May 5, 1964 K. S. DUCAYET, JR 3,131,819

SHUTTLE PILER

Filed April 14, 1961 3 Sheets-Sheet 1

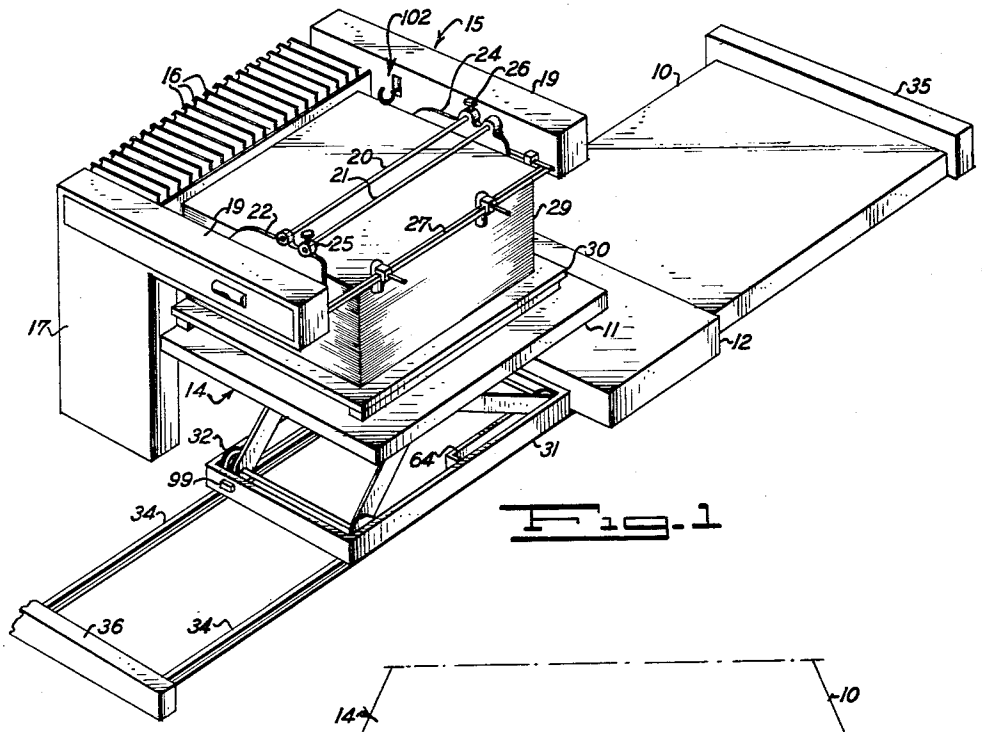


Fig. 1

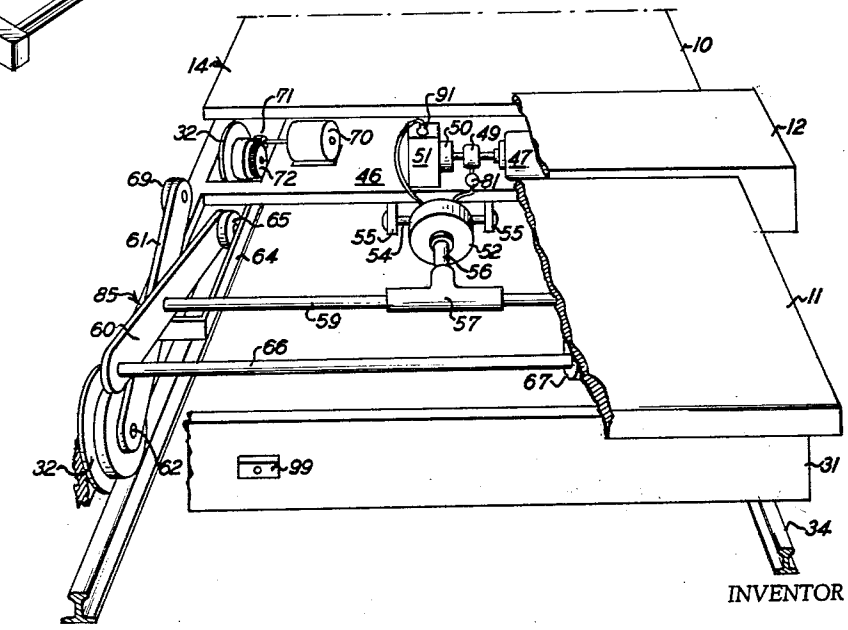


Fig. 7

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SHUTTLE PILER

Filed April 14, 1961 3 Sheets-Sheet 2

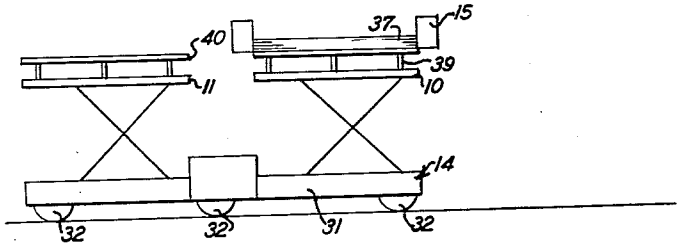


Fig-2

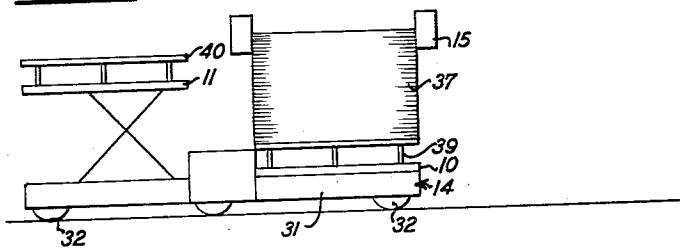


Fig-3

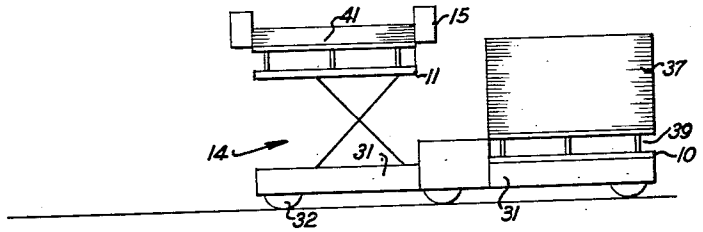


Fig-4

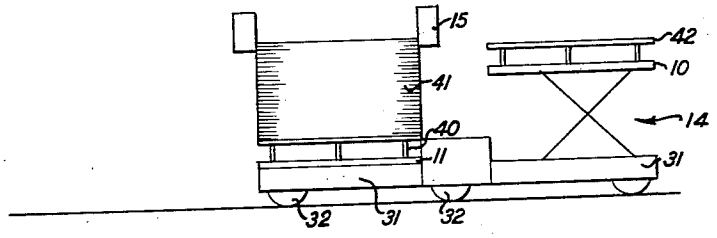


Fig-5

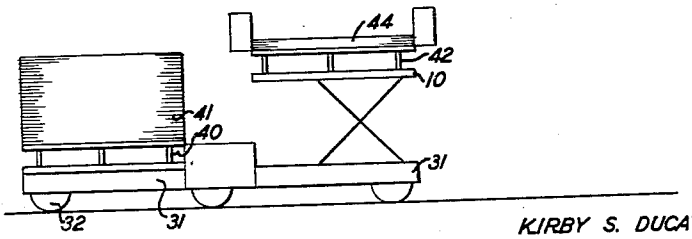


Fig-6

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SHUTTLE PILER

Filed April 14, 1961 3 Sheets-Sheet 3

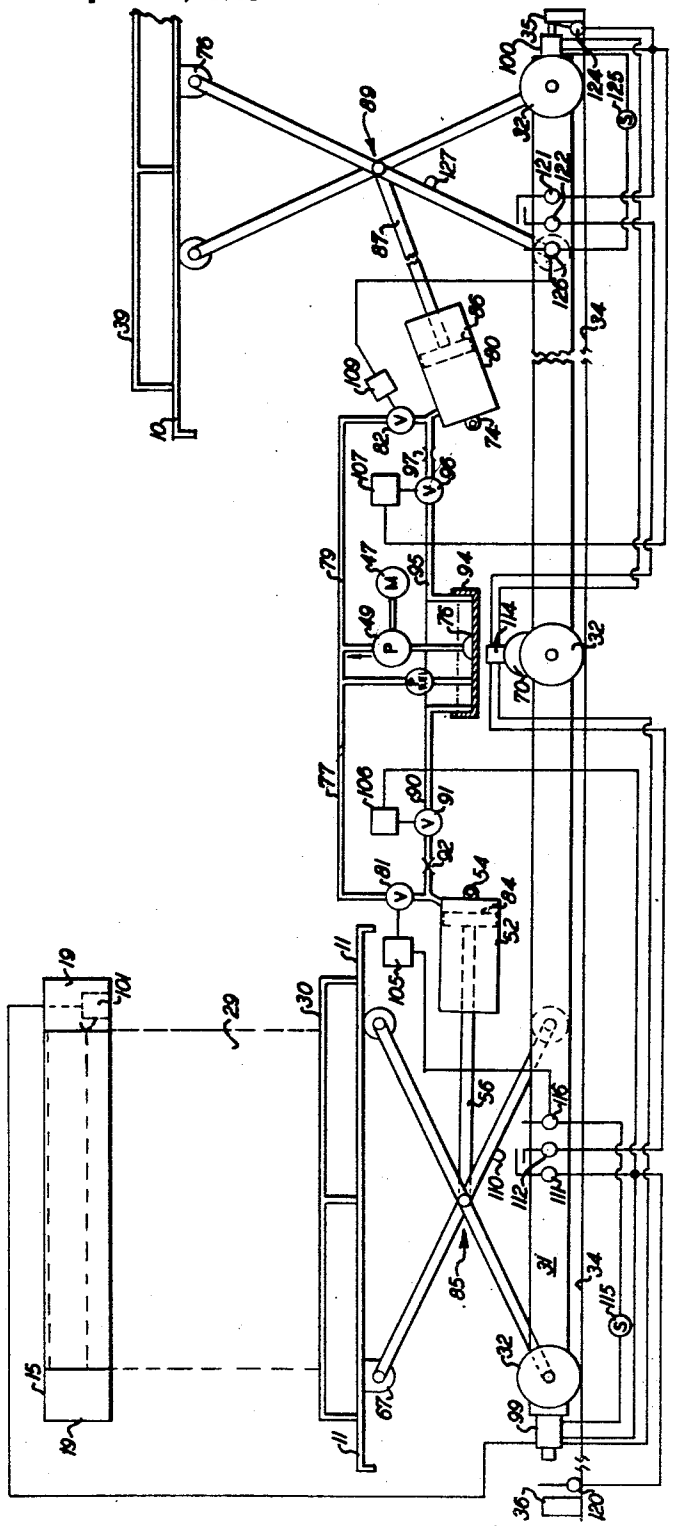


Fig. 3a

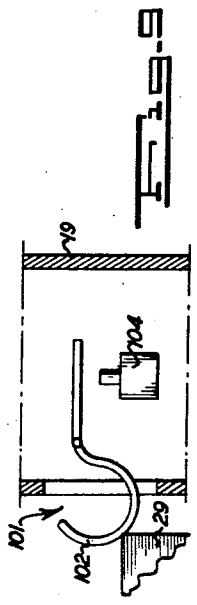


Fig. 3b

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3,131,819
SHUTTLE PILER

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Filed Apr. 14, 1961, Ser. No. 102,969
5 Claims. (Cl. 214—6)

This invention relates to improvements in apparatus used in the handling of sheet material, and more particularly to an improved piler for a layboy.

In the formation of sheets of paper, film, foil, etc., a layboy is usually provided for stacking the sheets as they are discharged from the cutter. The conventional layboy includes a series of joggers which constantly move back and forth against the edges of the sheets as they are being stacked to achieve their vertical alignment, and a mechanism to maintain the top of the stack at a predetermined level. When the desired number of sheets or height is attained, the cutter is shut down and the stack is lowered. The stack is usually received on a skid which, with the stack, is removed from the layboy and replaced by an empty skid. The time lapse which then occurs while the cutter is not operating is significant and consequently the capacity of the cutter and layboy is seriously affected.

In the continuous type of layboy, a temporary support is provided for the stack while the completed stack is removed. But this does not reduce the time lapse while the filled skid is removed and replaced by an empty skid, and in practice with a high-speed cutter, a layboy of this type cannot handle the stack in the time allowed without the close coordination of at least two men in unloading and replacing the skid. For this reason, at high-speed operations the cutter must be shut down periodically to permit the removal and replacement of skids with the resultant limitation on the efficiency of the cutter and layboy.

The foregoing difficulties are somewhat alleviated by a revolving layboy piler, but it is found with such a piler that centrifugal force on the formed stacks dictates slow rotation of the piler and, as a consequence, the cutter and layboy are shut down for an appreciable length of time. Moreover, the additional space required and type of construction necessary for such a piler make it unsuitable in many existing paper mills.

The object of this invention is to provide a sheet stacking arangement and system for a layboy which overcomes the above deficiencies and can be adapted to existing mills having either conventional or the continuous type of layboy.

Another object is to provide a novel means for expediting the handling of sheets so that the period during which the cutter is shut down is eliminated or substantially reduced.

An advantage of the invention resides in that not only does it save valuable time in providing a rapid exchange of skids in the layboy, but also it is economical insofar as the effective utilization of floor space is concerned. Other objects and advantages will become apparent from the disclosure with respect to the accompanying drawings in which:

FIGURE 1 is a perspective view showing the shuttle piler together with a portion of the layboy;

FIGURES 2 through 6 show a cycle of shuttle pilers in operation. In this respect, FIGURE 2 is a view diagrammatically illustrating the right receiving table in position and starting to receive a stack;

FIGURE 3 is a similar view, showing the stack completed on the right receiving table;

FIGURE 4 is a similar view, showing the left receiving table in position and starting to receive a stack whereas the right receiving table is ready to be unloaded;

FIGURE 5 is a similar view, showing the left receiving table now loaded and the right receiving table unloaded and ready for another stack;

FIGURE 6 is a similar view, showing the completion of the cycle with the left receiving table in position to be unloaded and the right receiving table in position and starting to receive a stack;

FIGURE 7 is a partly cut-away perspective view of the shuttle piler;

FIGURE 8 is a schematic drawing showing the hydraulic system and its electrical control circuit; and

FIGURE 9 is a diagrammatic view of the stack level detector.

The device relates to two platform lifts or receiving tables **10** and **11** which are linked together by a metal housing **12** which contains a hydraulic pump **49**, drive motor **70**, and other apparatus to provide lifting power for the tables **10** and **11** and drive the shuttle piler **14**. The assembly is basically designed to pile sheets of paper, film, foil, etc. with each table in itself being an elevator. The drive mechanism facilitates the rapid removal of a completed pile of paper on one of the tables while at the same time bringing in the second table.

The embodiment illustrated in the drawings shows the shuttle piler **14** in cooperation with a layboy **15** which in this case is a conventional layboy although it will be apparent from the disclosure that the shuttle piler **14** may also be used advantageously with other types of layboys such as continuous layboys. No attempt will be made to described layboy **15** in detail except insofar as it cooperates with the shuttle piler **14** inasmuch as the various designs of layboys are well known in the art. FIGURE 1, therefore, only shows the portion of the layboy which extends over the shuttle piler.

The layboy includes a plurality of conveyors **16** which convey the sheet paper to the piler **14**. Conveyors **16** are conventional such as conveyors **19** in U.S. Patent 2,849,236. It also includes a frame structure **17** which provides support for the terminal end of the conveyors **16**. Arms **19** extend over the shuttle piler as shown in FIGURE 1 from the frame structure **17**. Joining arms **19** are joggers comprising two horizontal shafts **20** and **21** which slideably carry guides **22** and **24**. Guides **22** and **24** may be selectively adjusted and fixed at any desired place along shafts **20** and **21** by securing means **25** and **26**. Joining arms **19** at their extremities away from conveyors **16** is an end guide **27** which acts as a sheet stop for the sheets delivered from conveyors **16**. Well known mechanisms for reciprocating the joggers are contained in arms **19**.

FIGURE 1 shows a stack **29** which has already been received on a skid **30** which, in turn, is carried by the left receiving table **11**. The shuttle piler **14** includes a left receiving table **11** and a right receiving table **10** which are each mounted on electric hydraulic lifts of the scissors type. The shuttle piler also includes a frame structure **31** which is rectangular in shape and provided with a plurality of wheels **32** which are adapted to travel on parallel rails **34** which are laid at right angles to arms **19**. It will thus be appreciated that shuttle piler **14** will travel transversely to the layboy **15** so that either table **11** or table **10** can be positioned to receive sheets from layboy **15**. The track is bounded at each end so that the travel of shuttle piler **14** is limited to that distance necessary to position first one table and then the other table under layboy **15** in a manner as will be presently seen. The limitation of travel is accomplished by stops **35** and **36** secured transversely across either end of rails **34**.

Referring now to FIGURES 2 through 6, it will be seen that the shuttle piler **14** is in starting position with a stack of sheets **37** already received on skid **39** which is supported by the right table **10**. Left table **11** is in elevated

position with a skid **40** carried thereon. FIGURE 3 shows the stack **37** as now completed and table **10** with skid **39** is in lowered position. Left table **11** with skid **40** remains in position as shown in FIGURE 2. When this occurs the shuttle piler **14** automatically moves into position, shown in FIGURE 4, whereby left table **11** is positioned under layboy **15** and has already commenced receiving a new stack **41**. Stack **37** with skid **39** is now ready to be removed from right table **10**. FIGURE 5 shows stack **37** and skid **39** removed. A new skid **42** has been placed on right table **10** and the table has been elevated so as to be ready to receive sheets from layboy **15** when the cycle starts anew. In the meanwhile, stack **41** is now completed and left table **11** together with skid **40** is in a lowered position. At this time the shuttle piler **14** automatically moves to a position whereby right table **10** and skid **42** begin to receive a new stack **44**. The just completed stack **41** and skid **40** are ready for unloading and a replacement of a new skid on left table **11** now is in a lowered position. When this is accomplished, table **11** is elevated and the cycle shown as starting in FIGURE 2 can begin again. It will thus be appreciated that the shuttle piler moves automatically from one side to the other as the stacks are formed in order to permit the loading of a new stack and the unloading of the old stack. The amount of movement of the shuttle piler **14** is minimal and the loading and unloading can be accomplished by one man with a fork lift or by automatic means.

Referring now to FIGURE 7, the structure of the shuttle piler **14** is shown. The rectangular frame structure **31** is borne by six wheels **32** adapted to travel on rails **34**. These wheels are located at positions as shown in FIGURES 2 through 6. A housing **12** is adapted to fit between tables **10** and **11** over a drive and hydraulic section **46**. In section **46** is an electric motor **47** which drives a constant capacity hydraulic pump **49** and a fan **50** for a cooler **51**. A sump tank not shown is disposed under pump **49** and cooler **51**. This hydraulic pump provides hydraulic fluid under pressure to cylinders **52** and **80** (see FIG. 8) which elevate and lower tables **10** and **11**. For convenience, only the cylinder **52** for the left table **11** is shown in FIGURE 7. This cylinder is secured so as to pivot about a rod **54** which, in turn, is secured to lugs **55** extending downwardly from section **46**. The cylinder **52** contains a piston **84** (see FIG. 8) and piston rod **56** which acts against a T-bearing **57**. Bearing **57** carries a shaft **59** which extends through scissor-link members **60** and **61**. Link member **61** is pivotally secured at wheel axle **62** to the frame structure **31**. Link member **60** is adapted to roll in a guide **64** on its lower end. Guide **64** in turn is secured to frame structure **31** and provides support for link member **60** through roller **65**. Extending transversely from the upper end of link member **60** is a shaft **66** which extends between link member **60** and a similar link member not shown on the opposite side of frame structure **31**. A lug **67** attached to the underside of table **11** embraces shaft **66** and secures table **11** in a position relative thereto. Several such lugs may be employed for this purpose. The inner portion of table **11** rides on roller **69** and a similar roller in a similar scissor link structure opposite thereto. The shuttle piler **14** is moved to and fro on tracks **34** by means of an electric motor **70** which turns a gear **71** which in turn meshes with and turns a gear **72** which is fixed to the proximate wheel **32**. In the hydraulic system there is a stop valve **81** and a discharge valve **91**. It will be understood that the mechanism for lifting table **10** is the same as that shown under table **11** in FIGURE 7.

Referring now to FIGURE 8, it will be seen that hydraulic pump **49** takes suction through a strainer **76** and discharges through lines **77** and **79** to cylinders **52** and **80** under the left table **11** and the right table **10**, respectively. Stop valves **81** and **82** are interspersed between the pump and the cylinders for each of the respective lines. The hydraulic pressure in cylinder **52** acts against piston **84** and piston rod **56** to control the height of the scissor-type elevator **85** under table **11**. In cylinder **80** a piston **86** is acted upon by hydraulic pressure to move a piston rod **87** in scissor-type lift **89** which controls the elevator of table **10**. Connected to the hydraulic fluid in cylinder **52** is a line **90** containing a stop valve **91** and a throttling or flow control valve **92**. Line **90** acts to carry hydraulic fluid back to sump **94**. Similarly, there is a line **95** which is interconnected with the hydraulic fluid in cylinder **80** to discharge fluid from cylinder **80** into sump **94** through a stop valve **96** and a throttling or flow control valve **97**. At either end of frame structure **31** are limit switches **99** and **100**.

Mounted on layboy **15** is a pile level detector **101** which is operatively connected with the pile lowering mechanism to maintain the top of the stack of sheets at a substantially constant level. The upper end of detector **101** is provided with a portion **102** curved in the direction of the pile and as this upper portion engages the edge of the pile and is held away from the pile it operates switch **104** which momentarily opens stop valve **91** to permit a small amount of hydraulic fluid to be discharged from cylinder **52** and thus cause a lowering of stack **29**. As the stack **29** lowers it permits detector **101** to move in a position overlying the pile (FIGURE 9) and thereby closes the stop valve **91** to stop the operation of the pile lowering mechanism.

Each of the stop valves **81**, **82**, **91** and **96** are controlled by solenoids **105**, **106**, **107** and **109**, respectively. In operation, when the stack **29** is of sufficient size, a projection **110** extending from the scissor links of mechanism **85** contacts a limit switch **111** which through solenoid **106** opens stop valve **91**. This also actuates switch **120** which causes the cutter mechanism to be shut off. When stack **29** lowers a slightly additional amount, projection **110** contacts a second limit switch **112** which actuates motor controller **114** of motor **70**, which, in turn, causes the shuttle piler **14** to travel to the left to such a position whereby table **10** will be ready to receive a new stack and table **11** is ready to be unloaded. When this occurs, limit switch **120** is deactuated and the cutter mechanism is started. Skid **30** and stack **29** are removed from table **11** and a new skid is replaced on the table. The operator then closes the switch **115** which opens valve **81** heretofore closed, through solenoid **105**. Hydraulic fluid then flows into cylinder **52** until limit switch **116** is actuated by the scissor-type elevator **85** which acts to turn off switch **115** and close valve **81** through solenoid **105**. In this position hydraulic fluid is trapped in cylinder **52** until the pile level detector will permit the discharge of the fluid through valve **91** in the manner previously described. When the shuttle piler **14** reaches the position whereby table **10** is to receive sheets, limit switch **99**, through controller **114**, will automatically stop motor **70**. Pile level detector **101** is selective as to which side it will control by passing through limit switches **99** and **100** whereby the controlling current of detector **101** is only permitted to go to the hydraulic system which is currently receiving sheets. It will be understood that motor **70** is reversible through control **114** and will run one way and then the other depending upon which elevator component supplies the actuation. The electric system for both elevators is, of course, the same and it will be appreciated that the shuttle piler will run automatically to and fro without the necessity of human control once the layboy commences the stacking of sheets.

On the right side, limit switches **124**, **121**, **122** and **126** correspond to limit switches **120**, **111**, **112** and **116** on the left. It will be understood that an electrical power is supplied where needed, as, for example, to motors **47** and **70**, controller **114**, switches **99**, **100**, **101**, **111**, **115**, **121** and **125**.

Once the operation commences, the only manual control required is for the raising of the tables after a new

skid has been placed thereon. This also may be performed automatically, if desired, but it is not done here for reasons of economy and safety.

The above description and drawings disclose a single embodiment of the invention, and specific language has been employed in describing the several figures. It will, nevertheless, be understood that no limitations of the scope of the invention are thereby contemplated, and that various alterations and modifications may be made such as would occur to one skilled in the art to which the invention relates.

I claim:

1. In combination with a layboy adapted to receive sheet material being successively fed thereto and arrange said sheet material in a vertical stack, a piler operatively associated with said layboy to receive sheets therefrom in a vertical stack comprising a rectangular frame structure mounted to move transversely with respect to said layboy, a pair of tables linked by a housing carried by said frame structure, motive means within said housing to position selectively one of said tables to receive sheets being fed to the layboy, hydraulic means for independently raising and lowering each of said tables, and control means associated with said layboy responsive to the height of the pile of said sheet material being formed to operate said lowering means of the selected one of said tables which is receiving sheets from the layboy so as to gradually lower said table as the height of the pile of sheet material thereon increases and switch means to cause said motive means to position the other of said tables to receive sheets fed to said layboy when the selected one of said tables has lowered a predetermined amount.

2. In combination with a layboy adapted to receive sheet material successively fed thereto and arrange said sheet material in a vertical stack, a piler operatively associated with said layboy to receive sheets therefrom in a vertical stack comprising a frame structure, a pair of parallel, horizontal rails laid transversely to said layboy wheels supporting said frame structure adapted to roll on said rails, a pair of hydraulic elevator means connected to said frame structure, a table carried by each of said elevator means, a housing linking said tables, motive means within said housing associated with said frame structure to move it on said rails and to position selectively one of said tables to receive sheet material being fed to said layboy, pile level control means responsive to the height of said pile of sheet material controlling said elevator means to maintain said pile of sheet material at a substantially constant height by gradually lowering said elevator means, and switch means for said motive means whereby when said table is lowered a predetermined amount said selected table with the pile of sheet material thereon is positioned for unloading and said other table is positioned to receive said sheet material to said layboy.

3. In combination with a layboy adapted to receive sheet material successively fed thereto and arrange said sheet material in a vertical stack, a piler operatively associated with said layboy to receive said sheet material therefrom in a vertical stack comprising a rectangular frame structure, a pair of parallel, horizontal rails transverse to said layboy supporting wheels mounted on said frame structure adapted to roll on said rails, a pair of independent elevator means carried by said frame structure, a receiving table carried by each elevator means, a housing linking said tables, said elevator means comprising an electric, hydraulic lift of the scissors type, motor means within said housing associated with said frame structure adapted to move it along said rails, stopper means associated with said piler to position selectively one of said receiving tables to receive sheet material fed to said layboy, pile level detector control means responsive to the height of said pile of sheet material relative to said layboy controlling said elevator means whereby to maintain said pile of sheet material at a substantially constant height by gradually lowering said elevator means, and motor switch means for said motor means whereby when said receiving table is lowered a predetermined amount said selected table with said pile of sheet material thereon is positioned for unloading and said other table is positioned to receive said sheet material to said layboy by transversely moving said frame structure along said rails.

4. In combination with a layboy adapted to receive sheet material being successively fed thereto and arrange said sheet material in a vertical stack, a piler operatively associated with said layboy to receive sheets therefrom in a vertical stack comprising a rectangular frame structure mounted to move transversely with respect to said layboy, a pair of tables carried by said frame structure, a housing linking said tables, motive means within said housing to position selectively one of said tables to receive sheets being fed to the layboy, hydraulic means for independently raising and lowering each of said tables, and control means associated with said layboy responsive to the height of the pile of said sheet material being formed to operate said lowering means of the selected one of said tables which is receiving sheets from the layboy so as to lower gradually said table as the height of the pile of sheets material thereon increases, and switch means to cause said motive means to position the other of said tables to receive sheets fed to said layboy when the selected one of said tables has lowered a predetermined amount, and further control means associated with the height of the selected one of said tables to discontinue the feeding of said sheet material during the positioning of the other of said tables.

5. The mechanism of claim 4 wherein said piler is mounted on tracks, and additional control means are associated with the position of said piler on said tracks to deactivate said motive means.

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