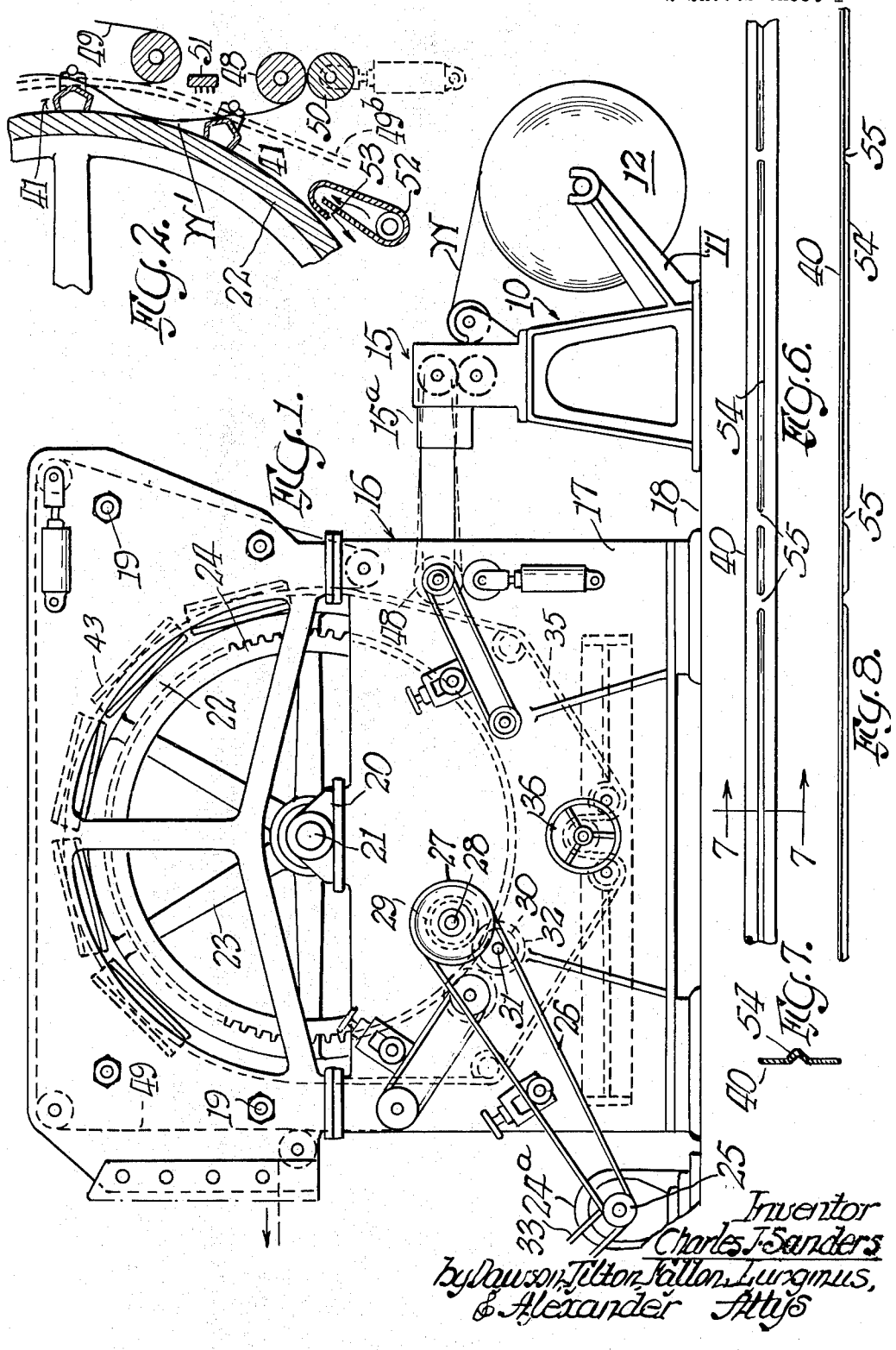
Dec. 7, 1965 C. J. SANDERS 3,221,613

STRIP BAG PRODUCING MECHANISM

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STRIP BAG PRODUCING MECHANISM

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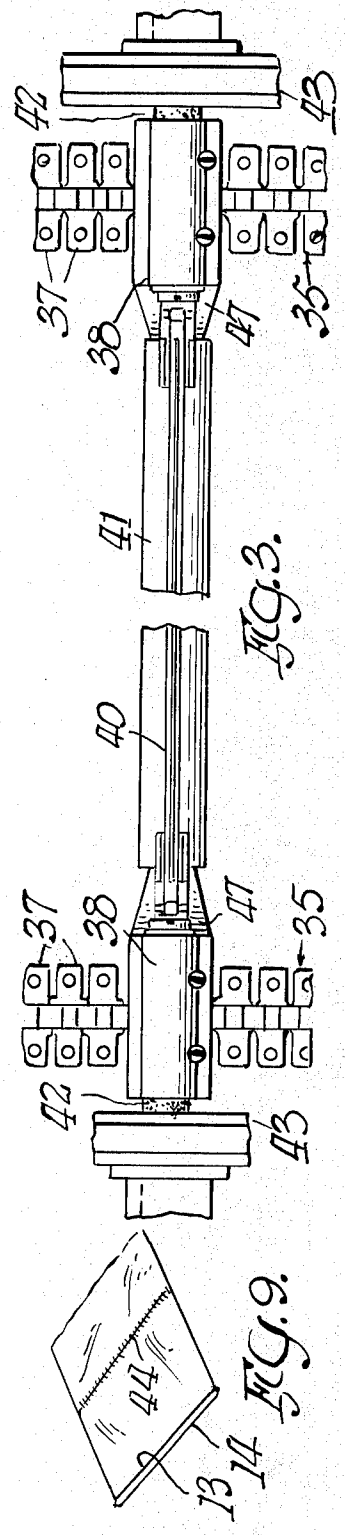


FIG. 3.

FIG. 6.

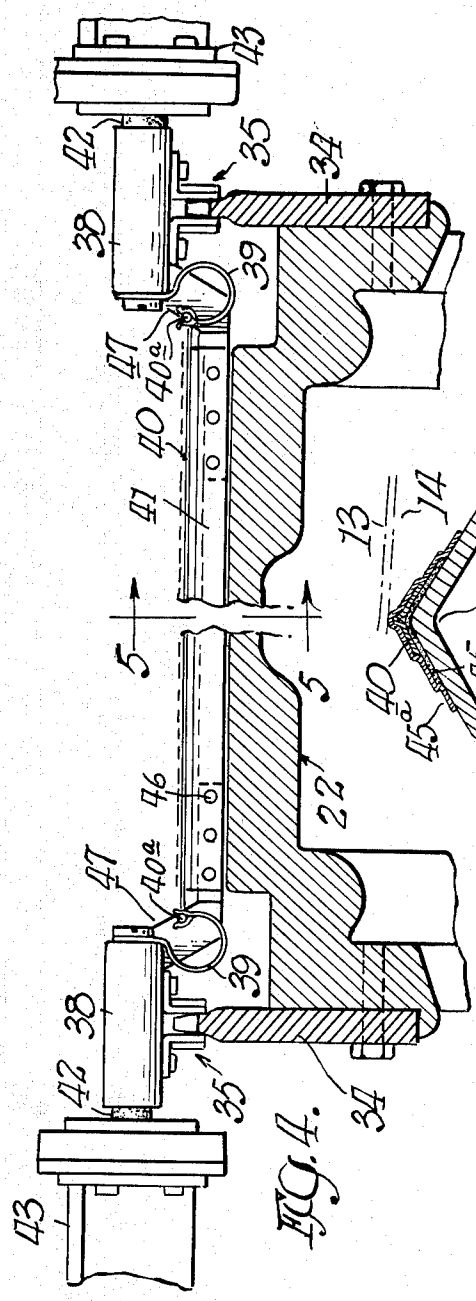


FIG. 4.

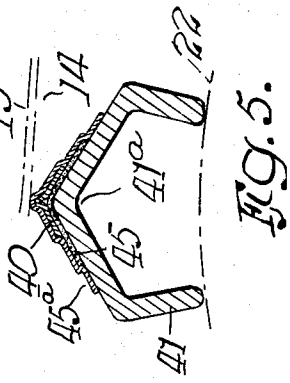


FIG. 5.

Inventor
Charles J. Sanders
by Dawson, Tilton, Fallon
Lungmus & Alexander Attys

United States Patent Office

3,221,613

Patented Dec. 7, 1965

3,221,613

STRIP BAG PRODUCING MECHANISM

Charles J. Sanders, De Pere, Wis., assignor to Paper Converting Machine Co., Inc., Green Bay, Wis., a corporation of Wisconsin

Filed Oct. 26, 1962, Ser. No. 233,216

7 Claims. (Cl. 93—8)

This invention relates to a strip bag producing mechanism, and, more particularly, to a machine for producing rolls of bags interconnected by bonds extending axially of each roll so that the bags can be dispensed sequentially.

This application is related to the co-owned copending application of Ernst D. Nystrand entitled "Strip Bag Producing Machine and Method," Serial No. 189,033, filed April 20, 1962, now Patent No. 3,107,585.

A general object of the above-mentioned invention was to provide apparatus and a method for making rolls of thermoplastic bags out of a continuous thermoplastic web where the bags are connected along longitudinally spaced-apart lines of severance so as to permit dispensing or usage merely by unwinding the roll-analogous to the fashion contemporaneously employed for toweling, toilet tissue, etc. One object of this invention is to provide an improved machine of this nature.

Another object of the invention is to provide novel heat-sealing apparatus in which novel heat-sealing elements travel with a drum for thermally uniting webs of thermoplastic material traveling with the drum.

Other objects and advantages of the invention can be seen in the details of construction and operation of the apparatus as set down in the specification hereafter.

The invention will be explained in conjunction with an illustrative embodiment in the accompanying drawing, in which—

FIG. 1 is a fragmentary elevational view of apparatus employed in practicing the invention;

FIG. 2 is an enlarged fragmentary sectional view of the apparatus of FIG. 1;

FIG. 3 is an elevational view, in fragmentary form, of the heat-sealing portion of the apparatus;

FIG. 4 is a fragmentary elevational view, partially in section, of the apparatus of FIG. 1;

FIG. 5 is a fragmentary sectional view of the sealing wire associated with the mechanism for transversely heat-sealing the webs passing through the mechanism;

FIG. 6 is a fragmentary top plan view of the sealing wire associated with the mechanism;

FIG. 7 is a sectional view taken along the sight line 7—7 of FIG. 6;

FIG. 8 is a fragmentary side elevational view of the wire seen in FIG. 6; and

FIG. 9 is a fragmentary perspective view of a portion of the web as it issues from the bag-producing mechanism.

In the illustration given, and with particular reference to FIG. 1, the numeral **10** designates generally an unwinder in which a backstand **11** rotatably supports a jumbo roll **12** of thermoplastic web material, such as polyethylene, polypropylene, etc. The roll **12** provides a web W which may be folded on itself to provide a web having two sides **13** and **14** (see FIG. 9). This overfolding may be provided by a plow **15***a* provided as part of a slitter **15**.

From the slitter **15**, the web W passes to to a heat sealer generally designated **16** and then to a rewinder (not shown). Other details of the apparatus may be seen in the Nystrand application, Serial No. 189,033, referred to above.

Focusing now on the portion of FIG. 1 which features the heat sealer **16**, it is seen that a frame **17** is supported

on the floor **18**. It will be appreciated that the entire apparatus is generally symmetrical about a longitudinal center line so that the invention can be readily appreciated from a consideration of a side elevational view. For example, the frame **17** is made up of a pair of side frames suitably interconnected by means of beam members **19**.

The side frame **17** seen in FIG. 1 is equipped with a pillow block **20** in which the journal **21** of drum **22** is held. The drum **22** is equipped with spider-like ends made up of arms **23** which supports the outer cylindrical wall. The drum **22** is equipped with a ring gear **24** which provides the means for rotating the drum **22** in the pillow blocks **20**.

The means for rotating the drum **22** includes a motor **24***a* suitably anchored to the floor **18**, and a drive pulley **25**. The pulley **25** is coupled to a first drive belt **26** which transmits power to a driven pulley **27** suitably journaled in the frame **16**. The pulley **27** is keyed to a shaft **28**, to which is also affixed a gear **29**. The gear **29** provides a part of a gear train which includes a gear **30** fixed to shaft **31** and a second gear **32** also fixed to shaft **31**. The gear **32** engages the ring gear **24** to rotate the drum **22**. The pulley **25** also is coupled to a second belt **33** which delivers power to the rewinder.

Heat sealer

The heat sealer **16** includes a pair of sprockets **34** (see FIG. 4), each of which are rigidly attached to the drum **22**. Entrained on each sprocket **34** is a roller chain **35** (see FIG. 3) which, at the lowest point of its travel, is maintained under suitable tension by means of an adjustable idling sprocket assembly generally designated **36** (see FIG. 1). As best seen in FIG. 3, each chain is equipped with a plurality of clips **37** with holders **38** bolted to axially-aligned clips **37**. Each holder **38** is constructed of insulating material (Delrin) and carries a spring **39** (see FIG. 4), and extending between the aligned springs **39** is a sealing wire **40** (see FIGS. 5–8). The wire **40** (see FIG. 4) is equipped with a fitting **40***a* at each end thereof for engagement with the springs **39** to deliver current to the wire **40**. The holders **38** also support bars **41** (see FIG. 5) which contact the periphery of the drum **22** and maintain the wires **40** at a spaced distance from the drum surface. Thus, it will be seen that the web W, in the portion of its path in which it travels with the drum **22**, assumes a chordal configuration, being supported on adjacent bars **41**, as seen in FIG. 1.

Each holder **38** is equipped with a brush **42** (see FIG. 3), and the brush **42** rides against a segmental communicator or slip ring **43**. The slip rings **43** are connected to a source of electricity (not shown), and thus the wires **40** are electrically heated and operate to provide an impulse line-type seal across the width of the web W, as at **44** in FIG. 9.

In operation, the web W may be transversely heat-sealed on about 15" centers, after which the rewinder may be employed to develop commercial-sized rolls. At a predetermined point in the rewinding, the web W is severed and rewinding continued on a following mandrel. Thus, for example, it is possible to produce a roll of 25, 50, 100, etc., bags arranged for sequential detachment.

The inventive construction makes it possible to provide bags that can be detached immediately adjacent the linear heat-seal so that there is no unsightly bottom projection in the bag. Operating advantageously in this connection is the generally channel-shaped bar **41** which has an angled bight portion as at **41***a* (see FIG. 5) to support the web in the chordal configuration previously mentioned and where the wire **40** is positioned at the peak of

the angled bight portion 41*a* and insulated therefrom by Teflon tape (i.e., a polyfluoroethylene plastic of excellent dielectric properties—high inertness, heat resistance, toughness, and low coefficient of friction available from E. I. du Pont de Nemours & Co., of Wilmington, Delaware), as at 45 in FIG. 5. Teflon tape as at 45*a* may also be used to secure the wire 40 in position. Alternatively, another fluorocarbon thermoplastic material in the form of Kel-F of M. W. Kellogg, or Bakelite Fluorothene, of the Bakelite Company, may be employed.

The bars 41 are sccured by screws 46 extending into an arm portion 47 (see FIG. 4) of the holder 38.

The web W, prior to engagement with the electrically heated wires 40, passes around a driven roller 48 (see FIG. 2) which is suitably journaled in the frame 17. After this, the web W is maintained in place by a seal belt 49.

Referring now to FIG. 2, it will be noted that the web W entering the nip defined by rolls 48 and 50 is somewhat slack, with this condition being brought about by the static bar 51. In the illustration given, the static bar is energized by a voltage of 40,000 volts D.C., with the drum 22 being grounded. This causes the polyethylene web W to assume the draped configuration seen in FIG. 2.

The web W is slack because the rollers 48 and 50 are arranged to slightly overfeed to the drum 22. I find it advantageous to have the web free of tension during the sealing cycle. The static provided by the bar 51 helps to drape the web over the bars 41 in an orderly fashion by making it cling to the surface of the drum 22, thereby taking up the excess stock and tucking it around the bars 41. Otherwise, the action of gravity would stretch the web in a chordal fashion from bar to bar and tension would exist in the web. Web shrinkage due to sealing would add to this tension and cause a poor seal.

It has also been found advantageous to provide means for relieving air carried along by the chain and crossbars as seen in FIG. 2. For this purpose, a supply air header 52 is provided which extends across the face of the drum 22 and which is equipped with an aspirating type outlet as at 53 for the removal of air from just below the nip defined by the rolls 50 and 48. Thus, there is no upward flow of air accompanying the chain and crossbars which would tend to upset the desirable draped configuration of the web W. In certain instances, as where slitting is not utilized, the depression or draping of the web W as at W′ in FIG. 2 can be achieved through the use of an air blast, in which case it is also possible to eliminate the pressurized air header 52.

It will be appreciated that should the location of the wires 40 be acceptable for permanent installation, the bars 41 may be secured directly to the drum 22, eliminating the need for the chains 37.

The cross-wires 40 are seen in enlarged form in FIGS. 6–8 and optimally may be constructed of Nichrome V obtainable from Driver Harris Company, of Chicago, Illinois. The wire employed in conjunction with the illustrated embodiment is generally flat, i.e., ribbon-like, having a thickness of the order of 0.003 inch and a width of 3/32 inch, and equipped with rounded edges. Centrally longitudinally of the wire, as seen in FIGS. 6–8, an elongated, longitudinally-extending rib or bead 54 is provided which is developed on a radius of about 0.005–0.007 inch and which has a transverse rib width of the order of 0.010 inch.

The height of the rib or bead 54 is determined by the thickness of the webs to be formed and the resilience of the belt 49 or other device used to press the webs against the ribbon-like wire 40. The width of the flat areas on the ribbon 40 on either side of the ridge or bead 54 is determined by the width of the seal desired.

The sealing ribbon 40 is mounted over a 0.006″ thick strip of Telflon tape as at 45, the bar 41 serving as both a supporting device and a heat sink. The bar 41 has a slight crown machined on the edge 41*a* on which the wire is mounted in order to concentrate the clamping pressure on the wire. This radius, or crown, is at right angles to the wire and bar lengths. The heat sink feature is advantageous in immediately cooling the wire after the sealing pulse so that the web material is not in a plasticized condition when the clamping pressure is released.

The rib may be interrupted as at 55 (see FIG. 8) to provide stronger bonds at spaced portions to facilitate the connection between adjacent bags prior to use.

In the specific embodiment shown, using wires of the character just specified and wherein the length of the wire was 40 inches, an alternating current voltage of the order of 60–70 volts was applied for a half second to polyethylene sheets having a thickness in the range of 0.0005–0.0015″.

In operation, sufficient heat is generated by a pulse of current through the wire 40 to melt the two or more layers of thermoplastic web material, i.e., 13 and 14, or plasticize the same to a degree where the two webs weld together in the area contacted by the wire. This welding is aided by the pressure of the belt or other device such as rubber pressure pads which clamp the web against the seal wire 40. Because of the bead or ridge along the center of the ribbon, the web material is slightly pushed aside in the center of the sealed portion, leaving, in effect, two flat seals with a weakened bond between the two seals. The strength of this bond is determined by the height of the bead in the ribbon, the hardness or durometer rating of the belt or rubber pressure block against which the ribbon is pressed, and also the degree of heat which is applied during the sealing operation.

If the seal is made rapidly and high temperatures are required with quick release, then the ribbon is covered with a 0.003″ Teflon tape, as at 45*a* in FIG. 5, to facilitate release. For very slow operation, where the ribbon temperature can be carefully controlled below the point at which the web material will actually flow, the ribbon 40 can be operated without a cover tape.

The device employed to press the webs 13 and 14 against the ribbon 40 may be the rubber-covered belt 49*b*, a rubber-coated roller, a rubber strip or block mounted on a bar or base, or any material in which the bead in the ribbon can make an indentation so that pressure is brought to bear on the remaining flat areas of the ribbon adjacent the bead 54. Silicone rubber is excellent for its release properties, but other types covered with thin Teflon tape are very effective. It is only necessary that the surface conform to the shape of the ribbon without undue pressure on the bead, but still enough pressure to leave an imprint of the bead in the web material which will weaken it enough to be easily torn off.

While, in the foregoing specification, a detailed description of an embodiment of the invention has been set down for the purpose of explanation thereof, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. Apparatus for transversely sealing together superposed, elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: a frame equipped with an elongated, ribbon-supporting member, means on said frame for positioning said web portions with the length of said web portions transverse of the length of the member, an elongated, metal ribbon having a thickness of a few thousandths of an inch supported on said member and having the ribbon length extending parallel to the length of said member, said ribbon being centrally, longitudinally deformed to provide an integral, elongated rib outstanding from said member a few thousandths of an inch, the rib width being substantially less than the ribbon width, with the base of the rib being of greater

width than the rib tip, means on said frame resiliently urging said web portions and ribbon together, and means on said frame for intermittently sending electric current through said ribbon, said current-sending means and resiliently urging means being arranged to develop linear web seals on opposite sides of a line of weakness provided by said rib.

2. Apparatus for transversely sealing together superposed, elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: a frame equipped with an elongated, ribbon-supporting member, means on said frame for positioning said web portions with the length of said web portions transverse of the length of the member, an elongated, metal ribbon having a thickness of a few thousandths of an inch supported on said member and having the ribbon length extending parallel to the length of said member, said ribbon being centrally, longitudinally deformed to provide an integral, elongated rib outstanding from said member a few thousandths of an inch, the rib width being substantially less than the ribbon width, with the base of the rib being of greater width than the rib top, a release material overlying said ribbon, means on said frame resiliently urging said web portions and ribbon together, and means on said frame for intermittently sending electric current through said ribbon, said current-sending means and resiliently urging means being arranged to develop linear web seals on opposite sides of a line of weakness provided by said rib.

3. Apparatus for transversely sealing together superposed, elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: a frame equipped with an elongated, ribbon-supporting member, means on said frame for positioning said web portions with the length of said web portions transverse of the length of the member, an elongated metal ribbon having a thickness of a few thousandths of an inch supported on said member and having the ribbon length extending parallel to the length of said member, said ribbon being centrally, longitudinally deformed to provide an integral, elongated rib outstanding from said member a few thousandths of an inch, the rib width being substantially less than the ribbon width, with the base of the rib being of greater width than the rib top, said member being equipped with a crowned top surface whereby said ribbon laterally of said rib is equipped with generally angularly related side flanges, a release material overlying said ribbon, means on said frame resiliently urging said web portions and ribbon together, and means on said frame for intermittently sending electric current through said ribbon, said current-sending means and resiliently urging means being arranged to develop linear web seals on opposite sides of a line of weakness provided by said rib.

4. Apparatus for transversely sealing together superposed, elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: a frame equipped with a drum, means for rotating said drum, at least one elongated ribbon-supporting member on said drum with the member length being parallel to the axis of the drum, means on said frame for positioning said web portions with the length of said web portions transverse to the length of the member, an elongated metal ribbon having a thickness of a few thousandths of an inch supported on said member and having the ribbon length extending parallel to the length of said member, said ribbon being centrally, longitudinally deformed to provide an integral elongated rib outstanding from said member a few thousandths of an inch, the rib width being substantially less than the ribbon width with the base of the rib being of greater width than the rib top, means on said frame resiliently urging said web portions and ribbon together, and means on said frame for intermittently sending electric current through said ribbon, said current-sending means and resiliently urging means being arranged to develop linear web seals on opposite sides of a line of weakness provided by said rib.

5. Apparatus for transversely sealing together superposed, elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: a frame equipped with an elongated, ribbon-supporting member, means on said frame for positioning said web portions with the length of said web portions transverse of the length of the member, an elongated metal ribbon having a thickness of a few thousandths of an inch supported on said member and having the ribbon length extending parallel to the length of said member, said ribbon being centrally, longitudinally deformed to provide an integral, elongated rib outstanding from said member a few thousandths of an inch, the rib width being substantially less than the ribbon width, with the base of the rib being of greater width than the rib top, said ribbon having a width of the order of $\frac{3}{32}$ inch and a thickness of about 0.003 inch, said rib having a height of the order of about 0.005–0.007 inch, means on said frame resiliently urging said web portions and ribbon together, and means on said frame for intermittently sending electric current through said ribbon, said current-sending means and resiliently urging means being arranged to develop linear web seals on opposite sides of a line of weakness provided by said rib.

6. Apparatus for transversely sealing together superposed, elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: a frame equipped with an elongated, ribbon-supporting member, means on said frame for positioning said web portions with the length of said web portions transverse of the length of the member, an elongated metal ribbon having a thickness of a few thousandths of an inch supported on said member and having the ribbon length extending parallel to the length of said member, said ribbon being centrally longitudinally deformed to provide an integral elongated rib outstanding from said member a few thousandths of an inch, the rib width being substantially less than the ribbon width, with the base of the rib being of greater width than the rib top, said rib being transversely rounded, means on said frame resiliently urging said web portions and ribbon together, and means on said frame for intermittently sending electric current through said ribbon, said current-sending means and resiliently urging means being arranged to develop linear web seals on opposite sides of a line of weakness provided by said rib.

7. A heating element for transversely sealing together superposed elongated web portions of thermoplastic material to develop adjacent bags separable along a line of weakness in the sealed portion, comprising: an elongated metal ribbon having a thickness of a few thousandths of an inch, said ribbon being centrally, longitudinally deformed to provide an integral, elongated rib outstanding from the remainder of said ribbon a few thousandths of an inch, the rib width being substantially less than the ribbon width, with the base of the rib being of greater width than the rib top, and a fitting on each end of said ribbon for coupling said ribbon to a source of electricity whereby said ribbon is adapted to fuse said webs when electricity is passed therethrough to develop linear web seals on opposite sides of a line of weakness provided by said rib.

References Cited by the Examiner

UNITED STATES PATENTS

2,229,121	1/1941	Nye et al.	93—19
2,737,859	3/1956	Allison et al.	93—8
2,743,761	5/1956	Snyder et al.	
2,796,913	6/1957	Fener et al.	156—515 X
2,868,942	1/1959	Lyijynen	219—19.10
3,033,257	5/1962	Weber.	

FRANK E. BAILEY, *Primary Examiner.*