July 24, 1951 J. A. STAKE 2,561,541

ARTICLE TRANSFER MECHANISM

Filed March 19, 1946 3 Sheets-Sheet 1

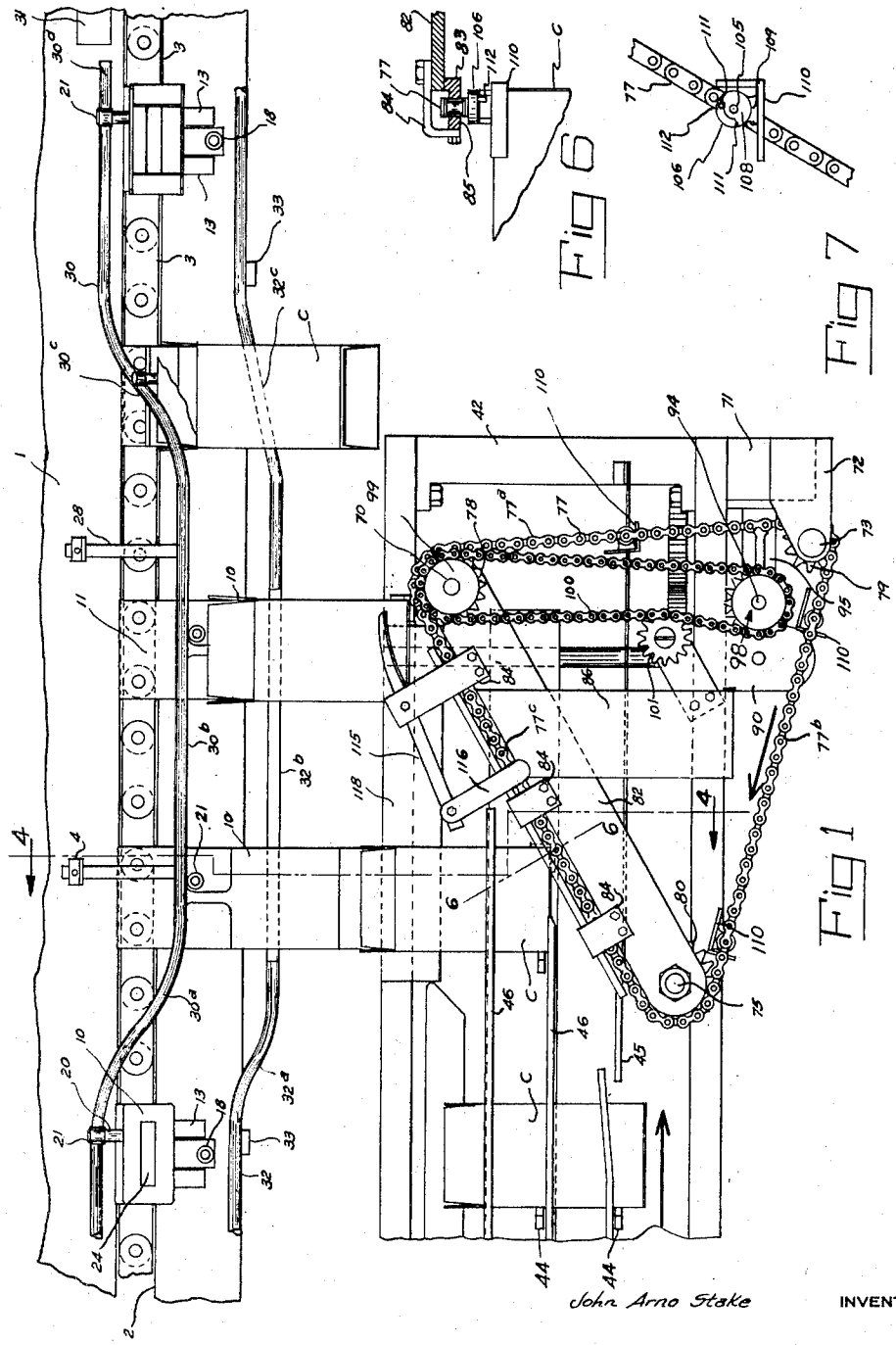


Fig 1

Fig 6

Fig 7

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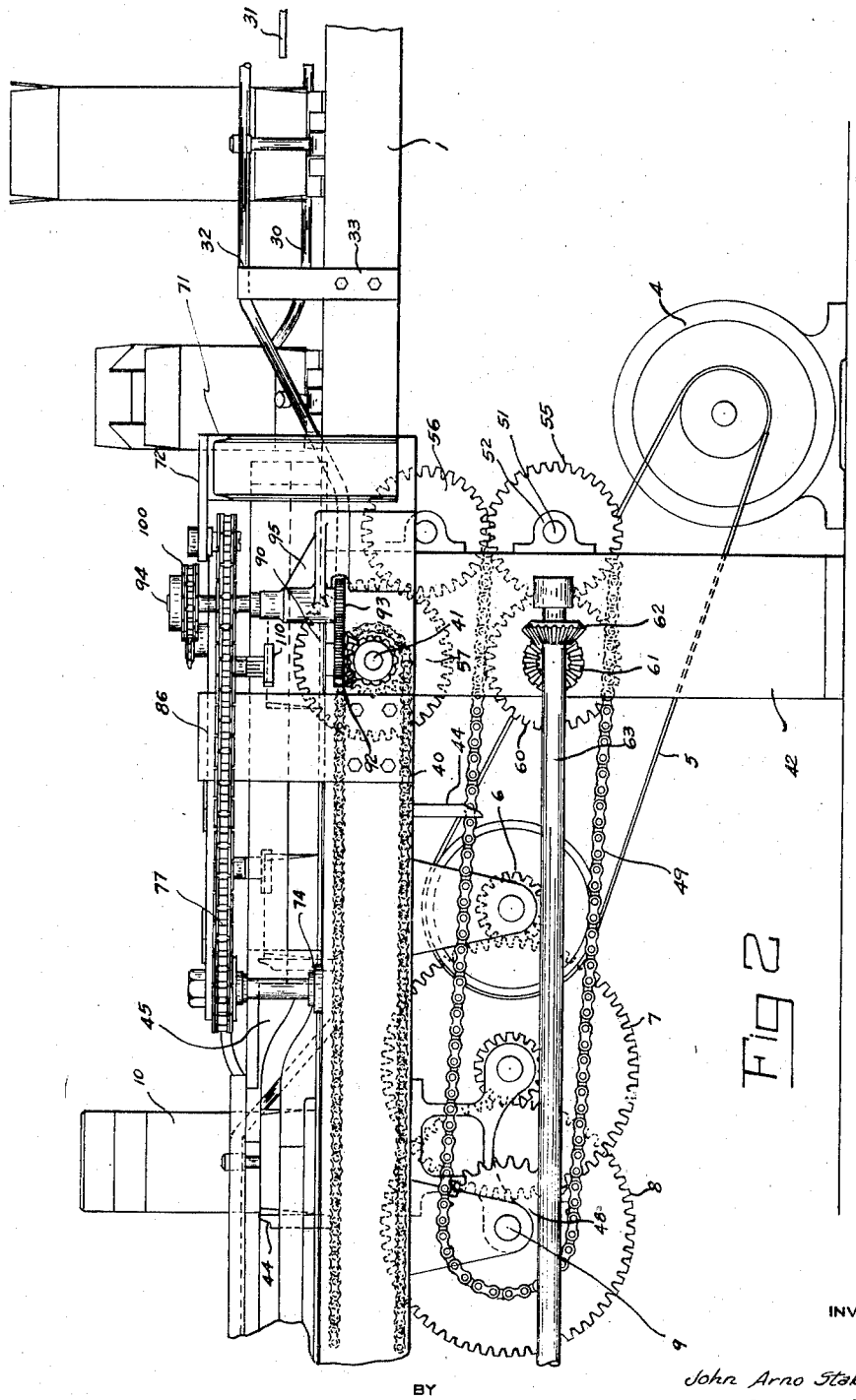


Fig 2

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ARTICLE TRANSFER MECHANISM

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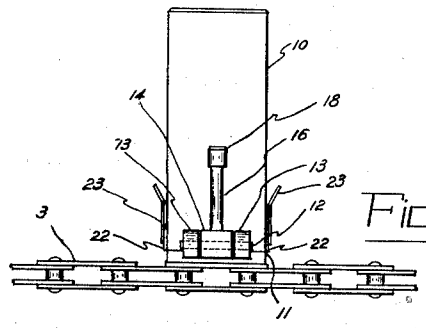


Fig 5

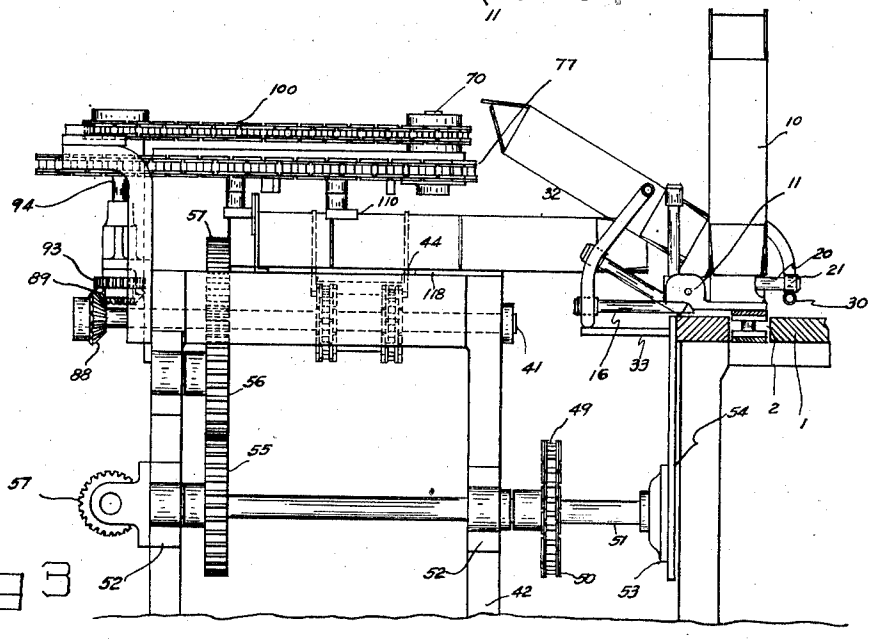


Fig 3

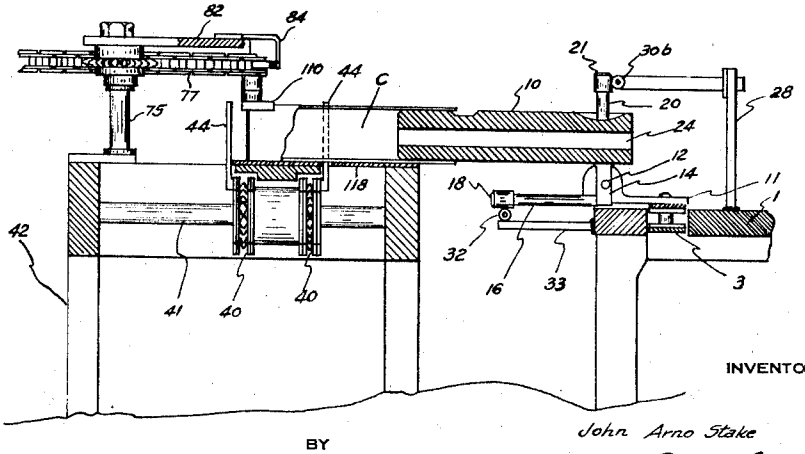


Fig 4

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UNITED STATES PATENT OFFICE

2,561,541

ARTICLE TRANSFER MECHANISM

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2 Claims. (Cl. 198—23)

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The present invention relates to machines for shaping and forming cartons from folded blanks. Cartons which are formed on the machine shown herein are intended for packaging all types of merchandise. These cartons are received from the carton manufacturer as flat, folded blanks with the flaps at each end of the carton in extended position. The carton blank is squared-up and the flaps at one end folded in position and sealed.

For the operations just described it has been the practice to employ an endless conveyor known as a carton forming conveyor to which forming blocks which fit the inside of the cartons are attached in upright vertical position. Operators are located at the side of the conveyor and their duties are to square up the individual blanks and place them over the forming blocks as they move past the operators. The open and squared carton blanks are fitted by the operators over the blocks in a position where the folding lines at the bases of the flaps coincide with the upper edge of the block. The continued movement of the conveyor carries the blocks in succession through sealing and folding devices which apply adhesive to the extending flaps and then fold the flaps over and onto the top of the blocks and press the flaps into sealed position. The blocks are provided with axial passages and at a further point in their travel these passages register with an air jet which blows the cartons off the blocks and into a discharge chute.

The above description of the general and customary practise is necessary in order to explain the present invention for, so far as the sealing and ejection of the finished carton is concerned, the present machine utilizes the old mechanisms.

The object of the present invention is to dispense with all of the manual labor in squaring up the carton blanks and placing them over the blocks on the conveyor. The invention shown herein, modifies the old carton forming and sealing conveyor so that it may be combined and coordinated with a second conveyor which delivers squared-up cartons and from which the cartons are transferred to the blocks.

It is also old in the art to have conveyors associated with mechanisms which square-up the carton blanks, and the invention employs such a conveyor as one of the elements of the complete machine. So far as known, no one has ever combined a conveyor for squared-up carton blanks with a second conveyor for folding and sealing the ends of the squared carton. By this combination, the operation of squaring up the blanks, and closing and sealing the flaps on one end may be carried on without the interposition of any manual labor.

It will be understood that so far as the mechanism for folding and sealing the projecting flaps over the top of the blocks, the machine is old and well known in the art. Also, so far as the operation of squaring up a carton is concerned, again the mechanism is old and well known in the art. In the drawings and specification these two devices are not fully shown as they form no part of the present invention and only such parts of both of these old devices are shown which will enable the invention to be understood.

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The present invention consists in arranging a conveyor for the squared-up cartons in close operative relation to a second conveyor which carries the forming blocks. The two conveyors are run in synchronism so that each opened carton on the first conveyor comes into exact alignment with a forming block on the second conveyor and the carton and the block move in parallel paths and at the same speed for a distance sufficient to enable the carton to be transferred on to the block. For this purpose the several blocks are not rigidly supported on the block conveyor as in the old practice, but are hinged thereto, and alongside the block conveyor are arranged devices which tilt the block from its vertical position to a horizontal position which it maintains during the period when it is receiving the open carton. After the carton is moved on to the block to the desired point, the block is raised to its vertical position which it maintains through the folding and sealing operations. When the carton is ejected the block is again tilted downwardly to receive a new carton.

In order to complete the automatic operation it is necessary to incorporate in the mechanism a device for shunting the horizontal squared-up carton from its position on the carton conveyor to telescoping relation with its block while the latter is in horizontal position. It is conceivable that several different devices might be employed to effect the transfer in exact timed relation as is required. One type of mechanism is shown and described herein which engages the outer forward corner of the carton and moves in a diagonal path across the carton conveyor and toward the block conveyor, keeping pace with the forward movement of the conveyors.

The foregoing is designed to give a brief résumé of the invention. The detailed description of the preferred mechanism which will follow is not intended to limit the invention to that particular mechanism but merely to illustrate an operative device which embodies the invention. Therefore, changes, modifications and improvements may be made in actual practice which fall within the scope of the appended claims.

The advantages of the present invention lie mainly in the elimination of the labor costs involved in the operation of squaring the folded blanks and placing them over the forming blocks.

In addition it is possible to operate the forming conveyor at a greater speed than was practicable with the manual placement of the cartons.

In the drawings in which the best known and preferred form of the invention is shown:

Fig. 1 is a plan view of the mechanism. This view, for the reasons stated shows only that portion of the block conveyor which is necessary for an understanding of the invention. It also shows only that portion of a standard carton forming conveyor which is necessary for the present purposes;

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

Fig. 3 is an end view looking from the right of Fig. 1;

Fig. 4 is a vertical section taken at the point where a carton is just passing on to its forming block. The location of this view is shown by the section line 4—4 Fig. 1;

Fig. 5 is a front elevation of the block;

Fig. 6 is a section on the line 6—6 of Fig. 1 showing one of the carton moving shoes; and

Fig. 7 is a view looking at the under side of the shoe.

Numeral 1 indicates the bed of the block conveying machine which is provided with the channel 2 in which the chain block conveyor 3 moves in an endless horizontal path. The motive power for operating the entire mechanism is derived from a motor 4 which through the belt 5 actuates the train of reducing gearing 6, 7 and 8 shown in Fig. 2. The gear 8 is mounted on the shaft 9 which is the main power shaft for the entire machine. From this shaft appropriate connections (not shown) drive the conveyor 3. The motive power for the carton conveyor is also derived directly from the shaft so that both conveyors are run continuously and in synchronism.

The carton forming blocks are indicated at 10. A large number of these blocks are attached at closely and regularly spaced intervals to the chain 3. During the entire cycle of operation except at the region illustrated in the drawings these blocks are erect so that the open flaps on the upper end of the carton may be folded and sealed in place. Instead of being mounted directly on the conveyor chain as in the former practice, each block 10 is carried on a bracket 11 which is secured to the chain. The bracket projects laterally of the chain and its outer end is provided with two lugs 13 through which is passed the pivot pin 12. An arm 14 is attached to the front face of the block near its lower end and extends between the lugs 13 where it receives the pivot 12. On the outer end of the arm 14 is located the vertical pin 16 on the upper end of which is mounted the roller 18. At the rear of the blocks opposite the arm 14 is a short horizontal pin 20 on the outer end of which is the roller 21. At the base of the blocks are located two ribs 22 to which are attached wings 23. These devices, which are shown in Fig. 5, receive the side flaps of the carton and act as stops for the carton. They are omitted from the other views for the sake of clearness. The center of the block is provided with a through passage 24 which registers with the air jet when the block reaches the ejection point for the completed carton.

Carried on the bed 1 by appropriately located brackets 28 is a rear guide rail 30. The roller 21 rides over the surface of this rail. The block to the left of Fig. 1 has just been stripped of its finished carton and at this point the rail 30 is deflected upwardly and forwardly so that the block is tilted forwardly about the pivot 12 until its center of gravity passes over the pivot. The deflected area of the rail which causes the block to move about its pivot is indicated by the numeral 30^a. At the central portion is a relatively long horizontal reach 30^b which acts to hold the block in its horizontal position as shown in Fig. 4 while the carton C is being telescoped on to the block. After the carton has been fully seated the rail 30 has a downwardly and rearwardly inclined portion 30^c which permits the block to reassume its vertical position. The rail terminates in a horizontal reach 30^d. If found advisable, an overhanging plate 31 may be located at the terminus of the rail 30 under which the roller 21 will run. This may be extended throughout the balance of the travel of the conveyor 3, to insure against any forward tipping of the block while the succeeding operations are performed thereon.

Attached to the front edge of the bed 1 by appropriately located brackets 33 is a second guide rail 32 which serves as a track for the roller 18 and thus acts as a support for the block when it is out of vertical and to elevate the block at the end of the operation. For this purpose the rail 32 has a downwardly and forwardly inclined reach 32^a. As the block is tilted forwardly the roller 18 strikes the reach 32^a which lowers the block to its horizontal position in which it is maintained by the horizontal reach 32^b. After the block is supplied with the carton the rail is provided with an upwardly and rearwardly inclined reach 32^c parallel to the reach 30^a which moves the block to an angle at which the center of gravity again passes over the pivot and the block rights itself. It will be noted that during the period when the block is horizontal it is rigidly held in that position by the two rails 30 and 32. The rails 30 and 32 constitute cam means operative during a portion of the cycle of the conveyor to tilt the blocks into and hold them in horizontal position.

The conveyor for the open and squared-up cartons C comprises a pair of chains 40 which are mounted upon horizontal shafts, one of which is shown at 41, in a framework indicated as a whole by the numeral 42. These chains carry spaced pairs of fingers 44 which act as pushers for the squared-up cartons. Beyond the left hand end of Fig. 2 is located any standard type of magazine for the flat cartons with which is associated any well known type of carton opening and feeding device. As these instrumentalities are known in the art and form no part of the present invention they are not illustrated. For the purposes of the present invention and the description thereof, all that is required is that the cartons are in squared-up condition on the conveyor 40 with the flaps which project toward the conveyor 3 in open condition. The flaps on the other end of the carton are preferably closed during their progression along the conveyor 40. Devices for this purpose are also known and are indicated by the cam rails 45. Rails 46 are located above the chains 40 to keep the cartons in position on the conveyor.

The several pairs of fingers 44 are spaced upon the conveyor chains 40 at distances equal to the spacing between the centers of the blocks 10 and are located so that as the conveyors 3 and 40 move in the direction of the arrows in Fig. 1 the open ends of the cartons will come into exact registry with the blocks 10 so that as the cartons are shunted from the conveyor 40 they will telescope over the blocks.

The means adopted for driving the conveyors 3

and 40 in the precise synchronism required is shown in Fig. 2. A sprocket 48 is mounted on the main power shaft 9 and over this sprocket is the chain 49 which engages a second sprocket 50 on the shaft 51. The shaft 51 is mounted in bearings 52 on the frame 42 and in a supplemental bearing 53 secured on the lower end of a hanger 54 depending from the bed 1.

On the shaft 51 is located the gear 55 which through an intermediate gear 56 drives the gear 57 on the shaft 41. These power connections serve the purpose of synchronous propulsion of the two main conveyors, but the arrangement is optional and may be designed in any practicable fashion.

As it is also essential that the carton squaring and feeding devices be driven in like synchronism, direct driving connections are provided for these instrumentalities from the conveyor 3. For this purpose the gear 55 meshes with a gear 60 on a countershaft in the frame 42 and this shaft drives the pair of meshing bevel gears 61 and 62, the latter being mounted on the horizontal shaft 63 which extends to the left of Fig. 2 and drives the carton feeding and squaring devices referred to.

A means for shifting the open cartons from the conveyor 40 to the blocks 10 while the latter are in horizontal position and in registry with the cartons will now be described. The action must take place progressively as the two main conveyors are moving in parallelism. The mechanism described is one form of device which may be adapted to this operation, but it will be understood that the present invention is not directed to the details thereof which are set forth, as any form of shunting mechanism may be employed, provided it moves the cartons laterally from the carton conveyor into telescoping relation with the blocks which are presented in horizontal position.

The carton shunting or shifting means comprises a third belt or chain which is located over the carton conveyor and moves in a diagonal path across the carton conveyor and toward the block conveyor. The belt or chain is provided with means to contact the outer forward edge or corner of the carton and by the joint progression of the carton conveyor and the shunting conveyor, the carton leaves the carton conveyor and moves onto the block which is in position to receive it.

Referring to the details of the particular shunting mechanism which is illustrated as exemplary of devices for this purpose:

Located in a plate 82 (to be described) adjacent the point where the carton is discharged is the vertical shaft 70. On the corner of the frame is a vertical bracket 71 to the upper end of which is attached the plate 72 in which is located the stub shaft 73. Midway of the front edge of the frame is a pedestal 74 in which is located a third vertical shaft 75. The shafts 70, 73 and 75 constitute the three corners of a triangular shunting device.

In the form shown this is an endless sprocket chain 77 which is trained over the sprockets 78, 79 and 80 on the several shafts respectively. The reaches 77^a and 77^b are idle reaches but the reach 77^c of the chain which extends diagonally over the carton conveyor performs the shifting of the cartons.

The plate 82 referred to above forms the bearing for the shafts 70 and 75 and extends in a diagonal line along the reach 77^c. To the outer edge of this plate is attached the angular guide rail 83. Along the top of the plate 82 are fixed at spaced intervals the brackets 84, 84 and 84' the outer ends of which are bent downwardly and support a second guide rail 85. The rails 83 and 85 constitute a channel for confining the chain 77 along its working reach. The plate 82 is secured at its outer end by an angular bridge piece 86 attached to the frame 42 by its vertical web.

The chain 77 is driven in the direction of the arrow in Fig. 1 in synchronism with the conveyors 3 and 40 by means of a bevel pinion 88 on the end of the shaft 41 and meshing with the bevel pinion 89 on a stub shaft located on the underside of a bracket 90 secured to the front edge of the frame 42. Fixed on the pinion 89 is a spur gear 92 which meshes with a second spur gear 93 on the lower end of a vertical shaft 94 mounted in a bracket 95 attached to the front edge of the frame 42. The upper end of shaft 94 carries a sprocket 98 and the shaft 70 carries a companion sprocket 99. Over these sprockets is trained the drive chain 100 through which the shunting chain 77 is driven. A chain tightening sprocket 101 is carried by the bridge 86.

At intervals along the chain 77 are the pushers or shoes which engage the forward outer corners of the cartons C and shunt them from the conveyor 40 to the blocks. These shoes are located on the chain at the requisite intervals so that as each shoe enters the guide channel 83, 85 it will meet and fit against the corner of the carton. Five of these shoes are shown attached to the chain 77. The construction of the shoe and its supporting means is shown in Figs. 6 and 7.

Certain of the pintles of the chain 77 are replaced by elongated rotatable pins 105 which extend through blocks 106 fixed to the under side of the chain. To the lower end of each pin 105 is attached a bracket 108 having a laterally extending arm 109 from which depends the shoe or pusher 110. This shoe is in the form of the letter L and the corner of the box nests within the angle formed thereby in the manner indicated in Fig. 6.

In order to insure that the shoe will fit the corner of the carton it is permitted to have a partial freedom of pivotal movement and this is provided for by cutting away one side of the bracket 108 forming the two shoulders 111. A pin 112 depending from the block 106 is located between the shoulders and constitutes a stop for limiting the oscillation of the shoe about its center. This allows the shoe to adjust itself to the carton corner.

To keep the carton in contact with the shoe during its sliding movement across the conveyor 40 a guiding plate 115 is attached to the extended end of the bracket 84' and to a supplementary bracket 116 secured to the top of the plate 82 and is arranged to wipe over the upper side of the carton. A shelf 118 is attached to the rear edge of the frame 42 and guides the front end of the carton during its transfer.

Operation

As the blocks successively pass the point where the finished cartons are blown off the blocks, the rails 30 acting through the rollers 21 tilt the blocks forwardly and they are lowered into horizontal position by the rails 32. While moving in the horizontal position the blocks register with the open cartons which are being moved by the conveyor 40 continuously and in the same direction. At this point each carton is engaged at the corner thereof by a shoe 110 which shunts it later-

ally off the conveyor **40** and into telescoping relation over the adjacent block. After the blocks are successively supplied with cartons they reach the rising portion of the rail **32** which restores them to erect position in which they are carried through the remainder of their cycle by the continuous progression of the conveyor **3**. This, as was stated, consists in the performance of the operations of gluing the flaps and pressing them together against the top ends of the blocks.

It will be seen that the placing of the open cartons on the carton forming conveyor **3** is wholly automatic and while the mechanism shown is the preferred type the objects of the invention may likewise be achieved with modifications which do not avoid the elemental features of the invention as set forth in the claims.

What is claimed is:

1. In a carton forming machine a continuously moving endless conveyor, a plurality of carton forming blocks on said conveyor, a second conveyor adjacent and parallel to the first conveyor said second conveyor having a plurality of holders for squared-up cartons, means for driving said conveyors in synchronism, and a belt moving across the second conveyor in a diagonal path approaching the first conveyor, means on the belt to engage a corner of each carton successively and slide the carton from the conveyor on to a block, and a device to hold each block in axial alignment with a carton while the last named means is operating.

2. In a carton forming machine, a continuously moving endless conveyor, a plurality of carton

forming blocks hingedly mounted on said conveyor at regular spaced intervals, means for tilting said blocks successively into horizontal position during one part of their cycle, a second continuously moving conveyor adjacent the first conveyor at the point where the blocks are in horizontal position, means on the second conveyor for holding squared-up cartons in register with the blocks, and a device extending diagonally across the second conveyor and having means to engage a corner of each carton to shunt the carton from the second conveyor into telescoping relation over a block.

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