Oct. 8, 1963 O. G. JEDDELOH 3,106,301

STACK TURNER

Filed Aug. 29, 1960 2 Sheets-Sheet 1

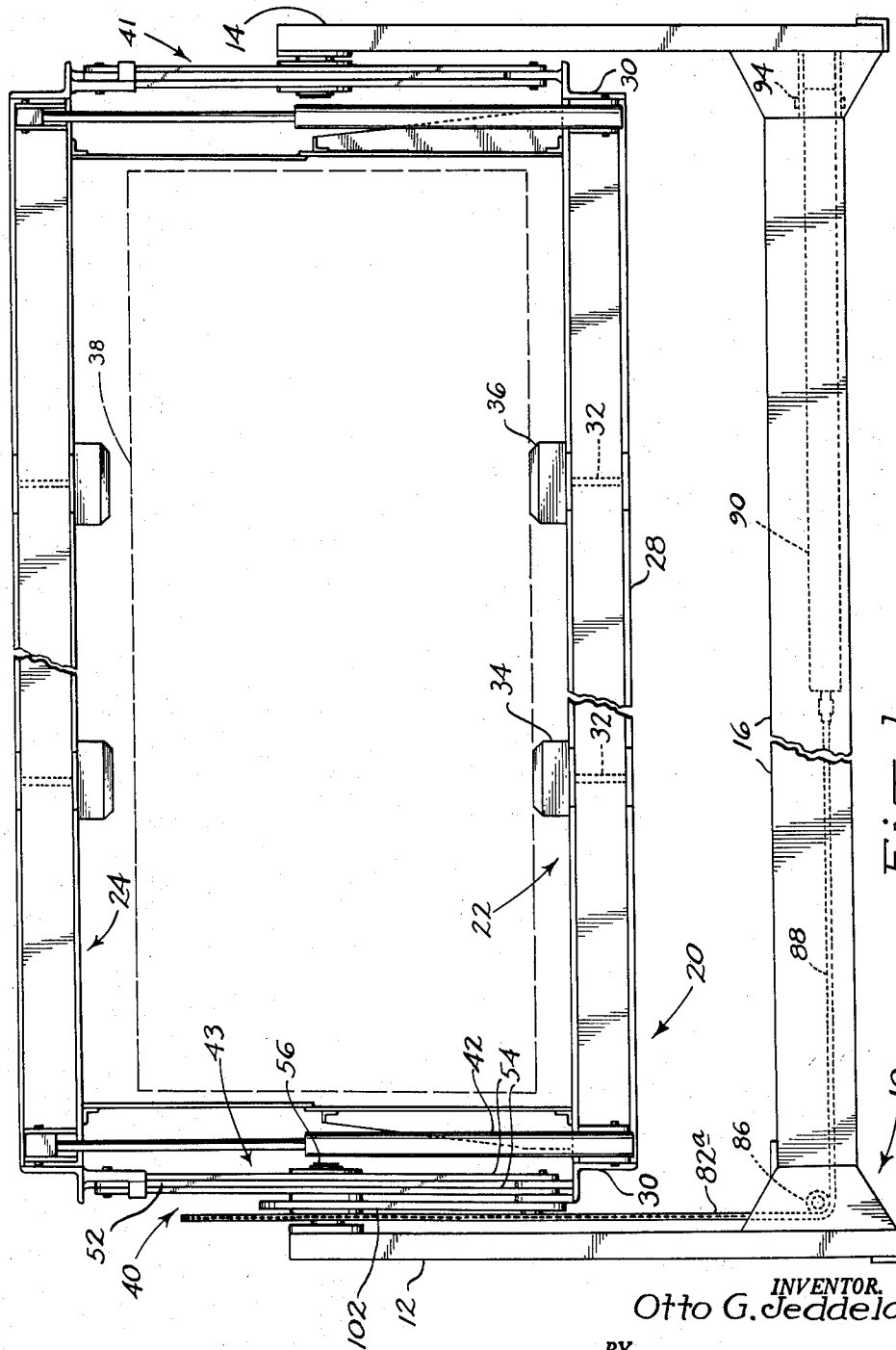


Fig. 1.

INVENTOR.
Otto G. Jeddeloh

BY
Ramsay and Kolisch
Attys.

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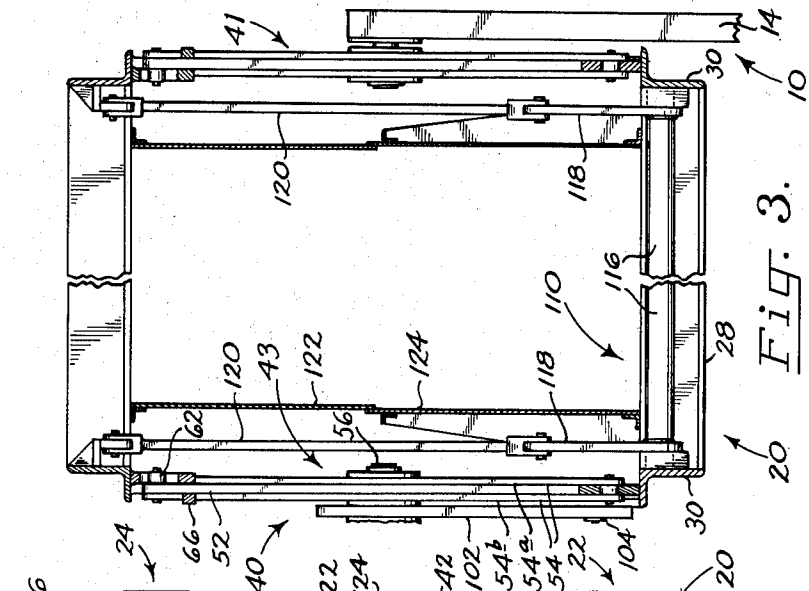


Fig. 3.

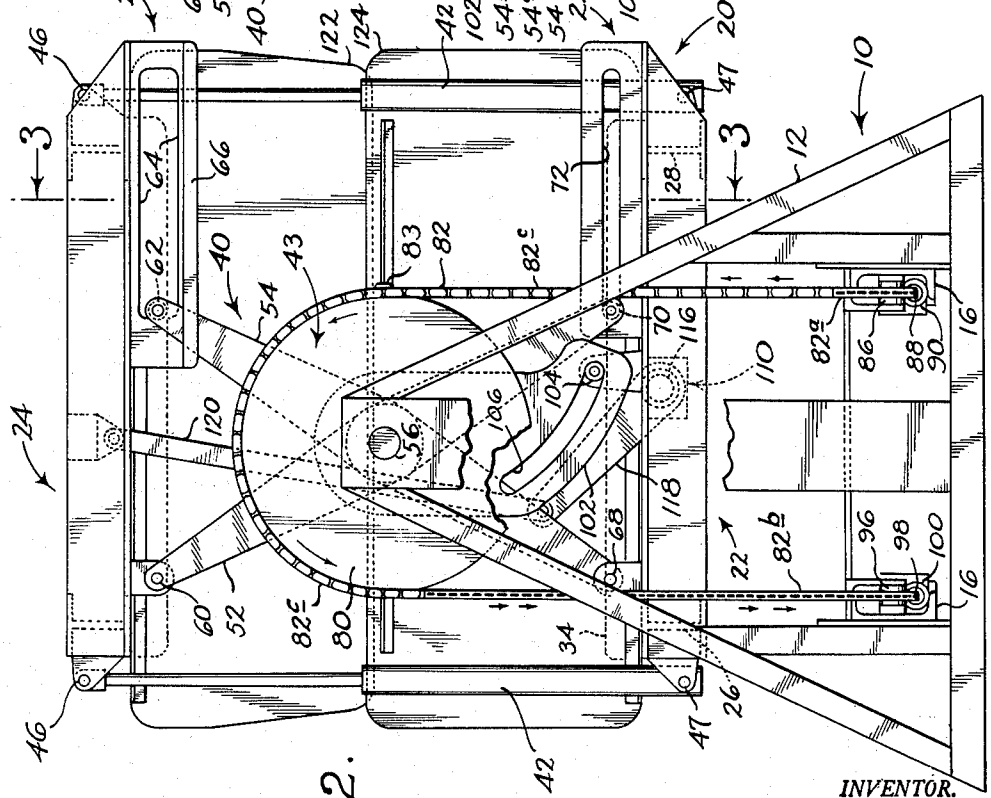


Fig. 2.

INVENTOR.
Otto G. Jeddeloh
BY
Ramsey and Klinck
Attys.

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STACK TURNER

Otto G. Jeddeloh, 266 Lathrop Road, Grants Pass, Oreg.

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This invention relates to a mechanism for turning a stack over, so that the bottom side of a stack may become the top side. More particularly, the invention relates to an improved turner mechanism for turning over stacks, such as stacks of veneer, that is easy to load and unload, and characterized by a number of novel features that make it practical and easy to use. Although, the invention is described in connection with the turning over of stacks of veneer, it should be obvious that the turner mechanism could be adapted to other applications where similar operating problems are encountered.

In the usual plywood plant, it is usually necessary at some stage in the manufacture of panels to turn over a stack of veneer sheets. Mechanisms known to date generally have been expensive and bulky pieces of equipment. Some have been difficult to load and unload. Others have resulted in damage to veneer sheets, by failing to grip properly a stack of sheets so that sheets have fallen from a stack during turning.

This invention contemplates a stack turner which comprises a pair of oppositely disposed stack-supporting or clamping structures (that in operation of the turner are brought together against opposite sides of a stack to hold it). Adjacent sets of ends of the supporting structures are connected together by a pair of collapsible-extensible means that adjust themselves on relative movement of the two structures toward and away from each other between contracted and extended positions, respectively. The supporting structures are mounted on a main frame for the turner by means that pivotally supports the pair of collapsible-extensible means. There is absent in the construction any encompassing rigid framework provided for the purpose of mounting the supporting structures. Each is supported on the other through the collapsible-extensible means. This contributes to a simple construction, and further makes possible savings in operating costs, since the mass of the movable parts in the turner may be kept at a minimum.

Each collapsible-extensible means has a mounting portion spaced intermediate the supporting structures that in all relative positions of the supporting structures occupies substantially the same proportional spacing from each. This mounting portion is connected by a pivot means to the main framework, and the supporting structures swing in arcs about the pivot axis of the pivot means. A condition where the parts stay in balance relative to the pivot means results, which means a smoother turning action and reduces wear and stressing in the parts.

Thus, a general object of the invention is to provide an improved construction for a stack turner, which comprises a pair of opposed and spaced-apart stack-supporting structures, and means interconnecting these through which the two stack-sunpporting structures are mounted on a main frame.

Another object is to provide an improved stack turner which comprises opposed stack-supporting structures, collapsible-extensible means interconnecting adjacent sets of ends of the structures, and pivot means mounting each collapsible-extensible means at a location that in all relative positions of the supporting structures occupies the same proportional spacing from each of the structures.

Another object is to provide such a turner where each collapsible-extensible means comprises scissor mechanism having legs pivotally interconnected intermediate their ends.

According to this invention, fluid rams extend between the stack-supporting structures, and these are actuated to draw the structures together, or to spread them apart. A feature and object of the invention is to provide a turner where rams interposed between a pair of stack-supporting structures are used to change the spacing between the two, which further includes means mechanically interconnecting opposite sets of ends of the supporting structures so that movement in one set of ends of the structures is accompanied with a corresponding movement in the other set of ends of the structures. By such interconnecting means, binding in the parts of the rams is prevented, as the stack-supporting structures in a longitudinal direction are kept parallel.

Although the overall thickness of the opposite ends of a stack of veneer ordinarily is about the same, in a transverse direction the thickness of a stack usually varies considerably. Thus, it is preferable in a turner to provide for supporting structures that can tilt relative to each other about longitudinally extending axes. Such tilting enables the supporting structures better to clamp onto a stack. It is another object of this invention to provide a novel stack turner where a limited amount of such tilting is possible.

Another object of the invention is to provide improved power-actuated means for swinging the stack-supporting structures of a turner about a 180° arc, so that first one and then the other may be shifted to an uppermost position, with the opposite one moving to a lowermost position.

The turner may easily be equipped with a control means operable to cause its opposed supporting structures first to come together until a certain clamping pressure is reached, and then automatically be swung so as to flip over a stack.

Other objects and advantages of the invention will become more fully apparent, as the following description is read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side elevation of a stack turner constructed according to an embodiment of the invention;

FIG. 2 is an end elevation of the stack turned in FIG. 1; and

FIG. 3 is a cross-sectional view taken along the line 3—3 in FIG. 2.

Referring now to the drawings, in the embodiment of the stack turner shown a main supporting frame is indicated at **10**. The frame includes end standards **12** and **14** at opposite ends of the turner, and these are interconnected and made rigid in an upright position by beams **16** extending between the standards adjacent their bases. Between the standards, and supported above beams **16**, is stack-gripping and turning mechanism, indicated generally at **20**. Mechanism **20** can be actuated to clamp onto the opposite sides of a stack, and then to turn over the stack to place the bottom side of the stack on top.

Specifically, stack-gripping and turning mechanism **20** comprises a pair of opposed (and in the position shown vertically spaced-apart) stack-supporting or clamping structures, indicated at **22** and **24**. The two are similar in construction, and for the most part only one of them will be described in detail.

Considering stack-supporting structure **22**, this comprises frame members **26**, **28** extending between the ends of the apparatus and braces **30**, **32** connected to members **26**, **28** extending transversely of members **26**, **28**. Frame members **26**, **28** and braces **30**, **32** define a rigid, skeletal frame that is substantially rectangular in outline. Secured to one side of frame members **26**, **28** are supports **34**, **36**. The upper surfaces of these supports in FIG. 1 come into contact with the face or side of a stack during the gripping

of a stack. The supports space the stack from frame members 26, 28 so that a stack may be easily loaded (as with a fork-lift tractor, with the forks of the tractor clearing the side of the stack and the frame members). A stack supported on supports 34, 36 is indicated in dashed outline in FIG. 1 at 38.

Interconnecting adjacent sets of ends of stack-supporting structures 22, 24 are a pair of collapsible-extensible means 40, 41. One is to the left and one is to the right of stack 38 in FIG. 1. The supporting structures are mounted on main frame 10 through means 40, 41 that interconnect the structures.

Collapsible-extensible means 40, 41 are similar and again only one is described in detail. With reference to collapsible-extensible means 40 this comprises a pair of expandable-contractable motors or fluid rams 42 one adjacent each side of the structure and a scissor mechanism 43.

Each ram is pivotally connected at its cylinder end to one of the supporting structures (structure 22 in the figures) and pivotally connected at its rod end to the other of the supporting structures (structure 24 in the figures). The pivot connections for the rod and cylinder ends are shown at 46 and 47, respectively The pivot connections accommodate pivotal movement about horizontal axes paralleling the length of the supporting structures. On extension of the rams, the supporting structures move apart, and on contraction they move together. The pivot connections described enable some relative tilting of the supporting structures about axes extending longitudinally of the supporting structures. Thus, if the left ram 42 in FIG. 2 is extended to a greater extent than the right ram 42, the two stack-supporting structures tilt so that their right set of edges in FIG. 2 are closer together than their left set of edges. It is this tiltable feature that enables the stack-supporting structures to clamp firmly onto a stack even though the stack is thicker along one edge than along the other.

Scissor mechanism 43 comprises crossed arms 52, 54 (arm 54 having portions 54*a*, 54*b* disposed on either side of arm 52 as seen in FIG. 3) pivotally interconnected intermediate their ends by and pivotally supported on a pivot shaft 56. The upper set of ends of the crossed arms in the figures are pivotally secured to supporting structure 24. Specifically, the upper end of arm 52 is pivotally connected by a fixed pivot connection 60 to structure 24. Arm 54 mounts a roller or follower 62 disposed in a guide slot 64 provided structure 24 so that this end may pivot with respect to the structure and also shift along the length of the slot. A retainer bar 66 holds the arm with the follower within slot 64. The lower set of ends of the crossed arms are pivotally secured to stack-supporting structure 22. Thus, arm 54 has a lower end pivotally connected by a fixed pivot connection 68 to structure 22. Arm 52 at its lower end carries a roller or follower 70 shiftable in a slot 72 so that this end may shift and pivot relative to structure 22.

As already indicated, side tilting of the two supporting structures is desired, and rams 42 are connected to the supporting structures in such a manner as to make this possible. If the ends of the scissor mechanism were mounted so that no movement of the ends up and down relative to the supporting structures was possible, side tilting of the supporting structures would be impossible. For this reason, slot 64 accommodating roller 62 is made somewhat larger than the roller, so that there is some limited play provided the roller within the slot. This amount of play provided roller 62 determines the extent to which the supporting structure may tilt with respect to each other.

The crossed, center portions of arms 52, 54 constitute a mounting portion for collapsible-extensible means 40 (used in mounting structures 22, 24 on frame 10) that is spaced intermediate the two supporting structures 22, 24. In all relative positions of the supporting structures, this mounting portion has the same proportional spacing from structures 22, 24. This is important in obtaining balance, as with either wide or narrow stacks, supporting structures 22, 24 are always positioned at equal distances to either side of the center of shaft 56, which forms the axis about which the supporting structures are swung during operation of the turner mechanism.

Power-actuated mechanism or means is provided for swinging stack-supporting structures 22, 24 about the horizontal axis that coincides with the center of shaft 56, so that either one or the other may be swung to the lowered, supporting position of structure 22 in the drawings. Thus, at one end of the apparatus (the left end in FIG. 1) and rotatably supported on shaft 56 is a wheel or member 80 (see FIG. 2). A chain 82 passes over wheel 80, and is secured to the wheel by a fastener 83. End portions 82*a*, 82*b* of the chain have links disposed at right angles to the links of an intermediate portion 82*c*. End portion 82*a* of the chain is trained over a sprocket 85, and thence is connected to the rod 88 of a fluid ram 90, the cylinder end of which is secured to frame 10 by a pivot connection 94. End portion 82*b* is trained over a similar sprocket 96 and is connected to the rod 98 of a ram 100, the cylinder end of which is similarly connected by a pivot connection (not shown) to frame 10.

The power-actuated means described has a double stroke. The strokes of the rams are selected so that when one ram is extended and the other ram is contracted, wheel 80 is rotated on shaft 56 in one direction over an angle of 180°. Reversing the actuation of the rams rotates wheel 80 in the opposite direction over a 180° angle.

Wheel 80 is operatively connected to at least one of the supporting structures (the lower one in the figures) by an arm 102 that is joined to the wheel. The lower end of arm 102 is anchored to structure 22 through follower or roller 104 mounted on structure 22 and a cam slot 106 provided the end of arm 102 (the cam slot and follower constituting anchoring means). When wheel 80 is rotated arm 102 swings causing the supporting structures to swing. The cam slot and follower organization accommodates relative vertical shifting of the supporting structures. Slot 106 is shaped in such a manner as to enable the supporting structures to be moved vertically relative to each other in FIG. 2 with such movement not accompanied by any shifting of the supporting structures from the horizontal position shown.

A mechanical means 110 (see FIGS. 2 and 3) is provided that interconnects opposite sets of ends of the supporting structures, and regulates movement of the two sets of ends whereby any movement in one set corresponds substantially to movement in the other set. Thus, 116 indicates an elongated shaft extending the length of lower supporting structure 22 which has its ends journaled in beams 30 for this lower structure. Secured to the shaft adjacent each end is a crank arm 118. The outer end of each crank arm is linked by a bar or link 120 to an end portion of supporting structure 24 thereabove. Assuming for purposes of illustration that the right set of ends of the supporting structures in FIG. 3 are moved together a predetermined amount, this movement produces rotation of the shaft 116 and a corresponding movement in the left set of ends of the structures in FIG. 3. By interconnecting the ends of the structures as described, such binding in the parts (for instance, in rams 42) as might result were the ends moved toward or away from each other an unequal amount, is prevented.

Panels 122, 124 are provided adjacent each set of ends of structures 22, 24, to shield the rams and other mechanism at the ends of the structures from stacks loaded into the turner mechanism.

Explaining the operation of the apparatus described, assuming that the supporting structures are in the relative position shown, a stack may be loaded between the structures using a fork-lift tractor or other loading device. Rams 42 at opposite corners of the spaced-apart structures may then be contracted, to bring the two struc-

tures together. This is accompanied with swinging of the arms of the scissor mechanisms, and traveling of the ends of arms **52**, **54** along slots **64**, **72**. After structures **22**, **24** firmly clamp against opposite sides of the stack, rams **90**, **100** may be actuated to cause 180° swinging movement of the supporting structures and inversion of the stack. The stack may then be readily unloaded by extension of rams **42** to move the stack-supporting structures apart.

Important is the fact that there is absent any surrounding or encompassing rigid framework mounting the two supporting structures. Thus, the mass of such a framework is eliminated. Further, a more compact organization is possible. To be noted also is that the pivot axis of collapsible-extensible means **40**, **41** in all relative positions of the supporting structures is always midway between the two supporting structures. Put in another way, the proportional spacing of the pivot axis from the two structures remains constant. By maintaining proper balancing, easy turning and smooth operation is obtained.

The turner mechanism may easily be controlled by means producing rotation of wheel **80** automatically on a certain clamping pressure being produced in structures **22**, **24**. Thus, a pressure responsive switch could be used to start proper actuation of rams **90**, **100** as soon as the pressure of fluid in rams **42** reached a certain level. The angle that wheel **80** is rotated over is limited by the length of the stroke of rams **90**, **100**.

While there has been described an embodiment of the invention, it is not intended to be limited to the specific form of the invention shown, as it is understood that changes may be made in the parts in their organization without departing from the invention. It is desired to cover all modifications and variations of the invention that would be apparent to those skilled in the art, and that come within the scope of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. A stack turner comprising a frame, a pair of opposed and spaced-apart and substantially coextensive stack-supporting structures, means mounting the pair of structures on said frame whereby they may be swung as one about a horizontal axis extending between the structures, power-actuated means for shifting the two structures toward and away from each other between contracted and extended positions, respectively, the latter means comprising an expandable-contractable motor extending between and connected at its ends to the two structures at at least one set of ends of the structures, and mechanical link means interconnecting said one set of ends of the structures and the set of ends of the structures opposite said one set of ends and constructed to produce movement in said opposite set of ends corresponding to the movement in said one set of ends.

2. A stack turner comprising a frame, a pair of opposed and spaced-apart and substantially coextensive stack-supporting structures, means mounting the pair of structures on said frame whereby they may be swung as one about a horizontal axis parallel to the structures, power-actuated means for shifting the two structures toward and away from each other between contracted and extended positions, respectively, the latter means comprising an expandable-contractable motor extending between and connected at its ends to the two structures at one set of ends of the structures and a second expandable-contractable motor extending between and connected at its ends to the two structures at the set of ends of the structures opposite said one set of ends, and mechanical link means interconnecting the two sets of ends of the structures equalizing the movement of said one set of ends and the movement of said opposite set of ends.

3. A stack turner comprising a frame, a pair of opposed and spaced-apart and substantially coextensive stack-supporting structures, means mounting the pair of structures on said frame whereby they may be swung as one about a horizontal axis parallel to the structures, means for shifting the two structures toward and away from each other between contracted and extended position, respectively, the latter means comprising an expandable-contractable motor extending between and connected at its ends to the two structures at one set of ends of the structures and another expandable-contractable motor extending between and connected at its ends to the two structures at the set of ends of the structures opposite said one set of ends, and mechanical link means interconnecting the two sets of ends of the structures equalizing the movement of said one set of ends and the movement of said opposite set of ends, said mechanical link means comprising a shaft extending the length of one of the structures and journaled at its ends on said one structure, a crank arm secured to said shaft adjacent each end of said one structure, and links connecting the crank arms to the other of said structures adjacent the ends of said other structure.

4. A stack turner comprising a frame, a pair of opposed spaced-apart and substantially coextensive stack-supporting structures, means mounting the pair of structures on said frame whereby they may be swung as one about a horizontal axis parallel to the structures, means for shifting the two structures toward and away from each other between contracted and extended positions, respectively, the latter means comprising a pair of fluid rams at each set of ends of the structures, one disposed adjacent one and one disposed adjacent the other set of sides of the structures, each of said rams being connected at opposite ends to the two structures, and mechanical link means interconnecting the two sets of ends of the structures equalizing the movement of said one set of ends and the movement of the opposite set of ends of the structures, said mechanical link means comprising a shaft extending along the length of one of said structures and journaled at its ends on said one structure, a crank arm secured to said shaft adjacent each of its ends, and a link connecting each crank arm to the other of said structures.

5. A stack turner comprising a frame, a first stack-supporting structure defining a substantially horizontal supporting frame, a second stack-supporting structure substantially coextensive with and above the first and defining a supporting plane substantially parallel to the first-mentioned supporting plane, collapsible-extensible means mounting one of the supporting structures on the other and collapsible on extensible and relative movement of the two supporting structures toward and away from each other between contracted and extended positions, respectively, said collapsible-extensible means comprising scissor mechanism having crossed arms and means pivotally interconnecting the arms intermediate their ends, one set of ends of the arms being connected to one of the structures and the other set of ends of the arms being connected to the other of the structures, motor means for moving the two structures toward and away from each other, and mounting means mounting on said frame the means pivotally interconnecting the arms whereby the supporting structures are supported on the frame, said mounting means accommodating swinging of the supporting structures about a horizontal axis.

6. A stack turner comprising a frame, a first stack-supporting structure defining a substantially horizontal supporting plane, a second stack-supporting structure substantially coextensive with and spaced above the first defining a supporting plane substantially parallel to the first-mentioned supporting plane, scissor mechanism at each set of ends of the structure interconnecting the two structures whereby one is supported on the other, each scissor mechanism comprising a pair of crossed arms and means pivotally interconnecting the arms intermediate their ends, means mounting on said frame the means pivotally interconnecting the arms whereby the supporting structures may be swung in an arc about a horizontal

axis disposed between the structures, and means for shifting the two structures toward and away from each other between contracted and extended positions, respectively, the latter means comprising an expandable-contractable motor extending between and connected at its ends to the two structures at at least one set of ends of the structures, and mechanical link means interconnecting said one set of ends of the structures and the other set of ends of the structures constructed to produce movement in said other set of ends corresponding to the movement in said one set of ends of the structures.

7. The turner mechanism of claim 6 wherein the mechanical link means interconnecting the sets of ends of the two structures comprises a shaft extending the length of and journaled adjacent each of its ends on one of the structures, a crank arm connected to the shaft adjacent each of its ends, and a link connecting the end of each crank arm to the other supporting structure.

8. A stack turner comprising a frame; a pair of opposed and spaced-apart, substantially parallel, stack-supporting platform structures; means mounting said platform structures on said frame whereby they may be swung as one about a rotation axis which extends between the ends of

the platform structures and which substantially parallels the platform structures; said last-mentioned means including means accommodating tilting of at least one of said platform structures about an axis which parallels said rotation axis; and means adjacent at least one set of ends of the platform structures for shifting the structures toward and away from each other between contracted and extended positions, respectively; said last-mentioned means comprising a first expandable and contractable motor means extending between and connected adjacent its ends to said platform structures adjacent one set of sides of the platform structures, and a second expandable and contractable motor means extending between and connected adjacent its ends to said platform structures adjacent the other set of sides of the platform structures.

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