

June 8, 1965

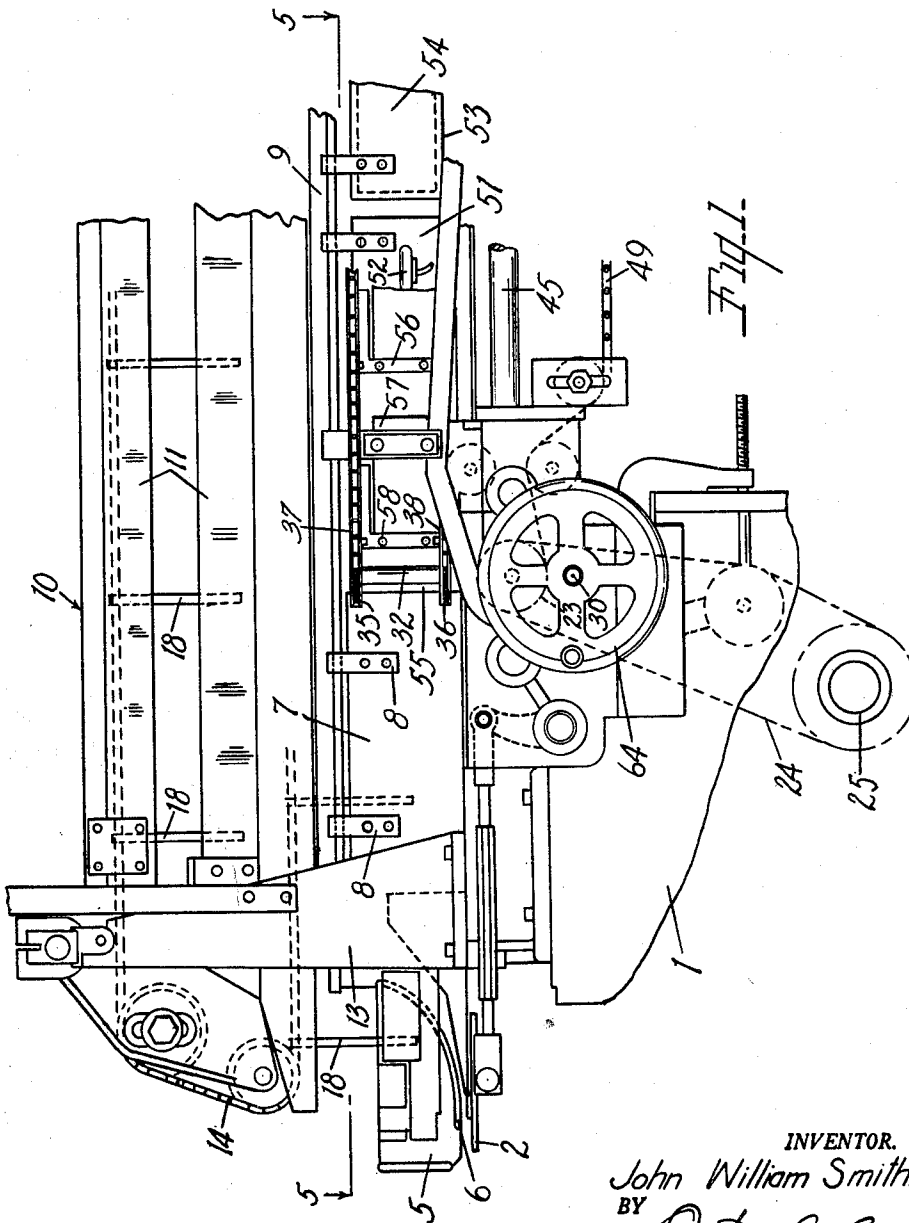
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3,187,484

MACHINES FOR SEALING WRAPPERS OF POLYOLEFIN
SHEET MATERIAL AROUND PACKAGES

Original Filed March 20, 1959

5 Sheets-Sheet 1



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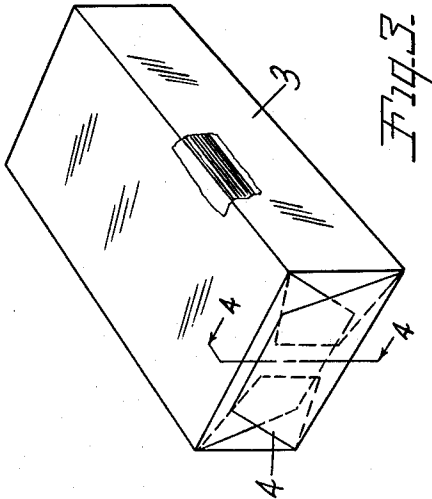


Fig. 3.

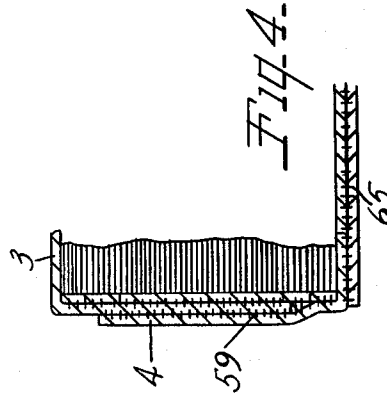


Fig. 4.

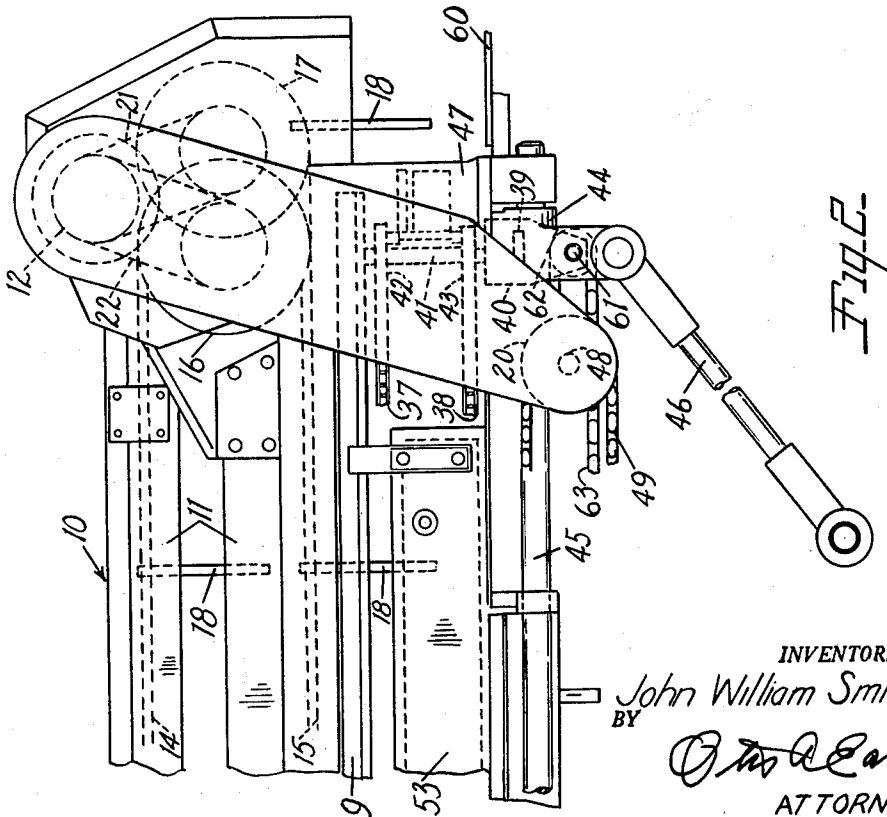


Fig. 5.

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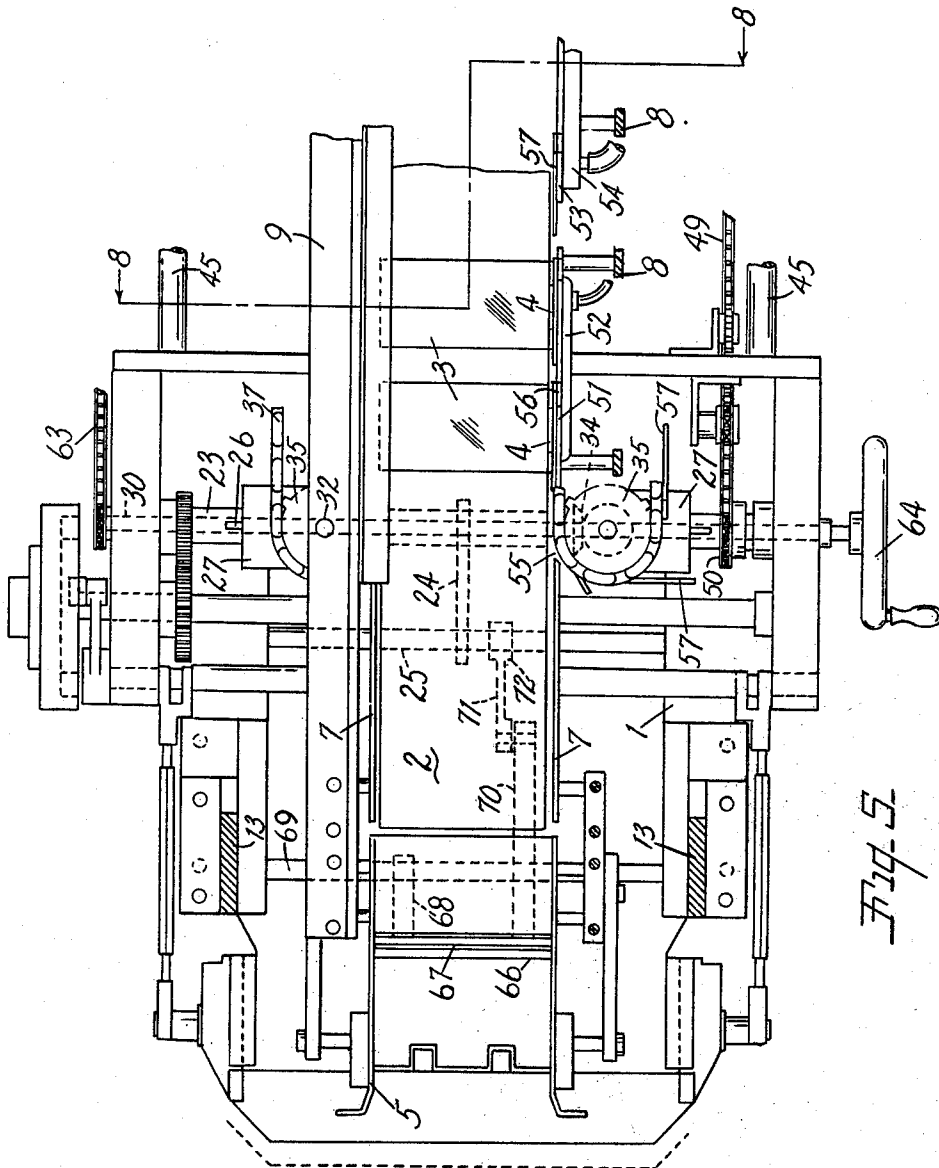


Fig. 5.

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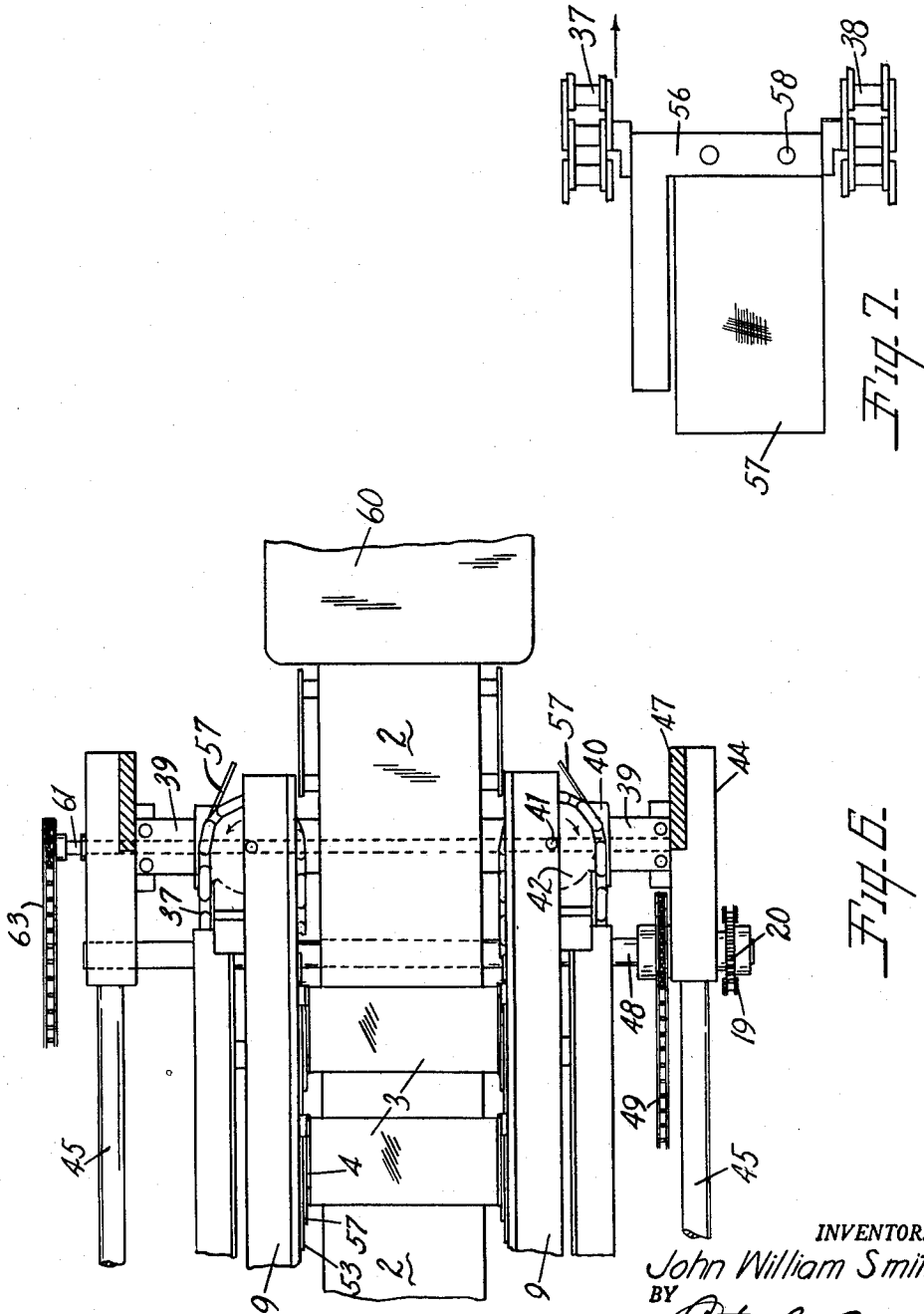


Fig. 6

Fig. 7

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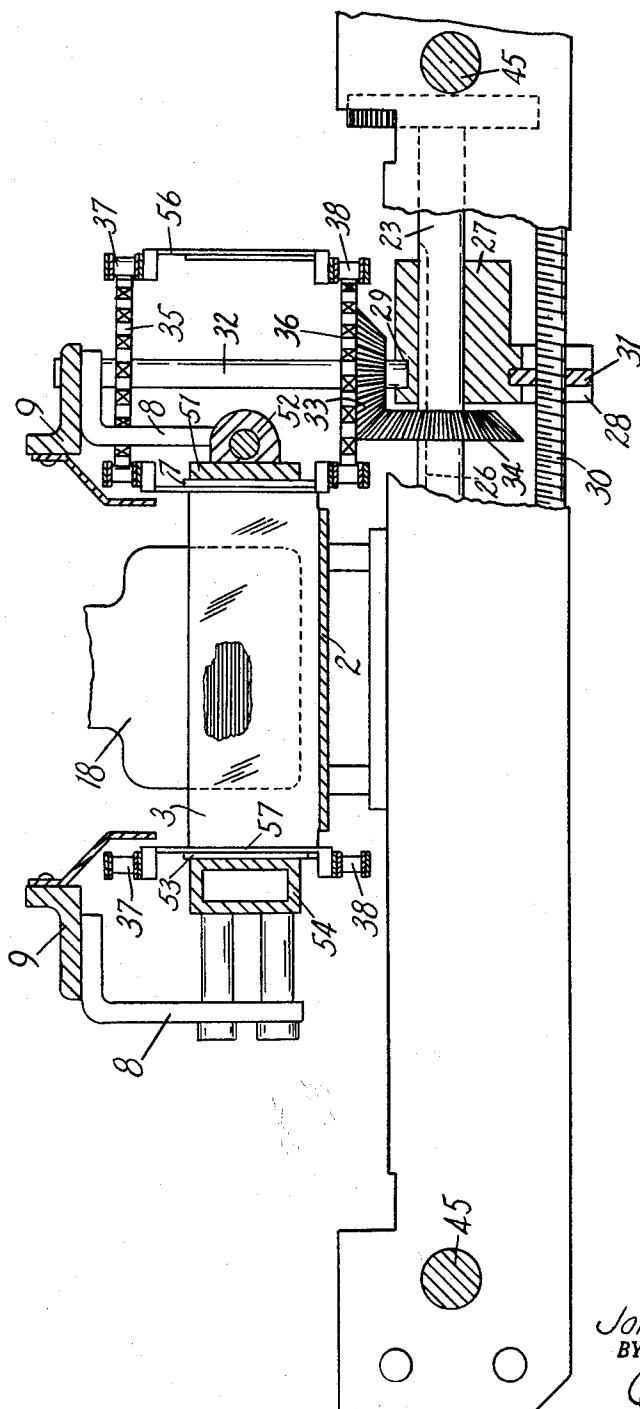


Fig. 8.

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3,187,484

MACHINES FOR SEALING WRAPPERS OF POLYOLEFIN SHEET MATERIAL AROUND PACKAGES

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Continuation of application Ser. No. 800,815, Mar. 20, 1959. This application Sept. 26, 1963, Ser. No. 311,778

6 Claims. (Cl. 53—379)

This application is a continuation of my co-pending application Serial No. 800,815, filed March 20, 1959, now abandoned, and claims details of structure disclosed but not claimed in the co-pending application.

This invention relates to improvements in machines for sealing wrappers of polyolefin sheet material around packages.

The principal objects of this invention are:

First, to provide in combination with a wrapping machine arranged to wrap a package in a sheet of wrapping material and form overlapped end folds on the ends of the package and overlapping edges on the bottom of the package, a way positioned to receive packages from the wrapping machine, a conveyor extending along and over said way and having depending flights arranged to advance packages along said way, a heated seal bar reciprocable through a slot provided therefor in said way in timed relation to delivery of said packages to said way to engage and fuse the overlapped edges on the bottom of said packages, side walls extending along the sides of said way in laterally supporting relation to the end folds on said packages, looped carriers arranged in longitudinally extending loops along both sides of said way with the inner reaches of the loops extending along and adjacent said side walls, means connected to drive said conveyor and said carriers with the inner reaches of the carriers and the conveyor advancing at the same speed, gaps formed in said side walls between the rear ends of said carriers, cross bars extending vertically from said carriers and connected thereto to be advanced through said gaps and along the inner sides of said side walls in equally spaced relation to the flights on said conveyor, heated plates mounted on the inner side of said side wall gaps and in horizontally continuous lateral supporting relation to the ends of said packages, cooled plates mounted on the inner sides of said side walls ahead of said heated plates and in horizontally continuous lateral supporting relation to the packages, and buffer sheets of flexible material having good heat conductivity and surfaces that are relatively inert connected at their front edges to said cross bars to trail therebehind between the ends of packages on said way and said heated and cooled plates.

Second, to provide a sealing mechanism for a wrapping machine which will successively and uniformly move packages with a thermoplastic wrapper sheet in straight rectilinear motion past a horizontally continuous heating plate to fuse or melt the plastic and a horizontally continuous cooling plate to rapidly set the fused plastic while moving a flexible sheet, inert at the temperature of the melted plastic, at the same speed as the packages between the packages and the heated and cooled plates so that the melted or softened material of the wrapper sheets is not subjected to friction forces or lateral separating forces which might displace the softened material.

Third, to provide sealing apparatus having the properties of the preceding second object in which the side walls and spaced side carriers traveling therealong are laterally adjustable to receive packages of different lengths, widths, thickness, weights and properties and in which carriers are arranged to advance buffer elements in timed relation with packages passed through the wrapper way to eliminate fric-

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tion on the part of the package being sealed with an overhead package advancing conveyor driven in equally timed relation to the buffer elements and engaging laterally balanced and substantial widths and heights of the back sides of the packages.

Other objects and advantages of the invention will be apparent from a consideration of the following description and claims.

The drawings of which there are 5 sheets illustrate a highly practical form of the wrapping mechanism.

FIG. 1 is a fragmentary side elevational view of the rear or inlet end of the sealing mechanism of the invention which receives packages partially wrapped from a wrapping machine.

FIG. 2 is fragmentary side elevational view of the front or delivery end of the sealing mechanism shown in FIG. 1.

FIG. 3 is a perspective view of a wrapped and sealed package formed by the machine of the invention.

FIG. 4 is an enlarged fragmentary cross sectional view taken along the plane of line 4—4 in FIG. 3 and conventionally illustrating the sealed end fold and bottom overlap on the package.

FIG. 5 is an enlarged fragmentary horizontal cross sectional view taken along the plane of the line 5—5 in FIG. 1 and illustrating the side sealing element of the invention mainly in plan view.

FIG. 6 is a fragmentary view of the delivery end of the sealing mechanism and constitutes a continuation of FIG. 5.

FIG. 7 is an enlarged fragmentary elevational view of the buffer sheets employed in the sealing mechanism and their connection to the side conveyors or carriers of the mechanism.

FIG. 8 is an enlarged fragmentary transverse cross sectional view taken along the plane of the broken line 8—8 in FIG. 5 and illustrating the parts of the sealing mechanism in operative relation to a package.

Machines for heat sealing wrappers made of fusible material such as wax paper are well known and have been successful because the fusible portion of the wrapper is, in effect, a coating carried by a body sheet which is relatively unaffected by the temperature created in fusing the wax. Recently there has been developed sheets of wrapping material of synthetic material known as polyethylene and polypropylene which are transparent sheets capable of being manufactured in various thicknesses and which have highly desirable properties as wrappers. These wrapping materials may be classified as polyolefin sheets. Polyolefin material has a very critical and narrow melting range and when melted loses all of its strength and resistance to tearing or pulling. The material is smooth and nonsticky until it is actually in melted condition and as a result the heat sealing mechanisms used for waxed papers have been unsuccessful for sealing polyolefin packages. If the degree of heat applied to the sheet is insufficient there is no adhesion by the overlapped parts and if the degree of heat is too great the material melts and shrinks away from the seal area. If exactly the correct amount of heat is applied to cause fusing of overlapped parts of the sheet the melted or softened areas will easily rub or smear away from unheated portions of the sheet if the wrapper or the package is moved relative to the heated surface while the material is plastic. It has been proposed as in Patent No. 2,727,345 to Schoppee and Patent No. 2,918,772 to Bell to provide means for interposing a buffer between a wrapper package and a heat sealing plate and moving the package by means of the buffer past a heat element. Bell further provides separate buffers for moving the packages past a cooling element so that the plastic material of the wrapping sheet is not subject to friction force but is subjected to compressive

sealing force as the material of the wrapper is raised to the critical or softening point and quickly cooled to solidify the fused overlapped portions of the sheet. These patents, however, omit means for engaging substantial and laterally balanced central areas of the backs of the packages to advance the packages in timed relation to the buffers and to hold the packages in uniformly perpendicular abutting engagement with the buffers and the heating and cooling plates. They also omit lateral end support of the flaps being sealed as the packages move from the heated plates to the cooled plates. So far as applicant is aware, the machines shown in these patents have never been placed in general commercial use.

In the drawings a suitable base or support 1 is illustrated as supporting a central flat bed or plate 2 constituting a way for receiving partially wrapped packages 3 from a wrapping machine, not illustrated. The partially wrapped packages are delivered with partially wrapped end folds 4 which are received by the side plates 5. As the packages are advanced to the right in FIGS. 1 and 5 the flaps on the wrapper are folded upwardly against the ends of the package by the curved slots 6 as is common in wrapping machines of this type and the packages are advanced between side plates 7 that hold the end folds in place. The side plates 7 are supported by hangers 8 depending from support rails 9 of angled cross section and the support rails are in turn supported for lateral adjustment on the machine by means which will be described presently.

In the particular embodiment of the sealing apparatus illustrated the means for moving the packages along the way 2 consists of an upper conveyor generally indicated at 10 and consisting of frame elements 11 pivotally supported at the front end of the sealing mechanism about the axis of a drive pulley 12 (see FIG. 2). The rear end of the top conveyor is supported upon pedestals 13 and can be swung upwardly to permit access to the top of the way 2. The conveyor 10 includes chain loops 14 and 15 trained around the longitudinally off set sprockets 16 and 17, see FIG. 2, at the front end of the conveyor. The chain loops 14 and 15 carry depending pusher plates or flights 18 that are advanced along the lower reaches of the chains along the top of the way 2. The upper conveyor 10 is driven by a chain 19 (see FIG. 6) from the sprocket 20 positioned below the forward end of the way. The chain extends upwardly to the previously described sprocket 12 from which separate drive chains 21 and 22 diverge to the sprockets 16 and 17. The particular details of the upper conveyor 10 are unimportant to the invention so are not illustrated or described in further detail.

Extending transversely across the machine between the side frame elements 1 and below the level of the package way 2 is a transverse drive shaft 23 driven by the chain 24 from a suitable power source connected to the shaft 25 located near the bottom of the machine. The shaft 23 is longitudinally splined as at 26 and slidably supports a pair of blocks 27 having forks 28 on their underside and upwardly facing bearings 29 on their upper side. The forks 28 straddle a transverse adjusting screw 30 and carry a traveling nut 31 engaged with the screw so that rotation of the screw 30 causes the blocks 27 to move transversely of the machine and longitudinally along the drive shaft 23. The bushings or bearings 29 support the lower ends of upright shafts 32, the upper ends of which support the rear ends of the previously mentioned support rails 9 from the drive shaft 23. The lower ends of the upright shafts 32 carry bevel gears 33 drivingly engaged with beveled gears 34 that are carried on the splined shaft 23 to rotate therewith but which are movable longitudinally along the shaft with adjustment of the blocks 27. The upright shafts 32 carry upper sprockets 35 and lower sprockets 36 around which are trained an upper chain loop 37 and a lower chain loop 38.

The forward ends of the chain loops 37 and 38 extend forwardly to structure shown in FIGS. 2 and 6 wherein

a horizontal cross bar 39 slidably supports adjusting blocks 40. The blocks 40 carry upright idler shafts 41 which engage and support the forward ends of the support rails 9 and also carry idler sprockets 42 and 43. The chains 37 and 38 are trained around the sprockets 42 and 43.

The crossbar 39 is supported at its ends on castings or brackets 44 that are in turn supported from the main frame 1 by horizontal rods 45 and angled brace rods 46. The castings or brackets 44 support upright pedestals 47 on which the shaft for the previously mentioned drive pulley 12 is supported. The casting 44 also forms a support for shaft 48 on which the previously described sprocket 20 and drive chain 19 are mounted. The shaft 48 is driven by a chain 49 extending rearwardly along side of the horizontal bar 45 to a sprocket 50 on the drive shaft 23 so that the chain loops 37 and 38 are driven in equal longitudinal timed relation to the top conveyor 10 and its flights 18.

The side walls 7 extending along the sides of the way 2 are made up in sections consisting of a heated section 51 heated by a suitable heater conventionally illustrated at 52 and a cooled section 53 cooled by a suitable refrigerant chamber 54. With reference to FIGS. 1 and 5 it will be noted that the heated sections 51 are positioned just ahead of the upright shafts 32 and the drive sprockets 35 and that the cooled side plates 54 are positioned at the head of the heated side plates. The heated side plates 51 are spaced forwardly from the rear unheated sections 7 by gaps 55 and the inner reaches of the chain loops 37 and 38 pass over and under these gaps.

The chain loops 37 and 38 constitute carriers to which are attached vertical crossbars 56 shown in detail in FIG. 7. The cross bars 56 have flexible relatively inert buffer sheets 57 secured thereto by the rivets or screws 58 and extending in rearwardly trailing relation to the advancing motion of the carriers and the crossbars 56. Desirably, the buffer sheets 57 consist of woven fiber glass fabric treated with an inert coating of tetrafluoroethylene resin. This material is a highly inert material which is unaffected by the heat of the plates 51 and does not adhere to the melted polyolefin. It is sold commercially under the trade name Teflon.

Other sheets relatively inert to the temperature of the heating plates 51 are usable and sheets of synthetic material, common kraft paper and metal foil have been found to operate successfully with some wrapper films in place of the fiber glass sheets.

The buffer sheets 57 are advanced by the inner reaches of the chain loop carriers 37 and 38 and the supporting cross-bars 56 through the gap 55 and forwardly along the inner surfaces of the heated plates 51 and the cooled plates 53. By reason of the synchronized motion of the chain loop 37-38 with the flights 18, a buffer sheet 57 is locked between the side plates and the folded ends of the package wrappers so no frictional force whatsoever is applied to the overlap end folds 4. At the same time the buffer sheets 57 transmit heat from the heated plates 51 to the overlapped folds 4 and by proper coordination of the speed of the conveyor 10 to the length of the heated plates 51 and the temperature of the heating elements 52 the overlapped flaps 4 on the ends of the package wrapper are raised to their critical melting temperature during the passage of the package along the heating plate. Lateral adjustment of the support rails 9 and the side plates carried thereby permit adjustment for various lengths of packages and create sufficient pressure against the buffer sheets and the end flaps engaged thereby to press the overlapped wrapper flaps together in their plastic or partially melted condition and the packages are immediately advanced to between the cooled side plates 54 which rapidly withdraw heat through the buffer sheets from the overlapped and now fused flaps 4. The buffer sheets bridge the narrow gap between the heated plates 51 and the cooled plates 53 that prevent heat transfer between the

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plates. The plates 51 and 43 are straight and continuous horizontally and preferably also vertically to provide smooth flat backing for the buffer sheets. The result is a package wrapped with end flaps that are fused into a single mass as indicated by the conventional weld lines at 59 in FIG. 4. As the wrapped and sealed package is advanced past the idler sprockets 42-43 to the delivery platform 60 the buffer sheets 57 are pulled laterally away from the ends of the package to return along the outer reaches of the chain loops 37 and 38.

The forward ends of the support rails 9 and the idler sprockets 42 are adjusted laterally concurrently with rear sprockets 35 by means of an adjusting screw 61 extending transversely between the forward brackets 44 and below the crossbar 39. The support blocks 40 which carry the idler shafts 41 having depending forks 62, see FIG. 2, and traveling nuts similar to the forks 28 on the support blocks 27 which engage the screw 61 to move the blocks 40 laterally. The screw 61 at the forward end of the sealing machine is rotated simultaneously with the adjusting screw 30 at the rear end of the sealing mechanism by a chain 63 extending along the back side of the machine. The screw 30 is extended to the front side of the machine and the hand wheel 64 so that both screws can be simultaneously adjusted. It will be appreciated that the screws 30 and 31 have oppositely pitched threads on their opposite ends so that rotation of the screws moves the support rails 9 oppositely to each other to vary the spacing or width of the way 2 and establish the proper end pressure against the overlapped end folds 4 as they are being sealed.

Since the wrapped package 3 will have an overlapped bottom edge 65 extending longitudinally along its under side the rear or left end of the central way 2 appearing in FIG. 5 is provided with a transverse gap 66 through which a transverse heated sealing bar 67 is vertically reciprocable to briefly touch the overlapped edges 65 and seal the bottom of the package as it is passed over the slot. The heated seal bar 67 is carried by arms 68 on a rock shaft 69 and a lever arm 70 connected to the rock shaft is oscillated by a push rod 71 engaged with a cam 72 on the drive shaft 25 so that each incoming package and its wrapper are engaged by the bottom seal bar 67 in timed relation with the other elements of the machine.

The example of the sealing apparatus illustrated is especially adapted for sealing end folds of polyolefin wrapper sheets but the invention is not limited to this specific use. The essential elements of the invention are the serially arranged horizontally straight and preferably flat hot and cold sealing plates with means for advancing an overlapped portion of a package wrapper therealong and simultaneously advancing an inert buffer between the package and the plates. The flights 18 of the overhead package advancing conveyor 10 are positioned and extend as shown in FIG. 8 to engage a substantial laterally and vertically extended area in balanced relation to the back sides of the packages being forwarded along the way. This assures that packages of different sizes, weights and conditions of rigidity will at all times be advanced with their ends and end flap folds in parallel uniform sealing pressure against the sealing plates 51 and 53, while the equally synchronized drive between the conveyor chains 14 and 15 and the buffer carrier chains 37 and 38 assures that there will be no relative movement between the buffers and the end folds or flaps being sealed.

What is claimed as new is:

1. A wrapper sealing machine for sealing the overlapped end folds of polyolefin wrappers on packages of different sizes comprising,

a flat way adapted to receive and support the wrapped packages with their ends at the sides of the way, laterally adjustable side walls extending along and projecting above the side of said way to retain said end folds against the packages,

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horizontally straight and continuously flat heated plates on the opposed inner sides of said side walls, horizontally straight and continuously flat cooled plates on opposed inner sides of said side wall and closely adjacent and ahead of said heated plates,

carrier means consisting of horizontal chain loops positioned with their inner reaches extending along said side walls and supported for lateral adjustment therewith,

buffer means consisting of sheets of flexible material inert to the temperature of said heated plates connected to said carrier means at regular intervals along the carrier means,

a package advancing conveyor positioned over said way and having depending flights movable over and along the mid-section of said way,

said flights projecting substantially laterally and vertically relative to said way to engage substantial areas of the back sides of said packages in laterally and vertically spaced and balanced relation in planes perpendicular to said side walls,

and means connected to drive said conveyor and said carrier means to advance said flights in equally timed relation to the sheets of said buffer means whereby the buffer means advance along the inner sides of said plates with said flights.

2. A wrapper sealing machine for sealing the overlapped end folds of polyolefin wrappers on packages comprising,

a flat way adapted to receive and support the wrapped packages with their ends at the sides of the way, side walls extending along and projecting above the side of said way to retain said end folds against the packages,

horizontally straight and substantially continuous heated plates on the opposed inner sides of said side wall,

horizontally straight and substantially continuous cooled plates on opposed inner sides of said side wall and closely adjacent and ahead of said heated plates,

carrier means consisting of horizontal chain loops positioned with their inner reaches extending along said side walls,

buffer means consisting of sheets of flexible material inert to the temperature of said heated plates connected to said carrier means at regular intervals along the carrier means,

a package advancing conveyor positioned over said way and having depending flights movable over and along the mid-section of said way,

said flights projecting substantially laterally and vertically relative to said way to engage substantial areas of the back sides of said packages in laterally and vertically spaced and balanced relation in planes perpendicular to said side walls,

and means connected to drive said conveyor and said carrier means to advance said flights in equally timed relation to the sheets of said buffer means whereby the buffer means advance along the inner sides of said plates with said flights.

3. A wrapper sealing machine for sealing the overlapped end folds of polyolefin wrappers on packages of different sizes comprising,

a flat way adapted to receive and support the wrapped packages with their ends at the sides of the way,

laterally adjustable side walls extending along and projecting above the sides of said way to retain said end folds against the packages,

horizontally continuous flat heated plates on the opposed inner sides of said side walls,

horizontally continuous flat cooled plates on opposed inner sides of said side walls and closely adjacent and ahead of said heated plates,

carrier means consisting of horizontal chain loops positioned with their inner reaches extending along

said side walls and supported for lateral adjustment therewith,

buffer means consisting of flexible material inert to the temperature of said heated plates connected to said carrier means at regular intervals along the carrier means,

a package advancing conveyor positioned over said way and having depending flights movable over and along the mid-section of said way,

said flights being disposed in substantially laterally and vertically spaced relation to said way to engage substantial areas of the back sides of said packages in laterally and vertically spaced and balanced relation in planes perpendicular to said side walls,

and means connected to drive said conveyor and said carrier means to advance said flights in equally timed relation to said buffer means whereby the buffer means advance along the inner sides of said plates with said flights.

4. A wrapper sealing machine for sealing the overlapped end folds of polyolefin wrappers on packages of different sizes comprising,

a flat way adapted to receive and support the wrapped packages with their ends at the sides of the way, laterally adjustable side walls extending along and projecting above the sides of said way to retain said end folds against the packages,

horizontally continuous heated plates on the opposed inner sides of said side walls,

horizontally continuous cooled plates on opposed inner sides of said side walls and closely adjacent and ahead of said heated plates,

carrier means extending along said side walls and supported for lateral adjustment therewith,

buffer means consisting of flexible material inert to the temperature of said heated plates connected to said carrier means at regular intervals along the carrier means,

a package advancing conveyor positioned over said way and having depending flights movable over and along the mid-section of said way,

said flights being disposed to engage substantial areas of the back sides of said packages in laterally and vertically spaced and balanced relation in planes perpendicular to said side walls,

and means connected to drive said conveyor and said carrier means to advance said flights in equally timed relation to said buffer means whereby the buffer means advance along the inner sides of said plates with said flights.

5. A wrapper sealing machine for sealing the overlapped end folds of polyolefin wrappers on packages comprising,

a flat way adapted to receive and support the wrapped packages with their ends at the sides of the way, side walls extending along and projecting above the sides of said way to retain said end folds against the packages,

horizontally straight and substantially continuous heated plates on the opposed inner sides of said side walls,

horizontally straight and substantially continuous cooled plates on opposed inner sides of said side walls and closely adjacent and ahead of said heated plates,

carrier means extending and movable along said side walls,

buffer means consisting of flexible material inert to the temperature of said heated plates connected to said carrier means to be advanced with the carrier means,

a package advancing conveyor positioned over said way and having depending flights movable over and along the mid-section of said way,

said flights being shaped and positioned to engage substantial areas of the back sides of said packages in laterally and vertically spaced and balanced relation in planes perpendicular to said side walls,

and means connected to drive said conveyor and said carrier means to advance said flights in equally timed relation to said buffer means whereby the buffer means advance along the inner sides of said plates with said flights.

6. A wrapper sealing machine for sealing the overlapped end folds of polyolefin wrappers on packages comprising,

a flat way adapted to receive and support the wrapped packages with their ends at the sides of the way, side walls extending along and projecting above the sides of said way to retain said end folds against the packages,

horizontally and substantially continuous heated plates on the opposed inner sides of said side walls,

horizontally and substantially continuous cooled plates on opposed inner sides of said side walls and closely adjacent and ahead of said heated plates,

carrier means extending and movable along said side walls,

buffer means consisting of flexible material inert to the temperature of said heated plates connected to said carrier means to be advanced with the carrier means,

a package advancing conveyor positioned over said way and having depending flights movable over and along the mid-section of said way,

said flights being shaped and positioned to engage the back sides of said packages in laterally and vertically spaced and balanced relation in planes perpendicular to said side walls,

and means connected to drive said conveyor and said carrier means to advance said flights in equally timed relation to said buffer means whereby the buffer means advance along the inner sides of said plates with said flights.

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