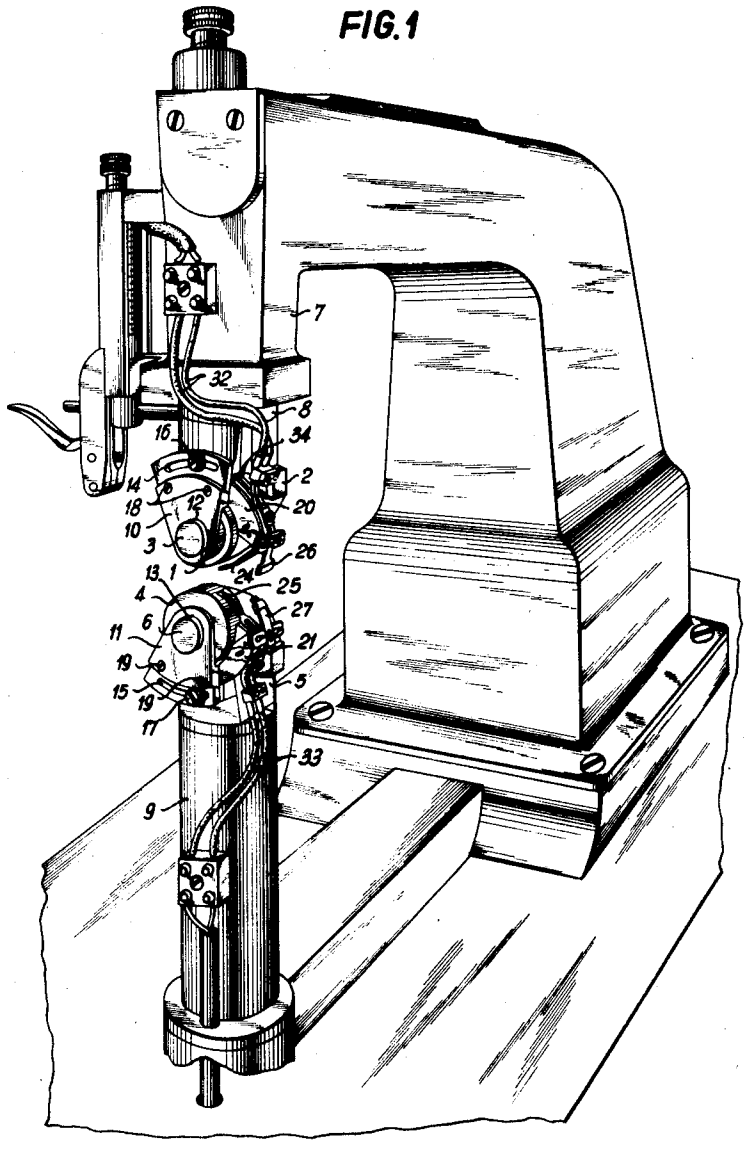
June 21, 1960 E. SCHENKENGEL 2,941,576

APPARATUS FOR CONTINUOUS HEAT-SEALING

Filed Dec. 13. 1955 2 Sheets-Sheet 1

FIG.1



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Filed Dec. 13, 1955 2 Sheets-Sheet 2

FIG. 2

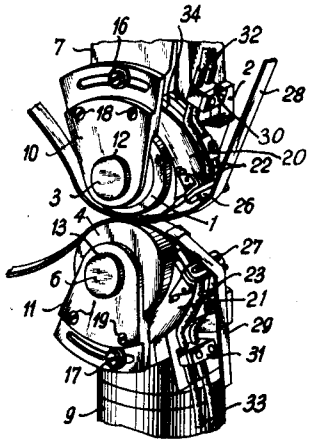


FIG. 3

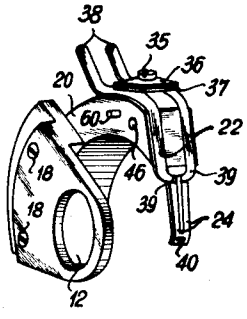
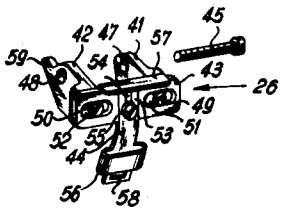


FIG. 4



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United States Patent Office 2,941,576
Patented June 21, 1960

2,941,576

APPARATUS FOR CONTINUOUS HEAT-SEALING

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Filed Dec. 13, 1955, Ser. No. 552,919

Claims priority, application Germany Dec. 16, 1954

6 Claims. (Cl. 154—42)

The invention relates to an apparatus for sealing plastics, and relates more particularly to such apparatus or machines for heat-sealing pieces of material that have thermoplastic surface characteristics, for instance that may either be composed of or be coated with, thermoplastic material. The pieces to be sealed may be plastic sheets, and may either be separate pieces or pieces of the same sheet.

It is among the objects of the invention to provide such a machine that has conventional feed and pressure rolls, and is provided with safety strips and with heating elements for heating the material while avoiding direct contact between the heating element and/or the rolls and the material itself.

It is a further object of the invention to fashion the heating elements in such a shape that the temperature distribution is most propitious, precluding any temperature variations within the ends of the heating elements which are in contact with the safety strips.

It is a further object of the invention to reduce to a minimum the electric consumption for heating, and to provide for a highly sensitive heat regulation.

It is a still further object of the invention to provide for adjustable guiding means for the safety strips, and for adjustable positioning of the heating elements as well as of the safety strips.

The propitious temperature distribution along the heating elements, broadly speaking, is accomplished by increasing the cross section of the heating element with increased distance from the free end thereof. Thereby, the electrical resistance will increase with decreased distance from the free end. The maximum temperature drop along the heating elements develops in the free ends, because the total resistance of the parallel circuit formed by the free ends is larger than the resistance of each heating element in advance of the free ends.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary perspective view of an apparatus in accordance with the invention, with the upper roll raised and the safety strip guides in inactive position;

Fig. 2 is a fragmentary perspective view showing some of the parts of Fig. 1, but with the rolls and guides in operating position;

Fig. 3 is a perspective view of a carrier for the heating element including a bracket; and

Fig. 4 is an extended perspective view of a guide for a safety strip.

In carrying the invention into effect in one of the embodiments which has been selected for illustration in the accompanying drawings and for description in this specification, and referring now particularly to Fig. 1, there is provided an upper driving feed roll 1 which is journalled on a shaft 3 that is held in a support 2. A lower driving feed roll 4 is journalled on a shaft 6 which is supported in a part 5. The support 2 is connected to

a spindle 8 which is guided for reciprocation in the head 7 of the frame of the apparatus. The part 5 is connected to a column 9 which forms part of the frame of the apparatus.

In front of each of the rolls 1 and 4 there is disposed a bracket, namely the upper bracket 10 is disposed in front of the upper roll 1, and the lower bracket 11 in front of the lower roll 4. Each bracket surrounds the roll shaft, and is tiltable about the shaft, and thereby about the axis of the shaft, among various positions angularly offset from each other. The bracket 10 is provided with a bore 12 around the shaft 3, and the bracket 11 has a bore 13 which surrounds the shaft 6. The upper bracket 10 has an arcuate slot 14 that is concentric with the axis of the bore 12; similarly, the lower bracket 11 has an arcuate slot 15 that is concentric with the axis of the bore 13. Through the slot 14 there protrudes a bolt 16 that is threaded in the frame, for latching the upper bracket 10 adjustably in position; similarly, a bolt 17 protrudes from the frame through the slot 15 of the lower bracket 11 to latch it adjustably in position.

To each bracket there is secured a carrier, namely to the upper bracket 10 there is secured by means of screws 18 an upper carrier 20, and to the lower bracket 11 there is secured by means of screws 19 a lower carrier 21. Each carrier is composed of insulating material, and is arcuately shaped and has one end in form of a wedge (Fig. 3).

The upper carrier 20 has two bus bars 22 made of conducting material to which there is connected a heating element 24 which includes two conductors and a bridge 40; similarly, the lower carrier has bus bars 23 and a heating element 25 and a bridge. To the upper carrier 20 there is connected a guide 26 for a safety strip 28, and to the lower carrier there is connected a guide 27 for the lower safety strip 29. Clamping means 30 and 31, respectively, are connected to the bus bars 22 and 23 for interconnection of the bus bars to flexible wires 32 and 33, respectively, and these wires are interconnected to an electric source by means of well-known, suitable regulating resistors and measuring instruments (not shown).

As the construction and arrangement of the guides 26 and 27 for the safety strips, and for the heating elements 24 and 25 on the upper and lower carriers 20 and 21 is alike, there will be described in the following the construction in detail only in connection with the upper carrier 20.

The carrier 20 has external grooves 34 (Fig. 1) in which there are disposed the bus bars 22. The bus bars 22 are held in the grooves 34 by means of a plate 36 (Fig. 3) which is secured in position by a screw 35. Between the plate 36 and the bus bars 22 there is placed a layer 37 of insulating material. The upper free ends 38 of the bus bars 22 are bent away from the carrier 20, and there is removably connected to these free ends 38 (Fig. 3) the clamp 30 (Fig. 2) that receives the wires 32. The other ends 39 of the bus bars 22 are disposed adjacent the edge of the wedge of the carrier 20 and are bent at right angle to each other, and interconnected to the conductors of the heating element 24 which protrudes from said edge.

The heating element 24 is built as a flat conducting loop and carries at its free end the bridge 40 which is parallel to the loop end. The cross section of the heating element 24 decreases uniformly towards the loop end. The end of the heating element 24, which has the bridge 40, is bent in such a manner that it will be parallel to the path of the material (not shown) to be heat-sealed in the apparatus.

The guide 26 (Fig. 4) comprises two parallel lugs 41

and 42, a bridge or plate 43 which is shiftable thereon parallel to the axis of the roll 1 and a guiding member 44 that is shiftable in a direction transverse to said axis, namely in the direction of feeding on the material in the feed path. The guide 26 is pivotally mounted on the carrier 20 by means of a screw 45 which protrudes through a hole 47 in the lug 41, a bore 46 of the carrier 20, and engages a threaded hole 48 of the lug 42. The axis of the screw about which the guide 26 tilts, is parallel to the roll axis. The bridge 43 is connected to the lugs 41 and 42 by means of screws 49 and 50 that protrude through chamfered slots 51 and 52 which are formed in the bridge 43. The guiding member 44 is guided in a groove 53 that is formed in the bridge 43, and is connected by means of a screw 55 that protrudes through a slot 54 of the member 44. The member 44 is provided with a sleeve 56 to guide the safety strip 28, and with guiding brackets 57 and 58.

The lug 42 has a nose 59 (Fig. 4) which is abuttable against a pin 60 (Fig. 3) of the carrier 20 to limit the extent of tilting of the guide 26.

The operation of the above described apparatus is as follows.

The adjustment of the heating elements 24 and 25 is necessary or at least desirable after each exchange of rolls. For this purpose, the operator will first raise the upper roll 1, for instance by means of the operating pedal (not shown), and he will then tilt outwardly the guides 26 and 27 and pull out the safety strips 28 and 29. After the exchange of rolls, the operator will lower the upper roll 1 until there is contact between the rolls 1 and 4. After loosening the screws 16 and 17, the operator will adjust the position of the brackets 10 and 11 about the shafts 3 and 6 so that the heating elements 24 and 25 will be exactly superposed with their parallel loop ends upon the exercise of light pressure. Thereafter, the operator will again lift the upper roll 1, and insert the safety strips 20 and 29 through the sleeves 56 of the guides 26 and 27, and return the guides to their operating positions by tilting. After the subsequent lowering of the upper roll 1 and the feeding in of the strips 28 and 29, the apparatus will be ready for operation (Fig. 2). After turning on the current for the heating elements 24 and 25, the operation may be started following a time interval of but a few seconds.

In order to adjust the guides 26 and 27, it is necessary to loosen the screws 49 and 50. If a wider safety strip is intended to be used, the operator will need to loosen the screw 55 and to replace the member 44 with a similar part that has a wider sleeve 56. In order to exchange the heating elements 24 and 25, the operator will loosen the clamps 30 and 31 as well as the screws 16 and 17, by which operation the brackets 10 and 11 together with the carriers and heating elements can be removed, for a subsequent exchange of parts.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. In continuous plastic sealing apparatus of the type including a pair of cooperating pressure welding rolls and means for passing a pair of superposed plastic members to be sealed between said rolls with intervening safety strips between each of said rolls and the adjacent members; electrical heating elements for each of said members, to raise the portions thereof to be sealed to plastic temperature and to effect sealing by said rolls along a continuous welding seam, said heating elements being separate from and disposed at a point ahead of the point of engagement of said strips and members by said rolls and each of said elements comprising a pair of spaced parallel conductors having a progressively decreasing cross-section towards said rolls in the feeding direction of said members and terminating in registering end portions engaging one of said strips passing therebetween together with said members, said end portions forming a bridge connecting said conductors and having an electric resistance higher than the resistance of said conductors.

2. In a plastic sealing apparatus as claimed in claim 1, wherein said conductors include equal and opposite angles with said superposed members and strips and said end portions are angularly bent relative to said conductors to be substantially parallel to said strips.

3. In plastic sealing apparatus as claimed in claim 1, a support for each of said rolls, and means for aligning said heating elements comprising separate carrier means therefor each being mounted upon one of said supports in rotatably adjustable relation thereto about the axis of the associated welding rolls.

4. In plastic sealing apparatus as claimed in claim 3, guide means for each of said safety strips mounted upon said carrier means, respectively.

5. In plastic sealing apparatus as claimed in claim 3, guide means for each of said safety strips pivotally mounted upon said carrier means for operation between an operative and a retracted position, respectively.

6. In continuous plastic sealing apparatus of the type, including a pair of cooperating pressure welding rolls and means for passing a pair of superposed sheet-like plastic members to be sealed between said rolls with intervening safety strips between each said rolls and the adjacent members; of a pair of heating elements for said members, to raise the portions thereof to be sealed to plastic temperature and to effect sealing by said rolls along a continuous welding seam, said heating elements being separate from and disposed at a point ahead of the point of engagement of said strips and members by said rolls and each of said elements comprising a pair of spaced conductive heating bands disposed in the same plane and having a progressively decreasing width towards said rolls in the feeding direction of said members, said bands terminating in angularly bent registering and substantially parallel end portions each engaging one of said strips passing therebetween together with said members, said end portions forming a bridge connecting said bands and having an electric resistance higher than the resistance of said bands.

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