

March 28, 1961

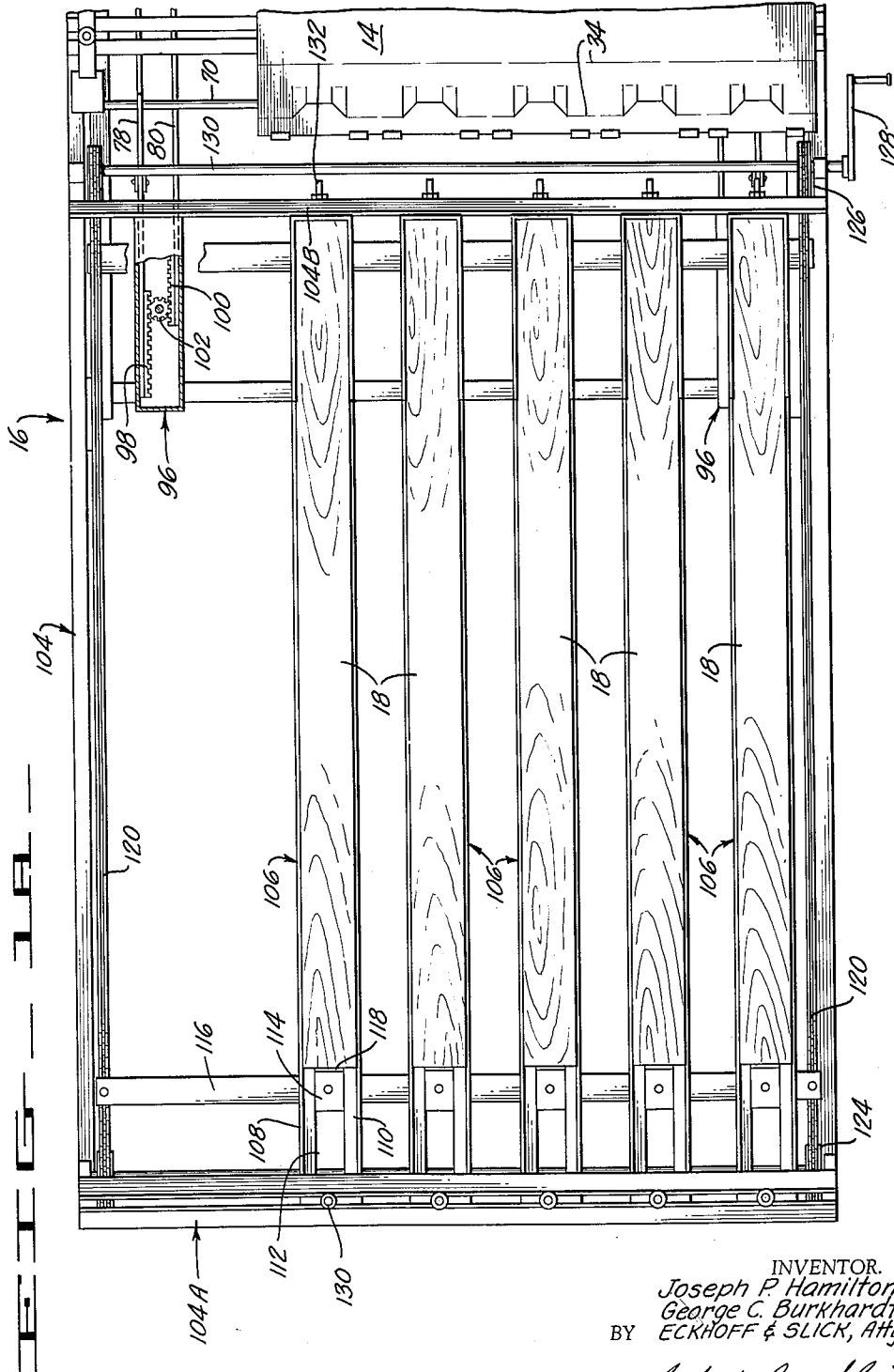
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2,976,779

PALLET MAKING MACHINE AND PROCESS

Filed Dec. 3, 1956

6 Sheets-Sheet 1



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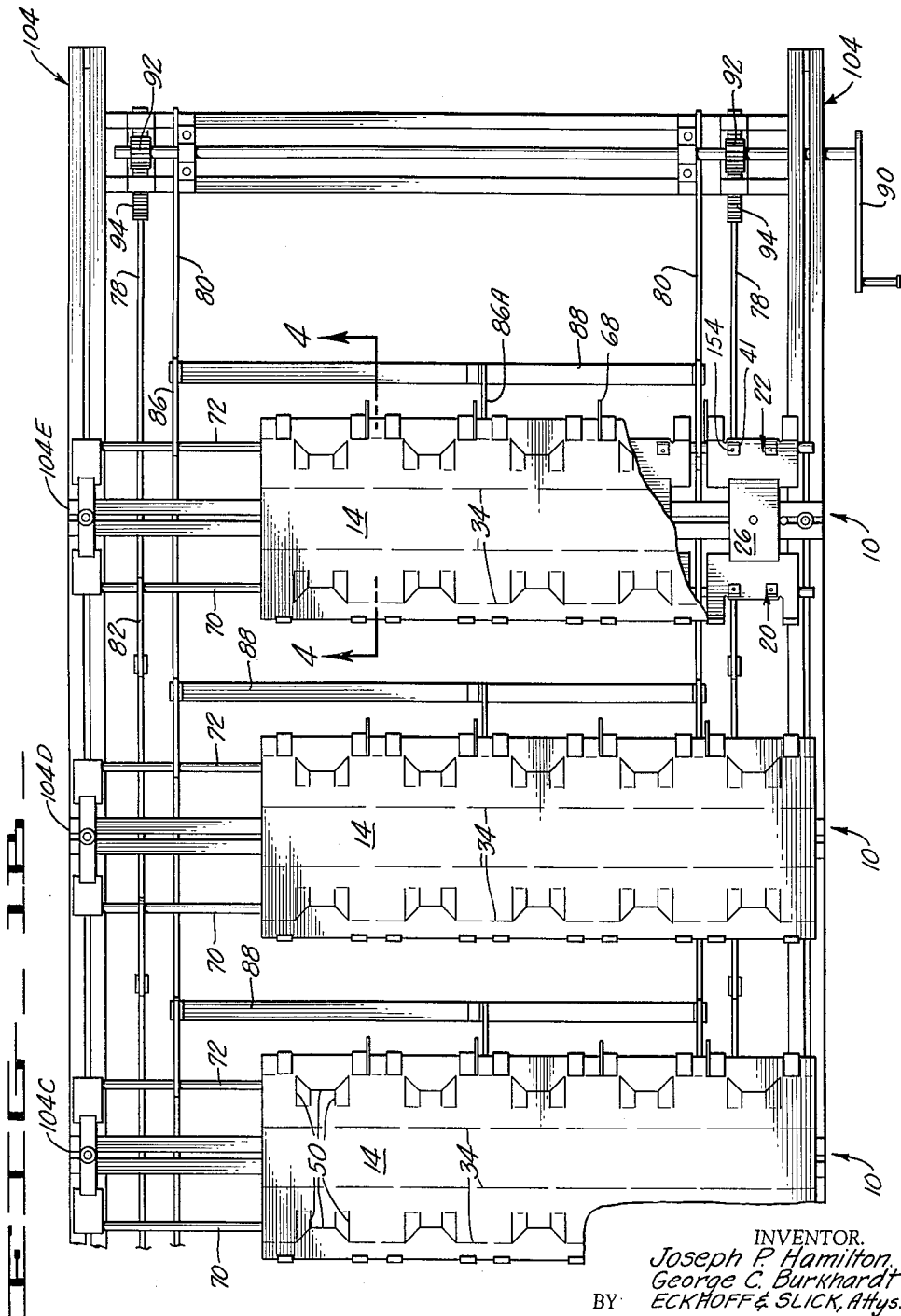
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PALLET MAKING MACHINE AND PROCESS

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6 Sheets-Sheet 2



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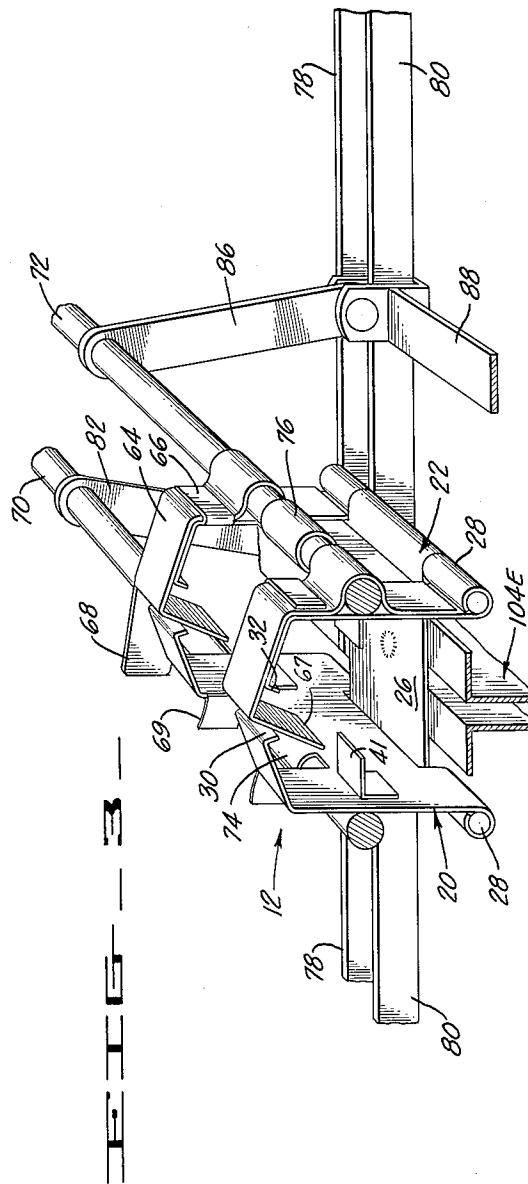
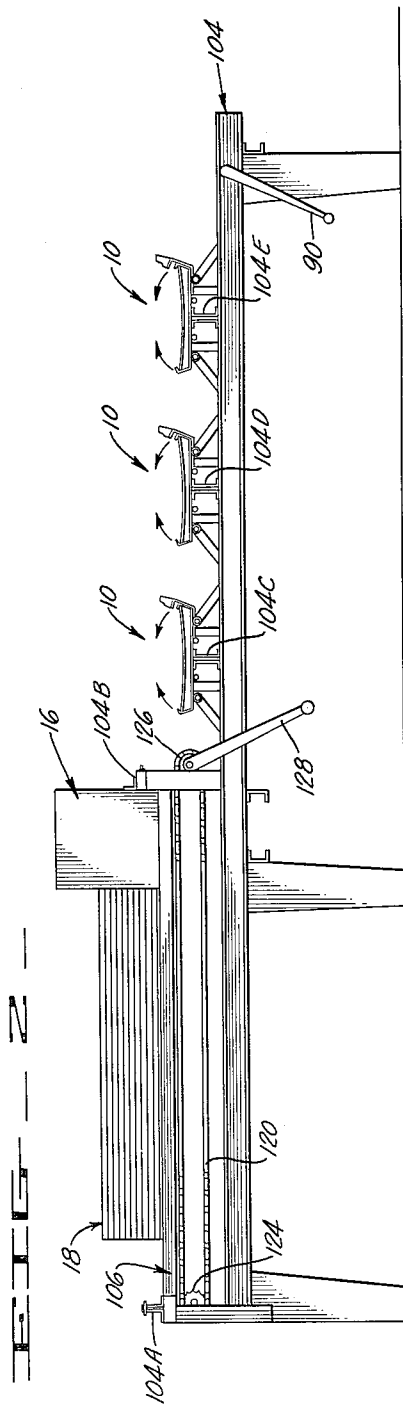
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PALLET MAKING MACHINE AND PROCESS

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6 Sheets-Sheet 3



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PALLET MAKING MACHINE AND PROCESS

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6 Sheets-Sheet 4

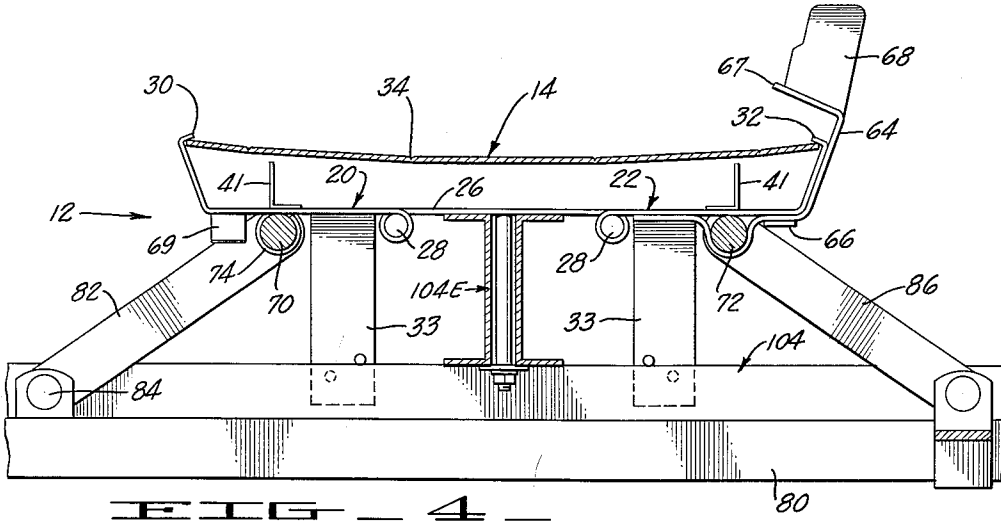


FIG. 4

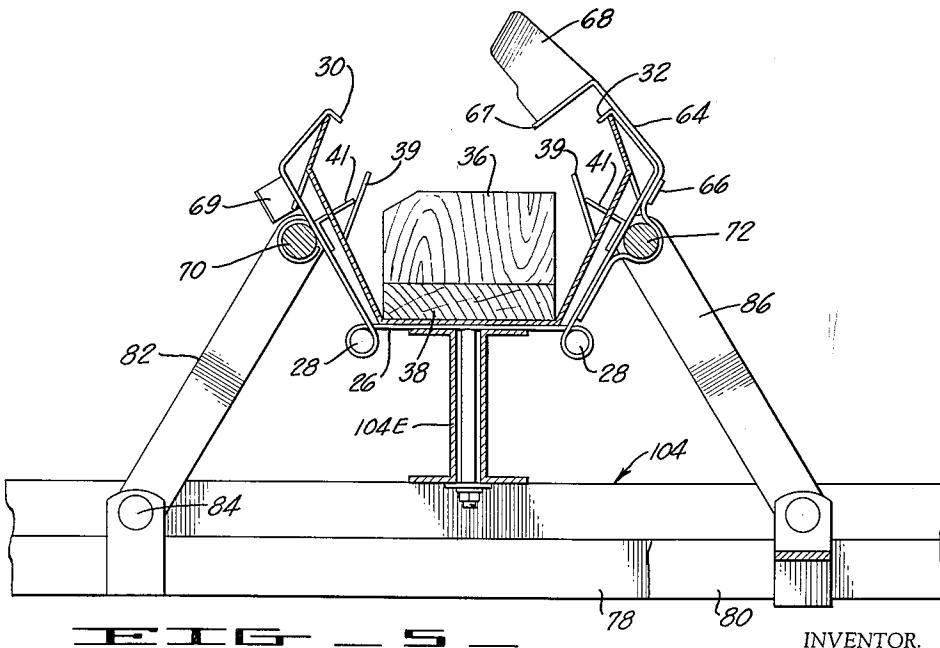


FIG. 5

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PALLET MAKING MACHINE AND PROCESS

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6 Sheets-Sheet 5

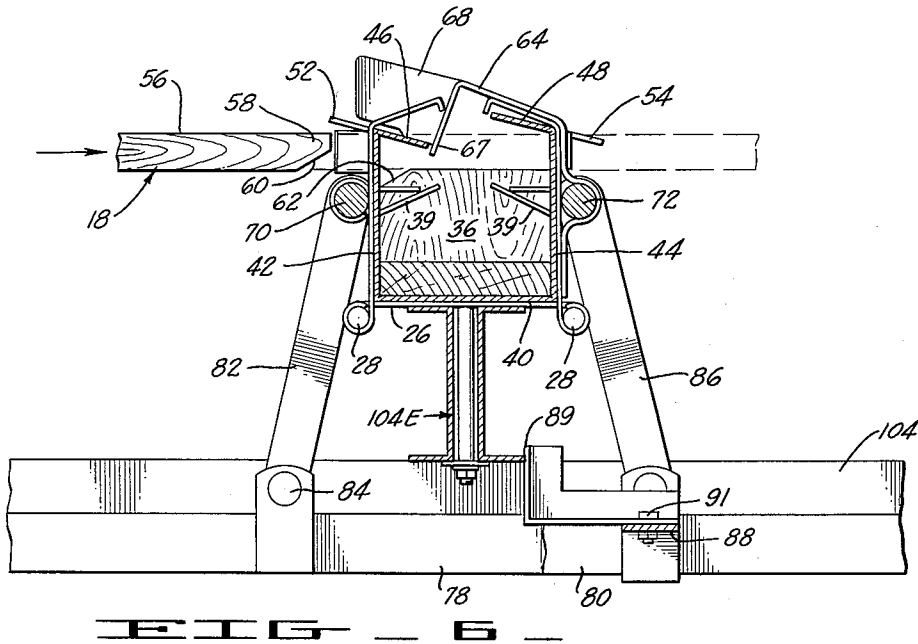


FIG - 6 -

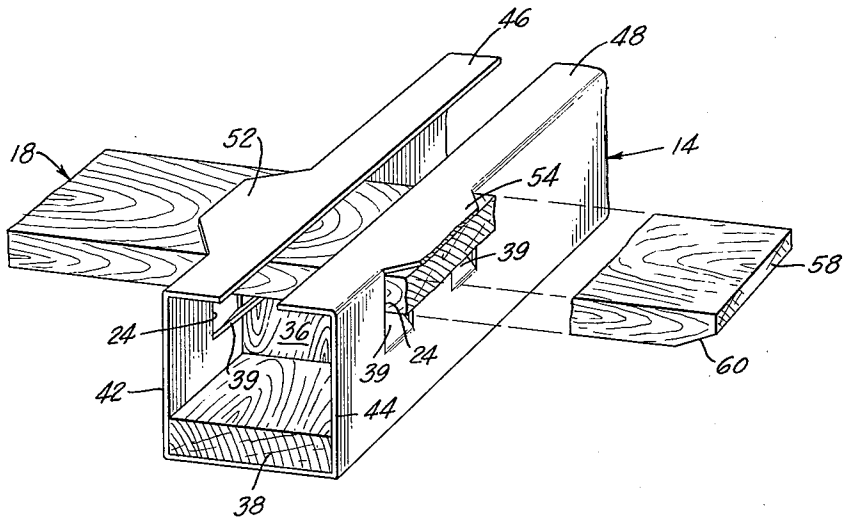


FIG - 7 -

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PALLET MAKING MACHINE AND PROCESS

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FIG. 8

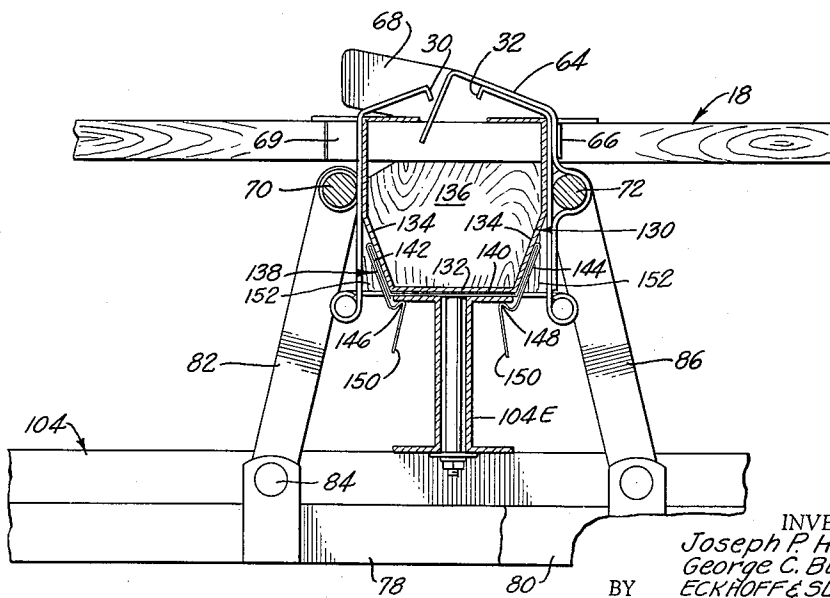
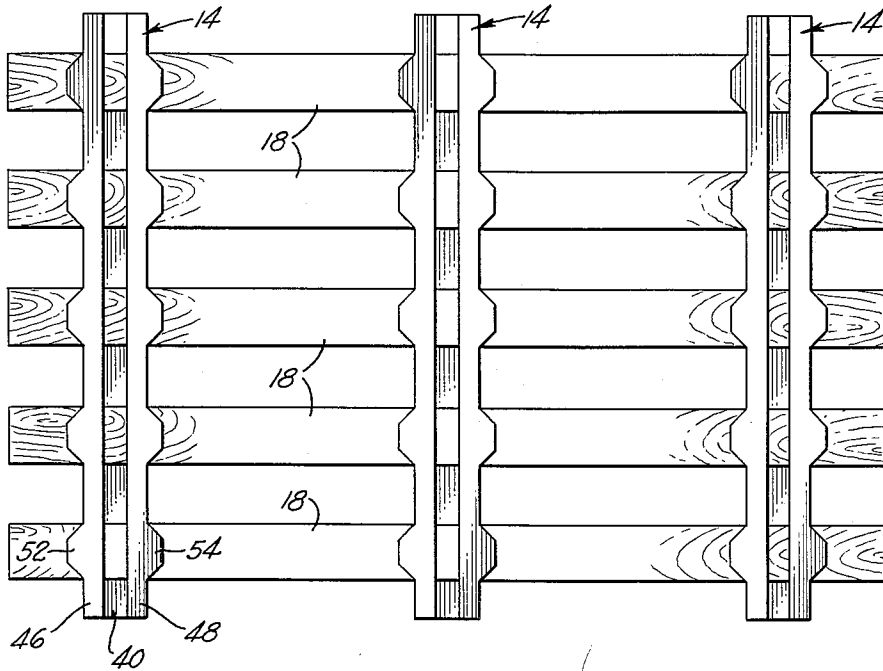


FIG. 9

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PALLET MAKING MACHINE AND PROCESS

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Filed Dec. 3, 1956, Ser. No. 625,976

5 Claims. (Cl. 93—1)

The invention relates to the assembling of pallets or skids of the type used as a support for a stack of objects, and more particularly to the assembly of pallets by inserting wooden stringers through openings in cross-members of cardboard.

Recent years have seen a great increase in the use of pallets or skids upon which a pile of objects may be stacked for transportation or storage as a unit. Pallets heretofore used for this purpose generally have been constructed of wood in the form of a platform supported and held together by cross-members. Such pallets are expensive because of expensive materials and the amount of labor necessary in fabrication, and are relatively heavy and cumbersome. Shipping of goods on such wooden pallets presents further problems. Among these are increased costs occasioned by the weight of the pallets and the necessity of returning the pallets due to high initial costs.

An improved light weight, expendable pallet is disclosed in the copending application of one of U.S. Serial No. 570,115, filed March 7, 1956, now abandoned, entitled "Pallet." This improved pallet utilizes structural cross-members of corrugated board folded to form a substantially box shaped cross-section, and spaced wooden stringers engaged through transversely aligned openings in the vertical sides of the cross-members to provide the stack supporting surface, wherein the stringers are held firmly in place by a ratchet-like action of the box members.

In assembling the improved pallet, it is desirable that the stringers fit as tightly as possible into the openings in the cross-members so that the pallet structure will be as rigid as possible. The method and apparatus of the present invention is particularly effective in effecting a rapid and precise engagement of the stringers in the openings in a manner providing a tight and durable pallet structure.

It is therefore a principal object of the present invention to provide a method of assembling a pallet from corrugated board cross-members and wooden stringers rapidly and precisely so as to obtain a tight and strong product.

Another object of the present invention is to provide an apparatus for assembling pallets from corrugated blanks and wooden stringers in a speedy and economical manner and with a minimum of skill required on the part of the operator.

A further object of the present invention is the provision, in an apparatus of the character described, of devices for quickly and accurately folding a corrugated blank to a desired configuration, and for firmly holding the blank in such configuration for insertion of the stringers.

A still further object of the present invention is to provide an apparatus of the nature set forth in which the several parts may be adjusted and aligned with ease and precision to accommodate the apparatus to various types and sizes of pallet.

Yet another object of the present invention is the provision of an apparatus of the character described in which the corrugated cross-members are held in precise orientation to one another, and the stringers are simultaneously advanced endforemost through aligned openings in the cross-members.

A further object of the present invention is to provide a device for forming corrugated blanks into structural pallet members which is adapted to hold the various portions of the blank in position for easy and fool-proof simultaneous insertion of the transverse stringers.

Another object of the present invention is to provide a method and apparatus for assembling a pallet of the type set forth which cooperate to produce economically a sturdy, rugged and lightweight pallet structure in a minimum of time and in a fool-proof manner.

Other objects and features of advantage will become apparent from a consideration of the following description and of the accompanying drawings forming a part of this specification.

With reference to said drawings:

Figure 1A is a plan view of a stringer feeding portion of an apparatus for assembling pallets constructed in accordance with the present invention.

Figure 1B is a plan view similar to Figure 1A but illustrating the balance of the apparatus.

Figure 2 is a side elevational view on a reduced scale of the apparatus of Figures 1A and 1B.

Figure 3 is a perspective view on an enlarged scale of a forming device, forming a part of the apparatus of the present invention, together with fragmentary portions of associated structure.

Figure 4 is a fragmentary cross-sectional view of a portion of the apparatus of the present invention and is taken substantially on the plane of line 4—4 of Figure 1B.

Figure 5 is a view taken similar to that of Figure 4, but illustrating the parts in an intermediate position.

Figure 6 is a view similar to those of Figures 4 and 5, but showing the parts in another position.

Figure 7 is a perspective view of a portion of a pallet as assembled on the apparatus of the present invention, with portions broken away and shown in section.

Figure 8 is a plan view of a pallet as assembled by the apparatus of the present invention.

Figure 9 is a view taken similar to Figure 6, but showing the apparatus modified for assembling a different type of pallet.

The apparatus for assembling pallets, of the present invention, consists basically of a plurality of rows of forming devices adapted for holding a plurality of blanks of foldable sheet material and forming the sheets in a box-like folded configuration in parallel spaced relation to each other, and means for inserting a plurality of stringers transversely through the folded blanks. Each of the forming devices includes a pair of opposed members which are movable between an open position, illustrated in Figure 4, for receiving a blank, and a closed position, illustrated in Figure 6, forming and retaining the blank in folded condition for insertion of the stringers through aligned openings provided in the blank. Figures 1A, 1B, 2 and 4 illustrate the members in open position with the blanks inserted between the members preparatory to folding.

As may best be seen in Figure 3, the folding devices preferably consist of a flat base portion upon which the members are pivotally mounted by hinges for upward swinging movement from open to closed position. In open position, the members extend outwardly from the base portion and are formed with inturned distal ends. The members are proportioned and positioned by adjustable

stops 33 so that the ends 30 and 32 are spread apart by a distance somewhat less than the width of the blank 14 in order that the blank may be snapped into place with the natural resilience of the corrugated material acting to hold the blank securely in place, the blank being bowed downward at the center. As the members 20 and 22 rise toward the intermediate position of Figure 5, the blank 14 is bent along previously scored lines 34. At approximately the position shown in Figure 5, the upward swing may be momentarily halted and reinforcing members 36 and 38 inserted. Reinforcing member 36 is preferably a wooden block or blocks standing on end and is held against displacement by tabs 39 formed in blank 14 and pressed inwardly by members 41 mounted on the inner faces of forming members 20 and 22. In light duty pallets, the members 38 may be omitted. The members 20 and 22 are then moved to their closed position shown in Figure 6 wherein the blank 14 assumes a box-like configuration having a flat floor 40, resting on base portion 26, and upstanding walls 42 and 44 terminating in inwardly turned portions 46 and 48. The blank 14 is then held firmly in this folded condition by the forming devices 12 for insertion of the stringers 18.

It will be noted from Figures 1B, 6 and 7 that the blanks 14 are precut to provide the tabs 39 and the transversely aligned openings 24 for the stringers 18. These openings are located in the upstanding walls 42 and 44 and are provided for by cutting the blank 14 along the solid lines 50 of Figure 1B. These cuts are so arranged that, when the blank is urged into its box-like configuration, a pair of flaps 52 and 54 will extend outwardly from the walls 42 and 44 in co-planar relation to the inturned portions 46 and 48. The openings 24 will therefore underlie the flaps 52 and 54 and the inturned portions 46 and 48, and when the stringers are inserted through these openings, the flaps and inturned portions will rest on the upper surface 56 of the stringer. As may be seen in Figure 6, the stringer will in turn rest on the reinforcing member 36.

In order to securely grip the stringer 18, the distance between the reinforcing member 36 and the overlying flaps 52 and 54 and inturned portions 46 and 48 is slightly less than the thickness of the stringers so that the flap and inturned portions will be distorted slightly upward when the stringer is in place. Because of this relationship, it is necessary to prevent hanging up of the forward end 58 of the stringer on the reinforcing member 36 during insertion. This is here accomplished by forming cooperative bevels 60 and 62 on the front portions of the stringer 18 and block 36 respectively, and by tilting the flap 52 upwardly to the position shown in Figure 6. This tilting of the flap is accomplished by means mounted on one of the forming members 20 or 22 and positioned for engaging and depressing the inturned portion 46. This means here consists of a member 64 mounted on forming member 22 by means of ears 66 and having a portion 68 extending therefrom in position to engage and press down on the inner edge of inturned portion 46 in the manner shown in Figure 6. An elongated, inturned tongue 67 is formed on member 64 and is proportioned to lie adjacent to the rear edge of portion 46 when the forming devices are in closed position. This serves to support portion 46, during insertion of the stringers 18, and hence prevent any tearing of the blank.

To further avoid any possibility of tearing or misalignment, the forming devices 12 are designed to securely hold the blank on both sides of the stringer openings 24 during insertion of the stringer 18. This is accomplished here by the provision of bifurcated forming members 20 and 22. As may be seen from Figure 3, this construction provides pairs of blank engaging fingers spaced apart by a distance slightly greater than the width of the stringer openings 24. This permits the stringers 18 to pass between the fingers while the latter are firmly

holding the blank in the described box-like configuration. Ears 69, similar to the ears 66 on member 22, are provided on member 20 at opposite sides of the stringer opening and are bent so as to diverge away from such opening for guiding the forward end 58 of stringer 18 into the opening.

For smoothness of operation, it is desirable that each of the forming devices in a row be synchronized to jointly operate in swinging from open to closed position. Accordingly, the corresponding forming members 20 are linked for conjoint movement, as are the forming members 22. This is here accomplished by a pair of rods 70 and 72 which extend along the opposite sides of the row 10 and which are journaled in bosses 74 and 76 formed on the members 20 and 22 respectively. As will be apparent from Figures 4, 5 and 6, swinging of the rods upwardly will cause joint movement of the forming members to closed position.

Opening and closing of the forming devices 12 in each row is effected, in the present apparatus, from a single station. To accomplish this type of operation, the forming members 20 and 22 are moved in concert by means acting simultaneously on the rods 70 and 72. The means consist of a pair of actuating members 78 and 80 running perpendicular to and below each end of the rows 10 of forming devices and having an operative connection to the rods 70 and 72 respectively. The operative connection between the actuating members 78 and rods 70 is provided by links 82 journaled at their upper ends to the rods 70 and extending downwardly and outwardly therefrom to a pivot connection 84 on the actuating members 78. Movement of the members 78 to the right as viewed in the drawings will serve to swing the rods 70 and associated forming members 20 upwardly to closed position of the latter. The operative connection of the actuating members 80 to the rods 72 is accomplished in a similar but reverse manner by links 86, it being noted however that added reinforcement to resist the thrust of stringers 18 is provided on this side. This reinforcement is afforded by a transverse bar 88 connecting the actuating members 80 and an additional link 86A between bar 88 and a central portion of rod 72. If desired, a stop member 89 may be adjustably secured to bar 88 by screw 91 in position (see Figure 6) to engage frame member 104E when bar 88 has moved to the left far enough to urge forming member 22 to closed position.

Movement of the actuating members 80 to the left as viewed in the drawings will swing rods 72 upwardly to closed position of the associated forming members 22. Thus, it will be seen that actuating members 78 and 80 must move in opposite directions and at the same speed to obtain synchronized movement of the forming members 20 and 22 from open to closed position. Such movement is here effected by a crank 90 which turns a pair of pinion gears 92 engaged with rack gears 94 secured to the ends of actuating members 78 so that turning of the crank will move these members in the direction desired. Corresponding movement of the actuating members 80 in the opposite direction is provided by a pair of reversing means 96, as in Figure 1A. Each of these means include rack gears 98 and 100 mounted on the ends of actuating members 78 and 80 opposite to racks 94, a pinion gear 102 being engaged between the racks 98 and 100.

In accordance with the present invention, the means 16 for inserting the stringers 18 is adapted to engage and advance the stringers simultaneously in an end-foremost direction through the transversely aligned openings 24 in the folded blanks 14. In the apparatus here shown, the rows 10 of forming devices 12, and the means 16 are both mounted on a common frame 104 of generally rectangular form. Preferably, the means 16 is adapted to support a stack of stringers 18 in alignment with each set of openings 24, and to advance the lowermost stringers in each stack simultaneously through the

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openings. The means 16 may best be seen in Figures 1A and 2 of the drawings, and as there shown includes a plurality of guideways 106 supported on frame 104 in parallel spaced relation perpendicular to the rows 10 of forming devices. The guideways 106 each consist of a pair of spaced angle iron members 108 and 110 having confronting lower flanges spaced apart to provide a groove 112. Stringer engaging members 114 are mounted on a transverse bar 116 and have portions 118 protruding upwardly through the grooves 112 for engaging the rear end of the lowermost stringer upon movement of the bar 116 to the left, as viewed in the drawings. Such movement is provided by attaching the opposite ends of bar 116 to a pair of continuous chains 120 entrained over sprockets 124 and 126 and driven by a crank 128 connected to shaft 130 supporting the sprockets 126.

As a feature of the present invention, the apparatus is adapted for producing different sizes and types of pallets. To this end, the guideways 106 are supported at their opposite ends by bolts 130 and 132 engaged through slots in frame members 104A and 104B whereby the spacing of the guideways may be adjusted at will by merely loosening the bolts and sliding to the desired position. Each of the rows 10 of forming devices 12 is likewise adjustably attached to the frame members 104C, 104D and 104E. When it is desired to use blanks having a different spacing between openings 24 than the ones previously used, the guideways 106 and forming devices 12 may be quickly and easily positioned to accommodate such blanks. The frame members 104C-104E are likewise adjustable along the side members of the frame 104 to vary the spacing between the rows 10, and accordingly the spacing between the pallet cross-members.

A modified type of pallet embodying a somewhat different type of blank 130 is illustrated in Figure 9, together with means for adjusting the apparatus to such blank. As may be seen, blank 130 has a base portion 132 somewhat narrower than its overall width, and the upstanding walls 134 (corresponding to walls 42 and 44 of Figure 6) are outwardly inclined from the base for a portion of their height. It will also be observed that the reinforcing member 38 is eliminated and the block 136 (corresponding to member 36) rests directly on the base 132. To insure correct alignment and folding of the blank 130, a series of short sheet metal clip members 138 are snapped over the lateral frame members 104C-104E between the forming devices 12. The clip members 138 are preferably formed from a single sheet of metal and have a flat base portion 140, upwardly diverging wall portions 142 and 144 bent back on themselves, inturned portions 146 and 148, and ears 150 extending downwardly therefrom which may be grasped and spread to remove the clip from the frame member. In this form of pallet, the blocks 136 are held against lateral displacement by engagement of the lower corners 152 of the block in slots in the inclined portions of walls 132 and 134. Since the tabs 39 are dispensed with, the members 41 for opening them are removed from the forming members 20 and 22. Removal and replacement of members 41, for different types of pallets, is conveniently provided by securing such members to the forming members with removable screws 154.

Operation of the modified apparatus of Figure 9 is essentially the same as that of Figures 1-6. The blank 130 is snapped into place between inturned ends 30 and 32 and forming members 20 and 22 are urged to closed position. The clip members 138 aid in folding the blank into the configuration shown in Figure 9 and keep the blank centered during the forming process. At a midway point in the closing, the blocks 136 are inserted and the process carried out as previously described. It is noted that the conversion of the apparatus from this type of pallet back to the other is quickly and easily effected by simply removing clips 138 and replacing members 41.

From the foregoing, it will be apparent that the method

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and apparatus for assembling pallets, of the present invention, affords a simple and rapid assembly of corrugated blanks and wooden stringers into a firm and tight pallet of sturdy construction and exceedingly light weight.

While the salient features of this invention have been described in detail with respect to certain embodiments thereof, it will of course be apparent that certain modifications may be made within the spirit and scope of this invention, and it is not desired therefore to limit the invention to the exact details shown except insofar as they may be defined in the following claims.

We claim:

1. An apparatus for assembling pellets from pre-cut blanks of foldable sheet material having transversely aligned openings formed therein and elongated stringers proportioned for engagement through such openings comprising, frame means, a plurality of forming devices mounted in parallel spaced rows on said frame means, each of said forming devices including opposed members movable between an open position for receiving a blank and a closed position forming and retaining such blank in folded condition, a plurality of guideways mounted on said frame means in parallel spaced relation perpendicular to said rows of forming devices, said guideways being formed for supporting a plurality of stacks of stringers in alignment, with the openings in said blanks, a pusher member positioned adjacent to said guideways and having a portion projecting into the latter for engaging and advancing one of the stringers in a stack endforemost along said guideway and through said openings in said blanks when the latter are in said folded condition.

2. A device for forming a structural member from a flat blank of foldable sheet material having transversely aligned openings for insertion of stringers comprising, a flat base portion, a pair of bifurcated forming members hingedly connected to opposite sides of said base portion for upward swinging movement between an open position extending outwardly from said base portion and a closed position extending upwardly therefrom, said forming members providing a pair of spaced apart fingers with in-turned distal end portions formed for engaging and holding the opposite sides of said blank whereby said movement of the forming members from open to closed position will fold said blank to a box-like configuration having a flat floor and upstanding walls terminating in in-turned portions, said fingers being spaced apart by a distance slightly greater than the width of the openings in said blank for passage of the stringer therebetween, and means on one of said forming members positioned for engaging and depressing one of said in-turned portions of said blank when said forming members are in said closed position.

3. An apparatus for forming a structural member from an elongated blank of foldable sheet material comprising a row of forming devices having opposed pairs of blank engaging members movable between an open position for receiving a blank and a closed position forming and holding such blank in folded condition, a pair of rods extending along the opposite sides of said row and secured to said forming members for joint movement thereof, and means for urging said rods upwardly for swinging said forming members to closed position, said means comprising at least two horizontal actuating members running perpendicular to and below said rods, one of said actuating members being operatively connected to one of said rods and another of said actuating members being attached to the opposite of said rods and means for moving said actuating members in opposite directions.

4. An apparatus as characterized in claim 3 wherein a stop member is mounted on said actuating means and is proportioned for engaging a fixed element for limiting the horizontal movement of said actuating means when said forming members are in said closed position.

5. An apparatus for assembling pallets from pre-cut

blanks of foldable sheet material having transversely aligned openings for engagement by elongated stringers comprising a frame providing an elongated track, a plurality of elongated carrier members mounted perpendicular to and slidable along said track to selected positions thereon, a plurality of forming devices adapted to receive and form a blank to folded condition mounted on each of said carrier members for adjustable positioning therealong, a plurality of guideways for said stringers mounted on said frame and adjustable laterally thereof in parallel spaced relation to each other and perpendicular to said carrier members, and means cooperative with said guideways and adapted for advancing said stringers endfore-

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most for engagement through the openings in blanks held in folded condition in said forming members.

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