

June 9, 1959

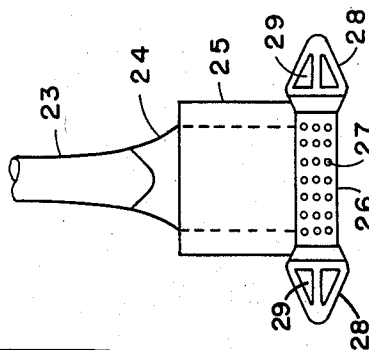
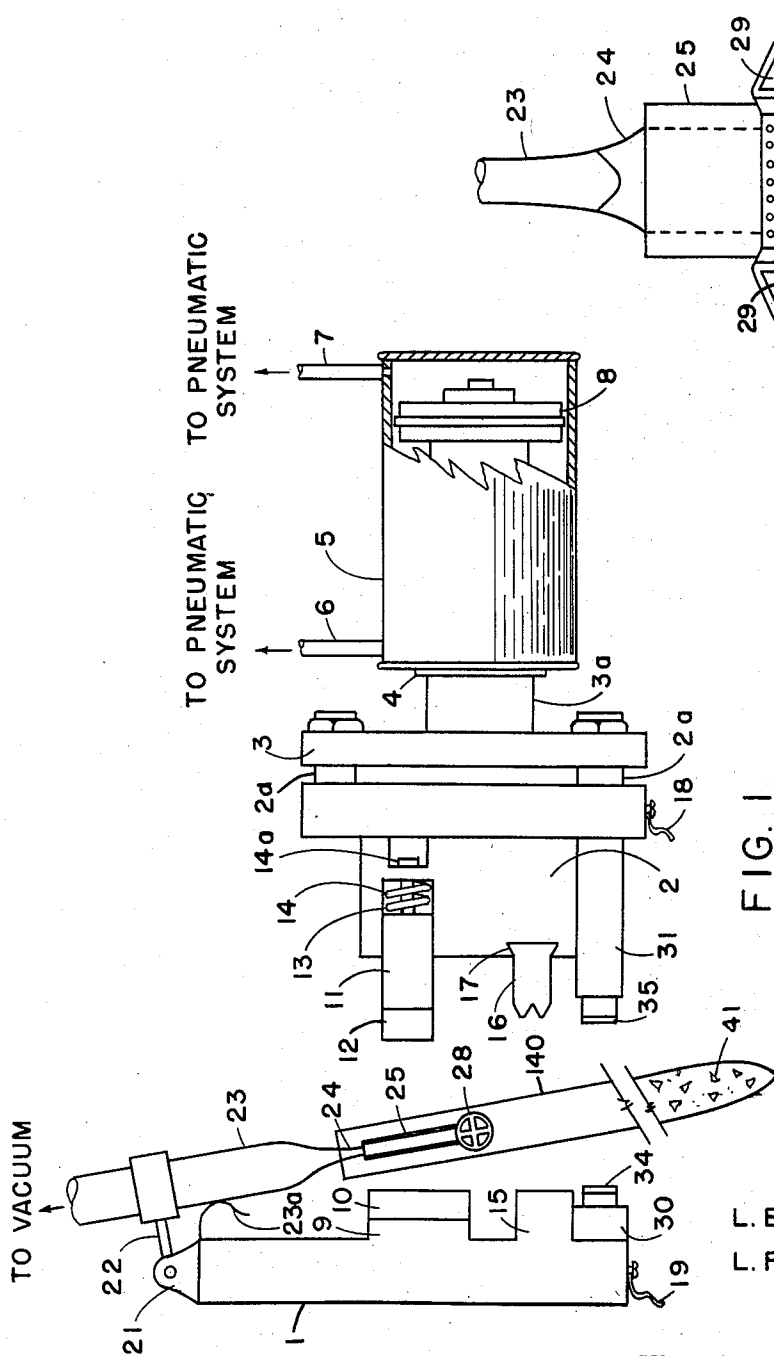
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2,889,673

SEALING DEVICE

Filed Oct. 24, 1955

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2

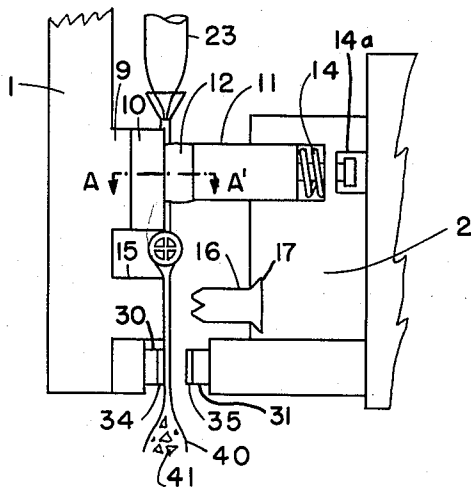


FIG. 3

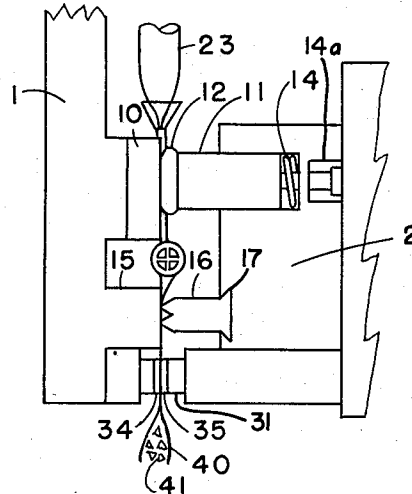


FIG. 6

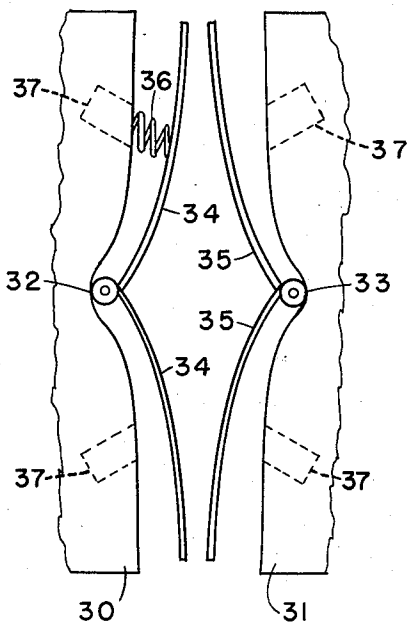
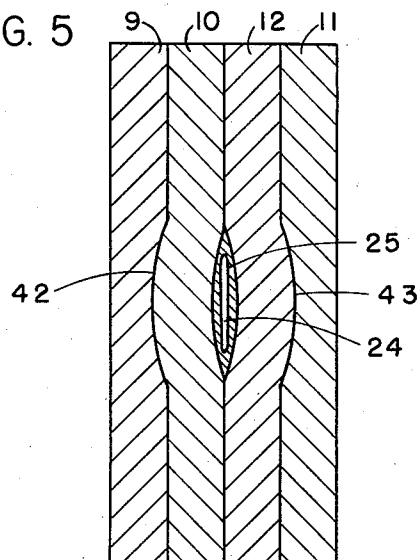


FIG. 5



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2,889,673

SEALING DEVICE

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2 Claims. (Cl. 53—112)

(Granted under Title 35, U.S. Code (1952), sec. 266)

A non-exclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government, with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States of America.

This invention relates to sealing devices particularly adapted to the sealing of containers made of plastic films or other sheet material. A particular object of the invention is the provision of novel equipment of such type by which containers can be evacuated, or invested with any desired fluid, prior to sealing. Further objects and advantages of the invention will be obvious from the following description taken into connection with the annexed drawing.

In the drawing:

Figs. 1, 2, and 3 are elevations of one modification of the sealing device falling within the scope of this invention. The separate Figures 1, 2 and 3 depict the same device in three phases of operation: Fig. 1 illustrates the device open for insertion of a container; Fig. 2 illustrates the device in the vacuumizing phase; and Fig. 3 illustrates the device in the sealing phase. In Figs. 2 and 3 parts have been omitted to simplify the representation.

Figs. 4, 5 and 6 represent, respectively, a side elevation of the evacuating tube, a cross-section taken on plane A—A' of Fig. 2, and a plan view of the bag-tensioning device. All of these figures are on an enlarged scale.

Within recent years there has been a trend toward increased use of containers made of plastic films for packaging various products. With many types of articles such containers are quite satisfactory and often cheaper and more attractive than conventional containers of metal or paper. In some instances it is desirable to package materials under vacuum or in an atmosphere of an inert gas. Such type of packaging is desirable for example with foodstuffs which are susceptible to oxidative changes on storage. Examples of such foods are nuts, bacon, ham, and many other meat products, dehydrated fruit or vegetable juices, dehydrated potatoes, dehydrated soups, coffee, and so forth. Equipment hitherto available for such packaging purposes is complex, expensive and slow in operation. For instance, the generally used sealers are of what may be termed the cavity type. These devices include a cylinder equipped with a removable lid. The bag containing the material to be packaged is placed in the cylinder, the lid is secured, and all the air in the container is exhausted. The package is sealed while in the cylinder, then the lid is opened and the sealed package removed. Such equipment has the primary disadvantage that all the air in the cylinder must be evacuated to achieve vacuum within the package. This is naturally a cumbersome technique and the packaging operation is slow because of this fact. Where the package is to be invested with an inert gas, there is considerable wastage of such gas as the entire cylinder must be filled with the gas.

One significant feature of the device of this invention is that only the air in the package itself need be exhausted

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to achieve sealing under vacuum. This means that the device of this invention can utilize a vacuum pump of smaller size and the attainment of vacuum requires less time because there is much less volume of air to be removed. Where an inert gas or other fluid is to be introduced into the package after evacuation, only that amount of gas which is actually needed in the package is used.

The principles of the invention are explained as follows:

Fig. 1 illustrates the sealing device in its open position for reception of a package to be sealed. The device includes fixed jaw 1 and movable jaw 2. Jaw 2 is adjustably attached by screws 2a to plates 3 which in turn is attached to shaft 3a. This shaft extends through packing gland 4 into cylinder 5, there being a piston 8 attached to shaft 3a within cylinder 5. At the opposite ends of cylinder 5 are provided pipes 6 and 7, these being connected to a conventional pneumatic pumping system (not illustrated). It is evident that by forcing the air into pipe 6 and withdrawing the air through pipe 7, jaw 2 can be moved away from jaw 1. By reversing the flow of air, jaw 2 can be moved toward jaw 1. Jaws 1 and 2 are preferably made of aluminum, brass or other electrically conductive metal in the modification in which the bags are electrically sealed, that is, by applying a high frequency current across the bag at the point of sealing. If sealing is to be carried out by thermal means, that is, by application of a heated blade to the bag, then the jaws may be constructed of strong, heat-insulating material. Where the jaws are made of metal their inner faces may be covered with an electrically insulating material to prevent accidental shock to the operator.

The means for pinching shut the open end of a bag during evacuation and sealing includes boss 9 mounted on jaw 1, this boss being covered with pad 10 made of rubber or other flexible material. Cooperating with these members and located on jaw 2 is arm 11 covered by rubber pad 12. Arm 11 is slidably received in horizontal slot 13 so that the arm can move toward or away from jaw 1 in a horizontal plane. A series of springs 14 adapted to exert an outward bias (toward jaw 1) against arm 11 is provided within slot 13. Arm 11 is provided with bolts 14a which act as limit of motion devices to prevent springs 14 from ejecting the arm 11 out of slot 13.

The means for sealing the bag includes anvil 15 protruding from the face of jaw 1. This anvil is metallic for use with an electronic sealing blade or is made of silicone rubber, for example, for use with a heat sealing blade. Cooperating with anvil 15 is metallic sealing blade 16 carried by jaw 2. The sealing blade illustrated has a double bag-contacting head and will establish a double seam of sealing across the mouth of the bag. Blades for forming a single seam or more than two seams may be used as desired. Sealing blade 16 may be exchanged for another of different shape by sliding it out of keyway 17.

A suitable generator of high-frequency electromagnetic waves (not illustrated) is connected via wires 18 and 19 to jaws 2 and 1, respectively. When the generator is actuated, the current will flow through the container to be sealed at the area of contact between anvil 15 and blade 16 causing the sides of the container to be fused together.

The means for withdrawing air from packages and for introducing desired fluid into the packages after evacuation is described as follows:

Upon jaw 1 is mounted bracket 21 to which is pivoted arm 22 which bears tube 23. Spring 23a biases tube 23 away from jaw 1 when the jaws are open. Tube 23 is connected to a source of vacuum (not illustrated). If desired a series of valves may be provided for serial connection of tube 23 with a source of vacuum, then

with a source of inert gas or other fluid desired for introduction into the package.

The lower portion of tube 23 is flattened as at 24. About the flattened portion is provided a rubber wing-like member 25, see Figs. 4 and 5.

Referring now to Fig. 4, it is seen that tube 23 connects with barrel 26 provided with perforations 27. The ends of barrel 26 are provided with generally acorn-shaped cages 28, the diameter of these being somewhat larger than the diameter of barrel 26. Air or other fluid can pass freely through perforations 27 into tube 23 or through apertures 29 into the open ends of barrel 26 and thence into tube 23.

The bag tensioning or flattening device is depicted in Fig. 6. Referring to this figure, on jaws 1 and 2 are provided bosses 30 and 31, respectively, made of strong, non-conductive plastic material which carry pivots 32 and 33 which in turn bear rubber-covered steel spring bars 34 and 35. Bearing against bars 34 and 35 are coil springs 36 (only one illustrated) set in recesses 37. Springs 36 tend to force bars 34 toward bars 35. When the sealing device is in the vacuumizing phase (Fig. 2) the bars 34 and 35 press against the container with minimum force and therefore do not cause the bag to be pinched shut whereby there is no interference with the evacuation of air from within the container. However, when the sealing device is in the sealing phase (Fig. 3), the bars 34 and 35 exert a sideward pressure on the container as the jaws 1 and 2 come together. The sideward stretching of the container prevents crimping at the seal and hence prevents ineffective closure.

In operating the device to seal a package, the jaws are open as in Fig. 1 and tube 23 is pivoted away from jaw 1 also as shown in this figure. A bag 40 of polyvinylidene chloride film or the like containing articles 41 is inserted between the jaws to envelop the lower part of tube 23.

The pneumatic system is then actuated to move jaw 2 to the left to the position shown in Fig. 2. At this stage, the power exerted by the pneumatic system is so balanced against the expansive bias of springs 14 that pads 10 and 12 are in tight engagement whereas anvil 15 and sealing blade 16 are a small distance apart. The engagement of pads 10 and 12 causes a closing of the open end of bag 40 so that the bag can then be evacuated.

After, or simultaneously with, the closing of jaw 2, tube 23 is connected to the source of vacuum. As the air is sucked out of bag 40, the walls of the bag collapse. However, barrel 26 and cage 28 prevent the collapsing walls of the bag from plugging up the passageway to tube 23. The perforations 27 permit the vacuum to hold the side walls of the bag close to the barrel 26 and aid in preventing the plastic film from being stretched and pulled into apertures 29. The tension bars 34 and 35, the bag mouth pinching assembly (members 9, 10, 13, 14, etc.) all aid in preventing extension of the plastic film and the collapse of the film which otherwise would tend to seal off apertures 29 and prevent evacuation of the bag. With the device of this invention, the residual air in bag 40 can be evacuated within a few seconds.

Referring to Fig. 5 it can be seen that during the evacuation and sealing phases, no air can get into the bag 40. Thus it is squeezed shut between pads 10 and 12. During these phases the pressure forcing jaws 1 and 2 together also causes pads 10 and 12 to deform about wing-like member 25 so that no air can leak in about the flattened portion 24 of tube 23 or about the sides of the wing 25. The boss 9 and arm 11 are recessed slightly as at 42 and 43 to permit deformation of rubber pads 10 and 12 to conform to the shape of the wing member 25 and tube 24.

It is obvious that the members 9 and 10, 11 and 12, 15 and 16, and 34 and 35 should have a length (the dimension running at right angles to the paper on which

Figs. 1, 2 and 3 are drawn) greater than the width of bag 40. On the other hand, wing 25 should be of less width than the bag so that the bag can easily be placed about wing 25 when the packaging operation is initiated.

After the bag 40 has been exhausted, the air pressure in the pneumatic system connected to tube 7 is increased to increase the pressure on the right hand side of piston 8 in order to overbalance the expansive forces of springs 14 bearing against arm 11 and springs 36 bearing against bars 34, 35. As a result, anvil 15 and sealing blade 16 bear against the walls of bag 40 extending between them, as shown in Fig. 3. At this time the source of electrical energy connected to wires 18 and 19 is turned on and as a result of the heating effect taking place at the point of contact the bag is sealed along parallel seams corresponding with the length of blade 16. During the sealing operation springs 34 and 35 stretch the walls of bag 40 to prevent crimping as explained above.

After the sealing has been completed, the hydraulic system is activated to move piston 8 to the right whereby the sealed bag 40 is released and drops out from between jaws 1 and 2. The device is then ready for sealing up the next package.

If the package is to be invested with a fluid prior to sealing, the following technique is applied. Bag 40 is exhausted as previously described then tube 23 is connected with a source of fluid to introduce this material into the bag. Jaw 2 is then moved further to the left to cause engagement of the sealing anvil and blade (15 and 16) and the sealing is effectuated as before.

Introduction of an inert gas, such as nitrogen, into the container after evacuation and prior to sealing is often desirable with diverse food products to protect them from oxidation, etc. during storage. Also by introducing a gas of this type the particles 41 will be loose within the package after sealing. If the package is sealed under vacuum the walls of bag 40 will remain tightly collapsed about the particles 41 so that the package will be a rigid unit and particles 41 will be held tightly together by the pressure of the atmosphere acting on the external walls of bag 40. Thus there is a matter of appearance to be considered here as to whether the final package is desired to be limp and contain loose articles (sealed in gaseous atmosphere) or whether the final package is desired as a rigid unit with coherent particles within it (sealed under vacuum).

Examples of food products which are preferably packaged under vacuum or in an atmosphere of inert gas are dried eggs, dried milk, bacon, sausage, hamburger patties, butter, margarine, shortenings, coffee, tea, orange juice powder, tomato juice powder, dried potato granules, dried string beans, dried peas, dried cabbage slices, dried mushrooms, nut meats, candies, pickles, and so forth.

Instead of an inert gas or together with the inert gas, other fluids can be introduced into the package prior to sealing. Thus in packaging food products, after the container is exhausted a stream of nitrogen, dry air or the like may be used as a carrier to introduce diverse vapors into the package. In this manner one may introduce vapors of such agents as: antioxidants, for example, butylated hydroxyanisole, nordihydroguaiaretic acid, propyl gallate, and so forth; enzyme-inactivating agents as sulphur dioxide; flavoring agents as volatile fruit essences, essential oils, hickory wood smoke, acetic acid, and so forth; fungicides as propylene oxide; etc. In the case of packaging hardware or other metallic objects, vapors of corrosion-preventing agents may be inserted in the package in the same fashion. Further extensions of these principles will be obvious from the foregoing.

In the preferred modification of this invention, high-frequency electrical energy is used for sealing the plastic film package. It is obvious that other sealing techniques can be used. For example, sealing blade 16 may be provided with internal coils heated by passage of an electrical

current whereby the blade becomes hot and the sealing is effectuated simply by applying thermal heating during the phase when blade 16 and anvil 15 are in engagement.

For rapid sealing of packages on the device of this invention it is preferred that there be provided rapid-acting mechanisms for actuating the step-wise closing of jaw 2, connection of tube 23 to the vacuum source, connection of tube 23 to the fluid source for adding fluid to the package, activating the high frequency electrical supply for sealing, and opening jaw 2. To this end there may be provided a series of push-button switches which operate through relays to activate the various valves and switches to accomplish the proper series of activities. Devices of this type are purchasable on the open market and need not be described further herein.

To prevent adhesion of the plastic film to anvil 15 and sealing blade 16 it is usually desirable that these members be covered with an thin film of polyfluoroethylene or other heat-resistant, non-adhesive, soft plastic film.

Having thus described the invention what is claimed is:

1. An apparatus for packaging commodities in a flexible-walled, open-mouth bag while the bag is held in the open atmosphere which comprises gas conducting means for withdrawing gases from a filled bag, including a vertically disposed flattened tube, a horizontally-disposed, hollow perforated cylinder connected to the lower end of the tube and extending in a line coincident with the larger cross-sectional diameter of the tube, a pair of perforated generally acorn-shaped hollow cages at the ends of the cylinder, said cages having a greater diameter than said cylinder, said gas conducting means being adapted to be inserted into the mouth of said filled bag, resilient means for pressing the upper walls of the bag about the said flattened tube to effect a temporary sealing of the bag and means for permanently sealing the walls of the bag at a zone below the position of gas conducting means.

2. A device for packaging commodities in a flexible-walled, open-mouth container while the container is held in the open atmosphere comprising a fixed jaw and a jaw movable toward and away from said fixed jaw, said jaws

being adapted to receive therebetween a container having an upper open end and a lower closed end, a first protuberant element on said fixed jaw, a second protuberant element on said movable jaw aligned with said first protuberant element, said protuberant elements being adapted to pinch the open end of the container therebetween when said jaws are moved together, gas conducting means for evacuating the container and introducing fluid therein, said gas conducting means including a vertically-disposed flattened tube, a horizontally-disposed, hollow perforated cylinder connected to the lower end of the tube and perforated hollow cages at the ends of the cylinder having a diameter greater than that of the cylinder, said gas conducting means being pivotally supported by said fixed jaw and extending downwardly between said jaws and elements, a pair of co-acting sealing members carried by said jaws, and means for adjusting said movable jaw between a series of positions including a first position wherein the jaws are open and a container may be inserted therebetween, a second position wherein the jaws are partly closed and the said protuberant elements co-act to close the upper end of the container but the sealing members are not in engagement, and a third fully closed position wherein said protuberant elements and sealing members are in engagement.

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