June 3, 1969 G. C. SPARKS ETAL 3,447,284

IN-LINE SEALING MACHINE

Filed June 12, 1967 Sheet 1 of 2

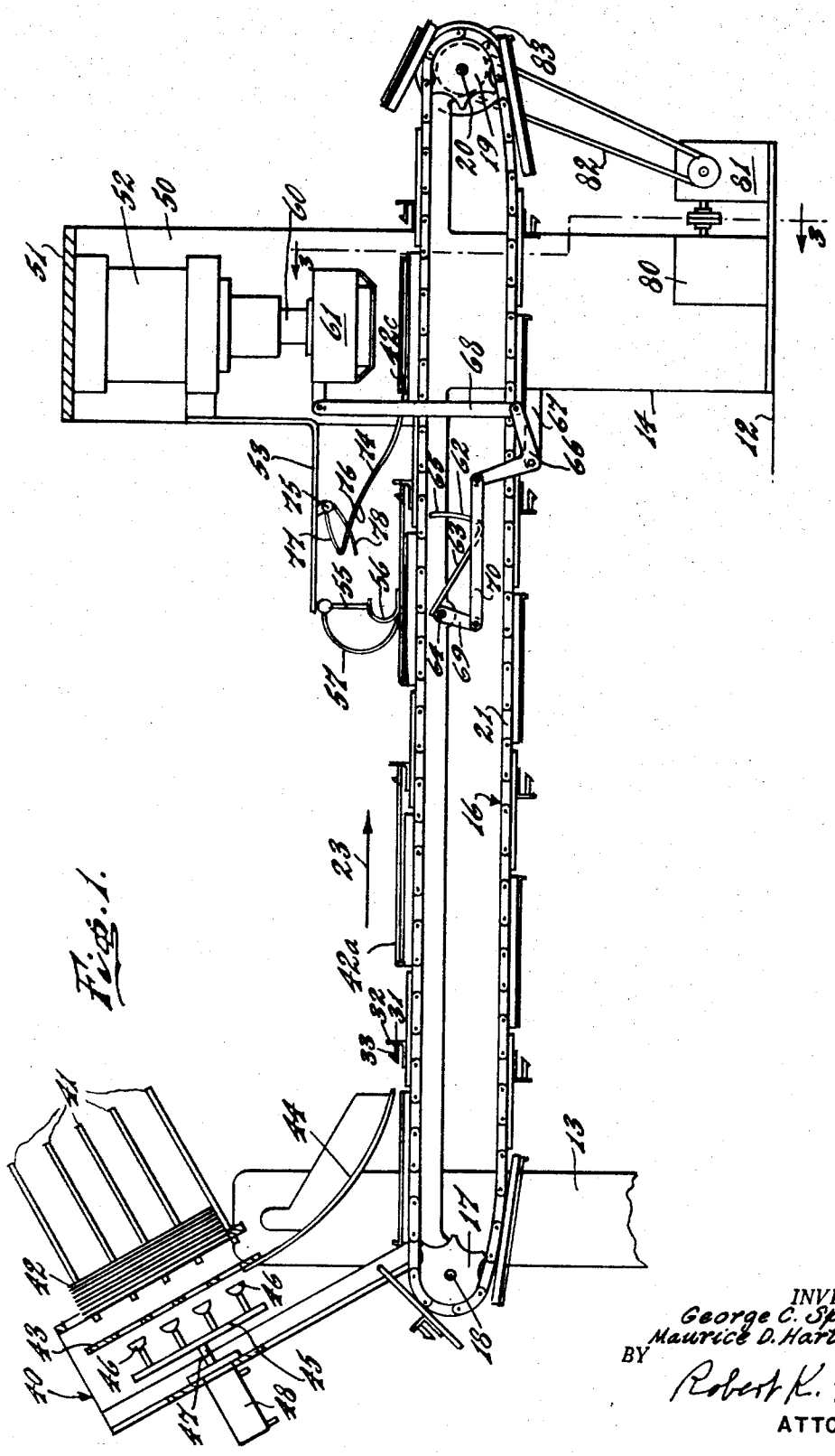


Fig. 1.

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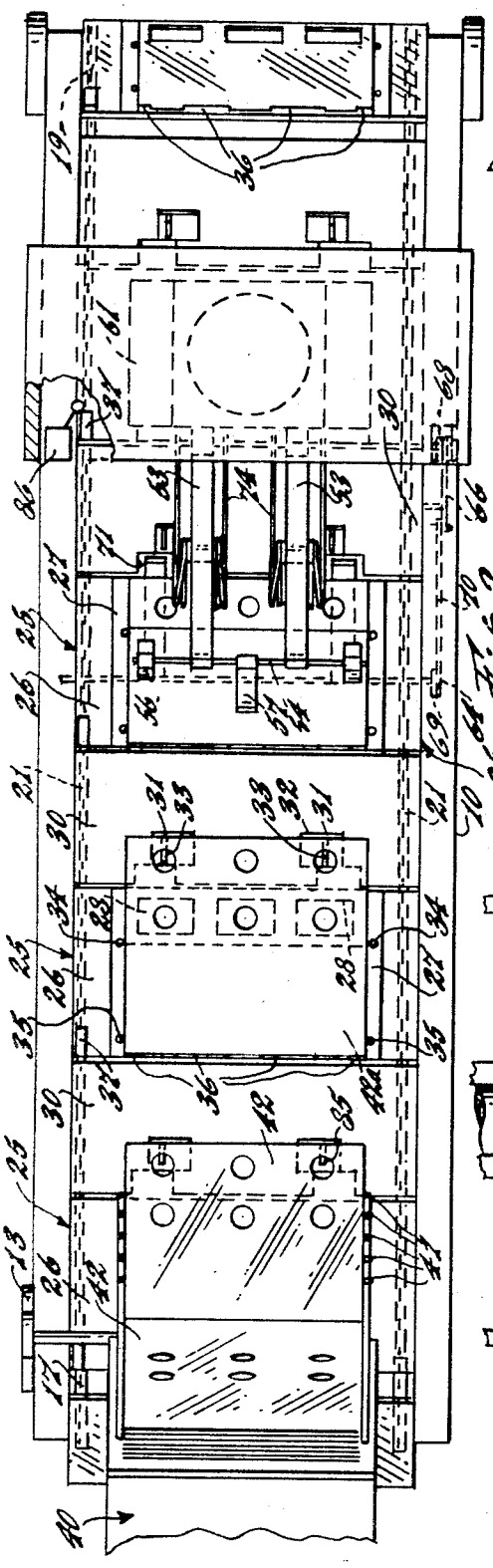


Fig. 3.

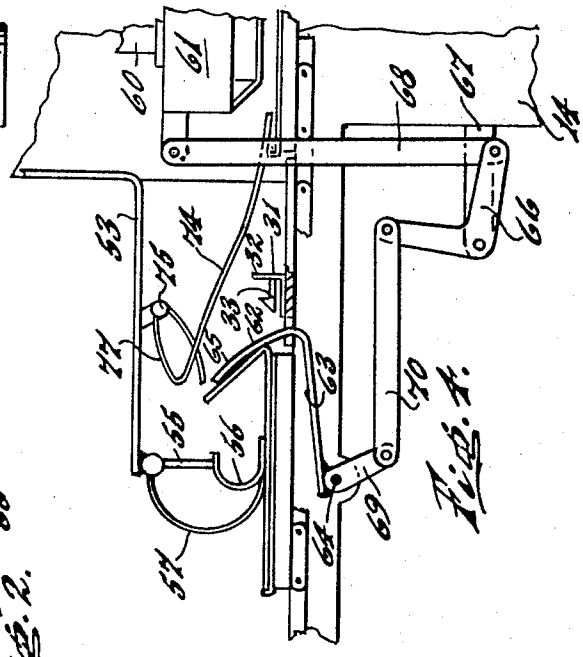


Fig. 4.

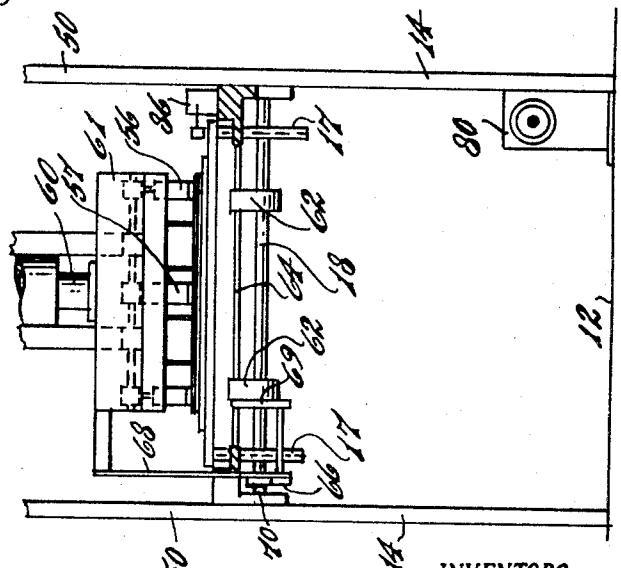


Fig. 2.

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IN-LINE SEALING MACHINE

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U.S. Cl. 53—209 7 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates generally to packaging machinery, and is especially concerned with such machines as are adapted to form and seal packages from sheet material.

The machine of the instant invention includes essentially a conveyor for receiving and transporting package blanks or sheets through a loading station to a folding station where the blank is folded to enclose the loaded material. The conveyor transports the folded sheet to a sealing station where the sheet is sealed in its folded condition, and subsequently discharged from the conveyor.

It is a primary object of the present invention to provide a rapid and highly automatic machine which receives package blanks or sheets and successively conveys the same through a filling or loading station where the desired contents are introduced to the sheet, and thence completely automatically effects folding of the sheet about the contents and sealing of the sheet in its folded condition to produce a finished package.

It is another object of the present invention to provide a packaging machine of the type described which is extremely simple in construction, durable and reliable in operation throughout a long useful life, and which can be economically manufactured, operated and maintained.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

In the drawings:

FIGURE 1 is a longitudinal sectional elevational view showing a packaging machine of the present invention with one side removed for clarity of illustration;

FIGURE 2 is a top plan view of the machine of FIGURE 1, partly broken away;

FIGURE 3 is a transverse sectional elevational view taken generally along the line 3—3 of FIGURE 1; and

FIGURE 4 is a partial sectional elevational view similar to FIGURE 1, but illustrating another operative condition of the machine.

Referring now more particularly to the drawings, and specifically to FIGURES 1–3 thereof, the machine there illustrated includes a pair of laterally spaced, generally horizontal frame members or sides **10**, which members are suitably supported in elevated relation with respect to a floor **12**, as by a pair of upstream legs **13** and a pair of downstream legs **14**. Carried by the frame members **10**, extending longitudinally in the space therebetween is a conveyor, generally designated **16**. The conveyor **16** may be of any suitable endless type, and is illustrated as including a pair of laterally spaced upstream sprocket wheels **17**, which may be rotatably carried by a laterally extending, generally horizontal, rotary shaft **18**. Adjacent to the legs **14**, and downstream thereof, the side members **10** may rotatably carry an additional pair of laterally

spaced sprocket wheels **19**, say by a laterally extending, generally horizontal, rotary shaft **20**.

Trained about the sprocket whels **17** and **19**, extending longitudinally along and inward of the side members **10**, are a pair of laterally spaced sprocket chains **21**. The pair of chains **21** are disposed in generally parallel vertical planes, and have lower and upper runs in substantially horizontal, vertically spaced planes. Thus, the conveyor **16** includes vertically spaced, generally horizontal lower and upper runs.

Carried by the chains **21** of conveyor **16**, for movement about the endless path of the conveyor downstream along the upper run and upstream along the lower run, as in the direction of arrow **23**, are a plurality of generally flat, spaced carriers **25**. That is, the carriers are generally of rectangular configuration, each including a rectangular baseplate **26** extending laterally across the space between the chains **21**, having its opposite side portions suitably secured to respective chains for movement therewith and permitting of chain flexure about sprocket wheels **17** and **19**. Mounted on each carrier baseplate **26** is a specifically configured adapter plate **27**, of a size and shape corresponding to the particular package being formed. In the specific embodiment illustrated, the adapter plates **27** are each formed with a laterally extending row of upwardly facing recesses **28**. The adapter plates **27** are arranged for convenient detachment from the baseplates **26** for replacement with other adapter plates of other configurations, as required.

Also carried by the chains **21** of conveyor **16**, and interposed in the spaces between adjacent carriers **25** are auxiliary mounting plates **30**, which may be generally rectangular, each extending laterally between and secured at spaced locations to respective chains for movement therewith. The auxiliary mounting plates **30** are each provided with a selected number and arrangement of engaging structures **31**, which may be arranged in accordance with the specific package being produced. In the illustrated embodiment, a pair of engaging structures **31** are carried in laterally spaced relation on each auxiliary mounting plate **30**, the engaging structures each including an upstanding flange or lip **32**, with the lips of respective engaging structures being in alignment with each other laterally of the conveyor. Carried by each lip **31** and projecting upstream therefrom, with respect to conveyor movement on the upper run, is an engaging element or hook **33** having an upstanding extremity or point, best seen in FIGURES 1 and 4. The engaging structures **31** and their hooks **33** are located in alignment with a respective pair of recesses **28** of the adjacent upstream adapter plate **27**, as seen on the upper conveyor run in FIGURE 2.

It will also there be apparent that the adapter plates **27** may be provided with upstanding guide pins **34** and **35** spaced laterally outward of the recesses **28**. Along the rearward or upstream edge of each carrier **25** there may be provided upstanding retainer flanges or lips **36**, of modest height, say approximating the thickness of sheet material being operated upon. Also, each of the carriers **25**, say at the trailing or upstream end of its plate **30**, may be provided with an upstanding boss or lug **37**, along one side of the conveyor, say adjacent to one side frame member **10**, the upper frame member, as seen in FIGURE 2.

At the upstream or loading end of conveyor **16**, there may be provided a sheet-feeding apparatus, generally designated **40**, which may be of conventional construction, as illustrated. The apparatus may include a hopper or stack storage structure **41** for retaining a stack of sheets **42** adapted to be removed from the underside of the stack. The stack of sheets **42** may be disposed in

forwardly inclined relation, as illustrated, and spaced below the underside thereof may be provided an inclined, apertured plate **43** having a chute **44** extending obliquely downstream from the lower end of the plate. A crosshead **45** may be arranged beneath the plate **43** and provided with a plurality of suction cups **46** reciprocable through the plate **43** for suctional engagement with the lowermost sheet **42** to draw the latter against the plate. The crosshead **45** may be carried by a plunger **47** mounted in a cylinder **48**, suitably actuated, say by hydraulic or pneumatic means. Thus, upon forward and upward shifting movement of plunger **47**, the suction members **46** pass through the apertures of plate **43** to grasp the lowermost sheet **42**, and upon return of the plunger **47** the sheet is drawn against plate **43** and released by the suction members for gravitational sheet movement downward along chute **44** toward the upper run of conveyor **16**.

Spaced downstream from the sheet-feeding means **40** the support legs **14** may each be provided with upward extensions **50** beyond the upper run of conveyor **16**, and a transverse support member or beam **51** may extend across the upper ends of extensions **50** spacedly over the conveyor. A mounting cylinder **52** may be fixedly carried on the underside of support beam **51**, depending therefrom toward and spaced above the conveyor **16**. Carried by the mounting cylinder **52**, on the upstream side thereof, may be a pair of angulate mounting brackets **53** extending in spaced relation generally horizontally over the upper run of conveyor **16**, upstream from the support structure **50, 51**. The mounting brackets **53** may carry at their upstream ends a laterally extending bar or rod **54**. Depending from opposite ends of the bar **54** are a pair of arms **55**, which terminate short of the upper run of conveyor **16**. Carried on the lower end of each arm **55** is a resilient hold-down element or pressure foot **56**. The pressure feet may each be fashioned of a resilient U-shaped strip arranged with its bight portion upstream and its legs spaced one over the other, with the upper leg fixed to the respective arm **55** and the lower leg in resilient bearing engagement with a nether carrier **25**. Medially of the bar **54** may be an additional resilient hold-down member or pressure foot **57**, which may comprise a relatively large U-shaped resilient strip having its bight portion upstream and its legs spaced one over the other, with the upper leg fixed to the bar **54**. The lower leg of hold-down element **57** is free for resilient bearing engagement with a nether carrier **25**.

Thus, the hold-down means defined by pressure feet **56** and **57** are located upstream of the mounting cylinder **52**, and spaced down-stream from the feeding means **40**, the space between the feeding means and hold-down means providing a filling or loading station, as will appear more fully hereinafter.

Projecting vertically downward from the mounting cylinder **52** may be a plunger **60** carrying on its lower end a sealing head **61** for movement with the plunger vertically downward toward and upward away from the upper run of conveyor **16**. The sealing head **61** may be a conventional heat-and-pressure applicator for sealing of thermoplastic materials, or other suitable sealing means.

Located below the upper run of conveyor **16**, intermediate the hold-down means **56, 57** and the sealing means **61**, is a swingable member **62**. More particularly, the swingable member **62** includes an arm **63** fixed at one end to a generally horizontal, laterally extending, rotatable rod or shaft **64**. The shaft **64** may extend laterally between and have its opposite ends journaled in respective side frame members **10**. In the lowered or retracted condition of swinging member **62**, as illustrated in FIGURES 1 and 2, the arm **63** extends downstream from the shaft **64** in a declining relation. Carried on the downstream end of arm **63** is an upstanding extension **65** in angulate relation with respect to the arm. The extension **65** may be of curved or arcuate configuration, as seen in FIGURE 1.

By suitable operating means the swingable member **62** is connected to the sealing head **61** for actuation thereby. In particular, a bell crank **66** is pivotally mounted on a bracket **67** fixed to one leg **14**. A generally vertical link **68** is connected between the sealing head **61** and one end of the bell crank **66** to swing the latter upon reciprocation of the sealing head. A crank **69** may be rigidly connected to the shaft **64**, and an additional link **70** may be connected between the crank **69** and bell crank **66**, so that rotation of the latter is transmitted through the link **70** and crank **69** to the shaft **64** for swinging the swingable member **62** between its lowered or retracted position of FIGURE 1 and an upper or extended position of FIGURE 4. In practice, a pair of swingable members **62** may be carried by the shaft **64** in laterally spaced relation; and, each of the auxiliary conveyor plates **30** may be provided with a pair of cutouts **71**, respectively adjacent to and upstream of the engaging structures **31** for receiving the extension **65**.

In addition, the brackets **53** may carry one or more folding mechanisms **74** located between the hold-down means **56, 57** and sealing means **61**. The folding mechanisms **74** may each be carried by a laterally extending bar **75** fixed beneath a respective bracket **53**, and may include an elongate resiliently deflectable rod or wire **76** extending downstream and obliquely declining to a free end at the level of the carriers **25**. The upstream end of elongate element **76** may extend upstream of the supporting bar **75**, and be provided with an extension **77** inclining downstream and toward the bar **75** for securement thereto. In practice, the elongate member **76** and its extension **77** may be integral and afford increased resilient deflectability to the elongate member. In addition, a retaining member **78**, of resilient elongate material, such as wire, may extend from the bar **75** and decline upstream, generally below the extension **77**.

In operation, suitable drive means **80** may be provided, such as a motor, or the like, and drive a transmission or reduction gear **81** which may be connected by suitable means, such as a belt or chain **82** to one of the conveyor sprocket-wheel shafts, such as shaft **20**. Further, the transmission chain or belt **82** may drive through a single-revolution clutch **83**, or other suitable means, to effect intermittent or stepped movement of the conveyor **16**.

During the intervals between conveyor movement, suitable actuating means (not shown) serves to energize cylinder **48** for delivering a sheet **42** to chute **44** where it slides gravitationally into engagement with engaging structures **31**. As best seen in FIGURE 2, a sheet **42** includes apertures **85** arranged to receive the upstanding engaging elements or hooks **33**. Upon the next movement of conveyor **16**, the previously delivered sheet **42** is drawn downstream, as by engagement of hooks **33** in apertures **85** to an intermediate location or filling station, where an operator may place contents on the sheet, as in the position of sheet **42*a***, say over the recesses **28**. It will be observed that the sheet **42*a*** is located with its rearward or trailing edge just forward of the lips or flanges **36**.

After filling, the sheet is conveyed by the next step of conveyor movement into position beneath the hold-down means **56, 57**, the latter resiliently bearing against the sheet to hold the same firmly on its carrier. The sheet in position beneath the holddown means is designated as **42*b***. Upon movement of the sheet **42*b*** into its held-down position, a lug **37** engages an activating member or switch **86**, say fixed on one frame member **10**, which effects energization of cylinder **52** to shift the sealing head **61** downward and simultaneously swing extension **65** upward to the position shown in FIGURE 4. It will there be observed that the leading or donwstream portion of the sheet **42*b*** held in position by the hold-down means **56, 57** is folded upwardly and rearwardly. The leading edge portion of sheet **42*b***, upon being swung upwardly

and rearwardly may snap-engage past the retaining element **78** to be held in its upwardly swung position by the retaining element upon retraction of the extension **62**.

Upon the next stepped movement of conveyor **16**, the sheet is moved into position beneath the sealing head **61**, as at **42***c*. During this movement, it will be apparent that the elongate element **74** effectively completes folding of the previously upwardly swung leading edge sheet portion, and upon the next downward movement of sealing head **61**, the folded sheet is sealed in its folded condition. Sheet movement between the positions of sheets **42***b* and **42***c* from beneath hold-down means **56, 57** to beneath sealing means **61**, is assured by abutment of the lips or flanges **36** with the rear or trailing edge of the sheet.

Upon successive stepped movements of the conveyor, the folded and sealed sheet, now a completed package, will be dropped or delivered from the downstream end of the conveyor **16**.

From the foregoing, it is seen that the present invention provides a packaging machine which fully accomplishes its intended objects and is well adapted to meet practical conditions of manufacture and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. A packaging machine comprising an endless conveyor having upper and lower runs, a plurality of outwardly facing carriers arranged along said conveyor for receiving respective packaging sheets on said upper run, a plurality of outwardly projecting engaging members arranged along said conveyor each forward of a respective carrier, feeding means at the upstream end of said upper run for depositing an apertured package sheet onto each successive carrier with an aperture of each deposited sheet in receiving relation with the adjacent forward engaging member, a filling station along the upper run of said conveyor downstream of said feeding means for placing contents on an upstream portion of each of said deposited sheets, a hold-down located along said upper run downstream of said filling station for bearing engagement with the upstream portion of a filled sheet to effectively hold the sheet in position on its nether carrier, a swinging member mounted between said runs just downstream of said hold-down for extension and retraction through said upper run to engage and swing the leading portion of said held sheet upwardly out of said receiving relation, a folding member located along said upper run just downstream of said swinging member for engagement with the upwardly swung sheet portion to fold the latter into overlying relation with the associated upstream sheet portion on its carrier, and a sealer located along said upper run downstream of said folding member for sealing together the overlying sheet portions.

2. A packaging machine according to claim **1**, in combination with rearward abutment means on each of said carriers and engageable with said sheets to insure sheet movement with said carriers past said folding member and sealer.

3. A packaging machine according to claim **1**, said carriers etach comprising a generally flat plate configured to support said sheet, and said hold-down comprising resilient foot means for bearing engagement with a sheet to hold the latter during upward movement of the leading sheet portion by said swinging member.

4. A packaging machine according to claim 3, said folding member comprising an elongate element declining downstream toward and terminating proximate to said upper run for folding said leading sheet portion.

5. A packaging machine according to claim **4**, said folding member comprising a resilient retaining element declining upstream toward and terminating short of said upper run for retaining said leading sheet portion in its upwardly swung condition.

6. A packaging machine according to claim **1**, said swinging member comprising an arm pivotally mounted beneath said upper run for swinging movement about a generally horizontal axis, and an upstanding extension on said arm and movable therewith between a retracted position beneath a carrier and an extended position above a carrier.

7. A packaging machine according to claim **6**, said sealer comprising a sealing head movable generally vertically toward and away from said upper run, mounting means mounting said sealer head for said vertical movement, and linkage means connected between said sealer-head mounting means and arm for effecting simultaneous upward and downward movement of said arm upon respective downward and upward movement of said sealer head.

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U.S. Cl. X.R.

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