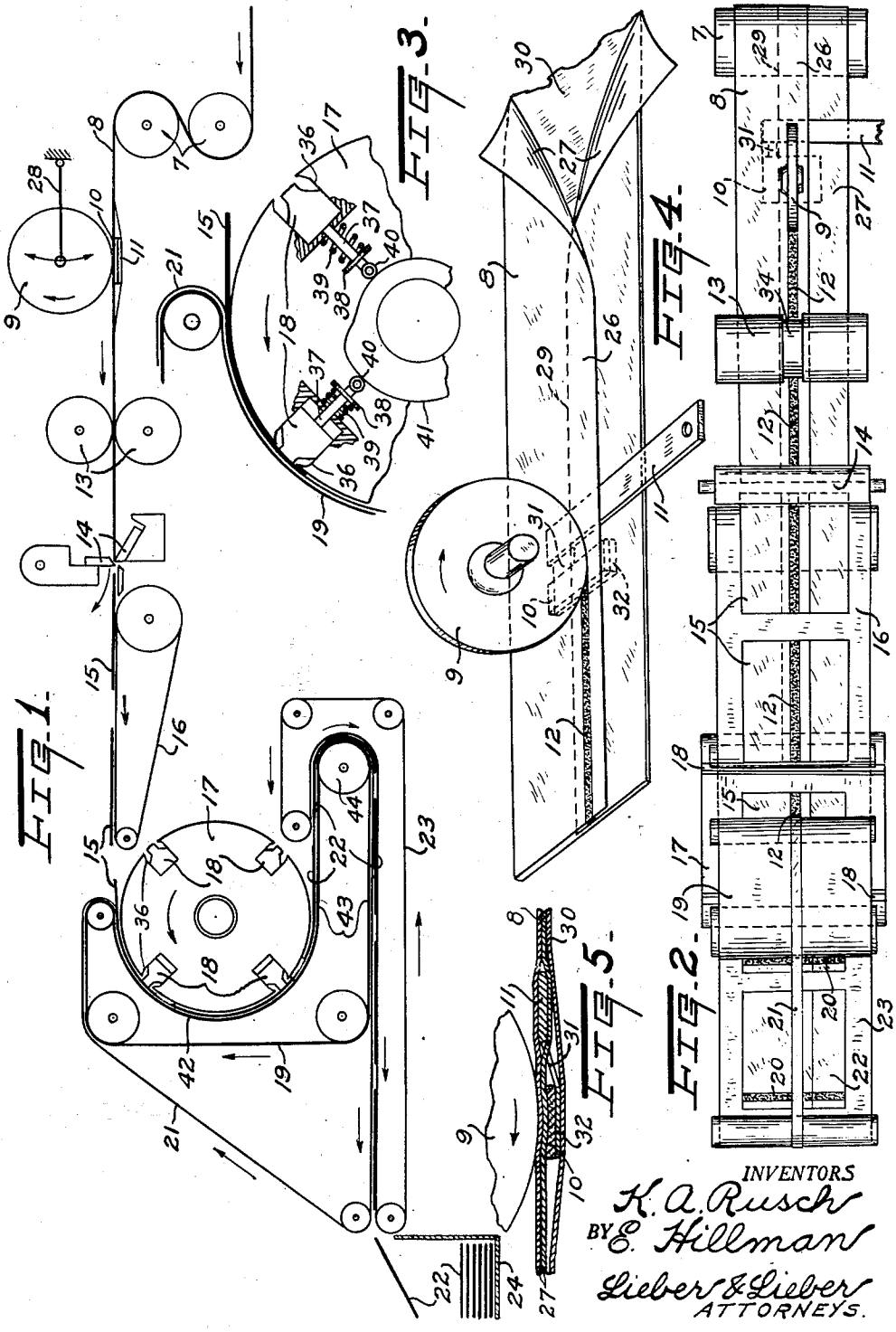
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DEVICE FOR SEAMING THERMOPLASTIC BAGS

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DEVICE FOR SEAMING THERMOPLASTIC BAGS

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This invention relates in general to improvements in the art of making bag-like receptacles, and relates more specifically to improved instrumentalities for effecting sealing of multi-ply ribbons or elongated tubes of thermoplastic material or the like, to form bags for receiving diverse commodities.

The primary object of the present invention is to provide improved means for rapidly and effectively heat sealing a multi-ply ribbon or elongated loosely folded tube of thermo-plastic sheet material both longitudinally and transversely to produce successive bag-like containers.

It has heretofore been customary in the commodity packaging and merchandising industry, to produce bags or the like from longitudinally advancing elongated sheets of heat-sealable material such as "Pliofilm," "polyethylene," or the like, by arranging or folding the sheet material into multiply or tubular formation and longitudinally heat-sealing the adjacent loosely overlapped edges thereof, and by subsequently severing the longitudinally seamed tube into successive lengths and thereafter transversely sealing one end of each severed section to complete a bag. Due to the fact that such thermo-plastic sheet materials are subject to static electrification and cling to each other when subjected to frictional contact with fixed and rotating guides, and that the heating at the seals must be continued for relatively prolonged periods of time in order to produce perfect seams, considerable difficulty has previously been encountered in forming longitudinal seams on one wall of a tubularly folded advancing ribbon without sealing the opposite side walls of the tube together at the seam, and in forming the transverse end closures and delivering the final bags without causing them to stick to the conveyor which transports the longitudinally seamed tube sections past the transverse heat sealers.

It is therefore an important object of our present invention to provide simple but effective and automatically functioning apparatus for obviating these difficulties and for thereby insuring rapid production of successive perfect bags.

Another important object of this invention is to provide an improved device for positively removing finished bags formed of thermo-plastic sheet material in rapid succession from a conveyor which transports them through a heat-sealing zone.

A further important object of the invention is to provide an improved device for insuring the production of an effective longitudinal heat sealed seam along the medial portion of one wall of a tubularly folded ribbon of thermoplastic sheeting, without causing the heat sealing to detrimentally affect the opposite wall of the flat tube by causing the opposed walls to adhere to each other.

Still another important object of the present invention is to provide improved automatically functioning mechanism for enabling the handling of relatively thin and highly flexible thermo-plastic sheet material while producing successive bag-like receptacles or containers of diverse sizes and shapes therefrom in rapid succession.

These and other more specific objects and advantages of the invention will be apparent from the following detailed description from which it will be noted that the gist of the improvement is the provision of devices for rapidly and effectively forming the longitudinal side wall and transverse bottom heat sealed seams on successive bag-like containers produced from thermo-plastic thin and flexible sheet material without detrimental interference due to static electrification of the advancing stock.

A clear conception of the improved features constituting our invention, and of the construction and operation of typical commercial apparatus embodying the improvements, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a diagrammatic side elevation of a bag-making installation adapted to produce commodity receiving bag-like containers in rapid succession from loosely tubularly folded heat-sealable sheet stock;

Fig. 2 is a likewise diagrammatic top view of the bag-producing installation of Fig. 1;

Fig. 3 is a more-or-less enlarged fragmentary side view of the transverse bag-bottom heat-sealing apparatus;

Fig. 4 is a likewise enlarged perspective view of the apparatus for producing the longitudinal heat-sealed seam on the loosely folded tubular and longitudinally advancing bag-forming thermo-plastic stock; and

Fig. 5 is a further enlarged and somewhat distorted and fragmentary longitudinal section through the bag-forming tube illustrating the action of the longitudinal heat-sealing device.

While the improved bag-making apparatus has been shown and described as having been applied to an installation especially adapted to produce successive bottom sealed flat bags having longitudinal seams medially disposed along one wall thereof from loosely folded tubular thermo-plastic stock, it is not desired or intended to unnecessarily restrict the use of the improved features by virtue of this limited embodiment; and it is also contemplated that specific descriptive terms employed herein be given the broadest possible interpretation consistent with the disclosure.

Referring to the drawing, and more especially to Figs. 1 and 2, the improved bag-producing installation shown therein comprises in general, a pair of guide rollers 7 for receiving loosely folded flat tubular heat-sealable bag stock 8 from a folder or former, and for delivering the tube longitudinally beneath a rotary heating element or seam forming wheel 9 coacting with a resilient reaction pad 10 fixedly supported within the tubular stock 8 by a bracket 11 to produce a continuous longitudinal heat seal or seam 12; a pair of draw rolls 13 coacting with the opposite walls of the longitudinally seamed flat tube to constantly advance the same; a set of cooperating cut-off knives 14 for cutting the flat tubular and longitudinally seamed stock 8 into successive open ended bag lengths or sections 15 and for delivering the severed sections onto the upper deck of a transfer belt 16; a rotor 17 having thereon a series of parallel heating elements or heat sealing bars 18 revolvable about the rotor axis across the path of advancement of the tube sections 15 and cooperating with an endless backing conveyor 19 to produce a transverse heat seal 20 across one end of each successive bag section 15; an elongated bag releasing member or tape 21 movable along the path of advancement of the bag sections 15 about the rotor 17 and through the heat sealing zone, while travelling between the conveyor 19 and the successive end sealed bags 22, and thereafter extending beyond the heat sealing rotor; and a final bag delivery belt 23 cooperating with the tape 21 to deposit the successive finished bags 22 into a receptable 24.

The former for initially converting the ribbon of thin and flexible thermo-plastic material into loosely folded bag stock 8 as it travels continuously toward the heat sealing installation, is of old and well known construction, but the longitudinal seam forming apparatus is an improved and important assemblage capable of most effectively producing the longitudinal heat seal 12. The thermo-plastic material used in the production of these bags is preferably transparent "Pliofilm," "polyethylene," or the like which is subject to static electrificiation and consequent sticking or clinging to adjacent surfaces of the same material when frictionally engaged by fixed metallic guides or guide rollers, so that great care must be exercised for preventing the opposed walls of the tubular stock 8 from contacting each other and being heat sealed together at the longitudinal seal forming zone. The heating at this zone should also be applied for a relatively prolonged period of time in order to insure a perfect longitudinal seam 12, and all of these desirable results are obtained with the improved apparatus shown in detail in Figs. 4 and 5.

The heating element or wheel 9 is preferably formed of relatively heavy and of large diameter in order to insure extensive peripheral contact between its heated periphery and the outer free edge 26 of the upper wall 27 of the flatly folded tubular stock 8, and this wheel 9 may be heated in any suitable manner and is swingably supported by an arm 28 so that it may rock up and down in order to compensate for slight unevenness in the stock or to permit removal thereof from active position. The inner reaction pad 10 is formed of relatively soft and resilient material and of considerable width in the direction of travel of the stock 8, in order to provide a support for the stock 8 throughout the entire sealing zone and to also insure maximum dwell between the wheel 9 and the outer edge 26 of the advancing tube, and the inner free edge 29 of the tubular stock 8 is overlapped by the outer free edge 26 of the upper wall 27 and advances over the top of the pad 10 while the lower wall 30 advances beneath this pad and is therefore separated from the upper wall 27 by a considerable space at the heat-sealing zone, see Figs. 4 and 5. The fixed pad supporting bracket 11 may be secured to the frame of the machine and reaches into the longitudinally advancing loosely folded flat tubular stock 8 between the upper and lower overlapped free edges 26, 29, and the free end of this bracket 11 has a laterally extending arm 31 secured thereto beyond the inner tube edge 29 and which carries a supporting shelf 32 for the pad 10. This shelf additionally spaces the lower wall 30 from the upper wall 27 of the tube, thus doubly protecting the lower tube wall from engagement with the upper wall 27 at the sealing zone.

The draw rolls 13 coact with the longitudinally heat-sealed tubular stock 8 to advance the latter past the first heat-sealing zone and to deliver the flat tube to the knives 14 which are operable in a well known manner to sever the stock 8 into successive sections 15 of the desired length. In order to prevent the upper draw roll 13 from contacting the freshly formed longitudinal heat-sealed seam 12, this roll is preferably provided with a medial gap 34 of reduced diameter, as shown in Fig. 2; and the endless transfer belt 16 is adapted to promptly remove the successive severed bag sections 16 from the cutting zone and is driven at such speed that it will endwise space the sections 15 apart for proper cooperation with the successive transverse heat-sealing elements or bars 18 of the rotor 17 to which the belt 16 delivers these bag sections in rapid succession.

The heat-sealing bars 18 of the rotor 17 may be heated in any suitable manner and are slidably confined within radial slots 36 formed in the rotor. As shown diagrammatically in Fig. 3, each bar 18 has one or more inwardly extending stems 37 each provided with a plate 38 engaged by a spring 39 which constantly urges the corresponding

bar inwardly into the slots 36 and toward the rotor axis, and the inner end of each stem 37 carries a roller 40 coacting with a stationary cam 41 formed to force the adjacent bars 18 outwardly beyond the rotor periphery and into sealing position but only after each tube section 15 which is to be transversely sealed has been brought into advancing engagement with the rotor periphery by the backing conveyor 19. This endless conveyor 19 is formed of relatively heavy and durable belting and has an arcuate advancing portion 42 snugly engageable with the periphery of the revolving motor 17 and terminating in a horizontally disposed reversely curved lower portion 43 coacting with a reversing drum 44 disposed considerably beyond the lowermost periphery of the rotor. The arcuate belt portion 42 is adapted to press the successive bag sections 15 against the successive outwardly projected heat-sealing bars 18 and coacts with the rotor periphery to frictionally advance the sections 15 while the transverse end or bottom seams 20 are being formed, and this frictional propulsion tends to produce static electrification of the final bags 22.

The endless bag releasing member or tape 21 is provided in order to positively release the successive final bags 22 from the revolving drum or rotor 17 and more particularly from the belt conveyor 19 due to static electrification and possible adhesion due to heat sealing, and this tape 21 may be of relatively narrow width preferably coacting with the bags along the seams 12 where it will not interfere with the production of effective end seams 20. The tape 21 travels around and beyond the rotor 17 between the conveyor portions 42, 43 and the successive bags 22; and when it leaves the rotor periphery, it cooperates with the bag delivery belt 23 to engage each of the opposite side walls 27, 30 of each succeeding final bag 22. Both the tape 21 and the belt 23 extend along the reversely curved conveyor portion 43 and around the drum 44, and travel considerably beyond the lower stretch of the portion 43 so as to insure positive release of the bags 22 from the conveyor 19 and delivery thereof to the receptacle 24.

While the construction and normal functioning of the improved bag making apparatus should be apparent from the foregoing detailed description, a short resumé of the operation will be given. The heat-sealing wheel 9 and bars 18 may be heated and energized electrically so that they will function only while bag stock 8 is being supplied, and will be deenergized when no stock is being fed. The revolving wheel 9 normally cooperates with the internal stationary pad 10 to form a continuous longitudinal heat-sealed seam 12 along the overlapped edges 26, 29 of the upper wall 27 of the flat loosely folded tubular stock being rapidly advanced through the initial heat-sealing zone by the draw rolls 13, and the pad 10 and shelf 32 prevent the lower wall 30 from engaging the upper wall 27 at this initial zone. The draw rolls 13 deliver the longitudinally seamed stock 8 to the knives 14 which sever the successive sections 15 and deposit them upon the transfer belt 16. This transfer belt 16 endwise spaces the successive bag sections 15 and delivers them in properly spaced relation to the final transverse heat-sealing zone.

The bag sections 15 discharged by the transfer belt 16 are not acted upon by the heat-sealing bars 18 until a substantial portion of each succeeding section 15 has been introduced between the periphery of the rotor 17 and the backing conveyor 19, whereupon the cam 41 acts to force the bars 18 outwardly against the action of the springs 39 and into heat-sealing contact with the adjacent ends of the sections 15 to form the end or bottom seams 20. The final bags 22 are thereafter conveyed away from the rotor 17 and are positively removed from the belt conveyor 19 by the tape 21 which travels medially between this conveyor and the successive bags 22, and the tape 21 subsequently coacts with the conveyor belt 23

to delivery the finished bags **22** in rapid succession from the installation.

It is to be noted that both the longitudinal seam **12** and the transverse seams **20** are effectively formed by subjecting the bag stock to the heating elements **9**, **18** for prolonged periods of time; and that the internal pad **10** positively prevents exposure of bag wall **30** to detrimental heat in the initial sealing zone, while the tape **21** insures positive release of the completed bags **22** from the backing conveyor **19** after they leave the final heat-sealing zone. The relatively heavy and large heating wheel **9** coacts with the soft and resilient pad **10** to produce considerable contact betwen the wheel periphery and the bag stock **8**, while the large diameter of the rotor **17** cooperates with the elongated arcuate conveyor portion **42** to likewise provide a long sealing period between each bar **18** and the adjacent bag section **15**.

From the foregoing detailed description it will be apparent that the present invention in fact provides improved and automatically functioning apparatus for rapidly and effectively heat-sealing a multi-ply ribbon or elongated loosely folded tube of thermo-plastic material both longitudinally and transversely so as to produce successive bag-like containers with utmost precision and with least waste of the material. The successive bags **22** are formed without interference due to static electrification of the thin and flexible stock, and are positively removed from the installation by the tape **21** coacting with the longitudinal seams **12** so as to prevent interruption of the transverse end seals or seams **20**. The improved mechanism may be used to produce bag-like containers from diverse sheet materials and of various sizes and shapes, and has proven highly satisfactory and successful in actual commercial use. While the apparatus has been shown and described herein as operating on successive tube sections **15**, it can of course be readily modified to effectively longitudinally and transversely seal a continuous ribbon by simply relocating the knives **14** to a position beyond the sealing rotor **17**. Likewise, when the tube is cut into successive sections prior to introduction to the rotor **17**, it is a mere matter to adjust the timing so that the transverse sealing bars **18** coact with the trailing edges of the successive sections **15** instead of with the leading edges thereof as shown.

It should be understood that it is not desired to limit this invention to the exact details of construction and operation of the precise apparatus herein shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

We claim:

1. In a device for seaming thermo-plastic bags, a heating element movable along a definite path, a conveyor movable along the path of said heating element for advancing multi-ply bag forming stock between said conveyor and said heating element with the portions to be heat sealed movable with said element and engageable therewith to form a seam, and means movable along and beyond the path of said conveyor between said conveyor and the bag forming stock for positively separating each sealed bag from the conveyor beyond the heat-sealing zone.

2. In a device for seaming thermo-plastic bags, a heating element movable along a definite path, a conveyor movable along and beyond the path of said heating element for advancing multi-ply bag forming stock between said conveyor and said heating element with the portions to be heat sealed movable with said element and engageable therewith to form a seam, and an elongated member of less than said conveyor movable along and beyond the path of said conveyor between said conveyor and the bag forming stock, said member diverging from said conveyor path beyond the heat-sealing zone for positively releasing the bags from the conveyor.

3. In a device for seaming thermo-plastic bags, an elongated transverse heating element revolvable along an arcuate path, an endless conveyor having a similarly arcuate portion movable along said path to advance multi-ply bag forming stock between said conveyor and said heating element with the portions to be heat sealed travelling with said element and engageable therewith to form a transverse seam, and a separating tape of considerably less width than said conveyor movable along said arcuate path locally between said conveyor portion and the bag forming stock, said tape diverging from the path of said conveyor beyond the heat-sealing zone for positively releasing the successive bags from the conveyor after the bags have been heat seamed by said element.

4. In a device for seaming thermo-plastic bags, a heating element movable along a definite path, a conveyor movable along and beyond the path of said heating element for advancing multi-ply bag forming stock between said conveyor and said heating element with the portions to be heat sealed movable with said element and engageable therewith to form a transverse seam, an elongated member movable along and beyond the path of said conveyor between said conveyor and the bag forming stock, said member diverging from said conveyor path beyond the heat-sealing zone for positively releasing the bags from the conveyor, and a conveyor cooperable with said member beyond the heat-sealing zone to discharge the finished bags.

5. In a device for seaming thermo-plastic bags, means for longitudinally heat-sealing flat tubular bag sections throughout their lengths, elongated transverse heating elements revolvable along an arcuate path, a conveyor having a similarly arcuate portion movable along said path to advance said longitudinally heat-seamed bag sections with the portions to be transversely heat sealed travelling with said elements and engageable therewith, and a separating tape movable along said path at the longitudinal seams and between said conveyor portion and the bags, said tape diverging from the path of said conveyor beyond the heat-sealing zone for positively releasing the successive bags from the conveyor after the bags have been transversely heat seamed by said element.

6. In a device for seaming thermo-plastic bags, an elongated transverse heating element revolvable along an arcuate path, a flexible endless conveyor movable along said path to advance multi-ply bag forming stock between said conveyor and said heating element with the portions to be heat sealed travelling with said element and engageable therewith to form a transverse seam, and means coacting with said element for positively moving the same radially toward said conveyor and firmly against the bag forming stock conveyed thereby only during and throughout the path of travel of the stock with the heating element.

7. Apparatus for effecting transverse seals at pre-determined portions of a multi-ply ribbon of thermo-plastic sheet material, comprising, a carrier member having a cylindrical surface, means for longitudinally advancing the ribbon in contact with the cylindrical surface of said carrier member, a heating element revolvable with said cylindrical member surface and cooperable with the side of the ribbon facing said member surface for subjecting a local portion of said ribbon side to heat transversely thereacross, means coacting with the other side of the ribbon to provide a backing therefor, and means coacting with said heating element for positively moving the same outwardly toward and against the ribbon during its travel with said element and inwardly toward the axis of said carrier as the ribbon leaves the carrier.

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