[54] METHOD OF MAKING A PACK FOR ABSORBING OR ADDING HEAT

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Filed: Sept. 18, 1972

Related U.S. Application Data

Continuation of Ser. No. 23,598, March 30, 1970, abandoned.

U.S. Cl. 53/25, 53/27, 53/36, 62/4, 128/403, 29/157.3 R

Int. Cl. B65b 3/00

Field of Search 53/28, 36, 180, 25, 53/27, 28, 36, 62/4, 206/47 A; 126/263; 128/403

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ABSTRACT

A hot or cold pack including a rupturable container having a first chemical therein and a second container having a second chemical therein sealed from the first chemical and reactive therewith to absorb or give off heat. The rupturable container is completely filled with the first chemical to facilitate rupture thereof in response to an impact blow. The rupturable container can be made from heat sealable sheet material in a process which involves heat sealing through a column of the first chemical which extends above the location at which the heat seal is formed to thereby assure complete filling of the container.

14 Claims, 8 Drawing Figures
METHOD OF MAKING A PACK FOR ABSORBING OR ADDING HEAT

This is a continuation of U.S. Pat. application Ser. No. 23,598 filed Mar. 30, 1970, now abandoned.

BACKGROUND OF THE INVENTION

A hot or cold pack typically includes a rupturable container, having a first chemical therein. A second chemical is positioned adjacent the rupturable container with the rupturable container preventing contact between the two chemicals. Upon rupturing of the rupturable container, the first and second chemicals mix and react to give off heat or to absorb heat to thereby produce the desired heating or cooling effect.

Hot and cold packs often use water within the rupturable container as the first chemical. When the pack is subjected to below freezing temperatures for a period of time, the water therein freezes. This can occur, for example, during transport of the pack or when a hot pack is to be used, for example, as a hand warmer in a cold environment. If the water freezes completely, the pack is not usable as little or no reaction will occur. With only partial freezing of the water of a hot pack, the exothermic reaction can be begun; however, much of the heat produced by the reaction is used to convert the ice to water without causing any temperature rise in the water, i.e., much of the heat of the reaction is necessary to overcome the latent heat of fusion of the ice.

It is also desirable to control the rate of heat emission of the hot pack. Therefore, the reaction causes the pack temperature to increase and drop off relatively rapidly thereby reducing the length of time during which the pack gives off heat.

One problem which relates to both hot and cold packs is the rupturing of the rupturable container. The rupturable container must not fracture during normal handling and storage but must fracture easily when struck with an intentional blow for the purpose of rupturing the same. Therefore attempts to control or facilitate the rupture of the rupturable container have been directed to the construction of the rupturable container.

SUMMARY OF THE INVENTION

The present invention provides a hot or cold pack which solves the above noted problems. First, to facilitate and/or control rupture of the rupturable container, the rupturable container should be completely filled with a first flowable, substantially noncompressible chemical and all compressible components such as air should be excluded from the rupturable container. Preferably the flowable chemical in the rupturable container is under some pressure greater than atmospheric. With the container completely filled, rupture thereof in response to an impact blow is more easily obtained. Furthermore, if the flowable chemical within the container is actually under some pressure, the rupture of the container is made still easier.

To reduce the freezing point of the water which is typically used as the flowable chemical in the rupturable container, salt such as calcium chloride (CaCl₂) can be added in varying quantities to the water depending upon the amount of freezing protection desired. In addition to providing freezing protection, calcium chloride can also be used to prolong the period of time during which a hot pack is maintained at an elevated temperature. This latter advantage is obtainable by using calcium chloride as a second chemical outside of the rupturable container and as an ingredient of the flowable chemical.

The present invention provides a method of advantageously filling the rupturable container. With this method complete filling of the rupturable container is assured. In addition, the flowable chemical in the rupturable container is pressurized by a column of the flowable chemical which extends above the container. The upper end of the container is then sealed by heat sealing directly through the column of flowable chemical. This assures complete filling of the rupturable container and pressurizes, to some degree, the flowable chemical in the rupturable container.

This method can be rapidly carried out in an apparatus which continuously forms and severs rupturable containers from a strip of sheet material. Preferably the apparatus密封s portions of the strip to form a container having an open upper end and this container is filled or partially filled with the flowable chemical. Predetermined regions of the container which are spaced upwardly from the bottom of the container and which lie beneath the level of flowable chemical are then sealed. The sealing operation is carried out through the column of flowable chemical with a quantity of the flowable chemical extending above such predetermined regions to thereby pressurize the flowable chemical sealed within the container.

The operation which seals the container is preferably a heat sealing operation. Because this heat sealing operation is carried out through a column of flowable chemical, it is necessary to heat the heat sealing members or jaws to a higher temperature than would be necessary if the water were not present. This is necessary because of the additional heat absorbed by the column of flowable chemical from the jaws thereby resulting in a greater temperature drop in the jaws than if the heat sealing operation were not carried out through the first chemical. Thus, the first chemical has a cooling effect on the jaws.

With the present invention, the jaws are preferably heated to a temperature which is sufficiently high to rupture the container if the heat sealing operation was carried out without the cooling effect of the flowable chemical. Accordingly, if the apparatus for supplying the first chemical should malfunction and fail to adequately fill the container, the heat sealing jaws will not be cooled and will rupture the sheet material of the container thereby failing to seal the container. Thus, this aspect of the present invention provides an inherent quality control feature which prevents the production of only partially filled containers.

Another feature of the present invention involves the heating of the flowable chemical prior to the heat sealing operation which seals the container. In this heat sealing operation, the heat sealing jaws must be reheated between each sealing operation and the time required to reheat the jaws can be the limiting factor in the speed of making the containers. With the present invention, the water in the containers is preferably heated to a temperature above ambient so that the jaws will transfer less heat as a result of the heat sealing operation and thereby suffer a smaller temperature drop. Thus, reheating of the jaws can be accomplished much
more quickly than if the water in the containers were not heated.

Although the heating of the water can be accomplished in many different ways, it can advantageously be provided by using water and calcium chloride as the flowable chemical. Thus, the salt not only provided protection against freezing and a more desirable heat emission curve but is also of substantial value in carrying out the method of this invention.

It is often desirable to place the rupturable container and a second chemical reactant with the flowable chemical within an outer container. According to the present invention this can be accomplished by making the rupturable container and the outer container in two substantially similar machines and by conveying the rupturable container to the machine forming the outer container in a predetermined timed relationship. In this manner, the rupturable container and the second chemical can be deposited within the outer container just prior to sealing of the outer container.

One kind of machine for making sealed plastic containers includes first and second rotors having first and second jaws thereon for forming the end seals on the containers. Following the sealing operation performed by these jaws, a knife automatically cuts the sealed container from the remainder of the sheet material and such container is allowed to fall by gravity to an appropriate location such as a conveyor. The heat sealing jaws must be pivotally mounted on their respective rotors and spring biased in the direction of rotation of their respective rotors in order to assure proper orientation of the jaws at the beginning of the heat sealing operation. As the jaws separate following the heat sealing operation, their respective springs thereof quickly snap the jaws toward the severed container. This can result in the jaws slapping the container and causing it to fall to a location spaced from the desired location. The present invention provides means for preventing slapping of the container by the jaws. Specifically, the present invention delays movement of the jaws in response to the forces directed thereagainst by their respective springs at the completion of the heat sealing operation.

The invention, both as to its organization and method of operation together with further features and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying illustrative drawings.

FIG. 1 is a side elevational view of an apparatus constructed in accordance with the teachings of this invention and adapted to carry out the method of this invention.

FIG. 2 is an enlarged fragmentary side elevational view of the heat sealing jaws and the means for delaying the abrupt movement of the jaws at the termination of the heat sealing operation.

FIG. 3 is a sectional view showing how the apparatus of FIG. 1 heat seals the plastic sheet material to form a container.

FIG. 4 is a perspective view of a rupturable container of the type utilized in a hot or cold pack.

FIG. 5 is a fragmentary sectional view showing typical sidewall construction of the rupturable container of FIG. 4.

FIG. 6 is a fragmentary sectional view taken generally along line 6—6 of FIG. 4.

FIG. 7 is a side elevational view partially in section of a hot or cold pack constructed in accordance with the teachings of this invention.

FIG. 8 is a representative plot of pack temperature versus time for a typical prior art hot pack and a hot pack constructed in accordance with the teachings of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 4 of the drawings, reference numeral 11 designates a rupturable container constructed in accordance with the teachings of this invention. Although the container 11 may take many forms, in the embodiment illustrated the opposite ends of the container 11 are sealed by seams 13 and 15 and the container is sealed longitudinally between the seams 13 and 15 by a back or side seam 17. The seams 13, 15 and 17 are preferably the result of heat sealing operations. As used herein, heat sealing means the formation of a seal through the application of heat and/or pressure to the regions to be sealed. The container 11 is adapted to contain a flowable, substantially noncompressible chemical 19 which may be in liquid form such as water.

The chemical 19 completely fills the container 11 so that substantially all compressible gases such as air are excluded from the container 11. Preferably, the chemical 19 is under some pressure greater than atmospheric.

The container 11 is a rupturable container and the complete filling thereof as well as the pressurization of the chemical 19 facilitates rupture of the container. The container 11 may be made rupturable in any desired manner such as by scoring or controlling the heat sealing operations to provide a weakened joint. Preferably, however, the container 11 is made rupturable in the manner described in common assignee's copending U.S. Pat. application Ser. No. 19,202 filed Mar. 13, 1970, now U.S. Pat. No. 3,674,134 and entitled "Rupturable Container."

The container 11 is constructed of thin flexible sheet material which is preferably heat sealable. Although the particular details of construction can be varied within the teachings of the present invention, it is preferred to utilize laminated plastic sheet material. In the embodiment illustrated, the laminate includes an outer layer 21 (FIG. 5) of a polyester film made from polyethylene terephthalate (commonly designated by the trademark Mylar) and an inner layer 23 of low density polyethylene film. For example, the outer layer 21 may be 50 gauge seran coated polyester such as Dupont M24 Mylar. The two layers may be bonded together with a suitable adhesive 25 such as a polyurethane adhesive compound.

FIG. 6 shows the seam 17 with the illustrated construction being simplified so that the seam appears as a two-layer structure. The seam 17 is preferably a flip or French seal and is folded over substantially as illustrated. The seam 17 may be formed in the manner disclosed in common assignee's copending U.S. Pat. application Ser. No. 19,202 filed Mar. 13, 1970, and now Pat. No. 3,674,134, and entitled "Rupturable Container."

FIG. 7 illustrates a pack 29 which includes an outer container 31 having the rupturable container 11 and a chemical 33 sealed therein. The container 29 may be made from one or more suitable layers of material to
provide the desired properties for the container. For example, the container 29 may have an inner layer 35 of a polyethylene composition to allow the inner surfaces of the container to be sealed as by the application of heat and pressure to form end seams 37. The container 29 may also include an outer layer 39 of a suitable material such as polyethylene terephthalate to impart strength to the container. The container 31 may also have a side seam (not shown) similar to the side seam 17 (FIG. 4).

The chemical 33 in the embodiment illustrated is a solid granular material and is sealed within the container 29. If the pack 29 is intended to apply heat to an object, the chemical 33 may be anhydrous calcium chloride (CaCl₂). When the pack is to remove heat from an object, the chemical 33 may be ammonium nitrate (NH₄NO₃). The ammonium nitrate may be commercial grade particles which may be partially ground before they are placed in the container. Commercial grade ammonium nitrate generally includes particles or pellets having a clay coating. By partially grinding the particles or pellets, the clay coating becomes ruptured to expose the ammonium nitrate.

The rupturable container 11 in the embodiment illustrated is disposed within the container 29 and is sealed so that the chemical 19 therein is sealed from the chemical 33. If the pack 29 is a hot pack, the chemical 19 may be a solution of water and a salt such as calcium chloride (CaCl₂). The calcium chloride lowers the freezing point of the water an amount dependent upon the relative proportions of the water and calcium chloride. For example, a solution containing 18 percent by weight calcium chloride and 82 percent by weight water can be expected to protect the water against freezing down to a temperature of 0° F.

Another advantage of adding the calcium chloride to the water within the rupturable container 11 is illustrated in FIG. 8. Curves A and B represent typical plots of prior art hot packs and a hot pack constructed in accordance with the teachings of this invention, respectively. It can be seen that the typical prior art hot pack produces a higher temperature initially and that the temperature of the prior art hot pack drops to ambient more rapidly. Thus, with the present invention, the hot pack provides elevated temperatures for a longer period of time.

In use of the pack 29, the user strikes the pack with an impact blow thereby rupturing the rupturable container 11 to allow mixing of the chemicals 19 and 33. The mixing of the chemicals 19 and 33 can be speeded up by shaking or kneading of the pack 29.

FIG. 1 shows an apparatus 51 which is particularly adapted for constructing hot or cold packs such as the pack 29 (FIG. 7). Generally, the apparatus 51 includes two substantially similar container forming machines 53 and 55 for making the containers 11 and 31, respectively. The machine 53 is elevated by a support 57 to a higher elevation than the machine 55. Each of the machines 53 and 55 may be of conventional construction except to the extent expressly noted herein and for this reason these machines are not described in intimate detail. For example, each of the machines may be of the type manufactured by Econ-o-Line Manufacturing Company, Houston, Texas.

The machine 53 includes rotors 59 and 61 suitably mounted for rotation about parallel horizontal axes with each of the axes being at the same elevation. Suitable means (not shown) are provided for adjusting the distance between the axes of the rotors 59 and 61. A plurality of heat sealing jaws 63 and 65 are pivotally mounted on the rotors 59 and 61, respectively. Although five of the jaws are mounted on each of the rotors 59 and 61, any number of jaws may be utilized; however, the number of jaws 63 should equal the number of jaws 65. The rotors 59 and 61 are synchronized so that each of the jaws 63 can cooperate with one of the jaws 65 to perform a heat sealing operation. The rotors 59 and 61 rotate continuously at the same angular velocity.

The construction and coaction of the jaws 63 and 65 can best be understood from FIG. 2 which shows a typical pair of the jaws 63 and 65. The jaws 63 and 65 are suitably mounted for limited pivotal movement on base members 67 and 69, respectively, by pins 71. The base members 67 and 69 are suitably rigidly mounted on the rotors 59 and 61, respectively. Springs 73 and 75 tend to pivot the jaws 63 and 65, respectively, in the direction of the arrows in FIG. 2. When the jaws 63 and 65 are unrestrained as shown in FIG. 1, their respective springs 73 and 75 bias them to a predetermined inclined position shown in FIG. 1. Suitable stops (not shown) hold the jaws in the inclined positions shown in FIG. 1. However, cooperation of a pair of jaws 63 and 65 causes the cooperating jaws to pivot to a generally radial position as shown in FIG. 2.

Each of the jaws 63 and 65 is suitably electrically heated in a conventional manner. Each of the jaws 63 and 65 have cooperating faces 76 which confront each other during the heat sealing operation performed thereby as shown in FIG. 2. Each of the jaws 63 has a knife 76a mounted in a conventional manner in a recess in the face 76. The machine 53 as described hereinabove in the Description of the Preferred Embodiment is conventional.

Delaying means in the form of angle members 77 and 79 are mounted on the upper ends of the jaws 63 and 65 as shown in FIG. 2. Each of the angle members 77 and 79 includes a base 81 for fixedly mounting the angle member on its respective jaw and an upright leg 83.

A roll 85 of heat sealable flexible plastic sheet material 86 is mounted for rotation on a spindle 87. The sheet material 86 may be of the type shown in FIG. 5. The sheet material 86 is run over a number of rollers 89 to a sealing and forming device 91 which forms the sheet material into a generally tubular configuration and which forms a longitudinal heat seal such as the seam 17 of the rupturable container 11 (FIG. 4). In the embodiment illustrated, the sheet material 86 is pulled through the machine by the jaws 63 and 65.

The device 91 is also of conventional construction and some of the details thereof can best be understood from reference to FIG. 3. Many different kinds of the device 91 can be utilized and the form shown in FIG. 3 is merely illustrative.

The device 91 includes a plate member 93 having a generally circular forming orifice 95 therein. A finger element 97 projects through the orifice 95 in spaced relationship to the wall of the orifice. The finger element 97 extends radially inwardly as it extends downwardly as shown in FIG. 3. The finger element 97 is arcuate in transverse cross section with the curvature thereof generally conforming to the curvature of the adjacent portion of the wall of the orifice 95. The finger
element 97 and the plate member 93 are suitably rigidly affixed to the machine 53 and form a portion thereof.

A side sealing element 99 is pivotally mounted by a pin 101 on a support arm 103 which is in turn pivotally mounted on the plate member 93 by a shaft 105. The support arm 103 can be pivoted to move the side sealing element 99 toward the finger element 97 to form a side seal for the container. The side sealing element 99 is suitably electrically heated.

In operation of the portion of the device shown in FIG. 3, the jaws 63 and 65 pull the sheet material 86 through the forming orifice 95 and between the finger element 97 and the wall of the forming orifice 95. This forms the sheet material 86 into a generally tubular column. The support arm 103 is pivoted to move the side sealing element 99 into cooperative engagement with the finger element 97 to continuously form a side or back seal such as the seam 17 (FIG. 4) as the sheet material 86 is pulled past the element 99. The lower end of the sheet material 86 is heat sealed by the lowermost jaws 63 and 65 visible in FIG. 3 to form the end seal 13. Accordingly, the apparatus shown in FIG. 3 forms the sheet material into an elongated container 107 having an open upper end.

The container 107 is supplied with the flowable chemical 19 from a tank 108 (FIG. 1) through a supply tube 109 by a pump 110 (FIG. 1) with the flow rate being Adjustable by a valve 110a. The supply tube 109 has a lower end 111 which lies below the upper surface of the flowable chemical 19. The flowable chemical is preferably continuously supplied through the supply tube 109 at a rate which will cause the lower end 111 thereof to always be maintained beneath the upper level of the flowable chemical. This significantly reduces the likelihood of the introduction of air bubbles into the flowable chemical 19.

As shown in FIG. 3, predetermined opposed regions 113 of the container 107 are being forcibly moved together by an upper set of cooperating jaws 63' and 65'. The regions 113 are spaced upwardly from the bottom of the container 107 which is defined by the seam 13. Continued rotation of the rotors 56 and 61 moves the jaws 63' and 65' downwardly and closer together to apply heat and pressure to the regions 113 to thereby heat seal these regions of the container 107 and form the end seal 15. During this operation, a column of the flowable chemical 19 has been maintained above the regions 113 so that the flowable chemical beneath the regions 113 is under a predetermined static head. The static head assures that the container will be completely filled by the flowable chemical and that such flowable chemical sealed within the sealed container will be at a pressure greater than atmospheric.

The sealed filled container is severed by the knife 76a from the remainder of the sheet material 86 automatically at the completion of the heat seal which joins the regions 113. The regions 113 are cut approximately in half longitudinally so that the lower half of the regions 113 forms the end seal 15 of a lower container while the upper half of the regions 113 forms the end seal 13 of an upper container. As the rotors 59 and 61 rotate continuously, containers 11 will be continuously formed with each of the containers having the chemical 19 therein. The length of the rupturable container 11 can be varied by varying the distance between the axes of rotation of rotors 59 and 61.

The jaws 63 and 65 are heated to a temperature higher than that required for heat sealing of the regions 113 and to a temperature sufficient to at least partially rupture or destroy the sheet material 86 of the container 107 through melting thereof. However, the flowable chemical 19 is supplied to the container 107 at a temperature significantly less than the temperature of the jaws 63 and 65. As the contact between the jaws 63 and 65 and the regions 113 occurs for a period of time during which the regions are also in contact with the flowable chemical 19, heat transfer between the jaws and the flowable chemical occurs. Such heat transfer results in a temperature reduction of the jaws 63 and 65 sufficient to prevent rupture of the container 107 and to allow the heat sealing operation to be carried out.

Should the apparatus for supplying the flowable chemical to the container 107 malfunction so that the upper level of the flowable chemical 19 lies beneath the regions 113, then little or no heat from the jaws 63 and 65 would be absorbed by the flowable chemical. In this event, the jaws 63 and 65 would be sufficiently hot to rupture the regions 113 and no heat seal would occur. By this arrangement an automatic quality control feature is provided which assures that each of the containers produced by the apparatus will be completely full of the flowable chemical.

After each set of jaws 63 and 65 have been utilized to form a heat seal, they must be reheated to the necessary temperature before they can be utilized again. One factor effecting the speed of rotation of the rotors 59 and 61 is the rate at which the jaws 63 and 65 can be reheated. According to the present invention, excessive cooling of the jaws 63 and 65 by the flowable chemical 19 is prevented by heating the flowable chemical. Although the amount which the flowable chemical is heated will vary depending upon the heat sealing temperature range of the sheet material 86, a temperature of 130° F. has been found satisfactory when the sealable sheet material 86 is low density polyethylene.

The flowable chemical 19 can be heated by any suitable means. However, it is preferred to heat the flowable chemical 19 by adding a substance which will produce an exothermic reaction. In the embodiment illustrated, the flowable chemical 19 is a mixture of water and calcium chloride with sufficient calcium chloride having been added to obtain a temperature in the neighborhood of 130° F. within a few minutes after the calcium chloride is added to the water.

As the containers 11 are severed by the knives 76a, they fall on a conveyor 121 mounted on, and extends between, the machines 51 and 53. The conveyor 121 runs continuously at a predetermined speed and lies beneath the region between the rotors 59 and 61 so that it can receive the rupturable containers 11 as they are dropped thereon. The conveyor 121 extends upwardly to a location just above a forming and sealing device 123 of the machine 55. The forming and sealing device 123 can be identical to the device 91 (FIG. 3) described hereinabove.

The chemical 33 is stored in a hopper 125. A suitable metering device 127 such as a volumetric filler supplies metered quantities of the chemical 33 through a tube 128 to a location just above the forming and sealing device 123.
Plastic sheet material 129 is wound on a roll 131 and rotatably supported by a spindle 133. The sheet material 129 which may be identical to the laminate formed by layers 35 and 39 (FIG. 7) is fed over a number of rollers 135 to the device 123. The device 123 forms the sheet material 129 into a generally tubular column and a side sealing element 136 continuously forms side seals for the containers 31 as described hereinabove with reference to FIG. 3.

The machine 55 also includes rotors 137 and 139 carrying heat sealing jaws 141 and 143, respectively. The jaws 141 and 143 and the rotors 137 and 139 are preferably identical to the corresponding parts of the machine 51 except that the rotors 137 and 139 have sponges 145 mounted adjacent each of the jaws carried thereby.

The jaws 141 and 143 cooperate in the same manner as the corresponding jaws 63 and 65 of the machine 51 to form end seals for the containers 31. The sponges 145 compress the zone of the container 31 beneath the jaws 141 and 143 just prior the heat sealing operation carried out by such jaws to remove air from within the container. Each of the jaws 141 and 143 includes a blade for severing the sealed container 31 from the plastic sheet material 129. The severed container 31 falls on a conveyor 147.

The rotors 59, 61, 137 and 139, the conveyor 121 and the metering device 127 are synchronized so that one of the rupturable containers 11 and a metered quantity of the chemical 33 will be supplied to each container 31 just after or while the bottom end seal thereof is being formed and before such container is completely sealed through the formation of the upper end seal. By so doing, the entire process can be carried out rapidly and automatically.

Although an exemplary embodiment of the invention has been shown and described, it will be apparent to those having ordinary skill in the art that many changes, modifications, and substitutions may be made without necessarily departing from the spirit and scope of this invention.

I claim:

1. A method of making a pack for adding heat to, or removing heat from, an object, including the following steps:

   providing a rupturable container of sheet material having a bottom and an open upper end with predetermined regions of the container spaced upwardly from the bottom being heat sealable to seal the container;

   depositing a flowable chemical in the container with the flowable chemical extending at least up to the predetermined regions; heating the flowable chemical to a particular temperature above ambient; heating said predetermined regions of the container to enclose a quantity of the heated flowable chemical in the container whereby complete filling of the sealed container with the flowable chemical is ascertained and whereby the flowable chemical heated to the particular temperature above ambient prevents the rupturable container from being ruptured during the heat sealing operation;

   pressurizing the flowable chemical during the sealing of the rupturable container so that the pressure of the enclosed chemical can aid in the rupture of the rupturable container;

   providing a second container which is capable of being heat sealed; filling the second container with a second chemical and simultaneously inserting the rupturable container into the second container with the flowable and second chemicals being sealed from each other, said chemicals being reactive to absorb or give off heat upon rupture of the rupturable container; and

   heat sealing the second container

2. A method as defined in claim 1 wherein the flowable chemical includes water and calcium chloride and said step of heating includes adding the calcium chloride to the water in sufficient quantities so that the heat of the resulting reaction is sufficient to heat the flowable chemical to a temperature above ambient.

3. A method as defined in claim 1 wherein the pressurizing step includes confining the flowable chemical to form a column extending through the predetermined regions to the bottom of the container so that the quantity of flowable chemical comprises a portion of the column, whereby the quantity is pressurized by the weight of the column and the pressure is variable in accordance with the height of the column.

4. A method as defined in claim 1 wherein said step of heating the rupturable container includes providing first and second heat sealing members, heating the heat sealing members to a first temperature in excess of that required for heat sealing said predetermined regions and sufficient to rupture said section of sheet material and relatively advancing said heat sealing members to heat seal said predetermined regions and to squeeze the portion of said flowable chemical from between said predetermined regions, said method including maintaining said flowable chemical at a temperature above ambient but sufficiently below said first temperature to maintain the predetermined regions at a sufficiently low temperature to avoid rupture of the rupturable container whereby if the rupturable container is not filled at least to said predetermined regions said heating members will rupture the container.

5. A method of making a pack for adding heat to, or removing heat from, an object, including the following steps:

   providing a container of sheet material having a bottom and an open upper end with predetermined regions of the container spaced upwardly from the bottom being heat sealable to seal the container;

   heating a flowable chemical to a temperature above ambient;

   depositing the flowable chemical in the container with the heated flowable chemical extending at least partially through the predetermined regions;

   providing a pair of heat sealing members;

   heating said heat sealing members to a temperature sufficient to heat seal said predetermined regions; relatively advancing the heat sealing members to heat seal said predetermined regions to thereby seal said container with a quantity of the heated flowable chemical therein and to reduce the temperature of the heat sealing members with such reduction in temperature being lessened by the heating of the flowable chemical; and

   placing a second container having a second chemical therein adjacent the sealed container with the chemicals being sealed from each other, said chemicals being reactive to absorb or give off heat upon rupture of at least one of said containers.
A method as defined in claim 5 wherein said flowable chemical includes water having a salt therein and said step of heating includes adding the salt to the water.

7. A method as defined in claim 6 wherein said heat sealing members are heated to a first temperature sufficient to rupture the sheet material of said container, said flowable chemical being maintained at a temperature sufficiently below said first temperature to avoid rupture of the container whereby if the container is not filled at least to said predetermined regions said heat sealing members will rupture the container.

8. A method of making a hot or cold pack, including the following steps:

- providing a first container having rupturable properties and a bottom and side walls defining predetermined heat sealable regions;
- providing first and second chemicals having characteristics for mixing and reacting to give off heat or cold;
- depositing the first chemical in the first container;
- preheating the first chemical to a particular temperature above ambient;
- providing at least a pair of heated jaws;
- biasing and moving said heated jaws to engage, heat seal and sever the predetermined regions so that the preheated first chemical is enclosed in the first container whereby the preheating of the first chemical to the particular temperature above ambient prior to the engagement of the first container by the heated jaws prevents the first container from being ruptured by the heat from the jaws;
- providing a controlled delay in the movement of the heated jaws after the severing of the first container to control the movement of the severed container as the jaws disengage and snap into their biased positions;
- inserting the second chemical and the sealed first container into a second container with the first and second chemicals being sealed from each other, the first and second chemicals being reactive to absorb or give off heat upon rupture of the rupturable container; and
- sealing the second container.

9. The method as recited in claim 8 further comprising filling the first container from a column of the first chemical which extends from the bottom of the first container to a height above the predetermined region whereby the sealing of the predetermined region encloses a portion of the column which fully occupies the container and the portion is pressurized within the first container in proportion with the height of the column.

10. The method as recited in claim 9 wherein the first chemical tends to absorb heat from and consequently lower the temperature of the jaws, and the reheating of the jaws causes a delay in the fabrication of the packs and wherein the step of preheating the first chemical is regulated so that the temperature gradient between the first chemical and the jaws is reduced to inhibit heat transfer therebetween, whereby the reheating delay is substantially decreased and the speed with which packs can be fabricated is significantly increased.

11. A method of making hot or cold packs including the steps of:

- providing first and second chemicals having characteristics for reacting when mixed to give off heat or cold;
- enclosing the first chemical in a first container having characteristics for being ruptured upon impact to release the first chemical;
- heating the first chemical to a temperature above ambient temperature;
- heat sealing the first container at a position below the level of the heated liquid in the container;
- providing a second container having a bottom and side walls defining heat sealable predetermined regions at the uppermost portions thereof;
- depositing the second chemical and the rupturable container in the second container so that they occupy less than all of the volume between the predetermined regions and the bottom of the second container and the remaining portion of the volume is occupied by air;
- expelling at least a portion of the air from the remaining portion of the second container;
- disposing at least one pair of jaws on the periphery of a pair of rotors to provide a movement of the jaws into relative engagement across the predetermined regions of the second container;
- heating the jaws to a temperature sufficient to seal the predetermined regions without rupturing the second container during the movement of the jaws across the predetermined regions of the second container; and
- rotating the rotors to move the heated jaws into relative engagement with the predetermined regions so that the regions are heat sealed to enclose the second container.

12. A method recited in claim 11 wherein the expulsion of at least a portion of the air from the remaining portion of the second container occurs prior to the heat sealing of the second container by the heated jaws.

13. A method of making a pack for adding heat to, or removing heat from, an object comprising:

- providing a container of sheet material having a bottom and an open upper end with predetermined regions of the container spaced upwardly from the bottom being heat sealable to seal the container;
- depositing a flowable chemical including water and calcium chloride in the container with the flowable chemical extending at least up to the predetermined regions; heating the flowable chemical by adding the calcium chloride to the water in sufficient quantities so that the heat of the resulting reaction is sufficient to heat the flowable chemical to a temperature above ambient;
- confining some of the flowable chemical to form a column with the column extending from said predetermined regions upwardly; heat sealing said predetermined regions of the container to seal the container while said column extends upwardly from said predetermined regions to thereby seal a quantity of the heated flowable chemical in the container whereby complete filling of the sealed container with the flowable chemical is assured, said sealed container being rupturable; and
- placing a second container having a second chemical therein adjacent the sealed container with the chemicals being sealed from each other, said chemicals being reactive to absorb or give off heat whereby upon rupture of the sealed container the chemicals are chemically react.
14. A method as set forth in claim 6, including the steps of:
severing the rupturable container after the heat sealing of the container by the heat sealing member, and

providing a controlled delay in the movement of the heat sealing member from the severed container to control the movement of the severed container after the container has been severed.

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