Inventor: Kenneth Stone
By: Zahl & Duitsbaugh
Attorneys
This invention relates to a bag closing machine for use in connection with the packaging of products in bags of the expanding wall or gusset type, and in particular to an improved tucker for tucking in the expanding wall.

The particular embodiment of my invention herein shown is adapted for use with heat sealing bags.

It is an object of my invention to provide an improved device for tucking the expanding walls of a bag and for bringing the top edges of the bag together while the bag is in motion.

It is a further object to provide an improved mechanism for conveying to and through a sealer, and one which straightens and shapes the bags and causes the top edges of the bag to be tuck ed in, closed and sealed.

A still further object of my invention is to provide an improved tucker which shapes the upper edges of the bag and contents at the same time that tucking is effected, thereby providing a neat looking package.

Other objects, features and advantages of my invention will become apparent as the description proceeds.

With reference now to the drawings in which like numerals designate like parts:

Fig. 1 is a side elevation of a preferred embodiment of my invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a vertical section taken along line 3—3 of Fig. 2;

Fig. 4 is an enlarged fragmentary elevation showing the detent wheel and its associated parts;

Fig. 5 is a section taken along line 5—5 of Fig. 3;

Fig. 6 is an elevation of the cam;

Fig. 7 is an elevation of a portion of the pawl wheel;

Fig. 8 is a fragmentary view showing the cam and the pawl wheel in locked position;

Fig. 9 is a sectional elevation illustrating the operation of the tucker;

Fig. 10 is a plan view taken along line 10—10 of Fig. 9;

Fig. 11 is a perspective view of the parts in the position shown in Fig. 9;

Fig. 12 is a sectional elevation similar to Fig. 9, but showing a changed position of the parts;

Fig. 13 is a plan view taken along line 13—13 of Fig. 12;

Fig. 14 is a horizontal section taken along line 14—14 of Fig. 3.

With reference now to Figs. 1 and 2, the machine comprises a frame designated generally by the reference numeral 18 which includes a base plate 11, one or more legs 12, and other conventional frame elements not shown. The right-hand portion of the machine as viewed in Figs. 1 and 2 constitutes a bag receiving portion 13 and the left-hand portion constitutes a bag shaping and closing portion 14. The bags move forward from right to left, and the term forward refers to the left-hand portion of certain elements and the term rear to the right-hand portion, as those elements would be viewed in Figs. 1 and 2. The bag receiving portion 13 is of substantial length, but for the sake of clarity, a portion of it is not shown in the drawings, as indicated by the break lines. The left-hand end of the machine, which includes a bag delivery table, is not shown since it forms no part of my invention.

The bag shaping and closing portion 14 includes a tucker designated generally as the reference numeral 19 and heat sealing rollers 10. The term "heat sealing bag" includes any bag, the top edges of which are made from a material which can be heat sealed. For instance, the top edges, or the whole bag, can be made from certain types of thermoplastic material, or they can be made from non-thermoplastic material which is provided with a heat sealing coating. Thus, after the top edges of the bag have been brought together, they are fed between the heat sealing rollers 10, and the bag is thus sealed. It is understood that heat sealing means other than the heat sealing rollers 10 may be employed, if desired.

The bags are advanced forwardly by means of a conveyor belt 17, the upper span of which is supported by a track 16. The latter may be in the form of a horizontal plate which is spaced above the base plate 11. The machine preferably includes means, not shown herein, for adjusting the elevation of the track 16. The conveyor belt is disposed between two pulleys, one of which, pulley 12, is disposed at the right end of the machine and the other one of which is at the left end of the machine and not shown.

Vertically disposed shaper belts 20 and 21 are also provided which engage the side walls of the bag and serve to shape the bag as it moves through the machine. The shaper belts and the conveyor belt are driven at the same rate of speed by conventional means, not shown herein. Each shaper belt is disposed between two pulleys, only one of which is shown herein. The pulley 22 is disposed at the extreme right end of the machine, and pulley 23 about which the shaper belt 21 passes, is disposed at the right-hand end of the shaping and closing portion 14. Thus, the conveyor belt 17 and the shaper belt 20 extend all the way out to the bag receiving portion. Filled bags are placed on the conveyor belt at the bag receiving portion, and they lean against the shaper belt 20 and are advanced by belts 17 and 20 up to the closing and shaping portion 14.

In the shaping and closing portion 14, the belts 20 and 21 pass over shaper plates 24 and 25 so
that the side walls of the bag may be shaped. These shaper plates are mounted by means of brackets 25, 27 on supporting plates 23 and 29 respectively, which are spaced above the base plate 11 and are mounted in suitable ways, not shown, for sliding movement toward and away from each other. Thus, the distance between the shaper belts may be adjusted for different size bags. This adjustment is made by means of shafts 30 and 31 which run crosswise of the machine and are provided with right and left hand screw threads 32 and 33 respectively. The supporting plates 23 and 29 are provided with threaded collars which cooperate with the screw threads 32 and 33 so that rotation of the shafts 30 and 31 will cause the plates to be moved toward and away from each other. The shafts are provided with sprockets 34 and 35 which are connected by a suitable chain 36. Thus, the shafts may be rotated in unison by means of a handle 37 which is secured to shaft 31. Pulleys 38 and 39 are mounted at the right-hand end of supporting plates 23 and 29 respectively and serve as belt guides. Thus, if the shaper plates are moved closer to each other, the guide pulleys prevent the belt from scraping over the edges of the bag, which carries four spokes 41. Pulleys 40 and 41 are adjus tably mounted on base plate 11 and bear against the outer spans of the shaper belts to regulate the belt tension. An adjus tably mounted backing plate 42 may be provided for that portion of the inner span of shaper belt 20 which extends over the bag receiving portion in order that the bags may be suitably supported as they are advanced. That portion of the bag path which lies between the pulleys 38 and 39 may be termed the throat 48 of the machine. Here the shaper belt 21 moves inwardly and there is straightened up the bags which have been tilted against the shaper belt 20 as they pass over the bag receiving portion 13.

From the throat, the bags are continuously advanced between the shaper plates past the tucker 13. The latter is mounted on a rotatable sleeve 43 which in turn is supported on a stationary shaft 46. The stationary shaft is secured to supports 48 and 49 which extend upwardly from the base plate 11. The tucker 13 is in the form of a paddle wheel and as shown in Figs. 3 and 9 comprises a hub 50 which carries four spokes 51. Each spoke is provided with a shoe 52. The shoe is generally T-shape and comprises a hexagon shaped plate 53 and a radially disposed plate 54. The forwardly extending portion of plate 53 can be termed a toe 55, and the rearwardly extending portion can be termed a heel 56. The shoe also includes a toe rod 57 and a heel rod 58 which are disposed parallel to the spoke 51.

As shown in Figs. 9 and 10, the bag 60 includes a bottom wall 61, front and rear expanding walls 62 and 63 respectively, and side walls 64 and 65. The contents of the bag is indicated by the reference numeral 66.

The operation of the tucker is shown in Figs. 9 to 13 inclusive. In the Fig. 9 position, the tucker is locked in a stationary position. As the bag 60 is advanced by the belts 17, 20 and 21 into engagement with the shoe 53, the heel 56 tucks the front wall 52. Then the tucker is caused to rotate at a peripheral or linear speed greater than the speed at which the bag is advanced so that the toe of the next succeeding shoe will engage the rear wall 63 of the bag. This position of the parts is shown in Fig. 12. The plate 53 is spaced slightly above the level of the contents 66 of the bag so that the tucking is effected without any tearing of the bag and so that the motion of the bag can be transmitted to the shoe by the pushing of the contents 65 against the radially disposed plate 54. The plates 53 and 54, which are perpendicular to each other also serve to shape the contents of the bag so as to make a comparatively sharp corner, thus contributing to the neatness of the package.

The tucker is intermittently rotated in the manner indicated above by means of a clutch designated generally by the reference numeral 70 and by means of suitable controls hereinafter described. The clutch, as shown in Figs. 3 to 8, serves to establish a driving connection between a continuously rotating sleeve 71 and the sleeve 45 on which the tucker is mounted. The sleeves 45 and 71 are disposed in end to end relationship on the stationary shaft 46. A pulley 72 is secured to the sleeve 71 and is continuously rotated by means of a belt 73 from a suitable source of power, not shown. A ratchet wheel 74 is secured to sleeve 71 and rotates continuously therewith and serves to drive a pawl wheel 75 mounted on the sleeve 45. The pawl wheel includes a pawl 76 which is pivotally mounted on a plate 77. The pawl is shown in Figs. 3 and 7. A spring 78 biases the pawl inwardly against the teeth of the ratchet wheel 74. The plate 77 is suitably riveted to the pawl wheel 75.

Disposed between the ratchet wheel and the sleeve 45 is a stationary cam 80 which is mounted on the stationary shaft 46. The cam is provided with four rising cam surfaces 81 and four drops 82. Thus, as the pawl wheel is driven by the ratchet wheel, the pawl 76 will be engaged by the cam and raised out of engagement with the teeth of the ratchet wheel, thereby breaking the driving connection. Means are provided to lock the pawl wheel and its associated parts in a position in which the pawl is held out of engagement with the ratchet wheel. Thus, the tucker and pawl wheel are caused to rotate intermittently in the direction 90° after which the parts are locked in a position corresponding to that shown in Fig. 9.

The locking means are shown in Fig. 4 and comprise a detent wheel 83 connected to sleeve 45 and having four notches 84 and a spring 85. A plunger 86 cooperates with the notches and is slidable mounted in a casing 87. A spring 88 disposed within the casing urges the plunger into engagement with the detent wheel. The plunger is retracted by means of a solenoid indicated generally by the reference numeral 89. The solenoid and the plunger casing are suitably mounted on a portion of the frame of the machine. The solenoid includes an armature 90 which is connected to the plunger by suitable means such as a pin 91. Thus, upon operation of the solenoid, the plunger will be retracted from one or the notches 84 and permit rotation of the detent wheel. It is necessary only that the plunger be maintained in its retracted position during the first few degrees of rotation of the detent wheel, after which the plunger can be released without impairing the movement of the wall 53 to the next locking position. The solenoid is actuated by a trip lever 91 which projects through an aperture in shaper plate 25 into the bag path. A suitable switch 92 is closed by the displacement of the trip lever and serves to close the solenoid circuit, the switch and solenoid being operatively connected by means of an electric cable 93.

The tucker is normally located in any one of
four positions, the locked position being shown in Fig. 9, and the corresponding locked positions of the detent wheel 58 and of the pawl wheel 76 being shown in Figs. 6 and 8 respectively. It will be observed from a comparison of these figures that the pawl of the pawl wheel is a few degrees out of alignment with the notches of the detent wheel, and that the notches of the detent wheel may be in alignment with the drops 82 of the stationary cam 80, when the parts are in locked position. However, the angular relationship of the parts 83, 75 and 85 may be changed, as pointed out hereinafter. The position of the trip lever is such that the solenoid will not be actuated until the bag has been moved into the Fig. 9 position in which the forward wall is tucked. Then the tucker, the pawl wheel and the detent wheel are caused to rotate at a greater rate of speed. The shape of the cam surfaces is not critical since the pawl wheel can be disengaged from the ratchet wheel at any time after the parts have been set into motion, the inertia of the parts serving to carry them into the next 90° position. After the detent wheel has been released it is the pressure of the bag against the radially disposed plate 54 which displaces the pawl wheel the few degrees which is necessary before the pawl drops off the cam drop 82 and is engaged by the teeth of the ratchet wheel. The detent wheel is mounted for angular adjustment on the sleeve 45 and the cam 80 is mounted for angular adjustment on the stationary shaft 46. Thus, the position of these two elements may be shifted somewhat from the positions shown in the drawing. For instance, it may be desired to rotate the stationary cam a few degrees forward in order to maintain the pawl and the ratchet wheel in engagement a little longer. Also, it will be observed that the pawl 75 is provided with an adjusting screw 113 which bears against the stationary cam and which serves to regulate the timing of the device. The microswitch 82 as shown in Figs. 3 and 15 is mounted on a standard 111, the standard being adjustably mounted on the supporting plate 12. Thus, the forward and back position of the trip lever 91 may be varied in order to regulate the timing. The foregoing adjustments permit the operation of the machine to be regulated in accordance with the dimensions of the bag to be closed.

After the front and rear walls have been tucked, the top edges of the side wall of the bag are closed by means of closing belts 100 and 101. These belts are disposed around pulleys 102, 103, respectively at the right end and pulleys 104, 105 respectively at the left end. The latter pulleys are driven by suitable gearing 107 which are jour-nalled in a bridge member 106, the pulleys 104, 105 being mounted on the under surface of the bridge member. The sealing rollers 16 in this machine are mounted directly in front of the pulleys 104, 105 so that after the bag has been closed, by bringing the edges together, it is immediately sealed. As indicated above, the bags are carried through the sealing rollers by belts 17, 20, 21, and the latter are extended so that the belt may be conveyed onto a suitable delivery table, not shown.

It will be understood that the sealing function can be performed by means other than the particular sealing rollers 16 which are shown herein, and that the position of the sealing means is not critical. Furthermore, it may be desired to provide between the pulleys 104, 105 and the sealing rollers, means for folding over the top edges of the bag, or for applying adhesive, or for performing various other functions. For instance, the invention is applicable for use with other types of bags than heat sealing bags.

The operation of the machine has been described in detail in connection with the description of the various parts and sub-assemblies thereof. In summary, the filled bags are placed on the conveyor belt at the bag receiving portion 13 of the machine, and they are maintained upright by the extended shaper belt 22. The bags are continuously advanced through the throat 42 of the machine which serves to straighten the bags and between the shaper plates 24 and 25 which shape the side walls of the bag and contents. As the bags pass between the shaper plates the front and rear walls are tucked, and the top edges of the side wall are closed by means of closing belts 100, 101. After this, the bag is sealed by the sealing rollers 16.

The machine can be readily adjusted to accommodate bags of various capacities by operation of the handle 31 which controls the shaper plates 24, 25 and the shaper belts 20 and 21 to move toward or away from each other. Similarly, the elevation of the conveyor belt 17 may be adjusted to accommodate bags of different height by adjusting the position of the track 18.

Although only a preferred embodiment of my invention has been shown and described herein, it is obvious that various modifications and changes may be made therein without departing from the spirit of my invention.

I claim: 1. A bag closing machine comprising a pair of belts having inner spans spaced from each other and adapted to move in a horizontal direction, said belts being disposed in vertical planes, whereby the side walls of a partially filled bag may be engaged by said inner spans and the bag advanced in an upright position, back spans for said inner spans, a tucker rotatably mounted about an axis spaced above said belts and having a plurality of radially extending arms adapted to project into the space between said belts, means for intermittently rotating said tucker so that the front wall of said bag will be engaged and tucked by one of said arms when said tucker is stationary and so that the rear wall of said bag will be engaged and tucked by an adjacent arm when said tucker is rotating, and a pair of closing belts disposed above said first-mentioned belts and in front of said tucker and having converging inner spans whereby the side walls of said bag will be engaged and brought together after the front and rear walls thereof have been tucked.

2. A bag closing machine comprising means to advance a succession of partially filled bags in an upright position, a tucking device having a plurality of radially extending arms and being rotatably mounted about an axis spaced above said bags, means for driving said tucking device, each of said arms having means extending rearwardly for cooperative engagement with the front wall of a bag and having means extending forwardly for cooperative engagement with the rear wall of a bag, clutch means between said driving means and said tucking device, said clutch means being normally disengaged, means actuated by the displacement of said tucking device for engaging an advancing bag for causing said clutch to establish a driving connection between said driving means and said tucking device to rotate said tucking device at a greater linear speed than the speed at which said bag is advanced, whereby
one of said forwardly extending means will tuck the rear wall of said bag, said clutch means including means for breaking said driving connection, and means for causing said tucking device to remain stationary in a position for tucking the front wall of a succeeding bag.

3. A bag closing machine comprising means to advance a succession of partially filled bags in an upright position, a tucking device having a plurality of radially extending arms and being rotatably mounted about an axis spaced above said bags, means for driving said tucking device, each of said arms having means extending rearwardly for cooperative engagement with the front wall of a bag and having means extending forwardly for cooperative engagement with the rear wall of a bag, clutch means between said driving means and said tucking device, means to lock said tucking device in a position in which the rearwardly extending means of one arm will be engaged by the front wall of a bag so that a portion of said wall will be tucked, and means actuated by the advance of said bag for releasing said locking means after said front wall has been tucked, said clutch means being operative upon displacement of said arm by said bag after said locking means has been released to establish a driving connection between said driving means and said tucking device to rotate said tucking device at a greater linear speed than the speed at which said bag is advanced, whereby said forwardly extending means of an adjacent arm will engage the rear wall of said bag so that a part of said rear wall will be tucked, said clutch means including means for breaking said driving connection prior to the time that said forwardly extending means engages said rear wall.

4. In a bag closing machine, the combination of a bag tucking device having a plurality of radially extending arms, means for continuously advancing a succession of bags in upright position past said tucking device, means for intermittently rotating said bag tucking device, said latter means comprising a continuously rotating ratchet wheel, a pawl wheel axially spaced therefrom and having a pawl for engagement with said ratchet wheel, a stationary cam engaging said pawl for establishing and disestablishing a driving connection between said pawl and ratchet wheels, means for locking said tucking device in a series of angular positions in which said arms are successively engaged by said bags as they are advanced by said bag advancing means, and means actuated by the advance of said bags to release said locking means so that said tucking device can be rotated by the movement of said bags, said tucking device being driven by said pawl wheel.

5. In a bag closing machine, the combination of a bag tucking device, means for continuously advancing a partially filled bag in upright position, and means for intermittently rotating said bag tucking device, said latter means comprising a continuously rotating ratchet wheel, a pawl wheel spaced therefrom and having a pawl for engagement with said ratchet wheel, means connecting said pawl wheel and said tucking device so that the latter may be driven by said pawl wheel, stationary cam means disposed for engagement with said pawl to break the driving connection between said pawl and ratchet wheels, detent means for locking said pawl wheel in a predetermined position at a time when said driving connection is broken, and means actuated by the advance of said bag to release said detent means so that said tucking device can be rotated by the movement of a bag, the movement of said bag subsequent to the release of said detent means serving to displace said tucking device and to release said pawl from said cam means so as to reestablish said driving connection.

6. In a bag closing machine, a tucking device comprising a supporting arm, a shoe mounted at the end of said arm, said shoe including a plate disposed in a plane perpendicular to the axis of said arm and a second plate disposed perpendicular to said first plate and projecting therefrom in a direction away from said supporting arm.

7. A tucking device according to claim 6 having a rod disposed substantially parallel to said supporting arm and projecting from the edge of said first plate in the same direction of said supporting arm.

8. In a bag closing machine, a tucking device comprising a hub, a plurality of radially disposed spokes, a plurality of shoes, one shoe being mounted at the end of each spoke, each shoe comprising a plate having pointed ends and secured at its central portion to a spoke and disposed in a plane perpendicular to said spoke, one end of said plate providing a toe for engaging the rear wall of a bag and the other end of said plate comprising a heel for engaging the front wall of a bag, and a second plate disposed in a plane perpendicular to said first plate and substantially parallel to the axis of said tucking device and projecting from the mid-portion of said first-mentioned plate in a direction away from said spoke.

9. A tucking device according to claim 8 in which said shoes are provided with toe rods and heel rods which are disposed parallel to said spokes and project from the ends of said plates in the same direction as said spokes.

KENNETH STONE.