United States Patent [19]

Stohlquist

[11] **3,727,365**

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[54] **METHOD AND APPARATUS FOR WRAPPING ARTICLES**

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[52] **U.S. Cl.** **53/33,** 53/182, 53/229

[51] **Int. Cl.**.....**B65b 11/10,** B65b 53/02

[58] **Field of Search**.....53/28, 33, 180, 182, 53/229, 228

[56] **References Cited**

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3,325,966	6/1967	Bruce et al.	53/182 X
3,453,801	7/1969	Stohlquist	53/182 X

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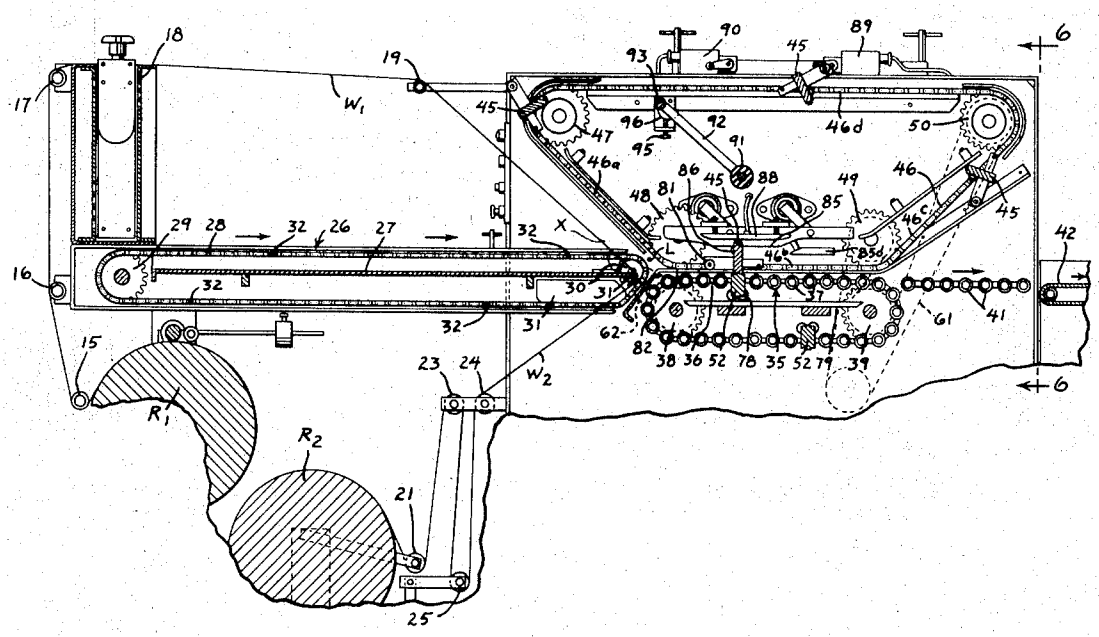
[57] **ABSTRACT**

Upper and lower webs of heat sealable material are joined to form a curtain of material extending across the article path and articles are advanced in succession into one side of the curtain while pairs of jaws at the other side of the curtain are moved laterally of the article path into position between the trailing side of one article and the lead side of a succeeding article and the jaws are thereafter moved forwardly along the article path to advance an article by pushing engagement therewith through the curtain while severing overlapping portions of the web between adjacent articles and sealing overlapping portions at opposite sides of the line of severance. The upper and lower webs of material are pressed against the upper and lower sides of the article to hold the webs in frictional contact with the article and inhibit stressing of the joint between the upper and lower webs at the lead side of the article during wrapping of the same.

15 Claims, 7 Drawing Figures



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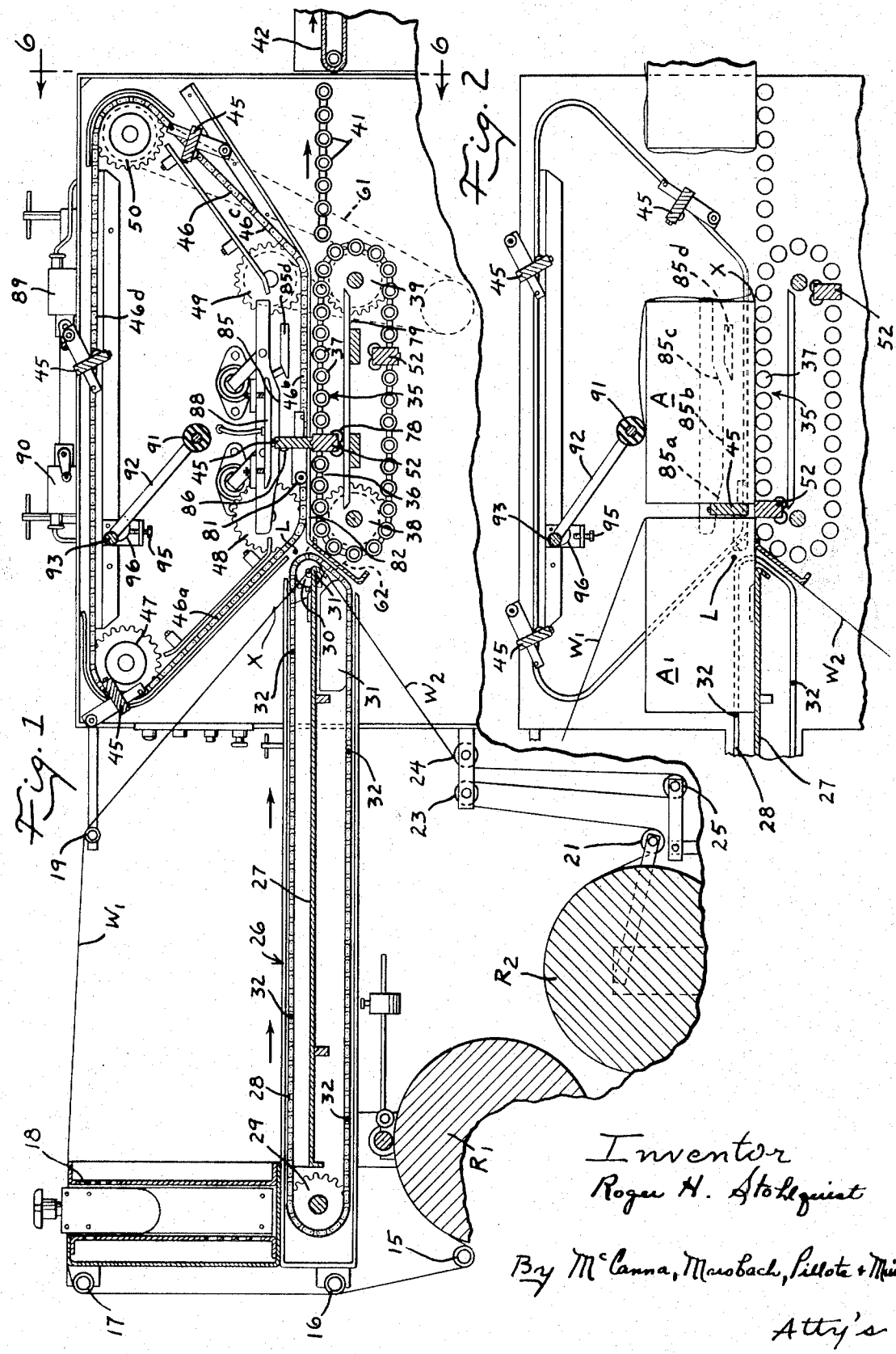
SHEET 1 OF 3



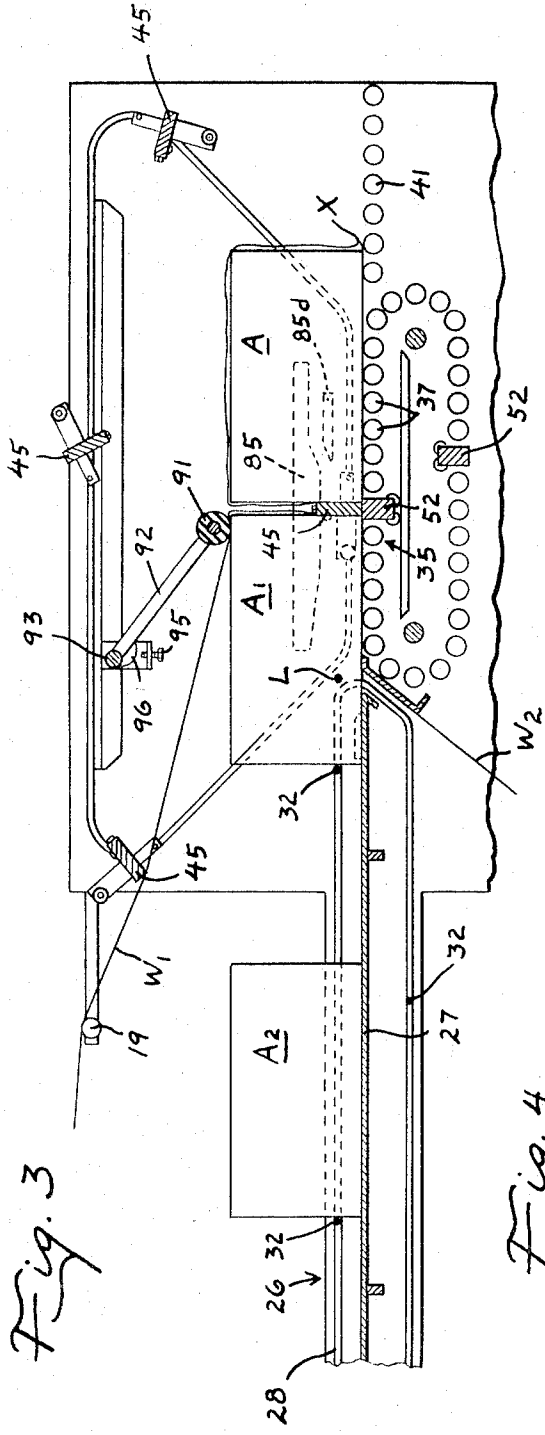


Fig. 3

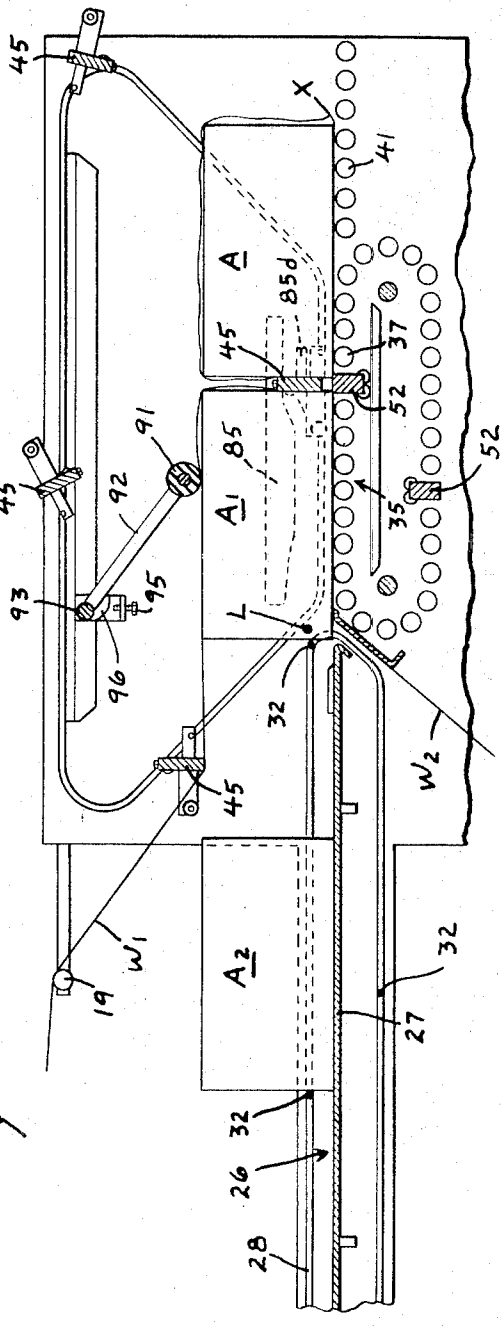


Fig. 4

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Fig. 5

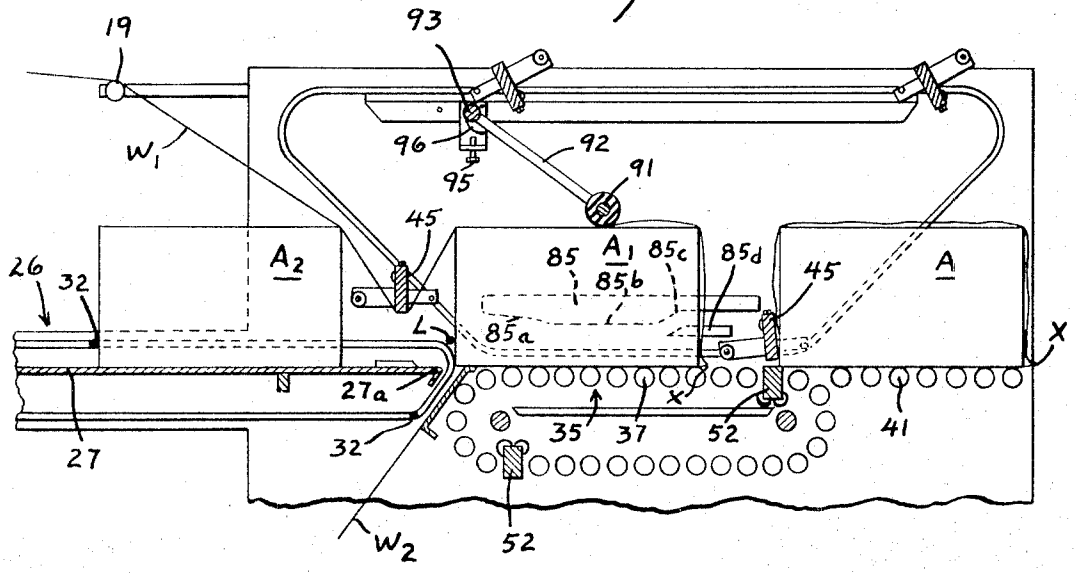


Fig. 6

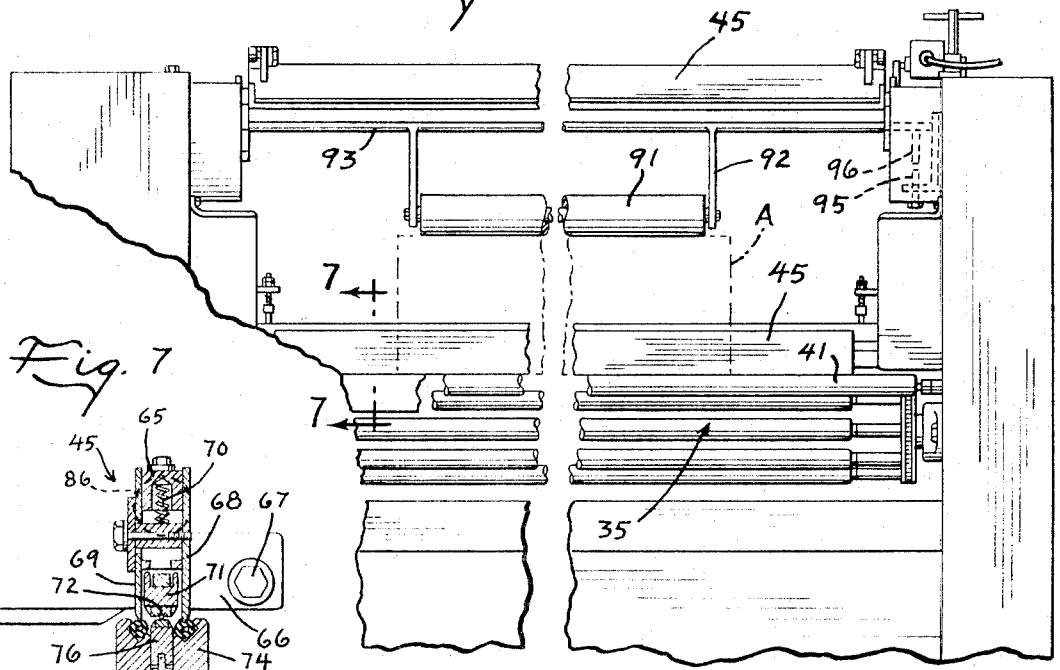
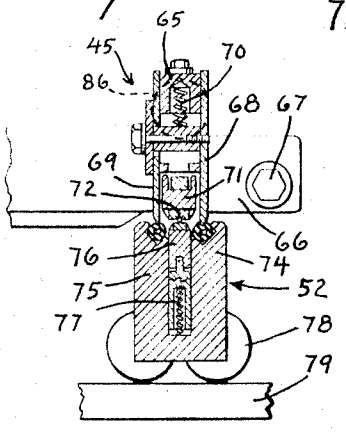


Fig. 7



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METHOD AND APPARATUS FOR WRAPPING ARTICLES

BACKGROUND OF THE INVENTION

The present invention relates to improvements in the method and apparatus for wrapping articles disclosed in the U. S. Pat. to Roger H. Stohlquist No. 3,453,801, dated July 8, 1969. In the method and apparatus disclosed in that patent, upper and lower webs of heat sealable wrapping material are joined to form a curtain extending crosswise of an article path and articles comprising either single items or groups of items, are advanced along a path into one side of the curtain of material to draw the material along the top and bottom of the articles. The advance of each article is interrupted when the trail side of that article reaches a preselected location along the path and sealing jaws are moved laterally of the path into a position between the trailing side of the stopped article and the lead side of the next succeeding article, and the sealing jaws are thereafter moved along the path to advance the previously stopped article by pushing engagement therewith through the web during the severing and heat sealing of the overlapping portions of the webs between the adjacent articles.

The jaws at the lead side of each article are spaced from that article and are released before another pair of jaws are moved into clamping engagement with the curtain at the trail side of that article and the curtain is maintained under sufficient tension to retract the curtain into engagement with the lead side of the succeeding article to effect a relatively tight wrap of the material around the article. The tension in the webs, however, is increased as the article is advanced into one side of the curtain and withdraws the webs from their supply rolls. In addition, as the jaws move laterally of the article path into positions at the trail side of the article, they draw the web along the trail side of the article into engagement with the article. This also increases the tension in that portion of the web that is wrapped around the article. If the joint or weld between the upper and lower webs is allowed to cool sufficiently, it usually can become strong enough to withstand the tensions exerted on the webs during wrapping. In the prior method and apparatus, the jaws were maintained in clamping engagement with the webs for a time after completion of the severing and heat sealing operation to allow the weld to cool before applying tensions. However, since the jaws are traveling during the heat sealing and subsequent cooling, the time allowed for sealing and cooling of the welds between the webs decreased as the lineal speed of operation of the sealing apparatus was increased and difficulties were encountered due to rupturing of the welds between the upper and lower webs at the lead side of the articles, at higher operating speeds. In addition, in the prior method and apparatus, the articles were spaced apart a substantial distance during sealing and the webs then retracted into engagement with the next succeeding article being wrapped. This resulted in the joint at the lead side of each article being located at a point spaced substantially above the bottom of the article and frequently along the top of the article.

An important object of this invention is to provide a method and apparatus of the type described for wrapping articles between two webs of heat sealable

wrapping material wherein the articles are wrapped by heat sealing the webs together first at the lead and then at the trail side of the article, which method and apparatus is adapted for wrapping articles at high speeds and which yet avoids rupturing of the joint between the webs at the lead side of the articles during wrapping of the same.

Another object of the present invention is to provide a method and apparatus for wrapping articles in which stressing of the joint between the webs at the lead side of the article is effectively avoided during wrapping of the same.

Another object of this invention is to provide a method and apparatus of the type described for wrapping articles between two webs of heat sealable wrapping material in which the joints between the two webs at the lead and trailing side of each article are located adjacent the bottom of the article.

Yet another object of this invention is to provide a method and apparatus for wrapping articles in which the curtain of material is held in frictional contact with the article during wrapping of the same and which effects a relatively close wrap of material around the articles.

Still another object of this invention is to provide a method and apparatus for wrapping articles in heat sealable wrapping material wherein the heat sealing jaws are in continuous motion for high speed operation and which does not withdraw or consume any wrapping material in the event no articles are advanced to the sealing apparatus.

These and other objects of this invention are achieved by the method and apparatus of the present invention wherein articles are advanced in succession into one side of a curtain of material and pairs of jaws at the other side of the curtain are moved laterally of the article path into positions between the trail side of one article and the lead side of a succeeding article to draw the curtain therearound and the jaws thereafter moved lengthwise of the article path in pushing engagement through the curtain with the article in front of the jaws to advance the article, the jaws being operated to clamp, sever and seal the overlapping portions of the curtain between the adjacent articles during advance along the path and thereafter release the overlapping portions of the curtain at the lead side of one article before movement of a succeeding pair of jaws into position at the trail side of the article, and wherein the curtain of material is pressed against the upper and lower sides of the article to hold the curtain in frictional contact with the article and inhibit application of tension in the web to the joint at the lead side of the article during wrapping of the same.

Other objects and advantages of this invention will be more readily understood by reference to the following detailed description when taken in connection with the accompanying drawings wherein:

FIG. 1 is a longitudinal sectional view through a heat sealing apparatus embodying the present invention;

FIGS. 2, 3, 4 and 5 are diagrammatic views illustrating the sealing apparatus in different moved positions;

FIG. 6 is a fragmentary rear end elevational view taken on the plane 6—6 of FIG. 1; and

FIG. 7 is a fragmentary sectional view through a sealing jaw assembly.

The method and apparatus of the present invention are generally adapted for wrapping articles in heat sealable wrapping materials. As used herein, the term "articles" includes single items as well as groups of items. The heat sealable wrapping material may, for example, comprise various different thermoplastic films such as polyethylene, polyvinyl chloride, etc. The thermoplastic films are preferably of the so-called heat shrinkable type, to enable heat shrinking of the wrapper into tight conformity with the article, after the article has been wrapped.

In the method of the present invention, upper and lower webs of heat sealable wrapping material are respectively supported above and below an article path, the ends of which webs are joined to form a curtain extending crosswise of the path, and articles are advanced and spaced in succession along the article path into one side of the curtain and advance of each article is interrupted when the trailing side of that article reaches a preselected location along the path. Sealing jaws at the other side of the curtain are moved into positions between the trailing side of the article whose advance has been interrupted and the lead side of a succeeding article to draw the curtain along the trail side of the article and the jaws are thereafter advanced forwardly along the path to advance the article in front of the jaws by pushing engagement therewith through the curtain. Overlapping portions of the curtain between adjacent articles are clamped together while the jaws advance forwardly along the path and the overlapping portions of curtain are severed and sealed on opposite sides of the line of severance while clamped between the jaws. The jaws at the lead side of the article are released from clamping engagement with the webs before a succeeding pair of jaws are moved into clamping engagement with the webs at the trail side of that article. In accordance with the present invention, the upper and lower webs are pressed against the upper and lower sides of the articles to maintain the upper and lower webs in frictional contact with the article during wrapping of the same and to inhibit application of web tensions to the joint or weld between the webs at the lead side of the article.

The wrapping apparatus is of the type disclosed in the aforementioned U.S. Pat. No. 3,453,801, the disclosure in which patent is hereby incorporated by reference. In general, the upper and lower webs W_1 and W_2 are supplied as from rolls R_1 and R_2. The web from roll R_1 is passed under a web tensioning roller **15** and over guide rollers **16** and **17** through a web tensioning and retracting apparatus such as a vacuum box **18** and over an upper guide roll **19** which supports the web W_1 above the article path. The web W_2 from the roll R_2 is passed under a web tensioning roller **21** and through a web retracting apparatus shown in FIG. **1** as comprising spaced guide rollers **23** and **24** and an intermediate dancer roll **25**, the guide roll **24** supporting the lower web W_2 at a level below the article path. The upper and lower webs W_1 and W_2 are joined by a joint or weld indicated at X in FIG. **1** to form a curtain extending crosswise of the path of advance of the articles.

An inlet conveyor or transfer mechanism **26** is arranged to advance articles in spaced succession along a path into one side of the curtain and until the trail side of the article reaches a preselected location indicated by a point designated L along this path. As more fully disclosed in the aforementioned patent, the inlet conveyor means includes a support plate **27**, the outlet end **27***a* of which extends to a point adjacent the location L, and an endless conveyor including laterally spaced tracks or cans **28** that are entrained about sprockets **29** at the inlet end and over sprockets **30** and guide plates **31** at the outlet end. Article engaging elements or pushers in the form of crossbars **32** extend between the laterally spaced chains **28** to advance articles along the platform. An article support means **35** has its inlet end extending from adjacent the location L forwardly along the article path, and the article support means is constructed and arranged to provide a dwell support for the articles advanced thereon by the inlet conveyor means **26**. As used herein, the term "dwell support" refers to a support for articles which will support the articles in a substantially stationary position after the inlet conveyor has advanced the articles thereon and until the articles are thereafter advanced by the sealing jaw means described hereinafter In the form shown and as more fully disclosed in the aforementioned patent, the article support means is advantageously in the form of a traveling bed of rollers including a pair of laterally spaced lower tracks or chains **36** having a plurality of rollers **37** extending between the chains and constructed for free axial rotation relative to the chains. Chains **36** are entrained about spaced sprockets **38** and **39** which support the upper run of the rollers **37** at a level adjacent the level of the platform **27** of the inlet conveyor and, although the endless chains are themselves driven in a manner and for a purpose described hereinafter, the rollers **37** are free to turn about their own axes so as to effectively avoid propelling or advancing the articles supported on the upper run thereof. An outlet guide conveniently in the form of a stationary bed of rollers **41** extends from the outlet end of the articles support **35** and a means such as a conveyor **42** may be utilized to advance articles from the outlet guide to a shrink tunnel (not shown) if heat shrinkable wrapping material is used.

As shown in FIG. **1**, the curtain of material formed by the joint webs W_1 and W_2 extends crosswise of the article path at a location intermediate the inlet conveyor **26** and the article support means **35** and adjacent the location L. Articles are advanced by the crossbars **32** on the inlet conveyor in spaced succession into one side of the curtain of wrapping material and onto the article support means **35** until the trailing side of the articles reach a position such as shown in FIG. **4** adjacent the location L, at which time the crossbars **32** pass around the sprocket **30** so that they are no longer effective to advance the articles. Advance of the articles it then momentarily interrupted while sealing jaws at the other side of the curtain move laterally of the article path into positions between the trail side of the article on the support means and the lead side of the next succeeding article to draw the curtain of material closely along the trailing side of the article on the support means, and to thereafter advance the article along the support means by pushing engagement therewith through the curtain. The sealing jaws include a plurality of upper jaw assemblies **45**, herein shown four in number which are mounted for movement in a closed loop course above the article support means. Each of

the upper jaw means **45** extend between laterally spaced tracks or chains **46** which are entrained over sprockets **47, 48, 49** and **50**. As shown in FIG. **1** and as more fully described in the aforementioned patent, the sprockets **47–50** are arranged so as to define a first downwardly and forwardly inclined run **46***a*, a second run **46***b* extending forwardly along the article path above the article support means **35**, a third run **46***c* extending upwardly and forwardly away from the article path, and a fourth return run **46***d* extending rearwardly back to the first-mentioned run. The sealing jaws also include a plurality of lower jaw assemblies, herein shown two in number and designated generally by the numeral **52**, which lower jaw assemblies are mounted on the tracks or chains **36** of the article support means to extend crosswise of the machine between adjacent ones of the rollers **37**. Jaws **52** are spaced apart along the chains **36** a distance equal to the spacing of the upper jaws **45** on the chains **46** and the chains **46** and **36** are driven in continuous fashion in timed relation with each other such as to bring a lower jaw **52** into opposed relation with an upper jaw **45**, as the latter moves along the second run **46***b*. As more fully disclosed in the aforementioned patent, one sprocket such as **39** is driven in continuous fashion preferably through a variable speed drive mechanism (not shown) and a chain drive **61**, shown in phantom in FIG. **1**, drivingly interconnects shafts for sprockets **39, 49** and **50** to drive the chains **46** and **36** at the same lineal speed but in relatively opposite directions so that the upper run of chain **36** and the lower run **46***b* of chain **46** move forwardly in unison. The inlet conveyor **26** is driven in timed relation with the movement of the jaws and at the same lineal speed as chains **36** and **46**, as by a chain drive shown in phantom at **62** in FIG. **1**.

The upper and lower jaws **45** and **52** are arranged to clamp overlapping portions of the thermoplastic curtain therebetween as the jaws advance forwardly along the article path, and to sever and seal the thermoplastic material at opposite sides of the line of severance during this forward movement. The jaw assemblies are conveniently constructed and mounted on the respective chains in the manner disclosed in the aforementioned patent and a cross-section of a suitable jaw assembly is shown in FIG. **7**. The upper jaws **45** include a main support bar **65**, the ends of which are swingably mounted as by arms **66** and pins **67** on the upper chain. Front and rear clamping jaws **68** and **69** are mounted on opposite sides of the support bar **65** for lateral sliding movement relative thereto and the clamping jaws are yieldably urged into clamping position as by springs **70**. An intermediate sealing jaw **71** is mounted on the intermediate support bar **65** between the front and rear jaws and carries a heat sealing and cutting element **72** at its underside. The lower jaws **52** also have spaced clamping jaws **74** and **75** and an intermediate sealing jaw **76** between the clamping jaws **74** and **75** and which sealing jaw is yieldably biased into clamping position by springs **77**. The lower jaws **52** are guidably supported during movement along the upper run of chain **36** by rollers **78** which ride along a support rail **79**. The upper jaws **45** have guide rollers **81** thereon which guide along a rail **82** during movement along the second run of chain **46**, and the upper jaws are moved into clamping engagement with the lower jaws during a portion of the movement of the upper jaws along the run **46***b*, by a cam **85** that engages rollers **86** on the intermediate support bar **65** on the upper jaws **45**. The heat sealing and cutting element **72** is preferably in the form of an electrical resistance element which is "impulse" heated, that is heated by passing a short duration pulse of current therethrough. Current is conveniently conducted to the element **72** through a commutator bar assembly **88**, and under the control of switches **89** and **90**, all in a manner disclosed in the aforementioned patent.

When the upper and lower jaws **45** and **52** are released from clamping engagement with the overlapping portions of the web, the weld or joint between the upper and lower webs at the lead side of the article is still at an elevated temperature and has not cooled sufficient to obtain its full strength. However, during a wrapping cycle, there are a number of forces acting on the webs W_1 and W_2 which effect the web tension and which tend to stress and sometimes rupture the newly formed joint between the upper and lower webs. Thus, the web retracting apparatus **18** and **25** which operate to retract the webs W_1 and W_2 exert a certain web tension. In addition, in order to withdraw material from the rolls R_1 and R_2, it is necessary to overcome the dancer rolls **15** and **21** and the inertia of the web supply rolls R_1 and R_2, and this also effects the tension in webs W_1 and W_2. Further, as the jaws move laterally of the article path and draw the webs along the trail side of the article and into engagement therewith, they act to increase the tension in the webs in the portion forwardly of the jaws. Heretofore, in order to minimize rupturing of the weld at the lead side of the article, it was necessary to allow time for the weld to cool sufficient to provide adequate strength to withstand rupturing and this, in turn, effectively limited the maximum speed in which the machine could heretofore be operated.

In accordance with the present method and apparatus, the upper and lower webs are both pressed against the respective upper and lower sides of the article, to maintain the webs in frictional engagement with the articles and thereby inhibit application of the web tensions to the joint at the lead side of the article. The article support means underlies and supports the article resting on the lower web of film so that relative movement between the lower web W_2 and the article is inhibited. In order to inhibit relative movement between the upper web and the article, a roller means **91** is mounted at a location to engage and press the upper web W_1 against the upper side of the article during wrapping of the same. The roller **91** is supported for limited vertical movement as on arms **92** that are swingably supported for movement about the axis of a shaft **93** extending crosswise of the article path and at a location above and rearwardly with respect to the roller **91**. In this manner, the roller is gravitationally urged downwardly to press the upper web against the top of the article and the roller is supported for limited vertical movement to accommodate variations in height of the article. Downward swinging movement of the roller **91** is limited by an adjustable stop **95** that engages a cam **96** rotatable with the arms **92**, to normally support the rollers at a level with the underside of the rollers slightly below the top of the article. The axis of the roller **91**, however, is maintained above the top of the

article so that, when the lead side of the article engages the roller, the article cams the roller upwardly until the roller rides on top of the article.

The roller **91** is located intermediate the ends of the run **46***b* of the upper sealing jaws at a position to press the film against the upper side of the article before the jaws at the lead side of the article are released from clamping engagement with the web and until after a succeeding pair of jaws has moved into clamping position at the trail side of the article. The roller **91**, however, also tends to inhibit retraction of the upper web and, in order to effect a relatively snug wrap of material around the articles, the operation of the input conveyor mechanism is timed with the movement of the jaws so that the input conveyor advances a succeeding article into a position closely adjacent the rear side of the sealing jaws, as the latter move along the horizontal run **46***b*. Further, since the roller **91** does inhibit retraction of the curtain toward the lead side of the article, the timing of the clamping of the jaws is arranged so that the jaws are released from clamping engagement with the web and the lead side of one article before the trail side of that article reaches said preselected location L along the path. For this purpose, the cam **85** which controls camping of the jaws, is shaped so as to provide a downwardly inclined cam portion **85***a* which engages the roller **86** on the sealing jaws to move the jaws downwardly into clamping engagement with the overlapping portions of the web; a generally horizontal pressure applying surface **85***b* which maintains the jaws in clamping engagement with the webs, and an upwardly inclined pressure relief surface **85***c* which allows the roller **86** to move upwardly and relieve pressure on the jaws. A supplemental cam surface **85***d* is provided to engage the underside of roller **86***d* to positively cam the roller upwardly along the underside of surface **85***c* and effect positive release of the jaws from their clamping engagement with the web. The relief surface **85***c* and supplemental cam surface **85***d* are spaced from the location L a distance such as to positively release the jaws from clamping engagement with the web before the rear side of the jaws **45** are spaced from the location L a distance equal to the length of the articles being wrapped. In this manner, the jaws are released from clamping engagement with the webs at the lead side of the article slightly before the time the advance of the article by the inlet conveyor **26** is stopped, with the trail side of the article at the location L.

Reference is now made more specifically to FIGS. **2–4**. In FIG. **2**, one article designated A is shown on the article support **35**, while it is being advanced by a pair of the jaws **45**, **52**. The pair of jaws **45**, **52** at the trail side of the article A have not yet clamped the overlapping portions of the web therebetween, but the upper jaw **45** is advanced toward the cam surface **85***a* where the upper jaw will be moved downwardly to clamp overlapping portions of the web between the upper and lower jaws. The roller **91**, however, is operative when the articles are in the position shown in FIG. **2** to press the upper web W_1 against the top of the article A and the roller is thus effective to prevent relative movement between the upper web and the article A during clamping of the overlapping portions of the material between the trail side of article A and the lead side of a succeeding article designated A_1.

The inlet conveyor means is operated at the same lineal speed as chains or tracks **46** and **36** and is timed in relation to the movement of the jaws so as to advance the succeeding article A_1 to position its lead side closely adjacent the rear side of the jaws **45**, **52**. Thus, as one pair of the jaws **45**, **52** operate to continue advance of the article A along the article support the inlet conveyor means continues advance of the succeeding article A_1 onto the support means. The sealing jaws are maintained in clamping engagement with overlapping portions of the web as the jaws move along the cam surface **85***b* and the heat sealing and cutting element **72** is energized while the jaws are clamped to sever the overlapping portions of the web and to heat seal or weld the overlapping portions of the web together at opposite sides of the severance. As shown in FIG. **3**, the pressure applying roller **91** moves out of engagement with one article A and thereafter operates to press the upper web against the top of the succeeding article A_1, while the jaws are in clamped relation with overlapping portions of the web. The jaws **45**, **52** are released from clamping engagement with overlapping portions of the web at the lead side of article A_1 before the articles reach the position shown in FIG. **4** where the trail side of the article A_1 is at the preselected location L, and the roller **91** continues pressing the upper web against the top of article A_1 during movement of a succeeding pair of jaws laterally of the article path into position between the trail side of article A_1 and the lead side of the next succeeding article, as shown in FIG. **5**, to avoid applying web tension to the weld at the lead side of the article during completion of the wrap around the article.

The spacing of the flights or bars on the inlet conveyor and the similar spacing of the sealing jaws **45** is greater than the length of the articles. However, as the upper jaws **45** move along the inlet run **46***a*, the component of their motion measured in a direction along the article path is less than the speed of the inlet conveyor and accordingly, the spacing between the lead side of the article and the sealing jaws decreases as the articles are advanced. The timing of the inlet conveyor and the sealing jaws is arranged so that the sealing jaws reach the position L and press the film against the trail side of one article (such as A_1) at about the same time that the lead side of the succeeding article (such as A_2) reaches the rear side of the sealing jaws. In this manner, the articles are spaced apart as they are advanced by the inlet conveyor to allow the sealing jaws to move laterally of the article path into position between adjacent articles, and the spacing between adjacent articles is then decreased so as to effect a relatively snug wrap of the material around the article.

The method and apparatus enables sealing of the articles at increased speed over that achieved with the method and apparatus disclosed in the aforementioned U.S. Pat. No. 3,453,801. It is not necessary to allow time for the heat seal joint between the webs to cool before releasing the jaws from clamping engagement with the webs so that the jaws can be moved at a higher speed during the forward sealing run. The roller maintains the upper web pressed in engagement with the article during wrapping of the article so that the tension in the web is not applied to the newly formed weld joint and rupturing of the still soft welds at the lead side of

the articles is accordingly effectively avoided. Further, successive articles are closely adjacent each other during the heat sealing operation so that it is not necessary to retract the webs when sealing of one article is completed, in order to effect a relatively snug wrap of material around the succeeding article. Accordingly, the weld joints between the webs remain adjacent the bottom of the article where they do not adversely affect the appearance of the wrapped article. More importantly, when heat shrinkable films are used, location of the weld joints adjacent the bottom corners of the article reduces exposure of the weld joints to the hot air currents in the heat tunnel and thus reduces failures of the weld joints due to overheating in the heat tunnel.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of wrapping successive articles in a heat sealable wrapping material comprising, supporting end sections of upper and lower webs of the material respectively above and below an article path, the ends of which webs have previously been joined to form a curtain extending crosswise of the path, advancing articles in succession along said path to extend one of the articles into one side of said curtain and stopping advance of that article when the trailing side of that article reaches a preselected location along the path, moving a pair of jaws at the other side of the curtain into positions between the trailing side of the article stopped at said preselected location and the lead side of a succeeding article to draw the curtain along the trail side of the stopped article and thereafter advancing said pair of jaws forwardly along said path to advance the previously stopped article by pushing engagement therewith through the curtain, continuing advance of the succeeding article behind said pair of jaws as they advance along the path and stopping advance of the succeeding article when the trailing side of the succeeding article reaches said preselected location along said path, moving a succeeding pair of jaws at the other side of the curtain into positions at the trailing side of said succeeding article to draw the curtain along the trailing side of said succeeding article and thereafter advancing said succeeding pair of jaws forwardly along said path to advance the succeeding article in a forward direction by pushing engagement therewith through the curtain, bringing the jaws of each pair of jaws together into clamping engagement with the overlapping portions of the curtain between adjacent ones of said articles during a portion of the forward movement of the jaws along the path and releasing the pair of jaws from clamping engagement with the curtain at the lead side of each article before bringing the pair of jaws at the trail side of that article into clamping engagement with the curtain, severing and heat sealing the overlapping portions of the curtain at both sides of the severance while the pair of jaws move forwardly along said path in clamping engagement with the curtain, and laterally pressing the upper and lower webs of the curtain respectively against the upper and lower sides of each article with sufficient pressure to inhibit relative movement between the curtain and the article as the article is advanced forwardly along said path at least from a time prior to release of the pair of jaws from clamping engagement with the curtain at the leading side of each article until after movement of the pair of jaws at the trail side of that article into clamping engagement with the curtain to thereby prevent stressing of the seal between the upper and lower webs at the lead side of each article during wrapping of the article.

2. The method of claim 1 wherein release of the pair of jaws at the lead side of each article is effected before the trail side of that article is advanced to said preselected location along said path.

3. The method of claim 2 wherein advance of each succeeding article into engagement with the curtain behind a pair of jaws moving forwardly along said path is correlated with the movement of the pair of jaws to position the lead side of the succeeding article closely adjacent that pair of jaws.

4. A method of wrapping successive articles in a heat sealable wrapping material comprising,

a. supporting end sections of upper and lower webs of the material respectively above and below the article path, the ends of which webs have previously been joined to form a curtain extending crosswise of the article path adjacent a preselected location therealong;

b. advancing articles in a forward direction along the path into one side of the curtain to draw the curtain across the top and bottom of the article and interrupting advance of the article when the trailing side of the article reaches said preselected location along the path;

c. moving a first jaw means at the other side of the curtain in a closed loop course:

1. along a first run downwardly and forwardly from above the article path to draw the curtain along the trailing side of the article at said preselected location;

2. then along a second run forwardly in a direction generally lengthwise of the article path to advance the article by pushing engagement through the curtain with the trailing side of the article to advance the article away from said preselected location;

3. then in a third run upwardly away from said article path;

4. and finally in a return run rearwardly above the articles back to the downward run;

d. bringing a second jaw means at the other side of the curtain into opposed clamping relation to the first jaw means after said first jaw means engages the trail side of the article and moving said second jaw means forwardly with said first jaw means as the latter moves along said second run;

e. clamping overlapping portions of the curtain between the first and second jaw means as the first jaw means moves along said second run and severing and heat sealing the curtain at both sides of the severance while the overlapping portions of the curtain are clamped between the first and second jaw means to separate the wrapped article from the webs and to rejoin the webs to reconstitute the curtain;

f. and pressing the upper and lower webs respectively against the upper and lower sides of the article while the first jaw means moves along said first run and along a portion of said second run at least until the overlapping portions of the curtain are

clamped between said first and second jaw means to inhibit stressing of the joint between the overlapping portions of the curtain at the lead side of the article.

5. A method in accordance with claim 4 including advancing a succeeding article along said path at a rate equal to the rate of movement of said first jaw means along said second run and timing the advance of the succeeding article such that the lead side of the succeeding article reaches a position closely behind the first jaw means when the latter starts said second run.

6. In an apparatus for wrapping successive articles in heat sealable wrapping material including means supporting end sections of upper and lower webs of the material respectively above and below an article path, the ends of which webs have previously been joined to form a curtain extending crosswise of the article path and having first and second sides, an article support means at said second side of said curtain and constructed and arranged to provide a dwell support for an article advanced thereon, means for advancing articles in succession along said article path into the first side of the curtain and onto said dwell support until the trailing side of the article reaches a preselected location along said article path, to draw the curtain along the top and bottom sides of the article, a plurality of pairs of jaw means at said second side of the curtain and means for moving said pairs of jaw means in succession along a first run laterally of said article path into positions between the trail side of an article on said support means and the lead side of the next succeeding article, then along a second run in a forward direction along said article path in pushing engagement through the curtain with the article on the dwell support to advance the article, then along a third run laterally away from the article path, and finally along a return run back to the first run, means operable during movement of each pair of jaw means along said second run for clamping the jaw means of that pair against overlapping portions of the curtain between the trailing side of one article and the lead side of a succeeding article and for releasing that pair of jaw means from clamping engagement with the curtain before bringing a succeeding pair of jaw means into clamping engagement with overlapping portions of the curtain between the trailing side of said succeeding article and the lead side of a next succeeding article, and means for severing and heat sealing overlapping portions of the curtain at opposite sides of the line of severance while the jaw means move along the second run, the improvement comprising roller means disposed at said second side of the curtain above said article support means and intermediate the ends of said second run for pressing the upper web against the upper side of an article during movement of a pair of jaw means along said first run into positions at the trailing side of that article and during subsequent movement of that pair of jaw means along a portion of said second run at least until that pair of jaw means is operated to clamp the overlapping portions of the curtain therebetween, said roller means being operative to hold the upper web in frictional contact with the upper side of the article to inhibit stressing of the joint between the upper and lower webs at the lead side of the article during movement of the pair of jaws into clamping position at the trailing side of the article.

7. In an apparatus for wrapping successive articles in heat sealable wrapping material including means supporting end sections of upper and lower webs of the material respectively above and below an article path, the ends of which webs have previously been joined to form a curtain extending crosswise of the article path and having first and second sides, an article support means at said second side of said curtain and constructed and arranged to provide a dwell support for an article advanced thereon, means for advancing articles in succession along said article path into said first side of the curtain and onto said dwell support until the trailing side of the article reaches a preselected location along said article path, to draw the curtain along the top and bottom sides of the article, a plurality of pairs of jaw means at said second side of the curtain and means for moving said pairs of jaw means in succession along a first run laterally of said article path into positions between the trail side of an article on said support means and the lead side of the next succeeding article, then along a second run in a forward direction along said article path in pushing engagement through the curtain with the article on the dwell support to advance the article, then along a third run laterally away from the article path, and finally along a return run back to the first run, means operable during movement of each pair of jaw means along said second run for clamping the jaw means of that pair against overlapping portions of the curtain between the trailing side of one article and the lead side of a succeeding article and for releasing that pair of jaw means from clamping engagement with the curtain before bringing a succeeding pair of jaw means into clamping engagement with overlapping portions of the curtain between the trailing side of said succeeding article and the lead side of a next succeeding article, and means for severing and heat sealing overlapping portions of the curtain at opposite sides of the line of severance while the jaw means move along the second run, the improvement comprising, roller means disposed at said second side of the curtain above said article support means and intermediate the ends of said second run for pressing the upper web against the upper side of an article during that portion of its advance along said path from prior to release of the pair of jaw means at the lead side of that article until after clamping of the pair of jaw means at the trailing side of that article, said roller means being operative to hold the upper web in frictional contact with the upper side of the article whereby to inhibit stressing of the joint between the upper and lower webs at the lead side of the article during wrapping of the article.

8, In an apparatus for wrapping successive articles in heat sealable wrapping material including means supporting end sections of upper and lower webs of the material respectively above and below an article path, the ends of which webs have previously been joined to form a curtain extending crosswise of the article path and having first and second sides, an article support means at said second side of said curtain and constructed and arranged to provide a dwell support for an article advanced thereon, means for advancing articles in succession along said article path into said first side of the curtain and onto said dwell support until the trailing side of the article reaches a preselected location along said article path, to draw the curtain along

the top and bottom sides of the article, a plurality of pairs of jaw means at said second side of the curtain and means for moving said pairs of jaw means in succession along a first run laterally of said article path into positions between the trail side of an article on said support means and the lead side of the next succeeding article, then along a second run in a forward direction along said article path in pushing engagement through the curtain with the article on the dwell support to advance the article, then along a third run laterally away from the article path, and finally along a return run back to the first run, means operable during movement of each pair of jaw means along said second run for clamping the jaw means of that pair against overlapping portions of the curtain between the trailing side of one article and the lead side of a succeeding article and for releasing that pair of jaw means from clamping engagement with the curtain before bringing a succeeding pair of jaw means into clamping engagement with overlapping portions of the curtain between the trailing side of said succeeding article and the lead side of a next succeeding article, and means for severing and heat sealing overlapping portions of the curtain at opposite sides of the line of severance while the jaw means move along the second run, the improvement comprising, roller means disposed at said second side of the curtain above said article support means and spaced forwardly from said preselected location a distance less than the length of the article measured along said article path for pressing the upper web against the upper side of an article, said roller means being operative to hold the upper web in frictional contact with the upper side of the article whereby to inhibit stressing of the joint between the upper and lower webs at the lead side of the article during wrapping of the article.

9. An apparatus according to claim **8** wherein said means for advancing articles into said first side of the curtain is timed with relation to said means for moving said jaws to position the lead side of an article advanced by said article advancing means closely adjacent the trailing side of a pair of said jaw means as the latter advance forwardly along said path.

10. An apparatus according to claim **8** wherein said roller is supported for vertical movement to accommodate articles of different height.

11. In an apparatus for successional wrapping of articles in heat sealable wrapping material including means supporting end sections of upper and lower webs of the material respectively above and below an article path, the ends of which webs have previously been joined to form a curtain extending crosswise of the path and having first and second sides, an article support means at said second side of said curtain and constructed and arranged to provide a dwell support for an article advanced thereon, means for advancing articles in succession along said article path into said first side of the curtain and onto the dwell support until the trailing side of the article reaches a preselected location adjacent the inlet end of said article support means, a plurality of jaw means at said second side of the curtain mounted for movement in a closed loop course, means for moving said jaw means in succession along a first run downwardly and forwardly toward the path into a position between the trailing side of the article on said support means and the leading side of the next succeeding article to press the curtain against the trailing side of the article, then along a second run extending forwardly along the article support means to push the article along the article support means, then along a third run laterally away from the article path and finally along a fourth run back to the first run, means for clamping overlapping portions of the curtain to the jaw means as the jaw means moves along at least a portion of said sealing run and for releasing the overlapping portions from the jaw means when the jaw means reaches a second location spaced along said path from said preselected location a distance less than the length of the article being wrapped, means for severing and for sealing the overlapping portion of the curtain at opposite sides of the severance while the jaw means moves along said second run and the overlapping portions are clamped to the jaw means, the improvement comprising, roller means for pressing the upper web against the upper side of each article to hold the upper web in frictional contact with the article and inhibit stressing of the joint between the upper and lower webs at the lead side of the article during wrapping of the article, said roller means being disposed at said second side of the curtain above said support means and spaced forwardly from said preselected location a distance less than the length of the article measured along said path.

12. An apparatus according to claim **11** wherein said roller means is located intermediate said preselected location and said second location.

13. An apparatus according to claim **12** wherein said roller means is supported for vertical movement to accommodate articles of different height.

14. An apparatus according to claim **12** including means supporting said roller for swinging movement about an axis spaced above and rearwardly of said roller.

15. An apparatus according to claim **8** wherein said means for advancing articles along said path includes means operated in timed relation with the movement of said jaw means around said closed loop course and arranged to advance the articles onto said support means with the lead side of the article closely adjacent the jaw means moving along said sealing run.

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