March 9, 1971 R. F. LENSE ET AL 3,568,402

BAG CLAMP FOR USE IN A PACKAGING MACHINE

Filed Aug. 6, 1969 4 Sheets-Sheet 1

Fig. 1

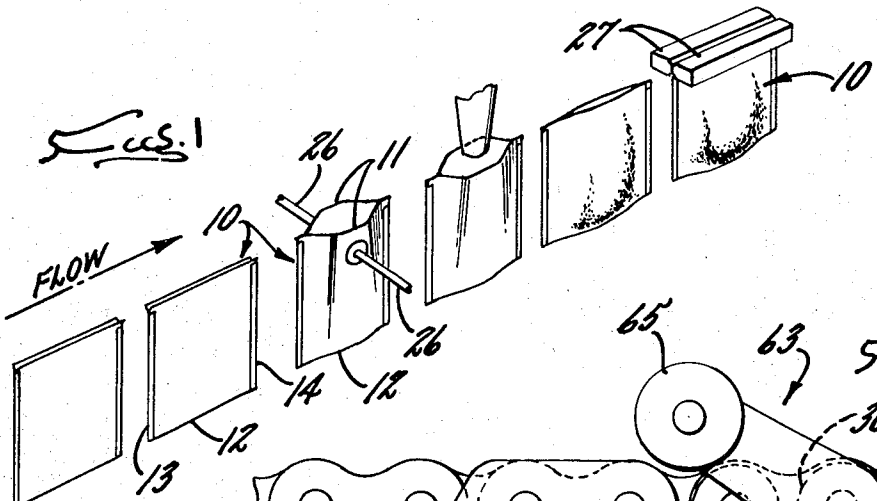
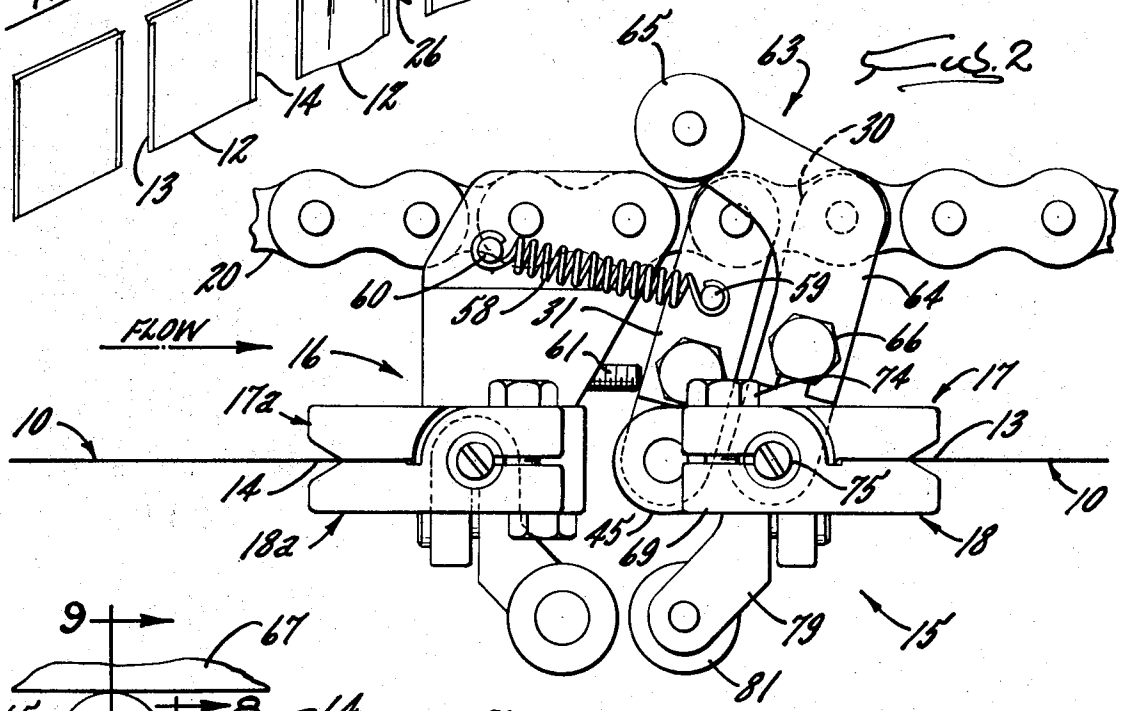


Fig. 2



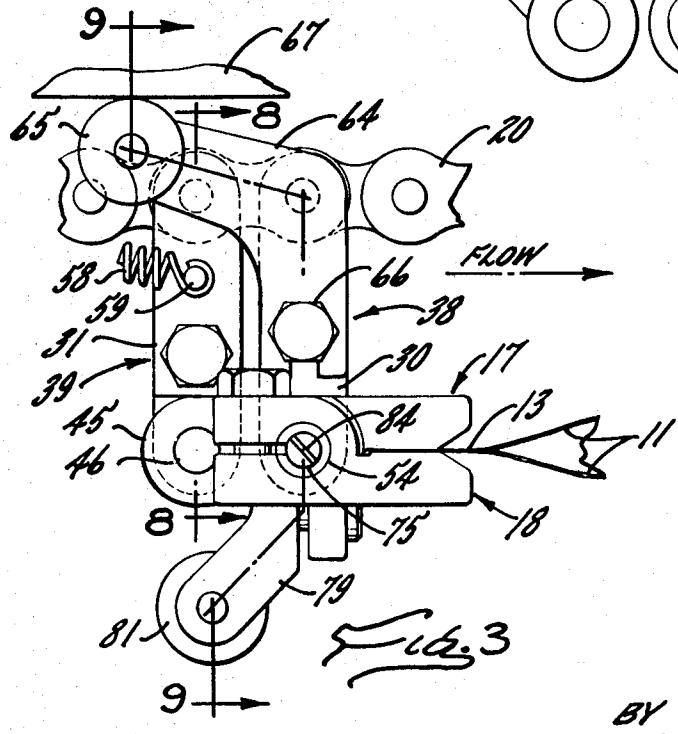
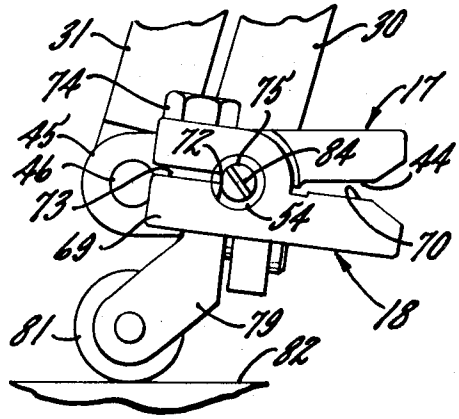


Fig. 3

Fig. 4

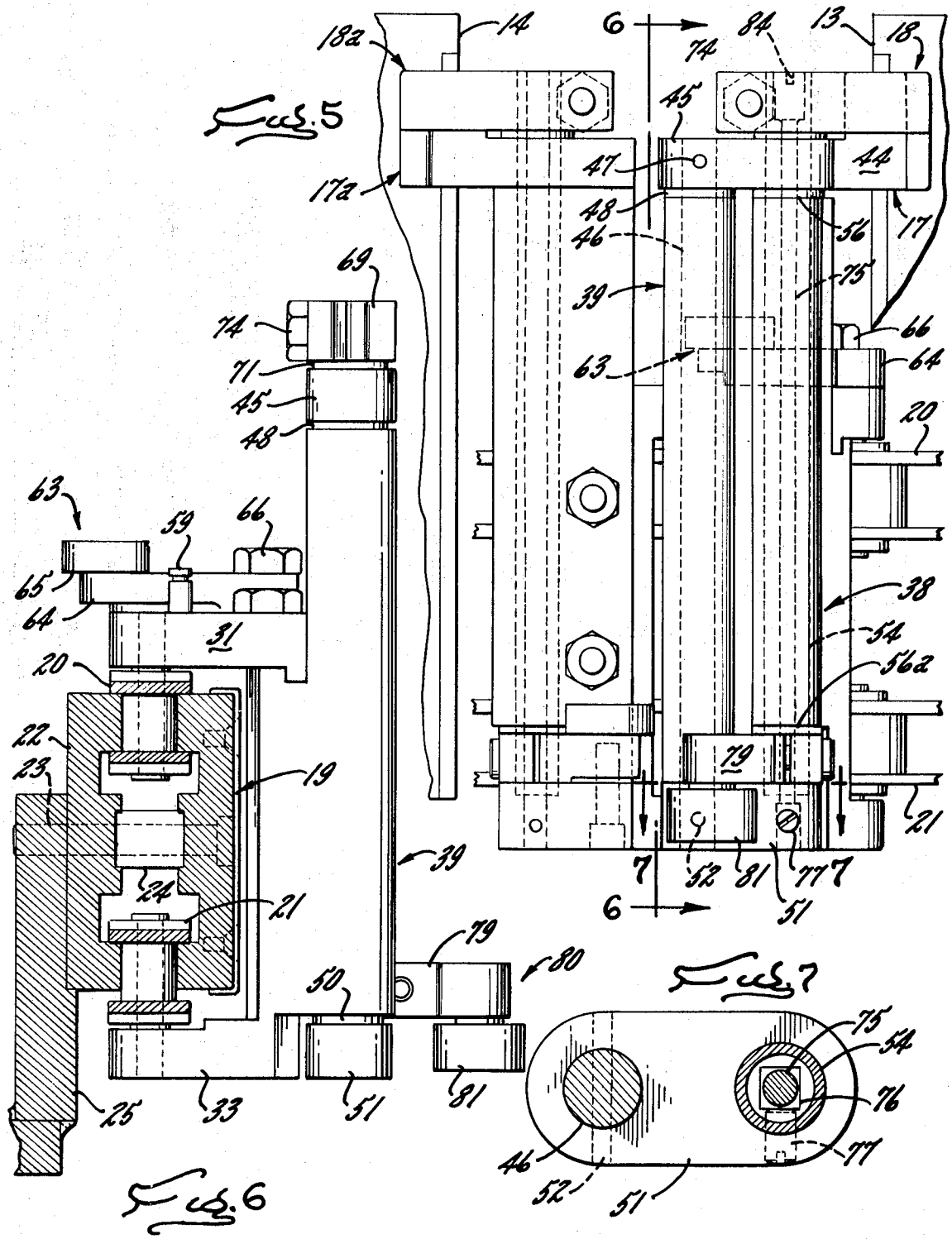


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Fig. 8

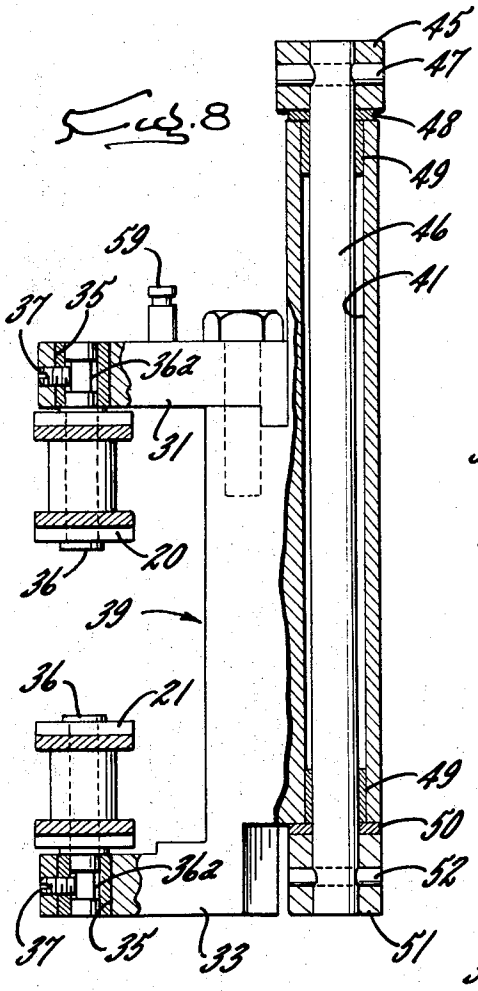


Fig. 9

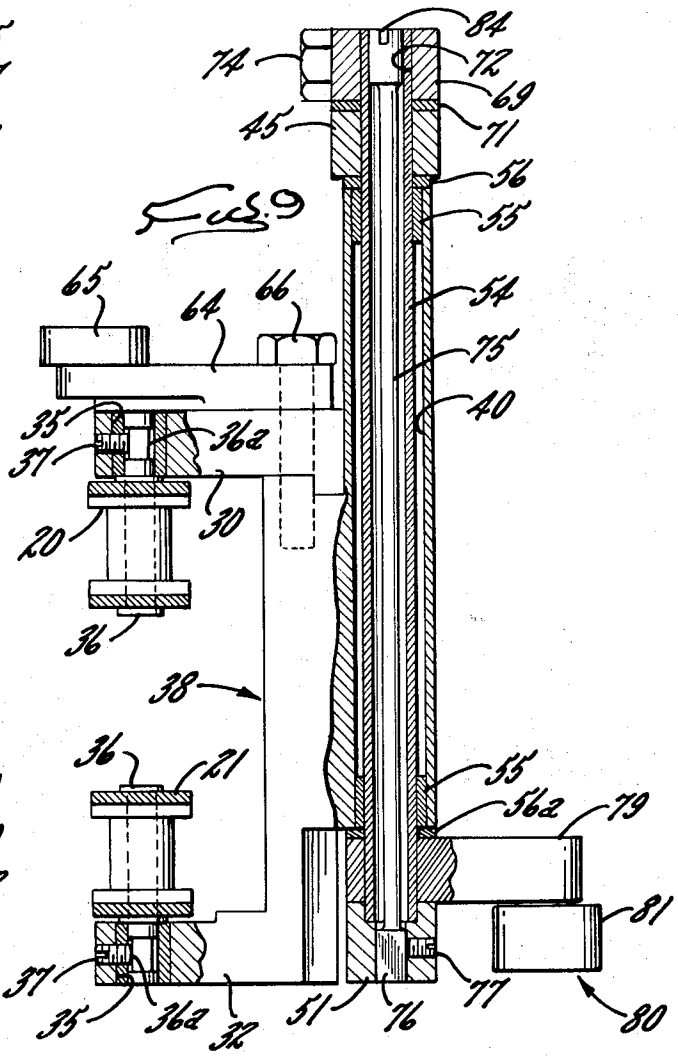


Fig. 10

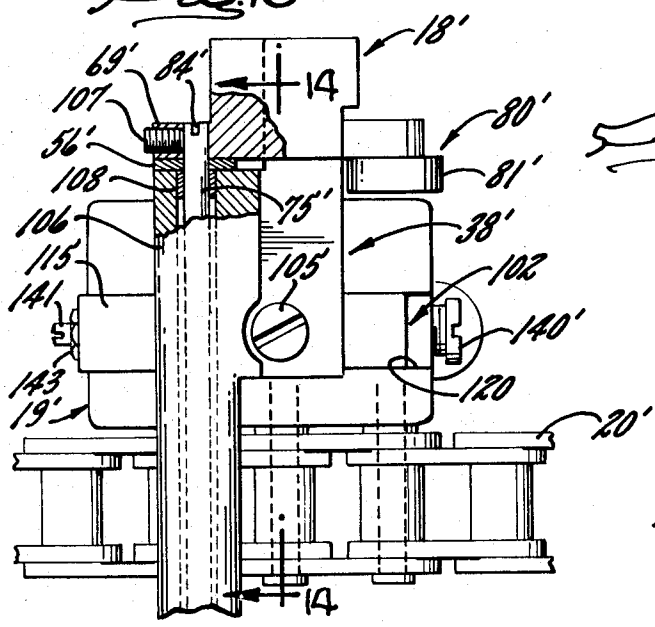
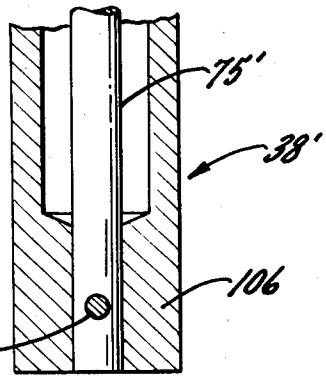


Fig. 11



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Fig. 12

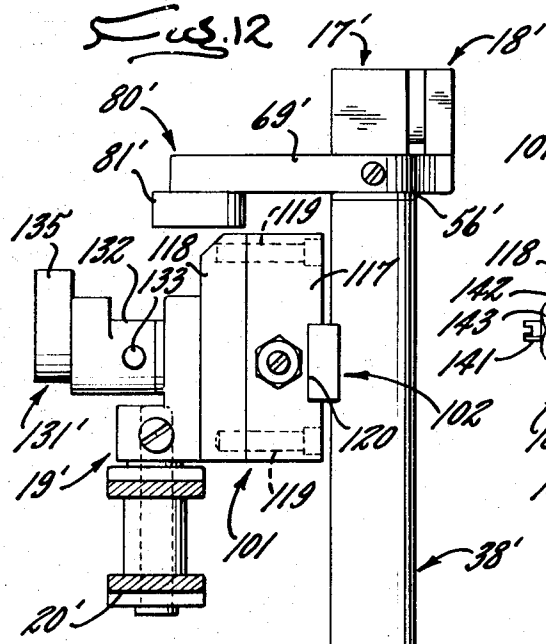


Fig. 13

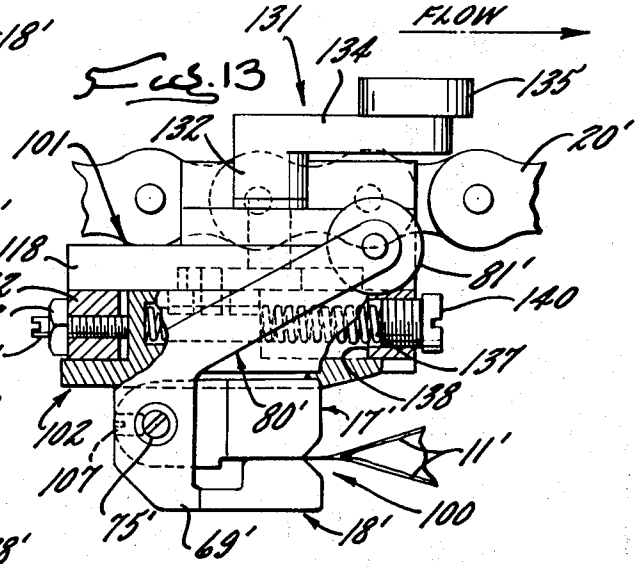


Fig. 14

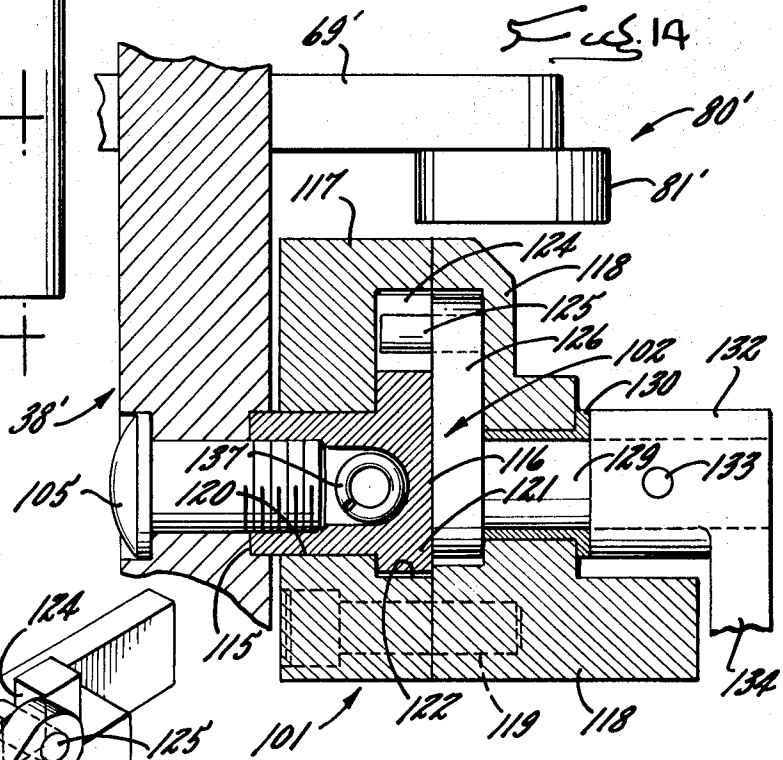
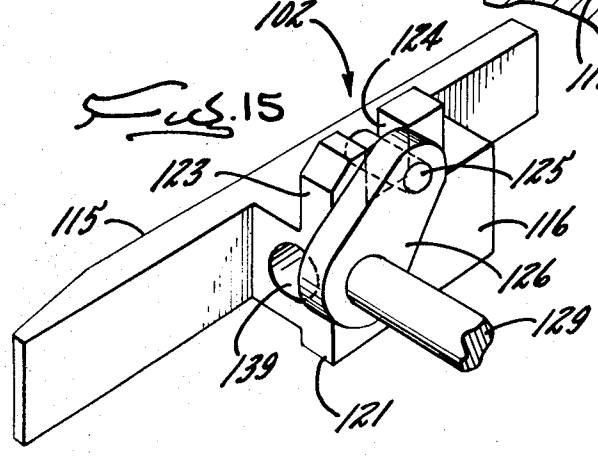


Fig. 15



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BAG CLAMP FOR USE IN A PACKAGING MACHINE

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Int. Cl. B65b 43/32
U.S. Cl. 53—384 12 Claims

ABSTRACT OF THE DISCLOSURE

A packaging machine for opening thin, flexible walled bags as the bags are advanced edgewise along a predetermined path into a filling station in upright positions with the walls of each bag positioned face-to-face. A carrier is mounted on the frame of the machine for movement generally parallel to the path with a pair of bag clamps mounted on the carrier and operable to support one bag with jaws which are operable to grip opposite edge portions of the bag and which are positioned parallel to the carrier. To bow open the bag, the trailing bag clamp is operable to move the jaws in a generally straight line toward the leading bag clamp while maintaining he jaws parallel to the carrier to avoid wrinkling the bag during the bowing. In the first embodiment, the jaws are connected to the carrier by parallel links which can be swung to move the jaws relative to the carrier. In the second embodiment, the jaws are mounted on a slide which is guided on the carrier for sliding movement in a generally straight, horizontal line relative to the carrier.

BACKGROUND OF THE INVENTION

This invention relates to a packaging machine for bowing open thin, flexible walled bags as the bags are advanced edgewise along a predetermined path in upright positions with the walls of each bag positioned face-to-face. A carrier is mounted on the frame of the machine for movement parallel to the path, and a bag clamp with a pair of jaws operable to swing relative to one another and biased toward one another to grip one edge portion of one bag is mounted on the carrier for movement with the carrier to support and advance the bag along the path. To bow apart the walls of the bag and open the bag, the clamp is operable to move the jaws along with the gripped edge portion of the bag relative to the carrier and toward the opposite edge portion of the bag.

SUMMARY OF THE INVENTION

The primary object of the present invention is to bow apart the walls of each bag more uniformly than has been possible heretofore thereby to cause less stressing of the walls and to produce less wrinkling and tearing of the walls.

It is a related object to accomplish the above by providing a novel bag clamp which is capable of moving one edge portion of each bag in a generally straight line toward the other edge portion in such a manner that the moving edge portion remains generally vertical as it is moved generally along a generally horizontal line. More particularly, this is achieved through the provision of a unique bag clamp in which the jaws may be shifted in a generally horizontal plane relative to the carrier to bow the bag while remaining parallel to the carrier at all times to avoid wrinkling the bag.

The invention also resides in the novel manner of mounting the jaws to provide, in one instance, a relatively inexpensive clamp and, in another instance, to cause shifting of the jaws with a pure straight-line motion.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view schematically showing a packaging machine and a plurality of bags in progressive steps of being opened, filled, and sealed closed.

FIG. 2 is a fragmentary top view of a lead bag clamp for one bag and a trailing bag clamp for the preceding bag, the latter clamp embodying the novel features of the present invention.

FIG. 3 is a fragmentary top view of the trailing bag clamp shown in FIG. 2 and illustrating the clamp in a moved position.

FIG. 4 is a fragmentary top view of the jaws of the bag clamp of FIG. 3 with the jaws shown open.

FIG. 5 is a fragmentary front elevational view of the clamps of FIG. 2.

FIG. 6 is a fragmentary cross section taken substantially along the line **6—6** of FIG. 5.

FIG. 7 is an enlarged cross section taken substantially along the line **7—7** of FIG. 5.

FIG. 8 is a partial cross section taken substantially along the line **8—8** of FIG. 3.

FIG. 9 is a partial cross section taken substantially along the line **9—9** of FIG. 3.

FIG. 10 is a fragmentary front view of a second embodiment of a trailing bag clamp incorporating the novel features of the invention.

FIG. 11 is an enlarged fragmentary cross section taken substantially along the line **11—11** of FIG. 12.

FIG. 12 is a side view of the bag clamp of FIG. 10.

FIG. 13 is a fragmentary top view of the bag clamp of FIG. 10 with parts broken away for purposes of clarity.

FIG. 14 is an enlarged fragmentary cross section taken substantially along the line **14—14** of FIG. 10.

FIG. 15 is an enlarged fragmentary perspective view of a slide mechanism forming part of the bag clamp of FIG. 10.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the drawings for purposes of illustration, the invention is embodied in a packaging machine for forming, opening, filling, closing and sealing pouches or bags **10** (FIG. 1) as the bags are advanced in upright positions along a predetermined path. The illustrated bag, several of which are shown in FIG. 1, comprises two panels or walls **11** made in this instance of flexible metal foil lined on the inside with heat-sealable material such as polyethylene film and disposed in face-to-face relation. The walls are joined together along their lower margin by a foil **12** with the two side edge portions **13** and **14** being sealed together to form a bag open at the upper end.

To support the bags **10** for edgewise advancement along the predetermined path, a pair of bag clamps **15** and **16** (FIG. 2) support the opposite edge portions **13** and **14** of each bag. Forming a part of each clamp are opposed jaws **17** and **18** with one jaw **17** being stationary and the other jaw **18** being pivotable and spring biased toward the stationary jaw. Each pair of jaws is operable to grip one edge portion of the bag. To move the bags along the path, the clamps are mounted on a conveyor or carrier **19** (FIG. 6). The carrier comprises a pair of horizontally disposed and vertically alined endless chains **20** and **21** with each chain being trained around and driven by horizontal, spaced sprocket wheels (not shown). The chains extend in a straight run from a point prior to the station for opening of the bags through the station

for sealing the bags. For rigidity, the two chains are positively guided in tracks formed between spaced, vertically disposed, and horizontally extending guide bars **22**. The guide bars are joined rigidly together by screws **23** (one shown in FIG. 6) which extend horizontally through the bars, through the spacer **24** between the bars, and into a frame member **25** thus mounting the bars rigidly on the frame.

As the bags **10** advance along the predetermined path through the opening station, the walls **11** of each bag are bowed apart to open the bag for filling. This is accomplished by two separate but synchronized actions on the bag. First, the trailing edge portion **13** is pushed generally toward the leading edge portion **14** by shifting of the trailing bag clamp **15** and, simultaneously, a pair of suction cups **26** (FIG. 1) grip the outsides of the walls and pull the latter apart. After each bag is bowed open, the bag is filled with a product such as liquid, powdered, or particle-like food substance. Following the filling operation, the edge portions of the bag are shifted away from one another by movement of the trailing bag clamp to bring the upper portions of the walls into face-to-face contact for sealing by sealing bars **27** (FIG. 1).

Because the bags **10** are made of metal foil, in this instance aluminum foil, the bowing apart and returning of the walls is a critical operation. Tiny pin holes form in the foil if the foil is crinkled, wrinkled or otherwise bent at a sharp angle thus allowing the food product within the bag to become contaminated or to leak from the bag. Additionally, the foils is extremely susceptible to stretching beyond the elastic limit of the foil. Therefore, stretch marks form in the foil if the foil is stressed nonuniformly, thus resulting in small bubbles forming when the bag is sealed by the sealing bars **27** with the possibility of some of the food product becoming trapped within the bubbles and becoming contaminated.

In accordance with the present invention, the trailing bag clamp **15** is operable to move the jaws **17** and **18** relative to the carrier **19** in a generally straight line while maintaining the jaws disposed parallel to the carrier thereby to effectively bow the bag open while reducing the danger of wrinkling the bag material. In the embodiment shown in FIGS. 2 to 9, this is advantageously accomplished by mounting the jaws of the trailing bag clamp on the upper chain **20** with a pair of upper parallel links **30** and **31** and by mounting the jaws on the lower chain **21** with a pair of lower parallel links **32** (FIG. 9) and **33** (FIG. 8), the two pair of links swinging in unison to move the jaws along and relative to the chains. With this arrangement, the trailing edge portion **13** of each bag **10** is moved in a generally straight line toward or away from the leading edge portion **14** of the bag with the trailing edge portion remaining generally vertical as it moves so as to greatly reduce the possibility of bending the foil or over stressing a small area of the foil thus creating pin holes in the foil or stretching the same. Moreover, the generally straight line movement of the trailing edge portion of the bag results in more positive and uniform bowing apart of the walls than has been possible heretofore. Additionally, with the embodiment of FIGS. 2 to 9, the trailing bag clamp is mounted to both chains **20** and **21** for greater stability of the jaws than has been possible heretofore.

In the embodiment of FIGS. 2 to 9, the links **30, 31, 32** and **33** are each pivotally connected to the respective chains **20** and **21** and pivotally connected to the jaws **17** and **18**, while being kept in parallel relationship, so that the links can swing in unison about their respective pivotal connections to the chains thus moving the jaws along and relative to the chains. Because the jaws are pivotally connected to the links which are maintained parallel, the jaws are kept parallel to the chains while being moved along the chains. As best shown in FIGS. 8 and 9, the inner end portion of each link is formed with a vertically extending hole **35**. To connect each link

pivotally to the respective chain, the free end portion of a pin **36** connected to and extending vertically through the chain extends through the hole. The pin is formed with an annular groove **36***a*, and a screw **37** extends through the link and into the groove to keep the pin from sliding out of the hole.

In this instance, the lower links **32, 33** are formed integrally with a vertically disposed member **38** (FIG. 9), **39** (FIG. 8), respectively, and these members are formed with vertical bores **40** (FIG. 9) and **41** (FIG. 8) extending therethrough. The outer end of each of the upper links **30** and **31** is rigidly connected to a respective member intermediate the ends of the member. With this arrangement, one upper link and one lower link are rigid with each member, and the upper link is positioned parallel with and directly over the lower link for movement of the upper link, the lower link, and the member as a single unit.

The jaws **17** and **18** are mounted across the upper end of the two members **38** and **39** and are connected to the members for pivotal movement relative to the members and thus to the parallel links **30, 31, 32** and **33**. As best shown in FIG. 5, the stationary jaw **17** is L-shaped with a vertically extending jaw face **44** and a horizontal mounting arm **45** (FIG. 5) which extends across the upper ends of both members. To mount the arm on the member **39**, a rod **46** (FIG. 8), rigidly connected at its upper end portion by a pin **47** to the end portion of the arm opposite the jaw face, extends vertically downwardly through a plastic washer **48**, through bushings **49** in the bore **41**, through a second plastic washer **50**, and through one end portion of a connecting link **51** (FIG. 7) to which the rod is rigidly connected by a pin **52** that extends horizontally through the connecting link and the rod. Intermediate the ends of the arm, the latter is connected pivotally by a tube **54** (FIG. 9) to the other end portion of the connecting link **51**. The tube extends through bushings **55** in the upper and lower end portions of the bore **40** of the member **38** and through plastic washers **56** and **56***a* at the upper and lower ends of the member to mount the arm of the jaw for pivotal movement relative to the member **38** and thus the upper link **30** and lower link **31** connected to that member.

With the above arrangement, the upper parallel links **30** and **31** and the lower parallel links **32** and **33** are spaced horizontally a fixed distance apart at their inner ends by the connections of the links to the chains **20** and **21** and fixed a like distance apart at their outer ends by the pivotal connections of the mounting arm **45** of the jaw **17** and the connecting link **51** to the members **38** and **39**. Therefore, when one parallel link is swung about its respective pivotal connection to the one chain, all of the parallel links are swung in unison with the upper links remaining parallel to one another and with the lower links remaining parallel to one another. With this type of parallel movement of the links, the mounting arm **45** and the connecting link **51** are kept parallel to the chains throughout the entire movement of the parallel links. From FIG. 2, it will be observed that the upper parallel links and the chain **20** along with the mounting arm **45** form a parallelogram which can swing due to the pivotal connections at all four corners but in which the various opposed sides must remain parallel. Since the mounting arm forms part of the stationary jaw **17** and since the movable jaw **18** is biased toward and against the fixed jaw, both jaws are maintained parallel to the chains **20** and **21** while being moved along the chains when the parallel links swing.

As each bag **10** is moved along the path prior to entering the opening station, the trailing bag clamp **15** is biased in an upstream direction to a normal position and is disposed such that the trailing edges of the parallel links **30, 31, 32** and **33** each form an acute angle with the respective chains **20** and **21** as shown in FIG. 2. When the bag enters the opening station, the parallel links are swung

counterclockwise to move the jaws **17** and **18** in a downstream direction toward the leading bag clamp **16** and into a bowing position as shown in FIG. 3, thus moving the edge portion **13** of the bag nearer to the edge portion **14** and bowing out the walls **11** of the bag. In this instance, the trailing bag clamp is biased into and held in the normal position by a tension spring **58** (FIG. 2) connected between an upstanding pin **59** mounted on the parallel link **31** and an upstanding pin **60** mounted on the leading bag clamp **16** for the adjacent trailing bag. To establish the normal position and hold the trailing bag clamp against the action of the spring, a stop **61** extends forwardly from the leading bag clamp **16** for the adjacent trailing bag and contacts the link **31** when the trailing bag clamp is in the normal position. For swinging the trailing bag clamp from its normal position to its bowing position against the force of the spring **58**, an operator **63** (FIG. 2) comprising an arm **64** and a follower **65** rotatably journaled on one end portion of the arm is rigidly connected by a screw **66** to the upper parallel link **30**. As the trailing bag clamp advances into the opening station, the follower is engaged and swung counterclockwise by a cam track **67** on the frame (FIG. 3) thus swinging the link **30** to move the clamp to the bowing position. From FIGS. 2 and 3, it will be seen that the parallel links travel through a relatively small angle from the normal to the bowing position, and the links move to positions nearly perpendicular to the jaws and chains thus resulting in the jaws moving along a generally straight line between the normal and the bowing positions and staying parallel to the chains **20** and **21**. As a result, the bag is bowed open without improperly stressing the walls **11** thus reducing the possibility of material of the bag being wrinkled, or bent or improperly stretched.

The movement of the trailing bag clamp **15** between the normal and bowing positions is used not only to help open the bag **10** prior to filling but also to close the bag after filling and prior to sealing. Before the open top of the bag can be sealed closed by the seal bars **27**, the upper edge portions of the walls **11** must be brought into flat, smooth, face-to-face engagement. This is accomplished by terminating the cam track **67** short of the sealing station thus removing pressure from the operator **63** and allowing the spring **58** to return the trailing bag clamp from the bowing position to the normal position. As the clamp returns to the normal position, the jaws **17** and **18** move along a generally straight line and pull the trailing edge portion **13** of the bag in an upstream direction to force the upper edge portions of the walls to move into flat face-to-face engagement ready to be sealed. The mounting of the jaws above the members **38** and **39** positions the jaws advantageously to grip the edge portion of the bag just below the area to be sealed by the sealing bars **27** to place the maximum stress close to the area to be sealed. From FIG. 5, it will be observed that the jaws **17***a* and **18***a* of the leading bag clamp **16**, the leading bag clamp for each bag **10** being the same, are positioned at the same elevation as the jaws **17** and **18** so that, when the trailing bag clamp returns to the normal position, the tension placed on the upper edge portions of the walls **11** acts on a horizontal line between the jaws of the leading and trailing bag clamps.

As shown in FIG. 4, the movable jaw **18** comprises a short arm portion **69** which overlies the mounting arm **45** of the stationary jaw **17**. A jaw face **70** is formed on one end portion of the arm **69** for face-to-face engagement with the jaw face **44** of the stationary jaw. The movable jaw is mounted above the arm **45** and on the tube **54** for pivotal movement relative to the stationary jaw and about the vertical axis of the tube, and a plastic washer **71** (FIG. 9) encircling the tube separates the stationary jaw and the movable jaw. Herein, the tube extends through a hole **72** (FIG. 4) in the arm portion of the movable jaw, and a slot **73** is formed from the hole to the end of the arm portion opposite the jaw face to divide the arm portion into two branches. To clamp the stationary jaw to the tube, a bolt **74** extends horizontally through the two branches and is tightened to force the two branches toward one another.

Advantageously, the movable jaw **18** is biased toward and against the stationary jaw **17** by a uniquely arranged torsion spring rod **75** (FIG. 9) of resiliently yieldable metal and, in this manner, the jaws are controlled by a spring which acts directly proportional to the force exerted against it for better control of the jaws. Moreover, the torsion rod is positioned within the bore **40** to encase the rod within the member **38** which forms a housing thus resulting in no external spring components being present so as to eliminate any potential problems which might be caused by a food product spilling onto the spring and lodging and decomposing there to become a potential contaminant. In this instance, the torsion rod extends vertically through the tube **54** within the member **38**, and the upper end portion of the rod, the upper end portion being enlarged, is clamped to the tube and thus to the movable jaw by tightening the bolt **74**.

In this instance, the tube **54** and the torsion rod **75** are mounted in such a manner that the entire length of the torsion rod is utilized and the movement of the movable jaw **18** can be controlled from a point well below the jaw. The lower end portion of the tube is pivotally journaled in the connecting link **51**, and the lower end portion **76** of the torsion rod, the lower end portion being enlarged and square, extends beyond the bottom end of the tube and is locked to the connecting link by a set screw **77** (FIG. 9). In this way, the movable jaw can be swung about the axis of the tube by rotating the tube and, when the tube is rotated to move the face **70** of the movable jaw away from the face **44** of the stationary jaw, the torsion rod is twisted and tensioned thus urging the movable jaw toward the stationary jaw. To rotate the tube and swing the movable jaw at preselected locations along the bag path, one end portion of the arm **79** (FIG. 9) of an operator **80** is clamped around the tube just above the connecting link **51** for rotation with the tube, and a cam follower **81** is journaled on the other end portion of the arm **79**. As shown in FIG. 4, the movable jaw is swung by the tube to open the jaws when the operator is forced to swing clockwise as the cam follower engages a cam track **82** fastened to the frame **25**.

For the jaws **17** and **18** to grip the trailing edge portion **13** of the bag **10**, the movable jaw **18** must be biased counterclockwise (FIG. 2) when the jaw faces **44** and **70** are face-to-face with the trailing edge portion therebetween. For this reason, the torsion rod **75** is preloaded before the branches of the arm **69** of the movable jaw are forced toward one another to clamp the tube **54**, the torsion rod, and the movable jaw together. The degree of force biasing the jaw faces together can be set by placing the blade of a screwdriver (not shown) in a slot **84** (FIG. 4) in the top of the torsion rod, turning the torsion rod clockwise to preload the latter the desired amount, and then clamping the movable jaw to the tube and the torsion rod. It will be observed that the movable jaw can be biased against the stationary jaw with any desired degree of force within the elastic limits of the torsion rod in the above manner.

The construction of the trailing bag clamp **15** with the parallel links **30**, **31**, **32** and **33** is a particularly advantageous arrangement because a generally straight line movement of the jaws **17** and **18** along the chains **20** and **21** is achieved at a relatively low construction cost. The trailing bag clamp is operable to bow open the bag effectively while reducing the possibility of wrinkling or improperly stretching the bag material, and this is accomplished with comparatively few parts which are assembled in a relatively simple manner.

A modified trailing bag clamp **100** embodying the novel features of the invention is shown in FIGS. 10 through 15 in which parts corresponding to those of the first em-

bodiment are indicated by the same but primed reference numerals. Like the trailing bag clamp **15** of the first embodiment, the trailing bag clamp **100** includes a movable jaw **18'** (FIG. 13), a stationary jaw **17'**, a torsion rod **75'** (FIG. 10) connected to the movable jaw to bias the jaw counterclockwise (FIG. 13) against the stationary jaw, and a carrier **19'** comprising a chain **20'** for supporting the bag clamp and moving the latter with the bag **10** through the opening, filling, and sealing stations. As in the embodiment of FIGS. 2 through 9, the jaws **17'** and **18'** of the embodiment of FIGS. 10 through 15 are moved relative to the chain **20'** while being maintained parallel to the chain to bow out the walls **11** of the bag and to reduce the danger of wrinkling, bending or improperly stretching the bag material. In this instance, however, the jaws are moved with a pure straight line motion in which the jaws move directly parallel to the carrier.

Herein, the trailing bag clamp **100** comprises, in addition to the jaws **17'** and **18'**, a slide support **101** (FIG. 12) which is connected rigidly to the upper surface of the chain **20'**, and a horizontally disposed slide **102** mounted on the slide support. The jaws are mounted on the slide for straight line, horizontal movement with the slide parallel with and relative to the slide support and the chain between the normal and bowing positions to accomplish bowing of the walls **11** of the bag **10**. To mount the jaws on the slide for movement with the slide, the stationary jaw **17'** is carried on the upper end of a vertically disposed mounting member **38'** (FIG. 12) which is mounted on the outer face of the slide by a screw **105**. The rear portion (FIG. 10) of the mounting member is formed as a vertical, hollow, closed bottom, cylindrical housing **106** with the movable jaw **18'** being pivotally mounted on the upper end of the housing with a plastic washer **56'** between the arm **69'** of the jaw and the top of the housing. In this instance, the movable jaw is biased toward the stationary jaw by the torsion rod **75'** which is housed within the housing with the upper end of the torsion rod extending through the mounting arm **69'** and rigidly fixed by a set screw **107** (FIG. 13) to the arm. A bushing **108** (FIG. 10) is positioned within the upper end portion of the hollow interior of the housing to support the torsion rod for rotation while spacing the rod from the inside faces of the walls of the housing. At its lower end portion, the torsion rod is rigidly connected to the housing by a pin **109** (FIG. 11). So that the jaws will grippingly engage the bag when the jaws are closed, the torsion rod is preloaded during assembly of the trailing bag clamp **100**. Before the set screw **107** is tightened, the tip of a screw driver (not shown) is placed in a slot **84'** (FIG. 13) in the upper end of the torsion rod, and the torsion rod is rotated clockwise (FIG. 13) sufficiently far to insure that the torsion rod will place the desired biasing force on the closed jaws.

In this embodiment, the operator **80'** (FIG. 13) is formed as an integral part of the movable jaw arm **69'**, and a cam follower **81'** is rotatably mounted on the free end of the operator. To swing the movable jaw arm clockwise (FIG. 13) about the torsion rod **75'** to move the jaw faces apart and open the jaws **17'** and **18'**, the cam follower contacts a cam track (not shown) which forces the operator arm to swing clockwise about the axis of the torsion rod thus swinging the movable jaw arm. Such swinging stresses the torsion rod even further so that the movable jaw will return to engagement with the stationary jaw when the cam follower is removed from the cam track.

So that the jaws **17'** and **18'** can be moved along and parallel to the chain **20'** in a straight line, the slide **102** is mounted on the slide support **101** for horizontal sliding movement relative to the slide support. As shown in FIG. 15, the slide is formed as a flat, elongated member

115 with a block **116** extending from the central portion of the member. In this instance, the slide support **101** is formed in two pieces **117** and **118** (FIG. 14) which abut in a vertical plane and are held together by screws **119** (FIG. 12), and the slide rides in a slot **120** (FIG. 12) formed horizontally along the outer vertical wall of the outside piece **117**. The end portions of the slot extend into the piece **117** a depth equal to approximately one-half of the thickness of the flat elongated portion of the slide while the central portion of the slot, the central portion being of greater length than the length of the block, extends completely through the outside piece. To mount the slide on the outside piece, the block extends through the central portion of the slot, and a depending flange **121** (FIG. 14) formed on the bottom of the block rides in the bottom portion of the recess **122** formed in the inner face of the outside piece, the recess being of the same length as the central portion of the slot but extending above and below the slot.

The slide **102** is moved back and forth along the slot **120** through the use of a pin-and-slot arragnement. To form the slot, a leg **123** (FIG. 15) extends upwardly from the upper surface of the block **116** with the leg riding in the upper portion of the recess **122**, and a vertical slot **124** is formed in the leg dividing the latter in half. A pin **125** mounted in the upper end portion of a link **126** rides in the slot **124**, and the link and pin are swung about a horizontal axis which extends transversely of the slide support, the link being positioned within a recess **127** (FIG. 14) formed in the wall of the inside piece **118**. As the pin is moved, it bears against the leg **123** and forces the latter to move, and thus the slide is moved along the slot **120**. For swinging the link and the pin, the lower end portion of the link is rigidly mounted on one end portion of a rod **129** which extends transversely through the inside piece and is journaled in a bearing **130** (FIG. 14) in the piece. To rotate the rod and swing the link and thus the pin, an operator **131** (FIG. 13) is connected to the other end portion of the rod. The operator is formed with a sleeve portion **132** (FIG. 14) which extends over the rod and is locked to the latter by a set screw **133** (FIG. 12) and also is formed with an arm **134** (FIG. 13) extending at a right angle from the sleeve with a cam follower **135** journaled on the end portion of the arm. Pressure on the cam follower swings the arm thus turning the rod and moving the slide to shift the jaws **17'** and **18'** to the bowing position.

To maintain the jaws **17'** and **18'** in the normal position, the slide **102** is biased in an upstream direction. In this instance, a compression spring **137** (FIG. 13) is compressed between the block **116** and the downstream wall **138** of the recess **122** in the outide piece **117** thus biasing the slide toward the normal position. One end portion of the spring is seated in a circular recess **139** (FIG. 15) formed in the block, and the other end of the spring abuts against an adjusting screw **140** (FIG. 13) extending through the wall **138**, the loading of the spring being adjusted by turning the screw. To adjust the extent of the movement of the slide in the slot **120**, a set screw **141** (FIG. 13) extends through the upstream wall **142** of the outside piece for abutment against the upstream face of the block to define the upstream limit of travel of the slide. The set screw is turned to define the desired travel, and a jam nut **143** is then placed on the end portion of the set screw to lock the set screw in place.

It will be observed that the mounting of the jaws **17**, **17'** and **18**, **18'** of the trailing bag clamp **15**, **100** for movement horizontally and relative to the carrier **19**, **19'** in a generally straight line in such a manner that the jaws are maintained parallel to the carrier is a particularly advantageous arrangement. With this arrangement, the walls **11** of the bag **10** gripped by the jaws can be bowed apart in a uniform manner as the jaws are moved from

the normal position to the bowing position, and this uniform bowing tends to prevent uneven stressing of the walls and wrinkling or tearing of the walls. Further, the jaws are returned to the normal position after filling of the bag along the same generally straight line to close the upper end portion of the bag smoothly and without improper stress on the walls so that the upper end portion of the bag can be sealed without danger of a tear or a hole or a small pocket being formed therein. Advantageously, the movable jaw **18**, **18'** is biased toward the stationary jaws **17**, **17'** by a torsion rod **75**, **75'** which is enclosed. In this manner, the jaws are biased for better control by a spring which acts in direct proportion to the force exerted on it, and the spring components are mounted within an outer housing to eliminate a potential contamination problem.

We claim as our invention,

1. In a machine for opening thin, flexible walled bags as the bags are advanced edgewise along a predetermined horizontal path in upright positions with the walls of each bag positioned face-to-face, the combination of, a frame, a carrier mounted on said frame for movement generally parallel to the path, and a bag clamp mounted on the carrier for movement with said carrier and operable to support one edge portion of one bag to advance the bag along the path as an incident to movement of the carrier, said bag clamp comprising a pair of jaws operable to grip the one edge portion of the bag, means disposed between said carrier and said jaws and mounting said jaws for movement relative to said carrier in a generally horizontal plane while keeping the jaws disposed parallel to said carrier, and an operator for selectively actuating said means whereby the edge portion of the bag gripped by said jaws can be moved in a generally straight line toward the opposite edge portion to bow the walls apart and open the bag upon actuation of said operator.

2. The machine of claim **1** in which one jaw of said pair of jaws is pivotally mounted on said means for movement toward and away from the other jaw, and including a torsion rod of resiliently yieldable material connected to said movable jaw and operable to bias said movable jaw toward said other jaw, said torsion bar being wound up against the resiliency of said material when said movable jaw is moved away from said other jaw.

3. The machine of claim **2** further including a housing connected to said jaws, said torsion rod being positioned within and protected by said housing.

4. The machine of claim **1** in which the carrier comprises two vertically spaced chains, said bag clamp being connected to each said chain so that said jaws are mounted on said carrier with greater stability.

5. The machine of claim **1** in which said means comprises a pair of parallel links with one end of each link being pivotally connected to said carrier and the other end of each link being pivotally connected to said jaws so that actuation of said operator pivots said parallel links about the pivotal connections to said carrier thus moving the jaws relative to the carrier.

6. The machine of claim **1** in which said means comprises a slide mounted on said carrier for linear sliding movement parallel with the path, and said jaws being mounted on said slide for movement therewith.

7. In a machine for opening thin flexible walled bags as the bags are advanced edgewise along a predetermined horizontal path in upright positions with the walls of each bag positioned face-to-face, the combination of, a frame, a carrier mounted on said frame for movement generally parallel to the path, and a bag clamp mounted on the carrier for movement with the carrier and operable to support one edge portion of one bag to advance the bag along the path as an incident to movement of the carrier,

said bag clamp comprising, a pair of jaws operable to grip the bag, a pair of parallel links each pivotally connected at one end to said carrier and pivotally connected at the opposite end to said jaws thus mounting said jaws on said carrier for movement relative to said carrier in a generally horizontal plane while keeping the jaws disposed parallel to said carrier, and an operator for selectively swinging said links toward the edge portion of the bag gripped by said jaws whereby such edge portion can be moved in a generally straight line toward the opposite edge portion to bow the walls apart and open the bag upon actuation of said operator.

8. The machine of claim **7** further including a second pair of parallel links aligned with and spaced vertically from the first said pair of parallel links, generally vertically extending connector means joining said pairs of links for movement in unison, and said jaws being mounted on said connector means.

9. The machine of claim **8** in which one jaw of said pair of jaws is mounted on said connector means for movement toward and away from the other jaw, and a torsion bar connected to said movable jaw and operable to bias said movable jaw toward said other jaw, said torsion bar being wound up against the resiliency of said material when said movable jaw is moved away from said other jaw.

10. The machine of claim **9** in which a portion of said connector means is hollow and in which said torsion bar extends into said hollow portion so that said connector means forms a protective housing for said torsion bar.

11. In a machine for opening thin flexible walled bags as the bags are advanced edgewise along a predetermined path in upright positions with the walls of each bag positioned face-to-face, the combination of, a frame, a carrier mounted on said frame for movement generally parallel to the path, and a bag clamp mounted on the carrier for movement with the carrier and operable to support one edge portion of one bag to advance the bag along the path as an incident to movement of the carrier, said bag clamp comprising a pair of jaws operable to grip said one edge portion of the bag, a support mounted on said carrier, a slide mounted on said support for linear sliding movement relative to and parallel with the carrier, said jaws being mounted on said slide for movement with the slide, and an operator for selectively moving said slide toward the edge portion of the bag gripped by said jaws whereby such edge portion can be moved in a generally straight line toward the opposite edge portion to bow the walls apart and open the bag.

12. The machine of claim **11** in which said operator comprises a crank arm, a generally horizontal rod rigid at one end with said crank arm and pivotally journaled in said support, a link rigidly attached on the other end of said rod, a pin mounted on said link, a vertical slot in said slide with said pin riding in said slot so that selective swinging movement of said crank arm rotates said rod to swing said link and move said pin along an arc thus pushing the slide and moving the jaws along the path.

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