Oct. 21, 1969 C. M. SCHOTT, JR 3,473,995

WEB ALTERING MECHANISM

Filed April 19, 1965 3 Sheets-Sheet 1

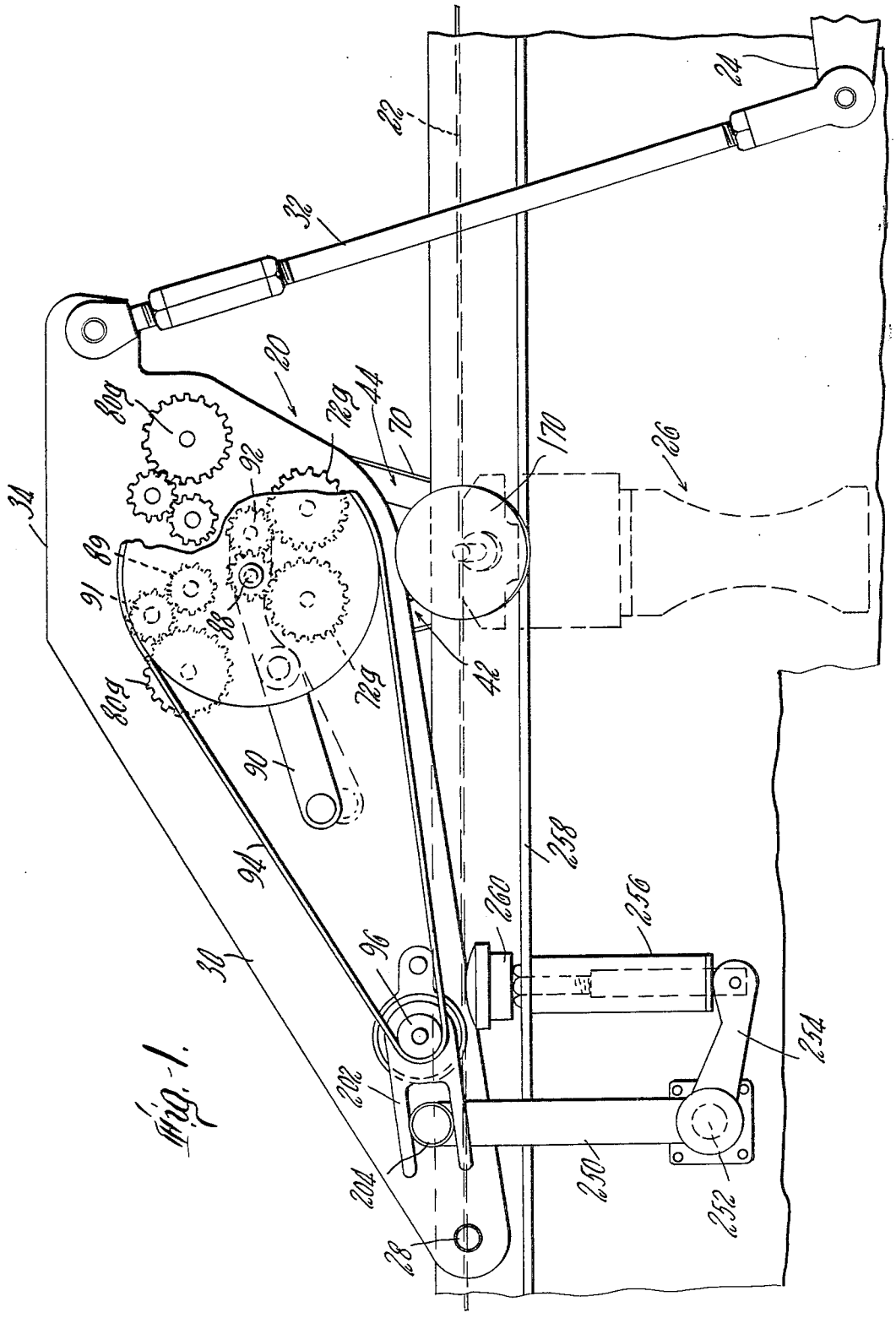

Fig. 1.

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WEB ALTERING MECHANISM

Filed April 19, 1965 3 Sheets-Sheet 2

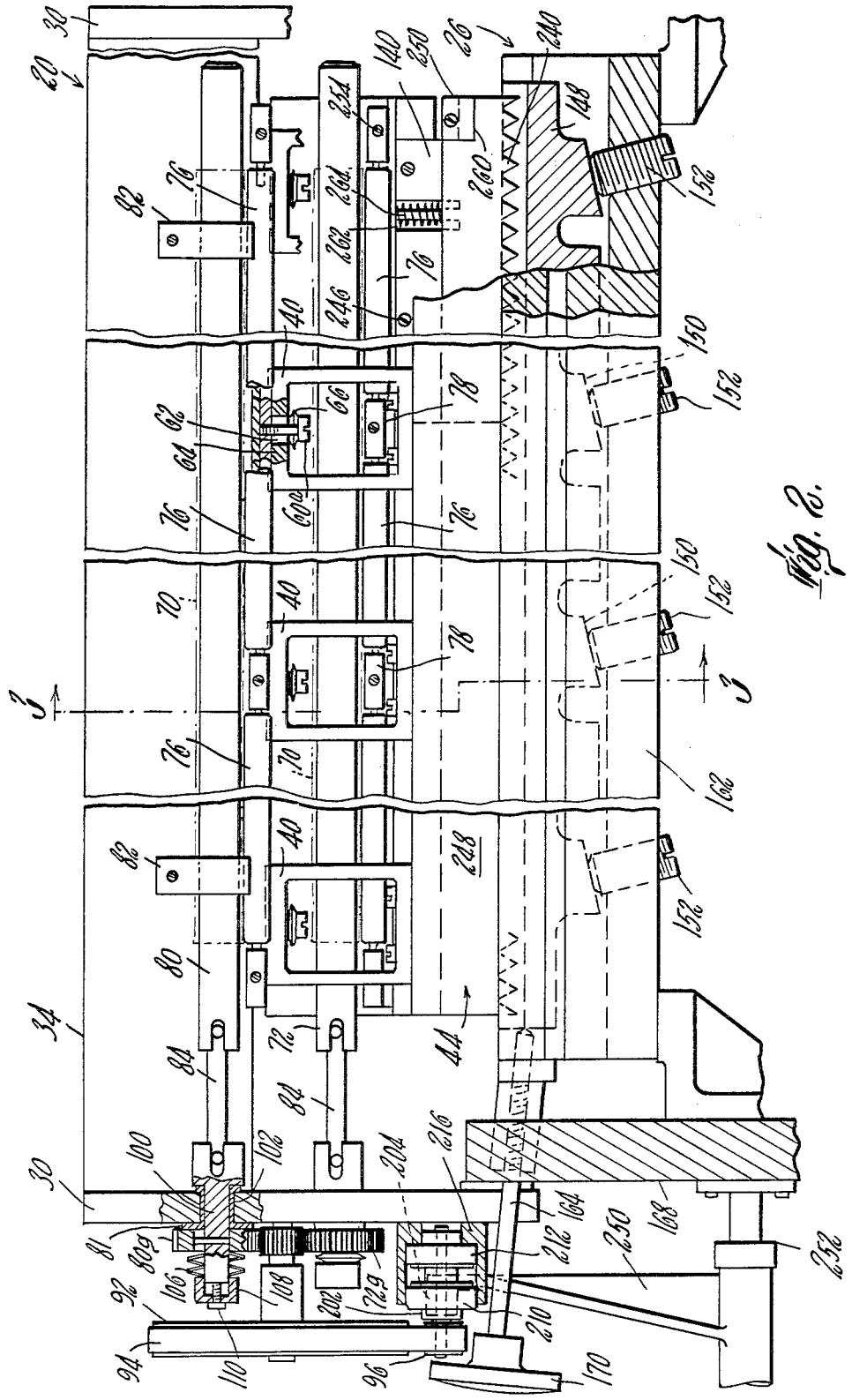

Fig. 2.

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WEB ALTERING MECHANISM

Filed April 19, 1965 3 Sheets-Sheet 3

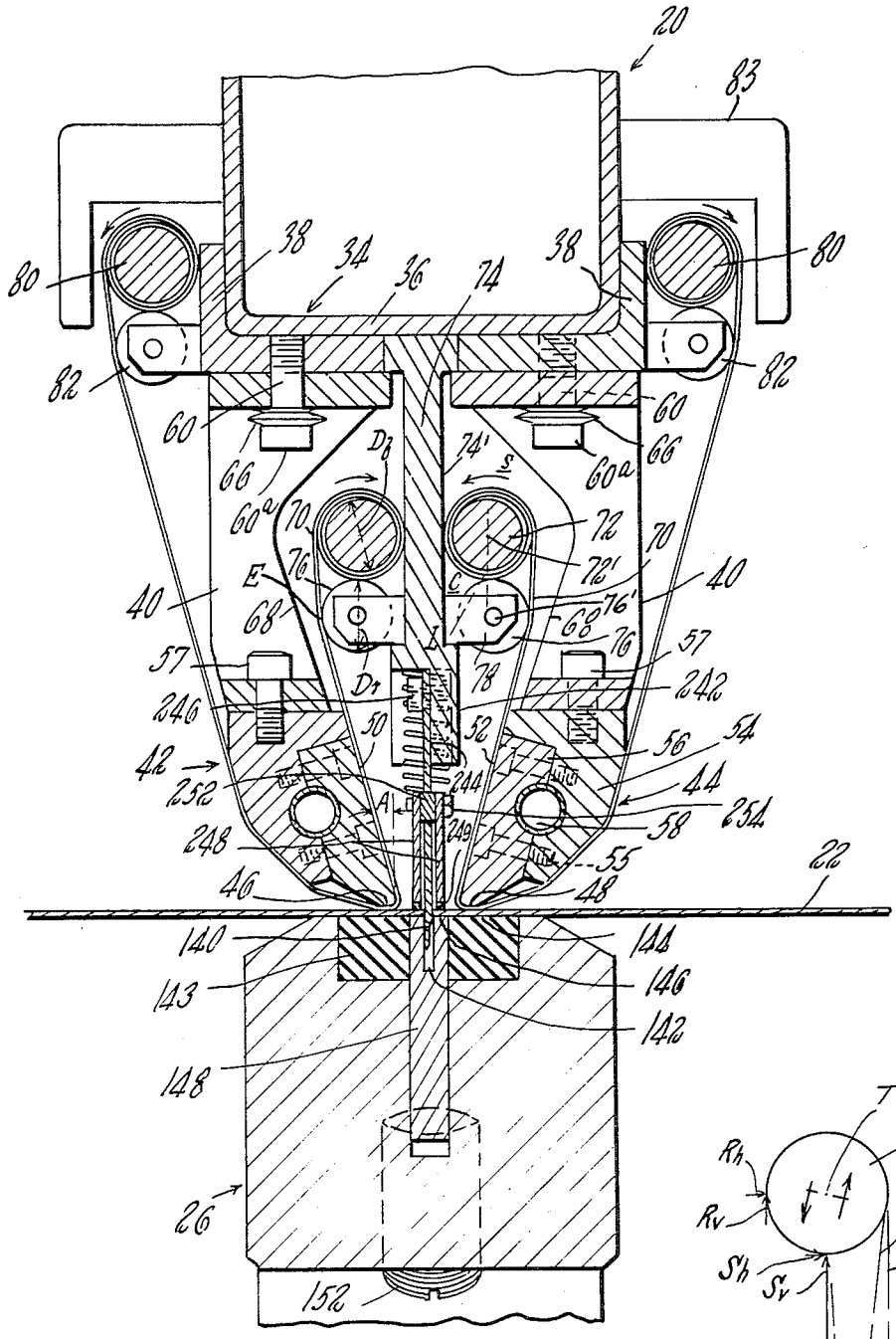

Fig. 3.

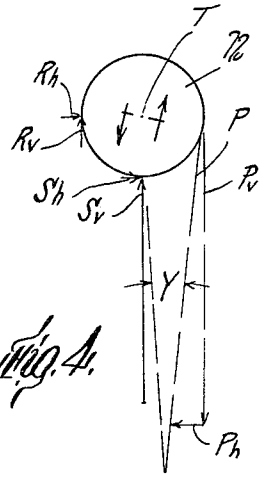

Fig. 4.

United States Patent Office 3,473,995 Patented Oct. 21, 1969

3,473,995

WEB ALTERING MECHANISM

Charles M. Schott, Jr., Gloucester, Mass., assignor to Gloucester Engineering Co. Inc., Gloucester, Mass., a corporation of Massachusetts

Filed Apr. 19, 1965, Ser. No. 449,073
Int. Cl. B32b *31/18;* B30b *15/34*
U.S. Cl. 156—513 18 Claims

ABSTRACT OF THE DISCLOSURE

Web altering head featuring a bobbin assembly for takeup of protective sheet used in conjunction with a heated die, a heat sealing bar assembly and a web penetrating assembly with adjustable penetration.

This invention relates to the altering of plastic film and other such webs and in particular to altering mechanisms which extend across the width of running lengths of web.

One principal object of the invention is to provide a web-altering head assembly which is capable of producing improved web products from such points of view as strength and uniformity of heat seals, closeness of heat seals to each other and to other web alterations such as perforations, improved accuracy of size of perforations, etc.

Another object of the invention is to provide a universal head assembly capable of optionally imparting single or multiple heat-seals across the width of a web in close association with other web alterations such as perforations or cuts.

Another principal object of the invention is to provide new web-altering elements per se, which are improved from the points of view of compactness, simplicity, durability, lightness of weight, low cost and ability to produce improved products.

Another principal object of the invention is to provide an improved combination of heat-seal element and protective sheet mechanism which positions the protective sheet in an improved manner between the heat-seal element and the web enables the formation of improved heat seals.

Another object of the invention is to provide an improved means of progressively replenishing protective sheet to a heat-seal bar.

A further object of the invention is to provide an improved heat-seal bar configuration and means of mounting which gives better support and maintains straightness of the operative surface of the heat-seal bar.

A further object of the invention is to provide an improved cutter blade along with improved stripper mechanism and anvil mechanism in combination therewith.

Still a further object of the invention is to provide an improved, simple adjustment means for regulation of the characteristics of perforations and cuts applied by a reciprocating head assembly.

And yet a further object of the invention is to realize the above objects in machines capable of processing wide width webs.

These and numerous other objects, features and advantages of the invention will be understood from the following detailed explanation of a preferred embodiment.

In the drawings, FIG. 1 is a side view of the preferred embodiment of a head mechanism according to the invention;

FIG. 2 is a front view thereof, across the width of the web to be altered;

FIG. 3 is a side cross-sectional view taken on line 3–3 of FIG. 2.

FIG. 4 is a force diagram for an inner bobbin of the preferred embodiment.

Referring to the drawings a head mechanism **20** extends across the width of a web **22** such as a running length of double-layer plastic film. Dwell means, not shown, such as the shuttle mechanism described in my copending U.S. application Ser. No. 251,327, (now U.S. Patent No. 3,322,604), are provided to periodically cause the web to stop. A head drive means is synchronized therewith to cause the head mechanism to descend toward an anvil mechanism **26**, alter the web, and then return to its rest position.

As shown the head mechanism is pivoted on side arms **30** about a sationary axis **28**, arms **30** being raised and lowered with push rods **32** and drive cranks **24**. The drive cranks **24** on opposite sides of the machine can be joined by a rocker shaft, not shown, which is caused to rock by a hydraulic cylinder and bell crank, not shown.

Located substantially from axis **28** in the direction of the length of the web **22** is a cross-beam **34**, supported by the side arms **30**, upon which are mounted the various head elements.

Referring in particular to FIG. 3, the cross-beam **34** comprises a member **36** of U cross-section to the underside of which are secured, e.g. by welding, a pair of nesting L shaped members **38**, one at each of the lower corners of the U shaped member.

At spaced apart intervals along the length of the cross beams **34** a plurality of support brackets **40** are bolted to the members **38**. Brackets **40** extend downwardly and at their lower ends they are secured to and support two heat-seal bars **42** and **44**. Each of the heat-seal bars has a lower sealing surface, **46**, **48** respectively, the two sealing surfaces being located close together, and each bar has a sloped inside surface, **50**, **52**, directed toward the other heat-seal bar, but angled at angle A from the vertical, in the direction upwardly away from the other heat-seal bar.

In the preferred embodiment the two heat-seal bars are identical except one is "left hand" and the other is "right hand" as can be seen in FIG. 3. Referring therefore only to the right hand bar **44**, each bar is comprised of two elongated strip members **54**, **56**. Inner strip member **56** is preferably bolted to outer strip member **54** (by bolts **55**) which in turn is bolted to the lower part of bracket **40** (by bolts **57**). Between the two strip members, in a suitable recess, is held an electrical heating tube **58** of conventional material. Preferably both strip members are of material having the same coefficient of expansion, with at least that strip member which forms the heat-sealing surface **46** (inside strip **56** in this embodiment) being of heat-conductive material; preferably both strip members are formed of aluminum.

The spaced-apart bracket members **40**, which for instance may be of cast iron, are rigidly secured to the heat-seal bar, and are thus displaced upon lengthwise expansion or contraction of the heat-seal bar.

Referring to FIGS. 2 and 3 the upper part of each bracket **40** is secured to the main beam **34** by means of shoulder bolts **60** threaded to the beam. Each bolt extends downwardly from its threaded connection with the beam through a slot **62** in the top flange **64** of bracket **40**, this slot being elongated in the direction of the length of the heat-seal bar **44**. Each bolt **60** terminates in a shoulder head **60***a*. A spring means, such as a series of cupped washers **66** (Belleville washers), whose outer conical surfaces are alternately directed up and down, are placed between the head **60***a* of the bolt **60** and the flange **64** of the bracket. By this arrangement each bracket is secured to the beam in a way that permits displacement

in the direction of the length of the heat-seal bar as the latter expands in length, and thus lateral buckling or wraping of the bar is prevented. The brackets, which may be spaced for instance ten inches apart along the length of the heat-seal bar provide firm vertical support for the heat-seal bar and ensure that its sealing surface is retained in a horizontal plane, albeit with some resilience.

Referring to FIG. 3 the inside edges **68** of brackets **40** are set outwardly from the slanted inside surfaces **50, 52** of the heat-seal bars, and flare outwardly, upwardly, thus providing clearance for two protective sheets **70**, e.g. fiber glass cloth coated or impregnated with fluoro carbon plastic such as Du Pont's "Teflon." These protective sheets extend under the respective heat-seal surfaces **46, 48** of the heat-seal bars, thence along the slanted inside bar surfaces **50, 52** towards inner bobbins **72** and each bobbin is adapted to enable the sheet either to be progresively wound up or progressively pulled away during operation as will be explained later.

The two inner bobbins **72** for the two heat-seal bars are located within the space provided by the inside edges **68** of the brackets.

For support of the inner bobbin **72** a downwardly extending central bar **74**, parallel to the heat-seal bars **42, 44**, is secured to the main beam **34**. Referring still to FIGS. 2 and 3 advantageously, according to the invention, each of these bobbins **72** is a small diameter rod which extends lengthwise across the full width of the web; for instance a solid aluminum rod of ⅝ inch diameter of a length in excess of **70** inches may be employed. Each rod is supported at least at a multiplicity of spaced apart points along its length, preferably substantially continuously throughout its length by means engaging the continuous face of the protective sheet. While this support could be achieved by a stationary ledge, preferably, according to the invention, a plurality of rollers **76** are arranged end-to-end directly beneath each inner bobbin **72**. These rollers are supported at their ends by pillow block bearings **78** which in turn are mounted upon the depending central bar **74**. Referring for example to the right hand bobbin, preferably, as shown, the direction of tension P (FIG. 4) of the protective sheet **70** from the bobbing is inclined at an angle Y to the line of centers **72'–76'** of the bobbin **72** and support roller **76**. Preferably as shown, the diameter D_r of the support roller **76** is smaller than the diameter D_b of the bobbin and the center **76'** of roller **76** is set outwardly relative to a vertical line L projected through center **72'** of bobbin **72**. Thus the bobbin **72** rests in the inward slope of roller **76** while the line of tangents of the rollers **76** and bobbin **72** which corresponds with the direction of tension P, extends inwardly, downwardly.

The bobbin **72** rests in the inward crotch C formed by the side of the central bar **74** and the series of rollers **76**, being urged there by tension force P. (Also, whether the sheet is being wound up or pulled away, a torsional effect is applied to the end of bobbin **72**.) For either the case of pulling away or winding up, the bobbin remains in place, despite the fact that it can rest loosely in the crotch.

Referring to the force diagram of FIG. 4 for the case in which the sheet is pulled away from bobbin **72**, it will be seen that pull-off force vector P has a horizontal component P_h urging the inner bobbin **72** toward crotch C. By virtue of the anti-friction quality of the protective sheet, it has only a slight tendency to frictionally engage and roll outwardly of the crotch C upon its supporting surface, (roller **76** in this case). This tendency can be more than overcome by the opposing pull-off force component P_h, in conjunction with the counterclockwise braking torque T applied to the end of the bobbin. Accordingly, in addition to the support force S_v and the lateral reaction force S_h offered by the support roller, the excess of the horizontal component of the pull-off force P_h is resisted by a reaction force R_h supplied by the side surface **74'** of central bar **74**, against which the bobbin is urged. Also, though slight, a fractional braking force R_v is applied to the bobbin by the side of central bar **74**.

It will be observed that the protective sheet **70** engages the support rollers **76** at E in extending from the bobbin **72** to the sealing surface **48** of the heat-seal bar. It is true that this engagement applies a clockwise torque to the rollers **76**, which would tend to carry the bobbin **72** outwardly of the crotch. But this is slight, due to the small radial component of tension P relative to the roller, hence this effect too is more than overcome due to the direction of tension P acting to hold bobbin **72** in crotch C.

Thus it is shown that the bobbin stays in place during pull-off, though merely resting in a crotch.

In the case of wind up, the torque T applied to the end of the bobbin, again is in the counter-clockwise direction, and is sufficient to turn the bobbin in the counter-clockwise direction, into crotch C, so that in this case too, the bobbin will remain in place.

So far only the inner portion of the protective sheet and its mechanism has been described. For each heat-seal bar, the outer portion of the protective sheet **70** beyond the respective heat-seal surface **46, 48**, slides over the outer surface of the heat-seal bar, thence outwardly and upwardly to outer bobbin **80** which can be identical to inner bobbin **72**, and support in an identical fashion by rollers **82**, and with the sheet taking a path from bobbin to roller parallel to the same path for the inner bobbin.

While the bobbins remain in place during normal operation, it is sometimes desirable in the case of the outer bobbins **80** to mount detachable retainers **83** upon the cross beam, having downwardly extending portions **84** which prevent the bobbins **80** from being dislodged even when subjected to severe blows.

A similar retaining function is performed, for the inner bobbins **72** by the brackets **40**, the bobbins **72** being insertable and removable by lengthwise motion through the space S defined between the brackets **40** and the central bar **74**.

The bobbins are restrained at one end by the indexing mechanism. At the other end toggle mechanisms can be mounted on the respective side arm, to engage one bobbin of each pair, and thus restain each pair from axial movement. Referring to FIGS. 1 and 2 the bobbins are provided with a feed mechanism which moves bodily, along with the bobbins and heat-seal bars, in reciprocating motion when the web is to be heat sealed.

In the preferred embodiment shown, and as previously mentioned, means are provided to automatically index the protective sheet progressively under the heat-seal bars. Accordingly each bobbin, **80, 72**, is provided with a gear at one end, 80_g, 72_g, respectively, located on the outside of side frame **30** and connected to the bobbins by prop rods **84** which can be detached when the bobbins and their attached protective sheets **70** are to be replaced.

The gears 80_g and 72_g are journaled to one of the side arms **30**, positioned so they can be meshed with drive gears. A main pinion **88** is mounted on a lever **90** having two positions. In the position shown in solid lines, pinion **88** engages left hand gear 72_g, and an idler gear **92**, also carried upon lever **90**, continually meshed with pinion **88**, meshes with right hand gear 72_g, hence both inner bobbins **72** are driven by pinion **88**, pinion **88** being driven by timing belt **94**, pulley **96** and indexing mechanism.

As gear 72_g drives inner bobbins **72** and causes the winding up of the protective sheet **70**, a retarding torque is applied to the outer bobbin **80** by means of a dragging effect applied by the bobbin support surface as well as a braking effect applied to the end of the bobbin.

Despite the small size of the bobbins and the small space occupied by the entire inner assembly, there is, for practical purposes, no deflection of the bobbins or the supporting rollers, hence tension is maintained uniformly throughout the length of the heat-seal bar by virtue of

the pull exerted by bobbins 72 and the braking of bobbins 80. Accordingly the protective sheet is maintained under substantial tension, and it tightly hugs the full length of heat-seal surface 46 or 48, and avoids the formation of wrinkles or folds in the sheet. As a result the heat transfer from the heat-seal bar, through the sheet, to the web being heat sealed is uniform throughout the length of the heat-seal bar. Also, the web is engaged by a completely planar surface (the heat-seal bars being deflection-free due to the structure previously described). Accordingly the invention enables very uniform and straight heat-seals to be formed, and also allows two such heat-seals to be formed very close together when desired.

The braking torque can be applied to the end of the supply bobbin by various means but it is advantageous to employ the drive mechanism itself to furnish the braking torque. Referring to FIG. 2 the gear 80_g is mounted by a spline or similar axially slidable connection to a shaft 100, and shaft 100 extends through a bearing opening 102 in the side arm 30 to a shoulder on the opposite side of the side arm 30. The gear 80_g is pressed toward the side arm 30 by a series of alternated, cupped washer springs 106, a retaining cup 108 and an adjustable nut 110 threaded to the end of the shaft 100. Between the rotary gear 80_g and the relatively fixed side arm 30 is placed a brass washer 81 defining brake surfaces which engage on the face the gear and the other face the side arm 30. By tightening nut 110, an increase in axial force is applied through the springs 106 to the brake surfaces, to increase the braking torque. Thus it will be seen, that so long as gear 80_g is not driven, the mechanism mounting the gear 80_g serves as a brake during the pulling of protective sheet from the outer bobbin 80.

For indexing purposes the pulley 96 which drives the timing belt 94, thence the bobbin gears, is itself driven by a fork member 202, serving as a cam surface, a cam follower roller 204 mounted on a stationary axis and confined by the fork, and a ratchet mechanism. The latter in the preferred embodiment comprises left hand and right hand single direction clutches 210, 212 respectively, such as made by the Formsprag Company of Warren, Michigan. Referring to FIGS. 1 and 2, the shaft 206 on which the pulley 96 is mounted serves as the inner race and extends through the outer race of both clutches 210, 212. The fork member is secured to the outer race of left hand clutch 210, hence as the head mechanism moves in one direction the fork member is turned by cam follower 204, and drives pulley 96; in the other direction the left hand clutch slips and the right hand clutch 212 locks shaft 206, by virtue of its outer race being fixed to the housing 216.

A provision is made for varying the length of the increment of protective sheet 70 that is moved for each cycle of the head, as the requirements vary depending upon such factors as sealing pressure and temperature.

For this purpose the cam follower 204 is mounted on bell crank 250, pivoted on stationary axis 252. The other arm 254 of the bell crank is secured to the end of an adjustment rod 256 which extends from stationary support 258. Turning of knob 260 raises or lowers bell crank arm 254 which in turn shifts the radial location of cam follower 204 within the fork member 202, and thus the length of the stroke can be adjusted.

The gears 72_g for the inner bobbins 72 are preferably mounted upon the side frame 30 in the identical manner as gears 80_g described above. Accordingly, referring to FIG. 1, when lever 90 is shifted to the dotted line position gears 92 disengaging the gears 72_g, then the respective brake surfaces apply a retarding torque to the inner bobbins 72. In the dotted line position pinion 88 drives left hand outer bobbin gear 80_g through intermediate idlers 89 and 91, and the right hand bobbin gear is similarly driven by gear 92. In this condition, the protective sheet is drawn from the inner bobbins 72 and wound upon the outer bobbins 80, with uniform tension and the other advantages described above.

Numerous modifications of the preferred embodiment are obviously possible. To mention a few, it is possible, where feeding in both directions is not required, to employ a brake mechanism for only one of each pair of bobbins, and the pinion can be permanently engaged with the other bobbin of the pair. In another arrangement, all gears may be omitted, and manual wind-up knobs can be affixed to the ends of the appropriate shafts, e.g. in place of gears 72_g.

With the unique heat-seal bar per se, the protective sheet mechanism per se, and the two in combination forming a single heat seal unit there are numerous advantages that are achieved, including improved quality of heat seals, simplicity, durability, low cost and ease of maintenance.

According to the invention substantial additional advantages are obtained with combination of two such heat seal units as described above, for forming two heat seals which are distinct from one another, but close together. Furthermore the combination of a pair of such heat seal units with a web-altering device located there-between, affords still further advantages, and takes further benefit from the simplicity and shape of the heat seal units.

Referring again to the drawings, in this preferred embodiment a knife 140 is secured to the lower end 74_e of the central bar 74, for bodily movement with the entire head assembly. The edge of the knife enters a slot 142 in the anvil 26 and forms spaced apart perforations in the web at the same time the heat seal surfaces press the web against the anvil (upper surfaces 144 of cushions 143 in this embodiment).

Thus it becomes possible to form the side seals of two bags by the two heat seal surfaces 44, 48 and simultaneously to apply tear-off serrations in the increment of web lying there-between, keeping this incremenet very short. In the case of side seals it is apparent that one of the longitudinal edges of the running length of double thickness web should constitute a folded edge and the other edge should be open. For other products it would be possible for both edges to be closed.

The head mechanism of the preferred embodiment is also suitable for forming bottom seals with either the heat seal in advance of the perforations or vice versa, depending upon which of the two heat seal bars 42 and 44 is employed and which is removed. It will be understood that some users require a continuous length of bags having their open ends occurring first as they are pulled from the roll, e.g. for a roll of bags adapted to be slipped down over Christmas trees. On the other hand, e.g. for gravity filling operations, it is often desired that the closed ends occur first.

It will be understood that the web-altering device located between the heat seal bar may be any of a wide variety of devices such as perforators, embossers, printers, etc.

Another aspect of the invention, however, concerns the particular perforating or cutting mechanism itself which is simple, low in cost, enables rapidity of action, and is durable. The blade 140 is preferably provided in relatively short segments, for instance one foot, and a number of these are mounted end to end in abutted relation to match the width of the web to be processed in the machine. Each segment comprises simply a vertically arranged metal plate, for instance of .050 inch thickness, of a suitable material for sharpening, for instance it may be hardenable tool steel or of relatively soft steel capable of being chrome plated. The operative lower edge of the plate is formed into "saw teeth" 240, the points directed downwardly. For instance the points may be spaced apart 3/8 of an inch and the included angle between the sides of the adjacent saw teeth may be 60° as shown. The plate in the region of the saw teeth as well as slightly above is of reduced thickness, for instance .012 of an inch produced e.g. by grinding the plate throughout its operative length

on one side. The cutting edge may be quite sharp, formed by a bevel on each side.

The blade is mounted rigidly on a flange **242** that extends downwardly from central bar **74**. This flange provides a vertical face **244** against which the blade is held by a series of spaced apart bolts **246**. On each side of the blade is a stripper member **248** which also serves the function of gripping the web during perforation. For the purpose of securing the stripper bars together an end notch **250** is provided on each end of each perforator blade section. Within this notch is confined a spacer block **252** of a slightly larger thickness than the perforator blade **140**. A bolt **254** extends through the spacer block **252** and joins together the two stripper bars **248**. The lower edge **260** of each notch in the perforator blade **140** serves as a bottom stop for the stripper bar assembly and assures upward movement of that assembly when the head is raised. The stripper bar assembly is biased downwardly against the edges **260**. For this purpose spaced apart pairs of slots **262** are formed in the perforator blade **140** and within each pair of these slots is confined a spring **264**. The flange **242** against which the perforator bar **140** is mounted is counter-bored as shown in dotted lines and thus confines one side of the spring, the other side being open. The upper end of the spring bears against the end of the central bar **74** and the lower end bears against the upper end of the strip bar assembly.

In operation in the rest position, the lower ends of the strip bar protrude downwardly beyond the tips of the saw teeth **240** of the perforator blade **140**. As the head moves down the stripper bars engage the web and force it against the upper surface **146** of the adjustable anvil member **148** clamping the web therebetween, the stripper bars extending substantially outwardly beyond the limits of slot **142**, so that they do not enter the slot, and so are restrained from further downward movement, hence deflect springs **264**. Advantageously the lower ends **249** of the stripper bars are of rubber enabling a tight but unharmful grip of the web. With the web thus gripped the stripper bar retracts relative to the blade **140** as the head continues to descend. Thus the saw teeth of the blade emerge downwardly from between the stripper bars and pass into the slot **142** which is wider than the teeth of the blade. The amount of penetration of the blades into the slot, and thus the size of the perforations is governed by the height of the upper surface **146** of the adjustable bar **148** relative to the stop position of the head.

By simple adjustment of this height the perforations can be virtually pin holes or substantial slits. Indeed because of the saw tooth from of the perforator bar, if the saw teeth are caused to enter completely into the slot, the web can be completely cut where this is desired. For this reason the perforator assembly has considerable utility beyond the particular preferred combination with other elements shown here.

The downward movement of the head can be limited in various ways, depending upon the type of seal desired. Where a high pressure seal is desired, for instance, the cushions **144** can serve as the stops. Thus when the heat-seal bars encounter a predetermined resistance, in the case of the preferred hydraulic cylinder driving the head, the hydraulic pressure builts up, and by means of a pressure relief valve, the fluid can be relieved, hence the head will stop. Alternatively, the piston can be arranged to complete its full travel before the heat-seal bars even reach the cushions, if a preset clearance is desired.

In the case of the saw tooth perforator blade **140**, and similar devices, it is desired to have the ability to adjust the size of the tear-off cut or perforations, because some users desire bags that are easily torn from the roll, and others desire bags that require greater stress. According to another aspect of the invention there is provided a unique control of the depth of movement of the perforator through the web, which, e.g. because of the upwardly diverging edges of each tooth, controls the length of the serration formed by the tooth, hence the width of the uncut material between adjacent serrations. As previously mentioned the teeth of the serrator bar enter a slot **142** in the anvil. According to this aspect of the invention, this slot is defined by a vertically adjustable bar member **148** whose upper surface **146** engages the web. Thus the size of the serration is adjusted primarily by the height of the upper surface **146** relative to the stop position of the heat-seal bars.

For vertical adjustment of the bar member **148**, the bar is slidably mounted lengthwise, and incorporates a series of ramps **150** along the lower edge which are identically inclined to the direction of lengthwise movement. A series of fixed members **152** (in this case screws, for initial adjustment purposes) extend upwardly from the fixed anvil frame **162**, so that lengthwise movement of the bar **148** to the right (FIG. 2) cause the ramps **150** to ride up on members **152**, thus raising the web-engaging surfaces **146** of the bar relative to the cushions **143** or other head stop, to increase the depth of penetration of the serrator teeth into the web.

In this particular embodiment a thrust bolt **164** threaded to stationary frame **168** of the machine can be turned by knob **170**. The end of bolt **164** engages the bar **148** and forces it right-ward. When it is desired to move the bar to the left and lower the bar, bolt **164** can be retracted and the weight of the bar **148** or the action of the head will cause the bar to move left-ward, down the ramps **150**.

It will be appreciated that by suitable upward adjustment, it is possible to raise the bar **148** sufficiently so that the serrated perforator bar **140** will form continuous cuts and sever the web completely, if this is desired. It will also be appreciated that the cushions **143** of the anvil, or indeed the mounting of the perforator blade on the head could provide for vertical adjustment relative to the other head elements to accomplish the adjustment of the size of the perforations, because in each instance the depth of penetration relative to the stop position can be adjusted. Furthermore, such adjustments could be accomplished by ramp surfaces like those shown.

It will be obvious to those skilled in the art that numerous modifications and adaptations of the various aspects of the invention are possible within its spirit and scope.

What is claimed is:

1. A heat sealing unit comprising, in combination, an anvil means extending across the width of a path for an endless web, a head mechanism also disposed across said path, actuating means adapted to periodically close said anvil and head mechanism together to produce a heat-seal formation in said web, said head mechanism comprising a heat-seal bar extending across the width of the web, said bar having a heat-seal surface, supply means for supplying a protective sheet to said heat-seal surface, to engage said web and prevent direct contact of said bar with said web, said means comprising at least one small diameter, elongated bobbin extending throughout the length of said heat-seal bar, parallel therewith, said bobbin arranged on one side of said heat-seal bar, sheet means arranged on the opposite side of the heat-seal bar to maintain uniform tension on said protective sheet, so that said protective sheet can extend from said bobbin, under said heat-seal surface, and to said sheet means, support means for said bobbin including means disposed beneath said bobbin at least at a multiplicity of spaced apart points along the length of said bobbin, arranged to engage the face of the protective sheet wound upon said bobbin, adapted to support said bobbin against deflection, first means associated with one of said pair of bobbin and sheet means adapted to apply take-up tension on said protective sheet, and second means associated with the other of said pair, adapted to apply retarding tension thereto, said heat-sealing surface ex-

posed to contact said protective sheet, and said first and second means, in conjunction with said small diameter bobbin that is supported against deflection, adapted to apply substantially uniform tension to said sheet and urge it uniformly tightly against said heat-seal surface.

2. A heat sealing unit comprising, in combination, an anvil means extending across the width of a path for an endless web, a head mechanism also disposed across said path, actuating means adapted to periodically close said anvil and head mechanism together to produce a heat-seal formation in said web, said head mechanism comprising a heat-seal bar extending across the width of the web, said bar having a heat-seal surface, supply means for supplying a protective sheet to said heat-seal surface, to engage said web and prevent direct contact of said bar with said web, said means comprising a pair of small diameter, elongated bobbins extending throughout the length of said heat-seal bar, parallel therewith, one of said bobbins arranged on each side of said heat-seal bar so that said protective sheet can extend therebetween and under said heat-seal surface, support means for each of said bobbins including means disposed beneath said bobbins at least at a multiplicity of spaced apart points along the length of each bobbin, arranged to engage the face of the protective sheet wound upon said bobbins, adapted to support said bobbins against deflection, means associated with one of said bobbins for applying a wind-up torque thereto, and brake means associated with the other of said bobbins adapted to apply a retarding torque thereto, said heat-sealing surface exposed to contact said protective sheet, and said drive means and brake means, in conjunction with said small diameter bobbins that are supported against deflection, adapted to apply substantially uniform tension to said sheet and urge it uniformly tightly against said heat-seal surface.

3. The heat-seal unit of claim 1 wherein said means for supporting said bobbin comprises a series of rollers, each roller being substantially shorter than said bobbin, said rollers rotatably mounted by their ends and disposed beneath said bobbin, parallel therewith, a stationary side surface extending upwardly along one side of said bobbin, said bobbin disposed in the crotch formed between said side surface and said roller, and the tension path of said protection sheet from said bobbin extending from the side of said bobbin opposite from said side surface, but having a directional component urging said bobbin toward said crotch.

4. The heat-seal unit of claim 3 wherein said rollers are of a diameter smaller than said bobbin, and located there-beneath, the axis of said rollers displaced at least slightly outwardly from a vertical line projected downwardly from the axis of said bobbin, said roller exposed to be contacted by said protective sheet as it moves directely from said bobbin, the point of engagement of said sheet upon said roller being located at least slightly closer to said vertical line projected downwardly from the center of said bobbin than is the point at which said sheet leaves said bobbin.

5. The heat-seal unit of claim 4 wherein said path of said protective sheet from said roller extends with a component towards said vertical line.

6. The heat-seal unit of claim 5 wherein said heat-seal bar has a side surface portion angled to the vertical along which said protective sheet slides.

7. The heat-sealing unit of claim 1 wherein said heat-sealing bar and said means for supplying protective sheet to said bar are mounted on a head structure to move bodily together toward said anvil, a web altering means also mounted on said head structure for bodily movement therewith and having a web engaging portion located closely adjacent to said sealing surface.

8. The heat-sealing unit of claim 7 wherein said head structure includes a structural member to the lower end of which said web altering means is mounted, said means for supporting said bobbin comprises a series of rollers, said rollers mounted on bearings which are mounted to one side of said vertical member.

9. The heat-sealing unit of claim 7 wherein a second heat seal bar and supply means as recited in claim 1 are disposed on the opposite side of said web altering means, said supply means including a small diameter bobbin supported by rollers mounted on said head structure, and said heat-sealing surface of said second bar located closely adjacent to the web engaging portion of said web-altering means.

10. The heat-sealing unit of claim 7 including stop surfaces arranged to engage and stop the closing movement of said head, said anvil including a slotted member into which said web engaging portion of said web altering means is adapted to enter, the depth of entry controlling the character of the alteration to said web, the height relation of said slot member to that of said stop surfaces when engaged being adjustable, adapted to permit adjustment of said depth.

11. The heat-sealing unit of claim 10 wherein said slot member includes a plurality of spaced apart, parallel inclined ramps having the same height, stationary means arranged to engage and support said ramps, and adjustable means for applying a lengthwise force to said slot member to cause said slot member to rise upon said ramps, to increase said depth.

12. The heat-sealing unit of claim 7 wherein said web altering means comprises a vertically arranged cutter means adapted to move vertically with said head structure, said cutter means having a web contacting edge of saw tooth form, with points directed vertically toward said web, and adjustment means relative to the stopped, heat-seal position of said head structure for adjusting the depth of penetration of said web by said vertically movable saw teeth to vary the length of serrations produced thereby.

13. The heat-sealing unit of claim 12 wherein said cutter means comprises a vertically arranged metal plate, the lower edge of said metal plate machined to said saw tooth from, the thickness of said saw teeth being substantially less than the thickness of the upper part of said blade, a slidable stripper bar mounted on each of said blade, biased downwardly to a lower position below the points of said lower edge of said blade, a slotted member located on the opposite side of said web positioned to receive said blade edge in the slot thereof, said slotted member having an upper web engaging surface on each side of said slot, the level of said surface being vertically adjustable relative to portions of said anvil adapted to be engaged by said heat-seal bar, said stripper bars adapted to be restrained from downward movement by said upper surfaces of said slotted member, for gripping said web during penetration thereby said blade.

14. Means for altering a web, comprising, in combination, an anvil means extending across the width of a path for an endless web, a head mechanism also disposed across said path, actuating means adapted to periodically close said anvil and head mechanism together to alter said web, said head mechnism comprising in combination a heat-seal bar means to supply a protective covering to the sealing surface of said heat-seal bar and a web altering device adapted to move bodily toward said anvil, a stop adapted to limit the movement of said head toward said anvil, said web altering means adapted to vary its effect upon said web by the amount of penetration thereof, said web altering means adapted to enter an opening in an envil member aligned therewith, said member having a surface adapted to engage said web, and adjustment means for varying the amount of penetration of said web by said web altering means.

15. Means for altering a web, comprising, in combination, an anvil means extending across the width of a path for an endless web, a head mechanism also disposed across said path, actuating means adapted to periodically close said anvil and head mechanism together to alter said web, said head mechanism including a web altering device

adapted to move bodily toward said anvil, a stop adapted to limit the movement of said head toward said anvil, said web altering means adapted to vary its effect upon said web by the amount of penetration thereof, said web altering means adapted to enter an opening in an anvil member aligned therewith, said member having a surface adapted to engage said web, and adjustment means for raising and lowering said surface relative to said stop to vary the amount of penetration of said web by said web altering means, said web altering means and said anvil member being elongated, extending across the width of said web, a supporting means for said anvil member upon which said anvil member can slide relatively lengthwise, means for moving said anvil member lengthwise relative to said supporting means, the pair comprising said anvil member and said supporting means defining a series of ramps and a cooperating series of ramp engaging means, said ramps inclined equally and in the same direction to the horizontal, adapted, upon said relative lengthwise movement of ramp and support means, to change the vertical height of said web engaging surfaces of said anvil member, thereby to vary the effect of said web-altering means upon said web.

16. A head mechanism for use in alterting a web comprising a pair of convering heat-sealing bar assemblies defining, at substantially their closest distance, a pair of heat-sealing surfaces, said assemblies providing a substantially wider space in a region spaced from said sealing surfaces, a central structural member extending into said region, small diameter bobbin means mounted on each side of said central member, each bobbin having a length generally corresponding to the length of said heat-sealing surface, means supporting each bobbin at least at a multiplicity of points along its length, for each

bobbin a sheet of protective material wound upon said bobbin, said sheet extending from said bobbin to the respective heat-sealing surface, thence to a second bobbin, for each pair of bobbins, means to drive one of said bobbins and means to retard the other.

17. The head mechanism of claim **16** in combination with a web altering means mounted between said heat-sealing bars for bodily movement therewith, the web-engaging portion of said altering means located between said heat-sealing surfaces.

18. The heating sealing unit of claim **1** wherein said means for supporting said bobbin comprises surfaces defiing a crotch having a bottom surface and a side surface, said bobbin disposed in said crotch, the tension path of said protective sheet from said bobbin extending from the side of said bobbin opposite from said side surface but having a directional component urging said bobbin toward said crotch.

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DOUGLAS J. DRUMMOND, Primary Examiner

U.S. Cl. X.R.

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