Nov. 8, 1960 R. NICKLASSON ET AL 2,958,938

PALLET FORMING MACHINE

Filed March 3, 1958 5 Sheets-Sheet 1

FIG_1

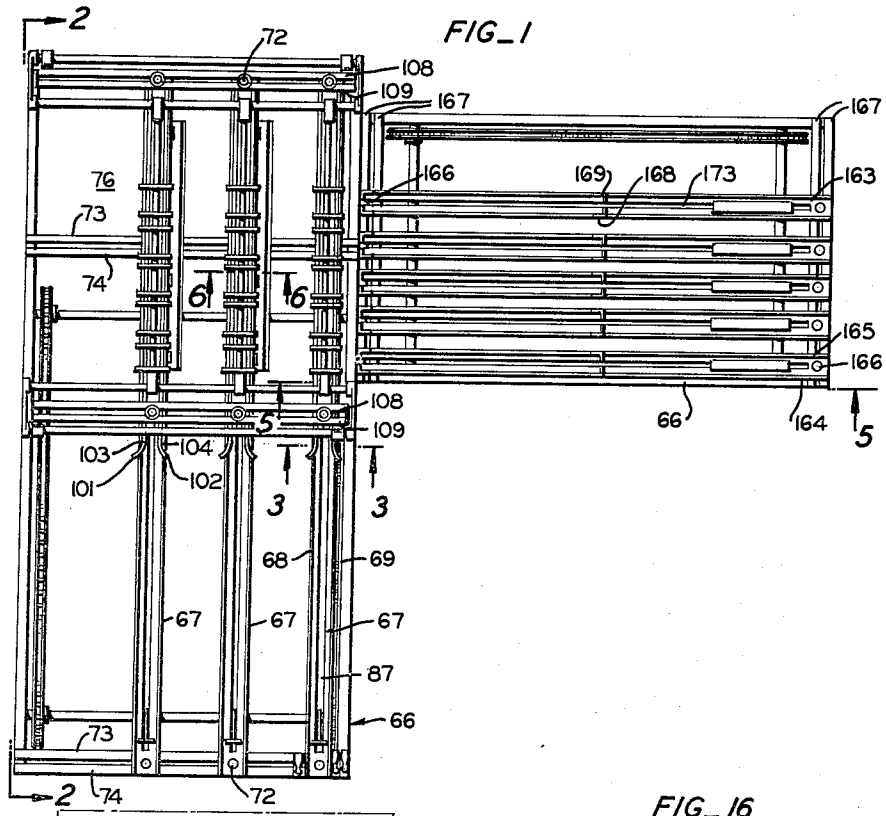
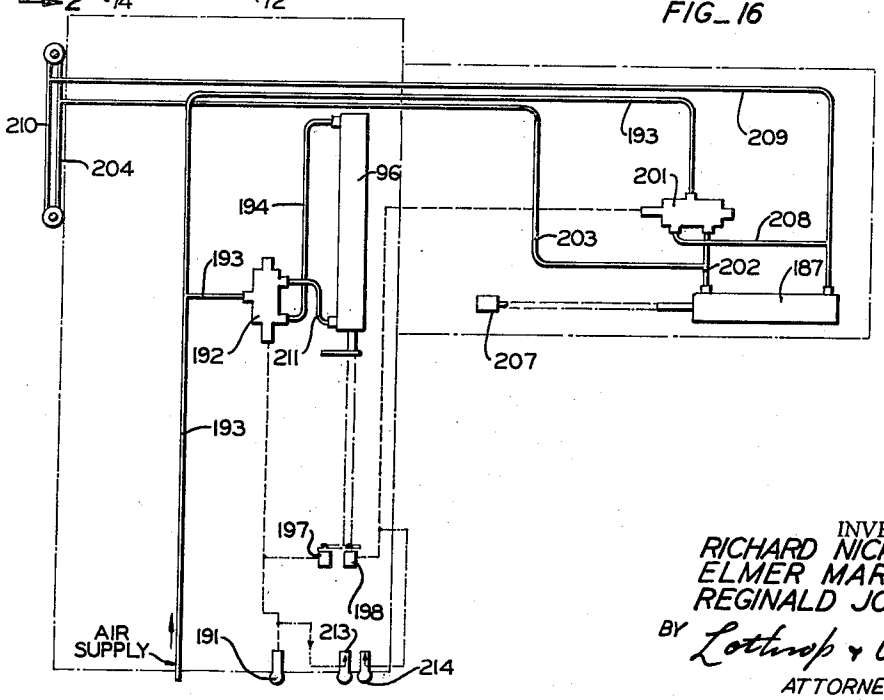


FIG_16



INVENTORS
RICHARD NICKLASSON
ELMER MARKS
REGINALD JOHNSON
BY Lothrop & West
ATTORNEYS

Nov. 8, 1960 R. NICKLASSON ET AL 2,958,938

PALLET FORMING MACHINE

Filed March 3, 1958 5 Sheets-Sheet 2

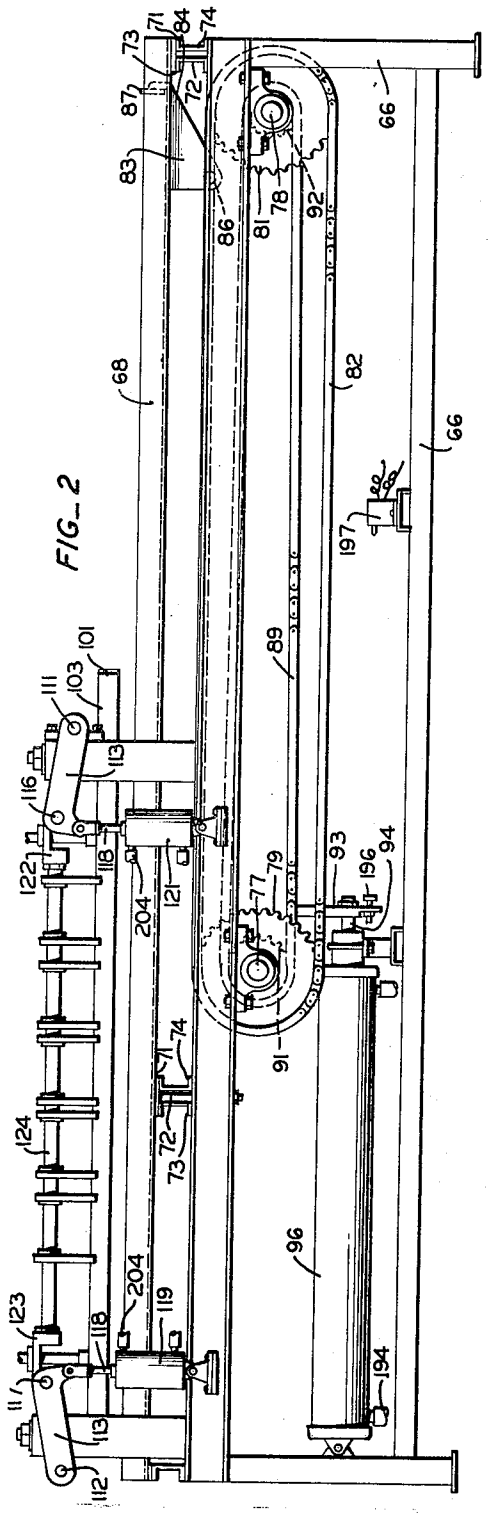


FIG_2

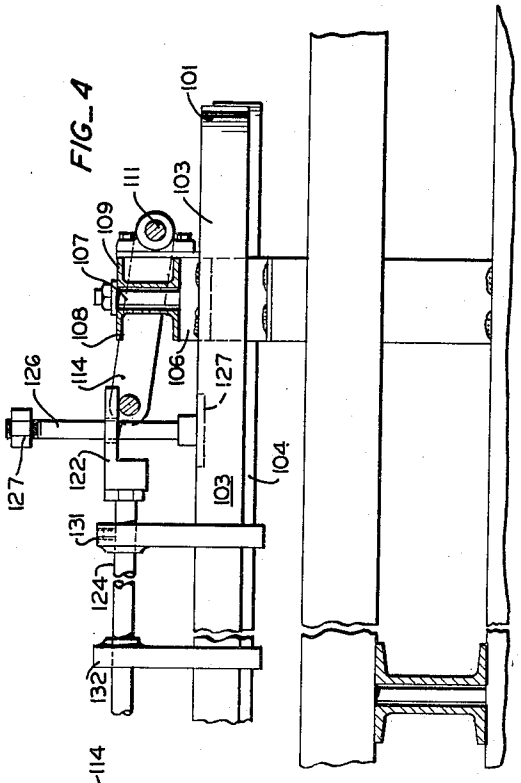


FIG_4

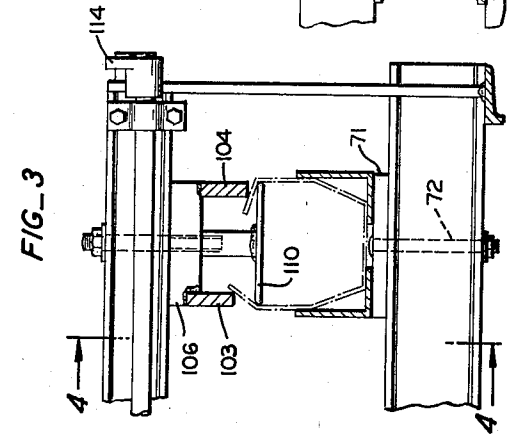


FIG_3

INVENTORS
RICHARD NICKLASSON
ELMER MARKS
REGINALD JOHNSON
BY Lothrop & West
ATTORNEYS

Nov. 8, 1960 R. NICKLASSON ET AL 2,958,938

PALLET FORMING MACHINE

Filed March 3, 1958 5 Sheets-Sheet 3

FIG_5

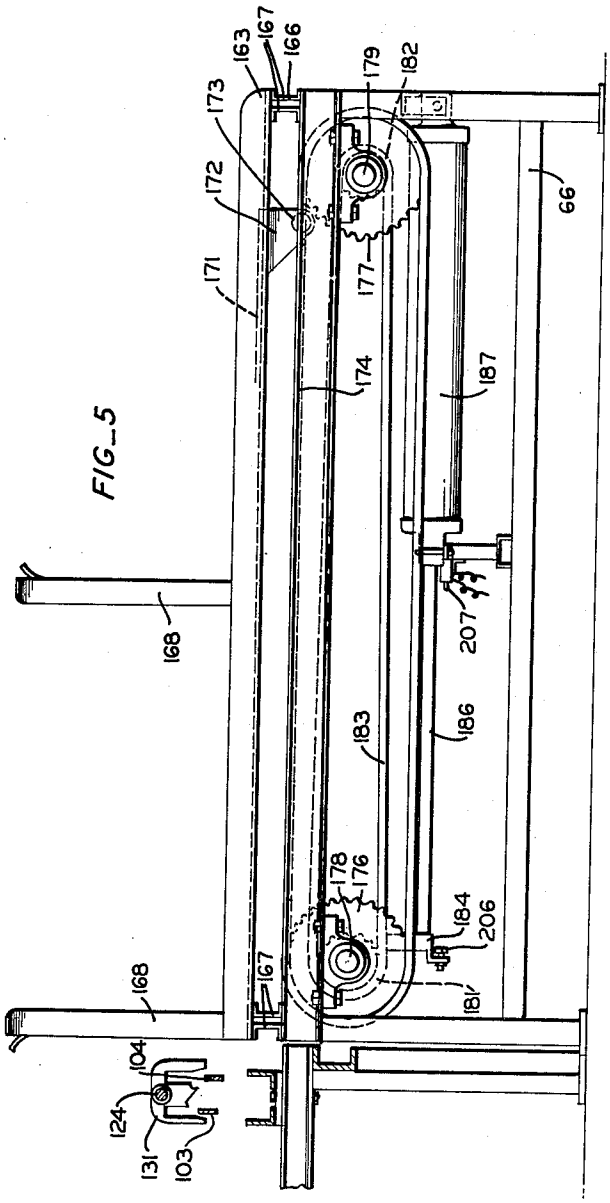


FIG_7

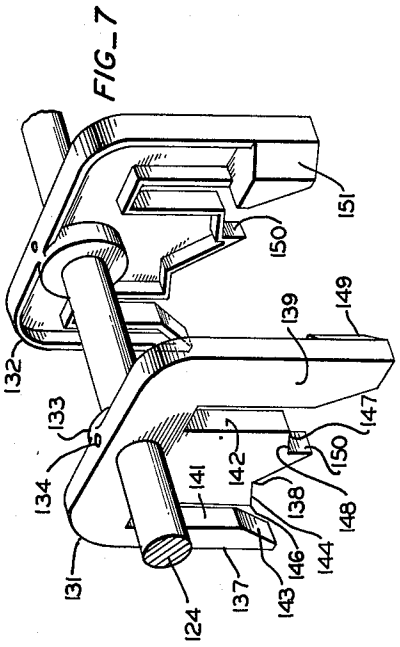
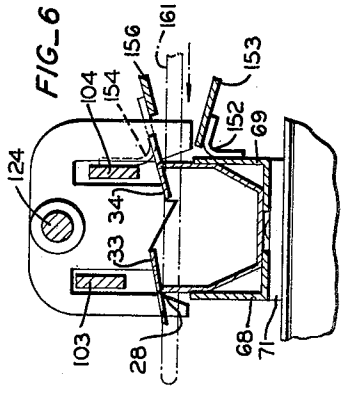


FIG_6



INVENTORS
RICHARD NICKLASSON
ELMER MARKS
REGINALD JOHNSON
BY Lothrop & West
ATTORNEYS

Nov. 8, 1960 R. NICKLASSON ET AL 2,958,938

PALLET FORMING MACHINE

Filed March 3, 1958

5 Sheets-Sheet 4

FIG_8

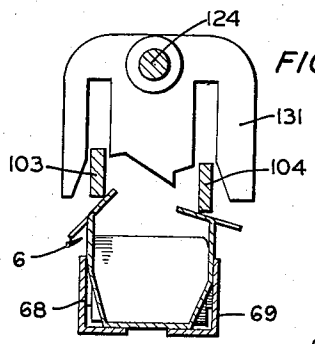


FIG_11

FIG_9

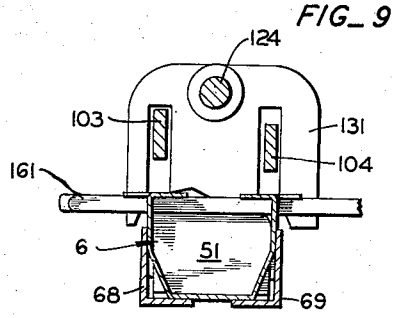
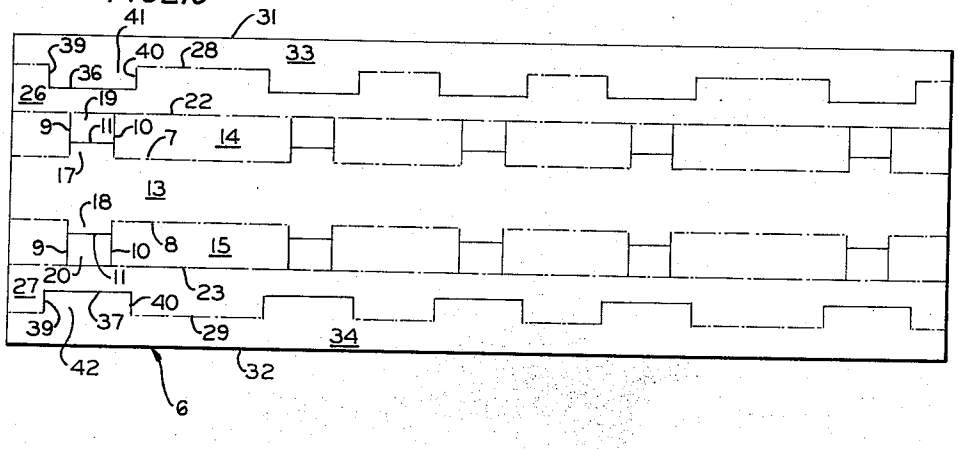


FIG_10



INVENTORS
RICHARD NICKLASSON
ELMER MARKS
REGINALD JOHNSON
BY Lothrop & West
ATTORNEYS

Nov. 8, 1960 R. NICKLASSON ET AL 2,958,938

PALLET FORMING MACHINE

Filed March 3, 1958 5 Sheets-Sheet 5

FIG_14

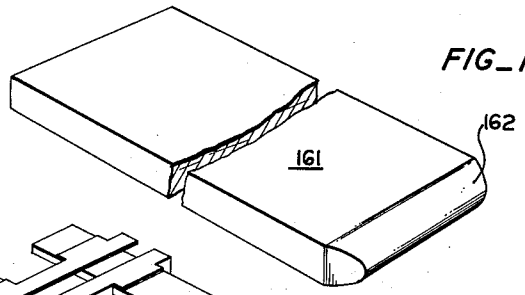


FIG_12

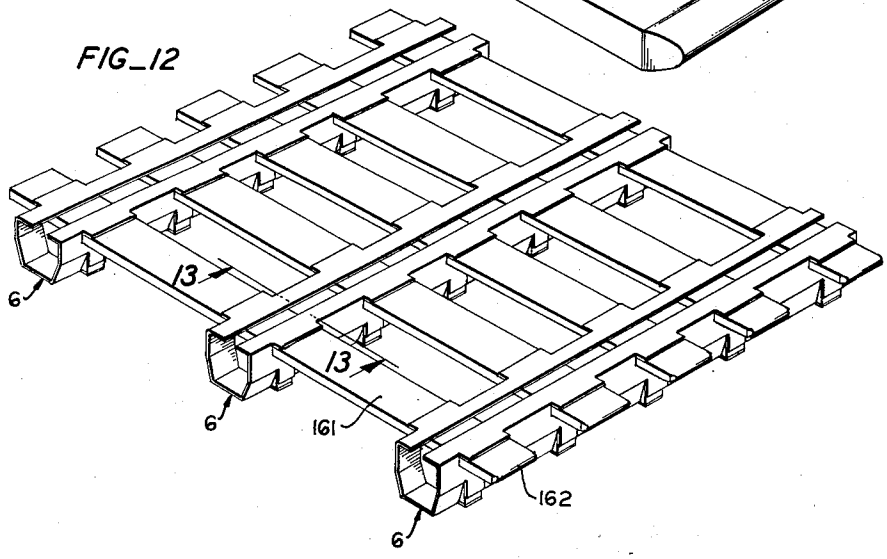


FIG_13

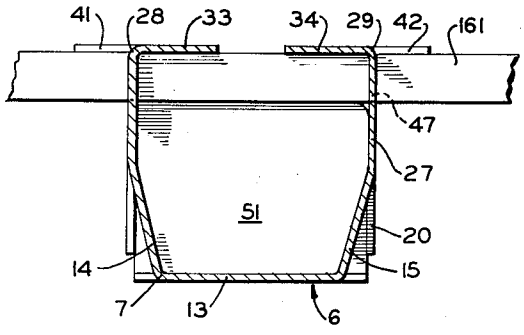
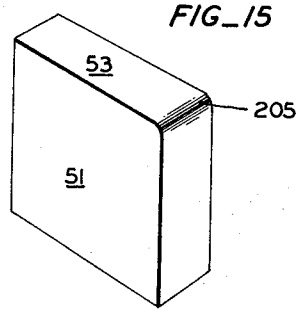


FIG_15



INVENTORS
RICHARD NICKLASSON
ELMER MARKS
REGINALD JOHNSON

BY Lothrop & West
ATTORNEYS

United States Patent Office

2,958,938

Patented Nov. 8, 1960

2,958,938

PALLET FORMING MACHINE

Richard Nicklasson, 183 Dondero Way, Fremont, Calif.; Elmer Marks, 11 Hennings Court, Hayward, Calif.; and Reginald Johnson, 757 Orangewood Drive, Niles, Calif.

Filed Mar. 3, 1958, Ser. No. 718,747

10 Claims. (Cl. 29—208)

Our invention relates to machines for use in the assembly of relatively light-weight, composite platforms or pallets.

These devices include a number of underlying beams arranged in parallel relationship and individually comprised of folded, hollow boxes usually fabricated of corrugated paper-board. The folded box beams have a number of flaps and openings so as to receive a plurality of parallel, transverse, wooden slats that are disposed through the openings in the beams and rest immediately under the flaps. Separate wooden blocks are disposed underneath each of the wooden slats where they pass through the individual paper-board beams. The resulting structure is in effect a platform in grid shape made up of paper-board beams and wooden slats and wooden blocks. It is very light in weight relative to its strength, can be reused and reconstituted a number of times, sometimes with the replacement of some of the individual portions, and remains assembled without the use of fastenings such as nails or bolts. While such a pallet can be assembled by hand, it is an object of the invention to provide the machine for doing so.

Another object of the machine is to provide a machine which will accurately and quickly assemble a pallet of the mentioned kind.

Another object of the invention is to provide a pallet forming machine which is semi-automatic in operation and carries out the assembly or forming steps in an expeditious fashion and without injury or damage to the materials making up the pallet.

Another object of the invention is to provide a pallet forming machine effective to operate on the constituent materials even though they vary from time to time in shape and size.

A still further object of the invention is to provide a pallet forming machine which is adaptable for use in making up pallets of the mentioned type, but having different numbers or spacing of beams and slats.

A still further object of the invention is to provide a pallet forming machine in which the sequence of operations is automatically timed.

A still further object of the invention is to provide a pallet forming machine that can readily be fabricated, operated and maintained.

Another object of the invention is to provide a relatively inexpensive pallet forming machine so that it is economical to assemble even a relatively small number of pallets of the indicated type.

Other objects, together with the foregoing, are attained in the embodiment of the invention described in the accompanying description and illustrated in the accompanying drawings in which:

Figure 1 is a plan of a pallet forming machine constructed pursuant to the invention;

Figure 2 is a side elevation, to an enlarged scale, of the machine of Figure 1;

Figure 3 is a detail in vertical, transverse cross-section through a portion of the machine shown in Figure 1, the plane of section being indicated by the line 3—3 in that figure;

Figure 4 is a cross-section in the plane of which is indicated by the line 4—4 of Figure 3;

Figure 5 is a side elevation of a portion of the machine the view being taken along the line 5—5 of Figure 1;

Figure 6 is a detail cross-section on a transverse vertical plane indicated by the line 6—6 of Figure 1;

Figure 7 is an isometric view of a typical template structure;

Figure 8 is a cross-section similar to Figure 6, showing the parts in a different position;

Figure 9 is a view similar to Figures 6 and 8, showing the parts in a still different position;

Figure 10 is a plan of a paper-board beam form in unfolded or developed position;

Figure 11 is an isometric view of a beam form in partially completed condition; the beam form being almost, but not quite entirely folded and supporting blocks being in position;

Figure 12 is an isometric view of a completed pallet constructed by the pallet forming machine of the invention, showing all of the various parts in their finally assembled condition;

Figure 13 is a cross-section to an enlarged scale, the plane of section being indicated by the line 13—13 of Figure 12;

Figure 14 is a fragmentary end view of one of the slats showing the rounded end;

Figure 15 is an isometric view of one of the supporting blocks; and

Figure 16 is a view of the control mechanisms.

While the pallet forming machine of the invention can be adapted to numerous, variant uses and is effective to assemble a number of different products, it is especially designed in the form shown herein for the assemblage of a special pallet. This is itself illustrated in Figures 10 to 15 as comprised of a number of beam forms 6. As shown in Figure 10, each of the beam forms is initially a rectangular, planar blank of corrugated paper-board or fiberboard, provided with certain score and fold lines. The blank is symmetrical about its longitudinal and transverse axes. In the present instance, it is designed to receive a plurality (i.e. five) of cross slats. The blank consequently is made to include five pattern zones each just like the others.

In each of the pattern zones there are provided left and right fold lines 7 and 8 at appropriate intervals interrupted by pairs of parallel, transverse cut lines 9 and 10 there being one pair on the left (upper) side of the pattern zone and another pair on the right (lower) hand side of the pattern zone. The cut lines 9 and 10 on each side of the blank are joined by a longitudinal cut line 11 so that there is defined a bottom panel 13, a pair of angle panels 14 and 15 and also bottom block tabs 17 and 18 and side block tabs 19 and 20. The cut lines 9 and 10 terminate approximately on intermediate fold lines 22 and 23 which extend for the length of the blank and define the upper boundary of the angle panels 14 and 15 and also constitute one boundary of side panels 26 and 27.

The other boundary of the side panels is afforded by top fold lines 28 and 29. These are parallel to the remaining fold lines and with the side edges 31 and 32 of the blank establish the main boundaries of top flaps 33 and 34. The boundary between the side panels 26 and 27 and the top flaps 33 and 34 is partly defined by inset cut lines 36 and 37 parallel to and symmetrical with the cut lines 11 in a longitudinal direction. The cut lines 36 terminate in end cut lines 39 and 40 spaced apart approximately the width of an individual slat and of a

height approximately the thickness of the slat to be accommodated.

In the use of the beam form, the blank is folded along the various fold lines by any suitable means, not forming part of the present invention, until it is of a shape substantially shown in Figure 11. The bottom panel 13 remains in its original position, but folds are accomplished along the lines 7 and 8 so that the angle panels 14 and 15 are upstanding, but not at right angles to the panel 13. With these folds accomplished, the tabs 17 and 18 are left co-planar with their original panels and so project beyond the adjacent panels.

Further folds are made along the fold lines 22 and 23 until the side panels 26 and 27 are parallel to each other and are perpendicular to the plane of the bottom panel 13. These folds leave the tabs 19 and 20 outstanding beyond the angle panels 14 and 15 and disposed perpendicularly to the tabs 17 and 18.

Additional folds are made along the fold lines 28 and 29 so that the top flaps 33 and 34 are directed inwardly but are not bent entirely into a co-planar condition. Rather, the top flaps 33 and 34 are left upstanding to a moderate degree. This last folding causes the tabs 41 and 42 to diverge beyond the side panels 26 and 27 somewhat, thus affording or defining apertures 46 and 47 immediately therebelow in the walls 26 and 27. The apertures 46 and 47 are in transverse alignment or registration and are in cross-section, in the plane of the side walls, substantially the same as the similar cross-section of the slats to be utilized.

The beam forms are further prepared for use by the introduction into each one of them, by any suitable means forming no part of the present invention, a suitable number of support blocks 51. As shown in Figure 15, each of the support blocks is preferably a substantially rectangular wooden block of a suitable width and of a volume and dimension so that it will fit snugly. Each block is introduced between the side walls 26 and 27 and rests partially against such side walls and partially against the tabs 19 and 20 at the side and also upon the tabs 17 and 18. The block fits rather snugly then against the edges of the cuts 9 and 10 and so is confined against twisting and displacement longitudinally and laterally of the beam form. The height of the block is such that its upper surface 53 is substantially on a level with the cut lines 36 and 37 forming the bottom boundaries of the apertures 46 and 47. The location of the parts is such that the supporting block 51 is disposed substantially symmetrically below the apertures 46 and 47, and due to its confinement within the openings formed by the various flaps 19 and 20.

The pallet forming machine itself includes a frame 66 made up of the customary structural members and is designed to receive a plurality of guide troughs 67 for the beam forms. While any suitable number of beam forms can be utilized in a pallet, three are employed in this example. Consequently, there are three guide troughs 67 in the present embodiment. Also, the spacing or distance between the respective guide troughs can vary from time to time so means are provided for mounting the guide troughs at any selected distance apart.

Each of the guide troughs 67 preferably is principally constituted by a pair of facing angle irons 68 and 69 at intervals joined in proper relationship by cross straps 71. The parallel guide troughs extend for the full length of the frame 66 and at appropriate points are preferably secured by through bolts 72 extending between pairs of cross members 73 and 74 included in the frame 66. The length of the troughs at the loading or feeding station is such that each of them is effective to receive a beam form 6 placed by hand. At this time, the beam forms are substantially in the condition shown in Figure 11 with all of the support blocks 51 in place.

Pursuant to the invention, the beam forms are advanced simultaneously in groups of three from the loading station adjacent one end of the frame 66 toward an assembly station generally designated 76 adjacent the other end of the frame 66. To accomplish the motion, the frame 66 as shown in Figure 2, includes a pair of cross shafts 77 and 78 suitably journalled and at adjustable intervals carrying an appropriate number of pairs of sprockets 79 and 81. Around the sprockets of each pair is trained a chain 82 for driving a pusher 83. A bracket 84 is connected to the chain by a pin 86 and extends through the space 87 in the bottom of the trough 67 between the angles 68 and 69. The bracket at its upper end carries a pusher plate 87 extending transversely between the angles 68 and 69 and designed to abut the rear end of a beam form in the trough.

The shafts 77 and 78 are connected for rotation in unison by a drive chain 89 trained around smaller diameter sprockets 91 and 92 fixed on the shafts 77 and 78. The drive chain 89 at an appropriate point has a depending drive bracket 93 secured to the end of a piston rod 94 within a hydraulically or pneumatically expansible chamber or cylinder 96. In the present instance a pneumatic mechanism is used.

When the piston rod 94 is impelled from one extreme position to another the drive chain 89 is similarly moved so that the shafts 77 and 78 are rotated. The extent of rotation of the shafts depends upon the stroke of the piston rod 94 so that the pushers 87 are simultaneously advanced a predetermined amount. For each stroke this is sufficient to advance a group of beam forms from the loading station and to position them in the assembly station 76. As the beam forms are advanced they have some friction with the sides and bottom of the trough and so stop in their respective assembly positions as established by the stop position of the pushers 87.

As the beam forms are advanced they are further folded as the top flaps 33 and 34 originally are substantially vertical or are only slightly inclined after the blocks 51 have been positioned. Their upstanding top panels 33 and 34 of the advancing beam forms come into contact with the converging leading ends 101 and 102 of a pair of guide bars 103 and 104. The guide bars are secured to cross plates 106 with the bar 104 slightly lower in elevation but otherwise parallel to the bar 103. The cross plates 106 are joined to fastenings 107 adjustably suspending the guide bars from cross channels 108 and 109 forming part of the frame 66. As the beam forms are advanced, their upper flaps engage the guide bars 103 and 104 and are further folded down substantially as shown in Figure 3. Interior plates 110 hold the shape of the box beam as the flaps are folded.

Additional means are provided for holding and positioning the flaps 33 and 34. Arranged adjacent the respective ones of the cross channels 108 and 109 on the frame 66 are cross shafts 111 and 112 (Figures 2–4) suitably mounted for rotary oscillation. At their opposite ends the shafts carry support arms 113 and 114 joined at their ends by cross bars 116 and 117. Each of the arms 113 is connected to the piston rod 118 of the respective one of a pair of pneumatic cylinders 119 and 121 suitably mounted on the frame 66. The cylinders 119 and 121 are simultaneously actuated so that the cross bars 116 and 117 are together lowered and raised a predetermined amount.

Resting on the cross bars 116 and 117 are adjustable brackets 122 and 123 connected in pairs by longitudinally extending support bars 124. The number of support bars is equivalent to the number of troughs 67 and the position of the support bars is laterally adjusted so that each of them lies substantially above the center of the subjacent trough. Since the cross bars 116 and 117 will accommodate any desired number of support bars 124 the machine can readily be set up for any selected number of troughs. Each of the brackets 122 and 123 is laterally adjusted and guided in a vertical direction by an associated spindle 126 upstanding from a support

strap 127 on the subjacent guide bars 102 and 104. An adjustable stop nut 127 is at the top of each spindle. With this arrangement, when the cylinders 119 and 121 are simultaneously actuated all of the support bars 124 are also simultaneously lowered or raised.

At appropriate intervals in its length each of the support bars 124 is provided with a pair of templets 131 and 132 (Figures 2 and 7) for each of the pattern zones of the beam form. In this instance there are five such pairs of templets 131 and 132 for each bar 124. The templets are very similar so that a description of one largely applies to the other. Each templet is preferably a plate-like casting having a substantially central boss 133 encompassing its support bar 124 and held in position thereon by a set screw 134 so that the templet can be positioned in any axially selected location. Each templet has three depending arms 137, 138 and 139 separated by slots 141 and 142 of sufficient extent as to clear the guide bars 103 and 104 in all positions of the templet.

As shown particularly in Figures 6, 7 and 9, the depending leg 137 adjacent the slot 141 is provided with a bevel contour 143 arranged to clear the angle 68, but in one position to lie substantially against the fold line 28 of the beam form so as to hold the side of the beam form in position. The distance between the templets 131 and 132 is just sufficient so that the projections 41 are appropriately accommodated between them and so that the beam form is accurately positioned.

The central leg 138 of the templet is provided with a surface 144 defining an inclined member 146 adapted to engage the edge of the top flap 33 and hold the general plane of the panel at an inclination to the horizontal with the leading edge of the flap disposed above the ultimate plane thereof. This is to afford an inclined plane for the subsequent entry of a slat.

Disposed at a similar inclination on the central leg 138 is another inclined surface 147 defining a holding member 148 for engaging with the top flap 34 and holding it also in a selected inclined position. The flap 34 is held at an inclination parallel to that of the flap 33 and so is depressed somewhat below the ultimate level. This is so that the projecting remaining portion 42 is correspondingly disposed at an inclination upwardly to form an inclined plane for the ready insertion of a slat. The central leg 138 also has a depending portion 150 engaging the edge of the top flap 34 and holding it against horizontal displacement.

The templets 131 and 132 additionally are provided with guide members 149 and 151 inclined in a fashion to direct an incoming slat toward the aperture 47 on either side of which they are disposed.

To serve as additional guide members below the apertures 47, the angles 69 at appropriate intervals are provided with brackets 152 supporting guide plates 153 forming lower inclined planes or slide surfaces. Similarly, the bars 104 are also provided with brackets 154 at appropriate intervals for supporting guide plates 156 forming upper slide surfaces. When the templets 131 and 132 are in proper position, the guide members 149 and 151 and the guide plates 153 and 156 form a guiding means for a slat being inserted.

Pursuant to the invention, means are provided for supplying appropriate slats for assembly into the pallet. The slats are all substantially identical and each of them comprises a wooden member 161 (Figures 12 and 14) of substantially the cross-section and size of the aperture 47. The leading end 162 is rounded both in a vertical direction and in a horizontal direction.

Any number of slats can be utilized in any selected spacing so that the frame 66 (Figures 1 and 5) is for this reason provided with an appropriate number of slat supports 163, at present, five. These preferably are made up of opposed angles 164 and 165 suitably joined at their ends and there fastened by adjustable bolts 166 extending between pairs of channels 167. Upstanding from each of the slat support angles 164 and 165 are side guide angles 168 and 169 disposed to hold a pile of slats in position, and passing only the lowest one.

By this means the various slat supports are suitably mounted on the frame 66 parallel to each other in any selected location and in alignment with the respective pairs of templets 131 and 132. The height and disposition of the various slat supports is such that they extend in a direction to intersect the various troughs 67 at the assembly station 66. Each intersection can be considered as a sub-assembly station. In this instance, since there are three troughs and five supports, the sub-assembly stations are fifteen in number.

As a slat feeding mechanism, each of the slat supports 163 is provided with a pusher plate 171 running on the bottom flanges of the angles 164 and 165 and extending upwardly a sufficient distance to abut the end of the lowest slat in the pile but low enough so as not to engage the superposed slat. The pusher 171 is provided with a depending plate 172 passing through a slot between the angles 164 and 165, and carrying a pin 173 fastened to a chain 174. This chain is trained around a pair of axially adjustable sprockets 176 and 177 mounted on cross shafts 178 and 179 journalled in the frame 66. All of the various sprockets 176 and 177 turn in unison and so the various pushers 171 all advance or retract simultaneously.

To drive the shafts 178 and 179 they are provided with smaller sprockets 181 and 182 around which a driving chain 183 is trained. To this chain is secured a driving lug 184 disposed at the end of a piston rod 186 extending into a pneumatically expansible chamber 187 mounted on the frame 66. When the cylinder is actuated, the shafts 178 and 179 are simultaneously turned and the various pushers 171 are moved.

In the operation of this mechanism, assuming that the troughs 67 are supplied with beam forms and contain blocks 51 and that the slat supports are loaded with piles of slats, an operator manually actuates a control 191 (Figure 16). This operates a control valve 192 governing the flow from an air supply conduit 193 containing compressed air from any suitable source, not shown. The actuation of the valve 192 supplies compressed air through a conduit 194 to the remote end of the expansible chamber 96. The pressure air then moves the piston rod 94 toward the operator at the control 191 and, through the chain 89, rotates the shafts 77 and 78 counter-clockwise as seen in Figure 2. Consequently the pushers 87 simultaneously advance beam forms in the troughs 67 to and into the assembly station 76.

At the position in which the beam forms have been sufficiently advanced, an adjustable contact plate 196 on the member 93 comes into contact with electric switches 197 and 198 mounted on the frame 66. The switch 197, according to one mode of operation, centralizes the valve 192 and stops forward progress of the pushers 87. The other switch 198 is effective to actuate a valve 201 supplied with pressure air through the conduit 193 and controlling air flow to the cylinder 187. The actuation of the valve 201 is such that air under pressure is supplied through a pipe 202 to the piston rod end of the cylinder 187 and also through a branch pipe 203 to a conduit 204 joining the upper ends of the cylinders 119 and 121.

The load on the cylinder 187 is relatively heavy or large whereas that on the cylinders 119 and 121 is relatively light. Consequently, before the cylinder 187 is effective, the cylinders 119 and 121 quickly rotate the levers 113 simultaneously so as to lower the support bars 124 by gravity and by air pressure. The templets move from the position shown in Figure 8 down onto the subposed beam forms and occupy the positions shown in Figures 6 and 9. The templets are all simultaneously lowered not only to cock the flaps 33 and 34 into their inclined locations, and backstop them against displacement by the slats, but also to position the side guides 149 and 151.

After all of the templets are in lower position and at the extreme lower position of the piston rods 118 the air pressure which first builds up only sufficiently to actuate the cylinders 119 and 121, then builds up within the cylinder 187. The piston rod 186, as shown in Figure 5, is then withdrawn into the cylinder 187 so that the pushers 171 are operated simultaneously on all of the slat supports. The pushers 171 at their leading end engage the trailing end of the lowermost slats within the supports 168 and 169 so that the bottom slats are simultaneously advanced from their loading station toward and into the assembly station. The curved or rounded ends 162 lead and may first engage either the upper or lower guide plates 153 and 156 at the individual sub-assembly station and may also engage either of the guides 149 and 151 on the lowered templets. The rounded ends of the slats therefore are accurately guided and confined. As a further entry aid, the leading corner 205 of the blocks can be rounded. Advancing movement of the slats drives them through the apertures 47 and 46 in that order, the flaps 33 and 34 being held in position laterally, or backstopped by the templets and their inclination assisting in the through passage of the slats. The sides of the slats engage the margins of the cuts 39 and 40 as well as the cuts 36 and 37 and slide directly over the upper surface 53 of each of the subposed blocks 51.

As the rounded end of the slat emerges from the aperture 47 it deforms and cams up slightly the trailing edge of the panel 34 extending freely in the interval between the templets 131 and 132. This tends to rotate the flap 42 downwardly into close contact with the slat. As the slat emerges from the aperture 46, contact with the panel 41 tends to lift the panel between the templets and to rotate the flap 33 down into contact with the slat.

The various slats are advanced through all of the beam forms and emerge on the far side thereof and continue into substantially a symmetrical location. The advancing movement of the slats is stopped when an adjustable screw 206 on the block 84 comes into contact with an electric switch 207 mounted on the frame 66. The switch 207, by a solenoid means not shown, reverses the position of the valve 201 so that air is supplied to the opposite end of the cylinder 187 through a conduit 208 and the pushers 171 are restored to their original position, as shown in Figure 5. Also, the bottoms of the cylinders 119 and 121 are supplied with air under pressure from the conduit 208 through a pipe 209 connected to a conduit 210 joining the cylinders. The levers 113 are reversely rotated simultaneously and all of the support bars 124 are lifted to lift the templets 131 and 132 back into their previous, uppermost positions. The switch 207 can also be made effective upon the previously centralized valve 192 so that this valve also is reversed and pressure air flows through a conduit 211 to reverse the cylinder 96 and finally restore the pushers 87 to their initial position.

Alternatively, and preferably the switch 197, when actuated by the plate 196, instead of merely centralizing the valve 192, then fully reverses it. Then, the cylinder 96 is reversed as soon as the pushers 87 achieve the end of their stroke at the assembly station. The pushers 87 are promptly returned to their loading station so that an operator has ample time to position additional beam forms for a subsequent operation.

As additional controls there are provided auxiliary manual switches 213 and 214 individually connected to the valves 192 and 201, respectively, so that either cylinder 96 or 187 can be selectively operated.

In the normal operation of the structure however, after the cylinder 187 has been restored to its original condition and after the operator has placed additional beam forms in the trough 67 for a subsequent operation the switch 191 is again actuated so that the entire cycle is automatically repeated. When this occurs and when the subsequently positioned beam forms are moved into the assembly station from the loading station, they serve to discharge ahead of them the previously formed templet. This is ejected at the upper left hand portion of the machine as shown in Figure 1. Upon each subsequent actuation of the switch 191, the machine is automatically made to cycle once and to supply one assembled pallet for each cycle.

In practice, one or two operators can supply the machine and control it to assemble a substantial number of pallets per hour. Each of the pallets is correctly and appropriately assembled without tearing or distortion of the paper-board beam forms despite some irregularities in or warping or curvature of the wooden slats or blocks and despite some variations in dimensions of the paper-board parts. There is automatically afforded a pallet having a tight frictional interengagement between the slats and the supporting blocks and between the supporting blocks and the beam forms as well as between the beam forms and the slats. The mechanism, consequently, is effective to assemble the desired kind of pallet in a cheap, satisfactory and quick fashion.

What is claimed is:

1. A pallet forming machine comprising a frame, a guide trough on said frame, means on said frame for advancing a beam form in said trough to an assembly station, a template, means on said frame at said assembly station for moving said template into holding engagement with a beam form at said station, a slat support on said frame extending in a direction to intersect said trough at said station, and means on said frame for advancing a slat on said support through a beam form at said station.

2. A pallet forming machine comprising a frame, a guide trough on said frame, means on said frame for advancing a beam form in said trough to an assembly station, a template having guide members thereon, means on said frame for moving said template adjacent to and away from said trough at said assembly station, a slat support on said frame extending transversely of and extending in a direction to intersect said trough at said assembly station, and means on said frame for advancing a slat on said support through said guide members when said template is adjacent to said trough.

3. A pallet forming machine comprising a frame, a guide trough on said frame for a beam form having a flap thereon, means on said frame for advancing a beam form in said trough to an assembly station, a template having a holding member thereon, means on said frame for moving said template from a remote position into a position adjacent said trough with said forming member in engagement with said flap at said assembly station, a slat support on said frame extending in a direction to intersect said trough at said assembly station, and means on said frame for advancing a slat on said support against said flap and through a beam form at said assembly station.

4. A pallet forming machine comprising a frame, a guide trough on said frame extending from a loading station to an assembly station and adapted to receive a beam form having a flap and a lateral opening, means on said frame for advancing a beam form in said trough from said loading station to said assembly station, a template having a holding member and a guide member thereon, means on said frame for moving said template from a remote position into a position adjacent said trough at said assembly station with said holding member in engagement with said flap and said guide member adjacent said opening, a slat support on said frame extending in a direction to intersect said trough, and means on said frame for advancing a slat on said support against said guide member and said flap and through said opening of said beam form at said assembly station.

5. A pallet forming machine comprising a frame, a

guide trough on said frame extending from a first loading station to an assembly station; a slat support on said frame extending from a second loading station in a direction to intersect said trough at said assembly station; means on said frame for advancing a beam form in said trough from said first station to said assembly station; beam form engaging and holding means on said frame movable from a remote point to said assembly station; means on said frame for advancing a slat on said support from said second station to said assembly station; and means on said frame for first actuating said beam form advancing means, then moving said beam form engaging and holding means to said assembly station, and then actuating said slat advancing means.

6. A pallet forming machine comprising a frame, a plurality of parallel guide troughs on said frame extending to an assembly station, a plurality of parallel slat supports on said frame all extending in a direction to intersect all of said troughs at said assembly station, each of said intersections being a sub-assembly station, a pair of templets at each of said sub-assembly stations, means on said frame for moving all of said templets simultaneously from remote positions into operative positions at said sub-assembly stations, means on said frame for simultaneously advancing beam forms in each of said troughs to said assembly station, and means on said frame for simultaneously advancing slats on each of said slat supports to said assembly station.

7. A pallet forming machine for use with elongated beam forms having transverse apertures therethrough and with elongated slats adapted to pass through said apertures comprising a frame, a guide trough on said frame adapted to receive a beam form, means on said frame for engaging a beam form in said trough and advancing said beam form along said trough to an assembly station, a template, means on said template for engaging a beam form, means on said template for guiding a slat, means on said frame at said station for moving said template into a position with said engaging means abutting a beam form at said station and with said guiding means adjacent the aperture in a beam form at said station, a slat support on said frame and disposed to extend in a direction to intersect said trough at said station, and means on said frame for advancing a slat along said support through said guiding means and through the aperture in a beam form at said station.

8. A pallet forming machine for use with elongated beam forms having transverse apertures therethrough and with elongated slats adapted to pass through said apertures comprising a frame, a guide trough on said frame adapted to receive a beam form, means on said frame engageable with a beam form in said trough for advancing said beam form a predetermined distance along said trough to an assembly station, a template, means on said frame for mounting said template for movement into and out of engagement with a beam form at said station, means on said frame for moving said template into engagement with said beam form, a slat support on said frame extending in a direction to intersect said trough at said station, means on said frame for advancing a slat on said support through an aperture in said beam form at said station, and means for operating said slat advancing means when said template is in engagement with said beam form.

9. A pallet forming machine for use with elongated beam forms having transverse apertures therethrough and with elongated slats adapted to pass through said apertures comprising a frame, a plurality of parallel coplanar guide troughs on said frame, a plurality of parallel slat supports on said frame and substantially coplanar with and intersecting said guide troughs at assembly stations, means on said frame for simultaneously advancing beam forms in said guide troughs to said assembly stations, a plurality of templates, means on said frame for mounting said templates for movement into and out of engagement with respective ones of said beam forms at respective ones of said stations, means for moving said templates into said engagement, means on said frame for simultaneously moving a plurality of slats on said slat supports into said station, and means for first operating said beam form advancing means, then said template moving means and finally said slat advancing means.

10. A pallet forming machine for use with elongated beam forms having transverse apertures therethrough and with elongated slats adapted to pass through said apertures comprising a frame, a guide trough on said frame adapted to receive a beam form, means on said frame for engaging the trailing end of a beam form in said trough and pushing said beam form along said trough to an assembly station, a template, means on said template for engaging and holding a beam form, means on said frame at said station for moving said template into a position with said engaging and holding means abutting a beam form at said station, a slat support on said frame and disposed to extend in a direction to intersect said trough at said station, means on said frame for engaging the trailing end of a slat on said slat support and pushing said slat along said slat support and through the aperture in said beam form at said station while said beam form is engaged and held by said template.

References Cited in the file of this patent

UNITED STATES PATENTS

1,302,280	Batchelder	Apr. 29, 1919
1,996,566	Boerger	Apr. 2, 1935
2,006,383	Boerger	July 2, 1935
2,743,512	Moyer	May 1, 1956