Aug. 30, 1966 A. CIANCI 3,269,885

HEAT-SEALING HEAD

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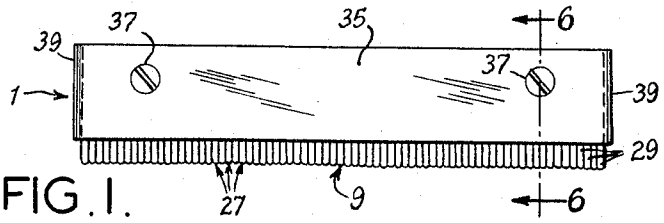


FIG. 1.

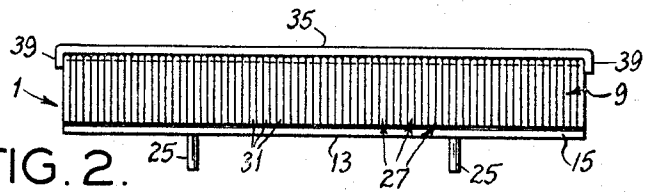


FIG. 2.

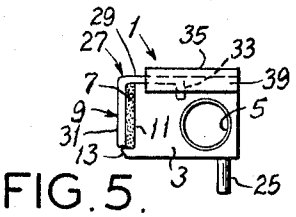


FIG. 5.

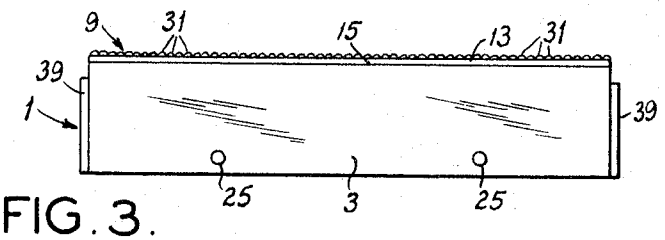


FIG. 3.

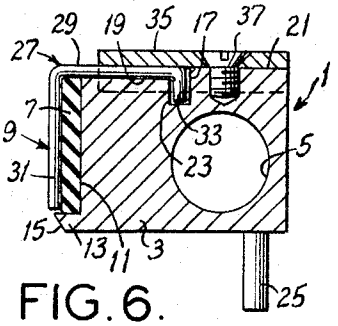


FIG. 6.

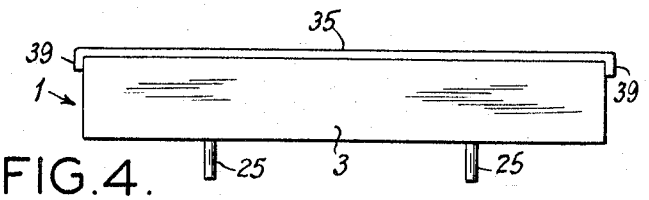


FIG. 4.

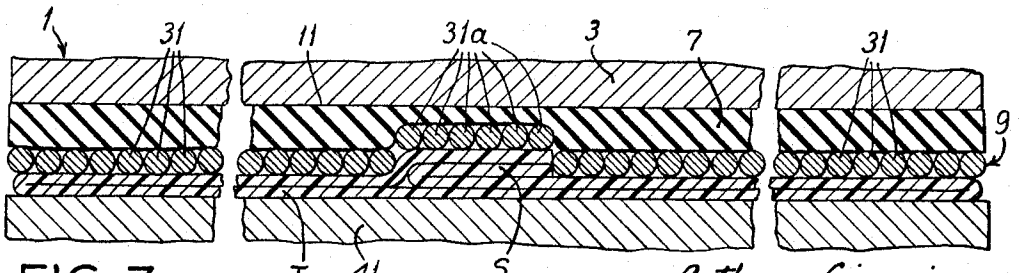


FIG. 7.

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HEAT-SEALING HEAD

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This invention relates to heat-sealing heads such as are used, for example, in packaging machines of the form-fill-seal type, in which packages are made from tubes or tubing of flexible packaging material heat sealable on the inside, to form the heat seals of the packages, and more particularly to what may be termed a yieldable-face heat-sealing head of this class.

It is conventional in packaging machines such as above described to form the transverse heat seals at the ends of a package by means of a pair of sealing heads which are clamped for a sealing interval on the tube or tubing of flexible packaging material from which the package is being formed to apply heat and pressure thereto as necessary to form a heat seal. The tube or tubing may have a longitudinal seam, which makes it of uneven thickness across its width where the package end seals are to be formed. For example, consider the case of a tube having a folded-over inside face to inside face longitudinal seam on the outside of the tube, which tube is to be formed into a tetrahedron-shaped package by forming end seals in planes at right angles to one another, with the ends of the longitudinal seam located between the ends of the end seals. In such case, each flattened end of the package will be twice as thick at the region of the respective end of the longitudinal seam as elsewhere. Since it is desirable that sealing pressure be applied substantially uniformly all across the flattened end of the tube, rather than being excessive at the thicker region and insufficient at the thinner sections, it is necessary that provision be made to accommodate the unevenness. Heretofore, heat-sealing heads have been faced with resilient rubber-like material for yielding for this purpose, but this expedient has the disadvantage that such material is a poor heat conductor, and lessens the heat transfer to the work, necessitating either sealing at lower temperature for a larger interval or increasing the heat output of the heads to obtain good seals.

Accordingly, among the several objects of this invention may be noted the provision of an improved heat-sealing head which, while having a yielding face for purposes of accommodating unevenness of the work to be heat sealed, is adapted for good heat conduction to the work when clamped thereon; and the provision of a heat-sealing head such as described which is of simple construction and economical to manufacture. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a plan of a heat-sealing head constructed in accordance with this invention;

FIG. 2 is a front elevation of FIG. 1;

FIG. 3 is a bottom plan of FIG. 1;

FIG. 4 is a rear elevation of FIG. 1;

FIG. 5 is an end elevation of FIG. 2;

FIG. 6 is an enlarged cross section taken on line 6—6 of FIG. 1; and

FIG. 7 is a greatly enlarged fragmentary section showing the FIG. 1 head and another head clamping the end of a tube (or a portion of tubing) having a folded-over inside face to inside face longitudinal seam.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a heat-sealing head constructed in accordance with this invention is designated in its entirety by the reference numeral **1**. As shown, this head **1** comprises a body **3** formed of material, such as aluminum, having a relatively high heat conductivity and having a recess **5** adapted to receive a cartridge-type electrical heater (not shown). Such heaters are well known in the art, and a detailed description thereof is not believed necessary. On one face of body **3** is a layer **7** of resilient material, such as a silicone rubber, this material inherently being of relatively low heat conductivity. On the outside face of the resilient layer **7** is a deformable facing **9** of material having a relatively high heat conductivity in relation to the resilient layer **7**. The resilient layer **7** constitutes a resilient backing for facing **9**, the latter being adapted for localized regional deformation into layer **7** to accommodate unevenness of work to be heat-sealed. Also, facing **9**, as will appear, is in heat transfer relation to the body for effective substantially direct passage of heat from the body to the work via the facing **9** by-passing the resilient layer **7** (which is to say the least poorly heat conductive, if not actually heat-insulative).

Body **3**, as herein illustrated, consists of an elongate block (an aluminum block, for example) of generally rectangular cross section. The resilient layer **7** seats against one face **11** of the block, which may be referred to as its forward face. This face **11** of the block is rabbeted to receive the layer **7**, the block having a forwardly projecting lip **13** at the bottom of face **11** as viewed in FIGS. 2, 5 and 6. The outer edge of the lip is beveled as indicated at **15**. The upper edge of the lip constitutes a seat for the lower edge of resilient layer **7**, which has a thickness somewhat less than the width of the upper edge of the lip. The top of the body or block **3** has a step at **17** so as to have a relatively low forward horizontal top face portion **19** generally at right angles to face **11** and a relatively high rearward horizontal top face portion **21**. Portion **19** has a groove **23** extending from end-to-end of the block **3** at the step **17**. Resilient layer **7** is of such width that its upper edge is generally flush with the forward top face portion **19** of the block **3**. Pins **25** are shown extending down from the bottom of the block, these pins serving as locating pins receivable in holes in a mounting (not shown) for the head.

Deformable facing **9** is shown as provided by a series of individually movable metal wire members, each designated in its entirety by the reference numeral **27**, and each of which is generally of inverted J-shape having an upper horizontal portion **29**, a relatively long downwardly extending forward leg **31** and a relatively short downwardly extending rear leg **33**. The forward legs **31** constitute facing elements proper, extending vertically in

side-by-side contiguous relation on the forward face of the resilient layer 7. The lower ends of these legs or facing elements 31 are located slightly above the upper edge of lip 13. Portions 29 of members 27 extend back over the upper edge of resilient layer 7 generally at right angles to legs 31 and contact the forward top face portion 19 of the body or block 3. The short rear legs 33 of members 27 extend down into the aforesaid groove 23 in the top of the block 3. This groove is oversize in relation to legs 33 to enable individual rearward and forward movement of members 27 with respect to block 3.

Members 27 are held captive with respect to the body or block 3 by a retainer plate 35 seated on the surface of the rearward top face portion 21 of the block and secured in place by screws 37. This plate projects forward over portions 29 of members 27. It has end flanges 39 which extend downward at the ends of the block to close the ends of the groove 23 thereby to prevent members 27 from sliding endwise off the block. The height of the step 17 is slightly greater than the thickness of portions 29 of members 27 so that the latter are sufficiently free to move rearward and forward relative to the body or block 3.

A relatively simple and economical way of providing the series of members 27 is to take a string of conventional U-shaped metal staples having legs of a length corresponding to that desired for legs 31 of members 27, cut off part of the string along a line extending lengthwise of the web portion of the string, and then bend down the margin of the remainder of the web portion of the string to form the short legs 33 of members 27. A string of staples made from wire of circular cross section may be used, in which case the seals made by use of the head 1 will be corrugated seals.

FIG. 7 shows how the head 1 accommodates for unevenness of work being sealed by localized regional deformation of the facing 9 into the resilient layer 7, and more particularly how the head accommodates for unevenness at an end seal of a package being formed from a tube or tubing T having a folded-over inside face to inside face longitudinal seam S on the outside. In FIG. 7, the tube or tubing T is shown clamped between the head 1 and a second head 41, the latter being shown simply as a metal block. The longitudinal seam S has a width generally corresponding to the width of six of the legs 31, and FIG. 7 shows how the six legs which engage the longitudinal seam, these six legs being specially designated 31*a*, have been pressed into the resilient layer 7 to accommodate for the excess thickness of the tube or tubing T at the longitudinal seam. This provides for substantially uniform sealing pressure across the tube or tubing from end to end of the seal being formed.

The body or block 3 is heated by cartridge heater (not shown) which is inserted in the recess 5. Heat is transferred from the body or block 3 to the portions 29 of members 27 by conduction where portions 29 contact the body and by radiation from the forward part of retainer plate 35 which covers over portions 29. The latter serve as means for conducting heat from the body or block 3 to the facing elements 31 for substantially direct passage of heat from the body to the work being sealed by-passing the resilient layer 7. In this regard, portions 29 of members 27 in effect act as heat conducting extensions of facing elements 31 extending back from the facing elements 31 into heat transfer relation with the body or block 3, and facing elements 31 and their extensions 29 are held captive with respect to the body or block 3 by retainer plate 35 while permitting their movement relative to the body.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A heat-sealing head comprising a body having relatively high heat conductivity, said body being adapted to be heated for generation of heat for sealing work to be heat-sealed, a layer of resilient material of relatively low heat conductivity on the body, and a work-engaging deformable facing of relatively high heat conductivity on said resilient layer, said resilient layer constituting a resilient yieldable backing for said deformable facing and said facing being adapted for localized regional deformation into said resilient layer to accommodate unevenness of work to be heat-sealed, and said facing being in heat transfer relation to said body for substantially direct passage of heat from the body to the work via the facing by-passing the resilient layer.

2. A heat-sealing head as set forth in claim 1 wherein said deformable facing comprises a series of individually movable facing elements positioned side-by-side on said resilient layer.

3. A heat-sealing head comprising a body having relatively high heat conductivity, said body being adapted to be heated for generation of heat for sealing work to be heat-sealed, a layer of resilient material of relatively low heat conductivity on the body, a work-engaging deformable facing of relatively high heat conductivity on said resilient layer, said resilient layer constituting a resilient backing for said deformable facing and said facing being adapted for localized regional deformation into said resilient layer to accommodate unevenness of work to be heat-sealed, and means for conducting heat from said body to said facing for substantially direct passage of heat from the body to the work via the facing by-passing the resilient layer.

4. A heat-sealing head as set forth in claim 3 wherein said means is constituted by an integral part of said deformable facing.

5. A heat-sealing head as set forth in claim 3 wherein said deformable facing comprises a series of individually movable facing elements positioned side-by-side on said resilient layer.

6. A heat-sealing head as set forth in claim 5 wherein said means is constituted by heat conducting extensions of said facing elements extending back from said facing elements into heat transfer relation with said body.

7. A heat-sealing head as set forth in claim 6 having means associated with said body for holding said facing elements and their extensions captive with respect to said body while permitting movement of said facing elements and their extensions relative to said body.

8. A heat-sealing head comprising a body constituted by an elongate metal block having two faces generally at right angles to one another, one of said faces constituting a forward face, a layer of resilient rubber-like material on said forward face, a series of individually movable relatively narrow metal members carried by the body each having a leg constituting a facing element fronting said resilient layer and a right-angle extension from one end of said leg extending back over an edge of said resilient layer and over the other of said faces of the block, said members being positioned side by side in contiguous relation on the block, and means for holding said members captive with respect to the block while permitting individual rearward and forward movement of said members.

9. A heat-sealing head as set forth in claim 8 wherein the block has a groove in its said other face, and said extensions have legs at their rearward ends extending down into the groove.

10. A heat-sealing head as set forth in claim 9 wherein said means comprises a plate secured to the block overlying said extensions.

11. A heat-sealing head as set forth in claim 10 wherein the groove extends from end to end of the block and

said plate has flanges at its ends closing the ends of the groove.

12. A heat-sealing head as set forth in claim **9** wherein each member is formed of wire.

13. A heat-sealing head as set forth in claim **12** wherein said series of members consists of part of a string of staples.

14. A heat-sealing head comprising a body having a work-engaging deformable facing of relatively high heat conductivity, said facing being constituted by a series of individually yieldable relatively narrow planar metal facing elements positioned side-by-side on said body with

the sides of adjacent elements in contact with one another.

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