March 5, 1957 H. L. WOLVEN 2,783,598

METHOD AND APPARATUS FOR PACKING FILLED BAGS WITHIN BALES

Filed Dec. 29, 1955 7 Sheets-Sheet 1

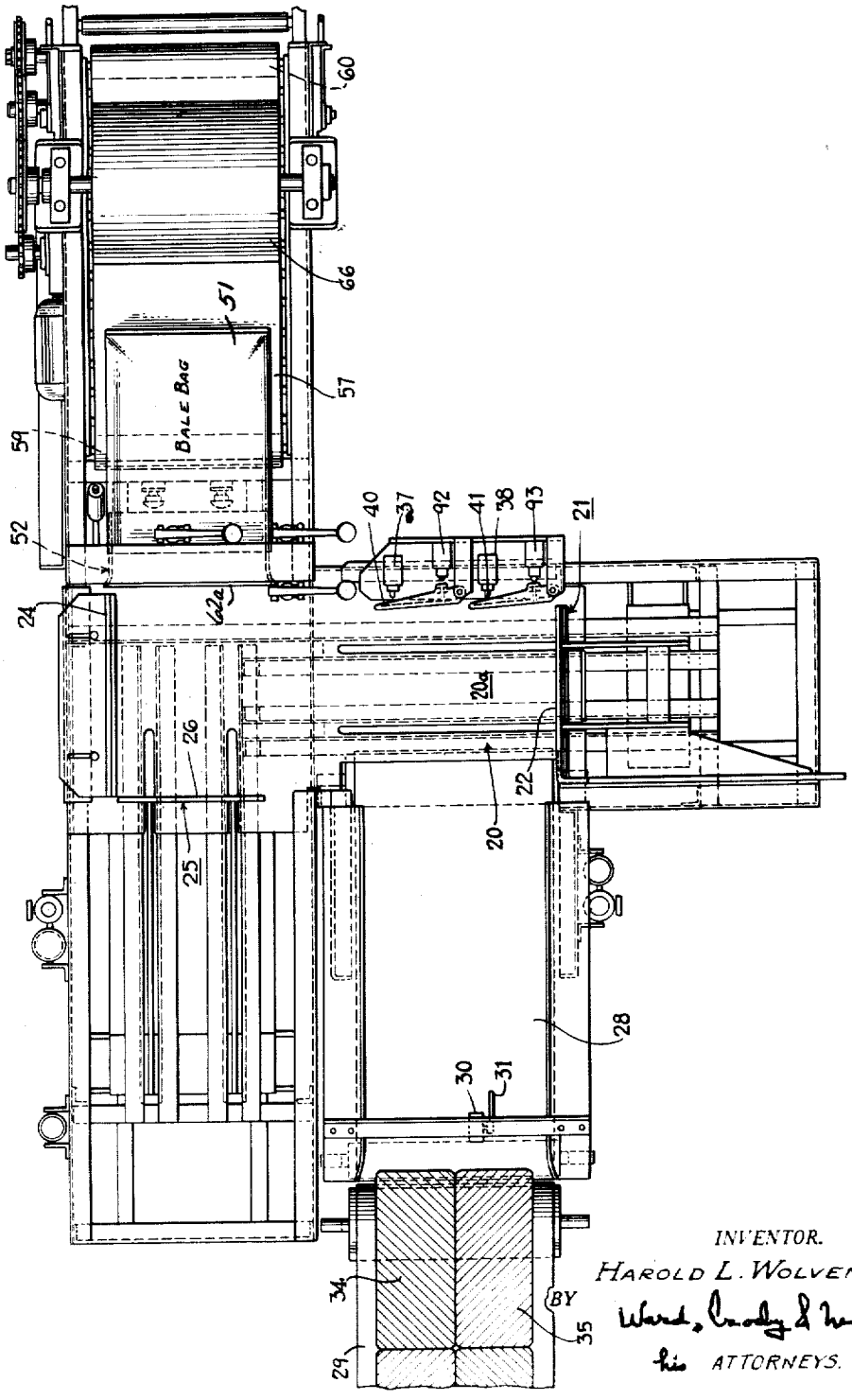


Fig. 1.

INVENTOR.
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his ATTORNEYS.

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METHOD AND APPARATUS FOR PACKING FILLED BAGS WITHIN BALES

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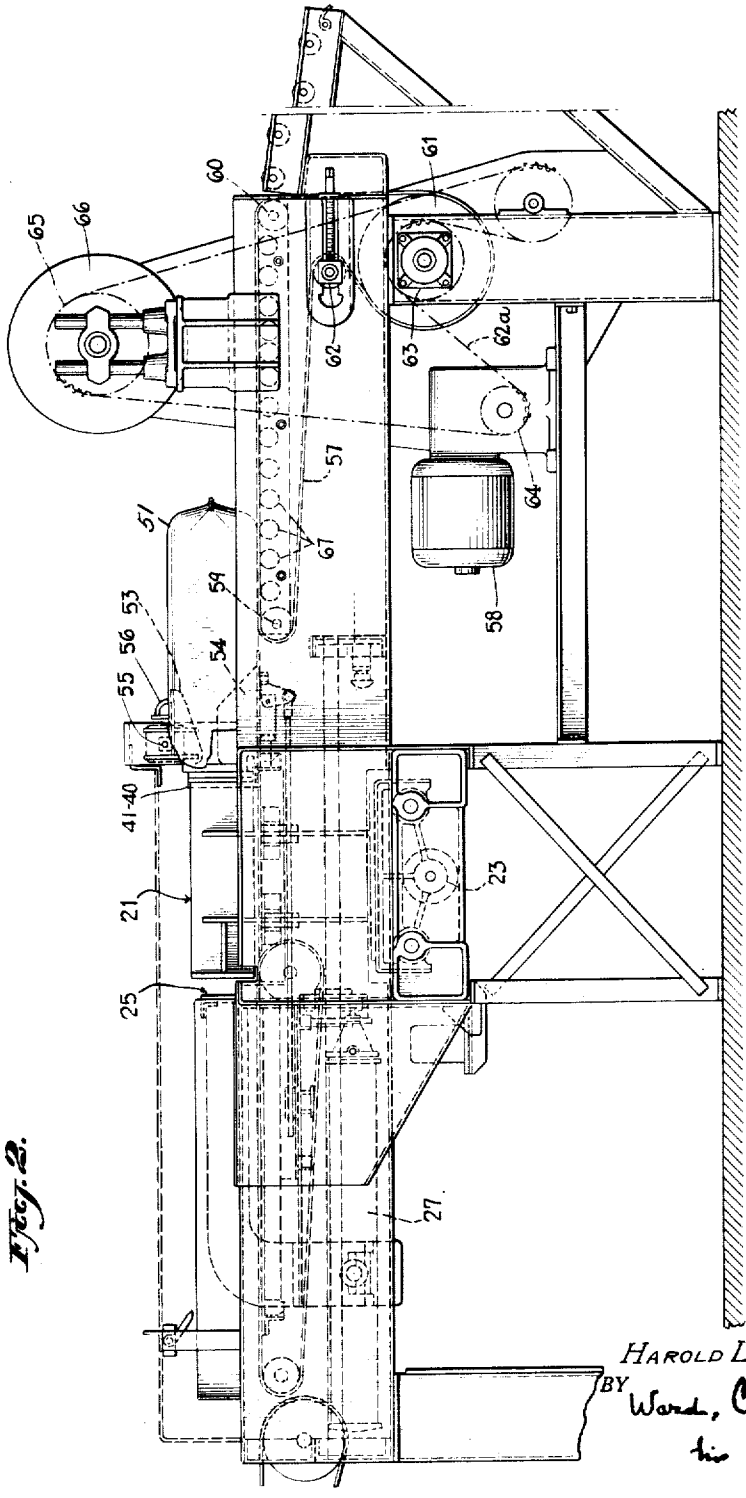


Fig. 2.

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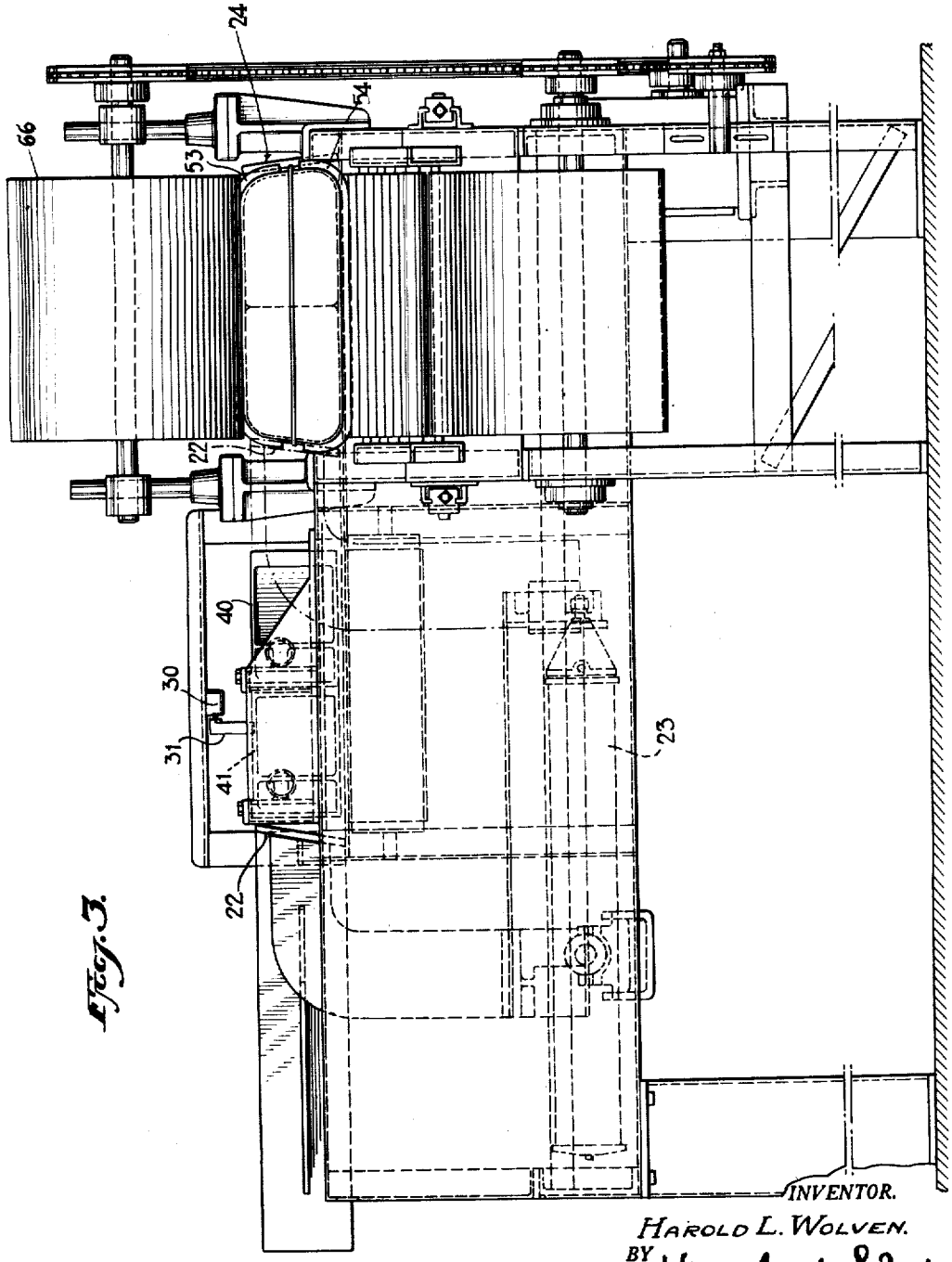


Fig. 3.

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METHOD AND APPARATUS FOR PACKING FILLED BAGS WITHIN BALES

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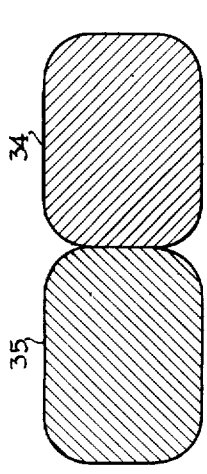


Fig. 4.

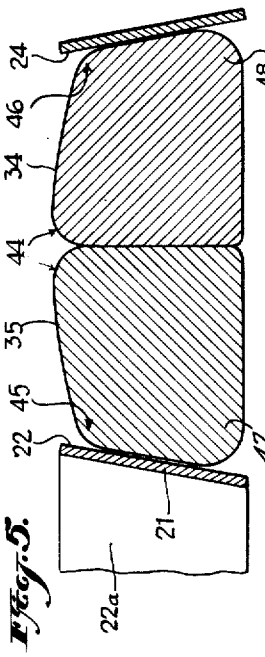


Fig. 5.

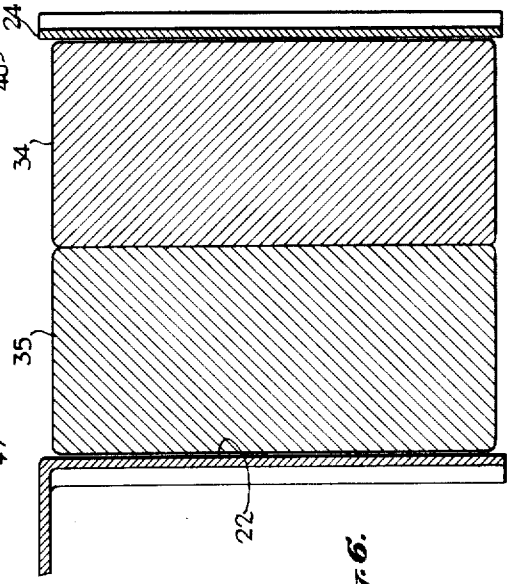


Fig. 6.

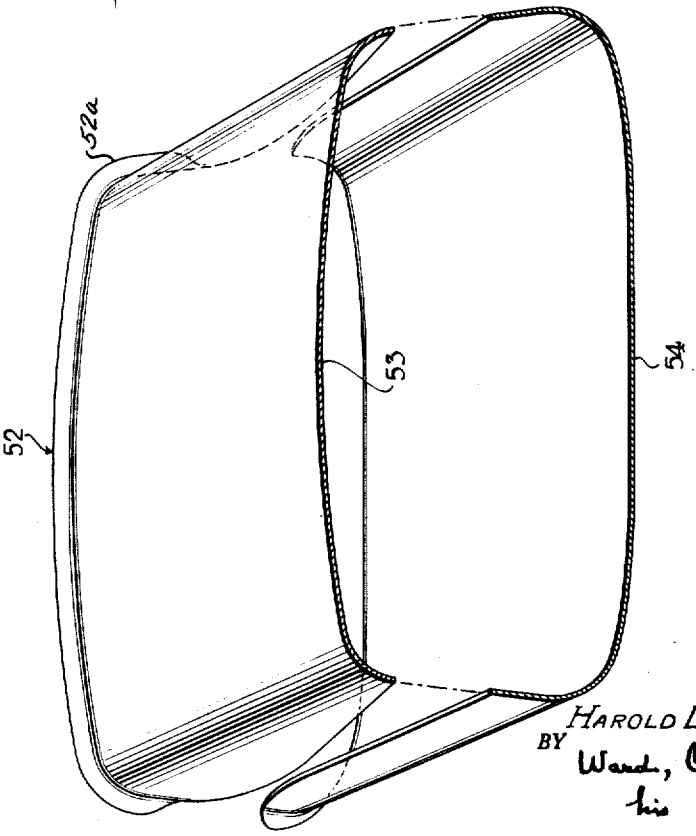


Fig. 9.

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METHOD AND APPARATUS FOR PACKING FILLED BAGS WITHIN BALES

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Fig. 7.

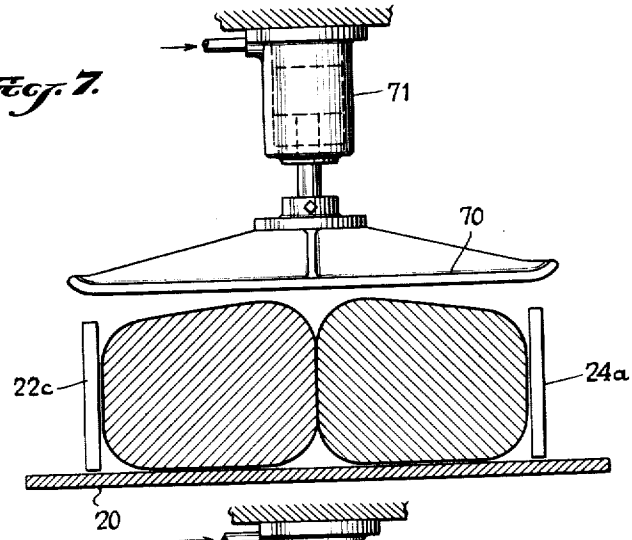


Fig. 8.

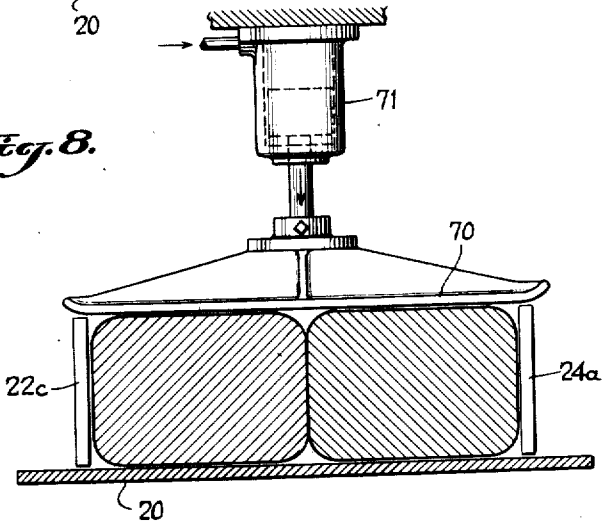
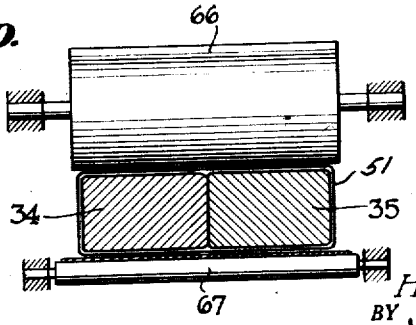


Fig. 10.



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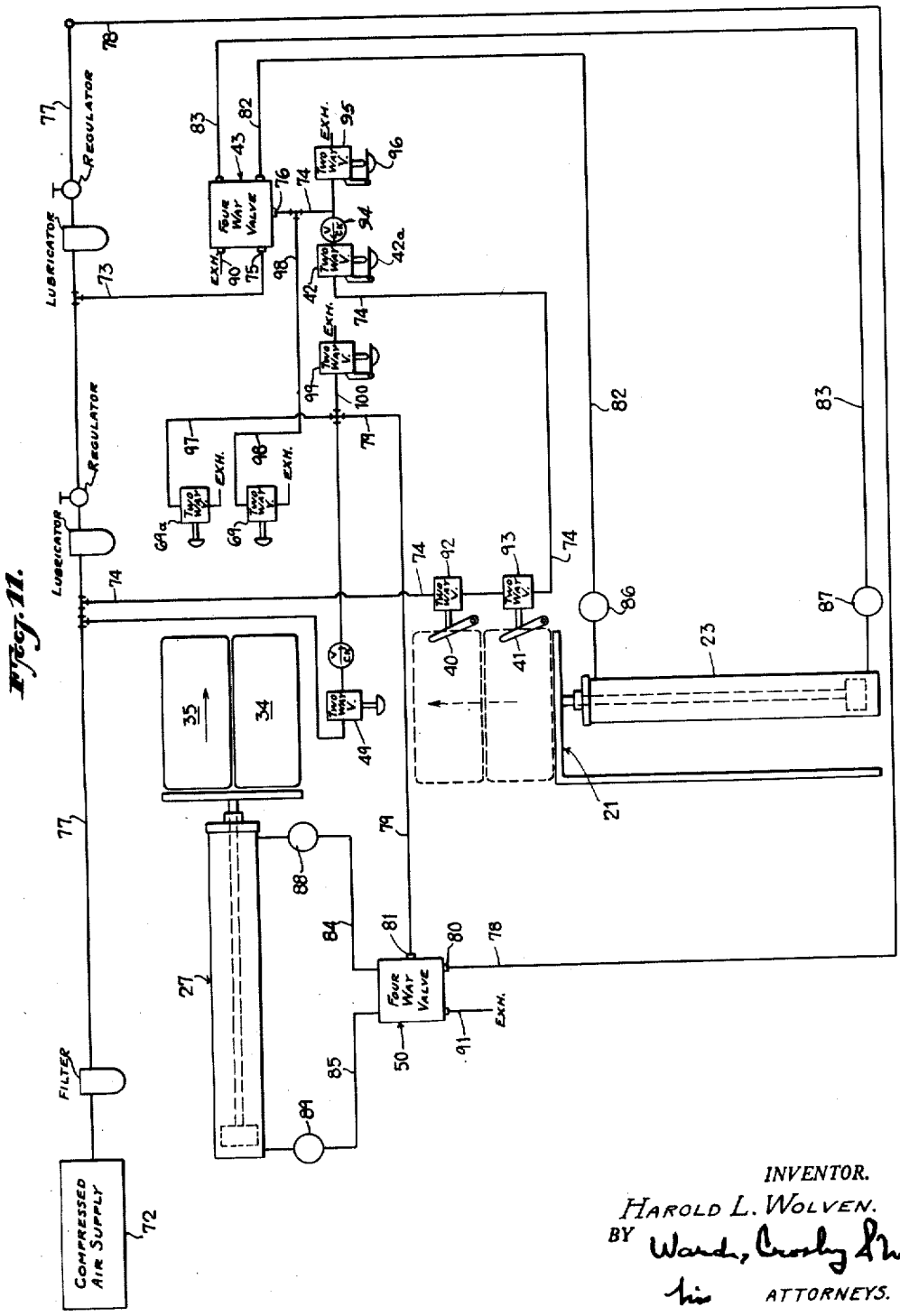


Fig. 11.

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March 5, 1957 H. L. WOLVEN 2,783,598

METHOD AND APPARATUS FOR PACKING FILLED BAGS WITHIN BALES

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Fig. 12.

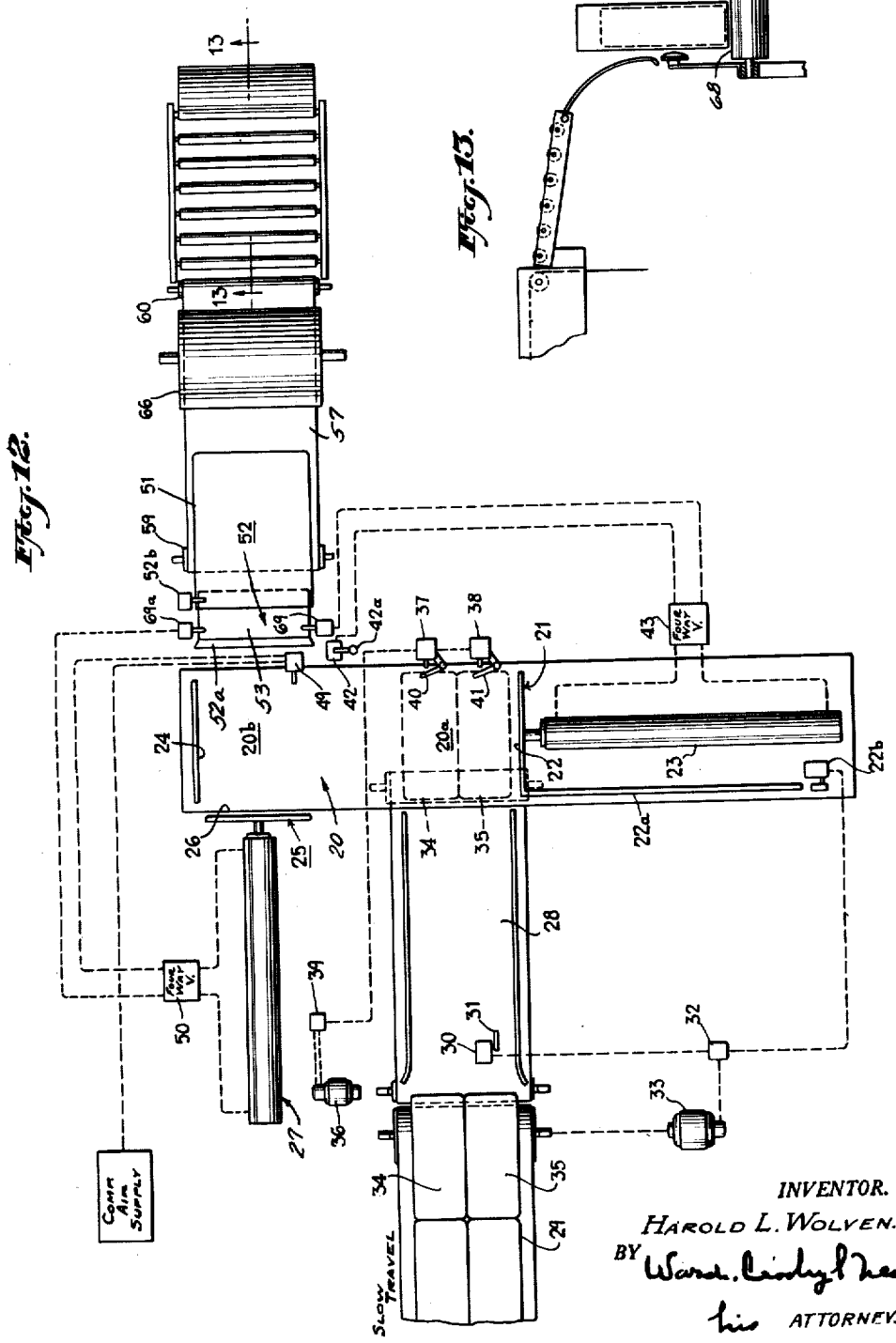


Fig. 13.

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United States Patent Office 2,783,598 Patented Mar. 5, 1957

2,783,598

METHOD AND APPARATUS FOR PACKING FILLED BAGS WITHIN BALES

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Application December 29, 1955, Serial No. 556,159
24 Claims. (Cl. 53—24)

This invention relates to so-called bag baling apparatus, and more particularly to a device for rapidly inserting a plurality of filled bags into a bale, such bags being filled with a pulverulent or granular material.

One of the most serious problems in the packing of a plurality of filled bags into a bale is that of tightly filling the bale with the bags in order to provide a filled bale which can be easily and safety stacked with a plurality of other bales. The term "bales" as employed herein refers to a single or multi-ply bale, for example, of kraft paper or the like sheet material, such bale being easily collapsible when empty and relatively inexpensive.

Furthermore, apparatus and methods of this general character heretofore suggested have been designed for the filling of either stiff and expensive cardboard boxes in lieu of paper bales or they have failed satisfactorily to fill a paper bale to a desired degree of tightness and at a desired speed without subjecting the bags to prohibitive forces which tend to rupture same.

One of the objects of the present invention is to overcome the above difficulties or to reduce same to insignificance.

The invention in one aspect thereof is constituted by a supporting platform having associated therewith means for delivering onto the platform, for example, a pair of filled bags, each of substantially rectangular, transverse cross-sectional shape, such bags being so delivered in side-by-side relationship. A shuttle ram is provided for urging such bags along the supporting platform and onto a bale loading station thereon, such shuttle ram compressing the bags between it and a shuttle ram stop plate situated at the end of and alongside of such loading station. The application of such compressive forces by the ram and stop plate is in a preselected direction tending "to square up" or make square the normally rectangular, transverse cross-sectional shapes of the bags. That is, the bags squeezed between said shuttle ram and stop plate have the major dimension of their cross-sectional areas diminished somewhat thereby also to diminish somewhat the girth of the bags as a group. A packing ram is also provided and is positioned for moving in a direction parallel to the surface of said supporting platform but perpendicular to the direction of the shuttle ram. A throat member having a bell or funnel-like mouth is located adjacent the bale loading station, the throat member having an outlet opening over which the open mouth of an empty bale can be stretched for receiving a group of bags. Means are provided for actuating the packing ram concurrently with the pressing of the bags between said shuttle ram and stop plate whereby the bags are forced through the throat member and into the bale. Means are provided for compressing the bags after insertion into the bale, such compression being in a direction which is perpendicular to the direc- of movement of said shuttle ram, that is, in a direction which is substantially perpendicular to the surface of said supporting platform, thereby to increase the girth of the bags as a group and tightly to fill such bale. According to one aspect of the invention, such compressive force may be applied by means of a compression roll and suitable backing means between which said baled bags are moved. According to still another aspect of the

invention, such compressor force may be applied by means of a vibratory means having side bag guides between which said baled bags are moved.

Various, further and more specific objects, features and advantages of the invention will clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification and illustrate, by way of example, preferred arrangements of apparatus for carrying out the invention. The invention consists in such novel methods and combinations of features and method steps as may be shown and described in connection with the device herein disclosed.

In the drawings:

Fig. 1 is a plan view of one form of the invention;

Fig. 2 is a side elevation of the embodiment shown in Fig. 1;

Fig. 3 is a front elevation of the embodiment shown in Fig. 1;

Fig. 4 is a transverse cross-sectional view of a pair of filled bags situated side-by-side as they are initially fed to the bag baling apparatus;

Fig. 5 is a transverse fragmentary sectional view of a shuttle ram and a shutttle ram stop plate acting upon a group of bags in accordance with a modification of such form of the present invention;

Fig. 6 is a plan view of the parts shown in Fig. 5;

Fig. 7 is a view substantially similar to that of Fig. 5 with the exception that a so-called crown ram is added and shown in position prior to the actuation thereof;

Fig. 8 is a view similar to that of Fig. 7 but with said crown ram exerting pressure upon the bags therebeneath;

Fig. 9 is a transverse sectional view of a throat member employed in the present invention through which the bags are urged just prior to insertion into a bale;

Fig. 10 is a transverse view, partly in section and with parts broken away, of a bale filled with bags in accordance with the present invention and undergoing compression between the compression roll and suitable backing means;

Fig. 11 is a schematic diagram illustrating one manner for operatively interconnecting, for example, by pneumatic means, the several power cylinders and control valves employed in the apparatus;

Fig. 12 is a schematic plan view of one form of the invention;

Fig. 13 is a sectional view taken substantially on line 13—13 of Fig. 12;

Fig. 14 is a schematic plan view, partially broken away, of another embodiment of the invention showing the relationship of the packing ram to a vibratory means for compressing the bale bags;

Fig. 15 is a schematic end elevation of the vibratory means of Fig. 14;

Fig. 16 is a schematic side elevation of the vibratory means of Fig. 14; and

Fig. 17 is a side elevational view of a modified form of vibratory means having a conveyor belt associated therewith.

Referring to the drawings in greater detail, particularly Figs. 1–3 and 12, the novel bag baling apparatus is constituted in general by a supporting platform **20** for receiving the filled bags which are to be inserted into the bales. The supporting platform provides preferably a smooth plane surface. Such platform has associated therewith a pair of rams which operate in perpendicular directions, the direction of both being parallel to the supporting platform **20**. The first of these rams is indicated in general at **21** and includes a ram surface or press plate **22** and power means for moving such surface, as at **23** (Fig. 2). This ram is referred to as a shuttle ram

and functions to shift a group of bags from a bag receiving station **20***a* (Fig. 12) on the supporting platform to a bale loading station **20***b* thereon, and also to compress the bags in cooperation with a shuttle ram stop plate **24**, as will appear more fully hereinafter. The second of the two aforementioned rams is referred to as a packing ram and moves in a direction parallel to the supporting platform but perpendicular to the direction of the shuttle ram and is indicated generally at **25** and which includes a ram plate **26** and suitable power means for actuating same, as at **27** (Fig. 2). Both of the power means **23** and **27** for actuating the shuttle and the packing rams are, in the form shown, of the pneumatic actuated variety.

In the form shown in Figs. 1–6, the plates **22** and **24** are tilted as is well shown in Fig. 5, and as will be described hereinafter. However, the invention is not limited thereto, inasmuch as such plates can be in other attitudes, e. g. parallel as in Fig. 7.

Suitable means for feeding the filled flour bags onto the aforementioned receiving station **20***a* on the supporting platform **20** comprise preferably: a high speed conveyor **28** of relatively short length and of the endless belt variety which receives seriatim a pair of bags from a slow speed conveyor **29** and thereby separates each pair from those behind. Conveyor **28** swiftly urges each pair onto the bag receiving station **20***a* of the supporting platform **20**. I have found it desirable to arrest the motion of the slow speed conveyor **29** until after a given pair of bags has been inserted into a bale. The means for initially arresting the motion of the slow speed conveyor comprises: for example, a microswitch, as at **30** (Fig. 12), which is mounted above the conveyor **28** at a suitable distance slightly in excess of the depth of the flour bag, the switch **30** being provided with an arm **31** which extends into the path of and can be moved by a flour bag to actuate switch **30** and thereby actuate suitable slow speed conveyor control means at **32** to stop a motor **33** driving such conveyor and thus to prevent the feeding of successive pairs of bags until a desired later time. The slow speed conveyor **29** is preferably of a width sufficient to accommodate a pair of bags, as indicated at **34** and **35**, such bags being of substantially rectangular transverse cross-sectional shape and being situated side-by-side in engagement with one another with the major axes of said transverse cross-sectional shapes substantially in alignment, that is, with the major dimension of the cross-sectional areas thereof substantially parallel to the conveyor (Fig. 4).

The high speed conveyor **28** is driven by an electric motor **36** which in turn is under the influence of a pair of microswitches **37** and **38**, which are operatively connected to a motor control means **39** for motor **36**. The microswitches **37** and **38** are positioned side-by-side, as shown in Figs. 1 and 12 and are respectively actuatable by levers **40** and **41**. These levers normally are in the position shown in these figures, that is, resiliently held out of engagement with their respective microswitches. A pair of bags thrust onto the table **20** at station **20***a* will move the levers **40** and **41** to the right (Figs. 1 and 12) and when both microswitches have been actuated thereby, the high speed conveyor motor **36** is immediately arrested.

The two bags **34** and **35** thus are advanced into contact with the levers **40** and **41** at which time they are of the transverse cross-sectional shape shown in Fig. 4, that is, each is substantially rectangular in such cross-sectional shape with the corners thereof rounded. These bags, for example, may contain twenty-five pounds each, e. g. of flour, the aggregate width being for example eighteen inches or nine inches per bag, and the height or depth of each bag being six and one-quarter inches. The length of each bag may be, for example, sixteen and three-quarter inches at this stage.

Thereafter the bags are pushed sideways from the receiving station **20***a* onto the bale loading station **20***b* by means of the aforementioned shuttle ram **21** which is

actuated by means of a manually operable valve control means, as at **42**, having a handle **42***a*, which means is operatively connected in a well-known manner to a control valve **43** for the pneumatic power cylinder **23**.

I have found it desirable, in one form of the invention, to dispose the plates **22** and **24** tilted toward one another and to compress the bags **34** and **35** therebetween, as is well shown in Fig. 5, that is, between the shuttle ram stop plate **24** and the shuttle ram press plate **22**, both of which are tilted toward one another from the vertical an equal amount, for example, about seven and one-half degrees. The reason for so tilting the plates **22** and **24** is to prevent excessive swelling of the bags therebetween at the mid-region thereof, that is, at the region midway between the two plates indicated generally at **44**. It will be seen from Fig. 5 that compression between plates **22** and **24**, when so tilted, causes a swelling at said mid-region **44** which is more pronounced than the swelling at the upper side edges of the bags, as at **45** and **46**, by virtue of the fact that some of the granular material in the bags is forced outwardly along the lower and outer side edges of the bags in the regions **47** and **48**.

By so compressing the pair of bags, as in Fig. 5 (referred to as primary compression) the transverse cross-sectional shape of each is shifted from one substantially rectangular, as shown in Fig. 4, to one which more closely approaches a square although it is true that in Fig. 5 the top side and outer side of each bag are not exactly parallel to their respective opposite bag sides. Consequently such cross-section temporarly is technically more in the nature of a trapezium with no opposite sides parallel. Neverthless, such compression of the bags diminishes the transverse peripheral girth of the bag group. For purposes of illustration only, the transverse peripheral girth of the bags in the condition shown in Fig. 4, before compression, may be approximately 45.5 inches whereas the transverse peripheral girth of the bags in Fig. 5, after compression, may be approximately 43.4 inches.

One of the characteristics of one of the types of bags which are baled by the novel method and apparatus comprising the present invention is that there is an initial differential between the lengths of the major and minor axes (length and width) of the transverse cross-section of each bag. That is, the transverse cross-section of each bag has a major and a minor axis which, as their names imply, are of unequal length. This differential in length is reduced by a desired amount under the influence of such primary compression thereby to reduce the girth of each bag and of the bag group. The bags are thereafter inserted into a bale, as will appear more fully hereinafter, the internal area of which, at the time of insertion, is adequate easily to receive the bag group, such bale being of such dimension that it can be tightly packed by the bags in response to a suitable increase in said reduced axes differential whereby the girth of the bag group is increased. Consequently following such baling of the bags, the latter are subjected to a secondary compression which increases said differential between such axes of each bag thereby to increase the girth of the bag group and to accomplish the aforementioned tight packing of the bags in the bale.

Reverting now to Figs. 5 and 6, when the bags are compressed, as shown in such figures, they are slightly elongated, that is, material is forced towards the ends of the bag actually lengthening same slightly, for example, from 16¾ inches up to, for example, 18 inches.

When the shuttle ram press plate **22** has shifted a preselected distance thereby so to compress the bags, as shown in Fig. 5, it contacts a control device such as a valve, as at **49** (Fig. 12), which actuates the packing ram **25**. The control device **49** is operatively connected to a suitable valve **50** for controlling the pneumatic pressure to the power cylinder **27**. Consequently, while the shuttle ram **21** holds the bags in the compressed condition shown in Figs. 5 and 6, the packing ram **25** con-

currently acts thereupon and thrusts the bags endwise thereof, that is, in a direction parallel to the longitudinal bag axes and toward a bag bale **51**, the open mouth of which is stretched over a funnel-like throat member, shown generally at **52**, and which comprises, as is well shown in Figs. 2 and 9, a pair of so-called duck bills, namely, an upper duck bill **53** and a lower one **54**. The latter is fixed and the former is mounted for pivotal movement about a pivot **55** (Fig. 9). These duck bills or guide members are generally channel-shaped. Suitable latch means are provided for retaining the upper duck bill **53** in the position shown in broken lines in Fig. 2 wherein it is positioned for the holding of the bale **51** during the packing thereof. The latch is automatically released, e. g., by motion of packing ram **25** after the bale is filled. A suitable bale clamp may be provided for clamping a bale upon the duck bill. Such a clamp is shown in Fig. 2, as at **56**. In the form shown, the bale clamp **56** is applied by moving the duck bill **53** to its latched position as shown in Fig. 2.

I have found it desirable for the transverse cross-sectional shape of the throat member **52** to be as shown in Fig. 9, which approximates the transverse cross-sectional shape of the two bags under compression shown in Fig. 5 or Fig. 8.

The bale **51** has the mouth thereof tightly stretched over the throat member **52**, the internal transverse cross-sectional area of the bale being substantially identical but slightly greater than the internal transverse cross-sectional area of such throat member.

The throat member **52** has an outwardly flaring bell-shaped mouth, as at **52*a***. The internal circumference or girth of the throat member **52** is substantially identical to the girth of the bags compressed, as shown in Fig. 5 or Fig. 8. However, the bags are caused to change shape slightly as they are forced through the throat member. At the extremity of the stroke of the packing ram the bags are fully inserted into the bale **51** and the aforementioned latching means for the upper duck bill **53**, shown schematically at **52*b***, are released in response to the packing ram plate **26** reaching a preselected advanced position thereby disengaging same. The bale clamp **56** thus is also released due to the downward pivoting of the upper duck bill **53** occurring after such latch release. The two bags after insertion into the bale are subjected to secondary compression (by means now to be described by way of example) which tends to increase said transverse axes differential and thus to increase the girth of the bag group thereby tightly to pack the bags in the bale. As is shown in Figs. 1 and 2, a conveyor **57**, preferably of the endless belt variety, is positioned beneath the bale **51** for receiving and removing same after it has been released from the throat member **52**. The conveyor **57** normally runs continuously, being driven by an electric motor **58**, said endless belt **57** passing over end pulleys **59** and **60** and also over an idler pulley **61**. The slack in the belt **57** can be taken up in any suitable means, for example, by the pulley **62** which may be urged resiliently to the right, as viewed in Fig. 2. The idler pulley **61** is operatively connected to the motor **58** by means of a belt **62*a*** which passes over a suitable belt wheel **63** which is coaxial with the idler pulley **61** and also over a pulley **64** driven by the motor **58** and also over a pulley **65** for driving continuously a compression roll **66** positioned above the conveyor **57** for a purpose to be set forth below. Positioned beneath the upper run of the belt **57** are a plurality of supporting idler rolls **67** which provide firm support for the filled bag as it is moved therealong and between it and the aforementioned compression roll **66**.

The interval between the supporting rolls **67** is relatively small beneath the roll **66**, that is, the cylindrical sides of the rolls are closely adjacent but spaced from one another whereas on either side of the region directly

below the compression roll **66** such interval is substantially larger.

The bale **51** thus, after release by the throat member **52**, is carried by the conveyor **57** and is compressed thereupon by means of the roll **66**, the direction of the compressive force exerted thereby being perpendicular to the plane of the supporting platform **20** and hence perpendicular to the direction of the compressive forces exerted between the shuttle ram press plate **22** and the stop plate **24**. Such rolling pressure upon the bags now within the bale **51** tends to restore their transverse substantially rectangular conformation thereby to increase the transverse girth thereof and to fill tightly the bale **51**, as shown in Fig. 10. After the bags have been so compressed by the roll **66** thereby filling the bale tightly, the latter is discharged, for example, onto a suitable horizontally moving conveyor **68** (Fig. 13), the bale standing thereupon vertically with the mouth thereof open. Thereafter the month of the bale can be closed by suitable closing means (not shown).

The shuttle ram **21** and the packing arm **25** can be retracted from their extended positions to their normal or initial positions, as shown in Figs. 1 and 12, by any suitable control means. For example, control valves **69** and **69*a*** may be engaged by the packing ram plate **26**, at the extremity of the movement of such plate, whereby control means for both such rams are actuated to retract the rams to their initial position, the valves **69** and **69*a*** being operatively connected with the penumatic control means **43** and **50** of the power cylinders **23** and **27** respectively.

When the shuttle ram **21** is returned to its initial position, an arm **22*a*** (Fig. 12) thereof engages a suitable microswitch, as at **22*b***, which is operatively associated with the motor control means **32** for again starting up the slow conveyor **29**. The fast conveyor **28** can be started again in a similar manner in response to the return of the shuttle ram to initial position, as shown in Fig. 1.

The aforedescribed apparatus can be altered, as shown in Figs. 7 and 8, to provide another embodiment of the invention wherein a shuttle ram presser plate **22*c*** and a shuttle ram stop plate **24*a***, instead of being tilted, as shown in Fig. 5, are parallel to one another. A so-called overhead platen or crown ram **70** is employed in this embodiment for compressing the bags prior to insertion into the bale, as shown in Fig. 8. The compression of the bags between the parallel shuttle ram press plate and its stop plate, as shown in Fig. 7, causes a swelling of the bags all along the top surfaces thereof, which swelling is reduced by means of the overhead platen. The overhead platen **70** is under the influence of a pneumatic cylinder **71** which can be controlled automatically whereby it is actuated after compression of the bags between plates **22*c*** and **24*a*** but before the packing ram **25** engages the bags. The overhead platen **70** is urged against the bags preferably during the stroke of the packing ram **25**.

Although the crown ram **70** is shown as acting in conjunction with the parallel plates **22*c*** and **24*a*** in Figs. 7 and 8, such crown ram can also be advantageously used with the tilted plates **22** and **24** of Fig. 5 and can be operatively connected to the apparatus for automatically compressing the bags after the plates **22** and **24** have squeezed the bags to the maximum desired extent.

In operation, the operator of the apparatus initially manually unlatches the duck bill **53** and manually applies a bale thereover, returns the duck bill to the latched position shown in broken lines in Fig. 2 thereby securing the bale between the duck bill and the clamp **56**. Assuming that the two conveyors **28** and **29** are in operation, a pair of bags will have been moved thereby into the receiving area **20*a*** thereby to stop first the slow conveyor and then the fast one in response to the actuation of the switches **31**, **37** and **38**. Thereafter the operator manually actuates the control lever **42** (Fig. 12) thereby to initiate the stroke of the shuttle ram **21** which pushes the bags sideways, as

above explained, over to the bale loading station **20***b* adjacent the packing ram **25** whereupon the bags are compressed, for example, as shown in Figs. 5 and 6, wherein the plates **22** and **24** are tilted, and upon completion of such compression the lever **49** is engaged by the shuttle ram press plate **22** thereby to initiate the operation of the packing ram **25** concurrently with the compression of the bags between the plates **22** and **24**. The pair of bags thus are thrust while so compressed into the bell-shaped mouth **52***a* of the throat member **52** and thence through the latter into the bale **51** which is clamped thereon. The compressing of the bags between the plates **22** and **24** reduces their collective girth, elongates them slightly, and facilitates their insertion into the bale. Such compression between the plates **22** and **24** changes the transverse cross-sectional area of each bag from substantially a rectangular one toward one more in the nature of a square, as in Fig. 7, or toward the shape shown in Fig. 5. Thus as described above in connection with Figs. 5 and 6, there is a reduction in the differential which exists between the major and minor axes of the transverse cross-section of each bag whereby the girth of each bag and of the bag group is reduced below its initial value. After insertion of the bags into the bale, the packing ram **25** engages the arm **69** thereby reactracting the rams and also engages the latch **52***b* for the upper duck bill **53** releasing same. Immediately upon the release of the bale **51** from the throat member **52**, the conveyor **57** urges same beneath the compression roll **66** whereby the bags are rolled or compressed by compressive forces which are substantially perpendicular to the supporting platform **20** and thus perpendicular to the direction of the compressive forces exerted between the plates **22** and **24**, such compressive forces tending to restore the substantially rectangular cross-sectional shape of the bags. Thus a secondary pressure is applied to the now baled bags which increases the differential between the lengths of the aforementioned axes of each bag thereby increasing the girth of the group of bags now in the bale and tightly packing such group therein. The compression roll **66** is adjusted in position to produce a desired tightness of the bags within the bale thereby to improve the stacking characteristics of the filled bale.

Thereafter the filled bale moves on and falls into an upright position, as shown in Fig. 13, with the open mouth standing upward and the bottom thereof resting upon a suitable conveyor which directs it to a bale closing machine. Such falling of the filled bale onto such conveyor tends further to pack the bags tightly into the bale.

The length of each bag, that is, the height thereof as viewed in Fig. 13, may be slightly diminished as a result of such fall thereby tending to restore the bags to their original lengths, i. e., before being subjected to the rams **21** and **25**.

There has been described in connection with Fig. 12 a schematic representation of the principal parts of the invention, including a schematic representation of the interconnection of certain of the control means. In Fig. 11 there is shown a somewhat different manner of operatively interconnecting certain of the elements of the apparatus, like reference characters in both Figs. 11 and 12 referring to similar parts. The main air supply is schematically indicated at **72** comprising, for example, a container of air under compression. Such air supply is connected to:

(*a*) The control valve **43** for the shuttle ram power cylinder **23** by means of conduits **73** and **74** which are respectively connected to the control ports **75** and **76** in the valve **43** and are also connected to a main air conduit **77**. The latter, of course, is connected to the air supply **72**.

(*b*) The control valve **50** for the power cylinder **27**, by means of conduits **78** and **79**, are, at one extremity thereof, connected to the main supply conduit **77** and at the other extremity to the control valve **50** respectively at the inlet ports **80** and **81**.

The control valves **43** and **50** are, in the form shown, air operated so-called "four-way pilot valves" of well-known design which are operated by a very small volume of high pressure air. Control valve **43** is connected to the power cylinder **23** by means of conduits **82** and **83** and control valve **50** is connected to the power cylinder **27** by means of conduits **84** and **85**. Interposed respectively in each of the latter conduits **82**, **83**, **84** and **85** are speed control valves **86**, **87**, **88** and **89**. Suitable exhaust conduits, as at **90** and **91**, are provided for the control valves **43** and **50**, respectively.

The levers **40** and **41** described in connection with Fig. 12 are designed not only for actuating the microswitches **37** and **38** (Fig. 12) thereby to control the high speed conveyor motor **36**, but also are designed for acting upon a pair of two-way valves **92** and **93** which are interposed in the conduit **74** and are normally in a closed condition. The movement of a pair of filled bags **34** and **35** into the bag receiving station **23** will open the two valves **92** and **93** through the intermediary of the levers **40** and **41** and thereby will permit air under pressure to flow toward the shuttle ram control valve **43**. The latter, however, is under the influence of a manually operable two-way valve **42** (described above) having a handle **42**. The manually operated air valve **42** is capable of starting the automatic cycle of operation when handle **42***a* is depressed by the operator. However, depression of the handle is ineffective unless the two valves **92** and **93** are opened in response to the movement of the filled bags against the levers **40** and **41**.

A suitable check valve, as at **94**, is interposed between the two-way valve **42** and the four-way valve **43** and in turn interposed between the latter check valve **94** and the four-way valve **43** is an emergency release valve **95** having a handle **96** which is manually operated in an emergency only and which can arrest the operation of the power cylinder **23** at any time by releasing the air pressure of the control valve **43**, thereby causing the piston of the power cylinder automatically to return to its starting or initial position.

The power cylinder **27** is under the influence of the aforementioned control valve **49** which is interposed in the conduit **79** (Fig. 11) and which when engaged by the shuttle ram **21** initiates a packing stroke of the power cylinder **27** and the packing ram **25** by actuating the four-way valve **50**. However, valve **49** is positioned so that the initiation of the packing stroke of the power cylinder **21** does not occur until the filled bags are compressed to predetermined dimensions at bale loading station **20***b*. The power cylinder **27** is also under the influence of the aforedescribed control valve **69***a* which is of the so-called two-way variety and which by a conduit **97** is connected to the conduit **79**. At the end of the outward stroke of the power cylinder **27** the control valve **69** is actuated thereby releasing the air pressure in the four-way valve **50** and causing the power cylinder **27** and the packing ram **25** to return to its starting position.

The control valve **69**, also described above concerning Fig. 12, is positioned in the path of the packing ram **25** for initiating the return stroke of the shuttle ram **21** and its power cylinder **23**. The control valve **69** is connected to the conduit **74** by means of a conduit **98** and operates in a manner analogous to the control valve **69***a*. A manually operated release valve for the power cylinder **27** for emergency use only is provided at **99** which is analogous to the aforementioned emergency valve **95** which is connected to the conduit **79** by means of a conduit **100**. The emergency release valve **99** is capable of arresting the operation of the power cylinder **27** by releasing the air pressure normally acting on the piston of the four-way valve **50**, thereby causing the piston of the power cylinder **27** to return to its starting position.

Turning now to Figs. 14–16, there is shown an alternative embodiment of the invention wherein vibratory means **110** are provided in place of the roll **66** for compressing

the bale carrying the filled bags so as to restore their transverse, substantially rectangular, conformation and thereby to increase the transverse girth thereof and to fill the bale tightly as has been discussed above. It will, of course, be understood that except as specifically hereinafter pointed out the construction and operation of this embodiment of the invention conforms to the description above set forth for the embodiment of Figs. 1–13. As shown in Fig. 14 in this embodiment a packing ram **105**, substantially similar to ram **25** of Fig. 12 but having a relatively longer operative stroke, is adapted to receive bags from a shuttle ram similar to member **21** of Fig. 12 and to advance said bags into a bale **106** which is held supported by a throat member similar to member **52** of Fig. 12. In this embodiment, however, after the bale **106** has been released by its throat member, the packing ram **105** continues its forward stroke, thereby moving bale **106** and its bags on to a downwardly inclined ramp **107** having idler rolls **108** adapted to cause discharge of the bale on to a conveyor and settler unit **109**. This conveyor and settler unit **109** may, for example, be similar to that shown in the co-pending patent application of W. R. Peterson and Herman S. Rhodes, Serial No. 441,814, which unit is provided with a vibratable settler plate **110** to which are secured a pair of side settler walls or side boards **111** and **112**. This conveyor-settler unit may, for example, be situated at right angles to the path of travel of the bale as it is discharged from inclined ramp **107**. Then as shown in Fig. 15 upon discharge from said ramp the bales will land in upright position with their bottoms resting on the vibrator settler plate. As is described in said copending Peterson and Rhodes application the vibratable settler plate is resiliently mounted as at **113** and an eccentric driving means **114** is provided to impart reciprocating motion to said plate while maintaining the same substantially horizontal, such reciprocative motion having a vertical component and a component in the direction of the longitudinal center of the base line. The resultant of such reciprocating motion is therefore tilted upwardly in the direction along which it is desired for the bags to be conveyed. Hence, activation of this settler plate will cause the bags to be vibrated and simultaneously moved along in the desired direction. If desired, the vibratory motion of the settler plate may be imparted to the spaced side board members so as to aid in vibrating of the bales, but it should be understood that the contents of the bales can be satisfactorily shaken down simply by vibrating the settler plate and therefore, if desired, the side boards may be stationary. In Fig. 17 there is shown a modified form of vibrating mechanism **120** wherein the bales are fed by the packing ram in the manner described above on to an endless conveyor belt **121** beneath which there is positioned a settler unit **122**. In this embodiment the conveyor belt itself serves to move the bales along in the desired direction between parallel side guides shown at **123**, while the settler unit or vibrating means **122** serves to impart a vibratory motion directly against the underside of the belt **121**, thereby causing the material within the bags in the bale to be shaken down or compressed, thereby expanding their transverse girth and causing them to set tightly within the bale. This application is a continuation-in-part of my copending application Serial No. 320,247, filed November 13, 1952 now abandoned.

While the invention has been described with respect to certain preferred examples which have given satisfactory results, it will be understood by those skilled in the art, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and is desired to be secured by Letters Patent is:

1. The method for filling a plurality of bags into a bale, said bags being filled with pulverulent material and initially being of substantially rectangular transverse cross-sectional shape, there being a selected initial differential between the lengths of the major and minor axes of such cross-section of each bag, which method consists in: disposing at least one pair of said bags in side-by-side engagement; compressing said group of bags comprising said pair on opposite side surfaces thereof thereby to diminish such axes differential of each bag by a preselected amount and also to diminish the transverse peripheral girth of said group; urging said bags into a bale concurrently with the application of such pressure thereon, the girth of said bale when said bags are so urged being substantially equal to but slightly greater than said diminished girth of said bag group; and thereafter compressing said bags in said bale by the application of pressure in a direction substantially perpendicular to the direction of the pressure effecting said first-mentioned compression, thereby tending to restore such initial axes differential and the initial transverse cross-sectional dimensions of said bags.

2. The method for filling a plurality of bags into a bale, said bags initially being of substantially rectangular cross-sectional shape which consists in: disposing at least one pair of said bags in side-by-side engagement, each such substantially rectangular cross-sectional shape having a major and a minor axis, one axis of one of the bags of the pair being parallel to a corresponding axis of the other bag in such pair; compressing said group of bags comprising said pair on opposite side surfaces thereof thereby: to diminish such major axes thereof by a preselected amount, to increase the minor axes thereof, to reduce the differential in length between such major and minor axes to a value not less than zero, and also to diminish the transverse peripheral girth of said group; urging said bags into a bale having a cross-sectional shape and size substantially identical to but slightly greater than that of said bags as a group when so compressed; and thereafter compressing said bags in said bale by the application of pressure in a direction substantially parallel to the direction of such increased minor axes, thereby tending to restore such differential and the initial transverse cross-sectional dimensions of said bags causing same to be tightly packed in the bale.

3. In apparatus of the class described, means for conveying a pair of bags to a compression station, said bags being initially of substantially rectangular cross-sectional shape and situated in side-by-side engagement; primary compression means for said bags comprising a pair of opposed primary compression surfaces, said surfaces having substantially parallel longitudinal axes but being tilted toward one another, the application of such pressure upon the bags by said primary compression surfaces altering the transverse cross-sectional shape of said bags and diminishing the dimension of the longer of the two sides of each thereof; a throat member mounted adjacent said bag compression station and having an outwardly flared inlet and an internal cross-sectional area substantially coincident in shape and size to the transverse cross-sectional area of said bags after undergoing compression by said primary compression surfaces, said throat member having an outlet over which can be stretched the mouth of a bale; means for urging said bags through said throat member, such means being operable concurrently with the application of pressure by said primary compression surfaces; means for conveying a bale away from said throat member after such bale has been filled with bags; and a bale compression means positioned above said conveyor means for acting upon such filled bale, the action of such bale compression means upon the bags in said bale tending to restore the original cross-sectional shape of such bags thereby to increase the joint girth of said bags and thus to fit said bags tightly within said bale.

4. In apparatus for baling a plurality of bags, such bags initially having rectangular, transverse cross-sectional shapes of substantially equal size; a table member having a bag compression station thereon; a bag stop plate secured to such table at one side of the compression station thereon; a primary transfer ram for urging bags from a receiving area of said table onto said compression station; means for directing a pair of bags onto said receiving area, said bags being in side-by-side engagement with the end surfaces thereof substantially in alignment, said primary transfer ram urging said bags against said bag stop plate thereby to reduce the longer rectangular cross-sectional dimension of each of said bags thereby to diminish the joint girth of said bags by a preselected amount; throat means having an outlet around which can be stretched the mouth of a bale and having an inlet situated near said compression station to receive bags moved from the latter station; bale packing means operable during the compression of said bags by said plates for urging same through said throat means and into the bale; and means for applying pressure to said bags after being packed in said bale, such pressure tending to restore the original cross-sectional shape of the bags thereby causing the latter tightly to fill said bale.

5. In apparatus for baling a plurality of bags, such bags initially having rectangular, transverse cross-sectional shapes of substantially equal size; a table member having a bag compression station thereon; a bag stop plate secured to such table at one side of the compression station thereon; a primary transfer ram for urging bags from a receiving area of said table onto said compression station; means for directing a pair of bags onto said receiving area, said bags being in side-by-side engagement with the end surfaces thereof substantially in alignment, said primary transfer ram urging said bags against said bag stop plate thereby to reduce the longer rectangular cross-sectional dimension of each of said bags thereby to diminish the joint girth of said bags by a preselected amount, said ram and plate having substantially parallel longitudinal axes but being slightly inclined toward one another; throat means having an outlet around which can be stretched the mouth of a bale and having an inlet situated to receive bags moved from said compression station, said throat means having a transverse cross-sectional shape of substantially similar shape and size as compared with that of said bags as a group after undergoing compression by said ram and plate; means operable during the compression of said bags by said ram and plate for urging same through said throat means and into the bale; and means for applying pressure to said bags after being packed in said bale, such pressure tending to restore the original cross-sectional shape of the bags thereby causing the latter tightly to fill said bale.

6. In a bag baling machine, the combination comprising: a supporting platform for receiving a plurality of bags, the latter initially having substantially rectangular, transverse cross-sectional areas; a shuttle ram stop plate located adjacent a bale loading station on said platform; a shuttle ram for cooperating with said stop plate for exerting compressive forces upon a plurality of such bags at a bale loading station on said platform; a crown ram for exerting pressure upon the crowns of said bags in said bale loading station concurrently with the operation of said shuttle ram and stop plate, said crown ram exerting pressure upon said bags in a direction perpendicular to the direction of movement of said shuttle ram, said crown ram urging said bags against said supporting platform; a packing ram movable in a direction perpendicular to the direction of both said shuttle and crown rams; means for actuating said packing ram concurrently with the operation of said shuttle and crown rams; a throat member having an outlet over which the open mouth of a bale can be stretched for receiving such group of bags, such throat member being positioned to receive the bags moved by said packing ram; and means for applying compressive forces to said bags after insertion into such bale and in a direction substantially parallel to the direction of movement of said crown ram.

7. In a device for packing a plurality of bags filled with granular material into a receiving bale or the like, such bags initially being of substantially rectangular, transverse cross-sectional shape, the combination comprising: a supporting platform having a bale loading station for receiving a plurality of such bags in side-by-side engagement; a shuttle ram stop plate positioned on one side of such bale loading station of said supporting platform; a shuttle ram for squeezing bags positioned between it and said stop plate thereby to apply compressive force to said bags over opposite sides thereof and in preselected direction; a packing ram movable in a direction perpendicular to said shuttle ram and substantially parallel to the surface of said supporting platform for urging bags in such bale loading station toward a receiving bale; a throat member positioned with the axis thereof in line with the motion of said packing ram for receiving therethrough bags moved by said latter ram, said throat member having an outlet over which an open mouth of a bale can be stretched for receiving such plurality of bags, means for actuating said packing ram concurrently with the application of compressive forces to said bags by said shuttle ram thereby to move said bags through said throat member and into the bale; and means for applying compressive forces to said bags after insertion into the bale and in a direction substantially perpendicular to the plane of said supporting platform.

8. In a device for packing a plurality of bags filled with granular material into a receiving bale or the like, such bags initially being of substantially rectangular, transverse cross-sectional shape, the combination comprising: a supporting platform having a bale loading station for receiving a plurality of such bags in side-by-side engagement with the major axes of said bag cross-sections in aligned relationship; a shuttle ram stop plate positioned on one side of such bale loading station of said supporting platform; a shuttle ram for squeezing bags positioned between it and said stop plate thereby to apply compressive force to said bags over opposite sides thereof and in preselected direction; a packing ram movable in a direction perpendicular to said shuttle ram and substantially parallel to the surface of said supporting platform for urging bags in such bale loading station toward a receiving bale; a bale holding member positioned with the axis thereof in line with the motion of said packing ram for receiving therethrough bags moved by said latter ram, said member having an outlet over which an open mouth of a bale can be stretched for receiving such plurality of bags, means for actuating said packing ram thereby to move said bags through said throat member and into the bale; and means for applying compressive forces to said bags after insertion into the bale and in a direction substantially perpendicular to the plane of said supporting platform.

9. The method for packing into a bale a group of juxtaposed bags filled with pulverulent material, there being a differential in length between the two axes of an initial cross-section of such group of bags whereby such axes are designated major and minor axes, which method consists in: applying a compression to such bags thereby to reduce such differential in the length of said axes; inserting said bags into a bale while such differential is so reduced the direction of insertion being normal to said cross-section; and thereafter applying force to such bags in the bale to increase said reduced differential and tightly to pack said bale with said bags.

10. The method for tightly packing into bales a plurality of bags filled with granular material, there being a differential in length between the two axes of a cross-section of each of such bags, which method consists in: placing at least two of such bags in side-by-side engage-

ment to form a bag group with one such axis of one bag parallel with a corresponding axis of another bag, said bag group having an initial perimetrical dimension around such cross-section; applying a primary compression to said bag group in a direction to reduce the differential between the lengths of said two axes of each of such bags thereby to reduce said initial perimetrical dimension of the bag group; inserting said bags as a group into a bale while such perimetrical dimension of the bag group is so reduced, the internal perimetrical dimension of said bale, when said bag group is so inserted therein, being substantially equal to but slightly greater than said reduced initial perimetrical dimension, and thereafter applying a secondary compression to said bag group in the bale in a direction tending to restore said first-mentioned axes differential and hence said initial perimetrical dimension, thereby tightly to pack said bags into the bale.

11. The method for tightly packing into a bale a plurality of bags filled with granular substantially non-resilient material, a cross-section of each of such bags having a major and a minor axis, there being a length differential between such axes of each bag, which method consists in disposing at least two of said bags in side-by-side engagement, one of such axes of one of said bags being parallel to the corresponding axis of the other of such bags, such two bags comprising a bag group and jointly having an initial perimetrical dimension around such cross-section; compressing opposed surfaces of said bag group between two primary compression surfaces, such application of pressure being in a direction for diminishing the aforementioned axes length differential thereby diminishing such initial perimetrical dimension of the bag group; applying pressure to the other surfaces of said bags concurrently with the application of said first-mentioned pressure thereby to force said bags into a bale, the internal transverse cross-sectional area of which is capable of being substantially equal to but slightly greater than the transverse cross-sectional area of said bag group; and thereafter subjecting said bags in said bale to pressure in a direction tending to restore the first-mentioned axes length differential thereby to increase such perimetrical dimension of said bag group and tightly to pack said bags within said bale.

12. The method for tightly packing into a bale a plurality of bags filled with pulverulent, substantially non-resilient material, each of said bags having a substantially quadrangular cross-sectional area with the opposite sides thereof substantially parallel, there being a preselected length ratio between the perpendicular axes of said quadrangular cross-sectional area, which method consists in disposing at least two of said bags in side-by-side engagement, said bags being of substantially similar cross-sectional dimensions and having as a group an initial perimetrical dimension as measured around said cross-section; applying pressure to said bags thereby forcing said bags under the influence of said pressure through a bale holding member, there being a bale with the mouth thereof stretched over the outlet of said member for receiving said bags, the transverse cross-sectional area of said bale being substantially equal to the cross-sectional area of such bag group when the latter is inserted therein, and thereafter subjecting said bags in the bale to pressure in a direction to produce a differential between the aforementioned axes of each of said bags thereby to increase such perimetrical dimension of the bag group whereby the bale is filled tightly.

13. The method for packing a plurality of bags tightly into a bale, each of said bags being filled with granular or friable substantially non-resilient material, said bags initially being of uniform, substantially rectangular cross-sectional shape, which method consists in: disposing a group of said bags in side-by-side engagement, squeezing said group of bags uniformly over opposite side areas thereof in a direction substantially parallel to the major dimension of said cross-sectional shapes thereby: to diminish such major dimension by a preselected amount, to increase the minor dimension thereof, thereby to reduce the initially existing differential in the length of such major and minor dimension of each bag; during such squeezing action urging said bags into the bale, the latter having a transverse cross-sectional area substantially the same as the transverse cross-sectional area of said group of bags; and thereafter squeezing said bags in said bale in a direction substantially parallel to the first-mentioned minor dimension thereby increasing such reduced differential and tending to restore the initial transverse girth of said bag group whereby the bags are packed tightly in the bale.

14. In a device for packing a plurality of bags filled with granular material tightly into a receiving bale or the like, such bags initially being of substantially rectangular cross-sectional shape thereby having a differential between the length and width of such cross-sectional shape, the combination comprising: opposing surface members between which a plurality of such bags can be interposed, means for urging said surfaces toward one another for squeezing bags interposed therebetween thereby to apply compressive force over opposite sides thereof to reduce the aforementioned differential; a packing ram movable in a direction perpendicular to the direction of the first-mentioned compressive force for urging such bags toward a receiving bale; a throat member positioned for receiving bags moved by said packing ram, said throat member having an outlet over which an open mouth of such bale can be stretched for receiving such plurality of bags, means for actuating said packing ram concurrently with the application of the first-mentioned compressive force thereby to move said bags through said throat member and into the bale; and means for applying compressive forces to said bags after insertion into the bale in a direction for increasing said reduced differential between said cross-sectional length and width and tending to restore the differential initially existing between such cross-sectional length and width of each bag.

15. The method for filling a plurality of bags into a bale, said bags initially being of substantially rectangular cross-sectional shape which consists in: disposing at least one pair of said bags in side-by-side engagement, each such substantially rectangular cross-sectional shape having a major and a minor axis, one axis of one of the bags of the pair being parallel to a corresponding axis of the other bag in such pair; compressing said group of bags comprising said pair on opposite side surfaces thereof thereby: to diminish such major axes thereof by a preselected amount, to increase the minor axes thereof, to reduce the differential in length between such major and minor axes to a value not less than zero, and also to diminish the transverse peripheral girth of said group; urging said bags into a bale having a cross-sectional shape and size substantially identical to but slightly greater than that of said bags as a group when so compressed; and thereafter moving said bale to a position suitable for closing the same.

16. The method for packing into a bale a group of juxtaposed bags filled with pulverulent material, there being a differential in length between the two axes of an initial cross-section of such group of bags whereby such axes are designated major and minor axes, which method consists in: applying a compression to such bags thereby to reduce such differential in the length of said axes; inserting said bags into a bale while such differential is so reduced, the direction of insertion being normal to said cross-section; and thereafter vibrating such bags in the bale to increase such reduced differential tightly to pack said bale with said bags.

17. In apparatus for baling a plurality of bags, such bags initially having rectangular, transverse cross-sectional shapes of substantially equal size; a table member

having a bag compression station thereon; a bag stop plate secured to such table at one side of the compression station thereon; a primary transfer ram for urging bags from a receiving area of said table onto said compression station; means for directing a pair of bags onto said receiving area, said bags being in side-by-side engagement with the end surfaces thereof substantially in alignment, said primary transfer ram urging said bags against said bag stop plate thereby to reduce the longer rectangular cross-sectional dimension of each of said bags thereby to diminish the joint girth of said bags by a preselected amount; throat means having an outlet around which can be stretched the mouth of a bale and having an inlet situated near said compression station to receive bags moved from the latter station; bale packing means operable during the compression of said bags by said plates for urging same through said throat means and into the bale; and means for moving said bale with its bags from said bale packing means.

18. In a bag baling machine, the combination comprising: a supporting platform for receiving a plurality of bags, the latter initially having substantially rectangular, transverse cross-sectional areas; a shuttle ram stop plate located adjacent a bale loading station on said platform; a shuttle ram for cooperating with said stop plate for exerting compressive forces upon a plurality of such bags at a bale loading station on said platform; a crown ram for exerting pressure upon the crowns of said bags in said bale loading station concurrently with the operation of said shuttle ram and stop plate, said crown ram exerting pressure upon said bags in a direction perpendicular to the direction of movement of said shuttle ram, said crown ram urging said bags against said supporting platform; a packing ram movable in a direction perpendicular to the direction of both said shuttle and crown rams; means for actuating said packing ram concurrently with the operation of said shuttle and crown rams; and a throat member having an outlet over which the open mouth of a bale can be stretched for receiving such group of bags such throat member being positioned to receive the bags moved by said packing ram.

19. The method for packing into a bale a group of juxtaposed bags filled with pulverulent material, there being a differential in length between the width and length dimensions of an initial cross-section of such group of bags whereby such dimensions are designated major and minor dimensions, which method consists in: applying a compression to such bags thereby to reduce such differential in the length of such dimensions; inserting such bags into a bale while such differential is so reduced, the direction of insertion being normal to said cross-section; and thereafter subjecting such bags in the bale to vibration to increase said reduced differential and tightly to pack said bales with said bags.

20. The method for packing into a bale a group of juxtaposed bags filled with pulverulent material, there being a differential in length between the width and length dimensions of an initial cross-section of such group of bags whereby such dimensions are designated major and minor dimensions, which method consists in: applying a compression to such bags thereby to reduce such differential in the length of such dimensions; inserting such bags into a bale while such differential is so reduced, the direction of insertion being normal to said cross-section; and thereafter subjecting such bags in the bale to vibratory force acting in a direction tending to restore said first-mentioned dimension differential thereby to increase such reduced differential and tightly to pack said bale with said bags.

21. The method for packing into a bale a group of juxtaposed bags filled with pulverulent material, there being a differential in length between the width and length dimensions of an initial cross section of such group of bags whereby such dimensions are designated major and minor dimensions, which method consists in: applying a compression to such bags thereby to reduce such differential in the length of such dimensions; inserting such bags into a bale while such differential is so reduced, the direction of insertion being normal to said cross-section; and thereafter acting upon such bags in the bale to increase said reduced differential and tightly to pack said bales with said bags.

22. The method for packing into a bale a group of juxtaposed bags filled with pulverulent material, there being a differential in length between the width and length dimensions of an initial cross-section of such group of bags whereby such dimensions are designated major and minor dimensions, which method consists in: applying a compression to such bags thereby to reduce such differential in the length of such dimensions; inserting such bags into a bale while such differential is so reduced, the direction of insertion being normal to said cross-section; and thereafter subjecting such bags in the bale to force acting in a direction tending to restore said first-mentioned dimension differential thereby to increase such reduced differential and tightly to pack said bale with said bags.

23. In an apparatus for baling a plurality of bags, such bags initially having rectangular, transverse cross-sectional shapes of substantially equal size; a table member having a bag compression station thereon; a bag stop plate secured to such table at one side of the compression station thereon; a primary transfer ram for urging bags from a receiving area of said table onto said compression station; means for directing a pair of bags onto said receiving area, said bags being in side-by-side engagement with the end surfaces thereof substantially in alignment, said primary transfer ram urging said bags against said bag stop plate thereby to reduce the longer rectangular cross-sectional dimension of each of said bags thereby to diminish the joint girth of said bags by a preselected amount; throat means having an outlet around which can be stretched the mouth of a bale and having an inlet situated near said compression station to receive bags moved from the latter station; bale packing means operable during the compression of said bags by said plates for urging same through said throat means and into the bale; and means for applying force to said bags after being packed in said bale, such force tending to restore the original cross-sectional shape of the bags thereby causing the latter tightly to fill said bale.

24. In apparatus for baling a plurality of bags, such bags initially having rectangular, transverse cross-sectional equal size; a table member having a bag compression station thereon; a bag stop plate secured to such table at one side of the compression station thereon; a primary transfer ram for urging bags from a receiving area of said table onto said compression station; means for directing a pair of bags onto said receiving area, said bags being in side-by-side engagement with the end surfaces thereof substantially in alignment, said primary transfer ram urging said bags against said bag stop plate thereby to reduce the longer rectangular cross-sectional dimension of each of said bags thereby to diminish the joint girth of said bags by a preselected amount; throat means having an outlet around which can be stretched the mouth of a bale and having an inlet situated near said compression station to receive bags moved from the latter station; bale packing means operable during the compression of said bags by said plates for urging same through said throat means and into the bale; and means for applying vibratory force to said bags after being packed in said bale, such vibratory force tending to restore the original cross-sectional shape of the bags thereby causing the latter tightly to fill said bale.

References Cited in the file of this patent

UNITED STATES PATENTS

2,633,280 Davies ---------- Mar. 31, 1953