Feb. 24, 1970 J. FLITTER 3,497,082

STACK TURN-OVER APPARATUS

Filed Nov. 20, 1967 4 Sheets-Sheet 1

FIG. 1

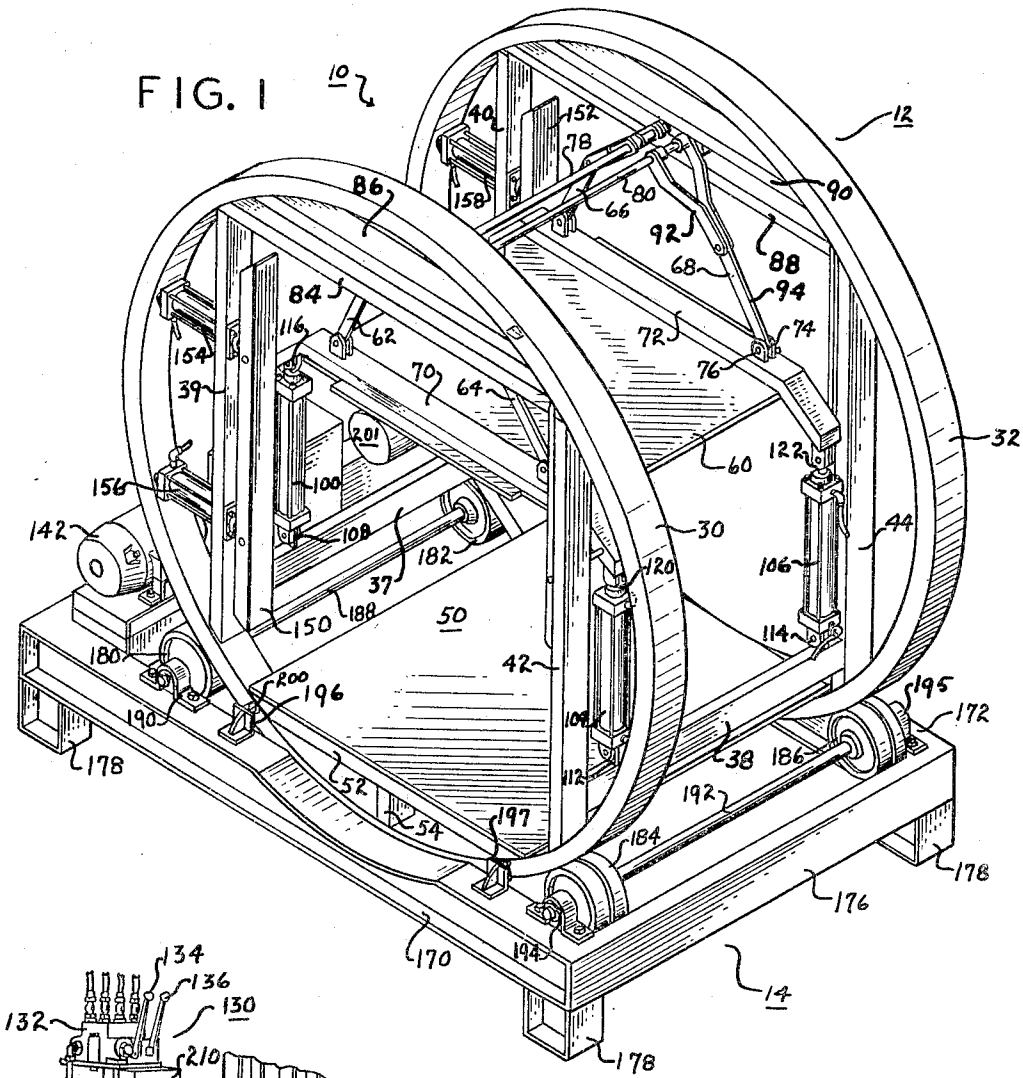
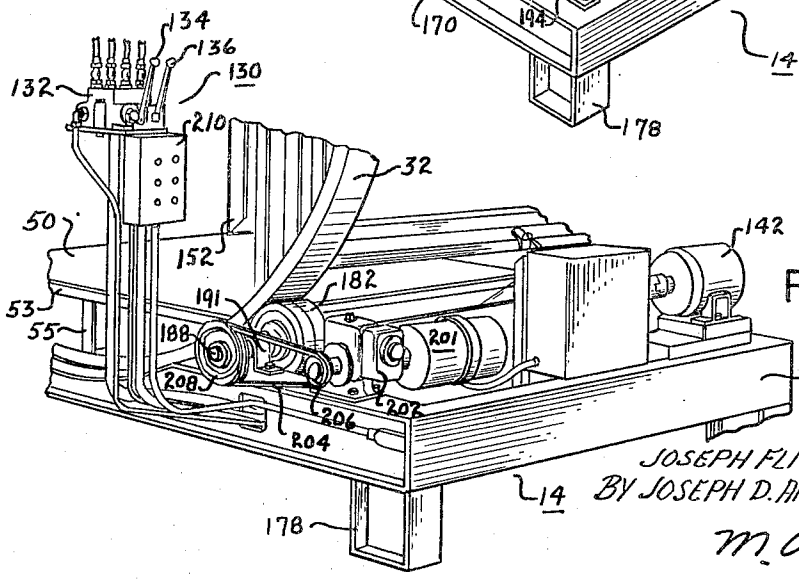


FIG. 2



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STACK TURN-OVER APPARATUS

Filed Nov. 20, 1967 4 Sheets-Sheet 2

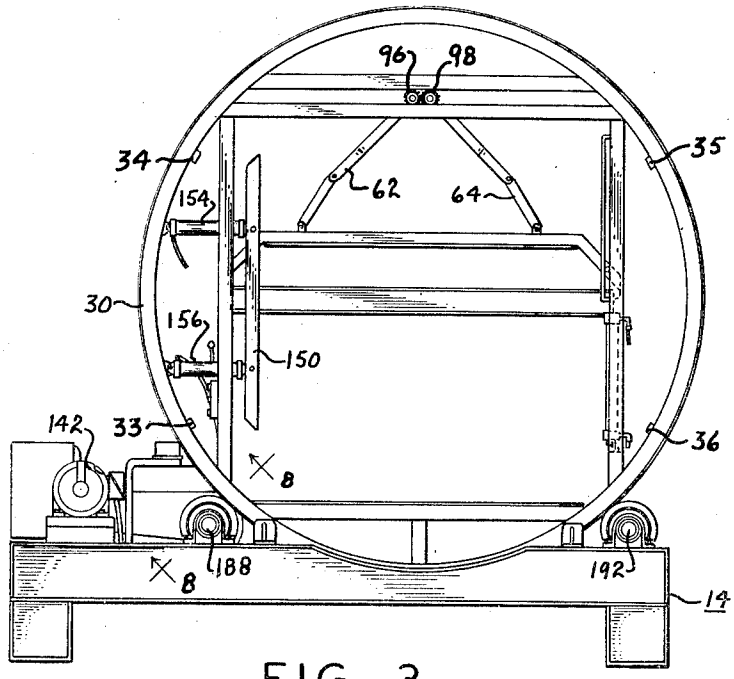


FIG. 3

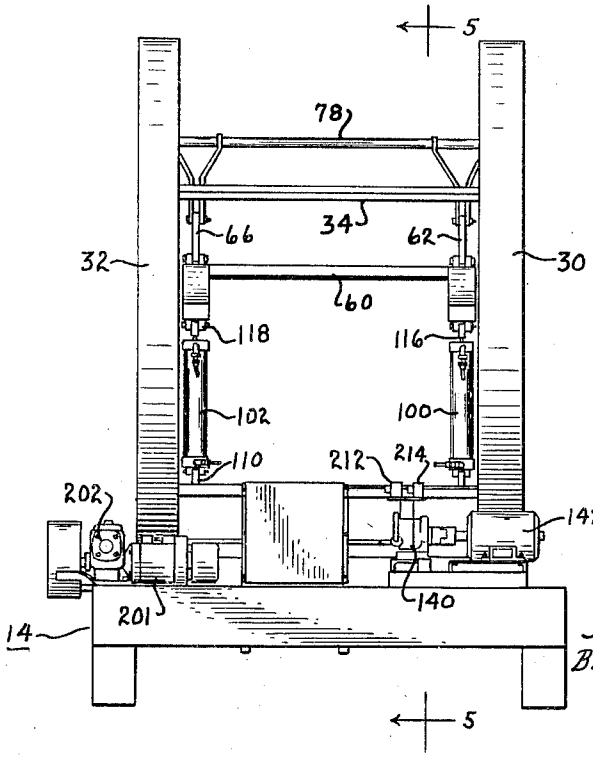


FIG. 4

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STACK TURN-OVER APPARATUS

Filed Nov. 20, 1967 4 Sheets-Sheet 3

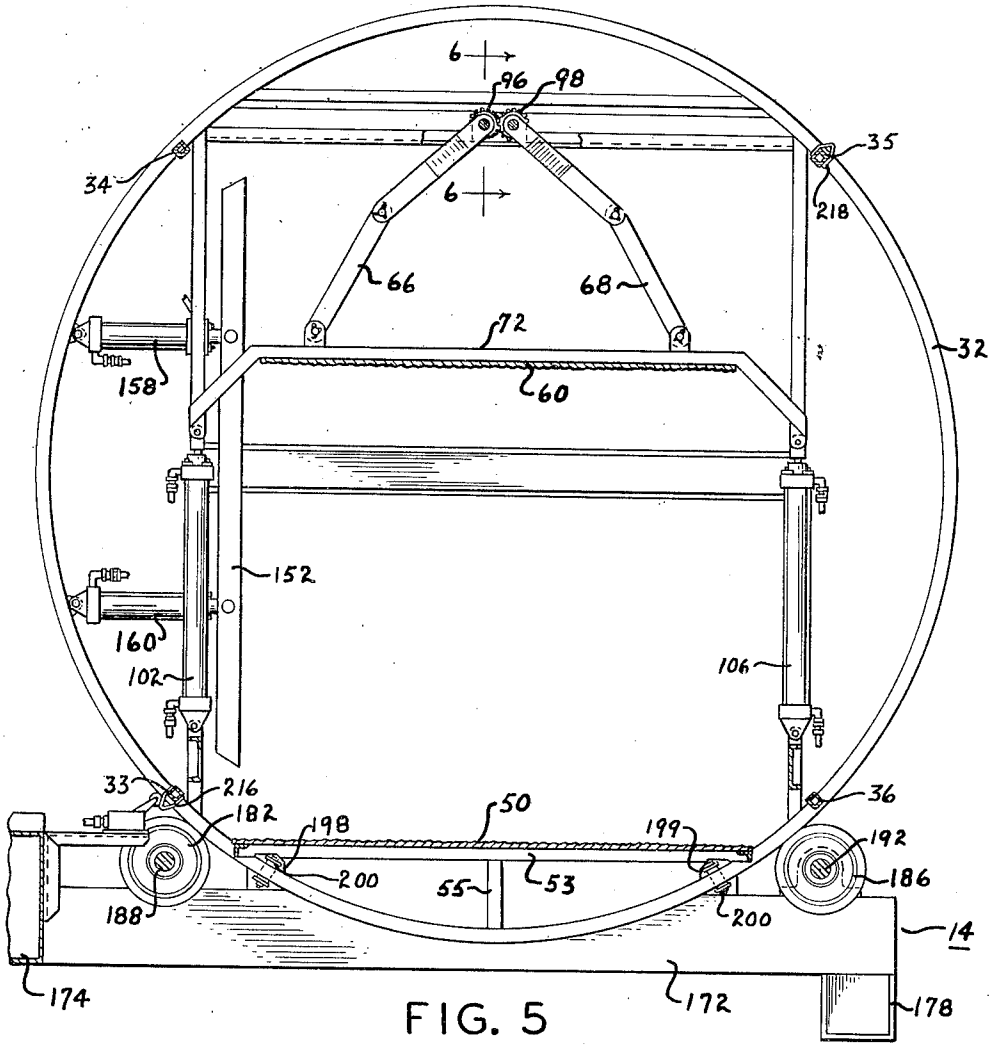


FIG. 5

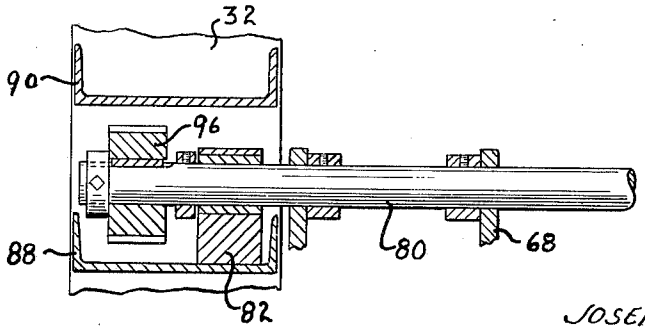


FIG. 6

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STACK TURN-OVER APPARATUS

Filed Nov. 20, 1967 4 Sheets-Sheet 4

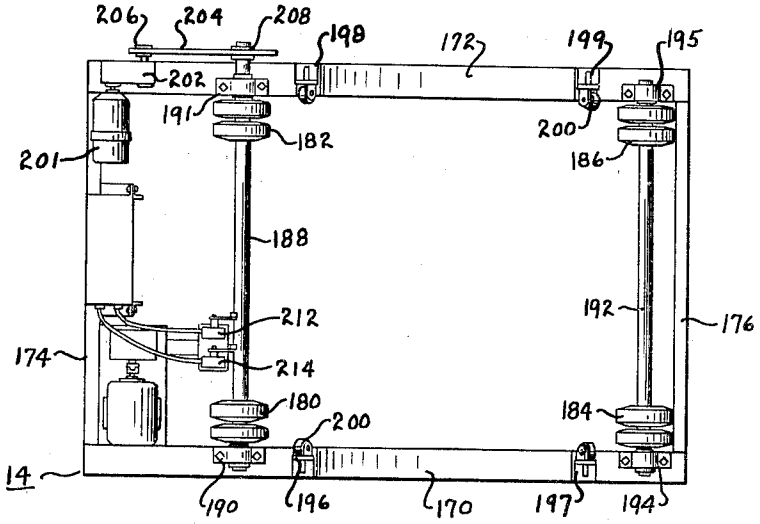


FIG. 7

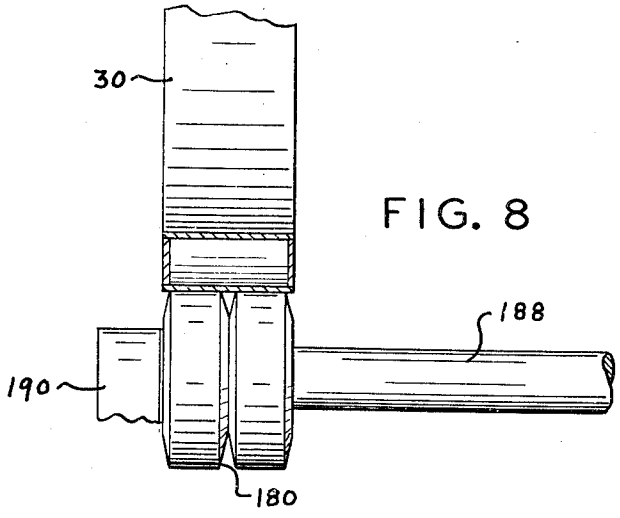


FIG. 8

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3,497,082

STACK TURN-OVER APPARATUS

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Int. Cl. B21b 39/20
U.S. Cl. 214—1 7 Claims

ABSTRACT OF THE DISCLOSURE

A stack turn-over apparatus in which a rotary stack support is mounted within a pair of rings on a base and a motor rotates the support 180° to invert a stack of sheet material or the like inserted therein. The stack of sheet material is clamped within the rings by a stationary plate and a movable plate, the movable plate having a means for applying pressures substantially equally to the stack of sheet material.

In certain types of printing presses flat sheets of paper or material come off the press printed on only one side and the sheets are stacked automatically into relatively large piles which are then reversed or inverted and the sheets rerun through the press to print the opposite sides of the sheets. Various types of apparatus have been used in the past to invert the pile, these apparatus usually consisting of a platform for receiving the pile supported on a skid or the like, and a clamping means for holding the sheets of the pile firmly together while the apparatus inverts the platform. A skid, which is normally placed on top of the stack before it is inverted, then becomes the support for the pile which is returned to the press for the final printing operation. These prior apparatus have had certain inherent disadvantages which have rendered them unsatisfactory, including inconvenience in loading and unloading, complicated and bulky operating mechanisms, lack of versatility under various normal operating conditions, and inability to effectively and dependably handle relatively large piles or loads without the use of excessively large operating mechanisms. It is therefore one of the principal objects of the present invention to provide a stack or skid inverter which is so constructed and designed that the weight of the stack is equalized or balanced in the mechanism so that the structural and operating parts thereof are relatively small and dependable and the overall machine relatively compact, and which can handle large stacks quickly and efficiently.

Another object of the invention is to provide a stack turn-over apparatus which can be loaded and unloaded from the same position or loaded on one side and unloaded from the other side, and which is so constructed and designed that it can readily be installed where it is most convenient to load and unload while the press is in operation.

Still another object of the invention is to provide a relatively simple, easily controlled stack inverter of the aforementioned type which can be operated without special skill or training and without the use of special equipment or tools.

A further object is to provide an apparatus of the aforementioned type having plates which engage the top and bottom ends of the stack to hold the sheets together and to maintain the stack as a unitary pile, and which are controlled to engage the ends of the stack uniformly and to equalize the pressure applied to those ends.

Additional objects an advantages of the invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a perspective view of the present stack turnover apparatus, showing it in a position to receive a stack of sheet material from a printing press or the like;

FIGURE 2 is a fragmentary perspective view of the opposite side of the apparatus shown in FIGURE 1;

FIGURE 3 is a side elevational view of the apparatus shown in the preceding figures;

FIGURE 4 is an end elevational view of the apparatus;

FIGURE 5 is a vertical cross-sectional view of the apparatus, the section being taken on line 5—5 of FIGURE 4;

FIGURE 6 is an enlarged fragmentary cross sectional view, the section being taken on line 6—6 of FIGURE 5;

FIGURE 7 is a top plan view of the base of the present apparatus; and

FIGURE 8 is a fragmentary cross sectional view, the section being taken on line 8—8 of FIGURE 3.

Referring more specifically to the drawings, and to FIGURE 1 in particular, numeral **10** designates generally the present stack turn-over apparatus, **12** the rotary support for receiving the stack of sheet material to be inverted, and **14** a base on which the rotary support is mounted. The present apparatus, while designed primarily to invert stacks of sheet material from a printing press so that both sides of the sheet can be printed in the press in the normal manner, can be used to invert other types of sheet material or articles, containers or the like, without any appreciable change being required in the basic structure of the apparatus.

The rotating support consists of two ring-like frame members **30** and **32** joined together by cross members **33**, **34**, **35**, and **36**, and by cross members **37** and **38**, member **37** being connected to members **39** and **40** within rings **30** and **32**, and member **38** being joined to members **42** and **44**. Members **39**, **40**, **42** and **44** are welded or otherwise joined at their ends to the inner surface of the respective rings. The foregoing cross members, in conjunction with members **39**, **40**, **42** and **44**, are joined to one another to form, along with rings **30** and **32**, a rigid rotating support structure, so that the two rings rotate together and in rigid spaced relation to one another. The two rings and the interconnecting members are preferably formed of steel, and the frame of the rotary support is adapted to rotate on the two rings, as will be more fully explained hereinafter.

A stack receiving platform or plate **50** is rigidly mounted in the frame of the rotary support member with the two ends supported by cross members **52** and **53** and reinforcing members **54** and **55** on the two rings. The plate, cross and reinforcing members are rigidly joined together and connected to the rings to form a rigid structure therewith. An adjustable platform or plate **60** is mounted in the frame of the rotary support and is supported therein by arms **62**, **64**, **66** and **68** connected to end members **70** and **72** joined rigidly to the respective ends of plate **60**. Each of the arms **62**, **64**, **66** and **68** is pivoted by a fixture **74** and pin **76** extending through the end of the respective arm and through the fixture to pivotally connect the arm to the respective members **70** and **72**, and in effect, to plate **60**. The opposite end of each lever is connected to a shaft **78** or **80**, and each end of each shaft is journalled in a bearing **82** supported in cross members **84** and **86** at one end, or **88** and **90** at the other end. The means for connecting the ends of the arms **62**, **64**, **66** and **68** are fixedly secured to shafts **78** and **80** so that the upper section **92** of each arm moves radially as the respective shaft rotates and thereby moves arm section **94** to control the position of the respective corner of plate **60**. The two shafts are connected for movement in unison by a pair of gears **96** and **98** secured to the two shafts and intermeshing, as clearly seen in FIGURE 5. As the two shafts are rotated in unison by the two gears at each end of the shafts,

sections **92** of the various arms move angularly upwardly and downwardly together, thus moving sections **94** of the arms upwardly and downwardly together. This arrangement of levers results in equalized movement of the plate from corner to corner, and facilitates applying a uniform pressure to a stack of paper placed in the rotary support.

Plate **60** is power operated by hydraulic cylinders **100, 102, 104** and **106**, one end of cylinders **100** and **102** being connected to cross member **37** by fixtures **108** and **110**, and one end of cylinders **104** and **106** being connected to cross member **38** by fixtures **112** and **114**. The piston rods of cylinders **100** and **102** are connected to the respective end of cross members **70** and **72** by fixtures **116** and **118**, and the piston rods of cylinders **104** and **106** are connected to the ends of members **70** and **72** by fixtures **120** and **122**. The four cylinders are connected to a common hydraulic system through conduits to a control station **130** so that all four cylinders operate in unison to apply substantially equal pressure to all four corners of plate **60**, and consequently to the respective end of a stack of sheet material in the rotary support. The control station includes a hydraulic valve **132** controlled by levers **134** and **136**, and the hydraulic pressure is supplied by a hydraulic pump **140** driven by an electrical motor **142**. In order to position the stack vertically and hold it in place, guides **150** and **152** are mounted within rings **30** and **32** on members **39** and **40**. These guides are moved to and from a stack of sheet material in the rotary support by hydraulic cylinders **154** and **156** for guide **150** and cylinders **158** and **160** for guide **152**, controlled by the main control valve **132** at station **130**. The cylinders are connected to the respective rings **30** and **32**, and the piston rods thereof are connected to the respective guides. As the rotating support rotates, the two guides **150** and **152** support the stack of sheet material and prevent it from becoming disoriented throughout the movement of the support.

The rotary support **12** is mounted on base **14** consisting of side frame members **170** and **172** and end frame members **174** and **176**, the side members being joined at their ends to the end members to form a rigid structure, with the frame thus formed preferably being supported on legs **178** at each corner thereof. The rotary support is rotatably mounted on rollers **180, 182, 184** and **186**, rollers **180** and **184** supporting ring **30** and rollers **182** and **186** supporting ring **32**. Rollers **180** and **182** are mounted on a shaft **188** journalled in bearings **190** and **191** at each end thereof and rollers **184** and **186** are mounted on shaft **192** supported by bearings **194** and **195** at each end thereof. The four rollers, which normally rotate with their respective shafts, are freely rotatable and permit free rotation of the rotary support, as will be more fully explained hereinafter. The rotary support is held on the base in rotatable relation by four fixtures **196, 197, 198** and **199** mounted on frame members **170** and **172**, each having a roller **200** for engaging the edge of respective rings **30** and **32** so that the rings are guided in base **14** as they rotate on the four rollers.

The rotary support is driven by a motor **201** through a gear reduction unit **202**, belt **204**, and sprockets **206** and **208** on the gear reduction unit and on the end of shaft **188**. As shaft **188** is driven by motor **201**, both rollers **180** and **182** are rotated, thereby rotating the rotary support from one position to the position inverting the stack of sheet mateiral held therein. The motors **142** and **201** are controlled at electrical control box **210**, and the rotary support is automatically stopped at the desired position by switches **212** and **214** operated by fingers **216** and **218** mounted on cross members **33** and **35** between rings **30** and **32**.

In the operation of the present stack turn-over apparatus, the stack of sheet material, such as the paper leaving a printing press with one side printed, is slid onto platform or plate **50** in the proper position near the center thereof, and the guides **150** and **152** are extended to engage the side of the stack and align it in the proper vertical position with respect to the platform. Cylinders **100, 102, 104** and **106** are then operated to move plate **60** downwardly until it engages the upper end of the stack firmly, thereby clamping the stack between plates **50** and **60**. With the stack held rigidly between the two plates and against the two guide members, the motor is operated to drive rollers **180** and **182**, thereby rotating rotary support **12** from the position shown in FIGURE 1 to the position at which plate **60** is at the bottom. Since the guide members give support to the stack of material, the rotary support is preferably rotated in the direction to move the guides downwardly beneath the stack and to a vertical position on the opposite side of the rotary support when plate **60** is at the bottom. After the stack has been inverted in the foregoing manner, cylinders **100, 102, 104** and **106** are operated to retract plate **60**. Since plate **60** is at the bottom, the stack follows it downwardly as it is withdrawn, thus separating the upper end of the stack from the now underside of plate **50**. The stack can then easily be removed from the apparatus from either side, preferably after guides **150** and **152** have been retracted to their original position. The rotary support is again operated to return it to its original position with plate **50** at the bottom. Since the stopping of the plate in both positions is automatically controlled by switches **212** and **214**, the operator merely needs to start the motor when the inversion operation is to take place.

One of the advantages of the present apparatus is the uniform application of pressure to the stack by the operation of the four arms **62, 64, 66** and **68** in conjunction with the intermeshing gears on the ends of shafts **78** and **80**. This structure provides a uniform pressure which holds the stack in proper place without distorting or damaging the sheet material positioned therebetween. Plates **50** and **60** may be, in effect, a segment of a conveyor, such as a roller conveyor, and the terms "plate" and "platform" as used in this application shall be construed to include and cover such modifications.

While only one embodiment of the present invention has been described in detail herein, various changes and modifications may be made without departing from the scope of the invention.

What is claimed is:

1. A stack inverting apparatus comprising a rotary support for a stack of sheet material or the like having a pair of rings on a common horizontal axis, a fixed platform and a movable platform supported by said rings and movable between an upper horizontal position and a lower horizontal position as said rings rotate 180°, arms connected to the corners of said movable platform, means interconnecting the opposite ends of said arms for guiding said movable platform forward and away from the stack, four power cylinders connected to said movable platform in spaced relation on said rotary support for operating said platform, a base for said rotary support, and power means for rotating said support on said base.

2. A stack inverting apparatus as defined in claim **1** in which said rotary support is mounted on a base having a plurality of spaced rollers for each of said rings and means for driving one roller of each of said rings.

3. A stack inverting apparatus comprising a rotary support for a stack of sheet material or the like having a pair of rings on a common horizontal axis, a fixed platform and a movable platform supported by said rings and movable between an upper horizontal position and a lower horizontal position as said rings rotate 180°, said platform being rectangular and having two edges of the platform parallel with the axis of said rings, arms connected to the corners of said movable platform, means including intermeshing gears interconnecting the opposite ends of said arms for guiding said movable platform toward and away from the stack, a base for said rotary

support, and power means for rotating said support on said base.

4. A stack inverting apparatus as defined in claim 3 in which said rotary support is mounted on a base having a plurality of spaced rollers for each of said rings and means for driving one roller of each of said rings.

5. A stack inverting apparatus as defined in claim 4 in which a control means responsive to the position of said rotary support controls said power means to interrupt the rotation of the support at a predetermined position.

6. A stack inverting apparatus as defined in claim 5 in which a pair of spaced guide means is movable transverse to the movement of said movable platform for retaining a stack in said rotary support in proper position while the support is in operation.

7. A stack inverting apparatus comprising a rotary support for a stack of sheet material or the like having a pair of rings on a common horizontal axis, a fixed platform and a movable platform supported by said rings and movable between an upper horizontal position and a lower horizontal position as said rings rotate 180°, arms connected to the corners of said movable platform, means

interconnecting the opposite ends of said arms for guiding said movable platform toward and away from the stack, a base for said rotary support, guide means movable transverse to the movement of said platform for retaining a stack in said rotary support in proper position while the support is in operation, and power means for rotating said support on said base.

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U.S. Cl. X.R.

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