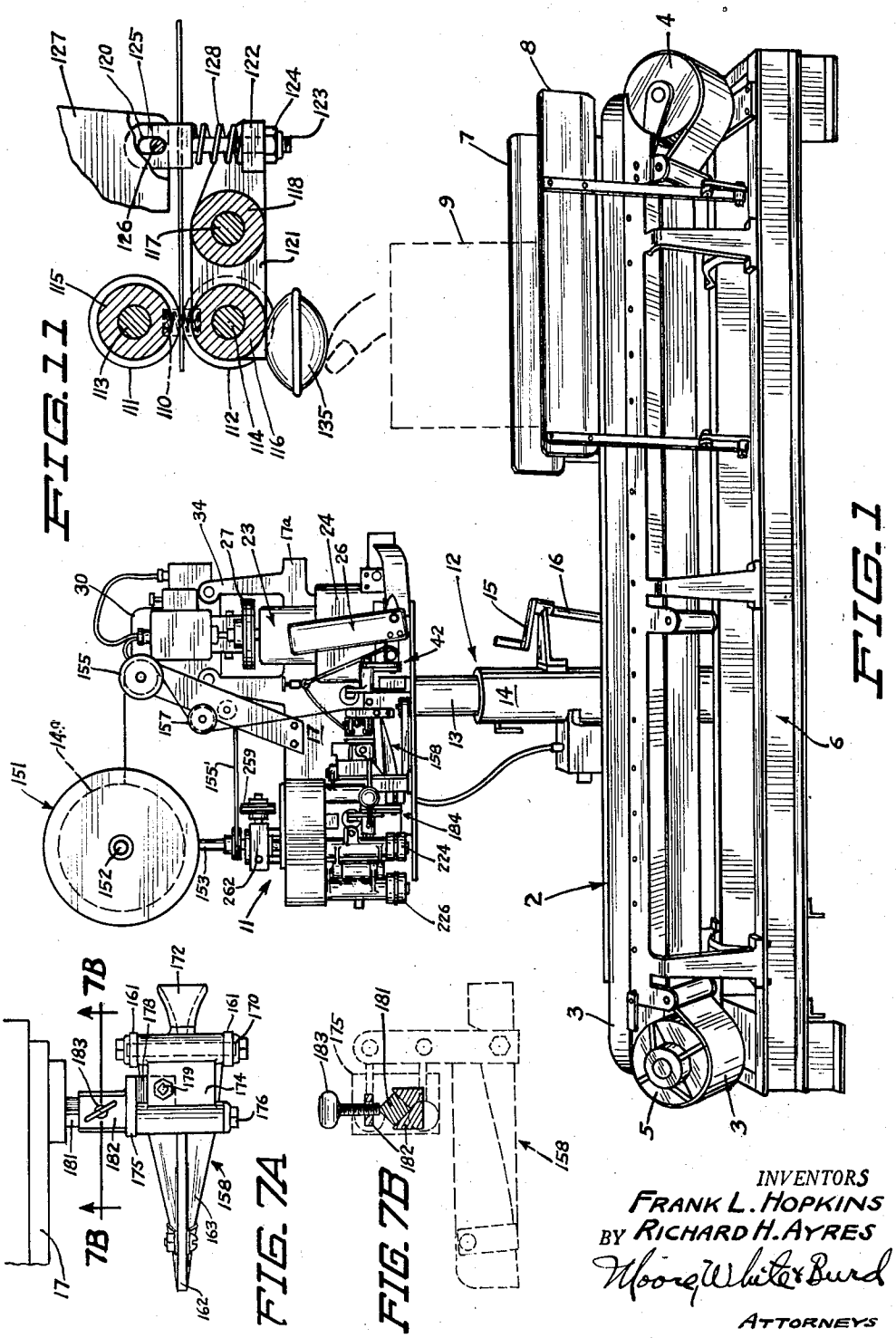
Aug. 5, 1958 F. L. HOPKINS ET AL 2,845,760

BAG TOP CLOSING AND SEALING MACHINE

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BAG TOP CLOSING AND SEALING MACHINE

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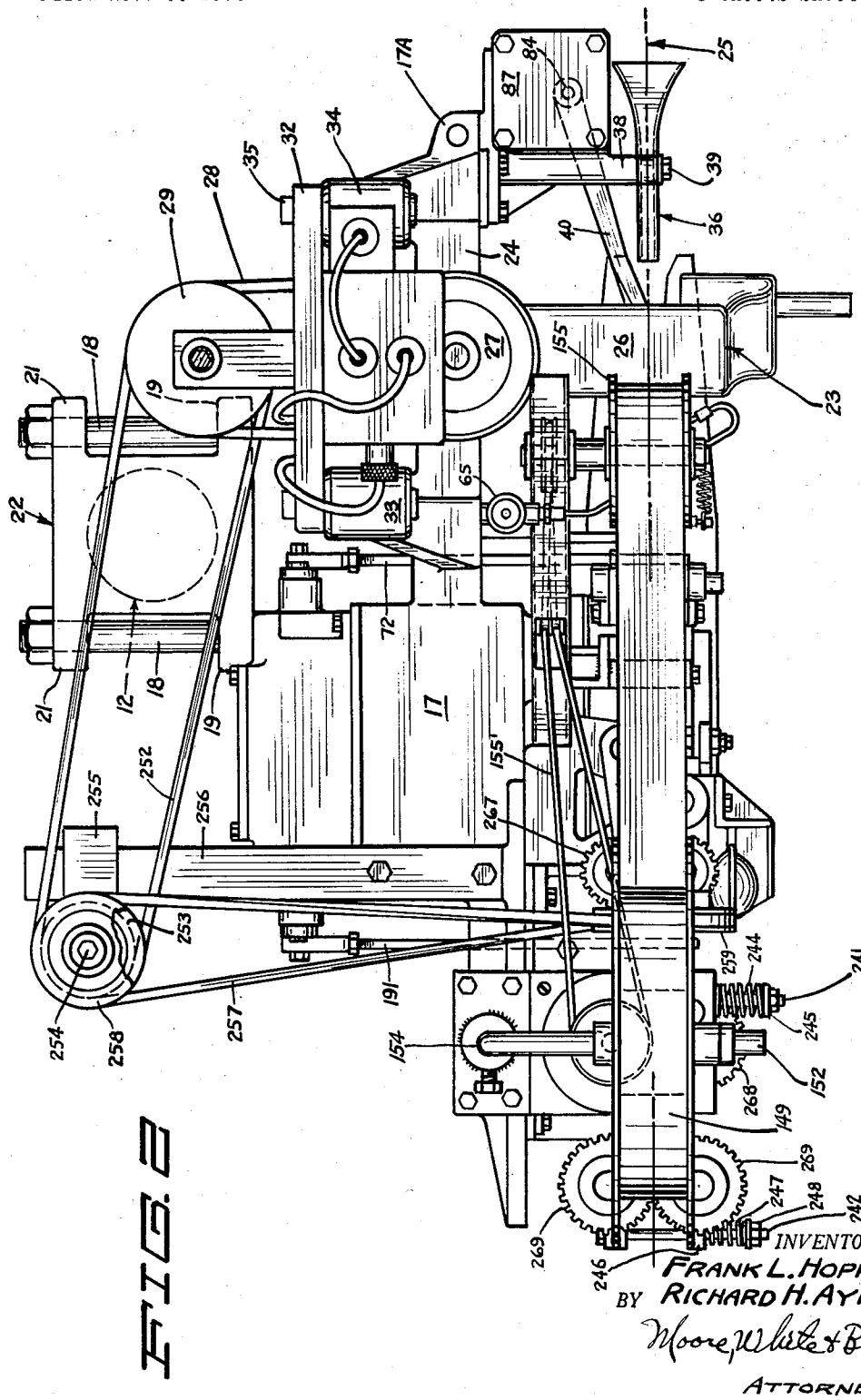


FIG. 2

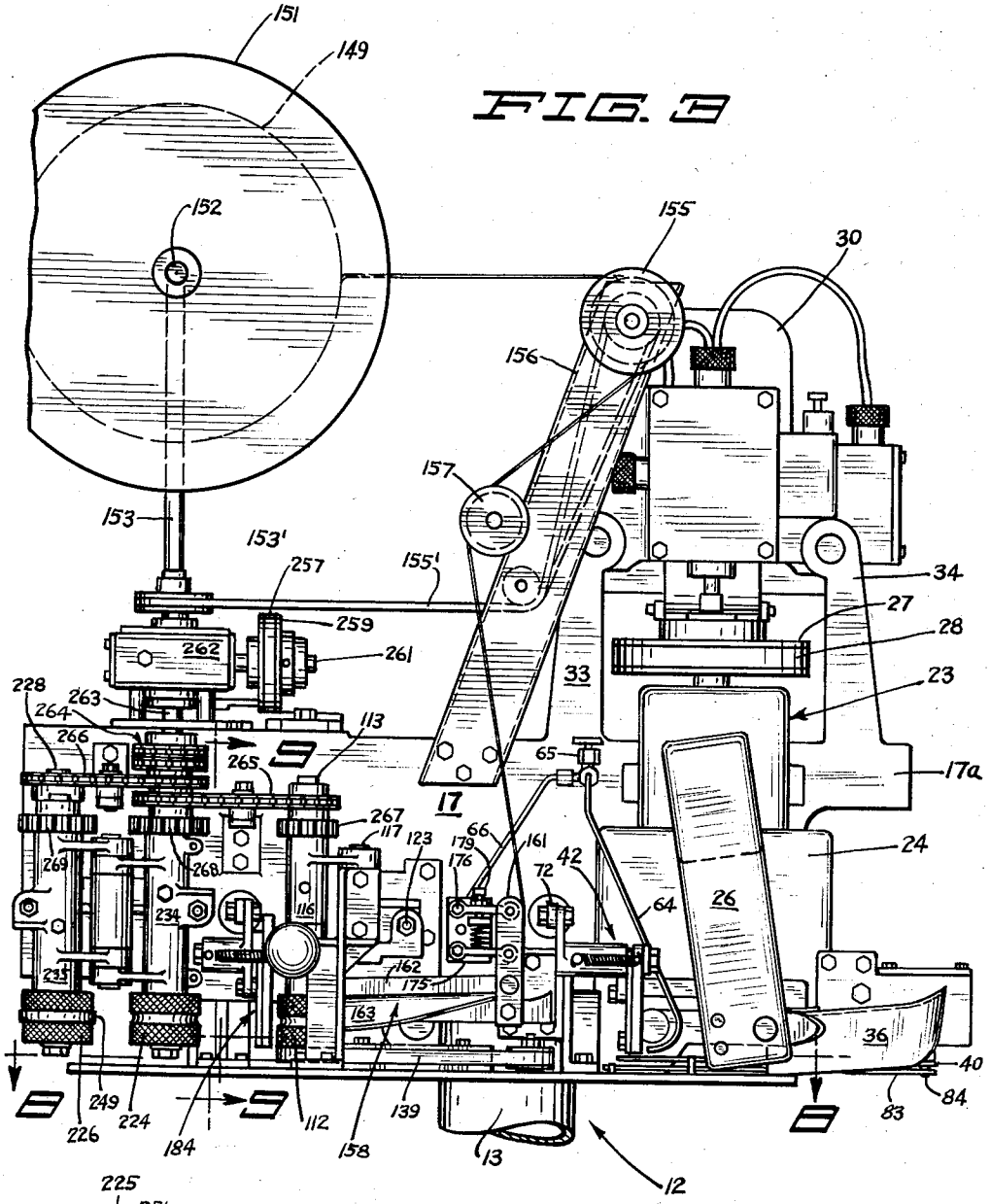
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BAG TOP CLOSING AND SEALING MACHINE

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FIG. 8



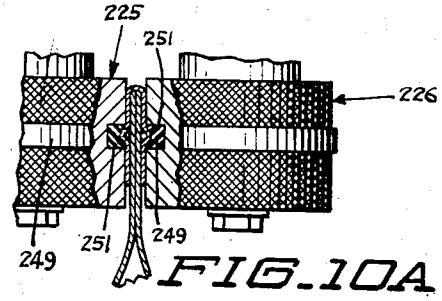


FIG. 10A

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FIG. 4

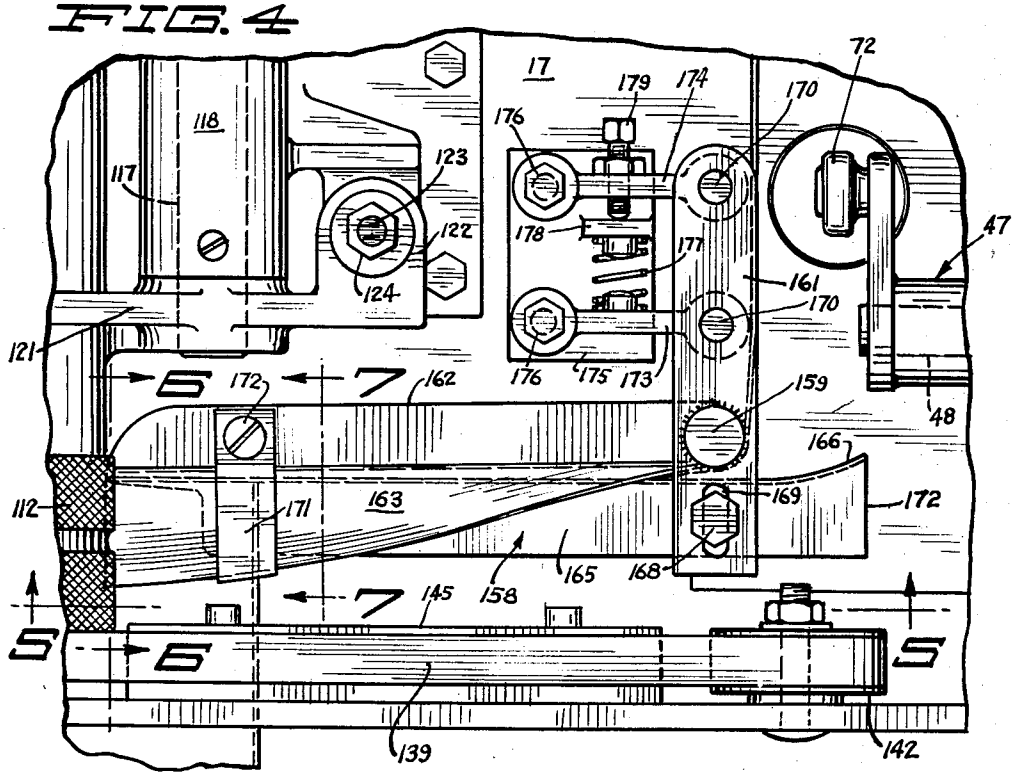


FIG. 5

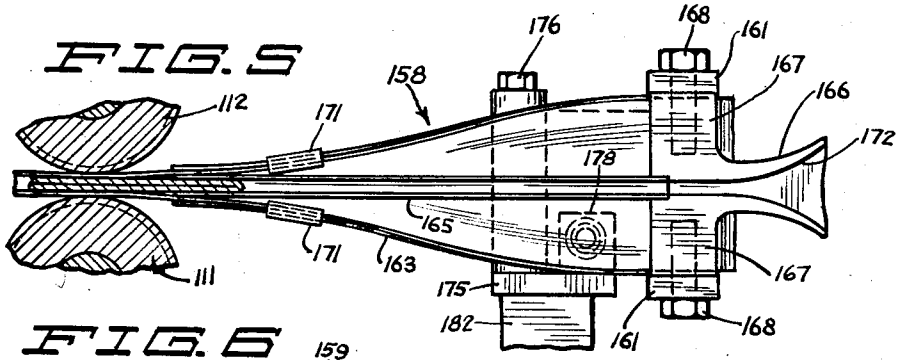


FIG. 6

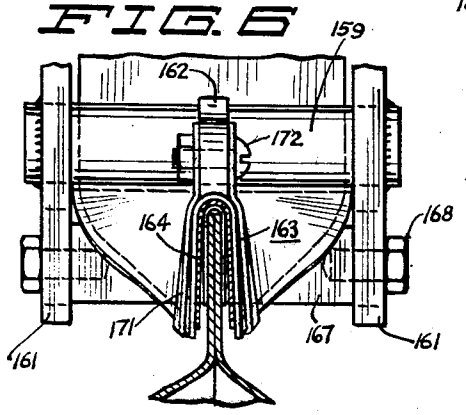
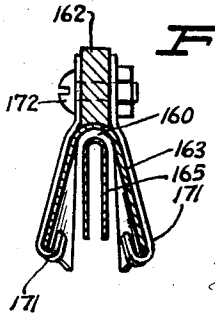


FIG. 7



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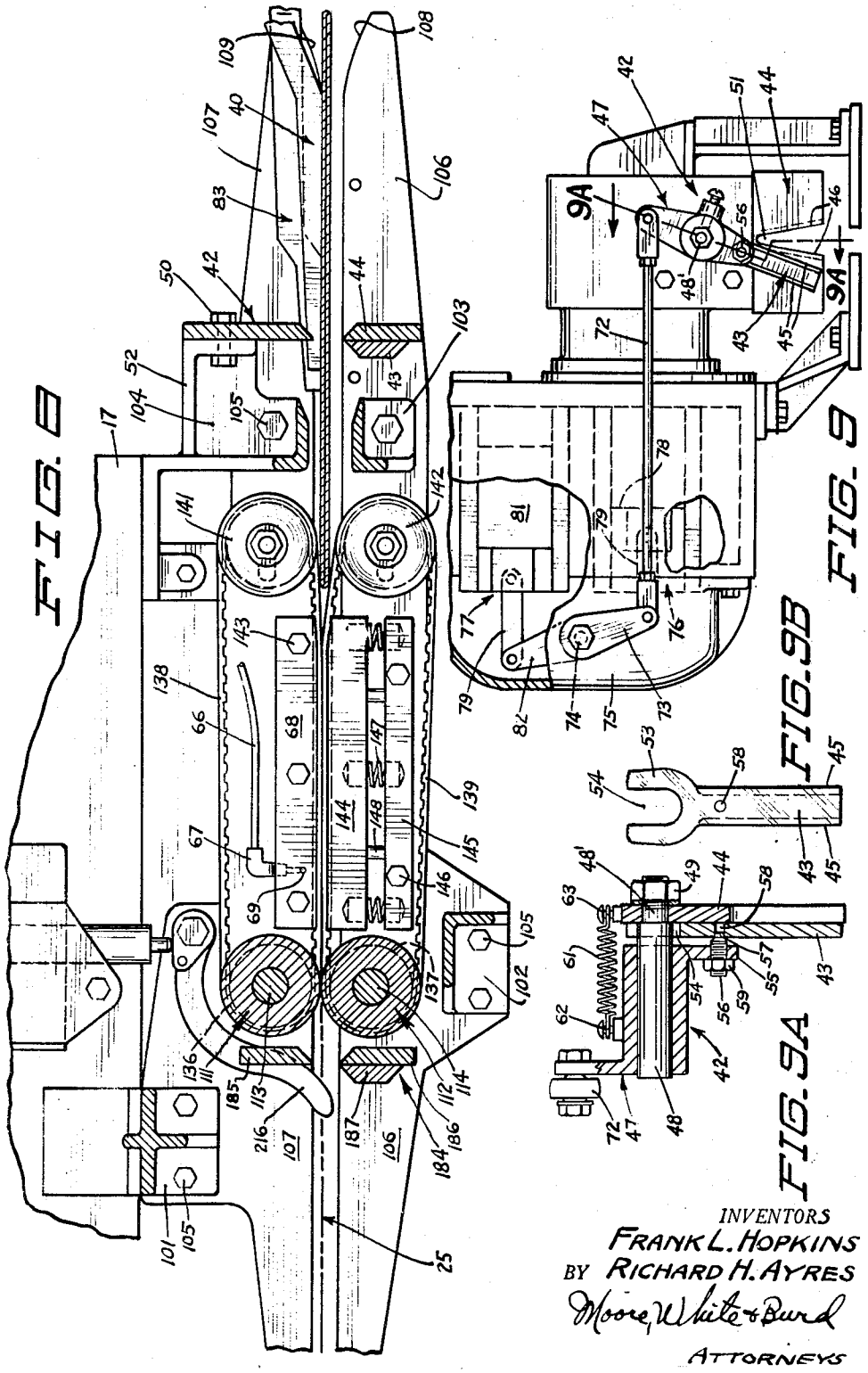


FIG. 8

FIG. 9

FIG. 9B

FIG. 9A

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BAG TOP CLOSING AND SEALING MACHINE

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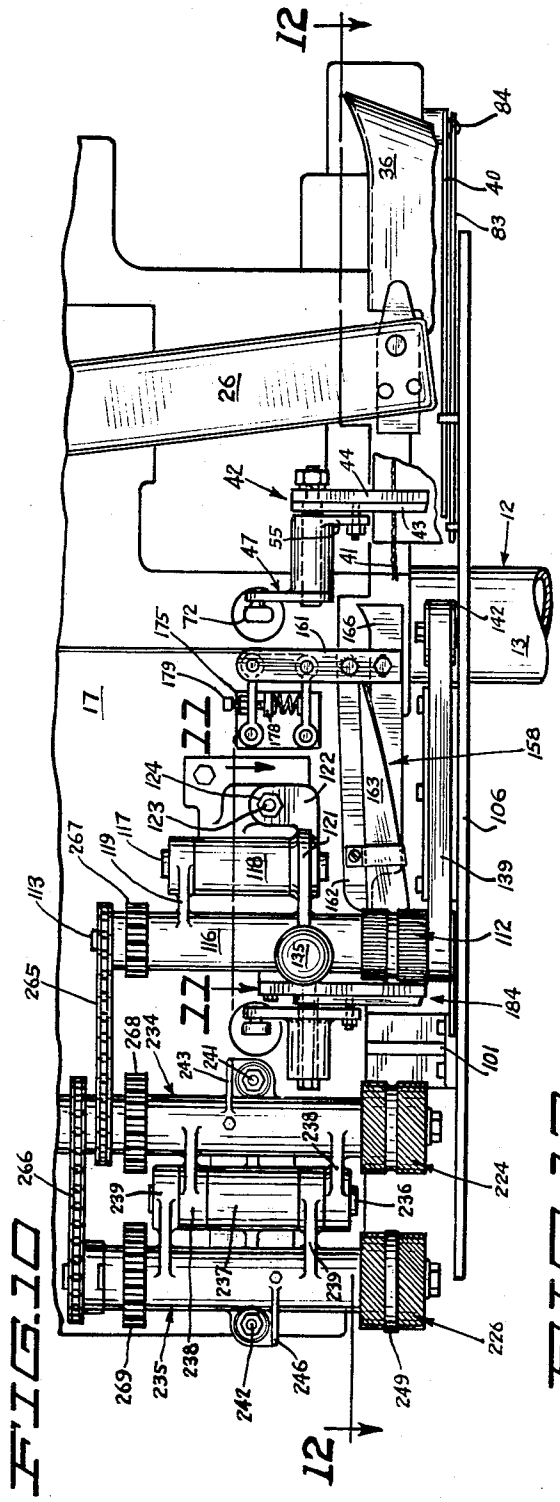


FIG. 10

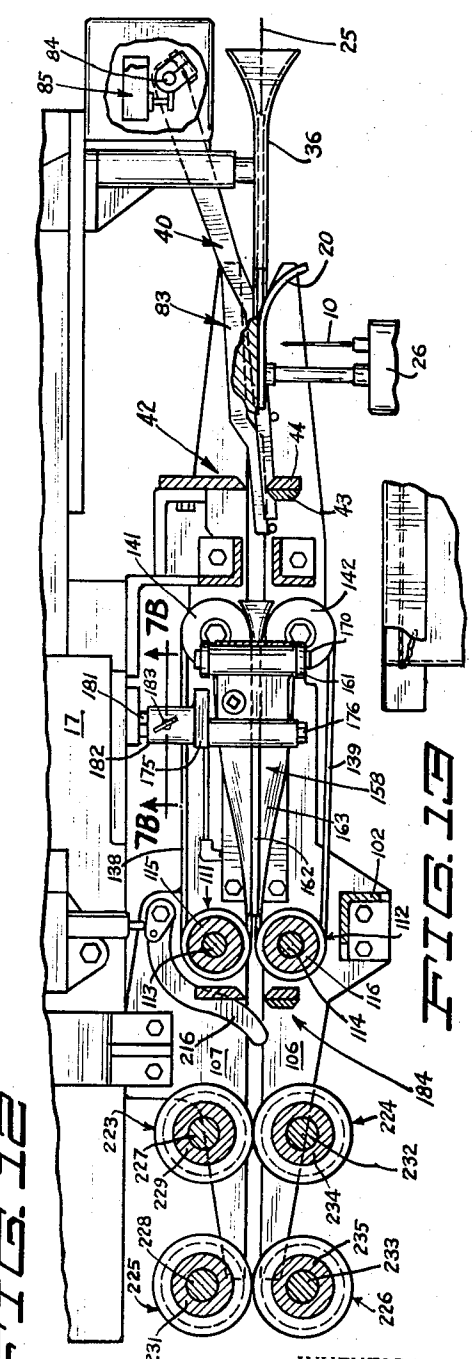


FIG. 12

FIG. 13

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BAG TOP CLOSING AND SEALING MACHINE

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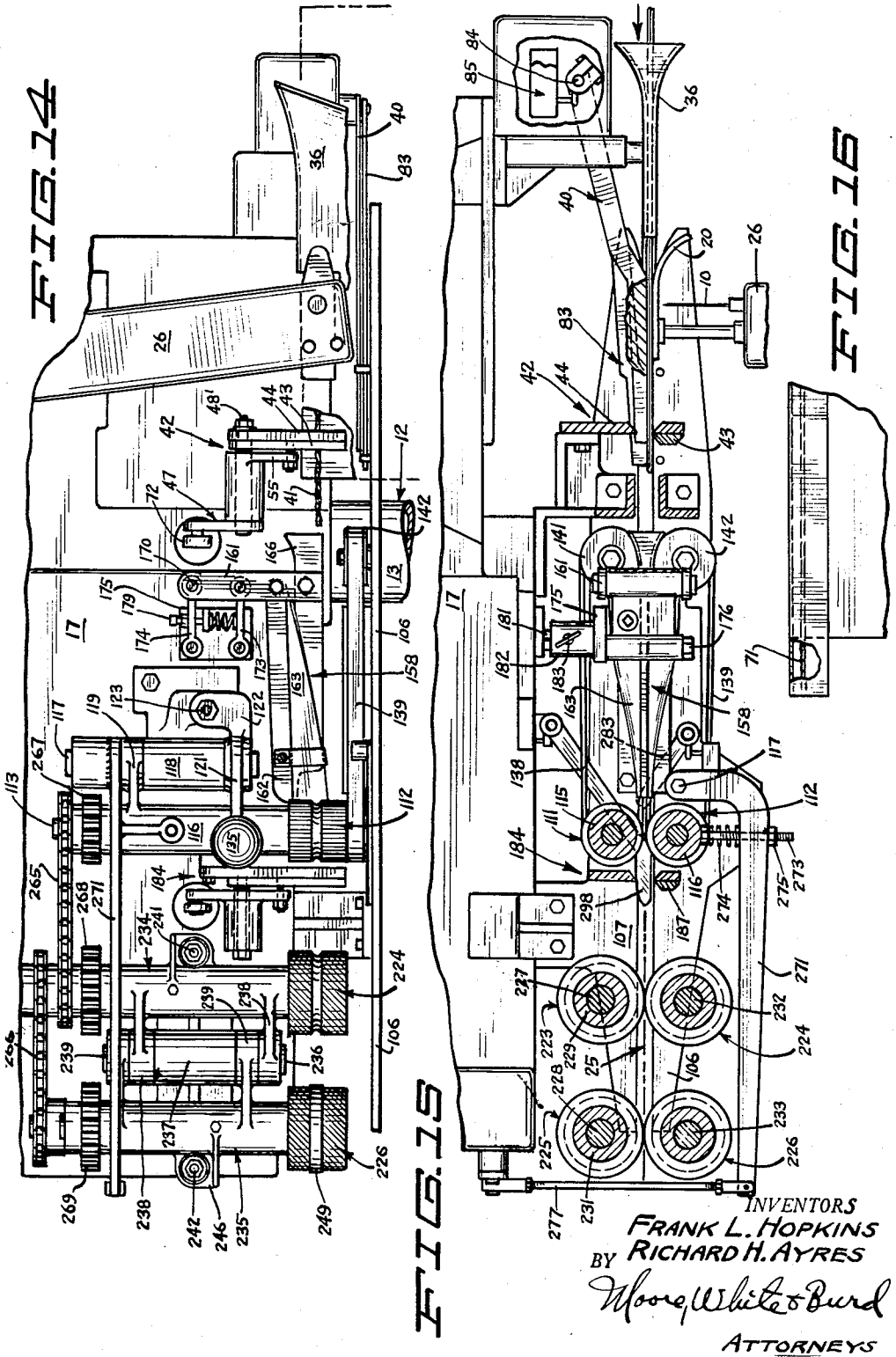


FIG. 14

FIG. 15

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BAG TOP CLOSING AND SEALING MACHINE

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FIG. 17

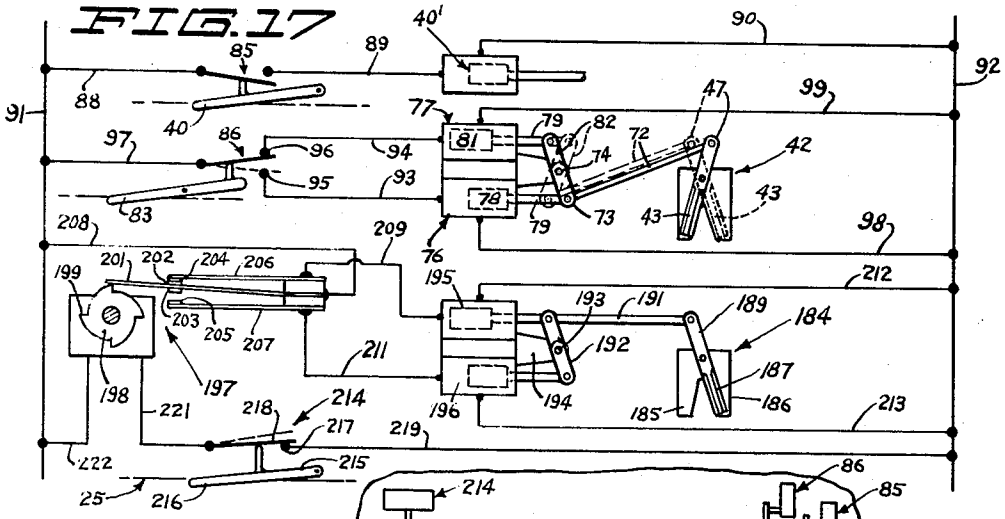


FIG. 18

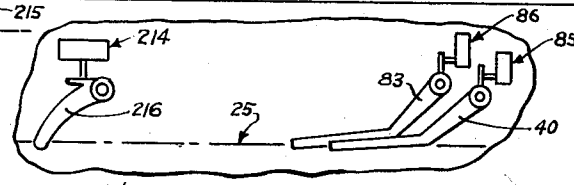
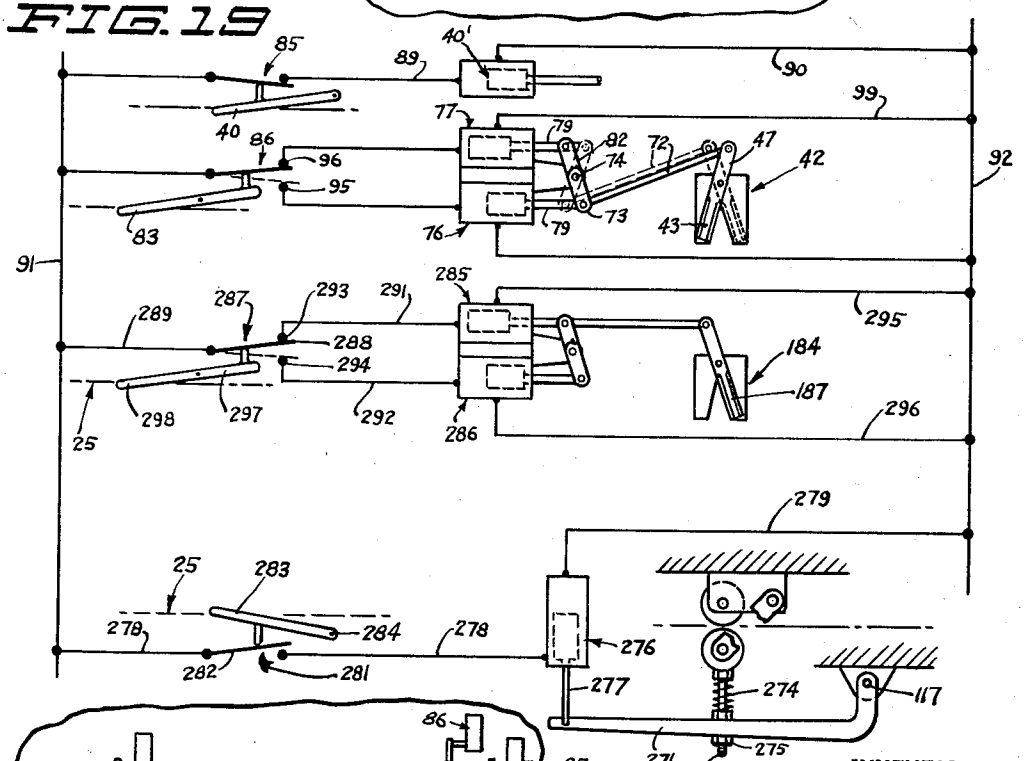


FIG. 19



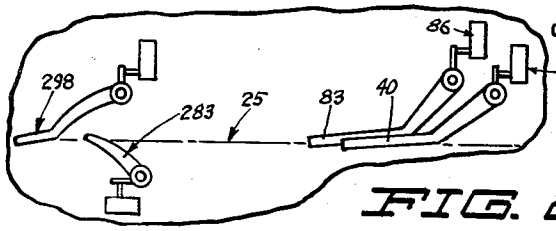


FIG. 20

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United States Patent Office 2,845,760 Patented Aug. 5, 1958

2,845,760

BAG TOP CLOSING AND SEALING MACHINE

Frank L. Hopkins and Richard H. Ayres, Minneapolis, Minn., assignors to Bemis Bro. Bag Company, Minneapolis, Minn., a corporation of Missouri

Application November 5, 1956, Serial No. 620,428

26 Claims. (Cl. 53—67)

This invention relates to new and useful improvements in machines for closing and sealing the open tops of relatively large flexible walled bags by firmly pressing the bag top walls into flatwise relation and sewing them together by a row of stitches extending the length of the bag tops, and applying a sealing tape over the top edges of the sewn bag top walls with its opposite wall portions folded downwardly into firm contact with the bag top walls and overlying and concealing said row of stitches, thereby to seal the needle holes against leakage of the contents of the bag therethrough.

It is now common practice to package numerous pulverulent materials, such as sugar, powdered milk, commercial fertilizer, cement, etc., in large flexible walled bags or containers. To close and seal the open tops of such bags to assure the formation of a strong, leaktight closure capable of withstanding rough handling and treatment in transit, the walls of the open bag tops are usually pressed into flatwise relation and sewn together by a row of stitches. A strip of pressure sensitive sealing tape is then applied to the top edges of the sewn bag top walls with its opposite wall portions being folded downwardly into firm contact with the opposite sides of the bag top to completely conceal and seal the needle holes against leakage. The downwardly extending walls of the sealing tape are bonded to the bag top walls by the application of pressure thereto. There are now available on the market machines for thus closing the open tops of large flexible walled bags, but to the best of our knowledge, none of these have proven entirely satisfactory.

It is therefore an important object of the present invention to provide a bag top closing and sealing machine of this general type wherein all of the objectionable features now inherent in such machines have been completely eliminated, resulting in the provision of a machine of this general type which is extremely efficient and expeditious in performance.

A further object of the invention is to provide an improved machine for closing and sealing bag tops comprising a continuously operating conveyer onto which the filled bags are placed, one at a time, by an operator, said conveyor conveying the filled bags through the machine without interruption and successively guiding the bag tops through a series of mechanisms placed along the travel path of the bag tops, said mechanisms first pressing the walls of each bag top into flatwise relation and securing them together by a row of stitches; then folding a strip of tape over the sewn bag top walls with its opposite wall portions extending downwardly over said row of stitches; and finally pressing the tape walls firmly into intimate bonding engagement with the bag top walls with a yielding pressure, whereby portions of the tape walls are pressed into conformity with the protruding portions of the stitches, and other wall portions are pressed well into the needle holes in the bag top walls, thereby to positively seal the closed bag top against leakage, even when the filled bags are roughly handled in

transit, etc., the operations of said mechanisms being automatically controlled by the passage of the bag tops through the machine.

A further object of the invention resides in the novel construction and mounting of the blade which folds the strip of sealing tape over the traveling bag tops, the mounting means for said blade imparting a floating action thereto and maintaining it in parallel relation to the top edges of the bag top walls, a highly desirable feature when utilizing a pressure sensitive sealing tape.

A further object resides in the means provided for feeding the tape from the supply roll to the tape folding blade or member, whereby the tape is maintained under a constant tension, necessary to assure accurate folding of the pressure sensitive tape over the flattened bag tops.

A further object of the invention resides in the means provided in conjunction with the tape feeding means, whereby the operator may, if deemed necessary, manually feed a portion of tape from the supply roll when the machine is at rest, which may be necessary when reloading or rethreading the tape through the machine, or when utilizing a tape requiring that an adhesive be applied thereto, should the adhesive coated portion of such tape have dried sufficiently to render the adhesive ineffective, caused by temporarily interrupting operation of the machine.

A further object resides in the novel construction of the co-acting pressure rolls which firmly press the tape walls into contact with the bag top walls in such a manner that the tape walls will conform snugly to irregularities in the surfaces of the bag top walls, such as the protruding portions of the threads and the needle holes in the sewn bag tops.

Other objects of the invention reside in the unique and compact construction of the apparatus, as a whole, whereby all mechanisms are readily available at all times for inspection and reptairs; in the adaptability of the machine for different sizes of bags; in the construction of the various control elements located along the travel path of the bag tops, and the manner in which such elements are interconnected, whereby the operations of the various mechanisms of the machine are accurately synchronized with one another, and are automatically controlled by the movement of each bag through the machine; and in the unique construction and operation of the thread cutter which has a movable cutting element provided with dual cutting edges, adapted to alternately cut the thread ahead of and behind each bag top, and in the provision of a similarly constructed tape cutter; the dual cutting edges of said thread and tape cutters assuring long and continued service without interruption.

These and other objects of the invention and the means for their attainment will be more apparent from the following description taken in connection with the accompanying drawings.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a side elevational view of the novel bag top closing and sealing machine herein disclosed, showing the compact arrangement of the various mechanisms of the bag top closing and sealing unit, and the conveyor for continually advancing the bag tops through the machine without interruption;

Figure 2 is an enlarged top view of the bag top closing and sealing unit;

Figure 3 is a side elevational view of the bag top closing and sealing unit, similar to that shown in Figure 1, but

showing it on a relatively larger scale to more clearly illustrate the various mechanisms thereof;

Figure 4 is an enlarged fragmentary view showing the means for supporting the tape holder in position over the travel path of the bag tops;

Figure 5 is a detail sectional view on the line 5—5 of Figure 4, looking in the direction of the arrows;

Figure 6 is a detail sectional view on the line 6—6 of Figure 4;

Figure 7 is a detail sectional view on the line 7—7 of Figure 4;

Figure 7A is a top view of the tape folder showing the means for detachably supporting it in the machine;

Figure 7B is a detail sectional view on the line 7B—7B of Figures 7A and 13, showing the fixed stud to which the tape holder is secured, the dotted lines indicating the outline of the composite tape holder;

Figure 8 is a sectional plan view substantially on the line 8—8 of Figure 3, showing the means for guiding the bag tops through the machine, and also showing the thread and tape cutters;

Figure 9 is a vertical sectional view on the line 9—9 of Figure 3, with some of the parts omitted, showing the tape cutter and the means for actuating it;

Figure 9A is a detail sectional view on the line 9A—9A of Figure 9, on an enlarged scale, to show the means for supporting the removable cutter blade to facilitate sharpening;

Figure 9B is a view showing the removable cutter blade detached from its supporting means;

Figure 10 is a side elevational view of the lower portion of Figure 3, with some of the parts omitted, showing the thread and tape cutters, the drive rolls for the bag top, and the compression or tape squeezing rolls;

Figure 10A is an enlarged fragmentary view showing the function of the rubber inserts in the peripheries of the compression rolls 226;

Figure 11 is a detail sectional view on the line 11—11 of Figure 10, showing the knob for manually controlling the tape feeding means to permit a portion of tape to be fed from the machine, when there is no bag in the apparatus;

Figure 12 is a sectional plan view substantially on the line 12—12 of Figure 10, showing the various mechanisms which cooperate to close and hermetically seal the bag top;

Figure 13 is a fragmentary view showing the upper corner of a sealed bag top, wherein the projecting end of the row of stitches is folded back under the tape walls;

Figure 14 is a detail view similar to Figure 10, but showing a construction whereby the stitching is extended to the end of the tape;

Figure 15 is a sectional plan view of Figure 14, showing the means for extending the stitching to the end of the tape;

Figure 16 is a fragmentary view showing the upper corner of a sealed bag top wherein the extended end of the row of stitches is concealed within the tape end or tab;

Figure 17 is a schematic wiring diagram showing the electric switches and solenoids for automatically controlling the operations of the sewing head and the thread and tape cutters;

Figure 18 is a schematic view showing the switch actuating elements in their normal positions in the path of the bag tops, whereby they are actuated by each bag top to automatically control the operations of the various mechanisms;

Figure 19 is a wiring diagram similar to Figure 17, but arranged for controlling the operation of the mechanisms shown in Figures 14 and 15; and

Figure 20 is a fragmentary view showing the relative positions of the switch actuating elements along the travel path of the bag tops.

Supporting structure and main conveyor

The novel bag top closing and sealing machine herein disclosed is shown comprising a main conveyor, generally designated by the numeral **2**. The conveyor, as illustrated in Figure 1, comprises a pair of angularly disposed endless belts **3—3**, supported on pulleys or drums **4** and **5**, whereby the upper inwardly facing runs of the belts **3—3** cooperate to provide, in effect, a conveyor of V-shape cross-section, corresponding substantially to the V-shaped bottoms of the filled bags to be closed and sealed.

Pulleys **4** and **5** are rotatably mounted on a suitable supporting frame, generally designated by the numeral **6**, and are adapted for continuous operation by a suitable motor, not shown on the drawings. Suitable side guide members **7** and **8**, are provided at the receiving end of the conveyor for retaining the filled bag bodies **9**, indicated in dotted lines in Figure 1, in upright positions, as they are successively fed into the bag top closing and sealing unit by the main conveyor **2**.

Bag top closing and sealing unit

The bag top closing and sealing unit **11** is shown supported on a vertically adjustable column, generally designated by the numeral **12**, comprising upper and lower telescoping sections **13** and **14**. The lower section **14** is secured in fixed relation to the main conveyor frame **6**, and is shown having an operating crank **15** for vertically adjusting the upper telescoping section **13** of the column relative to the lower section **14** thereof, thereby to adapt the machine for closing bags of different heights.

Crank **15** is secured to the upper end of a shaft **16**, the lower end of which is operatively connected to the lower end of the upper column section **13** by such means as screw threads, not shown in the drawings. In other words, the connection between shaft **16** and the lower end of column section **13** is such that when shaft **16** is rotated by manipulation of crank **15**, the upper column section **13** is relatively raised or lowered in section **14** to vary the spacing between the bag top closing and sealing unit **11** and the main conveyor **2** in accordance with the height of the bag to be closed and sealed.

The bag top closing and sealing unit **11**, as best illustrated in Figure 3, comprises a main supporting frame or casting **17**, partially shown in Figures 1, 2 and 3. Fixedly secured to the rear side of the supporting frame **17** and extending rearwardly therefrom, are a pair of spaced parallel studs **18**, shown received in apertured lugs **19—19** and **21—21** of a cap-like member **22**, indicated in Figure 2. Member **22** is secured to the top end of the upper column section **13** by suitable means, not shown in the drawings, whereby it is vertically movable therewith as a unit.

In some instances it may be found desirable to provide means in the connection between the upper end of column section **13** and the cap-like member **22**, whereby the bag top closing and sealing unit may be slightly tilted on the column **12** for facilitating the insertion of the bag tops thereinto by the operator. However, in actual operation, such tilting of the bag top closing and sealing unit has been found unnecessary.

Sewing head and bag top guide

The sewing head, generally designated by the numeral **23**, is best illustrated in Figures 1, 2 and 3. It is of conventional construction, and is shown comprising a body portion **24** having means (not shown) for fixedly securing it to the extension **17***a* of the frame casting **17** at the receiving end of the machine. The body of the sewing head is shown located rearwardly of the travel path of the bags, indicated by the broken line **25** in Figure 2, and has an arm **26** extending forwardly over said path, and thence downwardly with its usual needle **10** and presser foot **20** positioned adjacent to the travel path **25**, as indicated in Figure 12. The usual operating mech-

anisms for the needle and presser foot (not shown) may be housed within the arm **26**, as is well known in the art.

The sewing head **23** has a pulley **27** at its upper end driven by a V-belt **28** from a magnetically controlled clutch type drive pulley **29**, as best illustrated in Figure 2. Clutch pulley **29** is of well-known construction, and is continuously driven by a suitable motor **30**, partially shown in Figures 1 and 3. Clutch pulley **29** is normally in declutching or non-driving engagement with the V-belt **28**, and is magnetically operated, as hereinbefore stated. Its operation is controlled by actuation of a pivoted control finger **40**, normally having one end positioned in the travel path **25** of the bag tops so that each time a bag is inserted into the guide member **36**, its leading end will engage and actuate control finger **40**, which in turn will cause the clutch-pulley **29** to be rendered effective to drive belt **28**.

The sewing head will continue to operate as long as the bag top is in engagement with control finger **40**. When the bag top subsequently moves out of engagement with control finger **40**, said finger returns to its normal position in the path of the next following bag top. Thus, the sewing head operates intermittently, and its operation is controlled entirely by the traveling movement of the bag tops through the machine. Clutch pulley **29** is operated by a solenoid **40'**, the energization of which is controlled by actuation of control finger **40**, as will be understood by reference to Figure **17**.

Drive motor **30** may be secured to a frame member **32** fixed to the upper ends of a pair of upright arms **33** and **34** by suitable bolts **35**, shown in Figures 2 and 3. Arms **33** and **34** may be made integral with the main frame **17** of the sewing head, as best illustrated in Figures 1 and 3. As hereinbefore stated, the sewing head is of well known construction and, therefore, need not be further illustrated and described herein.

Located at the receiving end of the machine in the travel path **25** of the bags, is a bag top receiving and guide member **36** of inverted U-shaped cross-section. The opposed side walls of guide member **36** are outwardly flared, as best illustrated in Figure 2, to facilitate successively inserting the flattened bag tops thereinto. Guide member **36** is shown detachably secured to one end of a horizontally disposed member **38** by a bolt **39**. The flat bag tops are successively guided into the guide member **36** by the operator, after placing each bag upon the receiving end of the main conveyor **2**, as will be understood by reference to Figure 1.

Thread cutting mechanism

When sewing the tops of large flexible walled bag bodies, it is customary to utilize a filler cord for the purpose of stiffening the free end of the row of stitches made by the sewing machine before the bag top reaches the sewing needle, whereby the unsupported free end **41** of the stitching may be maintained in a forwardly directed position, as indicated in Figure 10, when it enters the thread cutter, generally designated by the numeral **42**.

The thread cutter, as best illustrated in Figures 9 and 9A, comprises a double-acting movable cutter blade **43** and a stationary cutter blade **44**. The movable cutter blade has opposed cutting edges **45—45**, and the stationary cutter blade **44** has opposed inclined cutting edges **46—46**. The stationary cutter blade **44** is shown in the form of a flat plate having its rear end portion fixedly secured to an extension **52** of the machine frame **17** by bolts **50**, as best illustrated in Figure 8.

The movable cutter blade **43** is detachably secured to a rocker **47** mounted for rocking and sliding movements on a fixed shaft or stud **48**. Stud **48** is provided at one end with a reduced end portion **48'** received in an aperture in the stationary knife blade **44**, and secured thereto by a nut **49**, as best illustrated in Figure 9A. The plate forming the stationary blade **44** has a downwardly directed V-shaped opening **51** therein, defined by the inclined cutting edges **46—46** thereof, as shown in Figure 9.

An important feature of the present invention resides in the novel means provided for supporting the movable cutter blade **43** in cutting relation to the stationary cutter blade **44**. It is highly desirable in a cutter of this general type that the movable cutter blade **43** be so mounted that it may readily be removed for sharpening, when the thread cutter shows indications of not cleanly cutting the thread. The movable cutter blade is therefore, so mounted that it may readily and quickly be detached from the composite thread cutter, when necessary, without the use of tools.

As best illustrated in Figure 9B, the movable cutter blade **43** has an enlarged forked head **53** at its upper end having a re-entrant slot **54** therein adapted to receive the fixed stud or shaft **48**, as shown in Figure 9A. Rocker **47** has a depending arm **55** in which is threadedly mounted a drive stud **56** having a reduced terminal **57** normally seated against the bottom of a recess **58**, provided in the adjacent face of the movable cutter blade **43**. A lock nut **59** secures the drive stud in adjusted position in arm **55**. The stud **56** is movable as a unit with the rocker **47**, and serves the dual function of oscillating the movable knife blade **43** with respect to the stationary blade **44** and, at the same time, retains the movable blade in cutting engagement with the stationary blade **44**.

To thus retain the movable blade **43** in cutting engagement with the stationary blade **44**, a spring **61** has one end secured to the rocker **47**, as indicated at **62** in Figure 9A, and its opposite end to the stationary cutter blade or plate **44**, as indicated at **63**. The hub of rocker **47** being slidable upon the fixed stud **48**, is thus constantly urged in the direction of the stationary cutter blade **44**, whereby the drive stud **56** constantly exerts a pressure against the movable cutter blade **43** to retain it in cutting engagement with the stationary cutter blade **44**, as will readily be understood. The reduced terminal **57** of stud **56**, being normally seated in the recess **58** of the movable cutter blade **43**, imparts pivotal movement to said blade, when the rocker **47** is actuated, as will be understood.

From the foregoing, it will thus be noted that when the operator desires to remove the movable cutter blade **43** for inspection or sharpening, such detachment of the movable blade may be quickly accomplished by simply manually sliding the rocket **47** in a direction towards the left, when viewed as shown in Figure 9A, whereby the drive terminal **57** of the set screw **56** in the rocker is removed from the socket **58** in the movable blade **43**. The movable blade **43** may then be quickly detached from the stationary cutter blade **44**, without the use of tools, as will be understood.

To maintain the free unsupported row of stitches **41** at the leading end of the bag top in a forwardly directed position, as the bag top approaches the thread cutter **42**, a jet of air, under pressure, is directed against the unsupported row of stitches from a small air tube **64** having its lower end positioned adjacent to the travel path **25** of the bag tops, as indicated in Figure 3. The opposite end of tube **64** is in communication with a control valve **65** connected to a source of compressed air, not shown. Said air jet, in addition to supporting the forwardly directed thread end in position for cutting, also removes the clipped off excess thread end from the travel path of the bag tops.

A second air tube **66** has one end connected to control valve **65** and extends forwardly therefrom with its opposite end connected to a fitting **67** secured to a belt guide bar **68**, shown in Figure 8. Bar **68** has an upwardly directed orifice **69** therein located adjacent to the travel path of the bag tops. Orifice **69** is in communication with fitting **67**, whereby an upwardly directed jet of air may be discharged from orifice **69** against the free unsupported row of stitching at the trailing end of each

bag top to retain it in position to be engaged by the opposite walls of the sealing tape, when the tape walls are folded into contact with the bag top walls, thereby to conceal the unsupported row of stitching at the leading end of the bag top between the tape walls, as indicated at **71** in Figure 16.

The rocker **47** to which the movable cutter blade **43** is secured is actuated by a connecting rod **72** having one end pivoted to the upper end of the rocker and its opposite end to an arm **73**, best illustrated in Figure 9. Arm **73** is fixed to one end of a shaft **74**, mounted in the wall of a housing **75** having a pair of solenoids **76** and **77** mounted therein. Armature **78** of solenoid **76** is shown connected by a link **79** to arm **73**, and armature **81** of solenoid **77** has a similar link **79** connecting it to an arm **82**, also secured to shaft **74**.

By thus inter-connecting armatures **78** and **81**, they are alternately actuated, when their respective solenoid windings **76** and **77** are energized by actuation of a switch operating element or finger **83**, partially shown in Figures 12, 16 and 17. Control fingers **40** and **83** pivot about the axis of a shaft **84**, indicated in Figures 2 and 10, and are operatively connected to the movable contacts of a pair of control switches **85** and **86**, respectively, located within a housing **87** secured to the frame **17**, as indicated in Figure 2. Switch **85** is shown connected in series with solenoid **40'** by wires **88**, **89** and **90**. Wire **88** is connected to a conductor **91** of a supply circuit, and wire **90** to the other conductor **92** of the supply circuit. Switch **85** is normally open, as indicated in Figure 17, whereby solenoid **40'** is normally de-energized, or in declutching position.

The thread cutter solenoids **76** and **77** are electrically connected by wires **93** and **94** to terminals **95** and **96**, respectively, of control switch **86**. As shown in Figure 17, the movable contact of switch **86** is normally engaged with contact **96**, whereby solenoid **77** is energized, thereby to normally retain its armature **81** in the position indicated in dotted line in Figure 17.

Control finger **83** of the thread cutter, when in its normal position, as indicated in Figure 17, retains the movable contact of switch **86** in circuit closing engagement with contact **96**. The movable contact of switch **86** is electrically connected to main line conductor **91** by wire **97**. Solenoids **76** and **77** are electrically connected by wires **98** and **99**, to the other main line conductor **92**, as shown in Figure 17.

Thus, when a bag top is initially inserted into guide member **36** of the sewing head, it first engages the switch finger or element **40** of the sewing head clutch, whereby solenoid **40'** is energized to render the drive pulley **29** operable to drive the sewing head. Immediately following starting of the sewing head, the advancing bag top engages switch element **83** of the thread cutter, whereby solenoid **76** is energized and effects actuation of the movable cutter blade **43**, whereby the projecting free or unsupported end of the stitching is cut off a predetermined distance from the leading end of the bag top, as hereinbefore stated. It will thus be seen that the double-acting thread cutter shown in Figures 9, 10 and 17, cuts the thread at both ends of the bag top, whereby the thread will not extend beyond the ends of the sealing tape, when the bag top closure has been completed, as will be understood by reference to Figure 16.

Secured to depending portions **101**, **102**, **103** and **104** of the supporting frame **17** of the bag top closing and sealing unit, by bolts **105**, are two longitudinally extending plate elements, generally designated by the numerals **106** and **107**. See Figures 8 and 10. The inwardly facing edges of plate elements **106** and **107** are spaced apart to complete the formation of the longitudinally extending travel path **25** of the machine, as will be understood by reference to Figure 8. The forward ends of the inner edges of plate elements **106** and **107** are outwardly flared, as indicated at **108** and **109** in Figure 8, to facilitate inserting the flattened bag tops into the machine.

Bag top drive rolls and feed belts

Mounted at the opposite sides of the travel path of the bag tops are a pair of drive rolls **111** and **112**, secured to vertically disposed shafts **113** and **114**, respectively, shown in Figure 11. Shafts **113** and **114** are mounted in upright bearings **115** and **116**. Bearing **115** is preferably fixed to the supporting frame **17** of the sewing head, whereby it is resistant to lateral pressure exerted thereagainst by the bag top, as will subsequently be described.

Bearing **116** which supports shaft **114** of drive roll **112** is mounted for limited lateral movement relative to the travel path **25**, whereby it is movable towards or away from its complemental drive roll **111** to control the feeding action of the sealing tape on to the bag tops.

To thus movably support drive roll **112**, bearing **116** is mounted for pivotal movement about a pivot pin **117**, supported in a fixed hub **118** which may be secured to the supporting frame **17** of the bag top closing and sealing unit or, if desired, it may be made integral therewith. As best shown in Figure 10, bearing **116** has laterally extending arms **119** and **121**, apertured to receive the opposed end portions of pivot pin **117**. The lower arm **121** has a lug **122** laterally offset from the axis of pivot pin **117**. Lug **122** is apertured to receive one end of an adjusting screw **123** having a nut **124** received in threaded engagement therewith.

The opposite end of screw **123** has a head **125** provided with an elongated opening or slot **120** for receiving a pin **126** secured to a fixed part **127** of the machine frame. A spring **128** is interposed between the lug **122** and head **125**, as best illustrated in Figure 11, and constantly maintains lug **122** against the nut **124**. A hand knob **135** is secured to the movable bearing **116** whereby the feed roll **112** may be manually moved into or out of driving relation to its complemental feed roll **111**. A small spring **110** is interposed between the fixed and movable hubs **115** and **116** of feed rolls **111** and **112**, and constantly urges roll **112** away from roll **111**. Spring **110** normally holds the lower end of slot **120** against pin **126**, when viewed as shown in Figure 11. Adjustment of nut **124** on screw **123**, varies the effective spacing between feed rolls **111** and **112**.

Secured to the lower ends of feed rolls **111** and **112** are a pair of pulleys **136** and **137**, respectively, having running connections with the corresponding ends of a pair of endless drive belts **138** and **139**. The opposite ends of belts **138** and **139** have running connections with a pair of idler pulleys **141** and **142**, as best illustrated in Figure 8. Pulleys **141** and **142** are adjustably mounted in plates **107** and **106** to maintain the belts **138** and **139** under the proper operating tension. Drive pulleys **136** and **137** are provided with peripheral teeth engageable with correspondingly shaped teeth on the belts **138** and **139**, whereby the belts cannot relatively slip on their respective drive pulleys.

Guide bar **68**, as hereinbefore stated, is fixedly secured to plate member **107** by bolts **143**, and is adapted to support the adjacent run of belt **138** against lateral pressure exerted thereon each time a bag top passes through the machine.

A similar belt guide bar **144** is adjustably mounted on plate element **106** and is yieldably retained in position thereon by a supporting bar **145** secured to plate element **106** by bolts **146**, as best shown in Figure 8. Spring elements **147** are interposed between guide bar **144** and its supporting bar **145**, and constantly urges bar **145** into engagement with its respective belt run, as will be understood. Guide pins **148** are secured to the fixed bar **145** and are guidingly received in apertures provided in pressure bar **144**, thereby to maintain the belt run in driving engagement with its complemental belt run.

Tape applying mechanism

The tape applying mechanism is best illustrated in Figures 3 to 7, inclusive, and Figures 10 and 12. The tape supply is in the form of a roll **149**, indicated in Figures 2 and 3, which is removably supported on a reel or spool **151**. Reel **151** is rotatably mounted on a horizontal spindle **152** provided at the upper end of a supporting post **153**. The lower end of post **153** is suitably secured to the machine frame, as indicated at **154** in Figure 2. The tape is coated on one side with a suitable bonding agent which normally is relatively non-tacky, but is highly sensitive to pressure, whereby the tape may readily be applied to the oppositely disposed flattened bag top walls by the application of pressure, as will subsequently be described.

From the tape supply roll **149** the tape passes over a power driven feed wheel or pulley **155**, shown supported at the upper end of a bracket **156**. From feed roll **155** the tape travels downwardly over an idler **157** to a tape folder, generally designated by the numeral **158**. From idler **157** the tape continues on downwardly under a horizontal cylindrical guide member **159** of the tape folder, and thence forwardly in the direction of bag top travel, through the tape folder **158**, as best illustrated in Figure 4. The tape feed wheel **155** is constantly driven by an endless belt **155'** having a driving connection with a drive pulley **153'** which, in turn, is driven from motor **30**, as will subsequently be described.

Another important feature of the present invention resides in the unique construction of the tape folder, per se, whereby it may be assembled as a complete unit, independently of the machine frame. By so constructing the tape folder, it may be detachably supported in the machine whereby it may readily be detached therefrom to facilitate cleaning, etc., when necessary, as will subsequently be described.

As best illustrated in Figures 4 through 7B, inclusive, the tape folder comprises a pair of upright members or bars **161** secured together in spaced parallel relation by the horizontal rod or guide member **159**, whereby said guide member, in addition to guiding the tape into the tape holder, also serves as a tie member between the upright bars **161** of the tape folder. Fixedly secured to the tie member or rod **159** is a forwardly extending horizontal bar **162**. To the bottom edge of this bar is secured a folding blade **163**. The end of the folding blade adjacent to the horizontal guide member **159** is substantially flat to receive the flattened tape from said member. The opposite marginal side wall portions of the folding blade **163** progressively bend downwardly from guide member **159** to the opposite end of said member, whereby it is substantially U-shaped in cross-section at its discharge end, as shown at **164** in Figure 6.

Detachably and adjustably secured to the lower ends of the spaced parallel bars **161** of the tape folder is a longitudinally extending member **165** of U-shaped cross-section. This member will hereinafter be referred to as the "liner" of the tape folder. It serves to guide the flattened bag top through the major portion of the length of the tape folder, whereby the bag top walls can not directly contact the adhesive coated walls of the tape until just before the leading edge of the bag top enters between the drive rolls **111** and **112**. The outer wall surfaces of liner **165** are spaced from the inner wall surfaces of the folding blade **163** and cooperates therewith to provide a channel **160** of U-shaped cross-section through which the tape travels over the flattened bag top walls until the tape is about to engage the drive rolls **111** and **112**, as indicated in Figure 5.

Liner **165** is secured at one end to a guide head, generally designated by the numeral **166**, having laterally disposed arms **167** fitted between the upright bars or members **161** of the tape folder **158**, and secured thereto

by suitable cap screws **168**. Cap screws **168** are received in vertical slots **169** in the members **161**. The threaded terminals of cap screws **168** are received in threaded engagement with the terminals of arms **167** of liner **165**, as indicated in dotted lines in Figures 5 and 6. The slots **169** provide vertical adjustment of the liner **165**, whereby it may be properly adjusted with respect to the upper edges of the flattened bag top walls, as will be understood.

Means is provided adjacent to the forwardly extending end portion of the folding blade **163** for retaining the tape therein under certain conditions, as when initially threading the tape through the folder, prior to starting the machine. To thus retain the tape in the folding blade, a pair of tape retaining clips, generally designated by the numeral **171**, are secured to the forwardly extending end portion of member **162** by a suitable screw or bolt **172**. The lower terminals of clips **171** are bent inwardly and upwardly in position to engage the lower marginal edges of the tape, thereby to retain the tape in proper position in the tape folder over the bag top walls, when the bag top has passed out of engagement with the drive rolls **111** and **112**, and the tape is no longer in feeding engagement with the tape walls.

Another important feature of the invention resides in the means provided for floatingly supporting the tape folder in position over the travel path of the bag tops, whereby the folder blade is always maintained in parallel relation relative to the upper edges of the bag top walls. Such means is shown comprising a pair of parallel links **173** and **174** arranged in vertically spaced relation, and pivoted at one end to a supporting plate **175** by suitable pivot bolts **176**. The opposite ends of links **173** and **174** are pivotally connected to the upright bars **161** by pivot bolts **170**, as best illustrated in Figure 4. A spring **177** is shown having one end seated against the top surface of the lower link **173** and its opposite or upper end against a fixed lug **178**, fixed to the supporting plate **175**.

An adjusting screw **179** is received in threaded engagement with the upper parallel link **174** and has its lower end positioned to engage the fixed lug **178**, thereby to limit the downward movement of the tape folder with respect to the bag tops. Rotation of adjusting screw **179** vertically adjusts the tape folder relative to the bag top, as will be understood.

The tape folder **158** which, as hereinbefore stated, is constructed as a composite unit and is detachably supported on the machine frame **17**. To thus detachably support the tape folder, a horizontal stud **181** is fixed to the machine frame **17**, as illustrated in Figures 7A and 12. Stud **181** is receivable in a socket member **182** provided on the back side of supporting plate **175** of the tape folder. A set screw **183** is shown received in threaded engagement with the socket member **182**, and is adapted to engage the stud **181**, thereby to detachably secure the tape folder **158** in operative position in the machine frame, as above stated.

To prevent the tape folder from relatively rotating about the horizontal axis of stud **181**, said stud is preferably square in cross-section, as indicated in Figure 7B, whereby the tape folder will always retain its normal horizontal position relative to the bag tops, without requiring any special attention on the part of the operator. It will also be noted by reference to Figure 5, that the head **166** of liner **165** has its walls outwardly flared, as shown at **172** in Figure 5, to permit the ends of the flattened bag tops to readily enter the liner, as the bags pass successively through the machine.

The tape feeding mechanism above described, is essential when sealing the bag tops with a pressure sensitive sealing tape, because of the tension which must be applied to the tape to unwind the adhesive coated tape from the supply roll **149**. If too much tension is imparted to the tape when thus unwinding it from the supply roll, the tape may tend to wrinkle when entering the folder

blade 163 as a result of the great adhesiveness of the tape on the tape supply roll 149. The power driven feed pulley 155 eliminates such wrinkling of the tape because each time a bag top bondingly engages the tape walls, the downward pull of the tape on the feed pulley increases its frictional engagement therewith, which causes pulley 155 to pull the tape from the supply roll 149 at bag top speed.

When the machine is idling, as when no bags are being fed therethrough, the drive pulley 155 simply rotates idly within the tape without imparting any movement thereto, it being understood that the adhesive coated side of the tape faces outwardly when the tape passes around drive pulley 155. The periphery of pulley 155 is coated with a friction material to facilitate its gripping the tape and unwinding a portion thereof from the supply roll 149, each time a bag top passes between the drive rolls 111 and 112.

Thus, when the leading end of the bag top enters between feed rolls 111 and 112, the tape is pressed into bonding engagement with the bag top walls which creates a tension in the tape between the tape folder 158 to the feed pulley 155, whereby the tape is pulled into frictional driving engagement with the periphery of pulley 155, thereby to cause the pulley to smoothly withdraw a fresh section of tape from the supply roll 149.

Tape cutting mechanism

Mounted adjacent to the feed rolls 111 and 112 at the side thereof opposite from the tape folder 158, is a tape cutter, generally designated by the numeral 184. This cutter is similar in construction to the thread cutter 42, hereinbefore described, and comprises a pair of stationary jaws 185 and 186, and a movable jaw 187, mounted for pivotal movement about a pivot 188, as schematically illustrated in Figure 17. The movable jaw 187 is shown fixed to an arm 189 having one end of a link 191 pivoted thereto. The opposite end of link 191 is shown connected to a rocker 192 pivoted at 193 to a fixed support 194. The opposite ends of rocker 192 are operatively connected to a pair of solenoids 195 and 196 adapted to be alternately energized by a conventional two-position step relay, generally designated by the numeral 197.

Relay 197, as diagrammatically illustrated in Figure 17, comprises a rotatable member 198, having a plurality of peripheral ratchet-like teeth 199 adapted to intermittently actuate a movable switch element 201. Switch element 201 comprises oppositely disposed contacts 202 and 203 adapted to alternately engage a pair of contacts 204 and 205 carried by resilient arms 206 and 207, respectively.

Movable switch element 201 is shown electrically connected to conductor 91 of the main supply circuit by a wire 208, and contacts 204 and 205 are electrically connected to solenoids 195 and 196 by wires 209 and 211, respectively, as indicated in Figure 17. The other ends of solenoids 195 and 196 are shown connected by wires 212 and 213 to main line conductor 92. The operation of the two-position step relay 197 is controlled by actuation of a normally closed control switch, generally designated by the numeral 214. Switch 214 is shown actuated by a pivoted control element 215 having its swingable end portion 216 normally positioned in the path of the bag tops, to be successively engaged thereby, as will subsequently be described.

Control switch 214 comprises a fixed contact 217 and a movable contact 218 arranged to be actuated by control element 215, as hereinbefore stated. A wire 219 connects the fixed contact 217 to the main line conductor 92. The movable contact 218 of switch 214 is connected to the main line conductor 91 through relay 197 by wires 221 and 222. From the foregoing it will thus be noted that the tape cutter 184 is double-acting in a manner similar to thread cutter 42, in that solenoids 195 and 196 are energized alternately by the action of the two-position step relay 197. It will also be noted that the operation of the tape cutter is automatically controlled by the passage of the bag tops through the machine by reason of the actuating element 216 of control switch 214 being disposed in the path of the bag tops.

In Figure 18 there is schematically illustrated the relative positions of the switch actuating elements of control switches 85 and 86 of the sewing head and thread cutter, respectively, and of control switch 214 of the tape cutter with respect to the travel path of the bag tops.

Compression rolls

Means is provided for firmly pressing and squeezing the walls of the sealing tape into contact with the walls of the bag top, whereby the sealing tape will conform to any irregularities in the surface of the bag top, such as the protruding portions of the stitches securing the bag top walls together, and also whereby portions of the tape walls are pressed into the needle holes in the bag top to thereby hermetically seal the bag top against leakage even when the bags are filled with a finely pulverulent material, and are roughly handled in transit, as is often the case.

To thus firmly press the walls of the sealing tape into seal-tight engagement with the walls of the bag top, the bag tops, upon leaving the feed rolls 111 and 112 with the sealing tape applied thereto, pass through a series of compression rolls 223—224 and 225—226, best illustrated in Figures 10 and 12. Rolls 223 and 225 are secured to upright shafts 227 and 228 rotatably mounted in fixed bearings 229 and 231, which may constitute a portion of the main supporting frame of the machine, or they may be in the form of brackets having means for detachably securing them in fixed position in the supporting frame.

Roll 223 has its periphery disposed in close proximity to the periphery of roll 224, and pressure roll 225 is similarly arranged with respect to roll 226, as indicated in Figure 12. Rolls 224 and 226 are secured to shafts 232 and 233, respectively, mounted in bearings 234 and 235. Bearings 234 and 235 are mounted for pivotal movement about the axis of a pivot pin 236, secured in a hub 237 fixed to the machine frame, as will be understood by reference to Figure 10. Bearing 234 is shown having laterally extending arms 238 apertured to receive pivot pin 236. Bearing 235 is provided with similar laterally extending arms 239 apertured to receive pivot pin 236, as clearly illustrated in Figure 10.

To facilitate manufacture, bearings 234 and 235 are identical in construction with the exception that in the machine they are disposed in inverted relation with respect to one another. The pivotal mounting of brackets 234 and 235 permit their respective pressure rolls 224 and 226 to be moved towards or away from their complemental pressure rolls 223 and 225, as will be understood.

Suitable stops, not shown in the drawings, are provided for controlling the space between compression rolls 223—224 and between compression rolls 225—226, which space is determined by the thickness of the bag tops with the sealing tape applied thereto.

Means is provided for yieldably retaining the movable compression rolls 224 and 226 in contact with the limit stops above referred to, and is shown comprising bolts 241 and 242. Bolt 241 has one end secured to the fixed bearing 229 of compression roll 223, or to some fixed part of the machine frame. The opposite end of bolt 241 traverses an aperture in lug 243 provided on the movable bearing 234, as best illustrated in Figure 10.

A compression spring 244 has one end seated against lug 243 and its opposite end against a nut and washer 245, adjustably secured to the end of bolt 241. Bolt 242 similarly has one end anchored to a fixed part of the machine and traverses a lug 246 on movable bearing 235.

A similar spring 247 is interposed between lug 246 and the nut and washer 248 adjustably secured to bolt 242. Axial movement of nuts 245 and 248 upon their respective bolts 241 and 242 controls the pressure exerted upon the bag tops by the compression rolls, whereby the correct pressure may be applied to the walls of the sealing tape to press them firmly into contact with the surfaces of the bag top walls to conform to the contour of the projecting portions of the stitches, and also whereby the tape may be pressed well into the needle holes to positively prevent leakage of the bag contents therethrough.

Another important feature of the invention resides in the provision of means in the peripheries of the compression rolls for applying a yieldable or resilient pressure against the walls of the sealing tape directly over the seams in the bag top walls. The means provided for thus resiliently pressing the walls of the sealing tape into firm contact with the contours of the projecting portions of the stitches in the bag top walls and into the needle holes in the bag top, is best illustrated in Figures 10 and 10A. It resides in the provision of a rubber insert 249 in the periphery of each compression roll. These inserts are in the form of annular rings, each fitted into an annular groove 251 cut in the periphery of each compression roll, as best indicated in Figure 10A. These inserts are located in alignment with the seam in the bag top wall so that as the bag tops successively pass between the compression rolls, the resilient rubber inserts 249 in the peripheries of the compression rolls cooperate to firmly press the walls of the sealing tape into conformity with the surfaces of the bag top walls to assure leakproof closures.

Drive means for drive and compression rolls

The drive means for the drive rolls 111 and 112, and the compression rolls 223—224 and 225—226, is best illustrated in Figures 2 and 3, and is shown comprising an endless belt 252 having a running connection with a pulley, not shown, secured to the shaft of the drive motor 30, and a pulley 253 rotatably mounted on a stud 254, shown in Figure 2. Pulley 253 is supported in a bracket 255 which may be adjustably mounted on a fixed support 256 of the machine frame, by means not shown in the drawings, thereby to proivide means for tensioning belt 252, and a second belt 257. Belt 257 has running connections with a pulley 258 rotatably supported on stud 254 and a pulley 259 secured to a shaft 261 of a conventional speed reducer, generally designated by the number 262. Belt 155′ for driving the tape feed pulley 155, is driven from pulley 153′ secured to the vertical shaft 263 of the speed reducer 262.

Shaft 263 of the speed reducer is shown provided at its lower end with a coupling 264 which may be of conventional construction and therefore need not be further described. Coupling 264 operatively connects shaft 263 of the speed reducer to the upright shaft 227 of compression roll 223. A chain drive 265 operatively connects shaft 227 of pressure roll 223 to shaft 113 of feed roll 111. A similar chain drive 266 operatively connects shaft 227 to shaft 228 of compression roll 225, as will be understood by reference to Figures 2 and 3. Thus, chain drive 265 drives the rear feed roll 111 and chain drive 266 drives the rear compression roll 225. The rear compression roll 223 is driven from the speed reducer shaft 263 by the coupling member or clutch 264.

Front feed roll 112 is driven from the rear feed roll 111 by intermeshing gears 267, the teeth of which are long enough to permit limited movement between the peripheries of the feed rolls necessary in the operation of the apparatus. The front compression rolls 224 and 226 are similarly driven from the supporting shafts 227 and 228 of the rear compression rolls 223 and 225 by similar sets of gears 268 and 269.

From the foregoing it will be noted that the feed rolls and the two pairs of compression rolls rotate continually during operation of the machine as a result of the belt 252 being continually driven from the motor 30 which, as hereinbefore stated, operates continually when the machine is in use.

Operation

In the operation of the machine, the operator places a bag in the receiving end of the main conveyor 2 between the guide boards 7 and 8, as indicated by the dotted lines 9 in Figure 1. Conveyor 2 operates continually, and advances the bag towards the sewing head 26. As the bag moves forwardly, the operator guides the flattened bag top into the guide member 36, shown in Figures 2 and 12. Upon actuation of feeler or control element 40 of control switch 85 by the leading end of the advancing bag top, switch 85 completes a circuit to solenoid 40′, indicated in Figure 17, whereupon the clutch controlling the operation of pulley 29 is actuated to drive said pulley and therefore the sewing head, which is operatively connected to pulley 29 by belt 28. See Figure 2. The sewing head then sews the bag top the length thereof as the bag continues on through the machine, as is well known in the art.

Immediately following the starting of the sewing head control element or finger 83 of the control switch 86 of the thread cutter 42 is actuated by the leading end of the bag top, effecting energization of solenoid 76, whereupon the movable blade 43 of the thread cutter is actuated to cut the thread or row of stitching a predetermined distance in front of the bag top, whereby the remaining portion 41 of the stitching, shown in Figure 10, may readily be concealed within the sealing tape, when the tape is subsequently applied to the bag top, as shown in Figure 13. The sewing head continues to operate so long as the control finger 40 is engaged with the bag top. When finger 40 drops off the tail end of the bag top, switch 85 opens and de-energizes solenoid 40′, whereby sewing machine clutch (not shown) is rendered ineffective to drive pulley 29. The thread is cut at both ends of the bag top by the double acting thread cutter 42. This results because of the alternate energization of solenoids 76 and 77 by actuation of control switch 86, as hereinbefore stated. See Figure 17. In other words, when feeler 83 is engaged by the leading end of the bag top, solenoid 76 is energized and shifts the movable cutter blade 43 to the dotted line position shown in Figure 17, and cuts the thread in front of the bag top. When feeler 83 subsequently drops out of engagement with the bag top, solenoid 77 is again energized and returns cutter blade 43 to its normal full-line position shown in Figure 17.

To facilitate clipping off the unsupported row of stitches at the leading end of the bag top a jet of air is directed upwardly against the forwardly extending unsupported thread or stitching from the air tube 64, whereby the thread may readily be cut, as hereinbefore described. The air jet also disposes of the clipped off excess thread end.

The advancing bag top next enters the outwardly flared head 172 of liner 165 of the tape folder 158. At substantially the same instant the flattened bag top walls enter between the adjacent runs of endless drive belts 138 and 139 the speed of which is synchronized with the speed of the main conveyor 2, whereby the bag top will maintain its correct position while passing through the various mechanisms of the machine.

As the bag top advances forwardly between the drive belts 138 and 139 through the tape folder, the tape remains stationary because of the clearance between the peripheries of drive rolls 111 and 112 being such that said rolls will not feed the tape until a bag top enters between the drive rolls. When the bag top enters between said rolls it presses the tape walls into driving engagement with the peripheries of drive rolls 111 and 112,

which causes the tape to adhere thereto, as will be understood.

When the feeding of the tape is thus initiated as a result of the bag top entering between the drive rolls, the strand of tape between the tape folder and the tape supply roll **149** is placed under sufficient tension to cause the tape feed pulley **155** to frictionally grip the tape and thus withdraw the tape from the supply roll **149**, whereby the tape may be applied to the bag top under uniform tension and with assurance that it will be smooth and unwrinkled.

The unique construction of the composite tape folder constitutes an important feature of the invention in that it makes it possible to apply the highly pressure sensitive tape directly to the flattened bag top walls without danger of the tape becoming adhered to its guide beams, such as the tape folder blade **163**. In other words, from the horizontal guide member **159** of the tape folder to substantially the point of application of the tape to the bag top walls, the tape travels freely through the U-shaped channel **160** of the tape folder, whereby it does not come into direct contact with the bag top walls until just prior to entering between the drive rolls **111** and **112**. During the operation of the machine a jet of air may be directed upwardly into the tape folder from the orifice **69**, shown in Figure 8, said orifice being connected to the air valve **65** by tube **66**. This air jet also holds the rearwardly projecting end of the thread at the trailing end of each bag top, where said thread ends are completely concealed within their respective tape ends, and so strengthen the tape ends that they are not likely to tear through rough handling of the sealed bags.

The advancing bag top next contacts the feeler or control element **216** of switch **214**. Since switch **214** is normally closed, the circuit to the two-position step relay **197** is broken, causing the relay ratchet dog to return. No clipping occurs at this time. As the bag top advances to the compression rolls **223** and **224** feeler **216** remains in contact with the bag top. When feeler **216** finally drops off the trailing end of the bag top, switch **214** returns to its normal closed position, thereby energizing the two-position step relay **197** and causing its movable contact element **201** to break the circuit through contact **205**, and establish a circuit through contact **202**. This de-energizes solenoid **196**, and simultaneously effects energization of solenoid **195**, whereby the tape cutter **184** is actuated to cut the tape at the trailing end of the bag top. No tape cutting occurs ahead of the bag top as in the case of thread. As hereinbefore stated, the dual pairs of cutting edges of the tape cutter are used alternately. When the bag top moves out of engagement with drive rolls **111** and **112**, tape feeding automatically stops, because the walls of the tape between the drive rolls are released from pressure as a result of the trailing end of the bag top having passed out of engagement with said rolls.

The bag top next passes between the two pairs of pressure rolls **223—224** and **225—226**, shown in Figures 10 and 13. These rolls cooperate to firmly press the walls of the tape into bonding engagement with the walls of the bag top, the resilient inserts firmly pressing the tape walls into conformity with the protruding stitches in the bag top, and also into needle holes, with the result that the bag top is hermetically sealed against leakage.

The provision of the hand knob **135** on drive roll **112** facilitates the operation of initially threading the tape through the tape folder before the machine is to be used. This is made possible by reason of the drive roll **112** being mounted for pivotal movement about the axis of pivot pin **117**. By so mounting drive roll **112** it may readily be pressed into tape feeding engagement with its complemental drive roll **111**, whereby the tape may be pulled through the tape folder, as when initially threading the tape through the machine, prior to starting. This may be of particular advantage when the machine is operated with a tape to which an adhesive must be applied as the tape passes through the machine, particularly if the adhesive has dried on the tape between the tape applicator and the tape folder, which may readily occur when the machine is at rest.

The machine as illustrated in Figure 1, is readily adjustable to bags of different sizes. The bag top closing and sealing unit may be assembled as a unit and is supported on the vertically adjustable pedestal **12**.

Figures 14, 15, 16, 19 and 20 illustrate a slightly modified construction wherein means is provided for keeping the thread extended out ahead of the bag top and completely enclosing it within the tape in that position, thereby to strengthen the tape tab. To thus extend the thread ahead of the bag top, a stiff filler cord is preferably used in the stitching. Means is also provided for actuating the drive rolls to cause them to start before the bag top reaches said rolls, whereby the feed rolls will grip the walls of the tape in advance of the bag top and thus press said walls firmly into bonding engagement with the extended thread end **71**, as shown in Figure 16.

To thus move the drive rolls into driving engagement with the projecting tape end, a lever **271** has one end pivoted at **117** to the machine frame. A stud or rod **273** has one end connected to the bearing **116** of drive roll **112** and its opposite end is slideably engaged with lever **271**. A spring **274** is interposed between bearing **116** and arm **271**, the tension of which may be varied by manipulation of nut **275**, to obtain the desired driving engagement with the tape walls, as will be understood.

The opposite end of link **271** is operatively connected to a solenoid **276** by a link **277**, indicated in Figures 15 and 19. Solenoid **276** is electrically connected to main line conductors **91** and **92** by wire **278**. A normally open control switch **281** is interposed in wire **278**. Switch **281** has a movable contact **282** normally in circuit-opening position, as indicated in Figure 19. Movable contact **282** is adapted to be actuated by a control element or finger **283**, having one end pivoted at **284** and having its opposite end normally positioned in the travel path **25** of the bag tops.

In the form shown in Figure 19, the tape cutter **184** is identical to the one shown in Figure 17, and is operated intermittently by solenoids **285** and **286**, similar to solenoids **195** and **196**, shown in Figure 17. Solenoids **285** and **286** are alternately actuated by a control switch **287**, comprising a movable contact **288**. Contact **288** has a wire **289** electrically connecting it to main line conductor **91**. Wires **291** and **292** electrically connect the fixed contacts **293** and **294** of switch **287** to solenoids **285** and **286**, and wires **295** and **296** electrically connect the opposite ends of solenoids to main line conductor **92**.

The movable contact **288** of control switch **287**, as shown in Figure 19, is normally engaged with a fixed contact **293**, and has one end of a pivoted control element or finger **297** operatively connected thereto. The opposite end portion **298** of control finger **297** is normally positioned in the travel path **25** of the bag tops whereby it is adapted to be engaged by each bag top thereby to move the movable contact **288** of switch **287** into electrical engagement with fixed contact **294**. Such actuation of control switch **287** causes alternate energization of solenoids **285** and **286** which, in turn, intermittently actuates the movable cutter blade **187** of the tape cutter **184** to cut the tape at the leading end of the bag top, as well as at the trailing end thereof.

In the operation of the construction illustrated in Figures 14, 15, 16, 19 and 20, the bag tops are advanced through the tape folder as in the previous figures. When the leading end of the bag top engages feeler **283**, it closes the circuit to solenoid **276**, whereupon arm **271** is actuated to cause the drive rolls to pick up the projecting tape end and thus drive or advance the tape simultaneously as the feed rolls press the tape walls into bonding engagement with the bag top walls. Thus,

the walls of the tape end ahead of the bag top are pressed firmly into bonding engagement with the extended thread end 71, whereby the thread end is concealed within the projecting end of the tape, as shown in Figure 16. By thus extending the stitching or thread ahead of the bag top and concealing and securing it to the walls of the projecting tape tab, said tab is materially strengthened, as will be understood. The remaining parts of the structure illustrated in Figures 14 and 15, are identical to the parts shown in Figures 10 and 12, respectively, and they are therefore indicated by like numerals.

An alternative method of strengthening the tape ends or tabs is to feed a cord in with the tape, whereby said strengthening cord will extend the full length of the sealing tape of each closed bag top.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, and the appended claims should be construed as broadly as permissible in view of the prior art.

We claim as our invention:

1. In a machine for closing and sealing the open tops of large flexible walled bags, a conveyor for advancing the bags through the machine without interruption, a sewing head for applying a row of stitches to each bag top the length thereof, drive means for intermittently operating the sewing head, said drive means being controlled by movement of the bag tops through the machine, a pair of drive rolls, a source of adhesive-coated tape, tape applying means including an inner inverted U-shaped guide member positioned to receive the sewn bag top from the sewing head, a tape folding blade overlying said guide member with its walls spaced from the walls thereof and cooperating therewith to provide a travel path for the tape, said U-shaped member preventing the adhesive-coated surface of the tape from directly contacting the bag top walls until just prior to the bag top engaging the drive rolls, said drive rolls pressing the tape walls into bonding engagement with the bag top walls and causing the tape to feed only when a bag top is in engagement with the drive rolls.

2. In a bag top closing and sealing machine according to claim 1, wherein fluid-operated means is provided for projecting the free unsupported end of the thread in a forward direction from the leading end of the bag top to assure such free thread end being concealed within the walls of the tape at the leading end of the bag top.

3. In a bag top closing and sealing machine according to claim 2, wherein the fluid-operated means for forwardly projecting the unsupported free end of the thread from the leading end of the bag top comprises a small nozzle having a connection with a source of fluid under pressure.

4. In a bag top closing and sealing machine according to claim 3, wherein a thread cutter is interposed between the sewing head and the tape folder for cutting the forwardly projecting free end of the thread a pre-determined distance from the leading end of the bag top.

5. In a bag top closing and sealing machine according to claim 1, wherein a pair of spaced parallel belt runs engage the opposite sides of the flattened bag top along the length of the tape folder, for imparting a positive feeding action to the bag top during application of the tape thereto.

6. In a machine for closing and sealing the open tops of flexible walled bags by securing the bag top walls together in flatwise relation by a row of stitches and folding a strip of pressure sensitive tape over the sewn bag top walls and securing it thereto by pressure, a conveyor for successively advancing filled bags through the machine, a sewing head, means for initiating operation of the sewing head by movement of each bag top through the machine, means for supporting a roll of pressure sensitive tape, a tape supply, a tape applying mechanism comprising an inner inverted U-shaped liner for receiving the sewn bag tops from the sewing head, a tape folder overlying said liner, a pair of drive rolls at the discharge end of the liner adapted to engage the tape and press it into bonding engagement with the opposite walls of a bag top, the horizontal spacing between the peripheries of said drive rolls relative to the combined thicknesses of the flattened bag top walls and the tape walls being such that the drive rolls are effective to cause feeding of the tape from the tape supply only when a bag top enters between said drive rolls.

7. In a bag top closing and sealing machine according to claim 6, wherein auxiliary power operated means is provided for withdrawing tape from the tape supply, said auxiliary power operated means being operable only when a bag top is engaged by said back wheels.

8. In a bag top closing and sealing machine according to claim 6, wherein the operation of the auxiliary tape feeding means is controlled by variations in the tension of the tape between the drive rolls and the tape supply.

9. In a bag top closing and sealing machine according to claim 6, wherein the auxiliary tape feeding means includes a constantly rotating tape feeding roll located between said drive rolls and the tape supply around which the tape is threaded, the frictional engagement between the ungummed surface of the tape and the periphery of said auxiliary tape feeding roll normally being insufficient to cause said feed roll to withdraw tape from the tape supply, said auxiliary tape feeding roll automatically being rendered effective to withdraw tape from the tape supply only when the leading end of a traveling bag top engages the adhesive coated tape walls between said feed rolls, whereby the increased tension imposed in the tape as a result of being pressed into bonding engagement with the walls of the traveling bag top will cause said auxiliary tape feeding roll to frictionally withdraw tape from the tape supply.

10 In a machine for closing and sealing the open tops of flexible walled bags by securing the bag top walls together in flatwise relation with a row of stitches and subsequently folding a strip of pressure sensitive tape over the sewed bag top walls and securing it thereto by pressure, a continuously operated conveyor for successively advancing filled bags through the machine, a sewing head, means made operable by movement of each bag through the machine for initiating operation of the sewing head, means for supporting a roll of pressure sensitive tape, a tape folder comprising an inner liner positioned to receive the sewn bag tops from the sewing head and a tape folding blade overlying said liner with its walls spaced from the corresponding walls of the liner and cooperating therewith to form a passage for guiding the tape onto the bag tops, means for floatingly supporting the composite tape folder over the travel path of the bag tops and whereby said liner and folding blade are adapted for limited vertical movement relative to the bag tops, a pair of drive rolls at the discharge end of the tape folder adapted to engage the tape and press it into bonding engagement with the opposite walls of each bag top, as the bag tops successively pass between said drive rolls without interruption, and an auxiliary tape feeding means made operable by increased tension in the tape between the tape supply roll and the tape folder for facilitating withdrawal of the tape from the tape supply roll, and to assure uniform tension in the tape during each tape applying operation.

11. A bag top closing and sealing maching according to claim 10, wherein the auxiliary tape feeding means comprises a constantly rotating power driven pulley normally in non-feeding engagement with the tape, said pulley being rendered operable to feed the tape by increased tension therein, thereby to facilitate withdrawal of the tape from the tape supply roll without wrinkling.

12. A bag top closing and sealing machine according

to claim 10, wherein the means for floatingly supporting the tape folder comprises a parallel link mechanism.

13. A bag top closing and sealing machine according to claim 10, wherein means is provided for manually moving the feed rolls into driving engagement with the tape, independently of a bag top, thereby to facilitate threading the tape through the machine.

14. A bag top closing and sealing machine according to claim 10, wherein means is provided for manually separating the drive rolls from one another to permit the operator to freely pull a portion of the tape from the tape folder and drive rolls.

15. In a machine of the class described, a continuously operating conveyor for successively advancing the bags through the machine, a sewing head made operable by movement of each bag top through the machine to secure the flattened bag top walls together by a row of stitches the length thereof, a thread cutter for cutting the thread forwardly and rearwardly of the bag top, a tape supply roll, a tape folder through which each sewn bag top passes, a pair of spring loaded drive rolls at the delivery end of the tape folder, means for guiding the tape from the tape supply roll to the tape folder, the spacing between the peripheries of said drive rolls being slightly less than the combined thicknesses of the bag top walls and the walls of the tape folded over the bag top, whereby as each bag top, with a strip of tape folded thereover, passes between said drive rolls, said rolls press the tape walls firmly into bonding engagement with the bag top walls and simultaneously cause an additional length of tape to be drawn into the tape folder for the next following bag top, said drive rolls being ineffective to withdraw tape from the tape supply roll when a bag top is not positioned therebetween, and means for cutting the tap adjacent to the trailing end of each bag top.

16. A bag top closing and sealing machine according to claim 15, wherein a continuously rotating tape feed pulley is positioned adjacent to the tape between the tape supply roll and the tape folder, said tape feed pulley normally being disposed in non-feeding relation to the tape, and being operable to frictionally engage and withdraw tape from the tape supply roll for the next following bag top, when the tension in the tape is relatively increased during application of a strip of tape to a preceding bag top.

17. A bag top closing and sealing machine according to claim 15, wherein a pair of co-acting spring-loaded timing belts grip each bag top as it enters the tape folder, and imparts a positive feeding action thereto.

18. A bag top closing and sealing machine according to claim 17, wherein a series of compression rolls are arranged to receive each bag top from the drive rolls and yieldably press the tap walls into conformity with the surfaces of the bag top walls, thereby to prevent leakage of the bag contents therefrom.

19. A bag top closing and sealing machine according to claim 18, wherein certain of the compression rolls have annular resilient inserts embedded in their peripheries for engaging the tape walls over the stitching in the bag top walls, thereby to press the tape walls into conformity with the protruding portions of the stitching and into open needle holes in the bag top.

20. In a machine of the class described, a conveyor for successively advancing filled bags through the machine without interruption, a sewing head for sewing the flattened bag top walls together the length thereof, means made operable by movement of each bag through the machine for initiating operation of the sewing head, means for cutting the thread adjacent to the leading and trailing ends of the bag tops, a tape supply roll, a tape folder arranged to receive the tape from the tape supply roll and guide it onto a bag top passing beneath the tape folder, co-acting timing belts gripping the flattened bag top walls and guiding the bag tops through the tape folder with a positive action, a pair of drive rolls positioned at the delivery end of the tape folder for receiving each flattened bag top from the tape folder with a strip of tape folded thereover, said drive rolls firmly pressing the walls of the tape into bonding engagement with the bag top walls the length thereof, means for accurately adjusting the spacing between the peripheries of the drive rolls to cause the drive rolls to engage the tape walls with a feeding action, manual means for momentarily varying the spacing between the feed rolls to facilitate threading the tape through the machine, means for cutting the tape at each end of the bag top, a series of compression rolls mounted to receive the bag tops from the drive rolls and to firmly press the tape walls into contact with the bag top walls, whereby portions of the tape will conform to the contours of the projecting stitches of the sewn bag tops, and other portions of the tape are pressed into needle holes to render the resultant bag top closure leak-proof.

21. In a bag top closing and sealing machine according to claim 20, wherein means is provided for actuating the drive rolls to drivingly engage the forwardly projecting end of the tape of each bag top, whereby the unsupported end of the thread at the leading end of each bag top is concealed between the tape walls.

22. A bag top closing and sealing machine according to claim 21, wherein the means for causing the drive rolls to grip the forwardly projecting end of the tape comprises a solenoid-actuated link mechanism made operable by traveling movement of each bag through the machine.

23. In a machine for closing and sealing the open tops of large flexible walled bags, a conveyor for advancing the bags through the machine without interruption, a sewing head for applying a row of stitches to each bag top the length thereof, drive means for intermittently operating the sewing head, said drive means being controlled by movement of the bag tops through the machine, a pair of drive rolls, a source of adhesive coated tape, and a tape folder, said tape folder comprising an inverted U-shaped guide member positioned to receive the sewn bag tops from the sewing head, and a folding blade which overlies said guide member and cooperates therewith to provide a travel path of U-shaped cross-section for folding the tape over the flattened bag top, said U-shaped guide member preventing the adhesive coated surface of the tape from directly contacting the bag top walls until just prior to the bag top walls engaging the drive rolls.

24. A bag top closing and sealing machine according to claim 23, wherein means is provided for floatingly supporting the tape folder over the travel path of the bag tops whereby the tape folder is adapted for limited vertical movement relative to the bag top.

25. A bag top closing and sealing machine according to claim 24, wherein the tape holder is supported by a pair of vertically spaced parallel links having means associated therewith for positively limiting the downward movement of the tape holder.

26. A bag top closing and sealing machine according to claim 24, wherein the tape holder may be assembled as a complete unit independently of the machine, and co-acting means are provided on the tape holder and the machine frame for detachably supporting the tape holder in operative position in the machine, and whereby the composite tape holder may readily and quickly be detached from the machine, when necessary.

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