

Dec. 21, 1954

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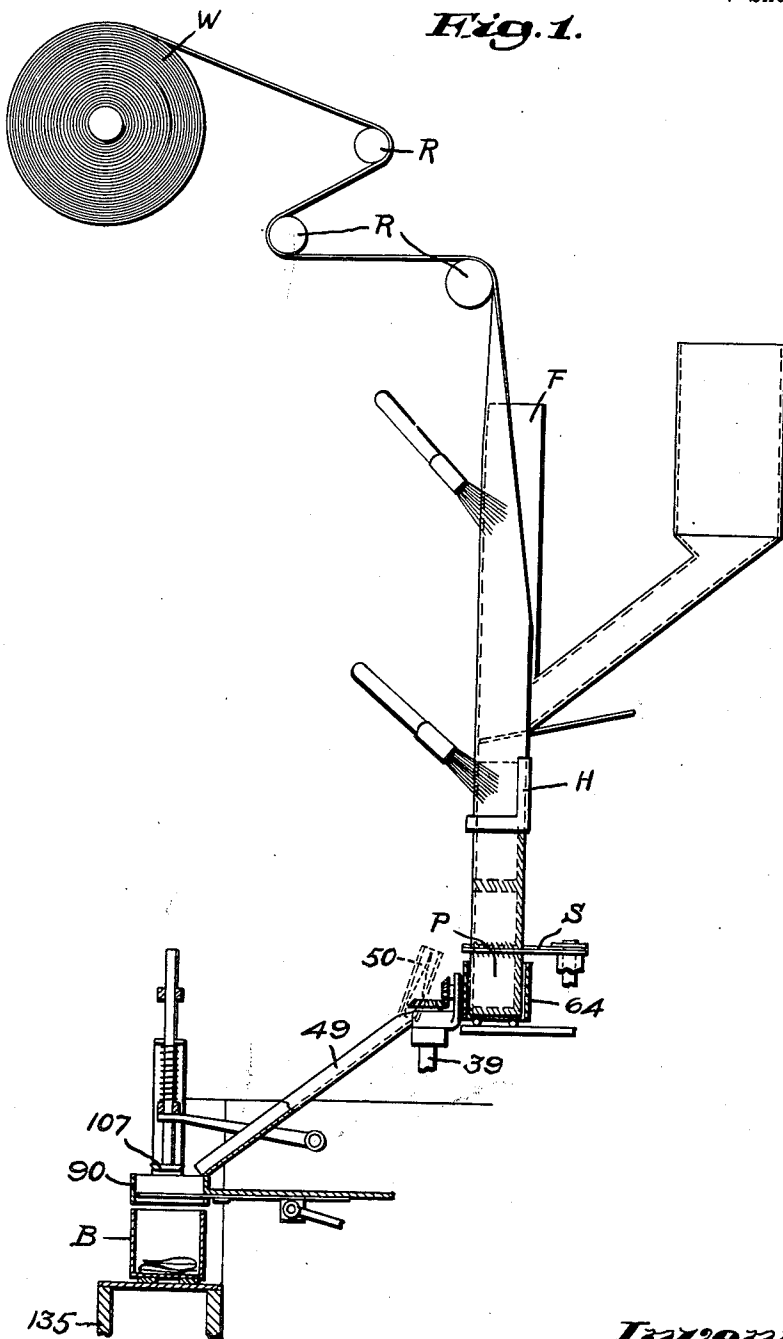
2,697,541

AUTOMATIC PACKAGING METHOD AND APPARATUS

Filed May 27, 1952

7 Sheets-Sheet 1

Fig. 1.



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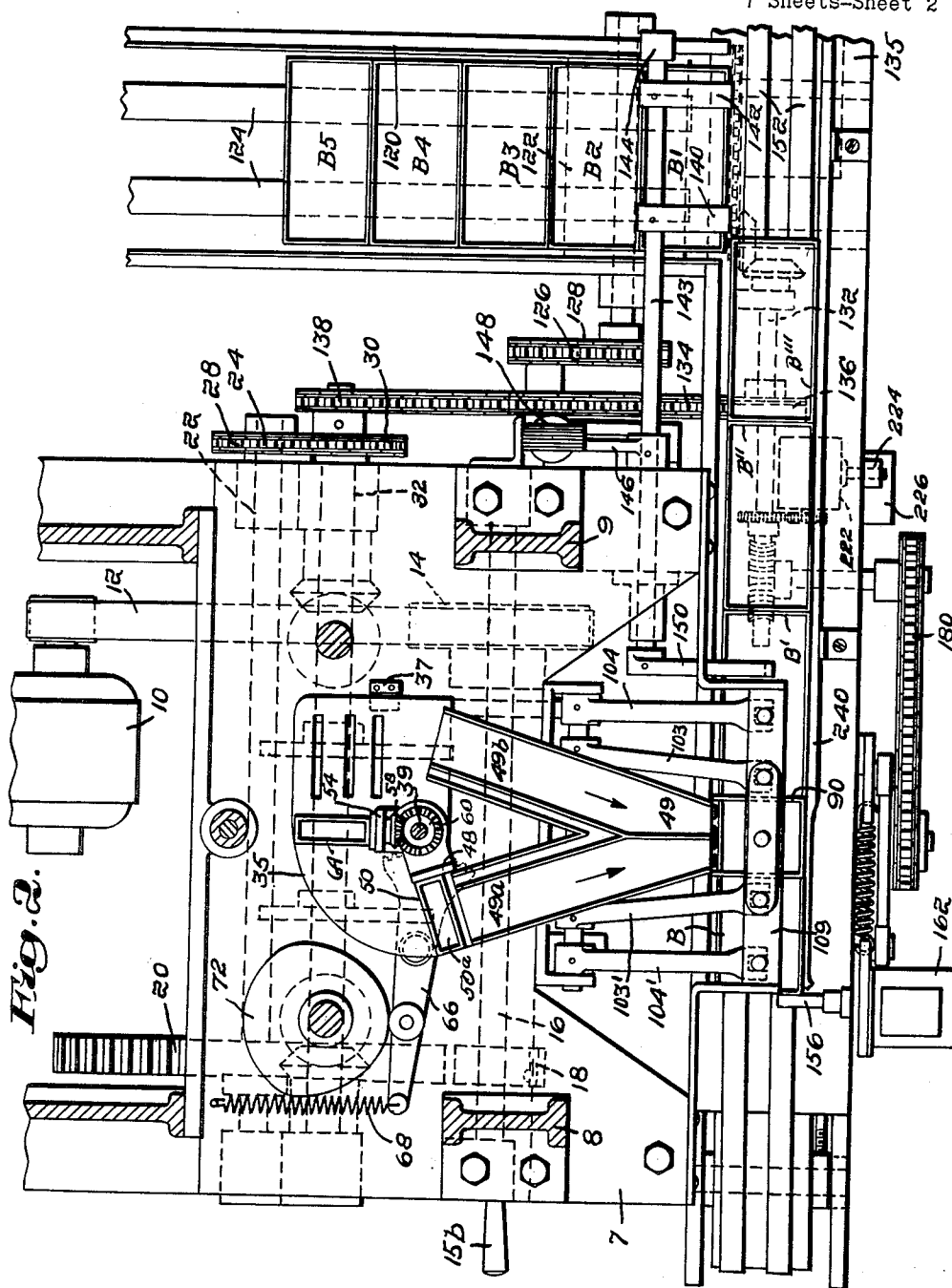
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7 Sheets-Sheet 2



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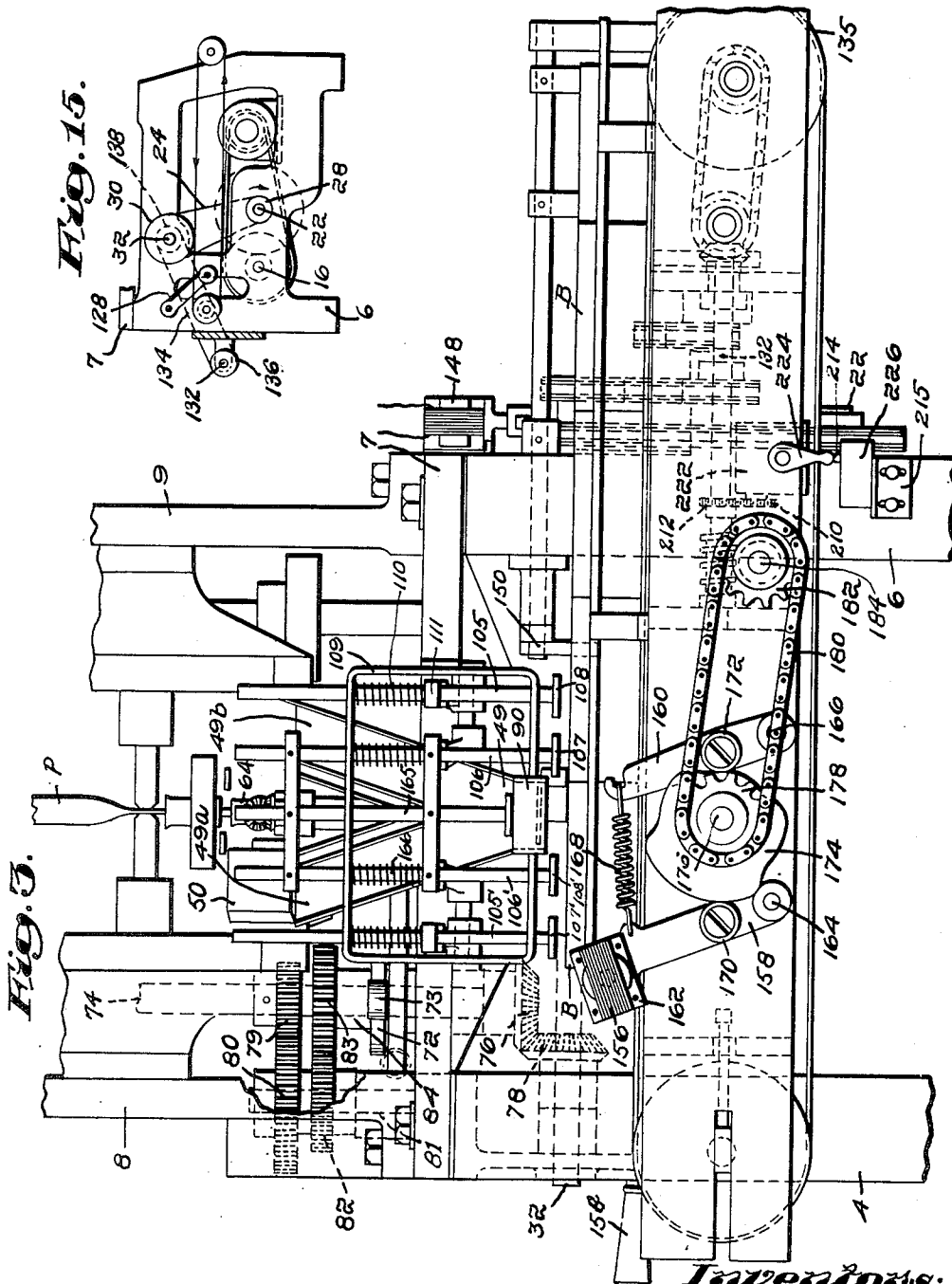
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AUTOMATIC PACKAGING METHOD AND APPARATUS

Filed May 27, 1952

7 Sheets-Sheet 3



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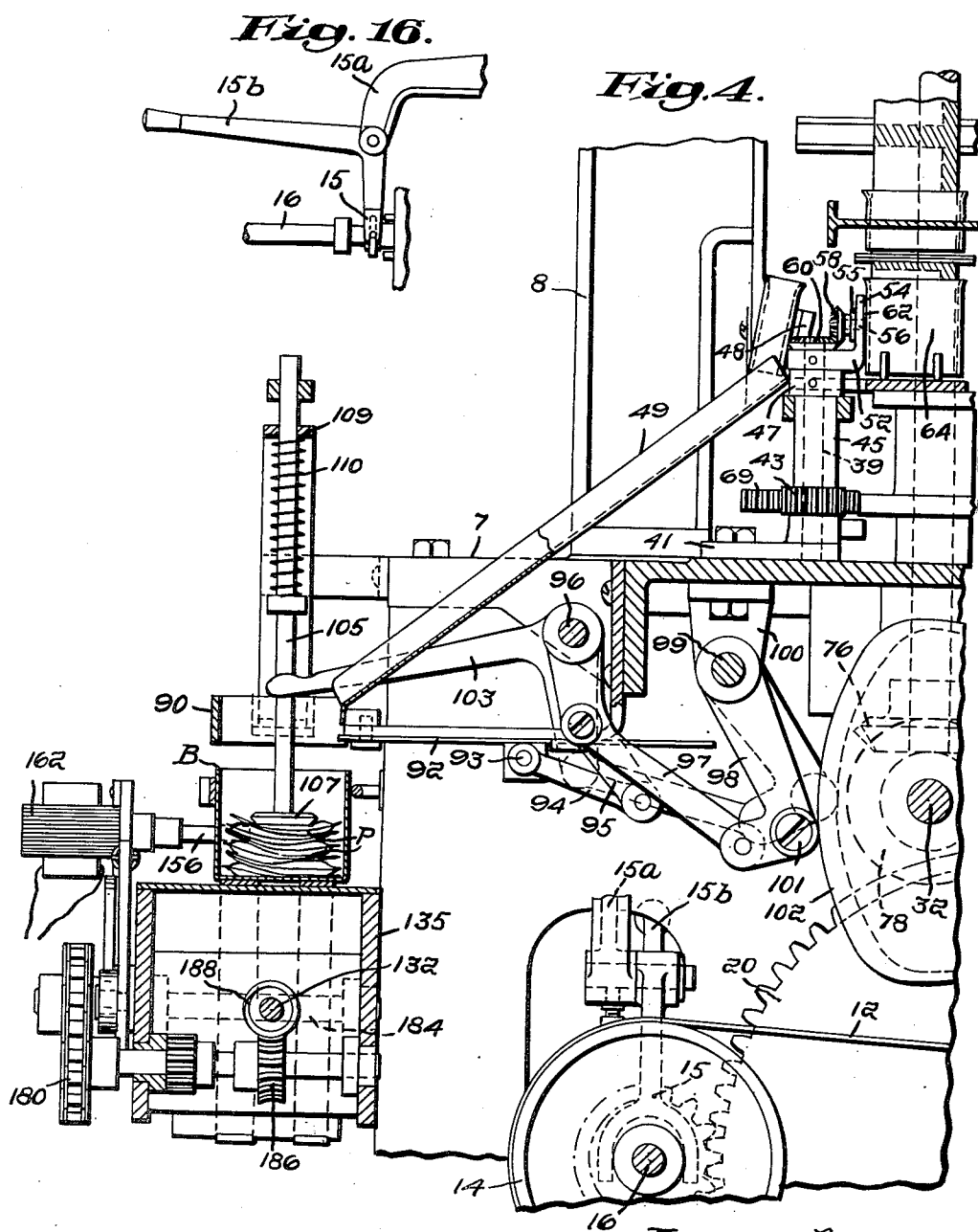
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2,697,541

AUTOMATIC PACKAGING METHOD AND APPARATUS

Filed May 27, 1952

7 Sheets-Sheet 4



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Filed May 27, 1952

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Fig. 5.

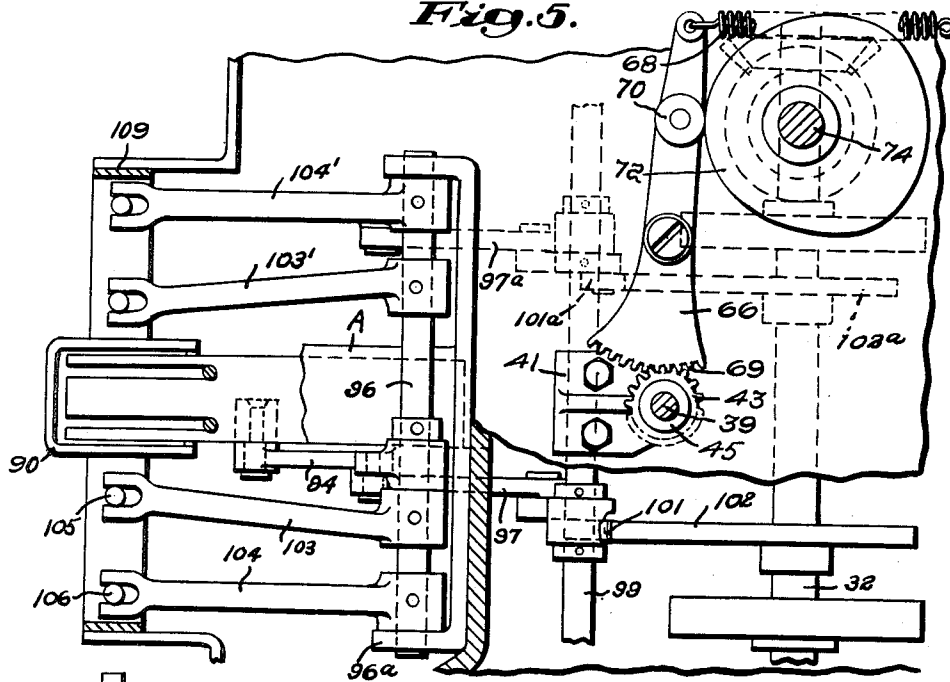
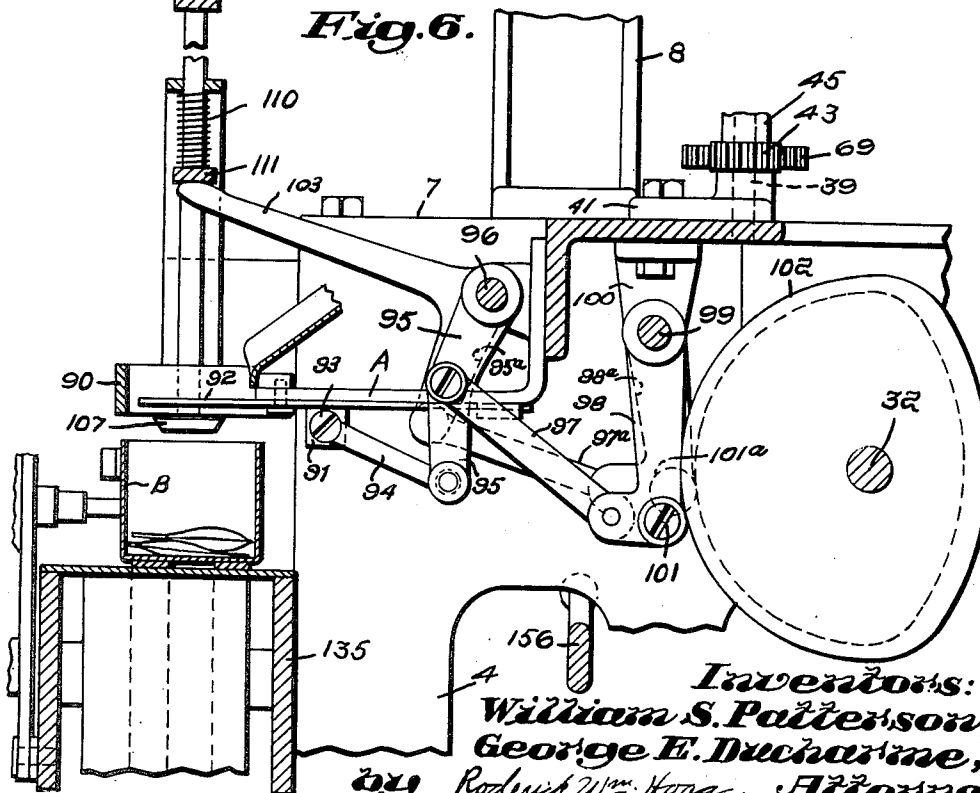


Fig. 6.



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Filed May 27, 1952

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Fig. 7.

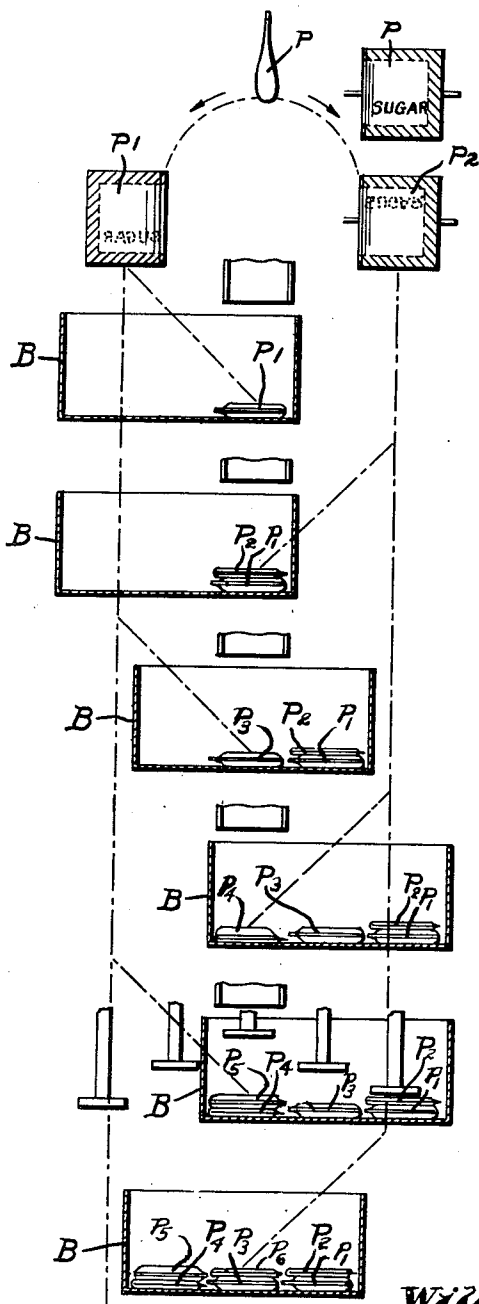


Fig. 8.

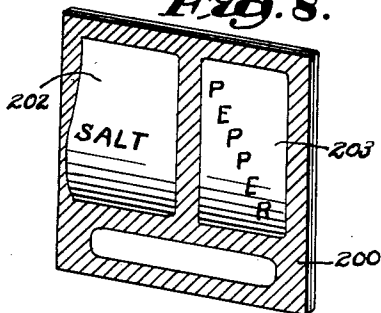


Fig. 9.

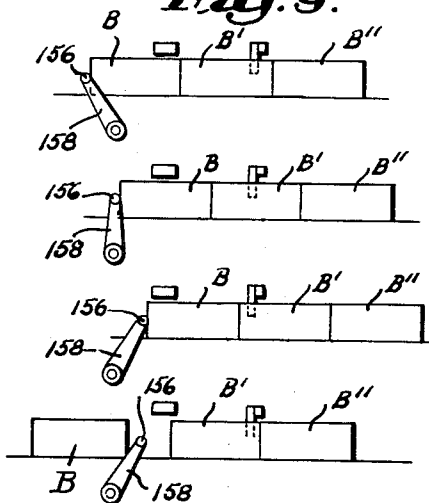
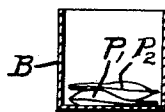


Fig. 10.



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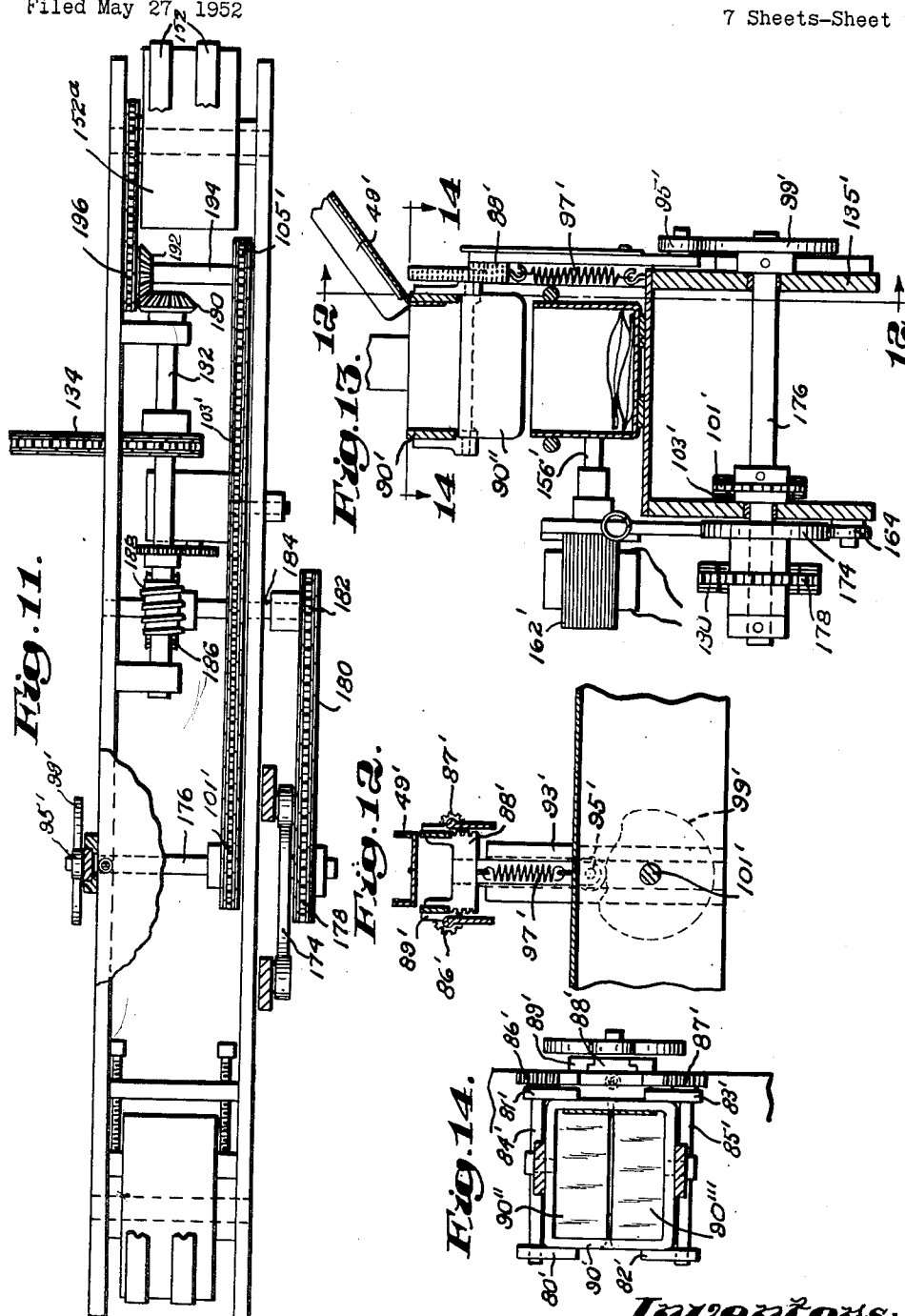
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2,697,541

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7 Sheets-Sheet 7



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AUTOMATIC PACKAGING METHOD AND APPARATUS

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Application May 27, 1952, Serial No. 290,144

11 Claims. (Cl. 226—14)

This invention relates to an automatic packaging mechanism for handling dispensing packets of the class particularly exemplified by sugar packets and similar envelope type containers used to hold materials such as spices, condiments, herbs, chemicals, and the like.

The packaging mechanism has been designed for use especially in bag forming machines of the general construction and operation described in the Patterson Pat. No. 2,385,229, issued Sept. 18, 1945. However, it should be understood that we do not intend to limit the invention to use with the earlier patented machines and we may desire to employ all, or parts, of our improved packaging mechanism with various types of apparatus for producing or handling dispensing packets and similar articles.

In forming a packet of the sealed edge type noted in the patent above referred to, the filling material is usually introduced while the packet is disposed in an upright position in a partly finished condition and, consequently, most of the loose solid material falls into the bottom of the packet to there produce a substantially greater packet thickness than is present at the top of the packet. Such a variation in thickness becomes an important consideration in packaging a considerable number of the packets, for example units of fifty packets or larger, especially where it is desired to arrange the packets flatwise in superimposed relation to one another. The difference in thickness in each packet makes it difficult to hold the packets in a uniform pile as the thick portions of the packets build up faster than the thin portions and, hence, the bags slide away from one another, preventing an orderly stacking process and, in some cases, interfering with such mechanism as may be employed for automatically feeding the packets into a box or other container.

The present invention is concerned with the problems indicated and aims to devise a method and apparatus for packing dispensing packets of the class described in suitable boxes, or other forms of containers, and in a manner such that the difficulties referred to are substantially eliminated or avoided and individual packets are compactly and efficiently arranged so that the packaged unit will reach the consumer with the packets occurring in a uniform and neatly disposed condition.

It is also an object of the invention to provide a simple, efficient and economical packaging mechanism which can be operated automatically at a relatively fast rate of speed without interference with the packets at any point in the handling process. Still another object of the invention is to devise a packaging mechanism which may be manufactured as an independent unit capable of being attached to bag forming machines of the character above referred to without modifying the operating parts of such machines and with only a minimum amount of changes being necessary in order to obtain a proper working relationship.

These and other objects and novel features will be more fully understood and appreciated from the following description of a preferred embodiment of the invention selected for purposes of illustration and shown in the accompanying drawings, in which

Fig. 1 is a diagrammatic view illustrating the movement of packets from those points at which individual packets are formed up to and including delivery of the packets to a container in which the packets are stacked;

Fig. 2 is a plan cross-sectional view showing parts of a bag forming machine of the class referred to and with which the automatic packaging mechanism of the invention has been shown;

Fig. 3 is a front elevational view of the structure shown in Fig. 2;

Fig. 4 is a fragmentary vertical cross-sectional view showing portions of the packaging mechanism combined with a bag forming machine;

Fig. 5 is a fragmentary detail plan cross-sectional view;

Fig. 6 is a detail vertical cross-sectional view of the plunger mechanism;

Fig. 7 is a diagrammatic view illustrating steps in the feeding cycle of packets;

Fig. 8 is a perspective view of a special type of packet;

Fig. 9 is a diagrammatic view showing steps through which containers are moved in receiving packets;

Fig. 10 is a detail vertical cross-sectional view of the hopper of the invention with packets disposed therein;

Fig. 11 is a detail plan view showing parts of the conveyor mechanism and drive therefor;

Fig. 12 is a cross-section taken on the line 12—12 of Fig. 13;

Fig. 13 is another detail vertical section taken at a point intermediate the conveyor mechanism and just in front of the dispensing hopper apparatus;

Fig. 14 is a cross-section taken on the line 14—14 of Fig. 13;

Fig. 15 is a detail elevational view; and

Fig. 16 is a fragmentary elevational view of a portion of the clutch mechanism.

In conventional methods of producing packets of the sealed edge type described in the patents above referred to, a strip of paper is led through guide rolls and pressed into contact with a vertical former by means of brushes to provide two adjacent sides of an envelope member, as has been indicated somewhat diagrammatically in Fig. 1.

The sides are thereafter sealed together in the well known manner by means of L-shaped heating elements, thus providing an envelope section secured at the bottom and along a rear edge, and having its top open. Filler material of some desired type is introduced into the envelope thus formed and thereafter the top edge of the filler is sealed. A shearing mechanism then cuts off the fully sealed bag section.

In the present invention we provide an improved method and apparatus for receiving packets just after they have been sheared and for guiding the packets and selectively turning them over upon themselves in a novel manner so that the solid material of any one packet will occur in an alternately disposed manner with respect to the solid material of a next succeeding packet.

This is achieved by means of a special alternating guide structure including a pair of spaced apart tubular guides which alternately move into position to receive successive packets as they are cut off. The guides then turn the packets about a vertical axis into a position such that they can be dropped on to a delivery chute. Thereafter the packets pass from the delivery chute into a dispensing hopper which is provided with a movable bottom section functioning in the nature of a trap door to periodically release packets and allow them to drop down into a box or other suitable container which is supported on a conveyor member directly below the dispensing hopper.

In accordance with a further novel aspect of the method and apparatus of the invention we provide for periodically changing the position of the box on the conveyor so that the packets as they are delivered from the dispensing hopper become stacked, one upon another, in a plurality of closely compacted adjacent piles.

In carrying out this movement we have devised a novel reversing step feed mechanism for forcing the box rearwardly of the conveyor belt in timed relationship with respect to the operation of the dispensing hopper and in a sequence such that a predetermined number of packets will be selectively located in the box as it moves through the different loading stations.

An important feature of the invention is a packaging mechanism so designed as to comprise a compact unit which can be readily attached to a bag forming machine of the type noted with a minimum amount of difficulty. As an aid to more fully understanding the packaging mechanism and the manner in which it is installed, a brief description will first be given of portions of one typical

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bag forming machine to which the packaging unit may be attached, together with parts of the machine drive which are employed to drive the packaging mechanism.

In the structure shown in the drawings there is illustrated an upright frame formed with lower vertical side walls 4 and 6 on which is supported a top section 7, as noted in Fig. 3. Solidly bolted to the top 7 are two upper side wall sections 8 and 9. A motor 10 drives a pulley 14 through a belt 12. The pulley member is free to rotate on a shaft 16 which has its ends mounted in suitable bearings in the side walls 4 and 6. The pulley 14 drives the shaft 16 through a clutch 15, better shown in Fig. 4, and manually controlled by a clutch handle 15b, as shown at the left-hand side of Fig. 2.

Secured on shaft 16 is a small gear 18 (Fig. 2) arranged to mesh with a large gear 20. The latter gear is fast on a shaft 22 which is supported at its ends in bearings located in the two opposite frame sides 4 and 6. As indicated at the right-hand side of Fig. 2, shaft 22 carries a sprocket gear 24 driving a sprocket chain 28, in turn driving a sprocket gear 30 on a shaft 32. This shaft also extends between the sides 4 and 6 of the machine at points intermediate the shafts 16 and 22 and at a somewhat higher point in the machine, as may be seen from an inspection of Fig. 4.

It will be understood that the motor and shaft arrangement described control the formation of dispensing packets through actuating mechanism, which has not been shown in the drawings since this actuating mechanism forms no part of the present invention. However, formation of packets has been indicated at the upper side of Fig. 3 wherein is shown a packet P about to be sheared and dropped into the alternating tubular guide mechanism which comprises one of the more essential parts of the present invention.

Guide mechanism

The guide mechanism includes a horizontal plate or table 35, better shown in Fig. 2, which is supported centrally of the machine on a bracket 37 bolted to the frame top 7. Vertically disposed through the table 35 is a post 39 having its lower end solidly received in a plate 41, as shown in Fig. 4. The plate 41 is bolted to the frame top 7 at a point below the table 35.

Rotatably mounted on the post 39 is a gear 43 which is formed with a sleeve 45. Fixed at the upper end of the sleeve 45 is a ring 47 carrying an arm 48 to which is fastened a tubular guide element 50. The latter member is open at each end and is normally supported in a substantially upright position. As shown in Fig. 2 the guide is constructed with an inner rectangularly shaped opening 50a which is chosen of a size slightly larger than the packet P so that the guide may freely receive the packet in one position and support it in an upright manner with its lower edge being allowed to rest momentarily upon the table 35 when the packet drops downwardly into the guide element 50.

It will be apparent that rotation of the gear 43 in one direction will cause the guide 50 to swing about a vertical axis and to move into register with the upper inlet 49a of a chute member 49, at which point the packet contained in the guide will be released on to the guide in a flatwise manner with its lower portion, in which is contained the solid filler material, assuming a foremost position.

Secured to the ring 47 above the gear sleeve 45 is a second ring 52 which extends outwardly and carries an upright arm 54 on which is supported a second tubular guide 64. This arm projects outwardly from the post at an angle slightly greater than 90° with respect to the arm 48. With this arrangement rotation of the gear 43 in one direction not only causes the guide 50 to move into register with the chute 49 but, at the same time, locates the guide 64 in position to receive the next packet, which is sheared. Thereupon rotation of the gear 43 in an opposite direction will move the guide 64 into a position of register with the upper inlet 49b of the chute 49 and, at the same time, return the guide 50 into position to receive the next succeeding packet.

Mounted through the arm 54 is a shaft 56 carrying at one end a bevel gear 58 fixed thereto. In mesh with the gear 58 is a second bevel gear 60 fastened securely at the top of the post 39. The opposite end of the shaft 56 extends through the arm 54 and carries a plate 62 which supports the above noted tubular guide 64. The

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latter is formed with a lower closed end so that when the guide receives a packet it is contained therein. As gear 43 and sleeve 45 are rotated, the guide 64 swings about a vertical axis on the post 39 and this movement causes the bevel gear 58 and its attached shaft 56 to revolve, simultaneously upending the guide 64 and causing it to discharge the packet at approximately the point at which the guide moves into register with the upper end 49b of the chute 49. By thus upending the guide 64 it will be apparent that the solid material in the packet will be positioned in a foremost position on the chute; i. e., in reverse order to the arrangement of packets from the other guide. Because of the fact that the two guides 50 and 64 are secured in fixed spaced-apart relation to one another and are arranged to move in timed relation to the rate of feed of packets from the forming machine, it should be observed that one or the other of the guides will always be in a position to receive a packet which is being dropped from the forming machine.

It is customary in forming machines of the class described above to produce a sheared packet with each rotation of a main driving shaft element, such as the shaft 32. An important feature of the invention is the provision of means for utilizing the driving shaft to actuate gear 43 in a timed relationship to the shaft 32 so that each of the guides 50 and 64 may complete a forward travel and its return travel during the feeding of alternate packets from the machine.

Included in the means for performing this function is an arm 66, best shown in Fig. 5, and pivotally supported on the frame top 7 and resiliently held in one position by means of a spring 68. At its inner end the arm 66 is constructed with an integral segmental gear portion 69 which is adapted to mesh with the gear 43 already described. At its opposite end the arm 66 carries a cam follower 70 which engages a cam member 72 fixed on a vertical shaft 74.

Shaft 74 is supported in the frame top 7 and its lower end extends below the frame top to receive a bevel gear 76 in mesh with another bevel gear 78 fast on the shaft 32, as is illustrated at the right-hand side of Fig. 4. At its upper end the shaft 74, as shown in Fig. 3, has fixed thereto a gear 79 which meshes with a large gear 80 having a 2 to 1 gear ratio and which is fast on a stub shaft 81 supported in the frame top 7. Also fixed on the shaft 81 is a second lower gear 82 which meshes with a larger gear 83 free on shaft 74. The gear 83 is formed with a hub 84 which extends downwardly about the shaft 74 and has fixed at its lower end the cam 72 already mentioned.

With this gear arrangement it will be observed that the gear 83, together with its attached cam 72, makes one revolution during the production of two packets or bags and, during this revolution the cam member 72 actuates the segmental gear first in one direction and then in the other, so that each of the two bags produced during the single revolution of gear 83 are received and guided to the chute members.

It will be noted that the chute member 49 is formed with diverging upper inlet portions 49a and 49b, already referred to, and it will be apparent that these inlets are spaced apart from one another a distance approximately corresponding to the spacing between the guides 64 and 50, as is more clearly shown in Fig. 3 of the drawings. In the case of the inlet 49b it may be desired to arrange for this member to extend upwardly slightly above the level of the surface of the table 35 so that it may receive a packet smoothly with little opportunity for the solid material therein to move forwardly in the packet as it is turned over. As shown in Fig. 4, the upper diverging ends of the chute 49 may rest against the table 35, while the lower end of the chute extends into communication with a packet dispensing hopper apparatus.

Dispensing hopper and plunger apparatus

The dispensing apparatus includes a hopper 90 comprising a substantially rectangularly shaped box which, in size, exceeds slightly the dimensions of a packet formed in the machine so that a packet passing from the chute may be received flatwise in the hopper. The hopper is also provided with a movable bottom section 92, Fig. 4, which may, for example, be of a horizontally retracting type adapted to be moved into and out of a closed position by means of a compound motion linkage, more clearly shown in Figs. 5 and 6, and including an arm 94 having

one end pivoted at 93 in a block 91 secured to the movable bottom section 92. The opposite end of arm 94 is pivotally secured to a lever 95 movable on a shaft 96 supported in a bracket 96a, better shown in Fig. 5. The arm 94 and the movable bottom section are connected to the remaining elements of the compound motion linkage through a pivoted link 97. This link connects lever 95 with another lever 98 which is pivotally supported on a stub shaft 99 carried in a bracket 100 bolted to the under side of the frame top 7. A cam follower 101 on lever 98 is arranged to engage with a cam 102 on the shaft 32 and actuates a compound motion linkage to provide a reciprocating movement of the bottom section 92.

A second cam 102a, also on shaft 32, engages a cam follower 101a on a link 98a pivoted on shaft 99. The link 98a is connected to a lever 97a which is pivotally secured on arm 95a fixed at its upper end to shaft 96. Movement of this latter linkage turns the shaft 96 about its longitudinal axis. On this shaft 96 are solidly secured lift arms 103, 104, 103' and 104', as noted in Fig. 5. These lift arms are adapted to engage at their outer extremities with plunger members 107 and 107' and 108 and 108'. The latter members are more clearly shown in Fig. 3 of the drawings and are supported on respective stems 105 and 106, 105' and 106' which are vertically disposed in a frame 109. The lift arms are formed at their outer extremities with yoke portions adapted to engage around the stems of the plungers, as has been further illustrated in Fig. 5.

The frame 109 extends above the dispensing hopper and supports at the upper side thereof vertically arranged springs 110 which are held between the upper edge of the frame and collar elements 111, with the latter members being slidable on their respective stems. The yoke portions of the lift arms are arranged to bear against the under sides of respective collar elements and the spring members 110 function to resiliently urge the plungers downwardly when the plungers are lifted up into a raised position such as that shown in Fig. 6 in response to the lifting action of the compound motion linkage already described.

The plungers are arranged to operate in timed relation to movement of the retracting hopper section so as to move downwardly and engage packets just as the retractable slide operates. Consequently, the plungers perform an important function of forcing the packets out of the hopper at a rate of speed greater than the speed at which they would move in falling, due to the action of gravity. This makes it possible to accelerate the loading of packets into a box which is supported on a conveyor extending just below the dispensing hopper 90. Also, with the aid of the plunger action noted, there may be achieved not only a fast repeating operation but a more uniform stacking action, during the course of which the packets are pressed and compacted against one another as they are stacked so that they tend to remain in a substantially squarely disposed and orderly pile. It should be noted that some types of packets when placed one upon another may tend to develop appreciable springiness which must be taken into consideration in attempting to compress the packets one upon another. In accordance with the invention we adjust the stroke of the plungers so as to produce a positive packing or tamping action of the plungers against the bags and this action, we have found, overcomes the tendency of the bags to spring apart from one another and to become disarranged.

Attention is also directed to the fact that in forcing the packets downwardly with a positive pressure the spring loaded plungers are self-regulating with respect to the length of their stroke by reason of the spring arrangement described, and therefore the plungers can adjust themselves to change in length of stroke in accordance with change in the height of a stack of packets accumulating from time to time in the container box.

It will be noted that the compound motion linkage is, in part, designed so as to provide for imparting a relatively long stroke to the plungers with a limited cam movement which must be observed due to structural limitations of the machine and due to the fact that the plungers must reciprocate in timed relation to the feeding of packets into the hopper, as well as in timed relation to the retracting cycle of the movable bottom section of the hopper. All of these operations are carried out in a cycle defined by the length of time required for one full revolution of the shaft 32 which corresponds to the time interval

during which one packet is formed and delivered from the forming machine itself.

With the guide mechanism, dispensing hopper and plunger apparatus described it will be apparent that each succeeding packet is arranged in an alternately disposed manner so that the solid material of one packet occurs in staggered relation to the solid material of an immediately adjacent packet. As a consequence of this, if the packets are stacked upon one another in a suitable container, there will be formed one or more piles of packets, each of which piles is of a substantially uniform height on all sides. Because of this the packets are more efficiently stacked and are more easily held in a uniform condition in the container.

Moreover, it should be observed that the folded edges of the packets normally leave the forming machine in a foremost position with a vertical sealed edge occurring at the rear of the packet. However, the alternating movement of the dual guide structure causes the packets to follow one another into the box B with the folded edge of one packet occurring on an opposite side from that of an immediately adjacent packet, when the packets are in a flatwise position, and this alternation of the packets further serves to equalize and smooth out any differences in thickness of adjacent packets so that they more readily tend to remain located in a uniform pile.

Since the packets are relatively small in size, for example having a common length of $2\frac{1}{2}$ " and a width of 2", as well as various other dimensions, it is desirable to package these containers in boxes which may contain a number of piles, and it is therefore essential to be able to stack the packets in adjacent piles in a compact manner using boxes which may, for example, in one dimension, closely correspond to the length of the packets and which, in another dimension, may be some predetermined multiple of the width of the packets. A common size of box is one having a capacity for snugly receiving three stacks or piles of packets, and such a box has been shown in the drawings illustrating the invention, it being understood that other sizes of containers may be utilized.

Reversing step feed motion

In accordance with the invention we have further devised a novel reversing step feed motion for carrying out a multiple stacking operation which, although not limited thereto, is particularly adapted to stacking in boxes having capacity for three piles of packets. The reversing step feed motion causes the stacking to take place so that each pile is built up progressively and at the same time in order that the height of each of the piles shall remain substantially the same at all points in the stacking cycle. With this arrangement each stack supports an adjacent stack and prevents packets from slipping out of position.

As shown in Fig. 2 of the drawings the reversing step feed motion preferably operates in conjunction with two cooperating conveyor units arranged at right angles to one another, the first conveyor unit being supported along the right side of the machine, as viewed in Fig. 2, and the second conveyor unit being arranged at the front of the machine.

Referring in detail to the structure shown in the drawings, and especially Fig. 2, numeral 120 denotes the first conveyor frame which supports drums 122 and belts 124. The conveyor drum may be driven in any convenient manner as by a sprocket 126 and chain 128. A shaft 132 is mounted in an elongated shaped housing 135 which comprises the second conveyor and which may be solidly fastened to the front of the forming machine frame, as is more clearly shown in Fig. 4, or in some other suitable manner. A sprocket chain 134 and sprocket 136 fast on the shaft 132 (Fig. 2) is driven by the sprocket 138 fixed at the outer end of shaft 32 referred to above.

As illustrated in Fig. 2, a series of boxes B1, B2, B3, B4, etc. are constantly fed along the conveyor 120 in a position such that they extend lengthwise across the conveyor belts 124 and are successively delivered to the second conveyor upon conveyor belts 152 of the latter member, more clearly shown in Fig. 2. At the forward end of the conveyor frame 120 the front box B1 is normally held against further forward movement by a pair of stops 140 and 142 which have bent over ends adapted to engage over the forward box B1 and hold it against the feeding action of the conveyor belts 124.

The stops 140 and 142 are fixed on a rod 143 which is

rotatably supported at one end in the frame side 6 and at the other end in a bearing block 144. Fixed on an intermediate part of the rod 143 is an arm 146 which carries at its outer extremity a solenoid part controlled by a solenoid member 148. This solenoid may be located on the frame, as shown in Fig. 2, or at some other desired point as, for example, at the extreme outer edge of the conveyor frame.

The purpose of the stops 140 and 142 is to control the feeding of boxes from one conveyor to the other and, in addition, to prevent boxes on the first conveyor from crowding against a rearmost box on the second conveyor and interfering with the feeding movement of boxes on the second conveyor.

At the inner end of the rod 143 is another intermediate stop 150 formed with a hooked end which normally extends downwardly into the path of movement of boxes passing along the second conveyor 152 in a position such that the hooked end may engage inside the first empty box occurring adjacent to a box which is being loaded. Although the empty box referred to is free to move in either direction through a limited travel without interference with the hooked end of stop 150, it will be seen that there is a point at which the hooked end will limit forward movement of this empty box. The purpose of stop 150, therefore, is to control movement of an empty box so that it can be temporarily held and then released to move into a stacking position as soon as the next preceding box has been filled.

The conveyor belts 152 act to move a series of boxes B, B', B'' and B''' thereon into an advanced position in which the foremost box engages against a stop member. The reversing step feed motion which we have devised acts to periodically push the boxes rearwardly along the conveyor belts 152 against the positive feeding action of these members into successive loading stations.

Included in the feed motion shown in Fig. 2 is the retracting stop 156 which extends transversely across the path of movement of the first box B to hold the box against the feeding action of the conveyor in each of three different loading stations. The stop 156 is supported on one of two parallel bars 158—160, Fig. 3, and its retracting movement is controlled by a solenoid 162 also secured at the outer end of the bar 158. When the solenoid is energized it operates to contract the stop 156, which allows the front box to pass along the conveyor. It will be understood that this retraction of the stop 156 will only occur at a point at which box B has been fully loaded with packets, as will be hereinafter described.

The parallel bars 158—160 are pivoted at 164 and 166 in the side of the housing 135 and are resiliently held in parallel spaced relation to one another by means of a balancing cam 174 and spring 168 engaged around the upper ends of the bars, as shown in Fig. 3. Each of the parallel bars has mounted on an outer side thereof cam followers 170 and 172, respectively, between which is located the balancing cam 174 which is free to rotate on a shaft 176 transversely disposed through the conveyor housing 135.

Cam 174 has secured to it a sprocket gear 178 also free on the shaft 176 and driven by a chain 180 in mesh with a gear 182 on a shaft 184, also shown in Fig. 11. Shaft 184 is driven by a worm wheel 186 fixed thereon and, in turn, engaged by a worm 188 carried by the earlier described shaft 132 supported in bearings, as shown. At the right-hand end of shaft 132, as viewed in Fig. 11, is fixed a bevel gear 190 meshing with another bevel gear 192 fast on a transversely disposed shaft 194. This latter shaft, through a sprocket and chain 196, drives the conveyor drum 152a, as shown.

An important feature of the invention is the combination with the stop 156, of the balancing cam mechanism which cooperates with the conveyor to repeatedly step the stop element 156 rearwardly in two stages, in each case halting the box in a different stacking position with relation to the dispensing hopper.

The steps referred to are illustrated diagrammatically in Figs. 7 and 9. Thus, in the position first shown in Fig. 9, as well as Fig. 2, the box B is in a forward loading position in which packets being delivered from the dispensing hopper will fall into the extreme right-hand side of the box B.

The first reverse step feeding movement then takes place, in accordance with the movement of the cam 174, at which time the box B is moved into a loading posi-

tion such that packets may be stacked in an intermediate or central portion of the box, as suggested in the second position of Fig. 9.

Thereafter a second reverse step feeding movement is produced by the cam movement and box B is moved in to the third position shown in Fig. 9, at which point packets are stacked at the extreme left-hand end of the box B. The next movement produced by the cam returns the box to the intermediate loading station described and a final movement of the cam re-locates the box B in its starting position, whereupon the cycle is repeated until the box B is filled. At this time the box B is released in the manner hereinafter described, and box B' is engaged by the stop 156.

In accordance with a further important aspect of the invention we provide in the cam means a travel for controlling the step feed movement so that there will be provided a time interval in which two packets are stacked at both the forward and rearward loading stations while only one packet is delivered to the box in an intermediate loading station. In other words, starting with the box B in an extreme forward position, two packets will be stacked at the right-hand end of the box in the manner diagrammatically illustrated in Fig. 7. Then the box will be stepped rearwardly and one packet will be stacked at an intermediate part of the box, and then a second reverse feeding will take place and two more packets will be delivered in the left-hand end of the box B. Thereafter the box feeds ahead into the intermediate stacking position with one packet again being delivered; then to the starting position with two packets being delivered; and this cycle is repeated until such time as the box is filled.

This operation has been illustrated diagrammatically by step in Fig. 7, wherein it will be noted that packets P delivered from the forming machine are guided by the tubular guides 50 and 64 in a sequence in which packet P1 is first located at the extreme right-hand side of box B, as viewed in Fig. 7. The latter member under control of the cam remains at rest for an interval long enough for a second packet P2 to be superimposed upon the packet P1, as shown. Then the cam and stop member will move the box rearwardly into an intermediate loading station, as shown diagrammatically, and a third packet P3 will be placed in an intermediate position, as shown. When this step has been carried out the cam and stop mechanism immediately moves the box into its third loading station, as diagrammatically indicated in Fig. 7, and a fourth packet P4 is located at the extreme left-hand side of the box B, as noted. The box remains in this third loading position for an interval long enough for one more packet to be delivered, namely packet P5, to be superimposed upon the packet P4. Then the box moves forwardly into its intermediate loading position, as shown at the bottom of Fig. 7, and a sixth packet, namely packet P6, is disposed upon the packet P3. The box then moves into its first loading position and the cycle described is repeated.

As will be noted in Fig. 10, the arrangement of the packets in alternate sequence in the manner carried out by the tubular guides will, in each one of the progressive steps described, result in the packets being disposed with the thick portion of one packet occurring alternately with respect to the thick portion of an adjacent packet. This is shown in Fig. 10 diagrammatically, which figure, it will be observed, views the packets in the box B at right angles to the position shown in Fig. 7. It will be apparent that with the filling material thus alternately disposed throughout the stack, a much greater stability and uniformity of pile is realized.

We have definitely found that by following this sequence for a box which is to contain three stacks or piles of packets, a rapid and substantially uniform building up of the piles may be achieved, in which the center pile or stack, at any time, will be of approximately the same height as an adjacent pile at either side thereof, less the thickness of one packet. That is to say, at the time stacking is completed at either end of the box there will be one more packet than occurs at the center pile. The practical result of this arrangement is to constantly keep the piles of approximately the same height and such procedure cooperates with the action of the tamping devices or plungers to avoid difficulty from the springiness of these articles and to achieve excellent uniformity of stacking and an orderly arrangement of the packets in the piles.

In connection with devising a reverse step feeding mechanism to deal with an article of the light weight characteristics found in the containers described, a considerable problem develops. It will be appreciated that the boxes are very light in weight and the packets are insecurely supported within the container. If the box or container is subjected to any appreciable impact or shock as it is moved rearwardly into successive loading stations, it will be thrown about on the conveyor tapes and may be difficult to control. Moreover, there may result a troublesome displacement of partly stacked piles of packets in the container. These considerations are further complicated by the fact that it is desired to effect some of the step feeding movements at a relatively fast rate of speed.

An important feature of the invention is the provision of the special cam and stop arrangement which we have provided to carry out the reverse step feeding movement. We prevent the box and partly stacked piles from being upset by means of a balancing cam action. This is achieved through the combination with the cam described of the parallel bars and connecting spring element, together with the two cam followers. The cam followers are combined on two sides of the cam member 174 so that any tendency for the cam to snap or jerk the stop element 156 sharply against the box is eliminated. Instead, a balanced actuating movement takes place in which the cam follower on the fall side of the cam, due to the shape of the cam and to the action of the spring, tends to oppose the movement of the cam follower on the rise side of the cam so that the movement of the stop element is smoothed out and caused to take place in an easy manner and there is no sharp impact or jerking of the stop against the box at any point in the reverse feeding operation. At the same time the forward feeding action achieved by the thrust of the conveyor belts, which is constantly maintained, avoids any occurrence of jerking in advancing the box.

Counter mechanism

When a sufficient number of packets have been delivered to the box B to fill this member, it is necessary to retract the stop 156 in order to allow the filled box to pass along the conveyor and to make room for an empty box, as has already been explained.

In accordance with the invention we have provided a novel counter mechanism which controls retraction of the stop member through the solenoid 162. With this novel counter mechanism we also provide means for simultaneously controlling the release of a box from the first conveyor to the second conveyor. In combination with the means for transferring a box from the first conveyor to the second conveyor we provide additional means for controlling movement of an empty box which occurs immediately in back of the box which has been receiving packets.

The movement of the counter mechanism, therefore, controls three distinct operations, as follows:

The stop 156 is retracted and immediately the conveyor belts pass the loaded box B ahead. As the loaded box moves away along the conveyor, the rearmost edge of the next empty box advances to a point where one end of this box strikes against the hooked end of the stop 150 and is momentarily retarded in its forward movement. At this point the second solenoid 148 operates to raise the stop 150 through rotation of the shaft 143 which permits the next empty box B' to be carried forwardly by the conveyor until the front edge of box B' is brought into contact with the stop 156. This latter member has now had an opportunity to regain its normal projecting position. Concurrently with these operations the two rear stops 140-142 also on the shaft 143 are simultaneously raised, allowing an empty box to move from the first conveyor to the second conveyor, and this action is repeated when the box B' has been filled.

The counter mechanism by which these movements are controlled includes a gear reduction unit 222 which may be of some conventional form and which is secured inside the conveyor housing 135. This gear reduction unit carries a gear 210 driven by a gear 212 on shaft 132. The reduction accomplished is such that after fifty revolutions of shaft 132 an index finger 224 completes one revolution about its axis and moves into contact with a button 214 on a switch 226 mounted just below the index finger on the outside of the conveyor

housing 135. The switch is supported on a bracket 215, and when actuated closes a circuit which energizes the solenoid 162 and retracts stop 156. Closing the switch 226 also energizes the second solenoid member 148 which controls rotation of the shaft 143. Although the counter mechanism may be set to operate the solenoid members and the stops controlled by them after a number of packets, such as fifty, have been loaded, various other sizes of units may be similarly handled.

A desirable feature of the dual conveyor system described and the timed retraction of the stops carried out by the counter mechanism involves the elimination of any interference on the part of boxes from the first conveyor with respect to boxes on the second conveyor. It is pointed out that in order for the reverse step feeding operation to take place smoothly, all of the boxes on the first conveyor line including boxes B, B', B'' and B''', must be free to slide rearwardly a distance included in the length of one box which, as shown in Fig. 2, automatically forces the rearmost box B''' into the path of movement of boxes coming from the first conveyor. It will be apparent that if a box from the first conveyor were allowed to progress into a position where it frictionally engaged any one of the boxes on the second conveyor, it would seriously interfere with the sliding of these boxes and, consequently, impede the reverse feeding motion. For this reason the provision of the stop members 140 and 142, together with the stop member 150, all working on the same shaft which is under a common solenoid control with the control of the stop member 156, prevents such an interference.

In moving the packets on the second conveyor into the various feeding stations in the manner above described, we may also employ guard rails for holding the boxes in proper alignment with the dispensing hopper and such guard rails have been indicated by the numeral 240 in Fig. 2 of the drawings. It will be observed that these rails are formed with inwardly offset portions which snugly fit against the sides of the boxes and lightly hold them, as shown.

The apparatus now described may be modified in various ways. For example, in Figs. 12, 13 and 14 we have illustrated another desirable form of mechanism for dispensing packets from a hopper. In the structure shown in the figures noted, 90' refers to a hopper member supported on the frame in the manner already described and into which are fed packets from a chute 49'. A conveyor 135' feeds boxes, as illustrated, in position to receive packets as they are dispensed from the hopper and a retractable stop 156' controlled by solenoid 162' provides a reverse step feed in the manner above explained.

The hopper 90' is provided with two door sections or shutters 90'' and 90'''. These sections are supported in such a manner that they may open and swing about horizontal axes. When closed the shutters form a bottom for the hopper 90', as illustrated in Fig. 14. Located at the four corners of the hopper 90' are vertical frame pieces 80', 81', 82' and 83' in which are rotatably supported rods 84' and 85'. Fixed to the latter members are the shutters 90'' and 90'''.

Fixed at the ends of the rods 84' and 85' are gears 86' and 87'. Arranged to mesh with these gears is a double rack member 88' slidably disposed on a guide frame 89', in turn secured to channel member 93' bolted on the side of the conveyor housing 135.

In the channel member 93' is a cam roll 95' connected to a compression spring 97' whose upper end is fastened to the rack 88'. The cam roll is operated by a cam 99' fast on shaft 176 already noted as carrying the cam 174. A sprocket gear 101' on shaft 176 is driven by a chain 103', in turn driven by a sprocket gear 105' on shaft 194.

The shutter mechanism described has been found to work very satisfactorily in conjunction with the plunger or tamping apparatus earlier described in the specification. It will be appreciated that in dropping the packets into a container in a plurality of stacks, it is essential to hold the packet flatwise as nearly as possible. The use of the shutter mechanism permits the plungers to come down into contact with the packets and force them through the opening shutters on to the underlying stack, and since the shutters open away from two opposite sides of the hopper there is produced an extended supporting effect on two sides of a packet which is leaving the hopper, with the result that there is less tendency for the

packet to be tipped or forced into an inclined position prior to its coming to rest in the container or stack below. It is pointed out that the use of the cam and cam roller, together with the rack and gear mechanism, provide an excellent means of opening and closing the shutter mechanism in properly timed relationship with respect to the movement of the cam 174 and the other power driven parts of the machinery which control the delivery of packets, as well as the plunger movement.

In addition to the type of packet shown in the said Patterson patent, and illustrated particularly in Figs. 1 and 7, we may also employ the packaging mechanism of the invention with other types of packets. In Fig. 8 we have shown a novel form of packet which we have constructed so as to provide a dual compartment feature. As shown in the figure referred to, numeral 200 denotes the envelope body which may be formed of the same material as the earlier described packets and which may be made in a sealing machine of the character indicated, having specially devised sealing elements which will produce sealing along the edges noted in the envelope body 200. In detail, the envelope body includes a compartment 202 for holding a condiment such as salt, for example, and a second compartment 203 for holding a condiment such as pepper. These compartments are so arranged that either compartment may be separately opened by tearing away a corner of the packet, thus affording a degree of selectivity and, at the same time, furnishing a useful article for dispensing small amounts of the condiment itself. Various other forms of packets may be constructed in this way to include a plurality of compartments or chambers.

From the foregoing description it will be apparent that we have devised an efficient and compact packaging apparatus highly useful in handling and packaging envelope type packets so that filler material contained in these packets will be distributed in a manner tending to provide for greatest uniformity in stacking. It is intended that the various parts of the mechanism described may be altered in various other respects and may be utilized either in part, or in whole, in connection with other packaging machines and other types of packaging operations.

While we have shown a preferred embodiment of the invention, it should be understood that we are limited only by the scope of the claims appended hereto.

We claim:

1. In a machine for packaging packets which enclose a solid material, means for dispensing a relatively small number of packets, said dispensing means including a dispensing hopper, guide means for conducting packets to the dispensing hopper, a conveyor member for locating a packet receiving carton in position to receive packets delivered from the said dispensing hopper, and means for varying the position of the carton relative to the dispensing hopper so as to cause successive piles of packets to be built up progressively in order that the height of each pile shall remain substantially the same in a plurality of adjacent piles in the carton, in which the said means for varying the position of the container includes a stop element, a cam, and means operating in response to movement of the cam to force the stop element and carton rearwardly along the conveyor member, said cam being formed with a series of continuous cam surfaces which produce changes in the position of the carton in a sequence such that the carton will pass successively from a forward stacking position to an intermediate stacking position, then to a rearward stacking position, then back to the intermediate stacking position, and then to the forward stacking position, remaining in each of the forward and rearward stacking positions twice as long as in the intermediate stacking position.

2. In a machine for making materials dispensing packets, a packet dispensing apparatus including a dispensing hopper having a trap door therein, guide means for conducting packets from the said machine to the dispensing hopper, a conveyor member for locating a packet container in position to receive packets delivered from the said dispensing hopper when the trap door is opened, means for varying the position of the container relative to the hopper, said means comprising a step feed motion having a stop element adapted to engage with the said container, a cam, and parallel bar means operating in response to movement of the cam to force the stop element and container rearwardly along the conveyor member,

said cam being formed with a series of continuous cam surfaces which produce changes in the position of the container in a sequence such that the box will pass successively from a forward stacking position to an intermediate stacking position, then to a rearward stacking position, then back to the intermediate stacking position, and then to the forward stacking position, remaining in each of the forward and rearward stacking positions during an interval sufficient for two packets to be released from the dispensing hopper, and remaining in the intermediate stacking position during an interval sufficient for a single packet only to be released from the dispensing hopper.

3. In a machine for making bags of the sealed edge sugar bag type, including means for producing a continuous length of vertically extending connected bag sections carrying a solid material therein and shearing means for periodically separating the lowermost bag section, the combination of a bag dispensing apparatus with a conveyor member for placing a container in position to receive separated bags delivered from the dispensing apparatus, said container being of a width corresponding to the width of one of the bag sections and having a length approximately corresponding to a multiple of the length of one of the bag sections, said bag dispensing apparatus including a plurality of guide elements movable to receive and selectively arrange the bags as they pass from the shearing means so that the bags are dropped into the container in an alternately disposed manner with those portions of solid material in adjacent superimposed bags occurring in staggered relation.

4. In a machine for making bags of the sealed edge sugar bag type, including means for producing a continuous length of vertically extending connecting bag sections carrying a solid material therein, and shearing means for periodically separating the lowermost bag section, the combination of a bag dispensing hopper with a conveyor member for placing a container in position to receive separated bags delivered from the dispensing hopper, and alternating tubular guide members movable to selectively arrange the bags and advance them to the hopper so that they are dropped into the container in an alternately disposed manner with those portions of solid material in adjacent superimposed bags occurring in staggered relation to one another.

5. A structure as defined in claim 4, in which the tubular guides include arms for supporting them in spaced-apart relation, and means for pivoting the arms about a vertical axis through arcs of approximately 90°.

6. A structure as defined in claim 5, including a chute formed with dual inlets, each of said inlets extending into a position to receive a packet from one of the tubular guides as the latter member reaches the end of its 90° travel.

7. In a machine for making bags of the sealed edge sugar bag type, including means for producing a continuous length of vertically extending connecting bag sections carrying a solid material therein, and shearing means for periodically separating the lowermost bag section, the combination of a pair of alternating tubular guides constructed and arranged to receive and support successive separated bags in an upright position in which the solid material contained in the respective bags occurs at the bottom portions thereof, an inclined guideway formed with a dual inlet and located below the alternating guides, means for rotating one of the guides with an enclosed bag about a vertical axis into position to release the said enclosed bag on one of the dual inlets to the said inclined chute with the solid material in the bag occurring in a foremost position, and means for rotating the second guide of the said pair with an enclosed bag in an opposite direction into a position above the other inlet to the inclined chute.

8. A structure as defined in claim 7, and further including gear means cooperating with the said second tubular guide for simultaneously upending and releasing its respective enclosed bag upon the inlet to the chute with the solid material therein occurring in a rearmost position.

9. In a machine for making bags of the sealed edge sugar bag type, including means for producing a continuous length of vertically extending connected bag sections carrying solid material therein and presenting a forward folded edge and top, rear and bottom edges which are sealed, and shearing means for periodically separating the lowermost bag section, the combination of a bag dispens-

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ing apparatus, with a conveyor member for placing a container in position to receive separated bags delivered from the dispensing apparatus, a pair of alternating tubular guides supported on arms which extend at right angles to one another, said tubular guides being constructed and arranged to receive and support successive separated bags in an upright position in which solid material contained in the respective bags occurs at the bottom portion thereof, an inclined guideway having diverging inlets located below the alternating guides, means for rotating one of the guides with an enclosed bag about a vertical axis into a position to release the said enclosed bag upon the inclined guideway with the solid material in the bag occurring in a foremost position and with the rear sealed edge of the bag extending from front to rear of the bag in its flatwise position and along one side thereof, means for rotating the second guide of the said pair with an enclosed bag in an opposite direction, and means cooperating with the said second guide for simultaneously upending and releasing its respective enclosed bag upon the chute with the solid material therein occurring in a rearmost position and with the said vertical sealed edge of the bag extending from front to rear of the bag in its flatwise position and in alternately disposed relation to the corresponding vertical edge of an immediately preceding bag.

10. In a packaging mechanism, a conveyor adapted to support a container in position to receive materials therein, in combination with a reversing step feed motion for controlling the position of the container on the conveyor, said step feed motion comprising a pair of parallel bars pivotally secured at one side of the conveyor, a pair of cam followers secured to the parallel bars, a cam member rotatably mounted between the parallel bars for engagement with the cam followers on two opposite sides thereof, a spring secured between the ends of the bars to resiliently hold the cam followers against the cam, a stop fixed to one of the parallel bars and extending into the path of movement of the container, said cam mechanism cooperating with the stop periodically to move the

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container into different positions on the conveyor, the engaging surface of said cam consisting of two opposite and similar dwell sections, and the cam followers being arranged to engage against the opposite sections at points so chosen that the rise of the cam follower on one side is resiliently opposed by the fall of the cam follower on the other side.

11. An apparatus of the class described, including a dispensing hopper, a conveyor member for locating a container in position to receive packets delivered from the dispensing hopper, a second conveyor member arranged to deliver empty containers from itself to the said first conveyor, stop means interposed in the path of movement of the containers, said stop means including a forward retractable stop, an intermediate stop for limiting movement of a box on the said first conveyor, and additional stop means for holding boxes on the said second conveyor, a counter mechanism for controlling release of a filled container, said counter mechanism including solenoid means operatively connected to the said several stop members, and means for periodically operating the solenoid means.

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