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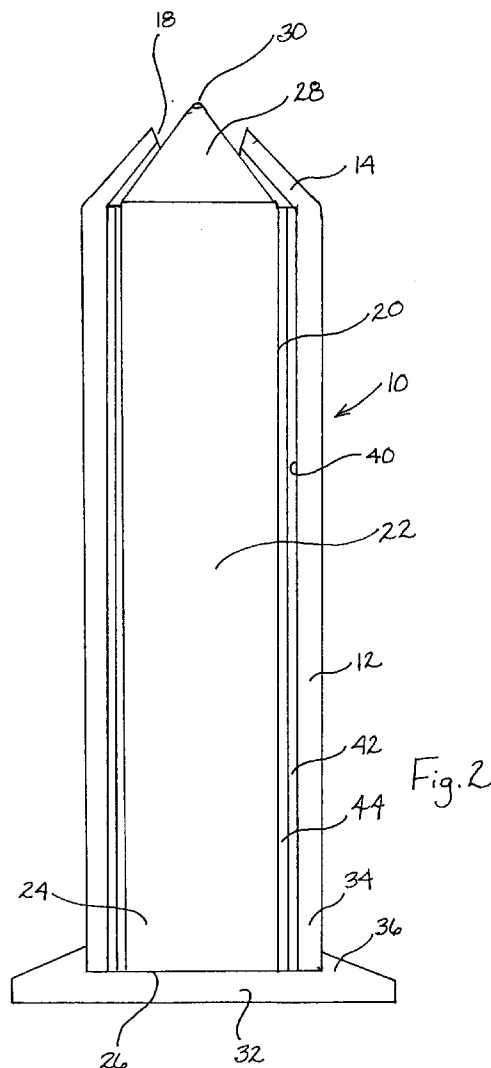
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(54) **Microwaveable adhesive dispenser and microwaveable adhesive charge therefor**

(57) A dispensing assembly (10) for heating and subsequent dispensing of a microwaveable adhesive material (22), comprising: a dispenser housing (12) having a microwaveable adhesive charge-receiving cavity therein; a microwave susceptor member (44) in the cavity, constructed and arranged to receive microwave energy when the dispensing assembly is exposed to microwave radiation and to responsively generate heat; and a microwaveable adhesive charge (20) of a size and shape for insertion into and retention in the cavity including said microwave receptor. The housing may comprise a seamless, resiliently deformable, unitary thermally insulating sleeve, and the microwaveable adhesive charge advantageously is devoid of susceptor materials and susceptor structure. The adhesive charge article may comprise a container (24) having disposed therein a solid body of hot melt adhesive material having a cross-sectional shape differing from the cross-sectional shape of the container in which the hot melt adhesive material is disposed for microwave heating.



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Description

Field of the Invention

The present invention relates generally to a microwaveable flowable material-dispensing assembly, and microwaveable adhesive charge articles, for the dispensing of hot melt adhesive materials which can be microwave heated for subsequent dispensing at a desired use location.

Description of the Related Art

In the use of hot melt adhesives and other flowable materials which are dispensed in heated condition at the point of use, the packaging of the heatable, flowable (at least in the heated state) material is highly important to the usefulness of the material.

Such materials may be heated immediately prior to their dispensing at the point of use, by microwave, ultrasonic, infrared, or other thermal radiation techniques, so that the material to be dispensed is at the appropriate temperature, for example in a readily flowable or self-leveling state. It therefore is desirable to deploy the material in a heatable form, in a package in which it can be heated as well as subsequently dispensed.

A wide variety of packaging designs has been proposed by the prior art for the sequential storage, heating and dispensing of such (e.g., microwaveable) materials, particularly in the case of hot melt adhesives which are provided in solid stick form and which under microwave irradiation melt to form a flowable hot melt adhesive medium for bonding and sealant applications.

International Patent Application No. PCT/US91/08661 published 11 June 1992 for "Microwave Hot Melt Adhesive Package and Dispenser," describes a package including a flexible pouch defining a chamber containing the hot melt adhesive, with a dispensing means provided as part of the pouch to permit squeezing dispensing of the hot melt adhesive. The package may include an insulating jacket for facilitating the handling of the package, particularly when the adhesive is in the elevated temperature melt form. The insulating jacket may be formed of polypropylene foam or preferably a foam blend of polystyrene and polyphenylene oxide which may be adhered to and laminated with the microwave transparent layer of the container. In the embodiment shown in Figures 1-3 of the patent, the insulating jacket comprises an insulating layer which is heat sealed with a microwave transparent layer at edge portions thereof. The hot melt adhesive employed in such package and dispenser is described to be of varying type (e.g., a water-retaining type which does not require microwave susceptors, or alternatively a type including microwave susceptors in the form of microwave susceptor particles blended or mixed in the hot melt adhesive medium).

International Patent Application No.

PCT/US92/05604 published 21 January 1993 discloses a microwave activatable adhesive article including the hot-melt or heat-curable adhesive, and a microwave susceptor layer of at least electrically semi-conductive microwave radiation absorbing material. The susceptor layer is disposed on at least a portion of the substrate, and is responsive to exposure to microwave radiation for raising the temperature of the substrate above a desired level sufficient to melt the substrate.

U.S. Patent 5,188,256 issued 23 February 1993 to J.R. Nottingham, et al. discloses a hot melt adhesive dispenser including a container having hot melt adhesive therein, and a susceptor comprising metal particles adhered to a film such as a high temperature polyimide film, wherein the susceptor is in heat transfer relationship with the hot melt adhesive. The hot melt adhesive container may be formed of a flexible film material having high temperature resistance, and the susceptor may be provided on an interior surface of the container, or otherwise in heat transfer relationship to the hot melt adhesive material. The dispenser disclosed in this patent may further comprise a cover of relatively rigid, heat insulating composite material, such as a foam polystyrene laminated with a bleached hardwood craft paper.

Other hot melt adhesive dispensers are known in the art in which microwave susceptors are a component of the container for the hot melt adhesive. Also known is the concept of a reusable package or sleeve accommodating receipt therein of a hot melt adhesive container including as a component of the container a microwave susceptor material. In the use of insulative sleeves of such type, the sleeve provides comfortable exterior temperatures for handling and dispensing of the hot melt adhesive despite temperatures of the adhesive being as high as 400°F

Prior efforts to produce foam insulating sleeves for microwave adhesive packaging have focused on high temperature molding processes, in which a piece of foam sheet stock is heat-bonded to produce a seamed foam tube. The seamed foam tube then is placed in a heated mold to produce a desired exterior shape. In use, such manufacture of the insulating sleeve has been found to have a number of associated inherent deficiencies. First, the seams on the insulating sleeve are difficult to produce in consistent quality, and seam splitting and spreading frequently occurs upon heating. Additionally, because the foam material has some "memory," it tends to return to its original shape upon heating. Further, the production molds for making the shaped insulating sleeve are expensive, thereby rendering design changes correspondingly disadvantageous in cost. Finally, the molding operation has a cycle time of approximately 20 minutes, and thus is not well-suited to high volume mass production of sleeves for commercial use.

Accordingly, it would be a significant advance in the art of microwaveable adhesive dispensing, to provide an insulating sleeve and appertaining microwaveable adhesive dispensing assembly, overcoming the aforemen-

tioned difficulties.

In the use of microwaveable hot-melt adhesive materials, the adhesive medium is typically packaged in solid form, comprising a solid, e.g., tubular-shaped, body of the adhesive solid, in a container of suitable material, such as injection-molded plastic, thin film material, or other packaging material, and the resulting adhesive article is termed a "glue stick."

Glue stick articles in prior art practice have incorporated therein a susceptor (sometimes termed "receptor," the terms "susceptor" and "receptor" being used synonymously in the art to denote a radiation-sorptive, e.g., microwave-sorptive, material which on radiation exposure converts radiation energy to heat), typically as a dispersed material or other component in the adhesive medium, or else as a part or component of the packaging material or other non-adhesive structure of the glue stick.

The glue stick may for example comprise a silicone tube having a microwave receptor dispersed in the silicone material as the container. Such tube may have a solid (hot melt) adhesive body of corresponding suitable size and shape disposed in the tube, with a silicone plug being placed in the open end of the tube, after insertion of the hot melt adhesive stick into the tube, for sealing thereof.

A problem which has arisen in the use of glue sticks of hot melt adhesive is the problem attendant the heating of air present in the glue stick, during the microwave heating of the glue stick. When the glue stick is heated, air, typically trapped at the bottom of the container holding the initially solid adhesive medium, also becomes heated, concurrently with the heating of the adhesive medium.

Such air invariably is present in the container holding the initially solid adhesive medium, being unavoidably incorporated in the container upon loading of the solid adhesive body in the container during the manufacture of the adhesive charge.

As it becomes heated during the microwave heating operation, the trapped air expands, erupting the molten glue, and thereby presenting a disadvantage in respect of the evulsion of molten glue on the surrounding environs, such as the microwave oven in which the glue stick charge is disposed in the receptor.

Further, in glue stick articles such as the silicone tube/adhesive solid body/silicone plug construction illustratively described above, there may be a relatively higher concentration of susceptor (receptor) material at the lower portion of the tube as a result of its fabrication in the described manner. In consequence, heating takes place preferentially in the lower portion of the glue stick during microwaving of the adhesive charge, so that the air trapped in the bottom of the glue stick article is even more highly heated by the concentrated susceptor/receptor material, before substantial heating of the hot melt in the upper regions of the adhesive charge takes place, exacerbating the hot melt adhesive eruption problem discussed above.

It therefore is another object of the present invention to provide an improved microwaveable adhesive charge comprising a container or package in which is disposed a microwaveable adhesive medium.

SUMMARY OF THE INVENTION

In one aspect, the present invention relates to a dispensing assembly for heating and subsequent dispensing of a microwaveable adhesive material, comprising: a dispenser housing having a microwaveable adhesive charge-receiving cavity therein; a microwave susceptor member in said cavity, constructed and arranged to receive microwave energy when the dispensing assembly is exposed to microwave radiation and to responsively generate heat; and a microwaveable adhesive charge of a size and shape for insertion into and retention in the cavity including said microwave receptor, the charge comprising a container wherein the charge is devoid (free) of susceptor materials and susceptor structure.

The dispenser housing may be formed with any desired shape, and of any suitable materials of construction, and may for example comprise an insulating liner or sleeve formed of a foamed or expanded polymeric material, of microwave-transmissible character, such as a material selected from the group consisting of polyethylene foam, polypropylene foam, polyphenylene oxide foam, polystyrene foam and silicone foam, or, more generally, a thermally insulative material selected from the group consisting of plastics, polymeric gels, polymeric foams, rubbers, and thermally insulative composite materials.

The dispenser housing includes a cavity therein for receiving the microwaveable adhesive charge, as hereinafter more fully described.

The insulating sleeve in the aforementioned dispenser housing construction may be of elongate form, having a generally uniform cross-section along at least a portion of its length, and preferably is of elongate cylindrical form along a major portion of its length, together with a distal portion of truncated conical shape, having an opening at its distal end, and with an open proximal end. The cylindrical sleeve member thus has a central cylindrical bore constituting the cavity for containing the microwaveable adhesive charge.

In one embodiment, the dispenser housing comprising the insulating sleeve may be adapted to be reposed on and positioned statically by a base containing a cavity therein receiving a lower portion of the insulating sleeve, whereby the sleeve is positioned in vertically upwardly extending relationship to the base. Alternatively, the dispenser housing may be integrally and unitarily formed with a base portion for positioning on the floor of a microwave oven or other support surface.

In the dispenser housing, e.g., comprising the aforementioned insulating sleeve, the housing on its interior

surface bounding the cavity has a susceptor material associated therewith. The susceptor may for example be in the form of a liner or jacket comprising a susceptor material, as a structural element of the dispensing assembly which is separate and distinct from the housing per se. Alternatively, the housing wall surface bounding the cavity itself be coated with or otherwise incorporate the susceptor material, provided that the housing is sufficient size (thickness) and shape so that the outer surface of the housing is manually graspable by a user of the dispensing assembly.

The susceptor may be of a known, temperature self-limiting type, in which impingement of microwave radiation on the susceptor results in conversion of the microwave radiation to heat energy, with consequent associated temperature rise in the susceptor (which heat energy is conductively transferrable to the microwaveable adhesive medium, disposed in proximate, preferably contiguous, relationship to the susceptor in the dispensing assembly), up to the self-limiting temperature level, beyond which no appreciable temperature rise is achieved with further microwave exposure.

Alternatively, the susceptor material may be of a non-self-limiting nature with respect to microwave exposure/temperature response, and such susceptor material may have associated therewith an elevated temperature-limiting material to prevent heating of the hot melt adhesive material in the adhesive material charge, above a predetermined temperature level.

In instances where the dispensing assembly comprises a susceptor layer or liner in the housing, a thermally insulating material layer, such as a fiberglass mat, or felted liner of heat-insulating material, may suitably be disposed between the susceptor element and the housing, to ensure that even when the susceptor has been heated to high temperature by microwave exposure thereof, the user of the dispensing assembly is not burned or subjected to discomfort by heat transmission through the housing.

In some instances, the housing may itself be constructed of suitable insulative material, and/or of a suitable thickness, obviating the need for such additional insulative structural member, but in the instance where the housing comprises a material such as a polymeric foam material of construction, the additional thermal insulative liner or liners is/are preferred, for reasons of safety and heat-retention efficiency.

The hot melt adhesive material charge suitably comprises the hot melt adhesive material in a container of suitable size and shape, constructed of any suitable material, such as a high temperature-resistant material. The container may for example be formed of a thin film material of such type, or alternatively of an injection-molded plastic or other satisfactory material of construction.

In another specific aspect, the present invention relates to a dispenser assembly for use with a charge comprising hot melt adhesive material, comprising: an insulating sleeve having a cavity comprising a central

bore extending through at least a major portion of the insulating sleeve and bounded by an interior surface of the sleeve;

a susceptor material disposed on at least a portion of said interior surface; and

a base member comprising a cavity into which the insulating sleeve is positionable so as to supportively maintain the insulating sleeve in a selected position relative to said base.

In a further aspect, the invention relates to dispensing assembly comprising an insulating sleeve containing removable insert(s) which are unitarily removable from the sleeve, such insert(s) comprising a susceptor material, and preferably at least one thermally insulating, non-conductive layers disposable between the susceptor material and the housing.

In a yet further aspect, the present invention relates to a dispensing assembly for heating and subsequent dispensing of a material, comprising:

a seamless, resiliently deformable, unitary microwave-transparent insulating sleeve formed of a thermally insulative material and having a cavity therein; and a charge of a size and shape for insertion into and retention in the cavity, the charge comprising a container having disposed therein a heatable material.

In one embodiment of the dispensing assembly, the insulating sleeve is adapted to be reposed on and positioned statically by a base containing a cavity therein receiving a lower portion of the insulating sleeve, whereby the sleeve is positioned in vertically upwardly extending relationship to the base.

In another embodiment, the insulating sleeve on its interior surface bounding said cavity has disposed thereon a susceptor material. The susceptor material preferably is of a type which is self-limiting in temperature, i.e., a material which is absorptive of energy until a specific upper temperature limit or level is reached, beyond which the material does not produce further temperature increases in the presence of the energy (e.g., radiation) source, such as the temperature self-limiting materials disclosed in the aforementioned U.S. Patent Application No. 08/200,852. If the susceptor is not of such temperature self-limiting type, the susceptor may have associated therewith an elevated temperature-limiting material to prevent heating of the heatable material above a predetermined temperature level.

The aforementioned heatable material may suitably comprise a hot melt adhesive material, and the charge may comprise a hot melt adhesive medium in a container of high temperature-resistant material. The adhesive may have associated therewith a susceptor material, e.g., in the form of particulate or other discontinuous-character material, dispersed in the adhesive medium. Alternatively, the charge may be devoid of any susceptor material or structure, and the susceptor, if present, may be associated with the insulating sleeve, or as a separate element or structure of the overall adhesive dispensing assembly. In still other embodiments,

the overall adhesive dispensing assembly may itself be devoid of any susceptor components or materials.

In another aspect, the present invention relates to a method of making a seamless insulating sleeve for heating and dispensing of a heatable material, comprising: providing a precursor workpiece formed of a flexible resiliently deformable material; drilling a cavity into the precursor workpiece; and lathing the exterior portion of the block to yield a predetermined surface conformation of the workpiece; and disposing a charge of heatable material in the cavity.

The precursor workpiece may for example be formed of a thermally insulative polymeric foam material.

The above-described method may further comprise disposing a susceptor material in the cavity for provision of the susceptor material in heat-transfer relationship to the charge disposed in the cavity.

In a further aspect, the present invention relates to a method of forming a cavity of other than cylindrical shape in a workpiece formed of a resiliently deformable, generally rigid material, comprising: applying a predetermined pressure force to at least a portion of an exterior surface of said workpiece; while maintaining such pressure force on said workpiece exterior surface portion, drilling the workpiece to form a cavity in a region of the workpiece subjected to compression and/or tension in consequence of the applied pressure forces; and relaxing the pressure forces to resiliently recover the original exterior shape of said workpiece, with a non-cylindrical cavity formed therein.

In yet a further aspect, the invention relates to a glue stick article suitable for use in the dispenser assemblies described hereinabove, comprising a container having disposed therein a solid body of hot melt adhesive material having a cross-sectional shape differing from the cross-sectional shape of the container in which the hot melt adhesive material is disposed, e.g., for microwave heating.

In an additional aspect, the invention relates to a hot melt adhesive dispensing assembly comprising a housing defining a receiving cavity, such as the sleeve or liner constructions discussed hereinabove, and a glue stick article adapted for positioning and heating in the housing cavity, such glue stick article comprising a container having disposed therein a solid body of hot melt adhesive material having a cross-sectional shape differing from the cross-sectional shape of the container in which the solid body of hot melt adhesive material is disposed for heating.

The invention thus contemplates in one aspect the use of a "disfigured" glue stick to direct or channel the expanding air during heating of the glue stick, so as to avoid eruption of the molten hot melt adhesive.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded perspective view of a micro-

waveable adhesive dispensing assembly according to one embodiment of the present invention.

Figure 2 is a vertical elevation sectional view of the microwaveable adhesive dispensing assembly shown in Figure 1.

Figure 3 is a sectional elevation view of a dispensing assembly according to one embodiment of the invention, featuring removable insert members including susceptor means.

Figures 4, 5, and 6 illustrate a manufacturing process according to one embodiment of the present invention, for forming an insulating sleeve.

Figures 7 and 8 illustrate a manufacturing process for making an insulating sleeve according to another embodiment of the present invention, wherein the central bore of the insulating sleeve is of varying transverse dimension along the length of the sleeve.

Figure 9 is a sectional side elevation view of the insulating sleeve of Figure 8, containing a hot melt adhesive container and an optional susceptor collar member.

Figures 10-12 illustrate a forming process for making an insulating sleeve according to another aspect of the present invention, wherein the hot melt adhesive charge-receiving cavity has a flared inlet for ease of insertion and removal of the hot melt adhesive charge.

Figure 13 is a top plan view, in cross-section, of a glue stick article according to one embodiment of the invention.

Figure 14 is a top plan view, in cross-section, of a glue stick article according to another embodiment of the invention.

Figure 15 is a top plan view, in cross-section, of a glue stick article according to a further embodiment of the invention.

Figure 16 is a top plan view of a glue stick article according to another embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION, AND PREFERRED EMBODIMENTS THEREOF

Referring now to the drawings, Figure 1 is an exploded perspective view of a microwaveable adhesive dispensing assembly 10 according to one embodiment of the present invention.

The microwaveable adhesive dispensing assembly includes an insulating sleeve 12 of generally cylindrical form having a conical distal portion 14 and a proximal open end 16 communicating with a central bore of the sleeve and terminating in distal opening 18. The insulating sleeve 12 on its interior surface may have associated therewith interior layers of optional components, such as insulating material layers or liners, susceptor liners, mechanical integrity support liners, temperature-limiting inner sleeves serving coactively with the susceptor layer to limit the maximum temperature of the dispensing assembly when subjected to radiation (e.g., microwave) exposure, etc.

When a separate susceptor liner is present in the

dispensing assembly, it is suitably and preferably disposed adjacent the adhesive charge, to provide high efficiency heating of the susceptor material and resultant heat transfer (conductive heating) to the adhesive charge, for melting of the initially solid adhesive material and production of a desired temperature therein for the desired adhesive dispensing operation. With the provision of such a susceptor liner or material surrounding the adhesive charge, and in recognition of the fact that the susceptor under radiation impingement conditions achieves very high temperature, it generally is desirable to dispose a thermally insulating material layer about the susceptor layer, between the susceptor layer and the insulating sleeve, in ensure that the user of the dispensing assembly is adequately protected against thermal burns during the handling and use of the dispensing assembly.

The insulating sleeve 12 is sized and shaped to accommodate insertion into its interior bore of a hot melt adhesive charge 20 comprising a hot melt adhesive medium 22 encased in a container 24 which may be formed of high temperature resistance material. The high temperature resistance material may be in the form of a thin film, or it may be provided in the form of an injection molded material or other preformed material (e.g., an injection-molded silicone tube into which the adhesive material is loaded), it being understood that the container 24 is formable by a wide variety of fabrication processes, and is formable of a wide variety of suitable materials of construction.

In the embodiment shown, the hot melt adhesive charge container 24 is closed at its proximal end 26 and features a conical-shaped distal portion 28 having an adhesive dispensing opening 30 at its distal extremity.

The insulating sleeve 12 in the dispensing assembly shown in Figure 1 is matingly arranged with respect to base member 32, which as shown may comprise a support having a circular-shaped cavity therein which receives the lower end portion 34 of insulating sleeve 12 therein, whereby the insulating sleeve containing the hot melt adhesive charge 20 may be stably mounted in the base member 32 and surrounded by the upper collar portion 36 thereof, so that the overall assembly may be reposed in unitary fashion in a microwave oven or in proximity to other heating means, for heating of the adhesive medium 42 in the hot melt adhesive charge 20.

The insulating sleeve 12 may be formed of any suitable heat insulating material, preferably a foamed or expanded polymeric material such as polyethylene foam, polypropylene foam, modified polythene oxide foam, polystyrene foam, etc., or other suitable insulating material of construction. The insulative sleeve is preferably manufactured from flexible, resilient, relatively deformable materials capable of withstanding high temperatures, for example temperatures of up to 500°F, for periods of time for which the dispensing apparatus is contemplated to be subjected to elevated temperature exposure, e.g., in a microwave oven.

The insulating sleeve provides a cool-to-the-touch

structural member which is manually graspable without burning of the user's hands, and the insulating sleeve, being essentially non-heat-transmissive, serves to retain heat in the material being dispensed, thereby extending the period of operability of the dispenser before additional heating is necessary.

The insulating sleeve is, in instances where microwave heating of hot melt adhesive is employed, microwave transmissive (transparent) in character, and capable of maintaining its shape and properties in exposure to the heating conditions.

It is a primary aspect of the embodiment of the invention shown in Figure 1, that the insulating sleeve 12 is of unitary and seamless character. Further, in contrast to prior art thermally molded insulating sleeves, the insulating sleeve 12 of the present invention may be shaped at ambient temperatures (ambient here referring to temperatures in the range of from about 0 to about 40°C).

In consequence of its seamless character, the insulating sleeve avoids the seam splitting and spreading problems of the prior art seamed sleeves. Further, because it is shaped at ambient temperature, the insulating sleeve has better shape retention than the prior art seamed insulating sleeves. Further, the seamless sleeve of the instant invention is amenable to ready modification in shape or size, and is amenable to high volume mass production, thus overcoming significant deficiencies of the prior art seamed sleeves.

Referring now to Figure 2, there is shown an elevation view in partial section of a dispensing assembly 10 of the type as shown in Figure 1. All parts and elements in Figure 2 are numbered correspondingly to Figure 1, for ease of description.

As illustrated in Figure 2, the base 32 of the dispensing assembly includes an upper collar portion for retentive placement of the insulating sleeve 12 therein at the lower portion 34 of the sleeve. The sleeve at its conical distal end portion 14 terminates at distal opening 18, through which the distal conical portion 28 of hot melt adhesive charge 20 upwardly protrudes, so that distal opening 30 of the hot melt adhesive charge 20 is disposed exteriorly of the insulating sleeve 12, to facilitate dispensing of the hot melt adhesive 22 from the charge 20. For such purpose, the sleeve, although relatively rigid, is sufficiently deformable as to allow manual squeezing of the charge 20 by manual pressure exerted compressively on the outer surface of the insulating sleeve 12.

In the dispensing assembly shown in Figure 2, the inner surface 40 of the insulating sleeve 12 has optionally secured thereto one or more layers, including in the specific embodiment shown in Figure 2, first layer 42 and second layer 44, it being understood that such layers may be wholly absent and that the container 24 holding the adhesive charge 22 may be in direct abutting contact with the inner wall surface 40 of the insulating sleeve.

The optional illustrated layers 42 and 44 may com-

prise any suitable respective materials of construction layers as necessary or desirable in a given end use application of the dispensing assembly 10.

For example, one of such layers, e.g., layer 42, may comprise a thermally insulating, non-conductive material layer, such as a fiberglass mat, or a woven or non-woven jacket containing a finely divided particulate-form mineral insulator material. The other one of such layers, e.g., layer 44, may comprise a susceptor liner of a suitable susceptor material of a type known in the art, for the purpose of effecting heating of the hot melt adhesive to a desired elevated temperature. The susceptor may be of a material for is absorptive of microwave or other electromagnetic energy impinged thereon. The thus-heated susceptor is in heat-transmission relationship to the adhesive charge 20, and thereby effects transfer of the requisite heat energy to the hot melt adhesive medium 22.

Preferably, at least one of the additional optional layers is a thermally non-conductive material layer, and most preferably, the outermost of the additional optional layers is a thermally non-conductive material layer, particularly where the inner layer (or one of multiple inner layers) is a susceptor material layer. The susceptor material layer, when present, preferably is located directly adjacent, in contiguous position, to the adhesive charge.

In the event that multiple additional optional layers are provided in the dispensing assembly, e.g., between the adhesive charge and the insulating sleeve, one of such layers may comprise a liner of suitable material imparting enhanced mechanical integrity to the insulating sleeve, or otherwise providing enhanced structural and/or performance characteristics to the dispensing assembly, relative to a dispensing assembly lacking same.

Correspondingly, the interior surface 40 of the insulating sleeve may have associated therewith any other and differing layers, liners, or other materials, efficacious for the storage, heating and dispensing of the adhesive medium or other medium to be dispensed by the dispensing assembly.

By the structure of the insulating sleeve, it is possible to utilize adhesive charges 20 of widely varying character.

As mentioned earlier herein, the adhesive in the charge may have associated therewith a susceptor material, e.g., in the form of particulate or other discontinuous-character material, dispersed in the adhesive medium. The charge alternatively may be devoid of any susceptor material or structure, with the susceptor, if present at all, being associated with the insulating sleeve, or as a separate element or structure of the overall adhesive dispensing assembly.

The charge 20 may, as hereinabove described, comprise a bag or container 24 formed of a suitable material of construction, e.g., a thin film material, or an injection-molded plastic material, for purposes of containing the solid adhesive medium 22 and dispensing of same after being heated to a flowable heated state.

In this respect, it will be appreciated that prior art hot

melt adhesive dispensing systems have invariably utilized susceptor materials as a constituent part of the container in which the adhesive medium is disposed. It is correspondingly to be appreciated that such susceptor components constitute a relatively expensive part of the dispensing apparatus, and when utilized in the package comprising the adhesive medium, the charges introduced into the insulating sleeve in such prior art systems, are of a relatively expensive character.

Contrariwise, in the dispensing assembly of the present invention, the susceptor material may be provided in the form of a layer or liner which is affixed to or secured directly or indirectly to the insulating sleeve, whereby the susceptor component is a reusable part of the dispensing assembly.

In use of the dispensing assembly shown in Figures 1 and 2, the reusable insulating sleeve assembly comprising optional layers 42 and/or 44, e.g., a fiberglass insulation mat or other layer of thermally non-conductive material as the layer 42, and a liner of susceptor material as the layer 44, is utilized to receive a disposable charge container 24 of hot melt adhesive medium 22.

The hot melt adhesive in solid form thus is provided as a "stick" or cylindrical article of medium to be dispensed, contained within a suitable container 24, such as a thin film polymeric material container constructed of a high temperature-resistant material such as polyimide or other suitable material known in the art. The sleeve assembly containing the charge then is reposed on the base 32 and disposed in a microwave heating oven at or in proximity to the application locus of use of the hot melt adhesive.

Subsequent to heating of the hot melt adhesive medium to a flowable state, the dispensing assembly, comprising insulating sleeve 12, adhesive charge 20, and base 32, is suitably removed from the microwave heating oven and transported to the locus of use.

At the locus of use, the sleeve assembly may be manually compressed to exert pressure on the adhesive medium 22, via compressive deformation of the insulating liner against the container 24 holding the flowable adhesive medium, to cause issuance of the adhesive through distal opening 30 from container 24.

Subsequent to use of the charge, the material-depleted container 24 may be removed from the insulating liner assembly and discarded.

By this arrangement, the adhesive charge is readily mass produceable in a convenient and economic manner, permitting significant cost savings to be realized in the use of hot melt adhesive media.

Figure 3 is a sectional elevation view of a hot melt adhesive dispensing assembly 210 according to another embodiment of the invention.

The dispensing assembly 210 comprises a vertically upwardly extending insulating sleeve 214 which at its lower extremity 215 is secured to a base member 216. The insulating sleeve may as in previously described embodiments be arranged for removable mounting on

the base member 216, as is described in the embodiment shown in Figures 1 and 2, or alternatively, the insulating sleeve 214 may be permanently secured at its lower end 215 to the base member 216, as for example by bonding, mechanical affixation, or the like.

The insulating sleeve 214 contains therewithin a cavity 217 as a central bore extending a major portion of the length of the sleeve. The cavity 217 is of cylindrical shape, so that the sleeve in turn is of an annular cylindrical structure, with the exception of the lower portion of the sleeve.

In cavity 217 is disposed a hot melt adhesive charge 222, comprising a container 224 which may be formed of a thin high temperature resistant film material which is microwave transmissive in character, or of other suitable microwave-transmissive material, being of generally cylindrical shape as shown with a conical-shaped distal portion 226 having an opening 228 at the distal extremity thereof.

The container 224 has disposed therein a hot melt adhesive medium 230, which prior to microwave heating thereof is of solid form, the charge 222 thus being referred to in the art as a "glue stick." The charge 222 is disposed in the cavity 217 in proximity to insert liners 218 and 220. The insert liners 218 and 220 may comprise any suitable elements as necessary or desirable for the microwave heating of the hot melt adhesive 230 in the charge 222. For example, the insert liner 220 may comprise a microwave susceptor material which in receipt of microwave radiation serves to become heated to a high temperature and conductively transfer heat through the heat transmissive container 224 to the hot melt adhesive 230 for melting thereof and heating of the hot melt adhesive to a predetermined temperature.

The insert liner 218 adjacent to insert liner 220 may in turn comprise an insulative medium, such as fiberglass, polymeric foam material, or any other suitable material such as those described illustratively hereinabove as used to form the insulating sleeve in the dispenser assembly of the invention.

In the embodiment shown in Figure 3, the insert liners 218 and 220 may be readily replaceable or otherwise removable from cavity 217, so that these liners can be withdrawn from the sleeve and discarded in favor of replacement liner elements, as necessary or desirable in the use of the dispensing assembly. For example, a susceptor liner may after some period of use become diminished in heat-absorbing ability, and may desirably be replaced by a new substitute susceptor liner element.

By such arrangement of the dispensing assembly device shown in Figure 3, the dispensing assembly 210 comprising sleeve 214, base member 216, charge 222, and liner layers 218 and 220, may be manually transported in unitary fashion from the oven or heating locus to the locus of use. At the locus of use, the hot melt adhesive may be selectively dispensed by manual compression exerted on the outer surface of the insulating sleeve 214, which in turn is transmitted through insert

liner 218, insert liner 220, and container 224 to exert a pressure force on the contents of container 224 thereby causing the hot melt adhesive to issue from the container through opening 228 at the distal end thereof.

For such purpose, the insert liners 218 and 220 are desirably of a resiliently deformable, flexible material, and may be constructed and arranged analogously to the liner layers 42 and 44 in the Figure 2 embodiment as described hereinabove, with at least one of the insert liners comprising a thermally insulative, non-conductive (of heat) material. The insert liner 218 may as mentioned comprise an insulating material and be of suitable character to accommodate manual compression and deformation, while at the same time providing sufficient thickness to ensure adequate insulative character to prevent burns or discomfort to the hands of a user holding same.

The assembly shown in Figure 3 in like manner desirably comprises an insert liner 220 of a flexible, deformable character. When insert liner 220 is a susceptor, the liner may constitute a thin film material which is impregnated with or otherwise comprises or contains a microwave-sorptive material as an active susceptor ingredient.

It will be recognized that the insert liners 218 and 220 may be varied and that fewer or greater numbers of insert liner elements may be employed, as necessary or desirable in a given end use application.

In use, the dispensing assembly shown in Figure 3, is unitarily placed in a microwave heating oven and subjected to microwave exposure conditions for sufficient time to effect microwave heating of the hot-melt adhesive material to a desired use temperature. The dispensing assembly then is removed from the oven and transported to the locus of use, where the heated hot-melt adhesive is selectively dispensed to the locus to be adhesively bonded. At the location of use, the dispensing assembly may be selectively reposed on a suitable support surface during the periods between actual dispensing use, resting on the base portion 216 of the housing structure.

It will correspondingly be recognized that the Figure 3 dispensing assembly may be widely varied in specific construction and arrangement of insert liner components, as well as the shape and size of the insulating sleeve 214.

Figures 4-6 illustrate a manufacturing process embodiment of the invention, for making a shaped insulating sleeve of the type shown and described with reference to Figures 1 and 2 herein.

Referring to Figure 4, there is shown a precursor block 60 of a suitable material, such as a polymeric foam material of thermally insulating character. The precursor block 60 as shown is of a rectangular parallelepiped shape, being elongate with respective end surfaces 62 and 64 of generally square shape, and rectangular front and back surfaces 66 and 68, respectively, top surface 70, and bottom surface 72.

Figure 5 shows the precursor block 60 positioned in recipient boring relationship to drilling tool 80 having a

generally conical-shaped distal portion 82. The drilling tool 80 is operatively coupled with suitable rotation-imparting means, such as a conventional drill unit or other means effecting rotation of the drilling tool 80 at a selected rotational speed in a direction of rotation such as shown by arrow A in Figure 5.

Upon rotation of the drilling tool 80 in the direction indicated by arrow A and forward translation of the drilling tool into engagement with the precursor block 60, there is formed a correspondingly shaped bore or opening 84 in the block 60, as shown in dashed line representation by dashed line 86.

Thus, there is formed a central bore 84 in the workpiece (precursor block), yielding the block having a bored cavity therein, the bounding interior surface of the cavity defining an inner surface of the resulting insulating sleeve.

Subsequent or prior to boring of the workpiece block 60, the block may be subjected to lathing operations to impart a cylindrical exterior surface thereto, with a conical-shaped distal end portion, as the sleeve article 90 shown in Figure 6, wherein the lathing operation has formed a cylindrical exterior surface 92 which is coaxial and concentric with the inner cylindrical surface 94 of the central bore 84. The relative dimension and shape of the core cavity 84 is demarcated by dashed line 86 in Figure 6.

The lathing operation may be carried out at ambient temperature, as may the coring operation, so that the disadvantages attendant elevated temperature molding of seamed sleeves in the practice of the prior art are wholly avoided in the manufacturing process of the present invention, producing a seamless sleeve in a ready and economical manner.

The insulating sleeve 90 as shown has a frontal opening 96 communicating with cavity 84.

Subsequent to its formation, the insulating sleeve 90 may be utilized in the manner shown in Figures 1 and 2. For such purpose, the optional material layers (layers 42 and 44 in the Figure 2 embodiment) may be usefully applied or formed in the interior of the sleeve on interior wall 94.

Figures 7-9 illustrate another manufacturing process for forming an insulating sleeve according to another embodiment of the invention, utilizing a compressive retention technique for deforming the sleeve precursor block 100, so that interior sleeve cavities of varying size and shape along the length of the precursor block may be achieved.

As shown in Figure 7, the precursor block 100, which is of rectangular parallelepiped shape similar to that shown in the perspective view of Figure 4, has a longitudinal axis L-L defining the central axis of the rectangular block. The block is of regular rectangular (square) cross-section along its length (the transverse dimension or cross-section being measured in a plane perpendicular to longitudinal axis L-L).

The precursor block 100 immediately prior to its boring

by drilling tool 102, suitably rotating in the direction indicated by arrow B by suitable drive means (not shown), is laterally compressed by exertion of force indicated schematically by arrows M on top surface 106 and arrows N on bottom surface 108, causing deformation of the precursor block 100 into the shape indicated by dashed line 110. The profile of the pressure-deformed block is of reduced cross-section at the locus of application of forces M and N, with the block correspondingly being enlarged at end regions 112, and having the curvate end profile 114.

With the pressure-deformed block 100 in the conformation indicated by dashed line profile 110, the drilling tool 102 rotated in the direction of arrow B is forwardly translated for boring contact with block 100 through its entire length, along the axis L-L. Subsequent to drilling and coring of the block 100, the pressure forces M and N are released, and the block thereupon is returned to its original rectangular parallelepiped form.

The resulting undeformed block 100 is shown in Figure 8, as containing the bored cavity 120 which at its central portion 122, in the region in which boring had taken place with the pressure forces M and N imposed, is of greater dimension than the diameter (transverse dimension) of the drilling tool 102. Conversely, in the end regions 124 and 126 of the cavity 120, the transverse dimension of the cavity is smaller than the diameter of the drilling tool 102.

By means of the above-described techniques, it is possible to form a cavity structure in which the diameter (transverse dimension) of the cavity is non-uniform. This produces a cavity structure with relatively narrower regions which will compressively grip the adhesive charge to a greater extent than the relatively wider regions of the cavity, so that the narrower regions can be selectively formed in the sleeve to grip and retain the adhesive charge, and protect the charge from slipping or dropping out of the sleeve during the use of the dispensing assembly.

This correspondingly improves the safety and reliability of the dispensing assembly, since the adhesive charge at the point of use is extremely hot and susceptible of severely burning the user if coming into contact with the user's skin. Further, the dispensing operation typically entails the application of manual pressure by the user on the sleeve containing the adhesive charge, an action which can compact the container having the flowable adhesive therein and contribute to the disengagement of the charge from the sleeve, in the absence of tight holding of the charge by the sleeve.

Figure 9 shows the resulting insulating sleeve block 100 including a container 130 of hot melt adhesive, the container being of generally cylindrical shape along the major portion of its length, as disposed in the cavity 120 and with a distal end portion 132 of container 130 protruding from the right-hand end of block 100, as shown.

In the embodiment shown in Figure 9, the central region 122 of cavity 120 is enlarged in cross-section in

relation to other regions of the cavity. The container 130 in this embodiment features a susceptor collar 134 over the exterior surface of the container 130 containing the hot melt adhesive medium.

The susceptor collar 134 may for example be formed of a suitable stretchable polymeric film material, having embedded therein fine metal particles or other susceptor component material. The susceptor collar thus circumscribes and is in abutting heat-transfer relationship to the container 130, to facilitate heating of the hot melt adhesive in container 130.

The collar 134 correspondingly is in abutting contact with the container 130 over at least a major portion of the length of the container, and most preferably is coextensive with the entire cylindrical portion of the container 130, as shown in Figure 9.

Upon microwave heating of the container 130 in the insulating sleeve block 100, the susceptor provides heating which is sufficient to cause melting and heating to the desired dispensing temperature of the adhesive material in the container. In subsequent use, the narrower-diameter end portions of the sleeve serve to positively grip the adhesive charge, to help prevent its slippage or disengagement from the sleeve, particularly during or contemporaneous to the dispensing operation.

The cavity formed in the precursor block for the insulating sleeve in the broad practice of the present invention may be widely varied, consistent with the foregoing description, to produce cavity shapes of widely varying character within the interior of the sleeve block. It will be recognized that in a manner similar to that described in connection with Figure 6 hereof, the insulating sleeve shown in Figure 8 may be correspondingly machined, before, concurrently with, or subsequent to, the formation of the cavity, so that the profile of the outer surface of the sleeve is altered to a shape other than the rectangular parallelepiped shape shown.

Further, it will be appreciated that the utility of the shaping method for the precursor block is not limited in utility to insulating sleeves for adhesive or flowable medium dispensing, but is broadly applicable in any instance in which a thermally insulative, or other, non-insulative, material is desired to be shaped with respect to the formation of a cavity therein, and the workpiece to be bored to form a cavity is amenable to deformation involving the imposition of pressure forces on selected area portions thereof.

Figures 10-12 illustrate the processing of an insulating sleeve precursor block 150 as shown in Figure 10, to yield an insulating sleeve product article 150 shown in Figure 12.

As shown in Figure 10, the precursor block 150 is of generally rectangular parallelepiped shape, similar to that shown in Figure 4 herein. Prior to the drilling/coring operation, the precursor block is subjected to pressure forces indicated by arrows P on the upper left-hand portion of the block, and pressure forces indicated by arrows Q on the lower left-hand portion of the block.

The profile of the applied pressure forces P and Q is such as to induce deformation of the left-hand portion of the precursor block 150 to the shape shown in Figure 11, wherein the pressure forces are maintained as the drilling tool 160 rotated in the direction of arrow G (by drive means not shown) is translated into boring relationship with block 150 along a major portion of its length, to provide the drilling profile in the partially compressed block which is identified by dashed line 156 in Figure 11.

Subsequent to drilling of the cavity profile indicated by dashed line 156, the respective pressure forces P and Q are released, thereby yielding the insulating sleeve 150 shown in Figure 12, having the interior cavity 156 as provided with a outwardly flaring inlet portion bounded by outwardly flaring wall surface 160 as shown.

Thus, by virtue of the compression profile exerted on the precursor block in Figures 10 and 11, the drilling of the precursor block produces a flared inlet cavity shown in Figure 12, which is of utility in respect of facilitating ease of insertion and removal of hot melt adhesive charges thereinto and therefrom, respectively.

As mentioned in the Background section hereof, trapped air in the glue stick adhesive charge article used in the dispenser may in the course of microwave heating boil and erupt, with consequent adverse affect on the safety of associated personnel and efficacy of the hot melt adhesive dispensing operation.

Additionally, in glue stick articles such as the silicone tube/adhesive solid body/silicone plug construction illustratively described hereinearlier, there may be a relatively higher concentration of susceptor (receptor) material at the lower portion of the tube as a result of its fabrication. In consequence, heating takes place preferentially in the lower portion of the glue stick during microwaving of the adhesive charge, and air trapped in the bottom of the glue stick article then boils, and causes eruption (evulsion) of the molten adhesive material, to an even greater extent than would occur if the susceptor concentration in the container were relatively uniform in character.

The eruption problem attendant the use of solid glue stick charges in microwaveable hot melt adhesive dispensing operations is resolved according to one aspect of the present invention, by the provision of glue sticks which are shaped with a shape providing interstitial or void space along the glue stick in the container of the adhesive charge. Various embodiments of this aspect of the invention are shown in Figures 13-16.

In accordance with the "channelized" glue stick construction of the present invention, the heated air in the lower portion of the adhesive charge channels upwardly, through the channel formed by predetermined shaping of the hot melt stick (to have a differing cross-section than the container wall) before substantial heating of the hot melt in the upper regions of the adhesive charge. As a result, the problems of boiling of adhesive medium and eruption (evulsion) of molten adhesive which have plagued the usage of prior art glue sticks, are avoided in

the practice of the present invention.

As shown in Figure 13, the solid hot melt adhesive stick 252 is encased in thin film container 250 having a cylindrical shape. The view shown in Figure 13 is a top plan view, in cross-section, it being recognized that the glue stick article typically has a significant aspect ratio of length to diameter, with the length typically being substantially greater than the diameter.

In the Figure 13 embodiment, the container 250 throughout a major portion of its circumferential extent is in direct abutting contact with the solid adhesive stick 252. At its left-hand portion as shown, however, the solid adhesive stick 252 is formed with a flat edge which is encased by the container wall such that there is a void or interstice 258 between the container wall and the solid adhesive stick at such left-hand portion. The void 258 extends along the length of the glue stick (perpendicular to the plane of the cross-section), along the entire length of the adhesive charge.

In such manner, air in the container upon heating is freely allowed to expand and egress from the container during the microwave heating operation, as the glue stick solid adhesive material is converted from solid to liquid form.

Figure 14 is a top plan view, in cross-section, of a glue stick article comprising solid adhesive body 262 having arcuate cutouts at spaced-apart intervals about its circumference, with the solid adhesive body 262 being encased in a casing member 264 which at such cut-out portions is in spaced relationship to the inner wall of the casing member so that the void spaces 268 accommodate heating, expansion, and egress of trapped air in the use of the adhesive charge.

Figure 15 is a top plan view, in cross-section, of another glue stick configuration, in which glue stick comprises a solid adhesive body 272 which is encased by casing 274, having a multiplicity of cut-outs along the circumference of the solid adhesive body, so that the casing 274 at the cut-out is in spaced-apart relationship to the outer circumferential surface of the solid adhesive body, to provide void spaces 278 for expansion and egress of heated air from the adhesive charge.

Figure 16 shows a glue stick 282 comprising a solid hot melt adhesive body of square cross-section, encased in a casing 286 which is in spaced relationship (along the flat sides of the glue stick) to the wall of the casing 286, thereby forming the void spaces 288 about the cross-sectional perimeter of the glue stick article.

Claims

1. A dispensing assembly for heating and subsequent dispensing of a microwaveable adhesive material, comprising:
a dispenser housing having a microwaveable adhesive charge-receiving cavity therein;
a microwave susceptor member in said cavity, con-

structed and arranged to receive microwave energy when the dispensing assembly is exposed to microwave radiation and to responsively generate heat; and

- 5 a microwaveable adhesive charge of a size and shape for insertion into and retention in the cavity including said microwave receptor, the charge comprising a container having disposed therein a microwaveable adhesive material,
10 wherein the microwaveable adhesive charge is devoid of susceptor materials and susceptor structure.

2. A dispensing assembly according to claim 1,
15 wherein the dispenser housing comprises a seamless, resiliently deformable, unitary insulating sleeve formed of a thermally insulative and microwave-transmissible material.

- 20 3. A dispensing assembly according to claim 1, wherein the dispenser housing comprises a base portion on which the dispenser assembly is selectively reposably on a flat supporting surface.

- 25 4. A dispensing assembly according to claim 1, wherein the dispenser housing comprises interior bounding wall surface bounding the cavity, and said interior bounding wall surface has a susceptor material associated therewith.

- 30 5. A dispensing assembly according to claim 4, wherein the susceptor material comprises a liner which is separate and distinct from the housing.

- 35 6. A dispensing assembly according to claim 1, wherein the dispenser housing is of a size and shape permitting the housing to be manually graspable by a user of the dispensing assembly.

- 40 7. A dispensing assembly according to claim 1, wherein the dispenser housing has a susceptor layer in the cavity adjacent the microwaveable adhesive charge, and a thermally insulating material layer disposed between the susceptor layer and the dispenser housing.

- 45 8. A dispenser assembly for use with a susceptor-free charge comprising hot melt adhesive material, comprising:

- 50 an insulating sleeve having a cavity comprising a central bore extending through at least a major portion of the insulating sleeve and bounded by an interior surface of the sleeve;
a susceptor layer disposed in said cavity; and
55 a thermally insulating layer between the susceptor layer and the interior surface of the sleeve.

9. A dispensing assembly for use with a susceptor-free

charge comprising hot melt adhesive material, comprising a housing having a cavity with cavity-bounding wall surface therein containing removable inserts which are unitarily removable from the housing, said inserts comprising a susceptor material insert, and at least one thermally insulating, nonconductive layer insert disposed between the susceptor material insert and the cavity-bounding wall surface of the housing.

10. A hot melt adhesive charge of microwaveable type, comprising a container having disposed therein a hot melt adhesive solid material, and said container and hot melt adhesive material being devoid of any susceptor material or susceptor structure.
11. A hot melt adhesive charge according to claim 10, wherein the container is formed of high temperature-resistant material.
12. A sleeve assembly for use with a charge comprising heatable material, comprising:
an insulating sleeve having a cavity comprising a central bore extending through at least a major portion of the insulating sleeve and bounded by an interior surface of the sleeve;
a removable susceptor material insert liner disposed in the cavity between the charge and said interior surface; and
a base member on which the insulating sleeve is positioned to supportively maintain the insulating sleeve in a selected position relative to said base member.
13. A dispensing assembly for a hot melt adhesive material, comprising an insulating sleeve containing a cavity therein, a hot melt adhesive material charge within the cavity in the insulating sleeve, and a susceptor insert which is positioned in the cavity at least partially surrounding the charge and which is unitarily removable from the sleeve.
14. A dispensing assembly for heating and subsequent dispensing of a heatable material, such as a hot-melt adhesive medium, said dispensing assembly comprising:
a seamless, resiliently deformable, unitary insulating sleeve formed of a thermally insulative material comprising a cavity therein; and
a charge of a size and shape for insertion into and retention in said cavity, said charge comprising a container having disposed therein said heatable material.
15. A dispensing assembly according to claim 14, wherein said container is devoid of any susceptor structure.

16. A dispensing assembly according to claim 14, wherein the insulating sleeve is formed of a foamed or expanded polymeric material.

5 17. A dispensing assembly according to claim 14, wherein the insulating sleeve is of elongate form, having a generally uniform cross-section along at least a portion of its length.

10 18. A dispensing assembly according to claim 14, wherein the insulating sleeve is of elongate cylindrical form along a major portion of its length, together with a distal portion of truncated conical shape, having an opening at its distal end, and with an open proximal end.

15 19. A dispensing assembly according to claim 17, wherein the insulating sleeve is adapted to be reposed on and positioned statically by a base containing a cavity therein receiving a lower portion of said insulating sleeve, whereby the sleeve is positioned in vertically upwardly extending relationship to the base.

20 20. A dispensing assembly according to claim 14, wherein the insulating sleeve on its interior surface bounding said cavity has associated therewith a susceptor material.

25 21. A dispensing assembly according to claim 20, wherein said susceptor material is in the form of a layer contiguous to said interior surface of the insulating sleeve.

30 22. A dispensing assembly according to claim 14, wherein said heatable material comprises a hot melt adhesive material.

35 23. A dispensing assembly according to claim 14, wherein the charge comprises a hot melt adhesive medium in a container of high temperature-resistant material.

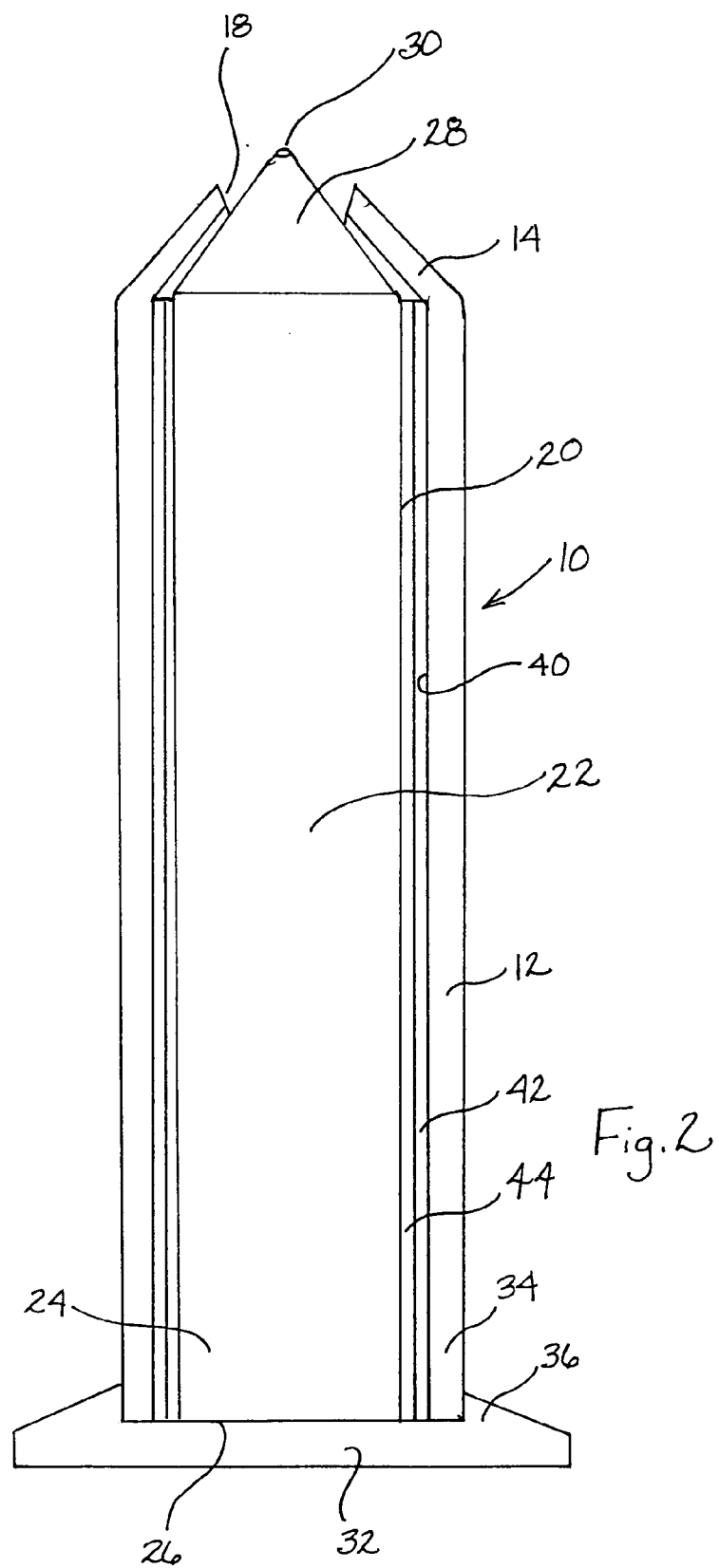
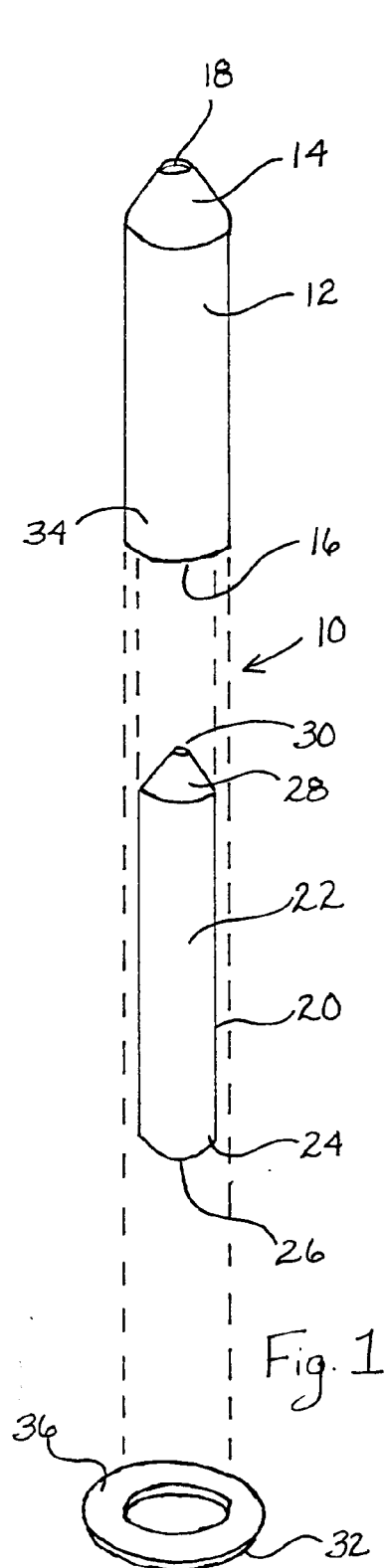
40 24. A dispensing assembly according to claim 14, wherein the insulating sleeve is formed of a microwave transparent polymeric foam selected from the group consisting of polyolefins and silicones.

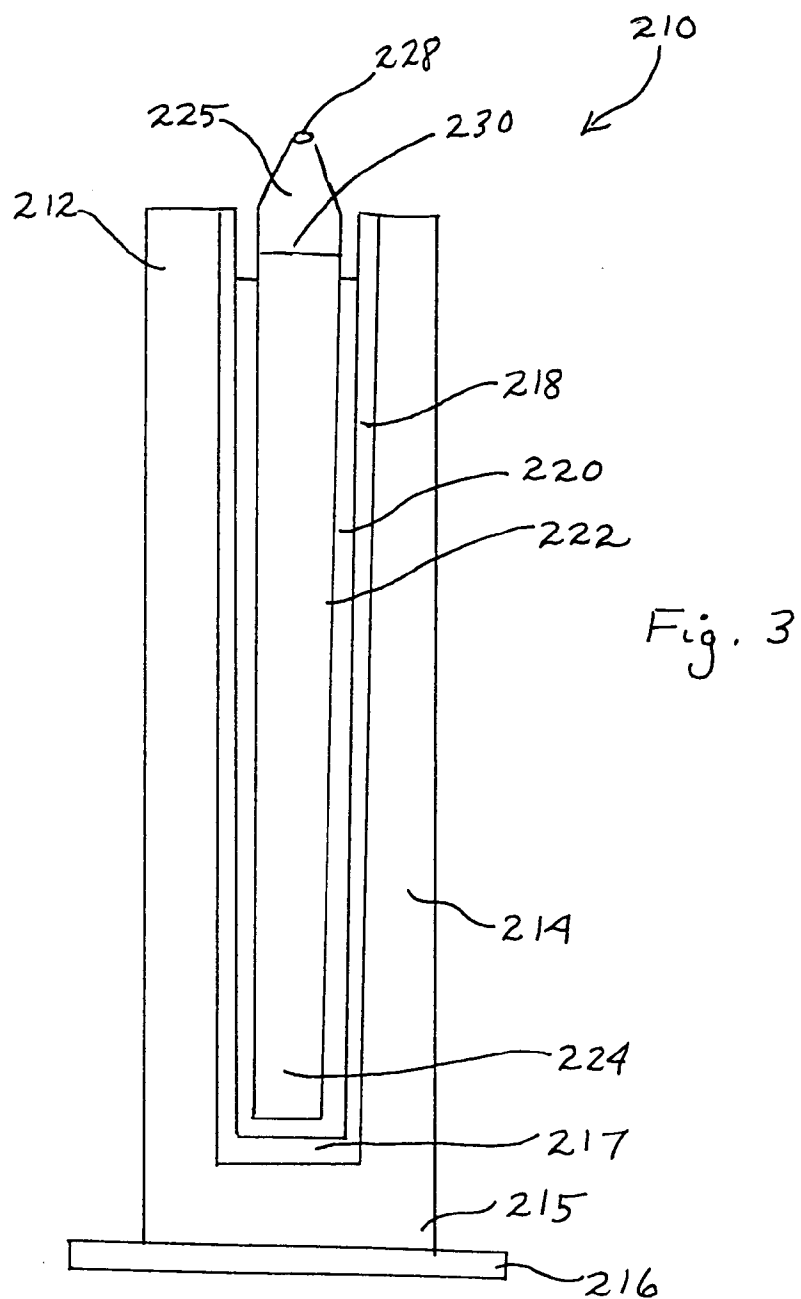
45 25. A method of making a dispensing assembly including a seamless insulating sleeve for heating and dispensing of a heatable material, comprising;
providing a precursor workpiece formed of a flexible resiliently deformable material;
drilling a cavity into the precursor workpiece; and
disposing a charge of heatable material in the cavity.

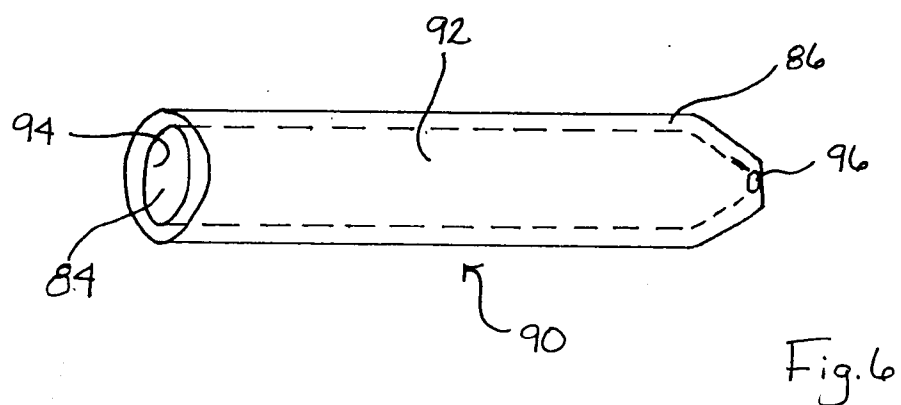
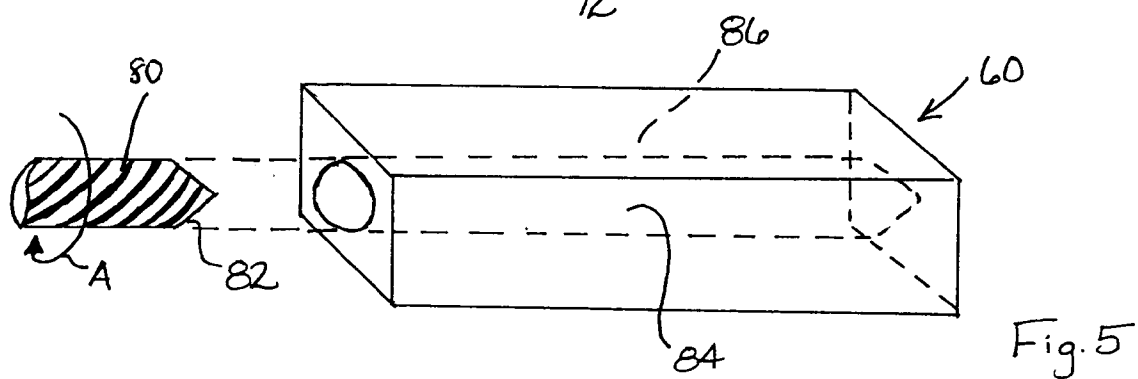
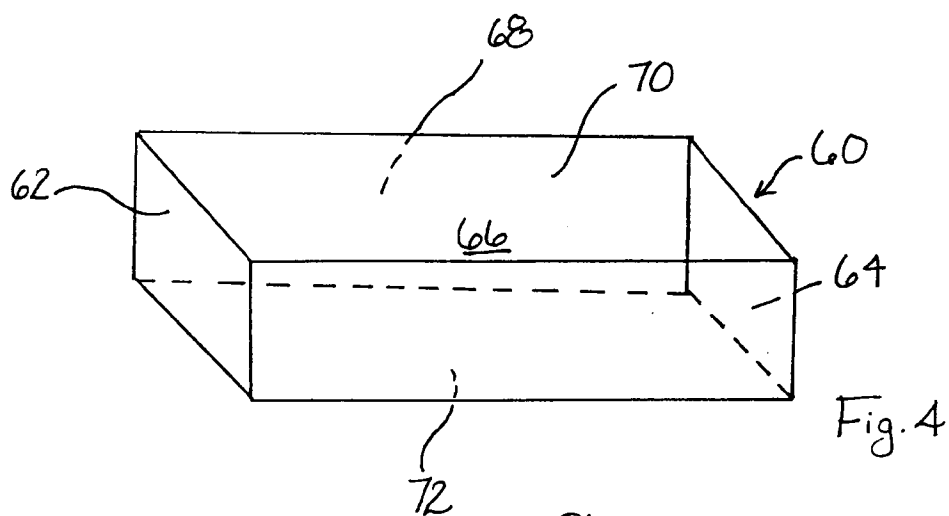
50 26. A method according to claim 25, wherein the precursor workpiece is formed of a thermally insulative pol-

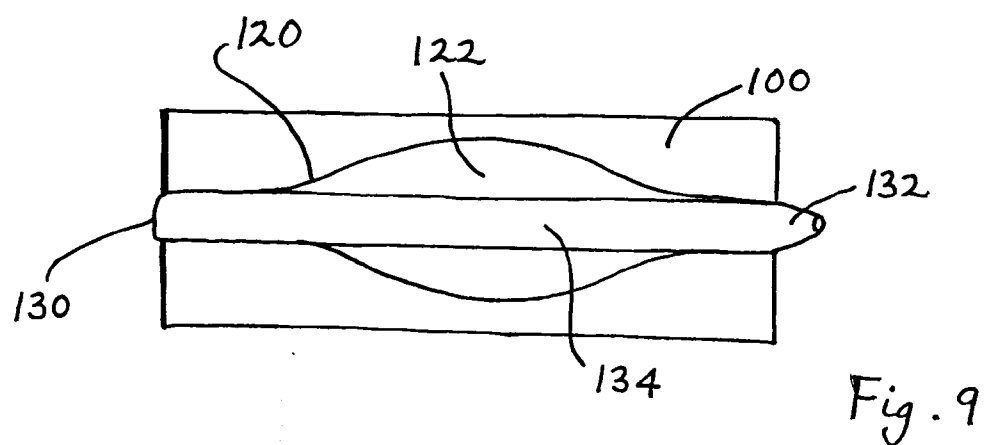
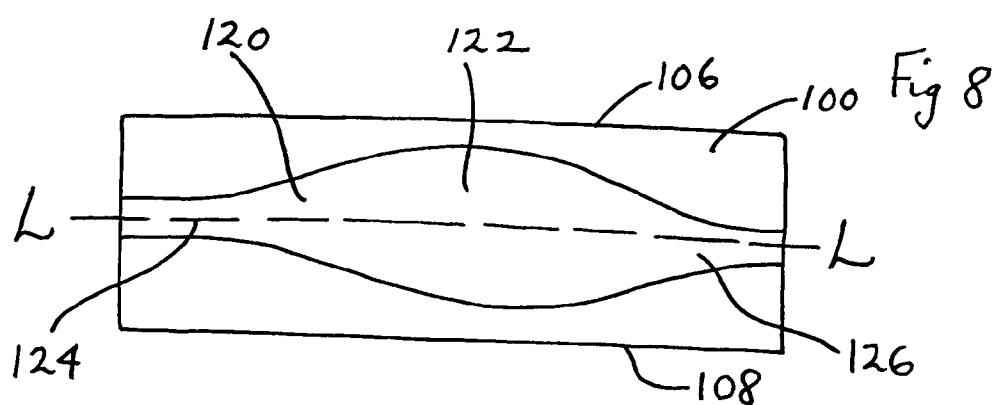
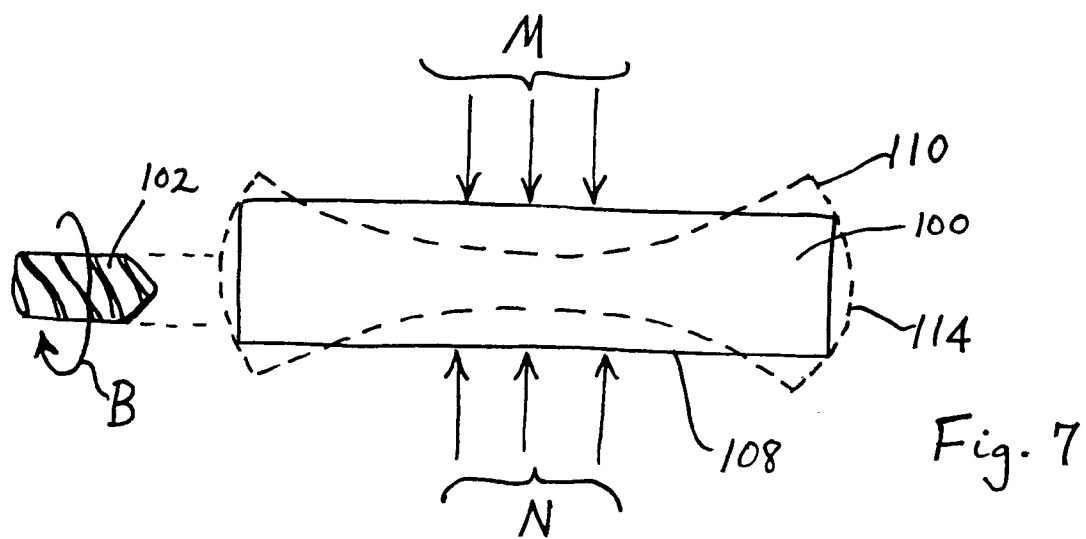
ymeric foam material.

27. A method according to claim 25, further comprising lathing the exterior portion of the block to yield a predetermined surface conformation of the workpiece.
28. A method of forming a cavity of other than cylindrical shape in a workpiece formed of a resiliently deformable, generally rigid material, comprising:
applying a predetermined pressure force to at least a portion of an exterior surface of said workpiece;
while maintaining said pressure force on said workpiece surface portion, drilling the workpiece to form a cavity therein in a region of the workpiece subjected to compression and/or tension in consequence of the applied pressure force; and
relaxing said pressure force to resiliently recover the original exterior shape of said workpiece, with a non-cylindrical cavity formed therein.
29. A method according to claim 28, wherein the workpiece is formed of a thermally insulative polymeric foam material.
30. A method of making a sleeve having a non-cylindrical cavity therein from a workpiece formed of a thermally insulative polymeric foam material, comprising selectively deforming at least a portion of the workpiece by pressure forces and subsequently drilling portions of the workpiece with a cylindrical drilling member under resulting compression/ tension, to produce on relaxation of the workpiece a non-cylindrical cavity therein.
31. A glue stick article for hot melt adhesive material dispensing, comprising a container having disposed therein a solid body of hot melt adhesive material having a cross-sectional shape differing from the cross-sectional shape of the container in which the hot melt adhesive material is disposed for heating.
32. A glue stick article according to claim 31, wherein the container comprises a microwave transmissive material including therein a susceptor component.
33. A glue stick article according to claim 32, wherein the susceptor component is selected from the group consisting of carbon black and ferromagnetic materials.
34. A glue stick article according to claim 31, wherein the hot melt adhesive material includes therein a susceptor component.
35. A glue stick article according to claim 31, wherein the article is devoid of any susceptor structure or component therein.
36. A glue stick article according to claim 31, wherein the hot melt adhesive material comprises a pressure sensitive hot melt adhesive material.
37. A hot melt adhesive dispensing assembly, comprising a housing defining a receiving cavity, and a glue stick article adapted for positioning and heating in the housing cavity, said glue stick article comprising a container having disposed therein a solid body of hot melt adhesive material having a cross-sectional shape differing from the cross-sectional shape of the container in which the solid body of hot melt adhesive material is disposed for heating.









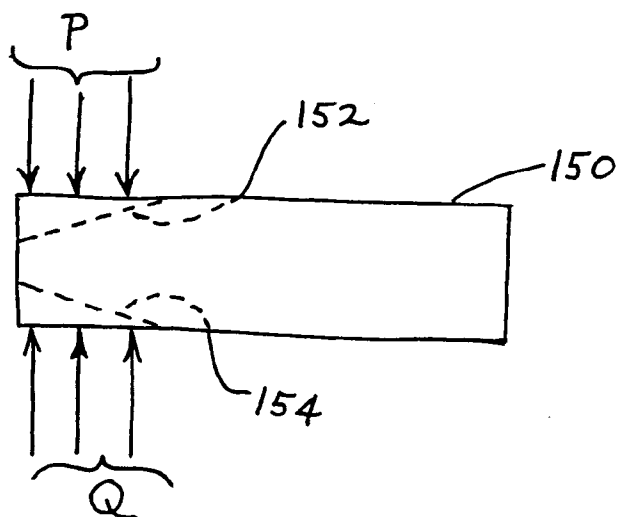


Fig. 10

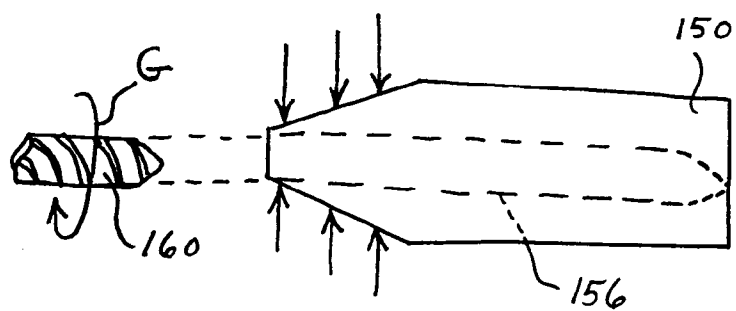


Fig. 11

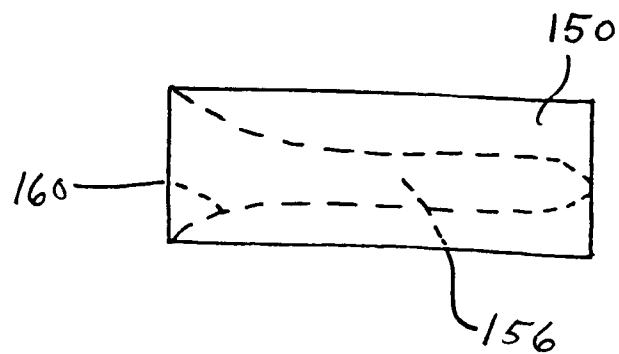


Fig. 12

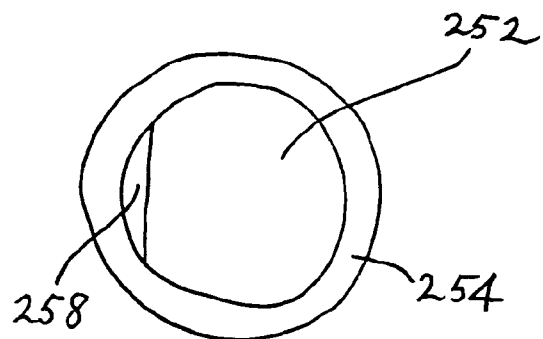


Fig. 13

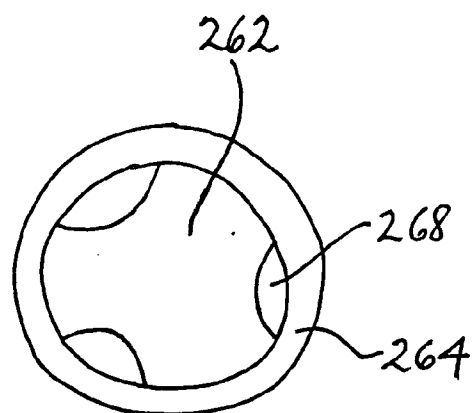


Fig. 14

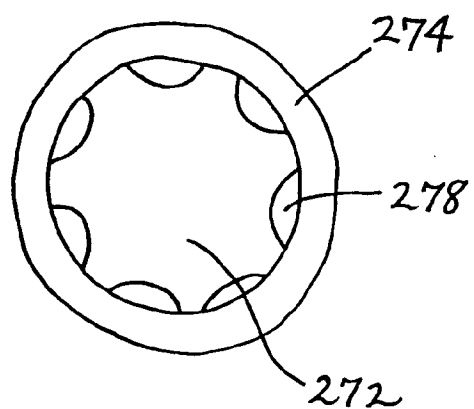


Fig. 15

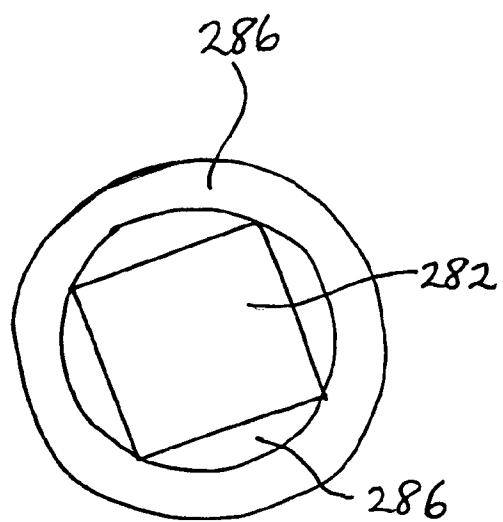


Fig. 16



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 5541

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
P,X	WO-A-94 19917 (LOCTITE CORP ; NOTTINGHAM SPIRK DESIGN ASSOCI (US)) 1 September 1994 * the whole document *	1-24	B05C17/00 B65D81/34
P,X	WO-A-94 19916 (NOTTINGHAM SPIRK DESIGN ASSOCI) 1 September 1994 * the whole document *	1-24	
D,A	WO-A-93 01247 (MINNESOTA MINING & MFG) 21 January 1993 * page 5, line 6 - page 21, line 19; figures *	1	
D,A	WO-A-92 09503 (MINNESOTA MINING & MFG) 11 June 1992 * the whole document *	1	
A	US-A-5 188 256 (NOTTINGHAM JOHN R ET AL) 23 February 1993		
A	EP-A-0 223 253 (TOYO ALUMINIUM KK) 27 May 1987		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B05C B65D
Place of search THE HAGUE		Date of completion of the search 14 November 1995	Examiner Mouton, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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