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Persson et al.

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[54] **APPARATUS FOR FORMING AND FILLING BAGS**

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[52] **U.S. Cl.** **53/182**

[51] **Int. Cl.**..... **B65b 9/08**, B65b 51/30, B65b 61/04

[58] **Field of Search**..... 53/180, 182, 29; 156/459, 464, 515, 543, 552

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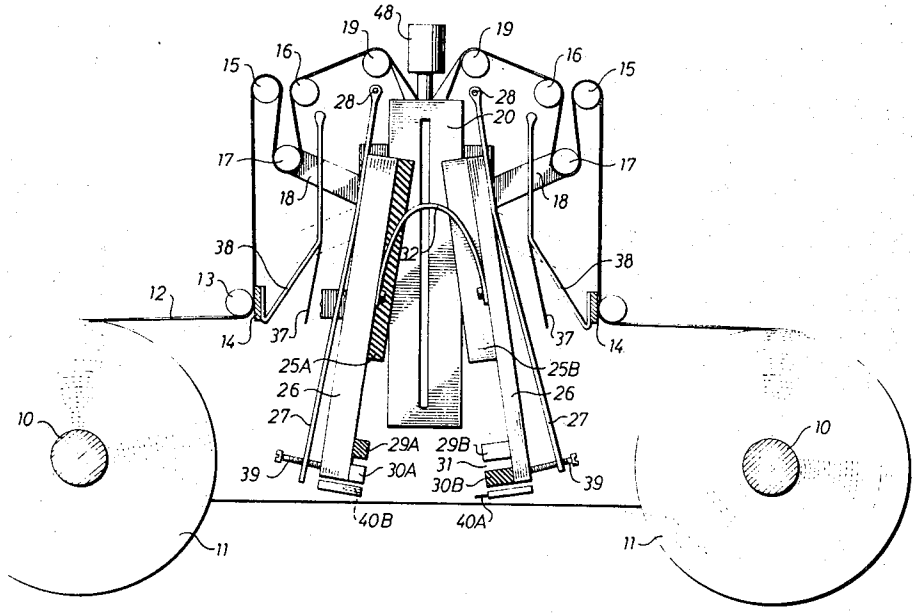
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Attorney—Lester Horwitz et al.

[57] **ABSTRACT**

An apparatus for forming and filling bags of heat sealable packaging material supplied as at least one web has heat sealing jaws for sealing the web when it has been shaped into a tube which are positively coordinated with a brake for the web and a device for forming a loop of the web in such a manner that a loop is formed with the jaws closed and the brake disengaged and is straightened out with the jaws open and the brake engaged when the web is being pulled down under the action of the weight of material filled into the bag.

5 Claims, 7 Drawing Figures



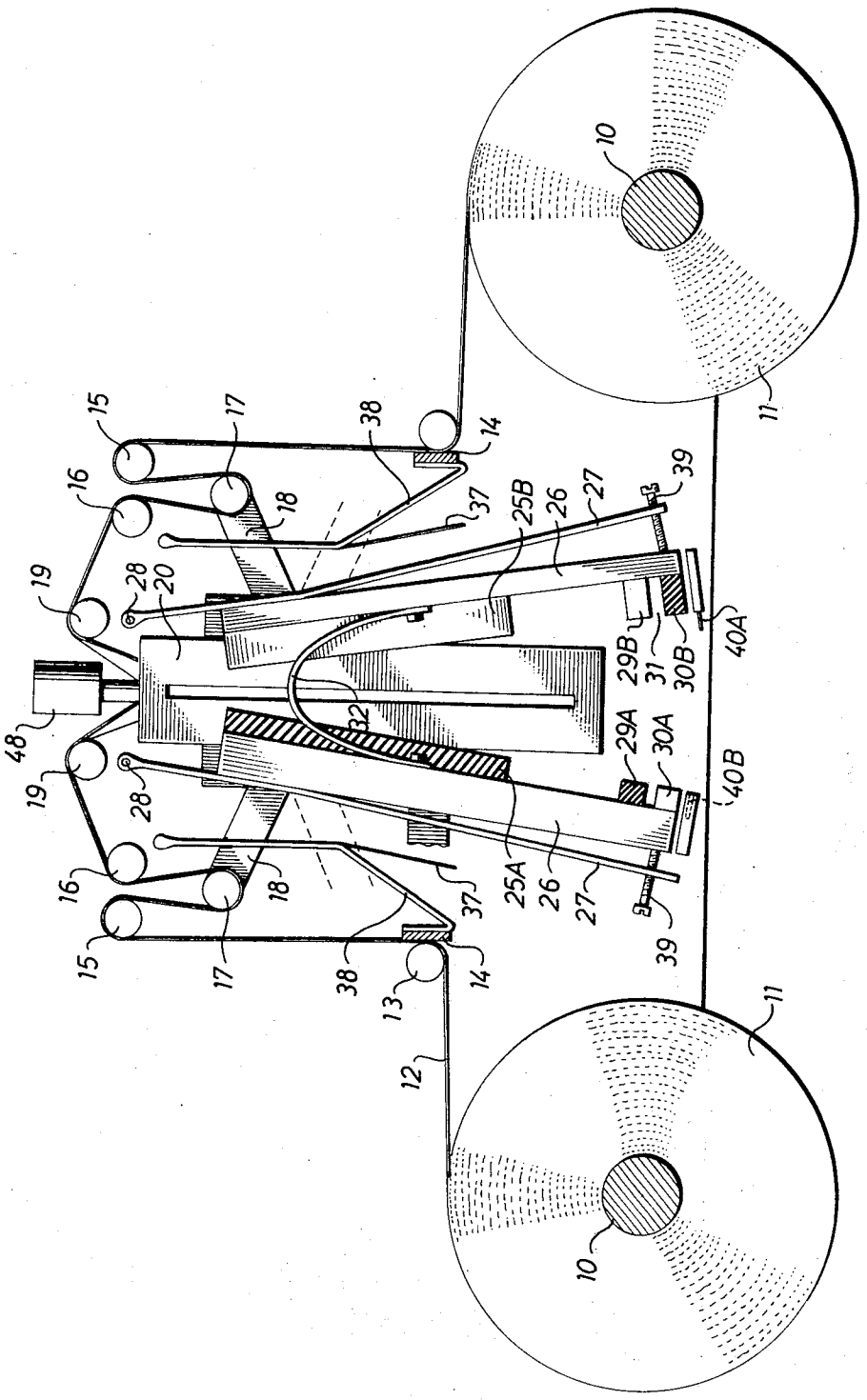

10
11
15
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17
18
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28
38
14
37
25B
26
27
39
29B
31
30B
40A
48
32
29A
30A
40B
25A
13
12

Fig. 1

Fig. 2

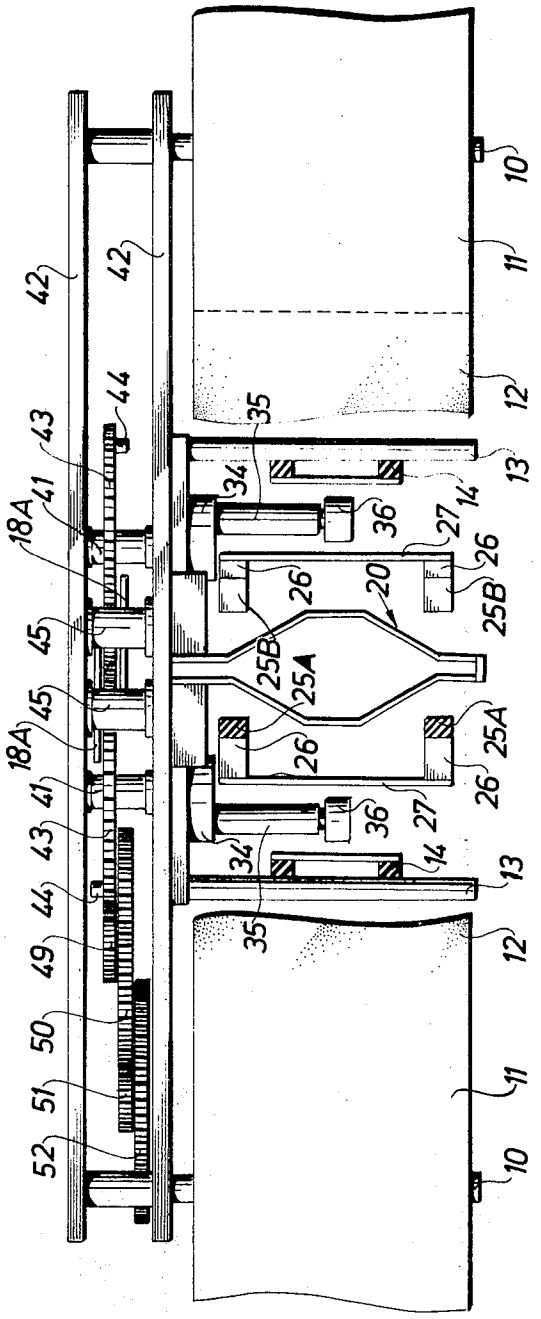

42
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18A
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18A
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26
20
25B
25A

Fig. 3

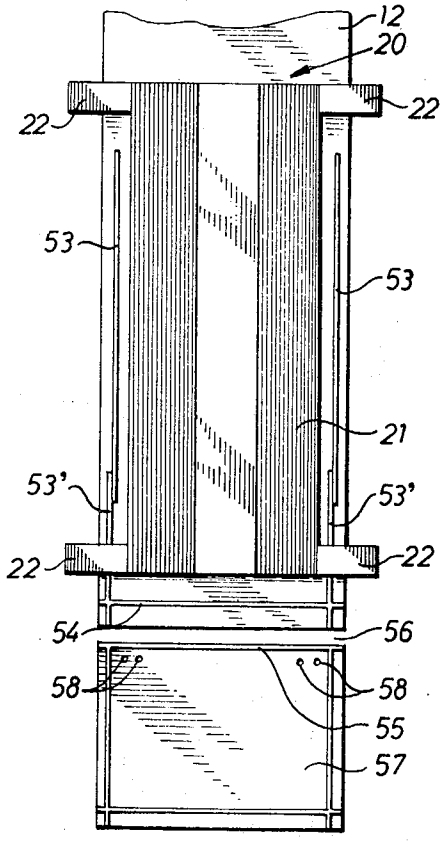


Fig. 4

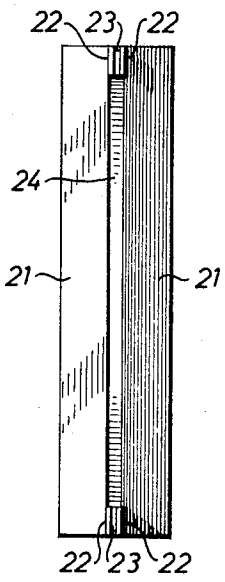


Fig. 5

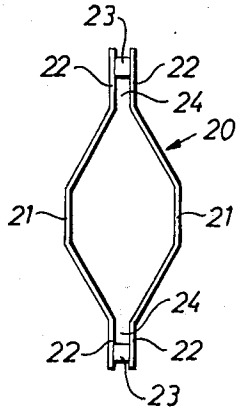


Fig. 6

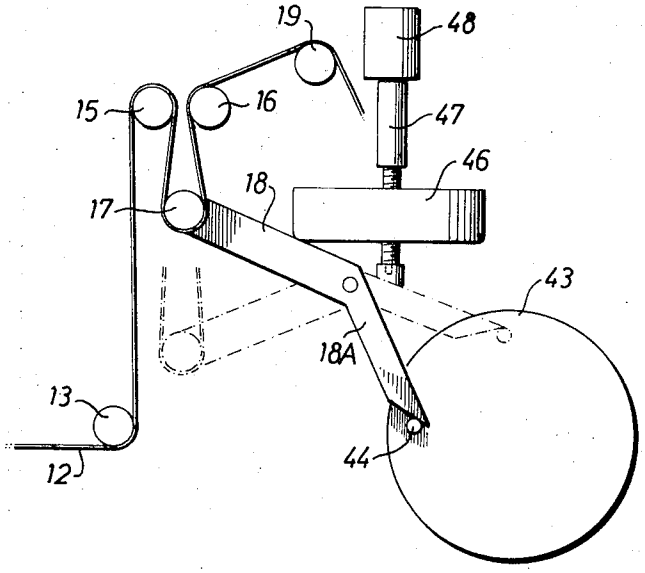
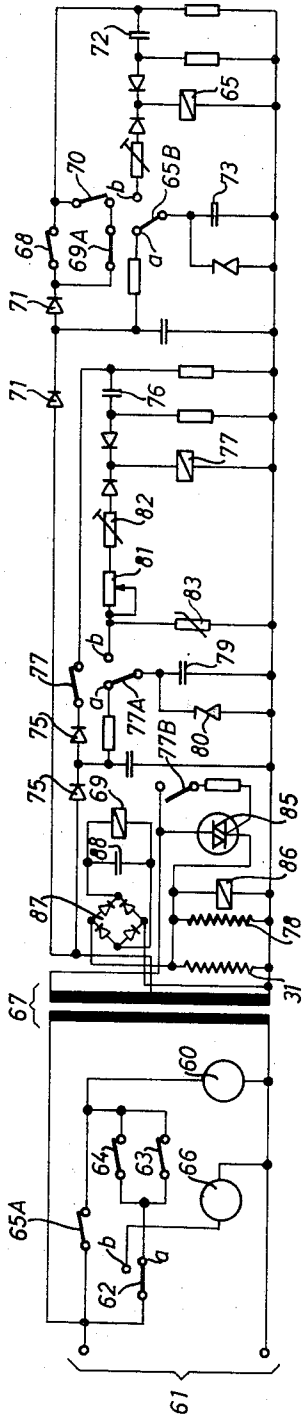


Fig. 7


72
65
70
65B
73
68
69A
71
76
77
82
81
83
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77A
77B
80
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88
86
87
78
31
67
60
64
63
66
65A
62
61

APPARATUS FOR FORMING AND FILLING BAGS

The present invention relates to an apparatus for forming and filling bags of heat sealable packaging material supplied as at least one web comprising means for forming a loop of the web, a guide housing which is adapted to enclose the web fed thereto in order to shape the web into a tube, and swingers mounted on either sides of the web of packaging material formed in the guide housing and supporting heat sealing jaws for longitudinal sealing of the web, and heat sealing jaws for transverse sealing of portions of the web projecting from the guide housing at the lower end thereof.

The apparatus according to the invention is particularly suitable for packaging small change coins and in that connection the apparatus may be arranged in combination with a coin counter in order to co-operate therewith in performing quick and reliable packaging of the coins in bags holding a predetermined number of coins in each bag through an automatic and continuous cycle of operation. However, the invention is not limited to this particular type of packaging but may be used also for packaging other materials, no matter of what kind they are, including liquid materials.

For the above purpose the invention provides an apparatus of the kind referred to above characterized in that the heat sealing jaws and the loop forming means as well as a brake for the web of packaging material are positively coordinated in order to form a loop with the jaws closed and the brake disengaged and straightening out the loop with the jaws open and the brake engaged when the web is being pulled down under the action of the weight of the material filled into the bag formed.

An embodiment of the invention provided for packaging coins will be described in greater detail in the following with reference to the accompanying drawings, in which

FIG. 1 is a side view, partly diagrammatic, of the apparatus;

FIG. 2 is a plan view thereof;

FIGS. 3 to 5 are three views perpendicular to each other of the guide housing forming part of the apparatus;

FIG. 6 is a lateral view, partly diagrammatic, of the loop forming means forming part of the apparatus; and

FIG. 7 is a diagram of the electric system of the apparatus.

The apparatus shown in the drawing comprises two shafts 10, on each of which there is freely rotatably journalled a roll 11 of a heat-sealable web 12, for instance plastic or plastic coated paper. Each roll is preferably exposed to a slight braking action in order to stop rather suddenly when the web is no longer withdrawn from the roll. In order to guide the web withdrawn from each roll there is provided a guide roller 13 adjacent the roll. A friction brake 14 is engageable with the web opposite to the said guide roller in a manner to be described later. Two additional guide rollers 15 and 16 and a guide roller 17 arranged between them, which unlike the other guide rollers is not journalled in stationary bearings in the frame of the apparatus but is mounted on a swinger 18, form a loopforming means, as will be described later. Finally there is an additional guide roller 19 for each web 12, said roller also having stationary bearings and being located immediately above the upper end of a stationary tubular guide housing 20 the construction of which is best seen in FIGS. 3 to 5.

The guide housing consists of two bent plates 21 which are provided with interconnected lugs 22 at their corners, spacers 23 being disposed between the lugs, whereby the longitudinal edges of the two plates are mutually spaced in order to define two diametrically opposed slots 24. The two webs 12 which are withdrawn in a manner to be described through the guide housing 20 and which are formed into a tube when passing through the guide housing will project from the two slots 24 at their longitudinal marginal portions in order to be sealed at these portions. For this longitudinal sealing of the two webs there are provided two pairs of mutually co-operating jaws 25A and 25B. These jaws are mounted on a pair of swingers 26 which are suspended by a leaf spring 27 for swinging movement about pivots 28 located at the top. The jaws 25A are preferably made from silicon rubber or a similar resilient heat-resistant material. On the jaws 25B there is disposed an electric heating wire for impulse heating. The jaws 25A and 25B are disposed in pairs on both sides on the guide housing 20 in order to co-operate in producing the said longitudinal sealing of the marginal portions of the webs 12 projecting through the slots 24. For transverse sealing of the web portions projecting below the guide housing there are disposed on the swingers 26 four transverse sealing jaws 29A and 29B as well as 30A and 30B, of which jaws 29A and 30B are of the same construction as the jaws 25A, while the jaws 29B and 30A are of the same construction as the jaws 25B. The transverse sealing jaws 29A, 29B, which co-operate with each other, and the transverse sealing jaws 30A and 30B, which co-operate with each other, are arranged to produce axially spaced transverse seals, i.e. these seals are spaced in the advancing direction of the two webs. Between the jaws 29B and 30B there is disposed a glow wire 31 for cutting the webs between the transverse seals formed by these two jaws and the jaws 29A and 30B, respectively, co-operating therewith. The seals (welds) produced by means of the jaws will be referred to later in connection with the description of the function of the apparatus.

The swingers 26 are held in the spaced apart or open position shown in FIG. 1 by a U-spring 32 and for actuating the swingers against the bias of the spring there are provided two disks 34, each having an excentric crank pin 35 on which there is rotatably mounted a roller 36 to be pressed against the associated leaf spring 27. For co-operation with these crank pins there are also provided leaf springs 37 which project from resilient arms 38 which are fixed to the frame of the apparatus at one end and carry the brakes 14 at the other end. When the cranks 34, 35 are rotated the rollers 36 consequently press the swingers 26 alternatingly against each other in order to move the swingers together and apply the brakes 14 against the guide rollers 13. Thus, the swingers will be pressed together when the brakes are disengaged while the swingers are moved apart when the brakes are engaged. In order to control the pressure on the jaws there are provided adjustment screws 39 for adjusting the bias of the leaf springs 27. At the lower end of one swinger 26 there are provided a number of pins 40A, while the other swinger 26 has corresponding apertures 40B for receiving the pins, the function of which will become apparent in the following.

The cranks 34, 35 are supported on shafts 41 which are mounted in the frame of the apparatus by means of two bearing plates 42 forming part of the frame. The shafts have gear wheels 43 engaging with each other and provided with excentric crank pins 44. The right-hand gear wheel 43 and its associated pin 44 is partly shown in FIG. 6. The previously mentioned swinger 18 with the guide roller 17 forms one arm of a bell crank which is pivoted between its ends by means of a shaft 45, while the other arm 18A of the bell crank is disposed in the circular path of movement of the pin 44. A corresponding arrangement which is shown in FIG. 6 with respect to the right-hand gear wheel 43 of the apparatus is provided with respect to the left-hand gear wheel 43, which is arranged to actuate the left-hand lever 18, 18A. The two shafts 45 are journalled in the bearing plates 42 the arm 18 being disposed on the outside of one plate and the arm 18A being disposed between the two plates. The angular position of each pin 44 in relation to the angular position of the associated pin 35 is chosen in such a way that the pin 44 will engage the arm 18A in order to swing the bell crank 18, 18A to a position shown in dot and dash lines in FIG. 6 for the left-hand bell crank, while the rollers 35 keep the swingers 26 pressed together and the brakes 14 are consequently disengaged for withdrawing the webs 12. This means that through the downward movement, thus produced, of the guide roller 17 from the position shown in solid lines in FIG. 6 to the position shown in dot and dash lines there is produced a loop of each web 12 between the guide rollers 15, 16 and 17. After these loops have been formed and the engagement of the pins 44 with the arms 18A has ceased, the bell cranks will remain in the position shown in dot and dash lines and the webs 12 are braked again by engagement of the brakes 14 by means of the rollers 36.

Swinging of the bell cranks 18, 18A from the position shown in dot and dash lines in FIG. 6 to the position shown in solid lines is brought about by withdrawing the webs 12 with the brakes 14 engaged in a manner to be described later, and in order to determine the position shown in solid lines in FIG. 6 there is provided a stop member 46 which is vertically adjustable. It is provided as a nut on a screw spindle 47 rotatably mounted in the frame and having an operating knob 48, the stop member 46 being held non-rotatably but vertically displaceably in the frame so that by turning the spindle 47 it is possible to produce vertical movement of the stop member 46.

In order to operate the gear wheels 43 there is provided a transmission with gears 49, 50, 51 and 52, the last-mentioned gear being driven by an elctric motor not shown. All these gears are non-rotatably mounted on shafts which in turn are journalled between the two bearing plates 42 in the frame.

The function of the apparatus will now be described starting from the position shown in solid lines in the drawings, in which case it is assumed that the webs 12 have been withdrawn through the guide housing 20 and are in the position shown in FIG. 3. During the operation of the apparatus the cranks 34, 35 are rotated synchronously with each other and with the gear wheels 43 by means of the driving motor of the apparatus, the rollers 36 moving the swingers 26 towards each other so that the jaws are pressed against each other. Immediately afterwards the rollers 35 disengage the brakes 14. While the jaws are kept pressed against each other the marginal portions of the two webs projecting through the slots 24 are heat-sealed by means of the jaws 25A, 25B by producing welds 53 and the webs are heat-sealed at the portions thereof projecting from the lower end of the guide housing by means of the jaws 29A, 29B and 30A and 30B by producing welds 54 and 55. At the same time the webs are cut between the welds 54 and 55 at 56 by means of the glow wire 31. It is assumed that in a previous operation of the apparatus there have been produced welds 53', overlapping being provided between the welds 53 and 53'. After these welds have been produced the two webs are consequently united into a bag closed at the sides and at the bottom, said bag being located in the guide housing 20. Through impulses from the packaging apparatus to a filling machine disposed above it and supplying the material to be packaged, e.g. a coin counter for supplying a predetermined number of coins, the predetermined amount is now supplied through an outlet tube opening in the guide housing 20 between the webs 12 but not shown, to the bag open at the top. After the jaws have been pressed together the driving motor is allowed to continue its operation, the levers 18, 18A being swung from the position shown in solid lines through the position shown in dot and dash lines, while the jaws are still pressed against each other. Since the brakes 14 are disengaged during this operation and the webs drawn into the guide housing 20 are immobilized by means of the jaws, the webs 12 are consequently withdrawn from the rolls 11 in order to form the loops between the guide rollers 16 and 17 as described above. The motor is then stopped and is immobilized with the jaws closed in order to produce welds of sufficient strength. It is restarted after a suitable time interval sufficient for welding and cooling, the rollers 36 allowing the swingers 26 to be moved apart under the action of the spring 32. These rollers are now pressed against the leaf springs 37 for engaging the brakes 14 immediately before the jaws are moved apart. Due to the fact that the jaws are moved apart from below and in a direction upwards, material which may stick to the jaws is successively torn loose from the jaws. With the brakes 14 engaged the material filled into the bag will withdraw the two webs due to its weight after the jaws have been moved apart, the filled bag sinking down through and out of the guide housing 20. Possibly, the levers 18, 18A may be spring biassed towards the position shown in solid lines in FIG. 6. The previously formed web loops produce the requisite web length for the withdrawal at the same time as the levers 18, 18A are swung back to the position shown in solid lines. The downward movement of the filled bag is limited by the stop member 46 in a manner described previously. After this operation the welds 53 previously formed are thus in the position corresponding the welds 53' in FIG. 3. During the next welding operation the filled bag will be sealed at the top by means of the weld 55 and will be cut off from the portion of the two webs located in the guide housing at 56 so that a package of the type appearing from FIG. 3 and designated 57 in that figure is obtained. In order that air enclosed in the package may escape from the package it is punctured by means of the pins 40A at 58 when the swingers 26A, 26B are moved together. This puncture may also funtion as a tear notch for opening the bag.

The electric system for operating the described apparatus, which is shown in FIG. 7, comprises the driving

motor of the apparatus which is shown at **60** and which can be connected to the electric mains **61** by a switch **62** which is normally in the shown position at a contact *a* but is switched to the other position at a contact *b* when the swingers **26** are in the pressed-together position, and two switches **63** and **64**, of which the switch **63** is normally in a closed position but is in an open position when the swingers **26** are in the separated position. The switches **62** and **63** are consequently shown in the position, which they occupy when the swingers are moved apart. An additional switch **64** normally opened and connected in parallel with the switch **63** is adapted to be actuated by a sensing means in the outlet for the filled bags in order to be kept in a closed position as long as a bag is located in or is passing through the outlet. Finally, the circuit of the motor **60** comprises a relay contact **65A** of a relay **65**, connected in parallel with the switches **62, 63, 64.** This relay contact is closed when the relay is energized. The wiring diagram also comprises an electric motor **66** which can be connected to the mains by the switch **62** being moved to the position at the contact *b* and this motor is part of the filling machine which is provided in connection with the apparatus according to the invention in order to supply the material to be packaged in predetermined quantities. Thus, the motor may form part of a machine for counting coins and supplying an amount of coins at a predetermined value.

To the mains **61** there is also connected the primary of a transformer **67** the secondary of which provides low-voltage to the control circuits of the related motor driving circuits. These control circuits comprise the relay **65** which can be connected to the transformer **67** by a push-button switch **68** connected in parallel with a normally closed relay contact **69A** of a relay **69** and a normally opened switch **70** which is mounted in the filling machine. When the switch **68** or alternatively the relay contact **69A** and the switch **70** are closed a current pulse will be supplied to the relay **65** from the transformer through rectifiers **71** and a condenser **72.** The relay will hold the contact **65A** in the closed position and an additional contact **65B** associated with the realy and normally engaging a contact *a*, in the position at a contact *b*. The contact **65B** provides self-holding of the relay **65** by means of a condenser **73** which has previously been charged from the transformer **67** through one of rectifiers **71** when the contact **65B** was in the position *a* so that the relay **65** remains energized for a short time after the supply of current through the condenser **72** has ceased. Assuming that the swingers **26** are initially in a separated position this means that the motor **60** will be energized through the contact **65A** for a sufficiently long time to permit the swingers to move so far that the switch **63** will be closed and the motor **60** then will be energized through the switch **62** and the switch **63.** The relay **65** cannot obtain a new impulse through the condenser **72** until there has been an interruption at the switch **68** and this has been closed again.

When the swingers driven by the motor **60** againsc the bias of the spring **32** reach the completely pressed-together position they actuate the switch **62** which is reset to its contact *b*, which means that the motor **60** of the apparatus stops, while the motor **66** of the filling machine starts. At the same time as the switch **62** is actuated a normally opened switch **74** is however also actuated, said switch **74** supplying a current pulse to a relay **77** through rectifiers **75** and a condenser **76.** This relay is part of a stabilized time circuit for controlling the current supply to the electrically heated jaws **25B, 29B** and **30A**, the heaters of which are collectively marked at **78**, and to the glow wire **31.** The relay **77** comprises a contact **77A** which is normally at a contact *a*, a condenser **79** which is connected in parallel to a Zener diode **80** being charged. When the relay **77** is energized the contact **77A** will be engaged with a contact *b* in order that the condenser **79** may supply self-holding current to the relay **77** through variable resistors **81** and **82.** The relay **77** consequently remains activated for a certain time which is determined by the setting of the two resistors **81** and **82,** one of which provides rough setting while the other one provides fine setting of the desired activation time. A thermistor **83** compensates for heat accumulated in the jaws so that the time set is shortened at increased temperature. When the relay **77** is activated a normally opened contact **77B** is also engaged and this contact, which is protected by means of a thyristor **85** closes the circuit through the heaters **78** and the glow wire **31,** and a pulling magnet **86** in the filling machine by means of which the said machine is activated in order to supply the predetermined portion of the material to be packaged; its motor **66** is already in operation. The filling machine in the manner described previously now feeds the predetermined portion of the material to be packaged, into the bag which has been prepared in the packaging apparatus as described above. The contact **77B** also closes the circuit to a bridge rectifier **87** which supplies current to a condenser **88,** connected in parallel with the relay **69** which in this part of the function will be energized from the rectifier **85** by the closing of the contact **77B**. This means that the contact **69A** will be opened at the same time as the welding operation begins. When the predetermined portion has been supplied by the feeding machine the switch **70** is closed by means of a sensing member in said machine but since the contact **69A** is opened the motor **60** cannot be started (except by means of the push-button switch **68,** which is not normally to be actuated during the automatic operation of the apparatus). The time circuit of which the relay **77** is a part will interrupt the current supply to the relay **77** after the predetermined time interval with consequent opening of the contact **77A**. As a result the current supply to the magnet **86,** the heaters **78,** the glow wire **31** and the bridge rectifier **85** ceases but since the relay **69** thereupon remains energized by current supplied from the condenser **88** the contact **69A** will remain in the opened position for a predetermined time interval during which the welds formed are cooled while the jaws remain pressed together. When this predetermined time interval has also elapsed the relay **69** becomes deenergized so that the contact **69A** will be closed and provided that the filling operation is then finished so that the switch **70** is closed, a new current pulse will be supplied for energizing the relay **65** and repeating the operation described.

Thus, it appears that the circuit shown in FIG. **7** keeps the apparatus according to the invention in operation after the push-button switch **68** has been closed at the beginning in order to provide a starting pulse, and controls the operation in such a way that the previously described operational cycle for forming and welding the webs and filling the bags will be performed automatically and will be repeated over and over again.

Obviously, however, other circuits than those described may be used for controlling the apparatus, and such circuits has to be matched to the type of filling machine combined with the packaging apparatus.

What we claim is:

1. Apparatus for forming and filling bags of heat sealable packaging material supplied as at least one web comprising means for forming a loop of the web; a guide housing enclosing the web over a substantially vertical length thereof in order to shape the web into a tube and forming side openings to expose marginal portions of the length of the web enclosed by the guide housing; swingers mounted on either sides of the web of packaging material when shaped into a tube in the guide housing; first heat sealing jaws for longitudinal sealing of the web at the exposed marginal portions thereof; second heat sealing jaws for transverse sealing of portions of the web projecting from the guide housing at the lower end thereof; said first and second heat sealing means being supported by the swingers; driving means for pivoting the swingers to move the sealing means supported thereby between opened and closed positions; a brake for the web of packaging material; operating means for engaging and disengaging the brake; means operatively interconnecting the swinger driving means, the brake operating means, and the loop forming means to lengthen the loop formed by the loop forming means when the jaws are being closed with the brake disengaged and to allow shortening of the loop when the jaws are being opened with the brake engaged by withdrawal of the web due to the gravity of material filled into the bag formed, the filling bag being discharged from the guide housing at the lower end thereof.

2. Apparatus as claimed in claim 1, further comprising means for cutting the web of packaging material, the transverse sealing jaws being provided partly above and partly below the cutting means.

3. Apparatus as claimed in claim 1, further comprising rotatable eccentric means and driving means therefor for actuating the heat sealing jaws to a closed position.

4. Apparatus as claimed in claim 3, wherein the excentric means are adapted to actuate also the brake for the web in order to keep the brake engaged when the heat sealing jaws are open.

5. Apparatus as claimed in claim 4, further comprising a time circuit for controlling the driving means of said excentric means in order to stop the movement of the excentric means during a predetermined time interval with the heat sealing jaws closed and for energizing the heat sealing jaws during a predetermined short time interval which falls during the first-mentioned time interval.

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