My present invention relates to improvements in the manufacture of bags and like containers, and more particularly, to an improved method of and apparatus for making silt-proof, air-tight and liquid resistant containers. 

My present invention also relates to an improved method of and apparatus for filling and sealing bags and like containers wherein the bag is closed and sealed simultaneously with the exhaustion of air from the container. 

A feature of my invention resides in the provision of a heat sealing device for securing together overlapped edges of material wherein the device comprises essentially two elements, one heat sealing element and the other a backing roll or member made of resilient material, as for example rubber. By the provision of such backing member a perfect seal is insured in spite of variations in the manner in which the edges are overlapped due primarily to the fact that the resilient backing roll will exert a constant pressure on the overlapped area to force this area firmly against the heat applying roll. 

Another feature of my present invention resides in the provision of a new and improved apparatus for filling bags made of liquid-proof material. The bag or other container, after being filled with the desired material, is subjected to vacuum to exhaust the air remaining in the bag and then, while the bag is at the sealing station, any suitable inert gas is allowed to replace the vacuum created in the bag. After the gas has been supplied and during the time that the bag is operatively connected with the gas applying means the end of the bag is sealed by heat, thereby insuring a complete packaging of the bag. 

In the practice of my invention, it is intended that bags manufactured of paper coated with a fusible substance or bags made of material which is inherently fusible, such as "pliofilm," or bags made of a base sheet such as regenerated cellulose and coated with a fusible substance, be used. It will of course be apparent that the coating applied to the base sheet may extend only throughout the area which is to be sealed by the application of heat, or may extend throughout one surface of the sheet or both surfaces of the sheet.

A preliminary object of my invention is to obtain, in a rapid, efficient manner, a seal in the closing of a previously filled bag which will be as efficient as the sealed portions of the bags themselves. An efficient apparatus and method for manufacturing the bags is disclosed in my copending application, Serial No. 20,370, filed May 8, 1938, for Machine and method for manufacturing bags. The present application is a continuation of my copending application, Serial No. 20,371, filed May 8, 1938.

These and other objects of my present invention will become more apparent from a study of the following description taken in connection with the accompanying drawing in which like numerals refer to like parts throughout.

Referring to the drawing:

Fig. 1 is a schematic representation of a machine embodying my invention, the view representing a cross section through the machine;

Fig. 2 is a front view partially in cross section of the machine taken along line 2—2 of Fig. 1;

Fig. 3 is a partial view corresponding to Fig. 1 showing a following step in the operation of the machine;

Fig. 4 is a partial cross section of Fig. 2 taken along lines 4—4;

Fig. 5 is an enlarged partial view of an element of the machine; and

Fig. 6 is a cross section of a modified form of element.

Referring to the drawing, there is schematically represented the closing unit of a bag closing machine. Bags 10, positioned in the machine, are filled with a predetermined quantity of material as represented at 11. The open mouth of the bag projects above the contained material and is sealed by the mechanism of my present invention. The bags are supported on a conveyor 12 of suitable construction, preferably an endless belt supported by rollers 13, the belt passing about a driving roll 14 intermittently revolved by a star wheel 15 and a driving wheel 16 of the usual type.

During a dwell in the forward progress of the bags each of the bags is closed by means of the following mechanism: As stated in the objects of the invention, the bags are preferably formed of a fusible material or have coatings of fusible substances applied thereto. At 20 there is rep-
resented a heating element which, upon making contact with the material, will fuse and cement the walls of the bag together. The heating element comprises a rigid bar 20 mounted upon a thrust member 21 guided in a frame 22. The thrust member carries a cam follower 23 bearing against a driven cam 24 and the heating element against the tension of a spring 25. The bar is suitably heated as by means of a coil 26 mounted therein. Opposite the heating bar there is positioned a backing member 30 similarly mounted upon a thrust member 31 guided in a frame 32 and having a cam follower 33. The backing member is actuated by a driven cam 34 synchronized with and similar to cam 24 and is retracted by a spring 36. The backing member, in accordance with my invention, is preferably a resilient, heat-resisting member formed of the type of rubber used in steam hoses. The forward bar-contacting edge of the backing member is preferably formed with longitudinal ribs 37 which will create undulations in the sealed area, thereby effecting a tight seal. The bars 24 and 34 are synchronized with the driving wheel 16 so as to cause the bag mouth to be momentarily squeezed by the heating bar and the backing member during the dwell of the conveyor, thereby fusing a portion of the bag walls together. The face of the heating bar 20 is preferably formed at an incline, thereby providing a sharp edge at its upper limit and a diverging surface at its lower limit. As seen in Fig. 3, the effect of this angularity of the heating face is such that any cutting of the bag material which may occur will take place above the sealed area. In Fig. 2 the sealed area is indicated at 40. The projecting end of the bag 41 may be trimmed from the bag or folded down upon the top of the bag. The form of backing member shown in Figs. 1, 3, and 5 may be replaced by the form shown in Fig. 6, consisting of a right rod 48 inserted through a length of rubber tubing 46, preferably having longitudinal ribs 47. Such tubing is readily procurable, being known as "steam tubing." I have consistently mentioned the backing material as being formed of rubber, but other resilient and heat resisting material may be substituted, it being my discovery that a better seal is obtained by the use of such a member.

In the packaging of numerous commodities such as coffee and the like, it is imperative that the goods be preserved in their original state. It is well-known that a number of commodities may best be preserved by evacuating the air therefrom. This may be further supplemented by refilling the bag with an inert gas. It is well-known that nuts are best preserved in an atmosphere of carbon dioxide. Coffee is best preserved in a vacuum. Various substances are preserved in various other gases. By the term "inert gas" I mean whatever gas is best to use in conjunction with whatever commodity is being packaged. It is perfectly within the purview of my invention that some goods may be best preserved by maintaining them in an atmosphere of a very chemically active gas, which will nevertheless be unharmed to the particular commodity and is therefore an inert gas within my meaning.

In order to evacuate the package and/or to replace the atmosphere with an inert gas, the following mechanism is employed: Mounted at one side of the conveyor upon a standard 60 is a hollow drum 61 pivoted at 62. An arm 63 carries a roller 64 biased against a cam 65 by a spring 66. Cam 65 is synchronized with the machine to rock the drum 61 during a dwell of the conveyor. A hollow extension of drum 61 extends over the mouth of the bag and terminates in a flattened mouth or spout 68 directly above the mouths of the bags. Upon delivery of the drum 61 which is synchronized into the mouth of the bag positioned immediately beneath it. A conduit 69 leads from the drum and a valve 70 is provided therein. The valve is so actuated as to open upon the insertion of the mouth of the extension 68 into the conduit 69 and is thereby connected to means for creating a vacuum. In order that the suction shall apply only to the drum 61 and the bag there is provided clamping means comprising resilient bars 80 and 81 mounted upon rods 82 and 83, respectively, which are actuated by similar cams 84 and 85 against the tension of springs 86 and 87, respectively. The resilient bars clamp the mouth of the bag around the mouth of the extension 68, and being deformable, are capable of forming a tight seal so as to prevent air entering the bag. As seen in Fig. 4, the bars 80, 81 press the sides of the bag against the extension 68 and likewise grip the edges of the bag beyond the extension.

Immediately upon the clamping of the bag mouth and the evacuation of the air therefrom, the valve 70 may be closed, and a valve 90 in a gas conduit 91 may be simultaneously opened, thereby forcing whatever inert gas is desired into the bag. The timing is preferably such that the inert gas is inserted into the bag just prior to the contacting of the heating bar and backing element with the sides of the bag. The momentary application of heat which follows effectively closes the bag, and thereupon the clamping bars 80 and 81 will be withdrawn and the drum 61 rotated to withdraw the extension 68 from the mouth of the bag. The next forward step of the conveyor brings the succeeding bag into position to repeat the cycle.

The present method of packaging is distinguished from other methods of packaging in that the evacuation of the air from the commodity is accomplished in a resilient and heat resisting bag rather than an ordinary vacuum packaging. The air is evacuated by placing the entire container in a vacuum chamber and exhausting the air therefrom.

I have mentioned the packaging of commodities and it will be apparent that the commodity packaged could be of liquid character as well as solid character. A feature of my invention is that even though a liquid or semi-liquid is placed in the bag, the air or other gas associated with the liquid may be withdrawn therefrom and/or an inert gas placed in association with the liquid. I have found that the sealing of the bag may be accomplished by my present apparatus through the liquid itself, the resilient backing member allowing a firm seal to be formed by forcing the liquid away from the area to be sealed.

I have illustrated and described a schematic embodiment of my invention. It will be readily apparent to those skilled in the art that other forms of machines may be devised, the main objects of the invention being nevertheless represented and illustrated. A primary feature of my invention is the provision of the resilient backing bar herein described. I do not intend to be limited to the details disclosed herein except in so far as determined by the scope of the following claims.
I claim as my invention:

1. In a machine for evacuating a filled bag and sealing the mouth of said evacuated bag, the combination of means for removing air from said bag including an extension terminating in a substantially flat mouth of less width than the bag mouth, means for holding the sides of the bag against the walls of said flat mouth and gripping the edges of the bag extending beyond said mouth.

2. In a machine for evacuating a filled bag and sealing the mouth of said evacuated bag, the combination of means for removing air from said bag including an extension terminating in a mouth having a cross-sectional area less than that of the bag mouth, and means for gripping the sides of the bag against said extension to hold the bag thereon, said last-named means comprising jaws made of resilient material, the working faces thereof holding the sides of the bag against the walls of said extension and gripping the edges of the bag extending beyond the mouth of said extension.

3. A machine of the class described comprising means for entering the mouth of a bag, said means having a cross-sectional area less than that of the bag mouth, means for gripping the edges of the bag mouth to hold the bag on said first named means, said gripping means comprising jaws made of resilient material, the working faces thereof holding the sides of the bag against the surface of said first named means, and gripping the edges of the bag mouth extending beyond said first named means whereby to form a seal between the material of the bag and said first named means.

4. The method of packaging commodities in flexible-walled fluid-tight bags which are sealed by securing their mouth portions into flattened face to face relation which comprises filling the bag with a measured amount of the commodity, applying yielding resilient collapsing pressure to a first transverse zone of the mouth portions of the bag about an interposed channel-shaped supporting surface thereby flattening said zone and bringing the terminal regions of the bag into a position closely approximating their face to face position after permanent sealing, withdrawing at least a portion of the gaseous atmosphere from the bag through the channel defined by said supporting surface, applying collapsing pressure to a second transverse zone of the bag below and in close proximity to said first-named zone without materially changing the direction of the bag walls between the first and second zones, and then sealing said bag in said second transverse zone.

5. The method of packaging commodities in bags constituted of flexible material fluid-tight and fusible on at least the inner face thereof which comprises filling the bag with a measured amount of the commodity, applying collapsing pressure to a first transverse zone of the mouth portions of the bag about an interposed channel-defining supporting surface thereby temporarily sealing said bag to said surface and bringing the terminal regions of the bag into a position closely approximating their flattened face to face position after permanent sealing, withdrawing gases from said bag through the channel defined by said supporting surface to cause collapsing of the bag on the contents under the effect of atmospheric pressure, and applying collapsing pressure and heat to a second transverse zone of the bag below and in close proximity to said first zone without materially changing the direction of the bag walls between the first and second zones thereby hermetically sealing said bag.

6. The method of packaging commodities in flexible-walled receptacles which comprises introducing a measured amount of the commodity into the receptacle to form a substantial head space, flattening the walls defining said head space in a first transverse zone with the application of a restricted portion in said zone, withdrawing gases from said receptacle through said restricted portion thereby to cause collapsing of the walls of the receptacle and elimination of the head space, flattening the walls of the receptacle throughout another transverse zone closely adjacent to and below said first zone without producing material changes in the direction of the walls intermediate to said zones, and then sealing the receptacle in said second zone while the receptacle is in the flattened condition.

7. A machine for packaging commodities in flexible-walled open-mouth bags which comprises means for withdrawing gases from a filled bag, including a hollow member having at least one of its cross-sectional dimensions a small fraction of the corresponding dimension of said bag mouth, said hollow member being adapted to be inserted into the mouth of said filled bag; means for flattening the terminal regions of said mouth about said member, thereby to displace the major portion of said regions into opposed face to face sealing position approximating the final sealing position; means for transversely flattening said mouth in a zone below and adjacent to said first flattening means, thereby to complete displacement of said bag mouth into final sealing position; and means for permanently sealing said bag in said zone.

8. A machine for packaging commodities in flexible-walled open-mouth bags, fluidtight and fusible on at least the inner face thereof, which comprises means for withdrawing gases from a filled bag, including a hollow member having at least one of its cross-sectional dimensions a small fraction of the corresponding dimension of said bag mouth, said hollow member being adapted to be inserted into the mouth of said filled bag; temporary sealing means for flattening the terminal regions of the bag mouth about said member in a first transverse zone, thereby to displace the major portion of such regions into face to face sealing position approximating the final sealing position; and permanent sealing means for heating and flattening said mouth in a second transverse zone adjacent to said first zone but below the end of said hollow member, thereby to complete displacement of said bag mouth into final sealing position and to cause fusion of the inner face and hermetic seal of said bag.

9. A machine for packaging commodities in flexible-walled open-mouth bags, fluidtight and fusible on at least the inner face thereof, which comprises means for withdrawing gases from a filled bag, including a hollow member having at least one of its cross-sectional dimensions a small fraction of the corresponding dimension of said bag mouth, said hollow member being adapted to be inserted into the mouth of said filled bag; temporary sealing means for flattening the terminal regions of the bag mouth about said mem-
ber in a first transverse zone, thereby to displace the major portion of such regions into face to face sealing position approximating the final sealing position; permanent sealing means for heating and flattening said mouth in a second transverse zone adjacent and parallel-spaced from said first zone but below the end of said hollow member, thereby to complete displacement of said bag mouth into final sealing position and to cause fusion of the inner face and hermetic sealing means.

10. A machine for packaging commodities in flexible-walled bags, fluid tight and fusible on at least the inner face thereof, which comprises means for withdrawing gases from a filled open-mouth bag, including a hollow member having at least one of its cross-sectional dimensions a small fraction of the corresponding dimension of said bag mouth, said hollow member being adapted to be inserted into the mouth portions of said filled bag; temporary sealing means including a pair of elongated sealing jaws for transversely flattening the terminal regions of the bag mouth and forming a substantially gastight seal between said terminal regions and said hollow member, thereby to displace the major portion of such regions into opposed face to face relation approximating the final sealing position; and permanent sealing means including a pair of elongated jaws for applying heat and pressure to said terminal regions in a transverse zone adjacent and parallel-spaced from said first zone but below the end of said hollow member without materially changing the direction of the bag walls between the first and second zones to cause fusion of the inner face and hermetic sealing of the bag.

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