July 11, 1950 J. E. ASHE 2,514,620

BAG CLOSING APPARATUS

Filed Jan. 12, 1948 5 Sheets-Sheet 1

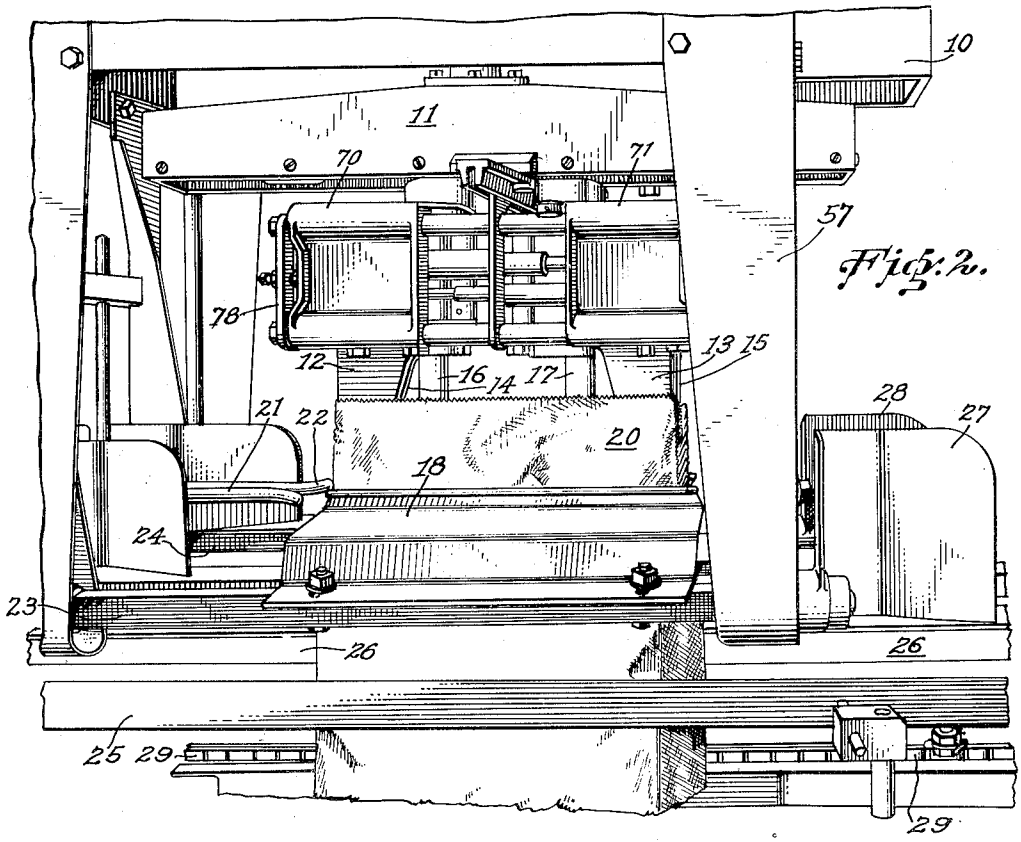



Fig. 2.

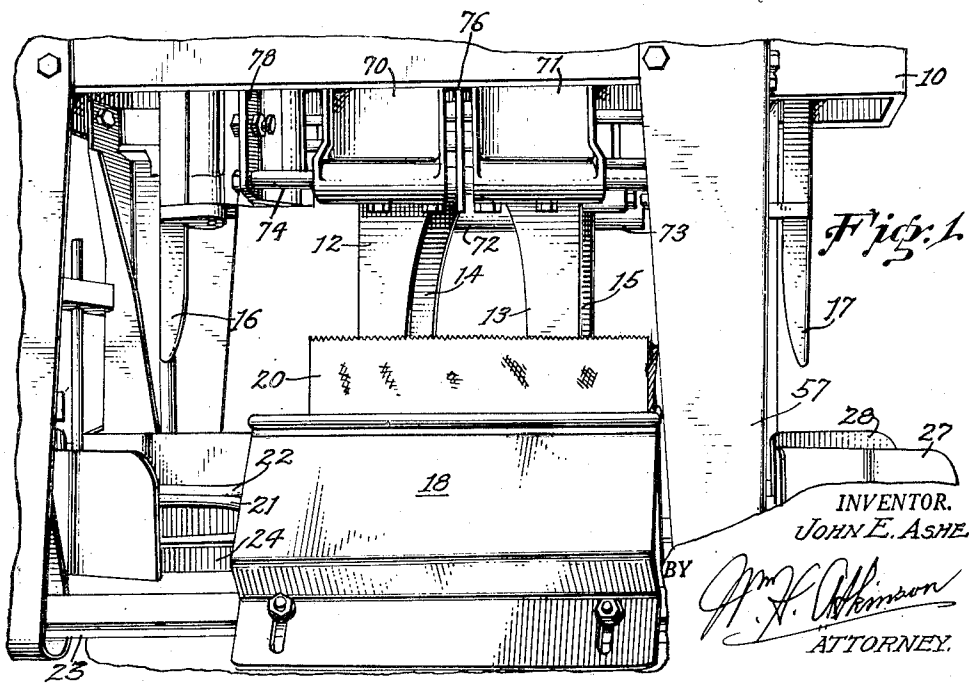



Fig. 1.

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BAG CLOSING APPARATUS

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Fig. 3.

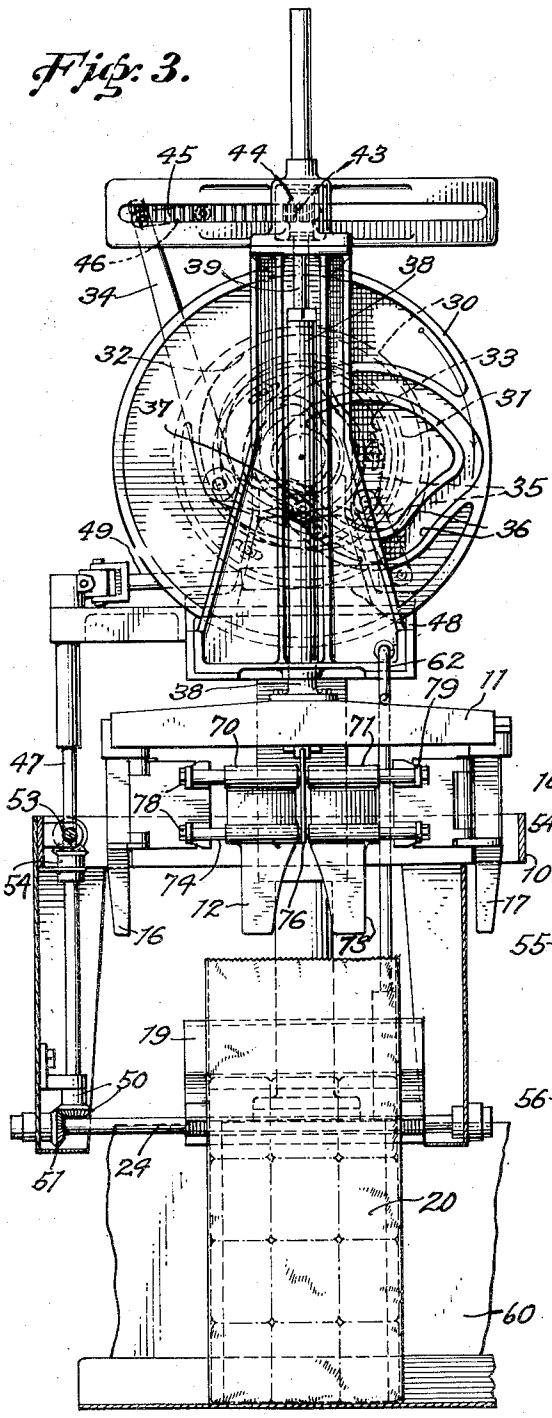
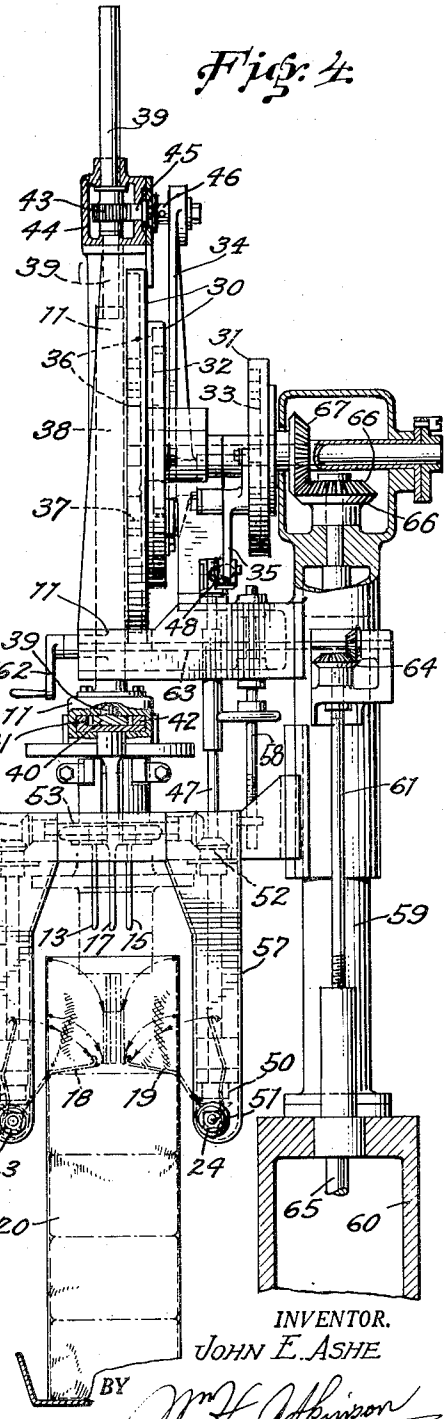



Fig. 4.




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BAG CLOSING APPARATUS

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Fig. 5.

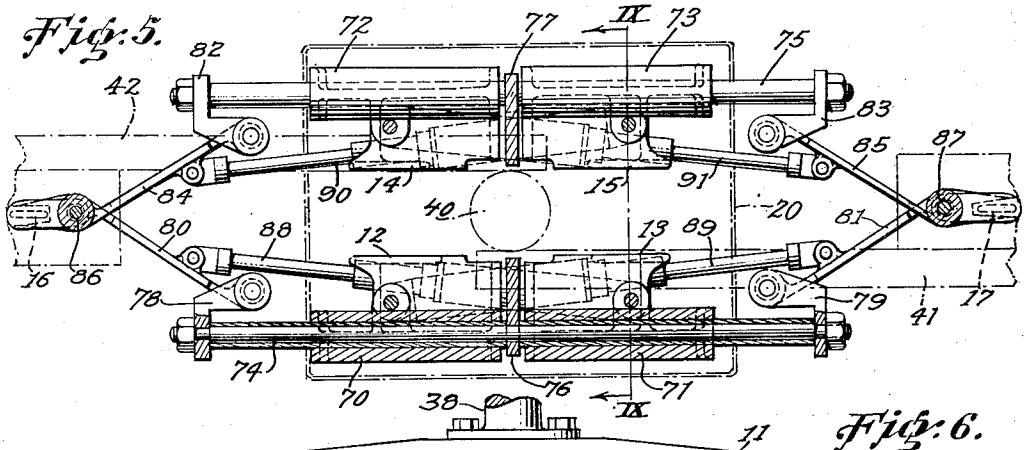
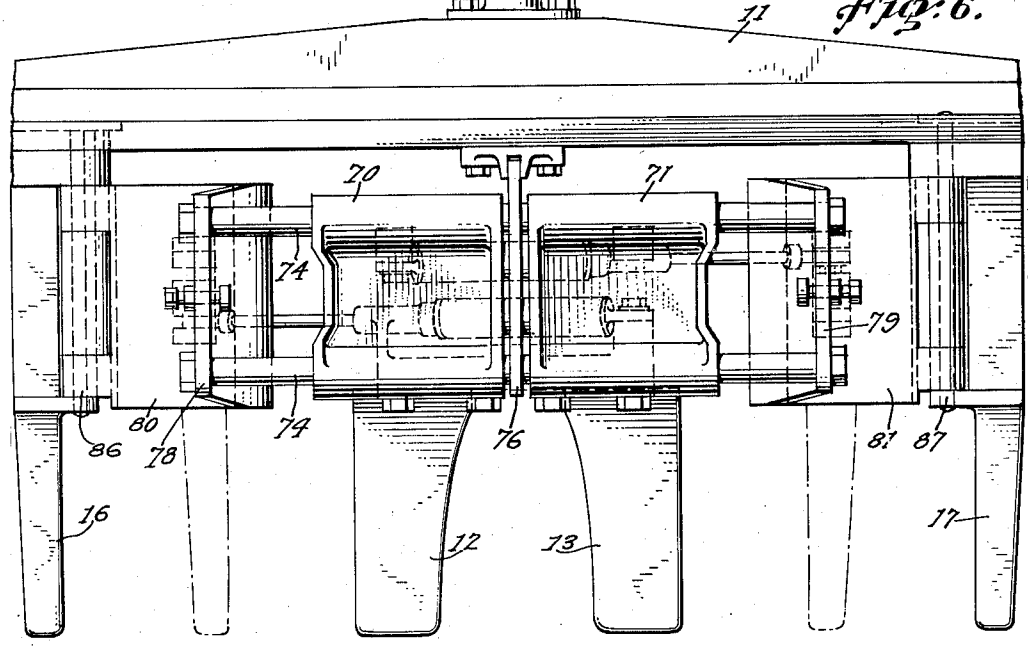



Fig. 6.



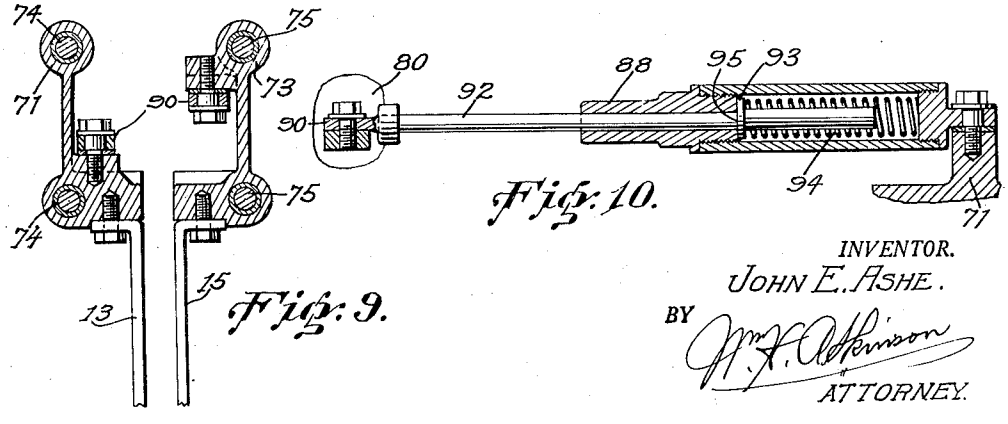




Fig. 9.

Fig. 10.

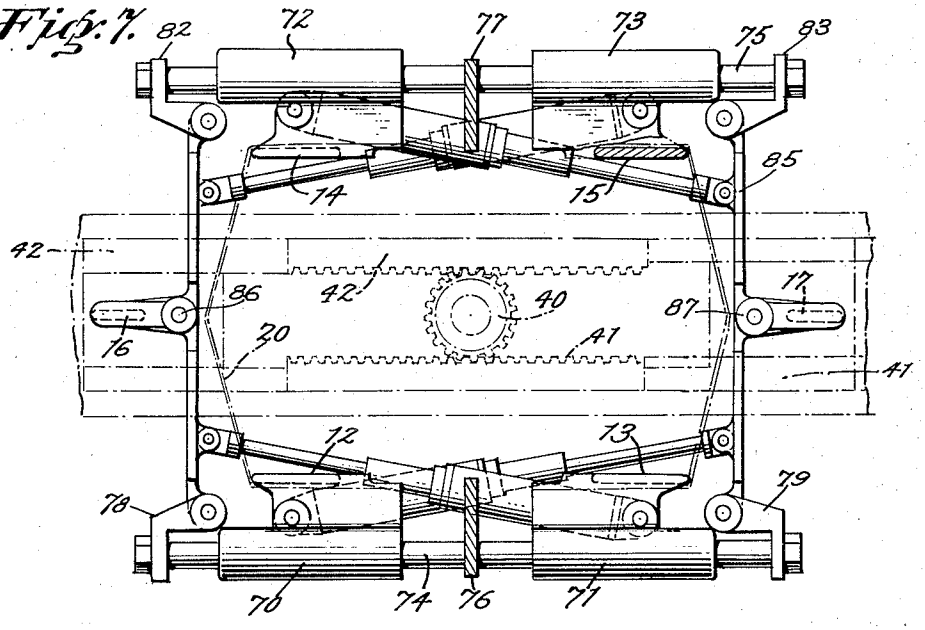
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BAG CLOSING APPARATUS

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Fig. 7.



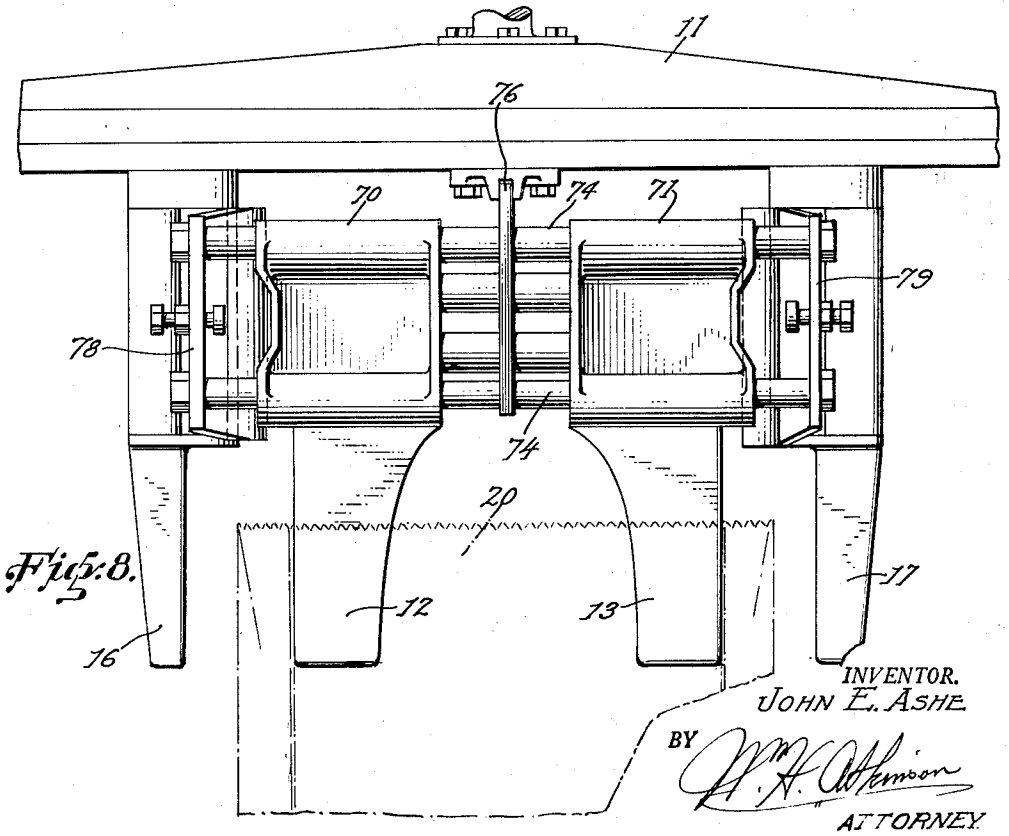




Fig. 8.

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BAG CLOSING APPARATUS

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Fig. 11.

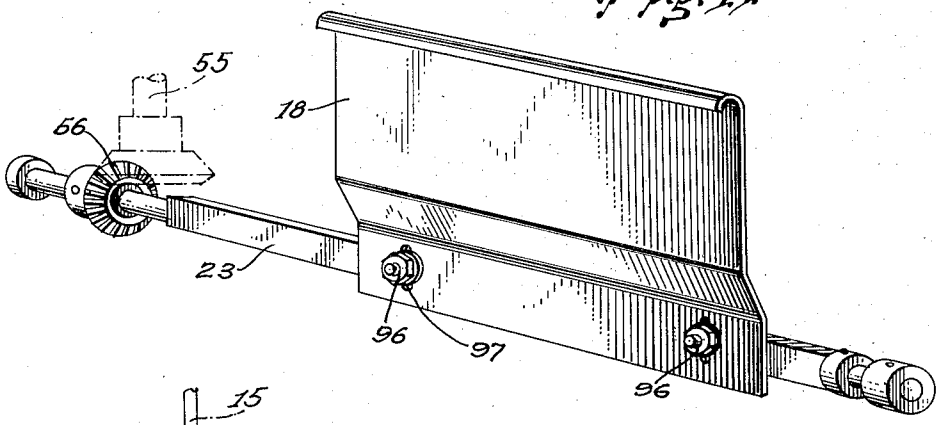



Fig. 12.

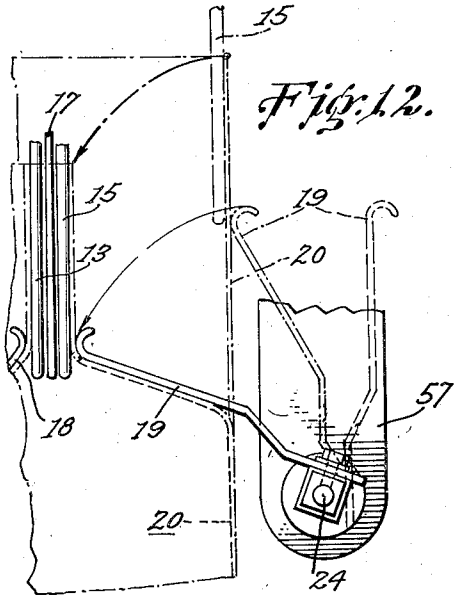



Fig. 13.

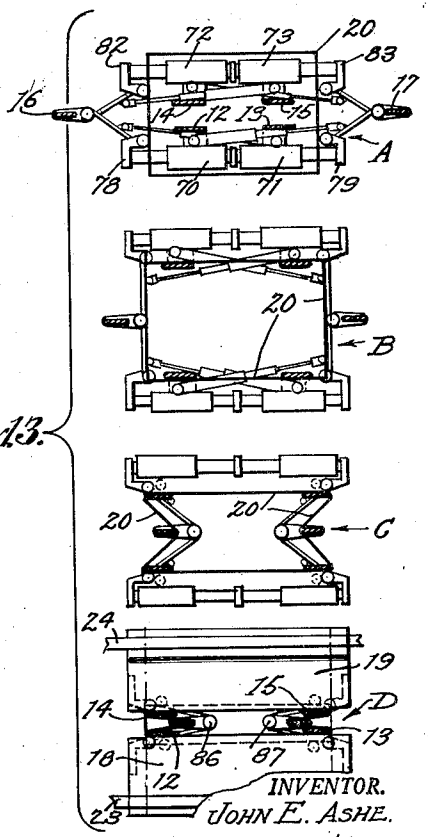
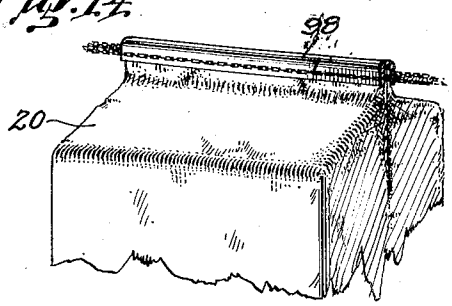



Fig. 14.




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Patented July 11, 1950 2,514,620

# UNITED STATES PATENT OFFICE

2,514,620

## BAG-CLOSING APPARATUS

John E. Ashe, Crockett, Calif., assignor to California and Hawaiian Sugar Refining Corporation, Ltd., San Francisco, Calif., a corporation of California

Application January 12, 1948, Serial No. 1,800

6 Claims. (Cl. 93—27)

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The present invention relates to commodity packaging apparatus and more particularly to a new and improved bag folding and closing device which will operate in an automatic manner in connection with an intermittently moving conveyor upon which the bags are transported from a bag filling station to a sewing machine where the bags are finally secured by a stitching applied across the folded end thereof.

The principal object of the present invention is to provide a bag folding and closing apparatus which is particularly adapted for use in connection with bag filling apparatus of the character disclosed and claimed in my co-pending application for patent, Serial No. 666,418, filed May 1, 1946 and entitled, Bag Handling and Filling Apparatus.

Another object of the invention is to provide bag folding and closing apparatus which is adapted to operate in conjunction with an intermittently moving conveyor to fold and close the open ends of a series of bags in an automatic manner as they are brought into cooperating relation therewith by the conveyor.

Another object of the invention is to provide a bag folding mechanism having novel bag wall engaging members which are particularly adaptable when closing the open ends of a bag of the so-called gusset type to crease the end walls and control the side walls during the creasing operation to the end that the bags will be closed in a neat and effective manner.

Another object of the invention is to provide a bag folding and closing mechanism which will be found particularly suitable for folding and closing the ends of relatively large bags such as are now constructed of heavy single and multiply paper for the shipping of a number of other smaller containers that are nested together to form a bale.

In the packaging of sugar and like granular commodities which were formarly shipped in cotton pockets for the retail trade and in burlap sacks for wholesale distribution there has now developed a considerable demand for the use of paper for these containers. At most refineries it is now the practice in the distribution of sugar and like commodities to employ smaller bags having a capacity of from five to ten pounds each and to then bale or combine a number of these smaller bags in properly arranged relation within an outer and much heavier bag that is formed of relatively heavier single or multiply paper. These outer bags or bale forming units like the inner bags or pockets are then closed by folding

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the sides and end walls together so that they may be secured with a suitable stitching and it is therefore a further object of my present invention to provide a bag folding and closing device which will be found particularly suited to the folding and closing of these larger bags or bale forming containers which are constructed of relatively stiff and heavy paper that cannot be easily and uniformly folded and closed by hand.

Other objects and advantages of the invention will be in part evident to those skilled in the art and in part pointed out hereinafter in the following description taken in connection with the accompanying drawings wherein there is shown by way of illustration and not of limitation a preferred embodiment of the invention.

In the drawings:

Figures 1 and 2 are fragmentary perspective views showing apparatus constructed in accordance with a preferred embodiment of the present invention respectively in its initial and final bag folding and closing positions,

Figure 3 is a more complete front view of the device shown in Figures 1 and 2 of the drawings with parts broken away and in section to reveal details.

Figure 4 is a side view of the apparatus as illustrated in Figure 3 of the drawings,

Figure 5 is a plan view in section showing the bag engaging elements of my improved device,

Figure 6 is a side elevation of the device with the bag engaging elements in the positions shown in Figure 5 of the drawings,

Figures 7 and 8 are respectively a sectional plan view and side elevation showing the bag engaging elements of my device in an intermediate bag folding position,

Figures 9 and 10 are fragmentary sectional views showing other details of construction,

Figure 11 is a fragmentary perspective view showing additional details of construction,

Figure 12 is a fragmentary side elevation showing a further feature of the invention,

Figure 13 is a diagrammatic view illustrating four positions which the bag engaging elements of my improved folding device may assume during a single cycle of its operation, and

Figure 14 is a fragmentary perspective view showing a bag or bale folded as contemplated by the present invention and finally stitched.

In another copending application entitled, Bag Folding and Closing Apparatus, Serial No. 691,210, filed by me on August 17, 1946, now abandoned, there is disclosed an apparatus for the folding and closing of paper pockets or bags,

but in this prior application the apparatus shown and described to illustrate the invention is primarily designed for the folding and closing of smaller and lighter weight bags and is adapted for operation in conjunction with a continuously moving conveyor by which the bags are moved into cooperating relation with the bag folding and closing mechanism in a continuous manner. As distinguished from the showings in my prior application, the apparatus shown in the accompanying drawings is primarily designed for the closing and folding of considerably larger size bags that are made of relatively heavier weight paper and in which a number of smaller bags of the commodity are enclosed to form a bale. The apparatus here described and shown in the drawings to illustrate the present invention also differs from the apparatus of my prior application, in that the present apparatus is adapted to operate in conjunction with an intermittently moving conveyor which positions the bales to be folded and closed in cooperating relation with the present apparatus where the bag or bale folding and closing operations are completed during a dwell period of the conveyor.

Briefly and with particular reference to Figures 1 and 2 of the accompanying drawings my invention may be described as comprising a stationary supporting frame 10 which is disposed in overhanging relation with an intermittently operating conveyor mechanism (not shown). This overhanging frame 10 carries a vertically movable head 11 that carries a number of relatively movable bag folding elements designated by the numerals 12, 13, 14 and 15 which depend therefrom to engage with the side walls of a filled bag and also two end wall folding members 16 and 17 which engage the creased gusset forming end walls of the bale forming bag, here designated by the numeral 20. As will hereinafter appear the side wall engaging elements 12, 13, 14 and 15 and the end wall engaging members 16 and 17 are adapted to operate and move relative to each other in timed relation with the vertical operations of the head 11 to fold the side and end walls of the bag into overlapping relation so that they may be stitched together to complete a closure of the bag. Cooperating with these bag side wall and end wall engaging members and elements my invention also contemplates the provision of two oppositely disposed fold completing and retaining plates 18 and 19 which serve to fold the side walls of the bag downwardly over the contents thereof so that when finally closed the bale will present a substantially squared and flat end surface. These fold retaining plates 18 and 19 also operate in timed relation with the bag wall folding elements 12, 13, 14 and 15 and members 16 and 17 referred to above and serve to hold the folded end of the bag until the conveyor operates to move the folds at the upper end of the closed bag between two spaced horizontally extending horns 21 and 22 which will retain the folds thus formed and guide the folded end of the bag 20 to a sewing machine station during the next succeeding operation of the conveyor upon which the bale forming bags are intermittently moved from one station to the next. The fold retaining plates 18 and 19 are respectively mounted upon spaced parallel shafts 23 and 24 which extend along opposite sides of the bag folding station and these shafts are adapted to be rocked or oscillated in timed relation with the bag wall folding operations as will be hereinafter described. In Figure 2 of the drawings there is also shown a pair of spaced guide rails 25 and 26 between which the bags 20 are adapted to move as they are carried along by the intermittently moving conveyor and at the bag entry side of the folding station there is a pair of flared plates 27 and 28 that will serve to guide the upper end of the bag 20 into the folding station as it is moved into position by the conveyor mechanism, a part of which, designated by the numeral 29, is here shown.

In the operation of the above described apparatus it will be understood that suitable stop motion and/or intermittent driving devices of a conventional type will be employed to establish the proper synchronization of the several related operations of the bag folding apparatus and the bag transporting conveyor.

By now referring to Figures 3 and 4 of the drawings it will be seen that the frame 10 in addition to carrying the vertically movable head 11 with its depending bag folding elements and members also carries two vertically disposed disc-like cam plates 30 and 31 which turn about a horizontal axis. These cam plates 30 and 31 have cam trackways 32 and 33 which in conjunction with cam track following levers 34 and 35 respectively impart operating movements to the bag wall engaging elements and members 12 to 17 inclusive and the fold retaining plates 18 and 19. The cam plate 30 also has a second cam trackway 36 formed in its front side into which a pin 37 carried by the vertically movable head 11 projects. This latter cam trackway 36 will serve to impart the required vertical movements to the head 11, in timed relation with the operations of the aforesaid bag folding elements 12, 13, 14 and 15 and the fold retaining members 18 and 19. At this point it should be explained that the pin 37 carried by the vertically movable head 11 extends rearwardly from a shaft supporting sleeve 38 which is slidably mounted upon the frame 10 so as to carry the operating head 11 into and out of cooperating relation with the bags 20 as they are brought into a position to be folded and closed. Journalled within the sleeve 38 there is a shaft 39 that carries a rack driving gear 40 at its lower end which is shown as meshing between two oppositely disposed horizontally extending racks 41 and 42 that operate to control the relative movements of the bag wall engaging elements 12, 13, 14 and 15 and the end wall engaging members 16 and 17. At its upper end the shaft 39 extends through and outwardly beyond a driving gear 43 to which it is slidably keyed. The driving gear 43 is retained against axial movement by a housing 44 at the upper end of the frame 10 and is adapted to be driven with a backward and forward rotation by means of a rack 45 which is slidably mounted in the housing 44. This rack 45 is connected to the upper end of the cam track following lever 34 by means of a link 46. In this manner the shaft 39 is caused to rotate first in one direction and then in a reversed direction as the bag engaging elements and members carried by the vertically movable head 11 brought into and out of engaging relation with the upstanding walls of an open bag 20.

At the same time while the cam plate 30 operates, as above described, to control the operating movements of the bag engaging elements and members carried by the vertically movable head 11, the cam plate 31 will also turn in unison therewith and cause its cam trackway engaging lever 35 to move and impart a properly timed rotation to a vertically extending shaft 47 that

controls the operations of the fold retaining plates 18 and 19. In this arrangement the cam trackway engaging lever 35 is connected in driving relation with the vertically extending shaft 47 by means of a horizontally disposed link 48 which is connected between the outer end thereof and a radially extending lever arm 49 that is keyed to the upper end of the shaft 47. At its lower end the shaft 47 is shown as having a beveled gear 50 that meshes with a similar beveled gear 51 carried by the shaft 24 upon which the fold retaining plate 19 is mounted. Intermediate its ends the shaft 47 also carries a second beveled gear 52 that is connected through a counter shaft 53 and suitable beveled gears 54 to drive a second vertically extending shaft 55 which is connected through suitable beveled gears 56 to the shaft 23 upon which the fold retaining plate 18 is mounted. In this manner it will be seen that as the vertically extending shaft 47 is caused to rotate first in one direction and then in another the two parallel extending shafts 23 and 24 will be caused to oscillate in response to movements imparted to the cam following lever 35 as the cam 31 rotates. Therefore by properly positioning the relative cam trackways upon the cams 30 and 31 it will be seen that the operating movements of the fold retaining plates 18 and 19 may be timed, in relation to the folding operations performed upon the bag 20, to retain the folding thus produced while the bag is moved out of the bag folding station and into engagement with the spaced horns 21 and 22 which direct the folding end of the bag to the stitching head of the sewing machine. At this point it will be noted that the shafts 23 and 24 which carry the fold retaining plates 18 and 19 are mounted in a frame 57 that is adjustably mounted with respect to the vertically movable head supporting frame 10 by means of a lead screw 58 and in a like manner the vertically movable head supporting frame 10 is shown as adjustably mounted upon a vertically extending pedestal 59 which is carried by a main supporting base 60. In this way the elevation of the frame 10 may be regulated by a jack screw 61 which is turned by a crank 62 operating through a shaft 63 and beveled gears 64. Extending centrally through the vertically extending supporting column or pedestal 59 there is a main driving shaft 65 that operates through beveled gears 66 and 67 to impart rotative movement to the trackway carrying cam plates 30 and 31.

Reference is now made to Figures 5 to 10 inclusive, of the drawings, for a more detailed description of the bag wall engaging and folding elements previously referred to as carried by the vertically movable head 11. As shown in these figures of the drawings the various bag wall engaging elements 12 to 15 inclusive and the end wall engaging members 16 and 17 are tied together by a novel system of connecting links which will cause these various elements and members to move between different extreme positions as they are brought into folding relation with the walls of the bag 20. To this end the bag wall engaging elements 12 to 15 inclusive are respectively shown as carried by oppositely disposed and slidable supports 70, 71, 72 and 73 which are mounted between two vertically spaced and horizontally extending rods 74 and 75 that are suspended from the underside of the head 11 by means of two spaced vertically disposed plates 76 and 77 so that these rods 74 and 75 may move



relative to each other during a bag folding operation as will now appear. In Figures 5 and 6 I have shown the bag side wall engaging elements 12, 13, 14 and 15 and end wall engaging members 16 and 17 in their bag wall approaching positions and in Figures 7 and 8 these elements and members are shown in an intermediate position. The horizontally extending rods 74 and 75 are firmly engaged at their mid point by the supporting plates 76 and 77 and are thus held against axial movement while at the same time they are free to move laterally with respect to each other as the racks 41 and 42 are reciprocated by rotation of the rack driving gear 40, as above explained. At their oppositely extending ends the spaced horizontally extending rods 74 carry hinge brackets 78 and 79 to which hinge plates 80 and 81 are respectively connected. In a like manner the horizontally extending rods 75 carry hinge plates 82 and 83 at their ends to which hinge plates 84 and 85 are respectively connected. The hinge plates 80 and 84 at one end of the rods 74 and 75 extend toward each other and at their free ends they are hingedly connected to a common pintle 86 carried by the rack 42. Likewise the hinge plates 81 and 85 extend toward each other and are hingedly connected together by a pintle 87 carried by the rack 41. With this arrangement it will be seen by reference to Figure 5 that as the racks 41 and 42 move toward the center of the bag folding station the hinge plates 80, 84 and 81, 85 will be caused to fan out and thus move the horizontally extending supporting rods 74 and 75 away from each other until the racks 41 and 42 have reached the mid point of travel. Then as will be seen by reference to Figure 7 of the drawings, when the racks 41 and 42 move further toward the center of the folding station these hinge plates 80, 84 and 81, 85 will fold in an opposite direction and cause the horizontally extending rods 74 and 75 to move toward each other. At the same time as the hinge plates 80, 84 and 81, 85 operate in this manner to cause the horizontally extending rods 74 and 75 to move toward each other, the end wall engaging members 16 and 17 previously referred to as carried by the racks 41 and 42 will be also caused to move into engagement with the end walls of the bag as it is held open by the bag wall engaging elements 12 to 15 inclusive. During this latter movement of the racks 41 and 42 the horizontally extending supporting rods 74 and 75 will be caused to move toward each other and thus permit the side walls of the bag to fold inwardly as a gusset or pleat is formed in the end walls of the bag by the members 16 and 17. During these movements of the supporting rods 74 and 75, it will be understood that their supporting plates 76 and 77 will slide freely in their mounting upon the vertically movable head 11. In addition to imparting lateral movement to the horizontally extending rods 74 and 75 upon which the slidable supports 70, 71 and 72, 73 are respectively mounted the hinge plates 80, 81 and 84, 85 are also adapted to impart a sliding movement to the supports 70, 71, 72 and 73. To this end the hinge plate 80 is shown as connected to the slidable support 71 by a connecting rod 88 and the hinge plate 81 is connected to the slidable support 70 by a similar but oppositely extending strut 89. In like manner the hinge plates 84 and 85 are respectively connected to the slidable members 73 and 72 by struts 90 and 91. These struts 88 to 91, inclusive, are each hingedly connected at their inner ends to their respective slidable sup-

port and at their outer ends they are hingedly connected to the hinge plates 80, 81 and 84, 85 at points intermediate their pivotally secured ends. As a result when the hinge plates 80, 84 and 81, 85 fan outwardly and later fold inwardly, as above indicated, the slidable supports 70, 71 and 72, 73 will be moved away from each other as their supporting rod 74 and 75 move outwardly. This will cause the bag wall engaging elements 12 to 15 to be moved in such a manner that the top of the bag 20 will be held fully opened until the end wall engaging members 16 and 17 are brought into operation to fold the end walls of the bag inwardly as is the practice with bags of the so-called gusset type.

In order to adapt the above described apparatus to variations in the size of the bag to be folded and also prevent a tearing thereof by an overspreading of the walls when in their fully extended condition and prior to folding, the struts 88 to 91, inclusive, are constructed to provide for a limited amount of lost motion between their ends so that any overtravel of the hinge plates to which they are connected will be absorbed after the bag wall engaging elements 12 to 15, inclusive, have extended the walls of the bag to their full open positions. This overtravel feature is clearly illustrated in Figure 10 of the drawings, where it will be seen that each of the struts 88 to 91, inclusive, are formed of two telescoping portions, one of which is an extending rod 92 that telescopes into a second or cylindrical portion 93 which supports a compression spring 94 against which a shoulder 95 carried by the rod 92 is adapted to operate. In this construction the spring 94 serves to maintain each of the struts in an extended position, but will permit a collapse thereof by compression of the spring 94 whenever the bag wall engaging elements 12 to 15, inclusive, carried by the slidable members 70 to 73 have been moved into a position where their further outward movement will be limited by the dimensions of the bag being folded and closed. At this point and by reference to Figure 9 of the drawings it will also be noted that the struts are connected to the inside faces of the slidable members 70 to 73, inclusive, at different elevations so that they will clear each other when imparting movement to these members. In this particular showing the slidable member 71 is shown as having the downwardly extending side wall engaging element 13 attached thereto and the slidable member 73 is illustrated as having the side wall engaging element 15 secured thereupon. Now as the racks 41 and 42 continue in their inward movement from the position shown in Figure 7 of the drawings, the end wall engaging members 16 and 17 will be brought into folding relation with the end walls of the bag 20 and produce a central fold or gusset which will permit the side walls of the bag to be folded inwardly and in contact with each other where they can be sewed together to finally close the bag. At the same time and during these latter bag wall folding operations the fold completing and retaining plates 18 and 19 will come into operation and hold the bag walls in this folded condition while the bag folding elements 12 to 15, inclusive, and the end wall engaging members 16 and 17 are being withdrawn from the folds thus formed in the end of the bag.

In Fig. 11 of the drawings where I have shown the fold retaining plate in greater detail, it will be noted that the plates 18 and 19 are preferably secured upon a squared portion of the shaft 23 by means of bolts 96 which pass through elongated slots 97. This will permit a limited adjustment of these plates to accommodate for bags having different wall thicknesses. As previously suggested, the fold completing and retaining plates 18 and 19 will operate in properly synchronized relation with the bag wall engaging elements 12 to 15, inclusive, and as is more clearly shown in Figure 12 of the drawings, the movement of the fold completing and retaining plates 18 and 19 is timed to move inwardly with the side wall engaging elements 12 to 15 as they move downwardly and inwardly to complete the gusset folds in the side walls of the bag. After these fold completing and retaining plates 18 and 19 have reached the positions substantially as here shown, the bag wall engaging elements 12 to 15 and the end wall engaging members 16 and 17 carried by the vertically movable head 11 will be withdrawn from the folds thus provided, but the fold retaining plates 18 and 19 will remain in the position here shown until the bag engaging elements 12 to 15 and end wall engaging members 16 and 17 have been completely withdrawn and the bag has been moved into fold retaining engagement with the spaced horizontally extending horns 21 and 22 that serve to guide the folded end of the bag 20 to the sewing machine station when the intermittently movable conveyor operates to bring another bag into a bag folding position under the vertically movable head 11 for a repetition of the above bag folding and closing operation.

The operation of my improved bag folding and closing apparatus will now be described in detail. In this operation it will be assumed that a bag 20 has been brought into a bag folding position under the vertically movable head 11, as shown in Figures 1, 3 and 4 of the drawings, and that the vertically movable head 11 is in its elevated position, as shown in the two latter figures of the drawings. Under these conditions and with the main drive shaft 65 in rotation, it will be seen that as the cam plates 30 and 31 are driven thereby in the direction indicated by arrow that the vertically movable head 11 will be caused to move downwardly as its trackway engaging pin 37' follows the cam trackway 36 formed in the outer face of the cam plate 30. Then as the vertically movable head reaches a pre-determined position in its downward travel the cam track following lever 34 will operate as its cam trackway engaging end follows the trackway 32 formed in the rear side of the cam plate 30 and move the rack 45 to the right as viewed in Figure 3 of the drawings. This will cause the driving gear 43 to turn the shaft 39 and rotate the rack gear 40 in a direction which will cause the oppositely disposed horizontally extending racks 41 and 42 to move inwardly and carry the bag wall engaging elements 12, 13, 14 and 15 and the end wall engaging members 16 and 17 into folding relation with the upwardly extending open end of the bale forming bag 20. Next as the bag wall engaging elements and members have substantially completed the folding of the end walls of the bag 20 the cam track following lever 35 will come into operation and through the connecting link 48 cause the shaft 47 to rotate and thus turn the spaced parallel shafts 23 and 24 at the sides of the bale forming bag 20 and move the fold retaining plates 18 and 19 into their fold retaining position, as indicated by full lines in Figure 12 of the drawings. As the cam plates 30 and 31 continue to turn the vertically movable

head 11 will be raised and at the same time the bag wall engaging elements 12 to 15 and the end wall engaging members 16 and 17 will be returned to their initial position, as illustrated in Figures 3 and 4 of the drawings. During the above described operation of the vertically movable head 11 the bag wall engaging elements 12, 13, 14 and 15 and the end wall engaging members 16 and 17 will assume various positions relative to each other as is diagrammatically illustrated in Figure 13 of the drawings. In this latter showing the bag wall engaging elements 12 to 15 and the end wall engaging members 16 and 17 are shown in four different positions which they will assume relative to each other during a bag folding and closing operation. From these showings it will be noted that the bag wall engaging elements 12 to 15 each follow an irregular path in that they move outwardly along a substantially diagonal line in spreading the bag walls and then move inwardly in a lateral direction with the side walls of the bag as the gussets are formed in the end walls thereof. In these diagrams the apparatus in position A corresponds with the showings of the Figures 1, 3, 5 and 6 of the drawings and the diagram B represents the relative intermediate positions of the bag wall engaging elements and members when the racks 41 and 42 have completed one-half of their opening movement, as illustrated in Figures 7 and 8 of the drawings. The diagram C indicates the position of the bag wall engaging members during an initial stage of the bag wall folding operation, while diagram D indicates the position of the bag wall engaging members as the final bag wall folding operations are completed. In this latter diagram it will be noted that the fold retaining plates 18 and 19 have moved downwardly into their fold retaining positions so that the bag wall engaging elements 12 to 15 inclusive and members 16 and 17 may be withdrawn without an unfolding of the bag walls. Following this the fold retaining plates 18 and 19 will remain in the position here shown for a predetermined period and thus operate to retain the folds thus produced until the bale forming bag 20 has been moved into engagement with the guiding horns 21 and 22 which lead to a sewing machine station where the closure of the bag 20 will be finally completed by a suitable stitching which in its preferred form will include an overlaying strip of tape 98, as illustrated in Figure 14 of the drawings.

While I have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, I desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a bag closing apparatus of the character described, the combination of a supporting frame having an overhanging portion under which a bag to be closed may be positioned, a vertically movable frame carried by said supporting frame and having a head at its lower end for supporting bag wall engaging elements in depending relation therewith, a vertically extending shaft journalled upon said latter frame and movable with said head having a spur gear at its lower end, means for imparting a forward and reverse rotation to said shaft as said frame is moved vertically, two oppositely disposed racks slidably mounted upon said head and adapted to be driven in opposite directions by said spur gear as said shaft is rotated first in one direction and then the other, a supporting rod extending along each side of said head parallel with said racks and supported for free lateral movement, a bag end wall engaging member fixed to the outer end of each of said oppositely disposed racks, a hinge connection between said racks and each of the supporting rods at the sides of said head, whereby said supporting rods will be caused to float laterally with respect to said head as said bag end wall engaging members are moved toward and away from each other by their supporting racks, a pair of oppositely movable bag side wall engaging elements slidably mounted upon each of said supporting rods, and a link extending between each of said bag side wall engaging members and one of the hinge connections between said oppositely disposed racks and said laterally movable supporting rods, adapted to cause said bag side wall engaging elements to slide toward and away from each other upon said supporting rods as said rods move laterally with respect to said head, whereby the open end of the bag will be spread to rectangular form by said bag side wall engaging elements prior to a folding of the end walls thereof.

2. In a bag folding apparatus of the character described, the combination of a stationary supporting frame having an overhanging portion under which an open bag may be positioned, a vertically movable frame carried by said stationary frame having a head at its lower end for supporting bag wall engaging elements in depending relation therewith, a vertically extending shaft movable with said head and having a spur gear keyed to its lower end, means for imparting a forward and reverse rotation to said shaft as said frame is moved vertically, two oppositely disposed racks slidably mounted upon said head and in mesh with said spur gear adapted to be driven in opposite directions as said shaft is rotated first in one direction and then the other, a slide forming support extending transversely along each side of said head parallel with said racks and supported for free lateral movement, a depending bag wall engaging member fixed upon the outer end of each of said oppositely disposed racks, a hinge-like plate extending between the outer ends of said racks and each of the slide forming supports at the sides of said head, whereby said slide forming supports will be caused to float laterally with respect to said head as said bag wall engaging members are moved toward and away from each other by their supporting racks, a pair of oppositely movable bag wall engaging elements slidably mounted upon each of said slide forming supports, and a connecting rod extending between each of said bag wall engaging members and one of the hinge-like plates between said oppositely disposed racks and said laterally movable slide forming supports, adapted to cause said bag wall engaging elements to slide toward and away from each other upon said slide forming supports as said supports move laterally with respect to said head, whereby the open end of the bag will be spread to rectangular form by said bag wall engaging

elements prior to a folding of the end walls thereof.

3. In a bag closing apparatus of the character described, the combination of a stationary frame having an overhanging portion under which a bag to be closed may be positioned, a vertically movable frame having a head at its lower end upon which bag engaging elements may be supported, a vertically extending shaft movable with said head and having a spur gear keyed to its end and located within said head, means for imparting a forward and reverse rotation to said shaft in timed relation with vertical movements of said movable frame, two oppositely extending racks slidably mounted upon said head meshing with said spur gear and adapted to be moved transversely upon said head in opposite directions to each other as said spur gear is rotated first in one direction and then the other a supporting slide disposed for lateral movement at each side of said head and extending parallel with said racks, a bag wall engaging member fixed to the outer end of each of said oppositely extending racks, a hinge connection extending from the ends of each of said racks to the adjacent ends of the supporting slides at the sides of said head, whereby said supporting slides will be caused to float laterally with respect to said head as the bag wall engaging members carried by said racks are moved toward and away from each other, to engage and disengage a bag, a pair of oppositely movable bag wall engaging elements slidably mounted upon each of said supporting slides, and a link extending between each of said bag wall engaging elements and one of the hinge connections between said oppositely extending racks and said laterally movable supporting slides adapted to cause said bag wall engaging elements to move toward and away from each other upon said supporting slides as said slides move laterally with respect to said head, whereby the end of the bag will be opened to rectangular form by said bag wall engaging elements prior to a folding of the end walls thereof.

4. In a bag closing apparatus of the character described, the combination of a horizontally extending vertically movable head, a pair of opposed gear racks slidably mounted to move transversely of said head, a spur gear disposed centrally between said opposed gear racks, means for rotating said gear in a forward and reverse direction in timed relation with vertical movements of said head, a downwardly extending bag end wall engaging member secured at the outer end of each of said racks, four downwardly extending bag side wall engaging elements disposed between said bag end wall engaging members and mounted for both lateral and transverse movement with respect to said head, and an operating connection between said bag end wall engaging members and said bag side wall engaging elements adapted to cause said bag side wall engaging elements to extend the open end of a bag into rectangular form prior to a folding in of the end walls thereof as the end wall engaging members carried by said racks move inwardly toward the center of said head, whereby gusset forming folds will be produced in the end walls of the bag when closed.

5. In a bag closing apparatus of the character described, the combination of a horizontally extending vertically movable head, a pair of opposed gear racks slidably mounted to move transversely of said head, a spur gear disposed centrally between said opposed gear racks, means for rotating said gear in a forward and reverse direction in timed relation with vertical movements of said head, a downwardly extending bag end wall engaging member carried by each of said racks, four downwardly extending bag side wall engaging elements mounted upon said head for both lateral and transverse movement, and a folding linkage connection between said bag end wall engaging members and said bag side wall engaging elements adapted to cause said bag side wall engaging elements to move outwardly from each other along substantially diagonal lines prior to a folding in of the end walls of the bag and then laterally in pairs toward each other as the end wall engaging members carried by said racks move inwardly toward the center of said head, whereby a pleat-like fold will be formed in the end walls of the bag when closed.

6. In a bag closing apparatus of the character described, the combination of a stationary supporting frame having an overhanging portion under which a bag to be closed may be positioned, a vertically movable frame having a head at its lower end for supporting bag engaging elements in depending relation therewith, a vertically disposed shaft having a gear at its lower end journalled upon said vertically movable frame, means for imparting a forward and reverse rotation to said shaft as said frame moves vertically, two oppositely disposed racks slidably mounted upon said head and adapted to be driven by the gear at the lower end of said shaft as said shaft is rotated first in one direction and then the other, a pair of vertically spaced slide forming rods extending along each side of said head parallel with said racks and supported upon said head for free lateral movement, a bag end wall engaging member fixed to and depending from the outer end of each of said transversely movable racks, a hinged operating connection between the ends of said pairs of slide forming rods and the adjacent end of one of said racks, whereby said slide forming rods will be caused to float laterally with respect to said head as said bag engaging members at the end of racks are moved toward and away from each other, a pair of bag side wall engaging members slidably mounted upon each of said pairs of slide forming rods, and an operating link connection between each of said slidable bag wall engaging members and the hinged operating connection between the ends of said transversely movable racks and said laterally movable vertically spaced slide forming rods, whereby said bag wall engaging elements will be caused to slide toward and away from each other as said slide forming rods move laterally upon said head.

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