

March 29, 1966

J. E. BLYTHE ETAL

3,243,574

IMPULSE SEALER

Filed April 26, 1961

4 Sheets-Sheet 1

FIG. 1

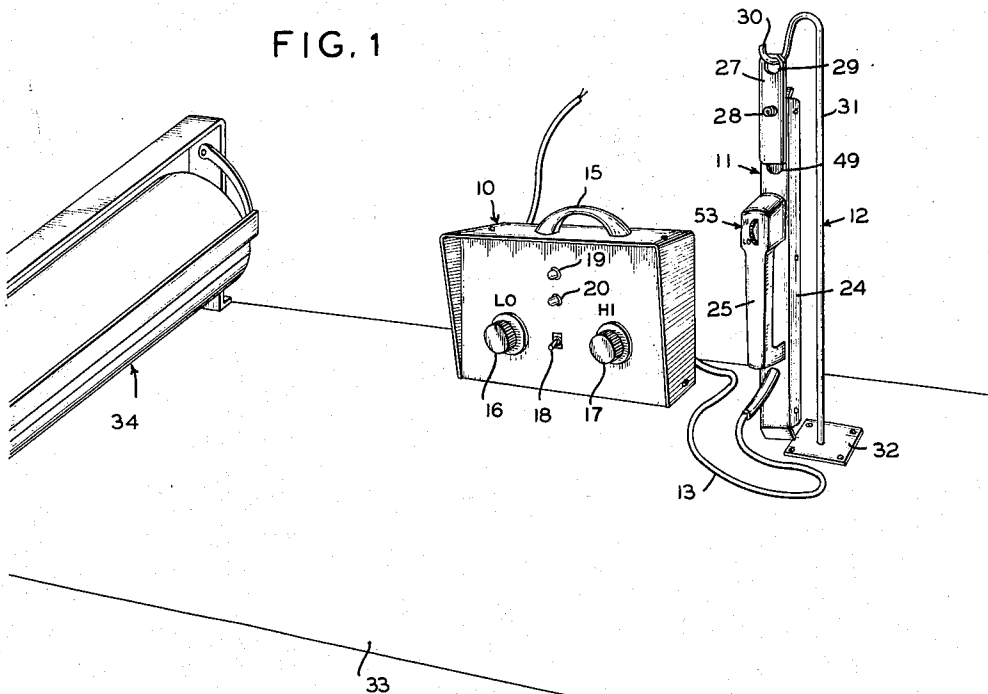


FIG. 2

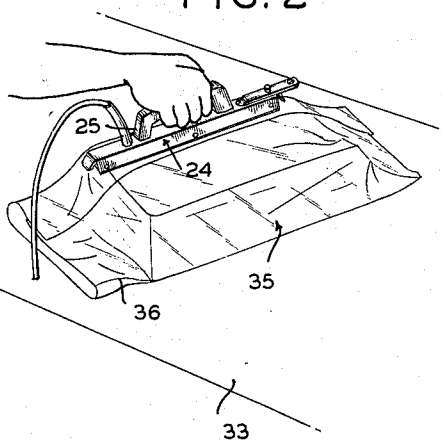
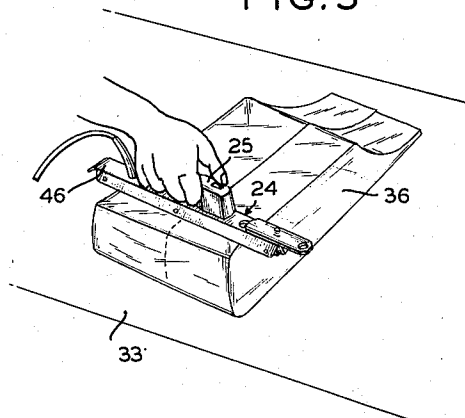


FIG. 3



INVENTORS

**JAMES E. BLYTHE &
MYRON A. MAYHEW**

BY E. Janet Berry
ATTORNEY

March 29, 1966

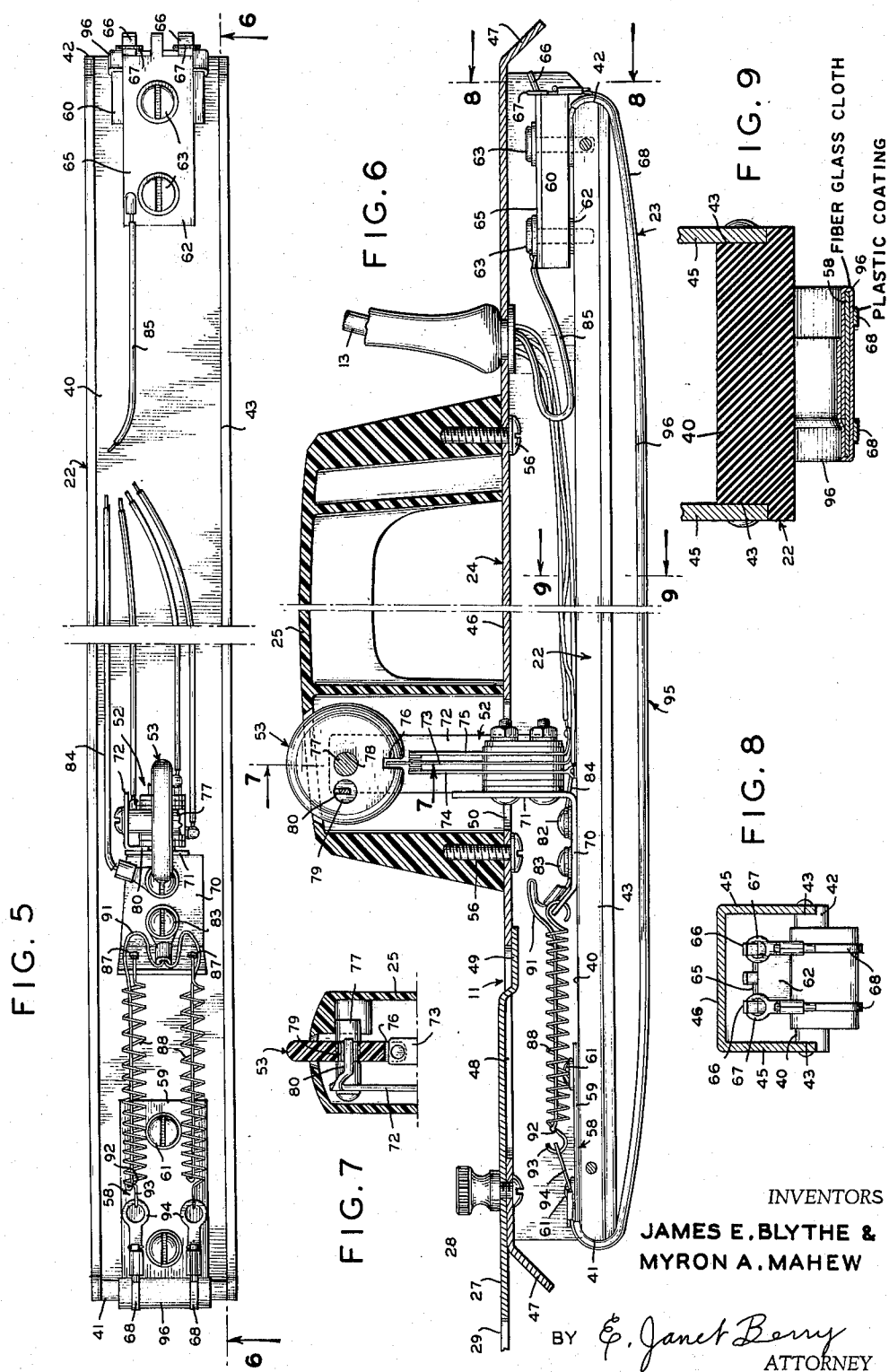
J. E. BLYTHE ET AL

3,243,574

IMPULSE SEALER

Filed April 26, 1961

4 Sheets-Sheet 3



March 29, 1966

J. E. BLYTHE ETAL

3,243,574

IMPULSE SEALER

Filed April 26, 1961

4 Sheets-Sheet 4

FIG. 11

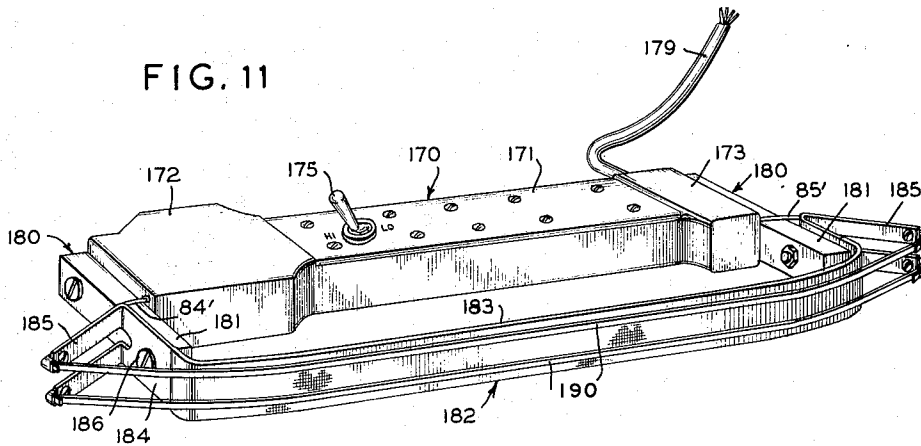


FIG. 12

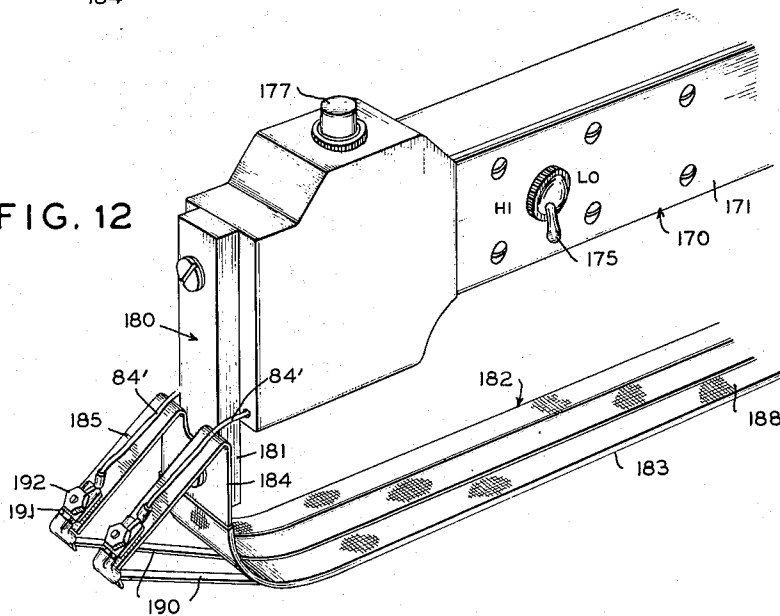
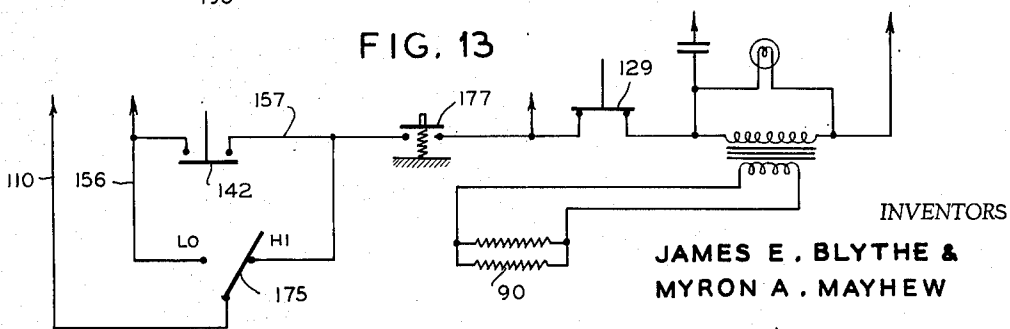


FIG. 13



INVENTORS

JAMES E. BLYTHE &
MYRON A. MAYHEW

BY

E. Janet Berry
ATTORNEY

1

3,243,574

IMPULSE SEALER

James E. Blythe, Pittsford, and Myron A. Mayhew, Rochester, N.Y., assignors to National Distillers and Chemical Corporation, New York, N.Y., a corporation of Virginia

Filed Apr. 26, 1961, Ser. No. 105,653

4 Claims. (Cl. 219—250)

This invention relates to merchandising and packaging and more particularly to the wrapping of various articles in relatively thin thermoplastic films. Although it has other applications, the invention is particularly directed to the sealing of the film on soft packages of such items as towels, sweaters, laundry and the like.

The use of films such as polyethylene, and the like, for wrapping laundry and other soft merchandise has displaced to a substantial extent wrapping in paper and cardboard boxes. Such film has the advantage of transparency, thus providing an attractive display and facilitating identification of the contents. It also has the property of being self-sealable, i.e., sealable to itself, thus eliminating additional wrapping and sealing means which are necessary with other materials.

Polyethylene and like films commonly used for such purposes ranges in thickness from 0.00075" to 0.00125" or approximately one mil.

Due to the thinness of the film, there have been difficulties in sealing soft packages on a commercial basis. The seal is dependent upon the temperature of the heating element and the pressure applied. Insufficient heating and/or pressure does not produce a seal. An excess of either melts and ruptures the film, with the danger of injury to the product being wrapped. Successful sealing requires particularly close contact of both heat and pressure.

Where the film is positioned between platens in which the heat and pressure may be mechanically and structurally controlled or where marginal or end edges are joined, proper sealing has been relatively easy to obtain. However, the wrapping and packaging of soft commodities does not readily lend itself to the use of end seals. Hence, it is desirable that such packages be wrapped with film placed about the same in a conventional packaging manner, with excess film material extending from the ends and folded over onto the package and sealed in this position. Such wrapping requires the application of appropriate heat and pressure against the film, backed by the packaged item, which may be of varying texture and softness, depending upon its nature. Various apparatus and methods for producing a seal in a package of this type have been attempted, but have suffered from various shortcomings, including difficulty of application, especially by unskilled operators.

Accordingly, it is an object of the present invention to provide an apparatus adapted to produce a seal between layers of thin thermoplastic film which is backed by material of varying degrees of softness and which may be of irregular configuration and density.

A further object is to provide a heat sealer especially adapted for the wrapping and sealing of soft packages rapidly and efficiently with thin plastic film.

A further object is to provide a novel and easily adjusted timing circuit for governing the application of electrical energy to a load.

These and other objects of the invention will become apparent from the following description in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a device in accordance with the present invention and illustrating its position for use on a wrapping line;

2

FIGS. 2 and 3, examples illustrating the use of the device in sealing a soft package;

FIG. 4, an enlarged perspective view of the sealing member;

FIG. 5, a top plan view of the sealing member with the cover removed;

FIG. 6, a partial vertical sectional view taken on the line 6—6 of FIG. 5 with the cover in place;

FIG. 7, a fragmentary sectional view taken on the line 7—7 of FIG. 6;

FIG. 8, a vertical sectional view taken on the line 8—8 of FIG. 6;

FIG. 9, an enlarged vertical sectional view taken on the line 9—9 of FIG. 6;

FIG. 10, a schematic diagram of the electrical circuit embodied in the device;

FIG. 11, a perspective view of a modified form of sealer;

FIG. 12, an enlarged fragmentary perspective view of an end portion of the device of FIG. 10, and

FIG. 13, a fragmentary schematic diagram of a modified circuit employed with the device of FIGS. 11 and 12.

Briefly stated, the present invention includes a sealing member having a resilient longitudinal contact member having one or more, preferably two, coated heating elements on its outer surface which are connected to a high energy source automatically controlled to pulse the heating elements for a brief measured period of time adequate for sealing and which is readily adjustable and provides an accurate and convenient method of controlling the heat and pressure applied during the sealing operation.

GENERAL DESCRIPTION

With further reference to the drawings, there is illustrated an electrical element control box 10 within which the major portion of the electrical components are mounted, and a sealer head 11 mounted on a stand 12 and electrically connected to the control box 10 by a cable 13. The control box has a carrying handle 15, high and low range potentiometer dials 16 and 17, an on-off switch 18, an on-off indicator light 19 and a heating indicator light 20.

Desirably the sealer head 11 includes a base 22 (FIGS. 4, 5 and 6) carrying a heating member 23 and mounted in a cover 24 to which a handle 25 is attached. At the forward end the sealer head has a hanger 27 mounted on the cover 24 by fastener 28 and having an aperture 29 for engaging the loop 30 of a post 31 mounted on the base 32 of the stand 12.

The sealer head is positioned for convenient use in connection with the articles being wrapped on a working surface 33. In one application a roll of film 34 is supported convenient to the working surface 33 in order that the operator may draw off and remove an appropriate length of the film for wrapping and sealing. FIG. 2 illustrates an article 35 which has been placed upon a length of film 36 torn from roll 34, the ends of which have been overlapped across the article and are being sealed together along the upper surface thereof. In FIG. 3, subsequent to the operation of FIG. 2, an end of the film 36 has had its corners folded toward each other and then overlapped onto the top of the package for sealing to itself and to the underlying film.

THE SEALER HEAD

With further reference to the sealer head illustrated in detail in FIGS. 4, 5 and 6, the base 22 is produced from rigid insulating material and consists of a flat strip 40 having rounded ends 41 and 42 and recesses 43 at the sides for receiving the side members 45 of the cover 24. The cover 24 has a deck 46 from which the sides 45

3

depend, and inclined shields 47 at each end which project beyond the extremities of the base 22.

The deck has an elongated access aperture 48 at its forward extremity which in normal use is covered by and receives an offset finger 49 of the hanger plate 27 to provide firm engagement therewith. The deck also is provided with a central opening 50 through which the upper portion of a control switch 52 extends, having as an operating element a roll wheel 53 of insulating material which projects through opening 54 in the forward portion of the handle 25 for convenient access by the operator's thumb. The handle is mounted on the deck by fasteners 56 extending into the handle from beneath the deck and passing through apertures therein.

The heating member 58 comprises a strip of flat, spring-like material having ends 59 and 60 rigidly connected to the base 22 on its upper surface. Although various connecting arrangements may be employed, desirably the front end 59 is conveniently held by fasteners 61 passing directly into the base and the back end 60 by a block 62 through which fasteners 63 extend into the base. Mounted on block 62 is a terminal plate 65 having spaced fingers 66 inclined upwardly for engaging connectors 67 at one end of heating wires 68.

One or more heating wires 68 may be employed. However, with the use of more than one wire the likelihood of obtaining a satisfactory seal is increased and hence the use of two wires is preferred. Such wires are of low thermal inertia, that is, they reach high temperature in a minimum of time and cool rapidly when the energizing current is interrupted, such cooling being facilitated by the proximity of the wire to the heater member 23 the temperature of which remains substantially below that reached by the wires during operation of the device.

At the forward end of the base of mounting plate 70 is provided, having an upstanding portion 71 supporting the frame 72 of the single-pole double-throw switch 52. The central pole 73 of the switch projects beyond the spaced contacts 74 and 75 and is received in the notch 76 of the roll wheel 53, which is mounted on post 77 projecting from the frame 72, the post extending through a central aperture 78 in the roll switch. The roll switch has an off-center opening 79 receiving a finger 80 projecting from the frame which restricts the range of oscillation of the roll wheel.

The base of the switch 52 has conventional contacts from each of the switch elements 73, 74 and 75, all of which are insulated from the frame 52.

The mounting plate 70 is secured to the base 22 by fasteners 82 and 83, the fastener 82 connecting a high energy lead 84 of the cable 13, the other high energy lead 85 being connected to the end 65 of heating member 23. The forward end of the plate 70 has a pair of spaced apertures 87 with which the extremities of tension springs 88 are engaged, the other extremities of said springs having loops 93 for engaging the connectors 94 at the ends of the heating wires 68. Access through the aperture 48 permits convenient replacement when required. In order to provide a path of high conductivity, low resistance leads 91 are connected to the plate 70 by fasteners 83 and pass along the springs to the opposite ends where they are firmly connected at 92. The end loops 93 of the springs may be modified, as by a low resistance coating, to improve their electrical conductivity.

The heating member 23 has a central outwardly bowed portion 95 which resiliently resists depression and hence is adapted to engage the surface being sealed, which may be soft or uneven, over a substantial portion of its length.

In order to resist the tendency of the heating member 23 to stick to the plastic film, the member is covered preferably with a plastic-coated glass fiber cloth 96 which extends the full length of the bowed portion of the member and around the rounded ends 41, 42 of the base. Various covering materials well known to the industry may be used.

4

The heater wires 68 are of the ribbon type and in one embodiment are $\frac{1}{16}$ " wide by 0.0005" thick, identified as "Nichrome V," each having a resistance of about 1.723 ohms per foot. In order to prevent the heater wires from adhering to the plastic film, the wires are coated with a plastic such as polytetrafluorethylene, available under the trademark "Teflon." The coated wires are maintained in intimate engagement with the heating member by the tension springs 88 and may be easily removed from engagement therewith and replaced as may be required.

The electrical control apparatus, to be described, permits the operator to adjust the heating of the wires to accord with the pressure exerted by the individual operator. As a specific operating example, the operator may overlap a sheet of film, providing a two-layer thickness, and place the sealing head with the heating member on the double layer and rotate the roll wheel to the "low" position, thus energizing the wires. Prior thereto the control box 10 is connected to a source of power (not shown), the on-off switch 18 is placed in the "on" position, lighting the indicator light, and a brief warmup time afforded.

Rotating the roll wheel 53 to the "low" position applies a large pulse of current of brief duration to the heater wires for a length of time determined by the operator's adjustment of the control dial 16. Such energization of the heater wires ceases abruptly at the end of the time interval, even though the operator does not release the roll wheel but continues to hold it in the "low" position.

Through judgment and trial an operator may select an adjustment of the control dial 16 which supplies sufficient heat for the operator's normal application of pressure to provide a seal in a double thickness of the material being used. Such dial adjustment may vary for different operators who exert different pressures and for different film materials and thicknesses. When the ends of the film are folded over or a thickness greater than a double thickness is encountered, if the heat provided by the "low" heat position is insufficient, then the operator rotates the roll wheel in the opposite direction to the "high" position, which results in current being conducted to the heater wires for a longer period of time, this being adjusted by the control dial 17.

The operator may ascertain at any time whether heat is being applied to the heater wires by observation of the indicator light 20 of the instrument. Thus, after initial setting of the device, the sealer may be applied to each succeeding package until the heat indicating light goes out, thus providing an easy method of applying a measured, predetermined heat for successive sealing operations with little effort on the part of the operator.

THE ELECTRICAL CONTROL APPARATUS

A schematic diagram of the electrical circuit is illustrated in FIG. 10. As shown, there is provided a connection to a source of current and to a heating transformer the secondary of which is connected to the heater wires 68. Energizing of the primary of the heating transformer is controlled by the length of time that a charged condenser requires to discharge through either of two selected potentiometers (one for the "high" heat position and the other for the "low"), the completed discharge of the condenser permitting a thyatron or gas-filled tube to fire, and the circuit for the firing including a circuit breaker for the primary of the heating transformer.

With particular reference to FIGS. 1 and 10, main switch 18 connects a 117 volt A.C. line to main lines 110 and 111. Across the lines is the primary 112 of a step-down transformer 113 whose secondary 114 is connected to the heater 115 of a thyatron or gas filled tube 116. Indicator light 19 bridges the secondary of the transformer to indicate that the transformer is energized.

When the thyatron is energized, a rectified capacitor-charging current flows from line 110 through branch 117, a capacitor 118, branch 119, grid 120 and cathode, 121.

5

of the thyatron, and a lead 122 with a current limiting resistor 123 to line 111. While the capacitor is maintained charged, the negative potential necessarily existing at the grid maintains the anode circuit of the thyatron inactive. When the capacitor is discharged and at a proper phase of the cycle of the line voltage, the thyatron will conduct.

The anode circuit of the thyatron back to line 111 includes the anode 124, and a relay 125 whose coil 126 is shunted by a capacitor 127 to impose a delay on the operation of the relay or prevent chatter. The relay includes normally closed contacts 128 and 129 bridged by a capacitor 130 to reduce arcing at the relay contacts.

Also included in the welding circuit are two control relays 131 and 132. Control relay 131 has two normally open contacts 134 and 136. Control relay 132 has normally closed contact 138 and normally open contacts 140 and 142. The capacitor 118 can discharge via either one of two potentiometers 144 or 146 (controlled by dials 17 and 16, respectively), set at different magnitudes of resistance, via a selected one of the contacts 138 and 140, one of which is closed while the other is opened, the discharge path being from a pole of the capacitor through the selected potentiometer line 110 and back to the other pole of the capacitor.

Current flow through the thyatron via contact 134 and branch 117 operates the coil of relay 125 thus opening the contact 129 which is in series with the primary 147 of a welding transformer 148, bridged by light 20 to indicate its energization, the transformer having a secondary 151. The welding transformer circuit is maintained open until either one of two normally open switches high weld switch 74 or low weld switch 72 is connected with center pole 73.

When switch 74 is closed, a circuit is established to the welding transformer primary 147 via normally closed time delay relay contact 129.

When low weld switch 72 is closed a circuit is established to the welding transformer primary via contact 142 of relay 132 and the contact 129 of relay 125, the contact 142 being closed because closure of switch 72 places the coil 150 of relay 132 across the lines 110 and 111.

When the "high" switch 74 is closed coil 150 of relay 132 is not energized and the discharge of the capacitor 118 is via potentiometer 144, set to a relatively high resistance to provide a long period of discharge for the capacitor, and through the contact 138. When the "low" switch 72 is closed, the coil of relay 132 is energized, breaking the circuit through potentiometer 144 while that through potentiometer 146 is established via contact 140. The potentiometer 146 is set at a relatively low resistance to afford a faster discharge of capacitor 118 than that provided by the potentiometer 144.

The closing of contact 142 of relay 132 also establishes a holding circuit for the relay 132 after the "low" switch 72 is closed momentarily. The holding or shunt circuit for the relay includes lead 149, the relay coil 150, lead 156 connected to relay lock-up contact 142, leads 157 and 158, the now closed time delay relay contact 128, lead 159, contact 136 of relay 131, and branch 117. The latter relay is energized simultaneously with the closure of either heat control switch, since the path of the current after it leaves either closed switch 74, or switch 72 and relay contact 142, is through the coil 160 of relay 131 to lead 149 and line 111. Relay 131 is also self-locking, by reason of current from line 110, branch 117, through its contact 136 and switch contact 128 of time delay relay 126, through coil 160 to lead 149.

Energization of the welding transformer will continue through contact 129 of relay 125 until the capacitor 118 discharges sufficiently to allow the thyatron to fire. Thereupon the tube becomes conductive and the coil 126 of relay 125 becomes energized to break the contacts 128 and 129. Thus the circuit to the welding transformer

6

is broken through contact 129; the holding circuits to the coil 160 of the control relay 131, and to coil 150 of relay 132, are broken through opening of contact 128. Recharging of the capacitor may then take place, since the circuit back to line 11 through contact 134 is broken. If either of the switches 72 or 74 be held closed, the relays 131 and 132 will remain closed and no sufficient charging of the capacitor may be effected. These switches must be released to allow the relays 131 and 132 to open so that recharging of the capacitor may again take place preparatory to another weld cycle.

Summarizing the operation of the welder circuit, when main switch 18 is closed, the filament of the thyatron 116 heats and rectification in this tube charges timing capacitor 118 via the control grid 120 and cathode 121 of the tube and charging resistor 123. The resulting negative potential on the grid prevents the tube from firing and the contacts 128 and 129 of relay 125 remain closed. No power is applied to the primary 147 of welding transformer 148 since at this time contact switches 72 and 74 are open and the relays 131 and 132 are released. Closing, for example, switch 74 simultaneously powers the coil of initiation and time selector relay 131 and the primary of the welding transformer. The relay is locked in through its own contacts 136 via the contact 128 of time delay relay 125. The remaining contact 134 on the relay 131 shunts the capacitor 118 and the rectifying circuit of the thyatron via line 110, contact 134 and resistor 123 to line 111. At this time timing capacitor 118 begins to discharge. When the voltage across this capacitor has fallen, the thyatron fires and all the contacts of the relay 125 open, thereby breaking the circuit to the welder transformer, the circuit to the coil of relay 131 being broken simultaneously. However, if the initiating switch 74 had not been released, the relay 131 would have remained energized but primary voltage removed from the welding transformer by the opening of contact 129 of relay 125. To recycle the timing operation, switch 74 must be opened at least momentarily to allow the switch contacts of relay 131 to drop out and the capacitor to recharge.

Switch 72 will initiate a similar timing cycle, excepting that self locking relay 132 is also energized and a different potentiometer is placed in the capacitor discharge circuit.

In sealing multiple layers of polyethylene film whose thickness is in the range of .00075 to .00125 inch, it has been found that a maximum of four seconds is required and the two potentiometers may be adjusted as desired to give timing of periods within the four seconds, e.g. adapted for double and quadruple thicknesses. Of course for treating other materials or thicknesses, other periods may be found to be more desirable.

THE MODIFICATION OF FIGS. 11-13

In the modification of FIGS. 11-13 the handle 170 has a central reduced portion 171 and enlarged end portion 172 and 173. On a side of the central portion 171 a two position snap switch 175 is mounted. A depressible impulse switch 177 is mounted in the top of the end portion 172 for convenient access by the thumb of the operator. A line cord 179 extends from the tool or circuitry described in FIG. 10 modified as indicated in FIG. 13.

Mounted at each end of the handle 170 is a support block 180 having a depending portion 181 extending beyond the end portions 172 and 173. Mounted on the depending portions 181 is a heating member 182. The heating member has a central portion 183, substantially perpendicular end portions 184 and angularly disposed contact portions 185. The heating member is of flat spring-like material and is rigidly connected to the depending portions 181 of the blocks 180 by fastening means 186. The central portion 183 and its curved ends are covered preferably with material 188 of the type previously described. Heater wires 190 of the type previously described are attached by connectors 191 and

fastening means 192 to the contact members 185 and to leads 84' and 85' extending from within the handle. The wires are of such a length that the connector members 185 exert tension thereon in order to maintain such wires in intimate engagement with the heating member 182.

As indicated in FIG. 13, the wiring diagram of FIG. 10 is modified by inclusion of the switch 175 which is of the snap type biased to either the low or the high position rather than being biased to an intermediate position as in FIG. 10. In order to operate the device the operator must depress switch 177 which is in line 157 and in series with the contacts to switch 175 when the switch is in the respective position.

In using the modified device the operator sets the switch 175 to either of the two positions desired prior to application of the device to a package. Then at the moment of application it is merely necessary to depress the impulse switch 177.

While the invention has been described as being particularly suitable for the wrapping and sealing of so-called "soft packages," the present sealer may be used with equal facility wherever sealing of thermoplastic films is required. While the inherent flexibility of a sealing element produced from relatively thin sheet material, such as spring steel or the like, where the extremities are fixed and the central portion may be free to flex, and where rolling or arcuate motion may be applied during the sealing step, lends itself particularly well to the sealing of packages containing soft or unsupported articles, an equally efficient seal may be obtained with the present device without any necessity for giving consideration to package contents or rigidity thereof.

While preferred embodiments of the inventive concept have been illustrated and described, the invention is not considered as limited thereto and reference is had to the appended claims for summaries of the novel features of construction, novel combinations of parts and circuitry, and novel methods disclosed herein, for all of which protection is desired.

It will be obvious to one skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is illustrated in the drawings and described in the specification, but only as indicated in the accompanying claims.

What is claimed is:

1. A sealer head comprising an elongated relatively flat base, a handle mounted on one face of said base, a heating member extending from the opposed face of said base, said heating member comprising a flat strip of heat conducting spring-like material having a central portion bowed outwardly away from the base and having its ends connected to the ends of the base, heating element means engaging the outer surface of said heating member, means insulating said heating element means from said heating member, said heating element means comprising relatively thin wire means, and means for electrically energizing said wire means.

2. A sealer head comprising an elongated relatively flat base, a handle mounted on one face of said base, a heating member extending from the opposed face of said base, said heating member comprising a flat strip of heat conducting spring-like material having a central portion bowed outwardly away from the base and having its ends connected to the ends of the base, an insulating cover over said heating member, a pair of spaced thin heating wires covered by insulating material and engaging the outer surface of said heating member, and means for electrically energizing said wires.

3. In a sealer, a support member, a longitudinal heating member mounted on said support member, and heating element means engaging the outer surface of said heating member and insulated therefrom, means for applying electrical energy to said heating element means, said heating member being spring-like to permit depression thereof when applied against a package being sealed, and spring means resiliently holding said heating element in engagement with said heating member during depression and springback of said heating member.

4. In a sealer as defined in claim 3, multilevel control means mounted in said support member and connected to said heating element means.

References Cited by the Examiner

UNITED STATES PATENTS

2,008,512	7/1935	Morack	317—149
2,097,578	11/1937	Smart et al.	317—149
2,629,808	2/1953	Ulmschneider	219—243
2,703,133	3/1955	Payton	156—583
2,708,648	5/1955	Ulmschneider	156—306
2,714,416	8/1955	Fener	156—583
2,868,942	1/1959	Lyijynen	100—93
2,889,672	6/1959	Anderson	53—33
2,932,717	4/1960	Beattie	219—266 X
2,963,838	12/1960	Harrison et al.	156—583 X
2,978,851	4/1961	Smith	53—33
3,005,402	10/1961	Starger et al.	219—243 X
3,008,028	11/1961	Christensson	219—244 X
3,015,601	1/1962	Fener	156—583 X
3,118,922	1/1964	Mayhew	156—579

FOREIGN PATENTS

810,742	3/1959	Great Britain.
834,882	5/1960	Great Britain.

OTHER REFERENCES

Jagenberg: German printed application No. J7663, pub. 3—8—56.

ANTHONY BARTIS, *Acting Primary Examiner.*

RICHARD M. WOOD, ROBERT A. LEIGHEY,
Examiners.

V. Y. MAYEWSKY, T. S. McGEHEE,
Assistant Examiners.