

May 31, 1938.

M. A. NICOLAS

2,119,174

FILLED BAG SETTLING AND SHAPING METHOD AND APPARATUS

Filed July 1, 1936

4 Sheets-Sheet 1

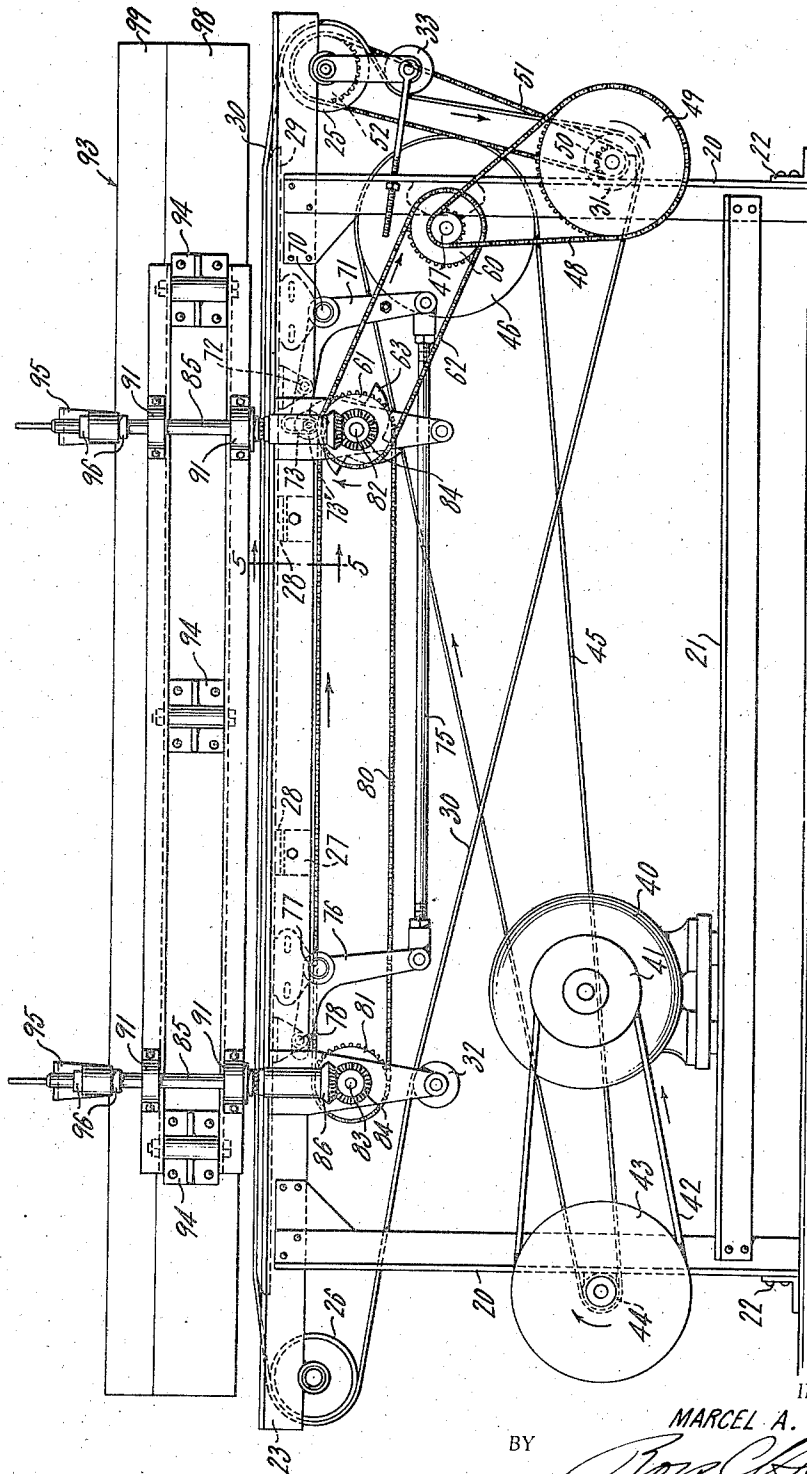


Fig. 1.

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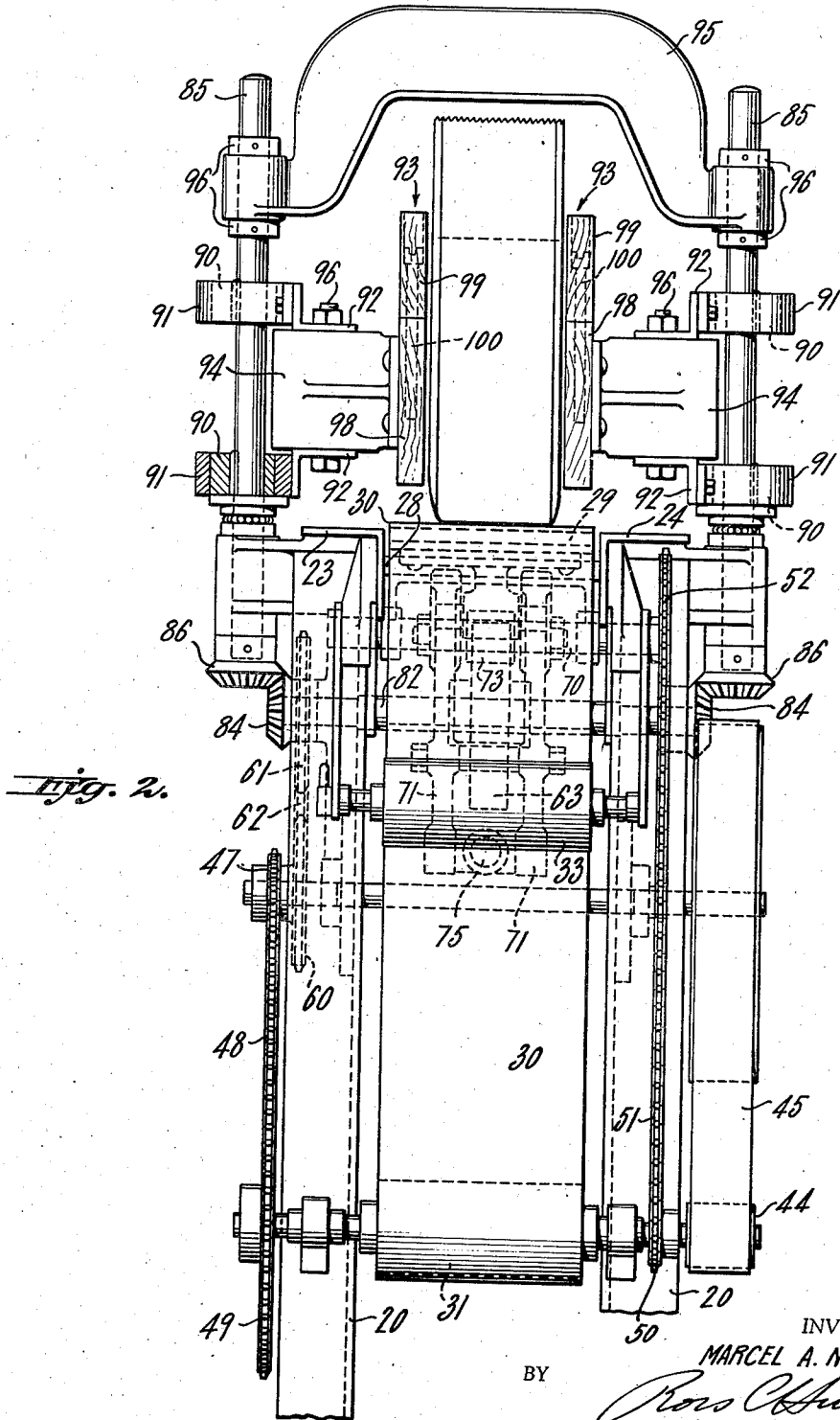
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4 Sheets-Sheet 2



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fig. 3.

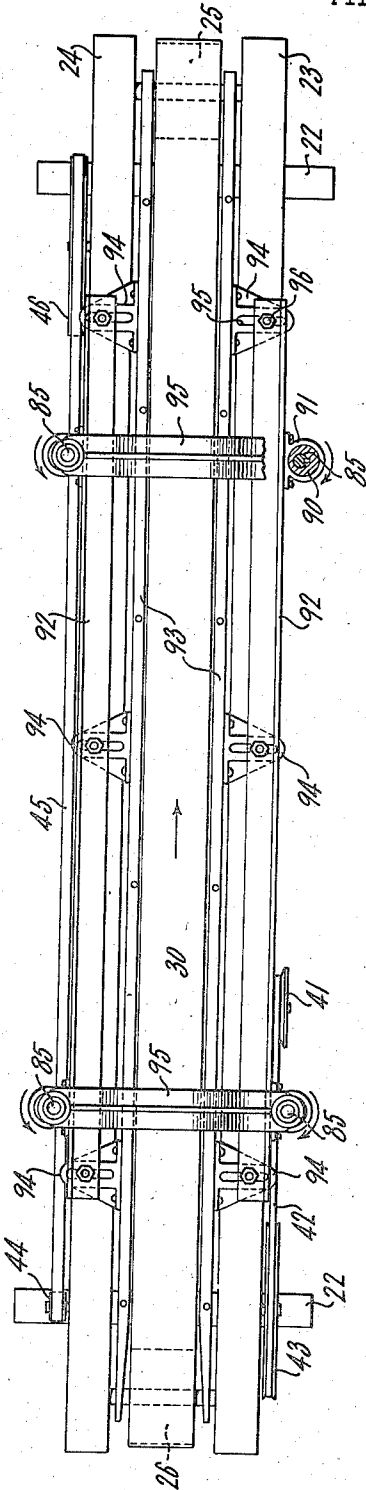


fig. 4.

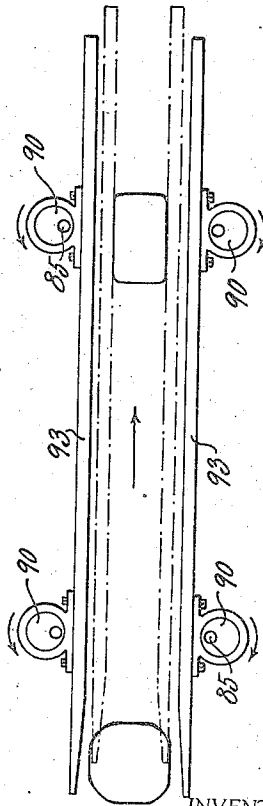


fig. 5.

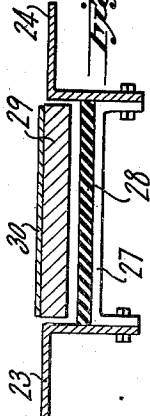
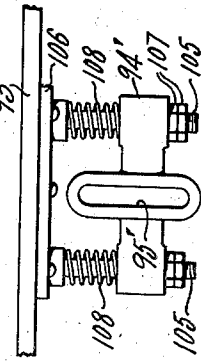


fig. 6.



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Fig. 7.

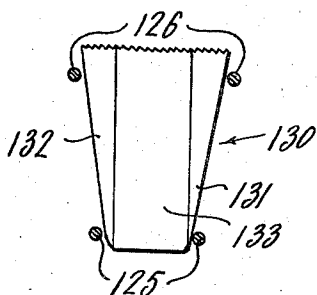


Fig. 8.

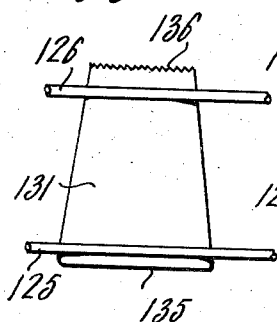


Fig. 9.

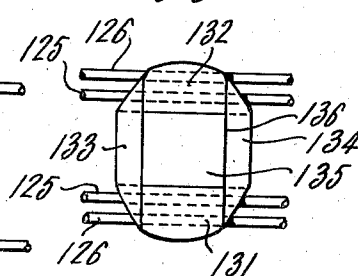


Fig. 10.

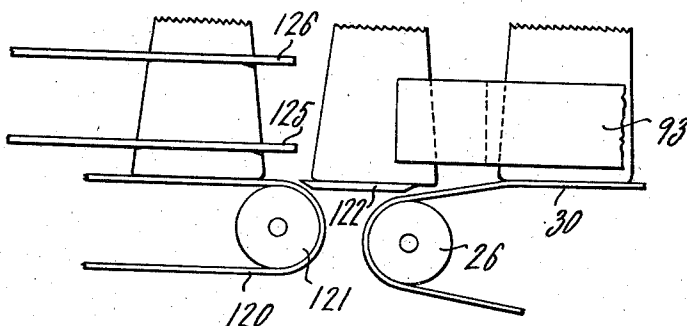


Fig. 11.

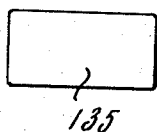


Fig. 12.

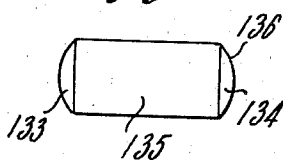
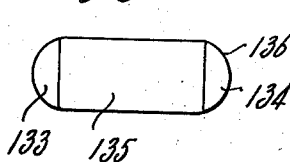


Fig. 13.



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FILLED BAG SETTLING AND SHAPING
METHOD AND APPARATUSMarcel A. Nicolas, Buffalo, N. Y., assignor to Con-
solidated Packaging Machinery Corporation,
Buffalo, N. Y., a corporation of New York

Application July 1, 1936, Serial No. 88,388

14 Claims. (Cl. 259-72)

The present invention relates to a method and apparatus for compacting and shaping the contents of flexible containers, particularly paper bags designed to hold up to several pounds of materials such as coffee, sugar, cocoa, flour, rolled oats, cereals, or the like. Particular utility for the present invention is realized in the formation of one to ten pound packages of flour or other powdered materials. It is to be appreciated, however, that the present invention would be equally of use in the formation of smaller or larger packages and in the packaging of granular materials.

It has long been a major problem in certain industries to devise means to form firm packages having tight seals. One reason for previous inability to form a seep-proof seal on flour packages is that the contents of the bag could not be so firmly compressed as to form a rigid backing against which to press the folded and glue-coated portion of the bag forming the closure. It is common knowledge that, in order perfectly to seal a package by means of adhesive, pressure must be applied to the closure while the adhesive is obtaining its first set, otherwise portions of the bag material spring away from each other and the adhesive dries ineffectually. It has therefore been the constant aim in packaging to be able firmly to press the folds or plies of the closure together immediately after the application of adhesive and until the adhesive has set sufficiently to hold the folds or plies together after the release of pressure. It is apparent that in order to achieve this object with certain types of closures the contents of the bag must be perfectly compressed or settled in order that a pressing member may have something against which to press the closure. In order to accomplish this it has long been the customary practice to pass the filled bag over a jogging mechanism as it is conveyed from the filling station to the closure-forming and adhesive applying mechanism. It would be thought that if one or two sharp jogging blows were struck against the bottom of the bag to settle the contents a certain degree, that an increase in the number or force of blows would correspondingly increase the compactness of the package. This would be true except for the fact that after a certain degree of compactness is achieved by means of blows, struck against the bottom or the sides of the bag any further blows tend to move the entire bag and its enclosed charge as a unit without affecting relative displacement between the particles within the bag. Hence, there is a certain minimum number

of blows which achieve all that can be achieved by blows alone.

It would likewise be a logical conclusion that in order to speed production it would be effective to strike a great number of blows in a short period of time. I have discovered, on the contrary, that in order for the material to become compacted sufficient time must elapse between blows for the particles to separate and permit the escape of trapped air and then to settle into engagement with each other. Accordingly, the blows must be spaced over a substantial period of time. An object of the invention is to provide means for striking the minimum number of jogging blows over a substantial period of time while continuously feeding the filled bag forward in order that the production of completed packages will not be delayed.

In the packaging of many commodities of the type particularly exemplified by flour it has been found that there is a certain point beyond which jogging of the filled bag will not affect any settlement of the contents. After this point is reached any further jogging merely has the effect of raising the bag and its contents without affecting displacement between the particles of the contents. This may be due to the formation of compacted layers between which air is entrapped, or it may be due to the formation of zones of vibration within the contents, or it may be due to the fact that the contents are of such a light nature that no appreciable momentum can be imparted to its individual particles. As evidenced by frequent explosions in flour mills it is apparent that the light particles tend to float in the air rather than to settle and permit the air to escape. The present invention overcomes this objectionable characteristic by subjecting the contents of the bag to alternate compression and release of compression in a direction transverse to the direction of the force imparted by the jogging motion. By means of eccentrically mounted, parallel side boards mounted above the jogging mechanism co-extensive pressure is applied to the opposite sides of the bag at each revolution of the eccentric mounting. The timing of the side pressure members is preferably such as to apply pressure to the sides of the bag after at least two jogging blows have been struck and while the bag is not being subjected to a jogging blow.

The object of settling and shaping is to cause the material to occupy a smaller space than when first deposited in the bag by the filling machine. To do this any air entrapped with the material must be expelled. In packing granular material

this is not very difficult because the voids between particles tend to allow air to escape when the material is agitated. Previous mechanisms and methods attempted to accomplish the desired result by rapidly and violently agitating the contents, upon the assumption that the air is liberated by such agitation. The lighter and fluffier the material being packaged the faster the bag would be vibrated. However, I have observed that actually there is no appreciable correction of the looseness of the mass but on the contrary some materials even become more loosely packed due to the tendency of the vibrating particles of material to float in the air. The common methods of agitating comprise shaking, vibrating or pounding the bottom of the container, and in some cases supplementing this by tapping or rolling the sides of the container. This appears suitable for large bags containing granular materials because the vibrations tend to cause the particles to fit more closely into contact with each other. However, when handling powdered materials the vibrations tend to keep the air entrapped particularly toward the top of the charge which is not compressed by the weight of the charge.

The present invention operates on a different theory and comprises a different mechanical action upon the material. Means are provided violently to jar the bag by raising the bag and dropping it so violently as actually to cause the bag to bounce as an entirety. This action is repeated at spaced intervals. The number of jarring actions is considerably less than has heretofore been the practice so that instead of rapidly vibrating the material it is alternately jarred and permitted to fall or settle. At timed intervals with respect to the jarring actions the sides of the bag are subjected to squeezing pressure by flat, parallel members which tend not only to shape the bag but to break up the material and cause cracks to appear therein through which the entrapped air may escape. The timing of the device is such that at least two, three, or preferably four, jars occur to one squeezing action. The extent of the compressing movement is such that pressure is smoothly applied and held for a longer duration than with previous side vibrating members. The timing of the side pressing members with respect to the jarring mechanism is such that the bag is caught in mid-air and the side pressing is accomplished while the bag is suspended free of the jarring mechanism.

A further advantage of the present invention is that the eccentrically mounted side boards are operated in such a manner as to move forward when in engagement with the bag and to move backward while disengaged, thereby permitting the application of pressure to the sides of the bag while furthering the progress of the bag through the jarring mechanism.

A further object of the present invention is to provide means to form a substantially rectangular package or, if desired, a parallel-sided bag having rounded ends. This object is accomplished by spacing the side boards so that at their point of closest approach the distance between the boards is substantially equal to the width of the end of the bag being filled and closed. At each compressing movement of the side boards the contents of the bag are therefore positively compressed to about the minimum thickness which would be realized if the bag were rigidly rectangular, and each time it is released the side walls of the bag tend to bulge to a lesser extent as the contents become compacted. This

is of great advantage in that it forms a substantially rectangular package having greater "eye-appeal" and having better packing qualities. This is also of great advantage in forming the closure for the end of the bag, since the closer the contents are to becoming rectangular the easier it is to form a perfect seal. Since modern production methods demand rapid packaging and the present invention is primarily designed to be used at the inlet end of an automatic closure forming machine, it can be seen that the rapid formation of an approximately square package is extremely important to the efficient operation of such a machine.

The primary object therefore of the present invention is to bring about the production of efficiently sealed, substantially rectangular packages. The present invention has been found to form a seven pound package approximately one inch shorter than packages submitted to jogging alone.

The objects and advantages of the present invention will be more apparent from the following specification taken in connection with the accompanying drawings wherein like parts are referred to by like numerals throughout.

In the drawings:

Fig. 1 is a side view of a preferred embodiment of the present invention;

Fig. 2 is an end view looking at the right end of Fig. 1, the view being taken upon an enlarged scale;

Fig. 3 is a plan view of Fig. 1, in which a portion has been broken away;

Fig. 4 is a schematic representation of the side compressing members in operation upon a bag being fed through the mechanism;

Fig. 5 is a vertical section taken along line 5—5 of Fig. 1;

Fig. 6 is an enlarged plan view of a modified portion of the mechanism;

Fig. 7 is an end view of a filled bag as it approaches the pressing and shaping mechanism;

Fig. 8 is a side view of the bag shown in Fig. 7;

Fig. 9 is a top view looking down into the bag of Figs. 7 and 8 as it would appear if the material were removed therefrom;

Fig. 10 is a side view showing bags approaching the pressing and shaping mechanism;

Fig. 11 is a typical top view of a bag formed by the present invention as it would appear if the material were removed therefrom;

Fig. 12 is a similar view of a slightly modified shape of bag which can be formed by the present invention, if desired; and

Fig. 13 is a similar view of an extreme form which can be formed by the present invention.

The machine comprises a frame consisting of vertical legs 20 braced by horizontal members 21 and 22 and supporting a pair of spaced angle bars 23 and 24, with the horizontal legs of the angles turned outward. A pulley 25 is mounted between the bars 23, 24 at the outlet end of the frame and an idler roll 26 is mounted in a similar position at the other end of the frame. The inner vertical legs of the angle irons 23 and 24 are joined by braces 27 on which are mounted pads 28, preferably formed of rubber. A jogging board 29 is positioned between the angle irons 23 and 24 and rests upon the rubber pads 28, its downwardly bevelled ends close to the pulley 25 and roll 26. The upper surface of the board 29 is preferably higher than the upper surfaces of the pulley 25 and roll 26. A belt 30 of sufficient width to support the widest bag for which the mechanism is

likely to be used passes around roll 26, over the length of board 29, and around pulley 25. Idle rolls 31 and 32 guide the lower or return lap of the belt 30, and a tensioning roll 33 keeps it under

5 proper tension to be driven by the pulley 25. Pulley 25 is driven by motor 40 through pulley 41, belt 42, pulley 43, pulley 44, belt 45, pulley 46, sprocket 47, sprocket chain 48, sprocket 49, sprocket 50, sprocket chain 51 and sprocket 52. 10 Belt 30 is therefore driven at a uniform rate of speed depending upon the ratios of the pulleys and sprockets involved.

Sprocket 47 is fixed to a sprocket 60 which drives a sprocket 61 through a sprocket chain 62. 15 Sprocket 61 is fixed to a horizontal shaft in the middle of which is mounted a multiple jarring cam 63, in this instance provided with four high and low parts, the lifting faces being gradual and the releasing faces being abrupt.

20 A horizontal rock shaft 70 fixed to the angle irons 23, 24 carries a bell crank 71, one arm of which is pivoted at 72 to a bracket fixed to the lower surface of the jogging board 29. The same arm extends beyond the bracket and carries a 25 cam following roller 73, the roller being mounted in a vertical yoke whereby adjustment of the roller vertically with respect to the axis of cam 63 may be accomplished in order to increase or decrease the extent to which the bell crank 71 30 is rocked about its axis at 70 as desired for different materials, some materials requiring less jarring than others. The weight of board 29 and the tension upon belt 30 cause cam follower 73 to follow the contour of cam 63 as closely 35 as permitted. Each lifting face of the cam raises the board 29 and each vertical face permits it to drop sharply against the sound deadening pads 28, thereby causing sharp jogging blows to be struck against the bottom of the bag and bouncing 40 the bag into the air. In order to distribute the effect of cam 63 evenly throughout the length of the jogging board, bell crank 71 is connected by link 75 to a second bell crank 76 pivoted to the frame at 77 and to the jogging board at 45 78. During the entire time that the bag is being progressed forward over the surface of board 29 it is therefore being subjected to evenly spaced, uniform jogging blows. The pads 28 reduce noise and vibrations, and for the same reason roller 50 73 is preferably provided with a facing 73' of rubber or the like.

Fixed to the shaft 82 to which cam 63 and sprocket 61 are fixed is a second sprocket of the same size as sprocket 61 driving a sprocket 55 chain 80 which through sprocket 81 rotates a horizontal shaft 83 at the other end of the machine. These shafts 82 and 83 are rotating at the same speed, and carry bevel gears 84, one at each end of each shaft. A vertical shaft 85 60 is mounted in a bearing supported by the frame directly above each bevel gear 84 and carries a bevel gear 86 meshing therewith, so that there are four vertical shafts rotating at the same speed, this speed of rotation being equal to the 65 speed of rotation of shaft 82. Each shaft 85 completes one revolution for every four times the bag is jarred.

Each vertical shaft 85 carries eccentrics 90 around each of which is positioned an eccentric 70 strap 91 bolted to a horizontal supporting bar 92, there being two such bars at each side of the machine. In the form of the invention shown in Figs. 1, 2 and 3 the bars 92 support the side boards 93 through brackets 94 fixed to the 75 boards, each bracket being provided with a ver-

tical slot 95 carrying a bolt 96 rigidly attaching the bracket to the bars 92. By loosening each bolt 96 the spacing of the side boards 93 may be adjusted for different sizes of bags. Spacers 95 brace the upper ends of the shafts 85, and 5 are supported between collars 96.

In Fig. 2 it is apparent that the side boards 93 are held above the uppermost point of movement of the board 29. Preferably the side boards comprise a lower section 98 and an upper section 10 99 joined by bolts 100. If the bag being packaged is of a relatively large size so that the level of the enclosed contents is above the board 98, the board 99 is added in order that substantially the entire contents may be compressed. 15 However, in the packaging of smaller bags, it is desirable to remove the board 99 in order that the mouth of the bag may be observed from the side of the machine. This is designed to permit an operator to remove any imperfect bags which 20 may have escaped the attention of the bag filling machine operator.

The action of the mechanism upon a filled bag is schematically represented in Fig. 4 which 25 shows a bag as it approaches the machine, having a substantially circular shape, and a bag as it leaves the machine, having a substantially rectangular shape.

In order properly to align the bags between the side boards, the boards are preferably bevelled 30 inwardly at their entering ends.

A modified form of side board supporting bracket is shown in Fig. 6, consisting of a member 94' provided with a slot 95' through which 35 the bolts 96 would pass. The member 94' is connected to the boards through bolts 105 slidably passing through the ends of the member. Bolts 105 are fixed to a supporting plate 106 attached to the side boards 93 and are provided with lock nuts 107, limiting the extent to which 40 member 94' may slide upon the bolts. Springs 108, encircling bolts 105, are positioned between member 94' and plate 106. Adjustment of lock nuts 107 permit alteration of the degree of compression of springs 108 and thereby cause an 45 increase or decrease in the force necessary further to compress the springs. The degree of adjustment may be determined by experiment with the bag and material in use at the time in order that a certain uniform pressure will be 50 applied to the sides of the bag, thereby preventing breakage of the bag in case it is slightly twisted or as occasioned by other unusual circumstances. This is of importance with some materials which vary in compacting character- 55 istics from time to time. Certain materials, such as flour and cocoa, are tremendously affected by slight variations in atmospheric conditions so that the density and extent to which the material can be compacted vary from hour to hour 60 or day to day. The resilient connection between the bars 92 and the side boards 93 afforded by the structure shown in Fig. 6 provides a safeguard against rupturing a number of bags in case of a change in the characteristics of the 65 material being packaged.

Referring to Figs. 7 to 13 inclusive, there is disclosed a conveyor 120 guided about a pulley 121 adjacent pulley 26. The gap between conveyor 120 and belt 30 is bridged by a station- 70 ary shelf 122. The conveyor 120 brings filled bags from the filling mechanism, the bags being guided between lower and upper guide rails 125 and 126, respectively. As seen in Figs. 7 to 9, inclusive, a rectangular bag 130 comprises side 75

walls 131 and 132, end walls 133 and 134, and a bottom 135. The bag is fed in the direction of the long dimension of the bottom 135. Due to the outward pressure of the enclosed contents the side walls 131 and 132 tend to bulge and draw the end walls 133 and 134 toward each other. The lip 136 of the bag mouth therefore tends to assume a rectangular shape of which the longer dimension is at right angles to the longer dimension of the bottom 135. This tendency is so pronounced in packaging many materials in certain types of bags that the upper guide rails 126 are spaced farther apart than the lower guide rails 125 in order that friction of belt 120 can advance the bag.

As the side boards 93 spread apart and move backward they reach toward a bag which has been deposited on the shelf 122. The bevelled ends of the boards provide sufficient space to receive the bag and also carry out a degree of pre-shaping. In case the bag is not sufficiently advanced to be gripped as the side boards come together it will be pushed into position to be gripped by the succeeding bags on conveyor 120. The bags are usually fed through the conveyor 120 at such a speed that they are substantially in contact with each other, but the bags may be fed at slower speeds so that they will be substantially spaced between the side boards 93. Due to the intermittent action of the side boards 93 the bags tend to become slightly spaced even when positioned adjacent each other on the conveyor 120. In the preferred embodiment of the machine, which is designed to form a package shaped as in Fig. 11, the forward movement imparted to the bags at each feeding movement of the side boards 93 while the bags are suspended above the belt is decisive and faster than the speed of belt 30 so that as the side boards separate and begin to loosen their grip on the bags the bags are slid forward so as to cause each bag to contact its neighbors. The side boards 93 in such case are preferably adjusted so as to be slightly farther apart at the entering end so as to permit the bags at that end to slide farther than the bags at the opposite end, whereby the bags are caused to close up the spaces in the line. This action tends to flatten the ends of the bags as shown in Fig. 11. However, by varying the speed of belt 30 bags having a shape such as shown in Fig. 12 with slightly rounded ends, or as shown in Fig. 13 with almost perfectly rounded ends, may be formed. The desirability of a rectangular bag as shown in Fig. 11 is recognized since a closure forming machine tends to form truer, more perfect closures on such a bag. However, the bag shown in Figs. 12 and 13 will have perfect closures applied thereto by certain types of mechanisms, since the side walls are substantially parallel.

A brief résumé of the operation of the device is as follows:

Filled bags are fed endwise in upright position onto the belt 30. The cam 63, through the roller 73 and bell cranks 71 and 76, causes vertical reciprocation of the board 29, thereby raising the bag and dropping it at intervals. At a slower rate of speed, preferably at the ratio of once for every four jars, the side boards 93 compress and shape the filled bag while moving the bag forward and while the bag is held suspended above the jarring board.

Modifications in arrangement and detail will be readily apparent to those skilled in the art. The true scope of the invention embraces such

modifications and alterations as come within the language of the following claims.

I claim:

1. The method of compacting material in flexible containers while shaping the containers which comprises continuously feeding the containers endwise in upright position, jarring the material vertically by raising and dropping the containers at spaced intervals, compressing the material sideways while the containers are suspended in mid-air between jarring actions, and feeding the containers slightly faster while compressing the same than while jarring the same in order that the containers will be caused more closely to contact each other thereby to square the end walls of the container.

2. The method of compacting material in flexible containers while shaping the containers which comprises continuously feeding the containers endwise in upright position, jarring the material vertically by raising and dropping the containers at spaced intervals, compressing the material sideways while the containers are suspended in mid-air between jarring actions and feeding the rearmost containers slightly faster than the foremost containers while the same are in mid-air in order that the containers will be caused more closely to contact each other thereby to square the end walls of the container.

3. The method of compacting material in flexible containers while shaping the containers which comprises continuously feeding the containers endwise in upright position, jarring the material vertically by raising and dropping the containers at spaced intervals, compressing the material sideways while the containers are suspended in mid-air between jarring actions, and feeding the containers slightly faster while compressing the same than while jarring the same and feeding the rearmost containers slightly faster than the foremost containers while the same are suspended in mid-air in order that the containers will be caused more closely to contact each other thereby to square the end walls of the container.

4. Apparatus for compacting and shaping the contents of a filled bag which comprises a pair of spaced substantially parallel side compressing boards, eccentrics to which said board are connected and means to drive said eccentrics at the same speed, the eccentrics to which one board is connected being rotated in one direction and the eccentrics to which the opposite board is connected being rotated in the opposite direction whereby said boards are caused to approach toward and recede from each other at the same rate of speed while maintaining their parallel relation to each other, a driven belt upon which a filled bag may be supported and conveyed between said boards, means to drive said belt in the direction of movement of said boards when closest to each other, a jarring board over which said belt passes, and means vertically to raise and drop said jarring board and the section of the belt in engagement therewith, said last means operating at such a speed with respect to said eccentrics as to raise said board a plurality of times for each rotation of said eccentrics.

5. Apparatus for compacting and shaping the contents of a filled bag which comprises a pair of spaced parallel side compressing boards, eccentrics to which said boards are connected and means to drive said eccentrics at the same speed, the eccentrics to which one board is connected being rotated in one direction and the eccentrics

to which the opposite board is connected being rotated in the opposite direction whereby said boards are caused to approach toward and recede from each other at the same rate of speed while maintaining their parallel relation to each other, and resilient connections between said boards and said eccentrics.

6. Apparatus for compacting and shaping the contents of a filled bag which comprises a pair of spaced parallel side compressing boards, eccentrics to which said boards are connected and means to drive said eccentrics at the same speed, the eccentrics to which one board is connected being rotated in one direction and the eccentrics to which the opposite board is connected being rotated in the opposite direction whereby said boards are caused to approach toward and recede from each other at the same rate of speed while maintaining their parallel relation to each other, and resilient connections between said boards and said eccentrics, said connections comprising springs adjustably mounted so as to vary the compression thereof.

7. Apparatus for compacting the contents of containers which comprises a jarring board, a belt passing over said board for supporting and conveying an upright filled bag thereover, means to raise and drop said board uniformly throughout its length comprising a rotating cam and a cam follower, a lever carrying said cam follower and connected to said board, and adjustable means connecting said cam follower to said lever whereby to vary the height to which said board is raised.

8. Apparatus for compacting and shaping the contents of flexible containers comprising a pair of spaced substantially parallel side compressing boards, eccentrics to which said boards are connected and means to drive said eccentrics at the same speed, the eccentrics to which one board is connected being rotated in one direction and the eccentrics to which the opposite board is connected being rotated in the opposite direction whereby said boards are caused to approach toward and recede from each other at the same rate of speed while remaining in substantial parallelism, and means to convey a series of filled flexible containers endwise in upright relation into the space between said boards at one end, said boards intermittently gripping and conveying said containers while adjacent their closest point of approach, said boards at said end of introduction of containers therebetween being slightly farther apart than at the opposite end whereby the containers are caused to close up any gaps therebetween while passing between said boards.

9. Apparatus for compacting and shipping the contents of flexible containers comprising a pair of spaced substantially parallel side compressing boards, eccentrics to which said boards are connected and means to drive said eccentrics at the same speed, the eccentrics to which one board is connected being rotated in one direction and the

eccentrics to which the opposite board is connected being rotated in the opposite direction whereby said boards are caused to approach toward and recede from each other at the same rate of speed while remaining in substantial parallelism, means to convey a series of filled flexible containers endwise in upright relation into the space between said boards at one end, said boards gripping and conveying said containers while adjacent their closest point of approach, said boards at said end of introduction of containers therebetween being slightly farther apart than at the opposite end whereby the containers are caused to close up any gaps therebetween while passing between said boards, and means to jar the contents of the containers by raising and dropping the same vertically while not being gripped by said boards.

10. The method of compacting material in containers comprising: progressing a series of filled containers along a path, raising and dropping said containers to subject the same to a series of impacts while progressing along said path, and periodically interrupting the series of impacts.

11. The method of compacting material in containers comprising: progressing a series of filled containers along a path, raising and dropping said containers to subject the same to a series of impacts while progressing along said path, and periodically interrupting the series of impacts while continuing the progress of the containers along said path.

12. The method of compacting material in containers comprising: progressing a series of filled containers along a path, raising and dropping said containers to subject the same to a series of impacts while progressing along said path, periodically interrupting the series of impacts, and laterally compressing the material within the containers during such periods of interruption.

13. Apparatus for compacting material in containers comprising: means for continuously progressing a series of filled containers along a path, means for alternately raising and dropping said containers to subject the material therein to a series of impacts, and means for periodically interrupting the series of impacts and for laterally compressing the material within said containers during such periods of interruption.

14. Apparatus for compacting material in containers comprising: means for continuously progressing a series of filled containers along a path, means for alternately raising and dropping said containers to subject the material therein to a series of impacts, relatively movable members located on opposite sides of said path, means operating in timed relation with said raising and dropping means to cause said members to engage said containers while in substantially their uppermost position and to hold the same during at least one cycle of operation of said raising and dropping means.

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