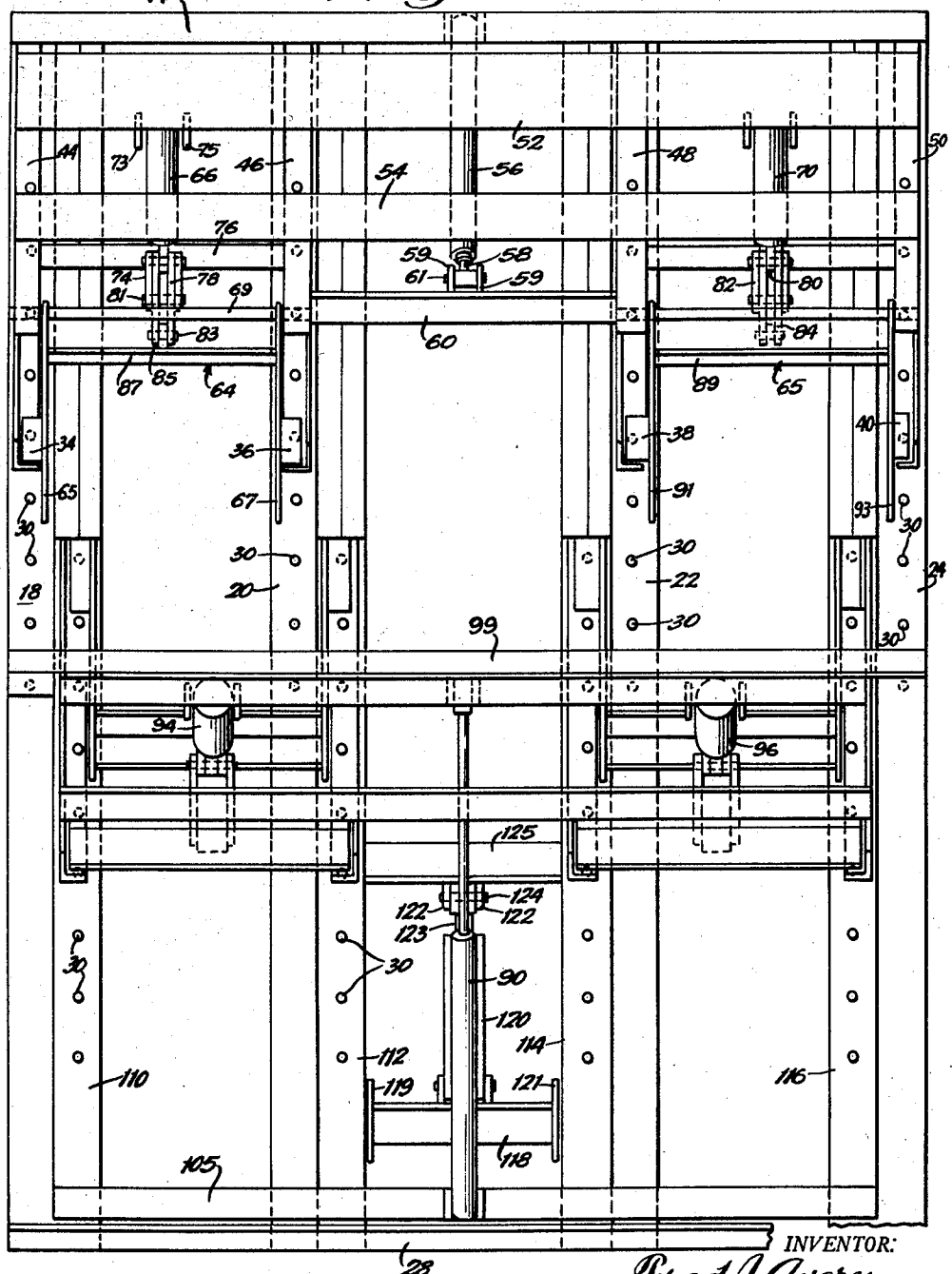
Dec. 8, 1959 F. J. AVERY 2,916,164

SHEET INVERTER

Filed July 2, 1956 2 Sheets-Sheet 1

Fig. 1



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SHEET INVERTER

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Fig. 2

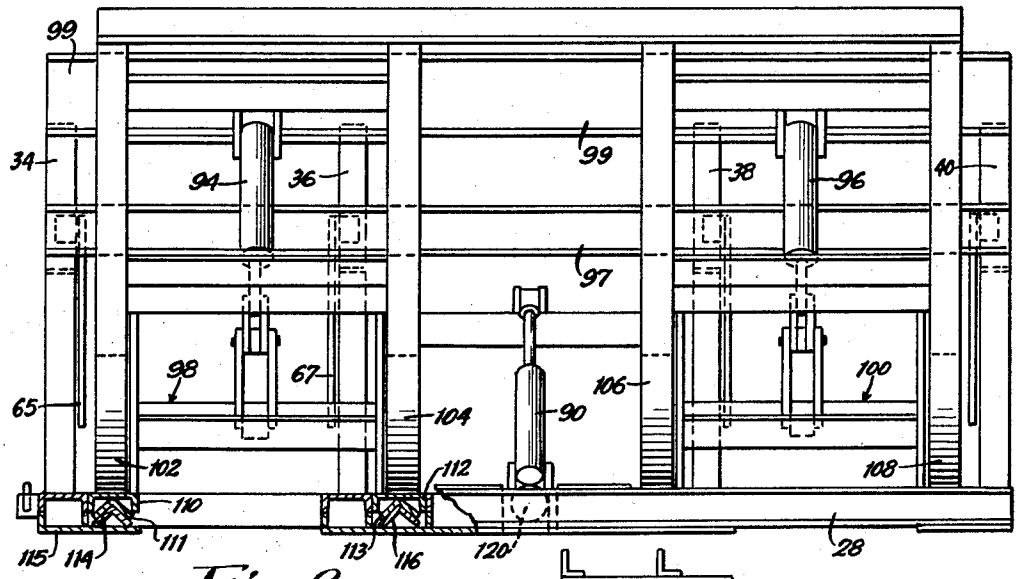


Fig. 3

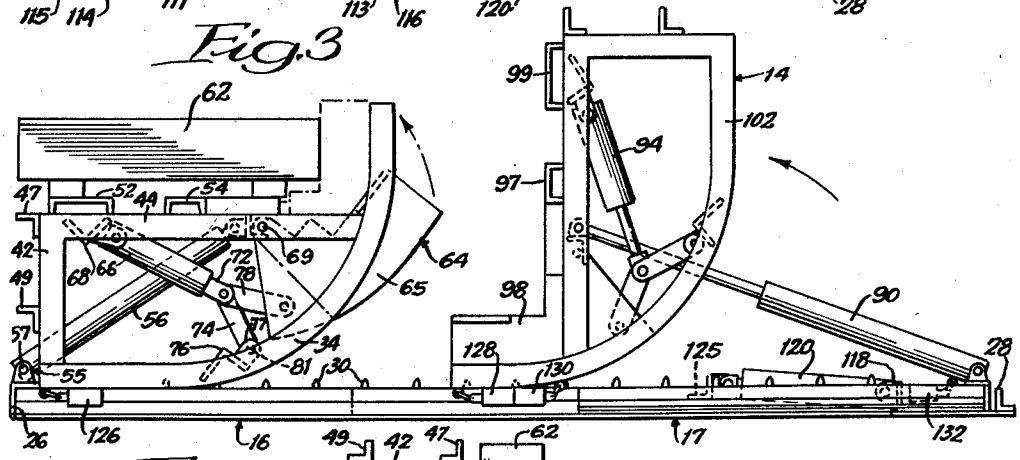
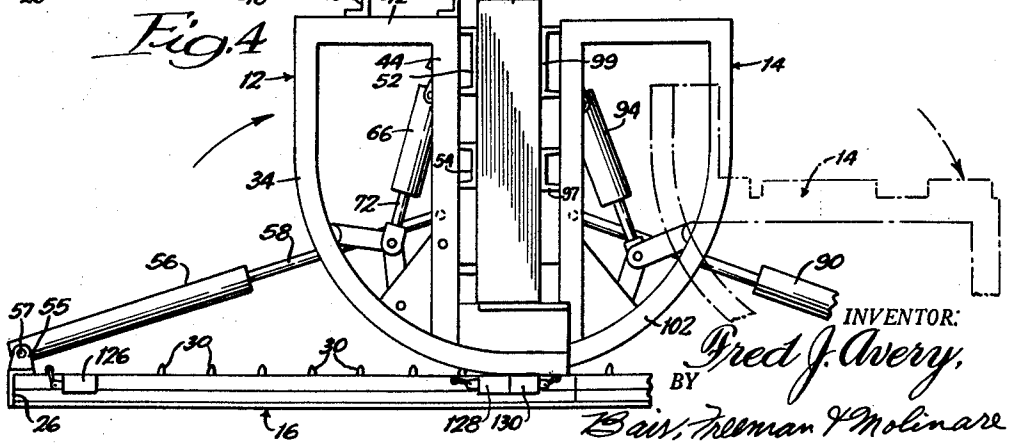


Fig. 4



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United States Patent Office 2,916,164 Patented Dec. 8, 1959

2,916,164

SHEET INVERTER

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Application July 2, 1956, Serial No. 595,362

4 Claims. (Cl. 214—1)

This invention relates to material handling devices and more particularly to an improved device for inverting heavy loads such as stacked sheet steel and the like.

In many modern day industrial operations it often is necessary to invert or overturn relatively heavy loads. This need arises for example in manufacturing plants where bundles of sheet steel having a weight of as much as five tons frequently must be turned 180° in a relatively short time. Prior art devices which have been available for producing an overturning function have not proved entirely satisfactory due to their size, cost of manufacture and lack of flexibility.

It is a general object of this invention, therefore, to provide an improved material handling device capable of the rapid overturning of relatively heavy loads.

It is another object of this invention to provide such an improved material handling device adapted to overturn bundles of metal sheets which may be either banded together or loosely stacked.

It is still another object of this invention to provide an improved material handling device adapted for automatically and rapidly overturning relatively large and heavy loads in accordance with a predetermined sequence.

It is a further object of this invention to provide an improved material inverting device adapted to be utilized with material transporting mechanisms such as fork truck or overhead crane handling equipment.

It is a still further object of this invention to provide an improved material inverting device characterized by its flexibility and relatively compact and inexpensive construction.

In accordance with a specific illustrative embodiment of the invention the improved material inverting device includes a pair of tables adapted to be rocked one towards the other for transferring a load with a rotation of 180°. It is a feature of this invention that the rocking tables are similar in construction and comprise a plurality of arcuate rocking arms, a receiving platform and an adjustable knee support forming a cradle with the receiving platform. In accordance with a further feature of this invention one rocking table is mounted on a stationary frame and the other rocking table is mounted on an adjustable frame so that the device may be adjusted to accommodate loads of various thicknesses by providing proper spacing between the tables while transfer is being made.

It is another feature that a plurality of hydraulic cylinders is provided with each rocking table for bringing about the rocking operation and for controlling the position of the knee support; an additional hydraulic cylinder is provided with one rocking table for carrying out the spacing adjustment operation.

In the operation of the device one rocking table has its receiving platform in horizontal position and the other rocking table is tilted up so that its receiving platform is in vertical position. The material load is placed on the receiving platform of the first rocking table and its knee

support is moved into position hydraulically to rest against the edges of the load. The other rocking table is hydraulically spaced from the receiving rocking table in accordance with the thickness of the material load.

The rocking cylinder then causes the load supporting rocking table to be tilted upwards so that the load is held in vertical position between the two vertically aligned rocking tables and is supported at this time by the knee supports of each table. The hydraulic rocking cylinder of the second table then causes the second table to be rocked down so that its platform is in a horizontal position in supporting engagement with the load which by the above-described operation has been inverted 180°. The knee support of the second table then may be moved by its hydraulic cylinder to enable the load to be carried away by suitable material transporting mechanisms such as a fork truck or overhead crane.

It is still another feature of this invention that due to the symmetrical construction of the rocking tables their functions are interchangeable and thus a load can be put on either table and rotated to the other as desired.

The above and other features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of this invention, however, its advantages and specific objects attained by its use, reference is had to the accompanying drawings and descriptive material in which is shown and described an illustrative embodiment of the invention.

In the drawing:

Figure 1 is a plan view of a material inverting device embodying the invention;

Figure 2 is an end view partly in section of the material inverting device of Figure 1;

Figure 3 is a side elevational view of the material inverting device showing the rocking tables in initial material receiving condition; and

Figure 4 is a side elevational view of the invention showing the rocking tables in material transferring condition.

Referring now to the drawing the illustrative embodiment of the invention shown therein comprises a load inverting device having a stationary rocking table 12 and an adjustable rocking table 14. Rocking table 12 is supported by a stationary platform 16 which includes elongated frame members 18, 20, 22 and 24, respectively held in parallel spaced relation by end angle members 26 and 28, preferably welded thereto. In accordance with the invention stationary platform 16 may be permanently secured to the floor and is adapted to support rocking table 12 for 90° rotation thereon.

Rocking table 12 comprises a plurality of arcuate rocker arms 34, 36, 38 and 40, respectively, each of which are rigidly connected to an L-shaped structure such as end member 42 and load support member 44 of rocker arm 34. To insure that rocking table 12 will not slip or slide on its stationary platform 16, but will rock on the arcuate surfaces of rocker arms 34, 36, 38 and 40, a plurality of raised guide members 30 are placed in spaced relation on the upper surface of each of the stationary platform frame members 18, 20, 22 and 24. These guides are adapted to cooperate with a plurality of similarly shaped and spaced depressions 32 disposed along the lower surface of each of the rocker arms.

Hydraulic cylinder 56 is pivotally connected by ears 55 and pin 57 to end angle member 26 of stationary platform 16. Piston 58 of hydraulic cylinder 56 is pivotally connected by ears 59 and pin 61 to cross member 60. Cross member 60 advantageously is rigidly attached, as by welding, to load support members 46 and 48 of the intermediate arcuate rocker arms 36 and 38 such that the entire rocking table 12 is rocked on

stationary platform 16 by the actuation of hydraulic cylinder 56. Thus it will be appreciated that in the operation of the device when piston 58 of hydraulic cylinder 56 is in its retracted position as shown in Figures 1 and 3, rocking table 12 will be in the horizontal load receiving condition and when piston 58 is in its extended position as shown in Figure 4, rocking table 12 will be tilted up in its load transfer condition.

A pair of elongated load support channel members 52 and 54 are welded in transverse relation to support members 44, 46, 48 and 50 for receiving a load such as a stack of steel sheet 62. To provide access for the material handling equipment transporting the load to and from the inverting device, such as a fork truck or overhead crane, load support channel members 52 and 54 are spaced from each other and are sufficiently high to enable the fork or the crane grab to be inserted between load 62 and the rocking table.

In accordance with an aspect of the invention knee supports 64 and 65, are pivotally associated with rocker load support members 44 and 46, and 48 and 50, respectively, so as to be adjustably positioned with respect to the edges of the metal sheets of load 62. Knee supports 64 include a pair of side plates 65 and 67, which advantageously may be of stepped shape at their load contacting edges for supporting engagement with the load. Side plates 65 and 67 are pivotally mounted on rod 69 journalled in load support members 44 and 46.

A hydraulic cylinder 66 is secured at one end between ears 73 and 75, which in turn are fastened to angle 68 welded between load support members 44 and 46. Piston 72 of hydraulic cylinder 66 is pivoted to a pair of connecting links 74 and 78. Connecting link 74 is pivotally attached between ears 77 by pin 81 and ears 77 are secured to angle 76 fastened between arcuate rocker arms 34 and 36. Connecting link 78 is pivotally attached by pin 83 and ears 85 to angle 87 fastened between side plates 65 and 67 of knee support 64.

Hydraulic cylinder 70 is connected to pivotally operate knee support 65 by means of piston 80, connecting links 82 and 84, attached thereto, and angle 89 supported between the side plates 91 and 93 of knee support 65. In the operation of rocking table 12, load 62 is placed upon load support channel members 52 and 54 and hydraulic cylinders 66 and 70 are operated to swing knee supports 64 and 65 up into engagement with the edges of the metal sheets comprising load 62. This is best seen in Figure 3 of the drawing, the solid line representing knee support 64 in its initial position and the dotted line representing knee support 64 in its load engaging position. After knee supports 64 and 65 are in their load supporting position, rocking hydraulic cylinder 56 is operated to tilt rocking table 12 up to the load transfer position, which, as shown in Figure 4, places load 62 in vertically supported relation between rocking tables 12 and 14.

Rocking table 14 is constructed in substantially the same manner as rocking table 12, described in detail above, and thus operates in a like manner. In fact, due to the symmetrical nature of rocking tables 12 and 14, they may be utilized interchangeably as load receiving and transferring tables, and by reversible control mechanisms are adapted to go through the load inverting operation in either the forward or reverse manner. Thus, when the inverting device is in the transfer condition, rocking hydraulic cylinder 90 of rocking table 14 is operated to place rocking table 14 in its horizontal position in supporting engagement with load 62, as shown in dotted line form in Figure 4. It will be appreciated that load 62 now has been inverted 180°.

Knee support hydraulic cylinders 94 and 96 of rocking table 14 then may be operated to release knee supports 98 and 100 from engagement with load 62 to enable the latter to be removed from the inverting device by suitable material handling mechanism.

The platform which supports rocking table 14 differs from that supporting rocking table 12 in that it is adjustable to permit rocking table 14 to be moved back and forth as desired in accordance with the thickness of load 62. The adjustable platform 17 comprises frame members 110, 112, 114 and 116. These frame members have upon their upper surface a plurality of raised guide members positioned in spaced relation which are adapted to cooperate with a plurality of similarly shaped and spaced depressions 32 along the lower surface of rocker arms 102, 104, 106 and 108 of rocking table 14. Frame members 110, 112, 114 and 116 are positioned in parallel spaced relation and are connected together at one end thereof by means of cross member 105. As shown most clearly in Figure 2 of the drawing each frame member is formed of a channel member mounted above and secured to an angle such as angle 111 welded to channel member 110 and angle 113 welded to channel member 112.

Spaced beneath each angle and in sliding relation therewith so as to form a slideway is a second angle fastened to the inverter base 115. Thus angle 114 forms a sliding track with angle 111, angle 116 forms a sliding track with angle 113, etc. A spacing hydraulic cylinder 120 is connected at one end thereof to cross piece 118 fastened between two stationary supporting members 119 and 121. The piston 123 of hydraulic cylinder 120 is pivotally connected by ears 122 and pin 124 to angle 125 rigidly secured between frame members 112 and 114.

Thus, in the operation of the device, rocking table 14 may be selectively adjusted with regard to rocking table 12 an amount determined by the thickness of load 62 through the operation of hydraulic cylinder 120. Manifestly when piston 123 of the latter is extended it causes rocking table 14 and its platform to be moved forward over the slideways defined by the angle pairs 114 and 111, 116 and 113, etc. It is contemplated that this spacing operation may be carried out manually or that means for automatically gauging the thickness of a load and for adjusting the moveable platform frame members 110, 112, 114 and 116 may be utilized with the material inverting device.

It further is contemplated that the above described sequence for carrying out a complete material load inverting operation may be predetermined and carried out automatically by suitable control circuitry. Thus, a number of circuit controlling track type switches such as switches 126 adapted to be actuated by rocking table 12, switches 128 and 130 adapted to be actuated by either rocking table 12 or 14 and switch 132 adapted to be actuated by rocking table 14 are disposed along frame members 18 and 110 in operative relation with the rocking tables for controlling the circuit to carry out this predetermined sequence of operation. It will be appreciated that although the details of the electrical control circuit do not form a part of this invention as such, this control circuit may be electronic, electric relay or any other suitable type of circuit which may be devised by those skilled in the art for this purpose.

While a particular embodiment of the invention has been described in detail for the purpose of teaching the principles of the invention it will be understood by those skilled in the art that this embodiment is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the pending claims.

What is claimed is:

1. An inverting device comprising a pair of rocking tables, each of said tables including a plurality of load receiving members and a plurality of arcuate rocking members in supporting relation with said load receiving members, a stationary platform adapted for rocking relation with one of said pair of rocking tables and an adjustable platform adapted for rocking relation with

the other of said pair of rocking tables, hydraulic cylinder means operatively connected between each platform and its associated rocking table whereby the rocking table is in its load receiving or discharging condition when its associated hydraulic cylinder is unoperated and is in its load transferring condition when its associated hydraulic cylinder is operated, hydraulic cylinder means operatively associated with said adjustable platform for adjusting the spacing between said rocking tables in accordance with the thickness of the load and means for moving adjustable knee support means operatively associated with each rocking table adapted to position the same for supporting a load when said rocking table is in its load transferring condition.

2. A device for inverting a load 180° comprising the combination of a pair of rocking tables, each table including a plurality of arcuate rocking arms and a load receiving and supporting structure connected to said rocking arms, a platform in supporting engagement with each of said rocking tables, each platform having a plurality of raised guide means disposed in spaced relation thereon adapted to cooperate with a plurality of similarly spaced recesses in said arcuate rocking arms, hydraulic motor means operatively connected between each platform and its rocking table adapted when actuated to cause said rocking table to be rotated through an angle of 90° thereby enabling transfer of a load from one rocking table to the other, means for causing said rocking tables to be operated in a predetermined sequence including a plurality of circuit controlling switches disposed in the path of travel of said arcuate rocker arms and adapted to be operated by the movement thereof and means for maintaining the load in supported relation when a rocking table is rocked to its vertical position, said means including a knee support and hydraulic motor means operatively connected between said knee support and the rocking table for moving the knee support into and out of engagement with the load.

3. A device for inverting a load 180° comprising the combination of a pair of rocking tables, each table including a plurality of arcuate rocking arms and a load receiving and supporting structure connected to said rocking arms, a stationary platform in supporting engagement with one of said rocking tables, an adjustable platform in supporting engagement with the other of said rocking tables, each platform having a plurality of raised guide means disposed in spaced relation thereon adapted to cooperate with a plurality of similarly spaced recesses in said arcuate rocking arms, hydraulic motor means operatively connected between each platform and its rocking table adapted when actuated to cause said rocking table to be rotated through an angle of 90° thereby enabling

transfer of a load from one rocking table to the other, means for causing said rocking tables to be operated in a predetermined sequence including a plurality of circuit controlling switches disposed in the path of travel of said arcuate rocker arms and adapted to be operated by the movement thereof, means for maintaining the load in supported relation when a rocking table is rocked to its vertical position, said means including a knee support and hydraulic motor means operatively connected between said knee support and the rocking table for moving the knee support into and out of engagement with the load and hydraulic motor means operatively connected to said adjustable platform and its rocking tables for enabling the spacing between said pair of rocking tables to be adjusted in accordance with the thickness of said load.

4. A device for turning a load 180° comprising a first platform, first load supporting means including a plurality of arcuate members rockable on said first platform, said first load supporting means further including raised supports for receiving a load and maintaining the same in relatively horizontal position, motor means operatively associated with said first load supporting means for rotating the latter 90° to place the raised supports and the load in relatively vertical position, a second platform, second load supporting means including a plurality of arcuate members rockable on said second platform, motor means operatively associated with said second load supporting means for rotating the latter 90° to a relatively vertical position for receiving the load transferred thereto from said first load supporting means and for rotating the load and said second load supporting means back to a relatively horizontal position, raised supports connected to said second load supporting means for maintaining the load in the relatively horizontal position a knee support pivotally connected to each of the first and second load supporting means and pivotal into supporting position with a load on the load supporting means when it is in its vertical position and motor means operatively connected to each of said knee supports for adjusting the position of the latter relative to said load.

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