engagable with said finger and wherein said separating means comprises a stop engagable with said sloping face for disengaging said finger and said projection upon movement of said finger.

12. Apparatus as set forth in claim 6 wherein one of said jaws is pivotally mounted and further comprising means for rotating said one jaw including a pair of legs pivotally interconnected at one end thereof, one of said legs being pivotally connected at its other end to said one jaw and the other of said legs being pivotally connected its other end to said cabinet, and means for locking said legs in alignment with each other with said jaws in substantially parallel relation and for rotating said legs about their interconnection with each other and thereby rotating said one jaw away from the other of said jaws.

13. Apparatus as set forth in claim 12 wherein said locking means comprises a sleeve encircling said legs at their interconnection and slidable thereon.

14. Apparatus for applying a shrink-film type closure to the mouth rim of an open-ended receptacle or the like, said apparatus comprising a cabinet having a base adapted to be mounted on a support; a sealing unit mounted on said cabinet, said unit comprising vertically movable plunger means adapted to engage said film and so mounted in spaced relation with respect to said cabinet and said base that a receptacle to be closed may be received below said plunger means when said cabinet is mounted on said support, a sealing tube above said plunger means adapted to receive said plunger means as it is moved and to receive the upper portion of said receptacle, said tube having circumferentially extending apertures adjacent the lower end thereof which in a predetermined upper position of said plunger means are below said plunger means, means around said sealing tube forming a heating chamber communicating with said apertures, at least one electric heating element mounted in said chamber, blower means for forcing air into said heating chamber; feed means for feeding measured amounts of said film beneath said plunger means, said feed means comprising guide means mounted on said cabinet adjacent said plunger means for guiding said film beneath said plunger means, film drive means engageable with said film for moving said film through said guide means, motor means for operating said drive means and manually operable means for activating said drive means for a predetermined period of time and thereby causing the feed of a predetermined amount of film beneath said plunger means, said manually operable means being mounted on said cabinet and being accessible from externally of said cabinet and from adjacent said sealing unit; cutting means disposed intermediate said guide means and said plunger means for cutting said film, said cutting means comprising a knife extending transversely of the direction of movement of said film and electrical means for heating said knife; and a movable stripper mounted above said guide means and engageable with said film thereat, said

stripper extending transversely to the direction of movement of said film and being movable from adjacent said guide means to adjacent said knife by upward movement of said film.

15. In apparatus for applying a shrink-film type closure to the mouth rim of an open-ended receptacle or the like, comprising a sealing unit having movable plunger means adapted to engage said film, a sealing tube adapted to receive said plunger means and the upper portion of the mouth of said receptacle and to direct heated air on shrink-film on said mouth, and means for supplying heated air to said sealing tube including a blower having an inlet valve movable from a first position in which it closes said inlet to a second position in which it opens said inlet, the combination therewith of means interconnecting said valve and said plunger means for moving said valve from said first position to said second position upon movement of said plunger means from a first position thereof to a second position thereof.

16. Apparatus as set forth in claim 15 wherein said valve is rotatably mounted and said interconnecting means comprises a lever connected to said valve for causing rotation thereof and a slidable rod engagable at one end with said lever and engagable at its other end with said plunger means.

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