June 10, 1969 L. H. GIRARD 3,449,195

HEAT SEALING APPARATUS

Filed April 12, 1966 Sheet 1 of 4

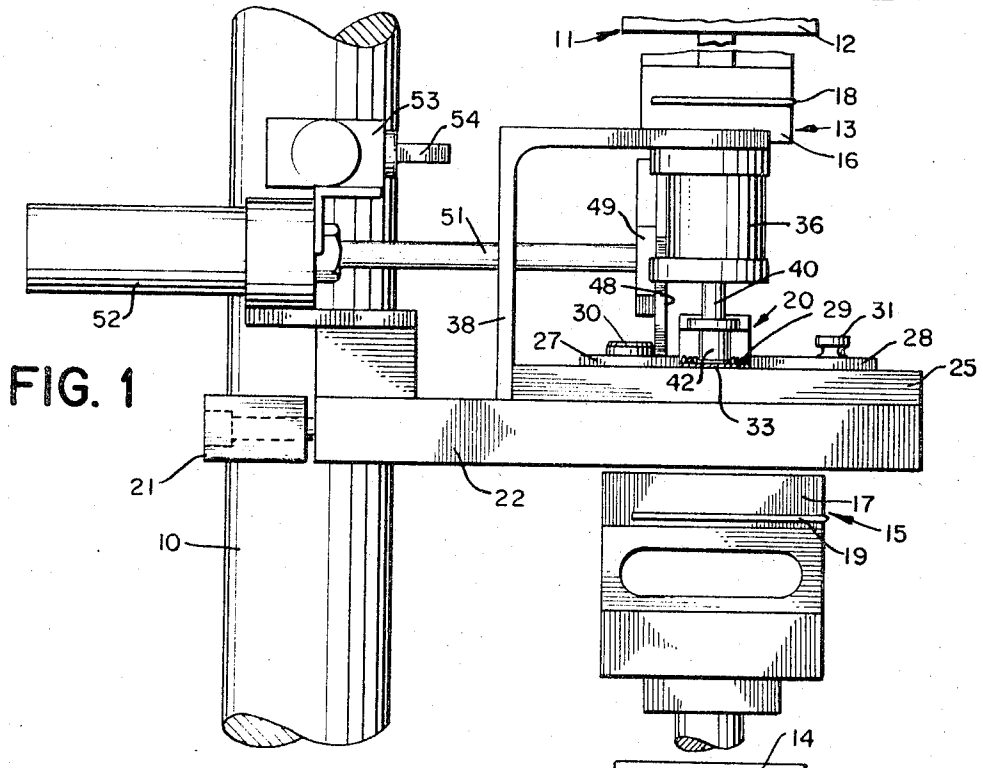


FIG. 1

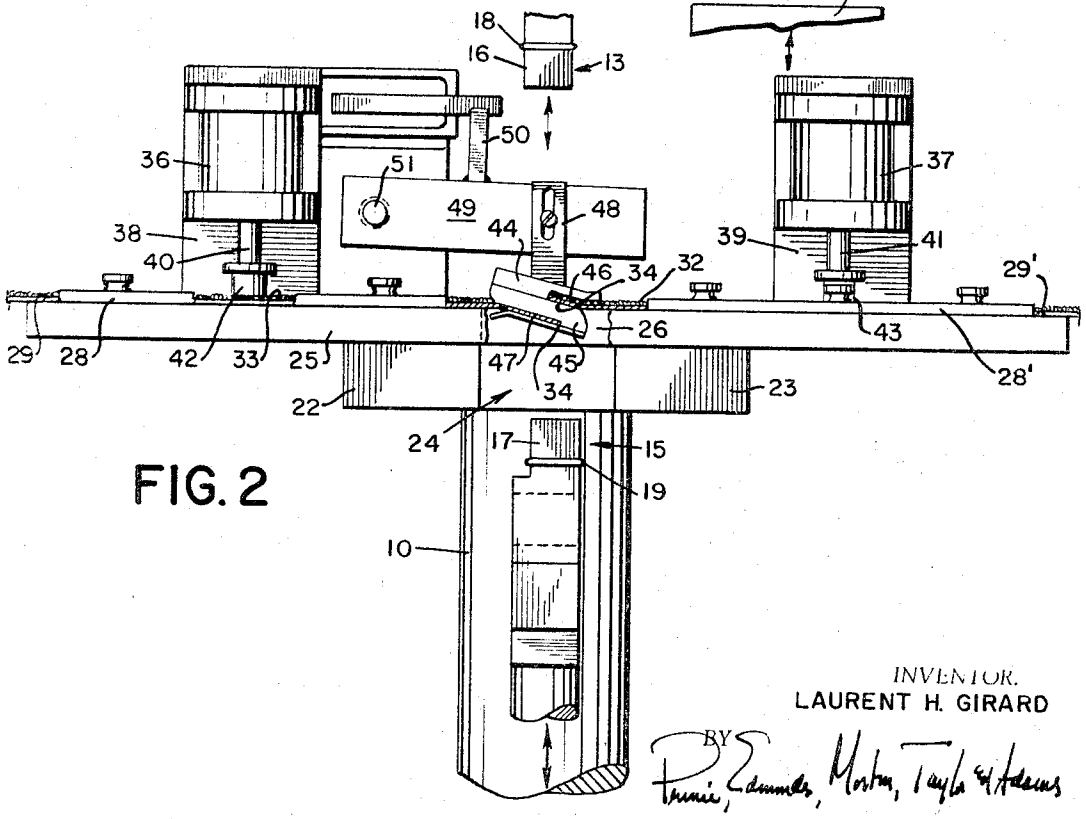


FIG. 2

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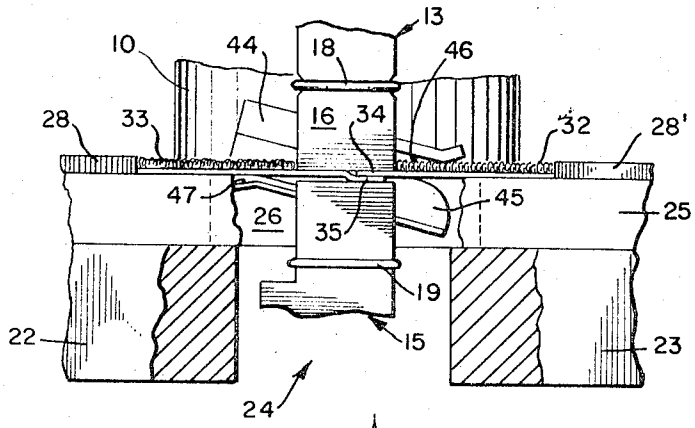
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FIG. 3



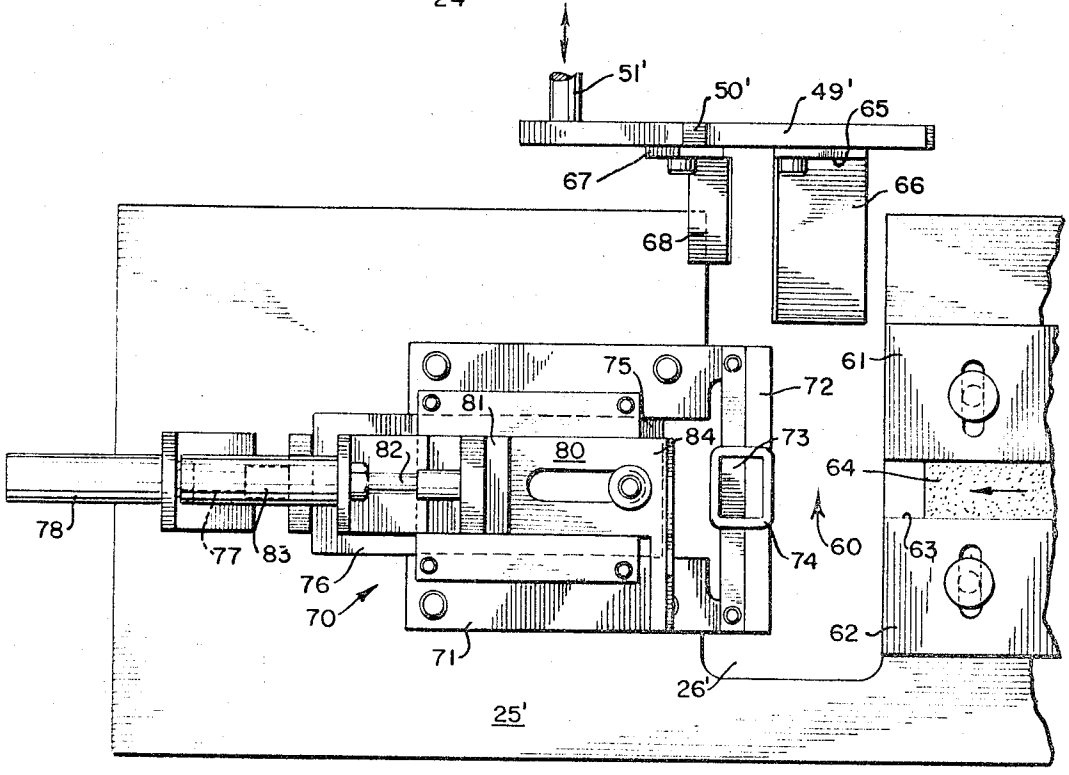


FIG. 4

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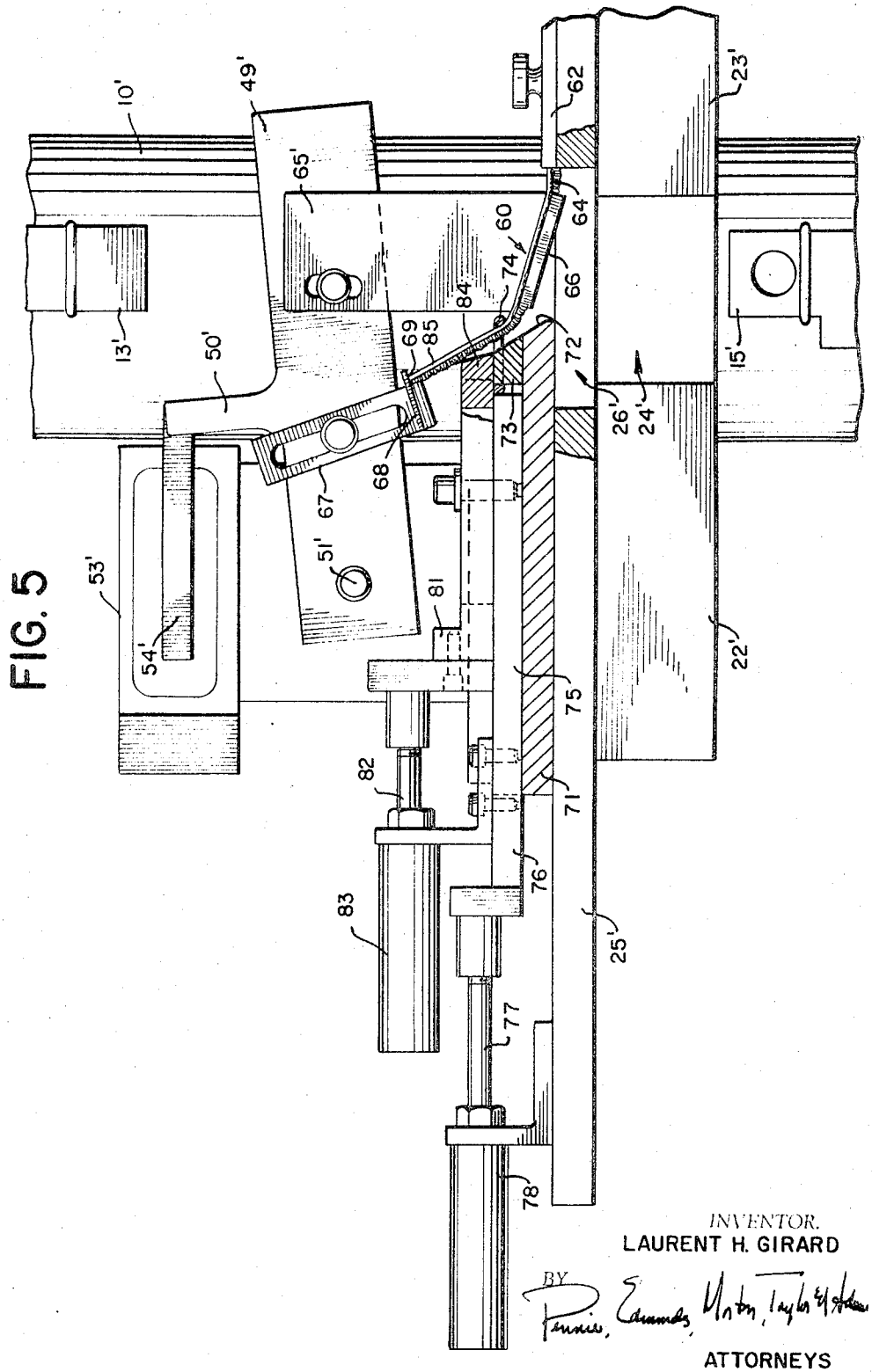


FIG. 5

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HEAT SEALING APPARATUS

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FIG. 6

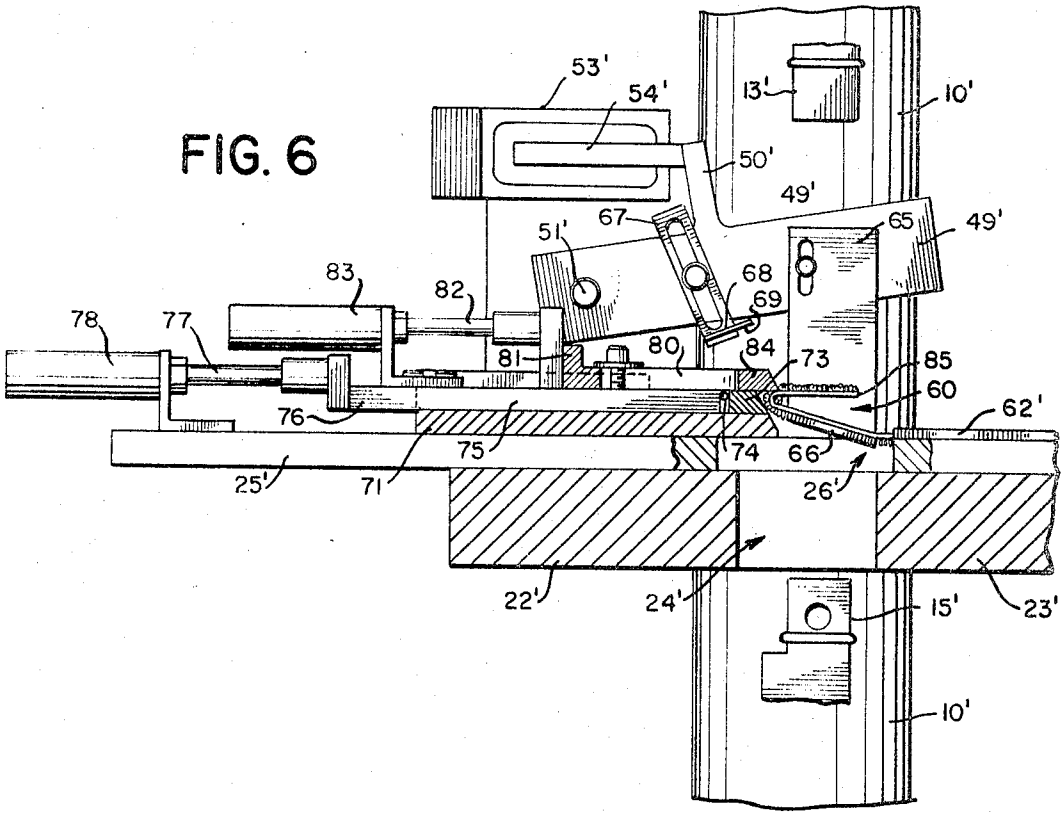
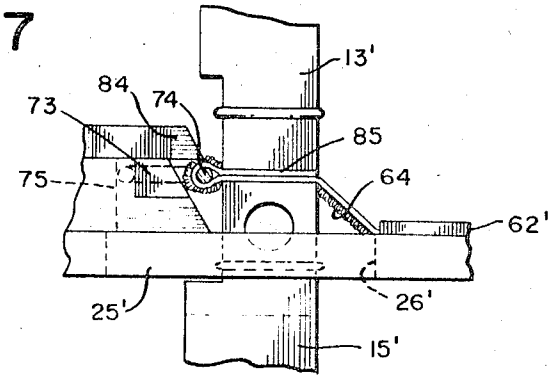


FIG. 7



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United States Patent Office 3,449,195
Patented June 10, 1969

3,449,195

HEAT SEALING APPARATUS

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Continuation-in-part of application Ser. No. 433,341, Feb. 17, 1965. This application Apr. 12, 1966, Ser. No. 542,018

Int. Cl. B65h 69/08; B29c 27/06

U.S. Cl. 156—443 9 Claims

This is a continuation-in-part of my co-pending application, Ser. No. 433,341 filed Feb. 17, 1965.

This invention relates to heat sealing apparatus and more particularly it relates to apparatus for holding portions of sheet material in overlapping relationship and heat sealing them together. It also relates to apparatus for holding a ring in position for insertion of a length of sheet material therein and folding the inserted sheet material back against itself and heat sealing overlapping portions together.

The pile fabric to which the invention has particular applicability is generally described in U.S. Patent No. 3,009,325. Basically, the pile fabric sheet material consists of a base of sheet material which has a surface defined by hooking elements secured thereto in positions extending generally vertically from one surface of the base sheet material to which they are secured. The hooking elements are formed from a flexible resilient material into either hooks or loops of the type characterized by the property that pressing a surface defined by the hooks in face-to-face relation with a surface defined by the loops will result in a large number of hooks engaging a large number of loops to secure the members in face-to-face relation.

In my co-pending application referred to above, a method is described for joining lengths of this pile fabric lengthwise to form a more extended length of one type of hooking element or a composite structure of the two types of hooking elements. The method described involves skiving the hooking elements down to the surface of the base material usually along a marginal end portion of a length of pile fabric so as to present a rather flat smooth marginal end portiton which is substantially free from the vertically extending hooking elements. A marginal end portion is then overlapped with a second length of sheet material, and adhesive is placed between the two flat surfaces and they are joined together by a heat sealing operation. Also described in my co-pending application is a composite length of hook and pile tape joined together with a ring at one end to form a strap.

This invention relates to apparatus for overlapping portions of sheet material and heat sealing them together. The portions of the sheet material can be either marginal end portions of separate lengths of either hook or loops or it can be an end portion of a length of sheet material which is inserted into a ring and folded back against itself in overlapping relationship and heat sealed together. Broadly stated, the apparatus comprises a pair of heat sealing elements mounted for reciprocal movement to and from a heat sealing station and means for reciprocating the heat sealing elements to and from the heat sealing station. Sheet material guide means are provided for receiving portions of the sheet material and positioning them in overlapping relationship at the heat sealing station and means are provided for moving the guide means away from the heat sealing station before moving the heat sealing elements in contact with the sheet material at the heat sealing station.

The invention also provides apparatus which includes means for holding a ring adjacent the heat sealing station in position for an end of the sheet material to be inserted through the ring and other means for folding

an end portion of the sheet material around a portion of the ring and back against itself in overlapping relationship at the heat sealing station.

Preferred embodiments of the invention are described hereinbelow with reference to the drawing wherein:

FIG. 1 is a fragmentary side elevation of one embodiment of the invention;

FIG. 2 is a fragmentary front elevation of the apparatus shown in FIG. 1;

FIG. 3 is an enlarged fragmentary elevation of the heat sealing station of the first embodiment of the apparatus;

FIG. 4 is a fragmentary plan view of a second embodiment of the invention in a first position;

FIG. 5 is an enlarged fragmentary front elevation of the second embodiment in a second position;

FIG. 6 is a fragmentary front elevation of the second embodiment of the invention in a third position; and

FIG. 7 is a fragmentary front elevation of the apparatus of the first embodiment in its fourth sealing position.

Referring initially to FIGS. 1–3, a first embodiment of the invention is shown. The apparatus is comprised of a vertical column **10** which supports a heat sealing device **11** (the control box of which is not shown). Extending downwardly from the control box of the heat sealing device **11** is a top cylinder **12** which has a heating element **13** connected to the cylinder rod. Underlying the top cylinder **12** is a bottom cylinder **14** which also has a heating element **15** connected to its cylinder rod. The heating units **13** and **15** have a polytetrafluoroethylene covering **16** and **17** which is secured around the heating elements by means of clips **18** and **19**; this covering prevents the heating elements from becoming attached to the material during sealing. This heating device **11** is of standard construction and one which is preferred in this apparatus is a device marketed under the trademark Electro-Sealer by Electro-Seal Corporation, Maywood, New Jersey. This device contains controls over the temperature of the heating element and is designed to bring the top heating element **13** and the bottom heating element **15** together at a heat sealing station **20** by actuating the reciprocating air cylinders **12** and **14**.

Attached to the column **10** by means of a clamp **21** are table supporting plates **22** and **23** which extend laterally outwardly from the column in a substantially horizontal position and are in parallel spaced relationship to provide a space **24** therebetween to permit the bottom heat sealing element **15** to pass therebetween. A table **25** is supported on the table supporting plates **22** and **23** and has an opening **26** therein which overlies the space **24** and substantially defines the heat sealing station **20**. Positioned on the table **25** and extending laterally across the table on opposite sides of the heat sealing station **20** are respective pairs of parallel spaced guide plates **27**, **27'**, **28** and **28'** which define an elongated positioned channel **29**, **29'** therebetween. The plates are adjustable on the table and are fixed on the table by locating pins **30**, **30'**, **31** and **31'**. The channels **29** and **29'** are adjusted to receive tapes **32** and **33** therein to position their marginal end portions **34** and **35** at the heat seal station **20**.

Attached to the table **25** on opposite sides of the heat seal station **20** and overlying the channels **29** and **29'** are a pair of air cylinder **36** and **37** which are mounted on the table by means of L-shaped upstanding brackets **38** and **39**. Extending downwardly from the cylinders **36** and **37** are cylinder rods **40** and **41** which have end portions **42** and **43** for contacting the tape and holding it in the channel.

Positioned at the heat seal station are a top guide plate **44** and a bottom guide plate **45**. The top guide plate **44**

has a laterally extending slot **46** provided therein into which marginal end portion **34** of the first length of tape **32** is positioned and bottom plate **45** has a laterally extending slot **47** for receiving the marginal end portion **45** of the second length of tape **33**. When the marginal end portions **34** and **35** are positioned in the guide plates **44** and **45** they are in spaced overlapping relationship with each other. The guide plates **44** and **45** are connected to an L-shaped bracket **48** which extends from the heat sealing station toward the column **10** and is adjustably mounted to a laterally extending plate **49** which has an upstanding contact plate **50** attached to it. The plate **49** is fixed to a cylinder rod **51** at one portion and the cylinder rod is connected to an air cylinder **52**. Mounted on the air cylinder **52** is a microswitch **53** which has a trip plate **54** extending from the switch in position to be contacted by contact plate **50** when the guide elements **44** and **45** are retracted from the heat sealing station **20**. The microswitch **53** is connected to the heat sealing device and when actuated it actuates the top and bottom heating elements **13** and **15** and brings them together at the heat sealing station as shown in FIG. 3.

In operation, a first length of tape **32** is positioned in guide channel **29** and its marginal end portion is inserted in slot **46** of guide plate **44**. A second length of tape **33** is inserted in guide channel **29'** and its marginal end portion **35** is inserted in slot **47** of the bottom guide plate **45**. The air cylinders **36** and **37** are actuated and the tape held in position by pressing contact of the end portions **42** and **43** of the cylinder rods **40** and **41**. Air cylinder **52** is then actuated causing plate **49** to be retracted and sliding the guide plates **44** and **45** away from the heat sealing station **20** with the marginal end portions **34** and **35** sliding out of the slots in the guide plates in overlapping relationship at the heat sealing station. Upon full retraction of the plate **49**, the contact plate **50** actuates the microswitch trip plate **54** and the heating elements **13** and **15** are brought together at the heat sealing station where they contact the overlapping marginal end portions **34** and **35** of the tape and by heat and pressure seal them together. An adhesive is usually used between the interface of the seam being formed and the adhesive is ordinarily positioned on either of the two marginal end portions prior to being inserted in the apparatus.

Referring now to FIGS. 4–7, a second embodiment of the invention is shown. The heat sealing device of the second embodiment is identical to that of the first embodiment and comprises a column **10'** on which the heat sealing device is supported and holds top heating elements **13'** and a bottom heating element **15'** in position to be moved toward and away from a heat sealing station **60**. The apparatus also includes a microswitch **53'** and a microswitch trip plate **54'**. A cylinder similar to the cylinder **52** of the first embodiment (not shown) is also provided and has a cylinder rod **51'** connected to a plate **49'** which has an upstanding contact plate member **50'** extending in position to contact the microswitch trip plate **54'** when the cylinder rod is in its retracted position.

Attached to the column **10'** in the same manner as that described in the first embodiment are table support plates **22'** and **23'** which support a table **25'** in a horizontal position. A space **26'** is provided in the table and the table support members **22'** and **23'** are spaced apart defining a space **24'** therebetween. On one side of the heat seal station **60** there is provided a pair of parallel spaced guide plates **61** and **62** which define a channel **63** therebetween for positioning a length of tape **64** as shown in FIG. 4. Connected to the reciprocal plate **49'** is an L-shaped adjustable bracket member **65** which has an inclined bottom plate portion **66** positioned at the heat sealing station **60** in the extended position of the cylinder rod **51'**. Also secured to the reciprocal plate **49'** is a second smaller adjustable L-shaped bracket **67** which has a bottom laterally extending shoulder portion **68** that defines an abutting surface **69** for an end portion of the tape **64**. On the opposite side of the heat sealing station to the guide channel **64** and supported on the table **25'** is a device **70** for inserting an end portion of the tape **64** into an end ring. This device **70** consists of a base plate **71** which is mounted on the table **25'** and extends over the opening **26'** with an end portion **72** adjacent the heat seal station **60**. Positioned on the end portion **72** is a raised shoulder portion **73** which is sized to receive an end ring **74**, here a D-ring. Mounted on the base plate **71** is a first slide plate **75** which has one end portion **76** connected to a cylinder rod **77** of a cylinder **78**. By actuating the air cylinder **78**, slide plate **75** can be brought into abutting relationship with one portion of the D-ring **74** and hold it adjacent the heat seal station spaced from the raised shoulder **73** so that an end portion **74** can be inserted into the ring.

Once the end portion of the tape **64** is inserted in the ring **74**, the end edge of the tape **79** is abutted against the shoulder **69** of the bottom portion **68** of the bracket **67**. A second slide plate **80** which is fixed to first slide plate **75** and is moveable with the first slide plate **75** in a direction toward the heat sealing station **60** as shown in FIG. 5 has one end portion **81** connected to a cylinder rod **82** of an air cylinder **83** and upon extension of the cylinder rod **82** the opposite end portion **84** of the second slide plate is moved toward the heat sealing station causing a marginal end portion **85** of the tape to be folded over the D-ring **74** and back against itself at the heat sealing station.

The reciprocal plate **49** can then be withdrawn to its retracted position so that the guide bracket **65** is removed from the heat sealing station. In its fully retracted position, the upwardly extending contact portion **50'** of the plate **49'** contacts the microswitch trip plate **54'** and the heat sealing elements **13'** and **15'** are brought into contact at the heat sealing station **60** and by pressure and heat seal, the marginal end portion **85** of the tape to that portion of the tape which it overlaps as shown in FIG. 7 thereby securing the D-ring to an end portion of a length of tape.

It is to be noted that an adhesive can be applied to the marginal end portion of the length of sheet material prior to insertion into the ring; folding of the marginal end portion overlaps the marginal end portion against a back surface of the sheet material which has no pile elements extending therefrom.

I claim:

1. Apparatus for overlapping portions of sheet material and heat sealing them together comprising:

(a) a pair of heat sealing elements mounted for reciprocal movement to and from a heat sealing station,

(b) means for reciprocating the heat sealing elements to and from the heat sealing station,

(c) sheet material guide means for receiving portions of sheet material and positioning them in overlapping relationship at the heat sealing station, and

(d) means for moving the guide means away from the heat sealing station before moving the heat sealing elements into contact with the sheet material at the heat sealing station.

2. Apparatus according to claim **1** wherein said guide means include a top guide plate having a slot for receiving a marginal end portion of a first length of sheet material and a bottom plate having a slot for receiving a marginal end portion of a second length of sheet material.

3. Apparatus according to claim **1** including switch means in position to be actuated by said guide means for automatically moving the heat sealing elements to and from the heat sealing station as the guide means are moved away from and toward the heat sealing station.

4. Apparatus according to claim **1** including means for holding lengths of sheet material from movement away from the heat sealing station after positioning in the guide means.

5. Apparatus according to claim **4** wherein said holding means are a pair of air cylinders positioned on opposite

sides of the heat sealing station and a table surface is provided on opposite sides of the heat sealing station against which the sheet material is pressed by the cylinders.

6. Apparatus according to claim 1 including means for holding a ring element adjacent the heat sealing station in position for an end of sheet material to be inserted therethrough, and means for folding the inserted end portion of the sheet material around a portion of the ring and back against itself in overlapping relationship at the heat sealing station.

7. Apparatus according to claim 6 wherein said means for holding the ring includes a raised member mounted adjacent the heat sealing station about which the ring member fits, a first slide member reciprocally mounted to hold the ring against the shoulder portion with one portion of the ring spaced from the shoulder portion, a space great enough to permit the end portion of the sheet material to be inserted therebetween and a second slide member reciprocally slidable over the shoulder portion toward the heat sealing station to fold the inserted marginal end portion of the tape back against itself in overlapping relationship at the heat sealing station.

8. Apparatus according to claim 6 including switch means in position to be actuated by said guide means for automatically moving the heat sealing elements to and away from the heat sealing station as the guide means are moved away from and toward the heat sealing station.

9. Apparatus according to claim 6 wherein said guide means includes a first guide plate reciprocal to and away from the heat sealing station and inclined away from the ring holder, and a second sheet material edge abutting means positioned over the ring holder for holding the inserted marginal end portion of the sheet material in position to be folded over toward the heat sealing station.

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DOUGLAS J. DRUMMOND, *Primary Examiner.*

U.S. Cl. X.R.

156—502, 583