March 23, 1965 R. J. SWIHART ETAL 3,174,631

TURNTABLE MECHANISM

Filed Sept. 8, 1961 3 Sheets-Sheet 1

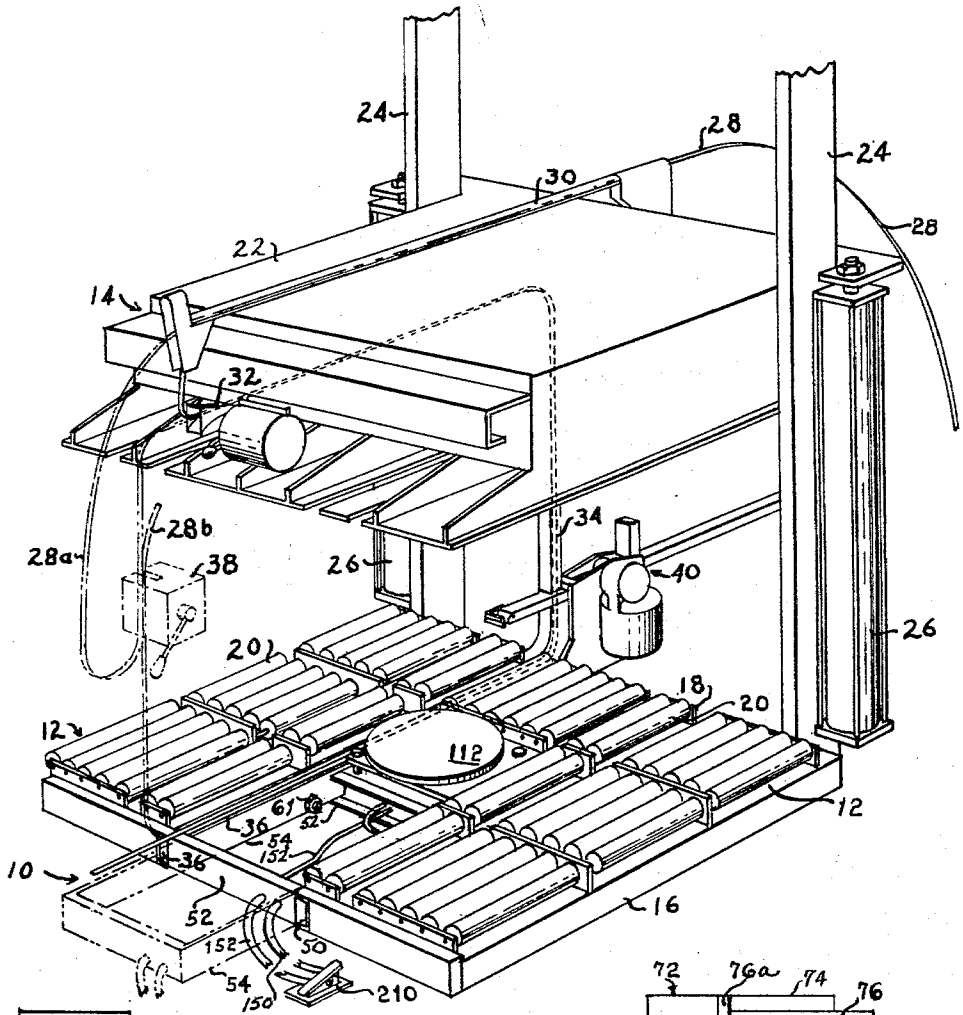


FIG. 1

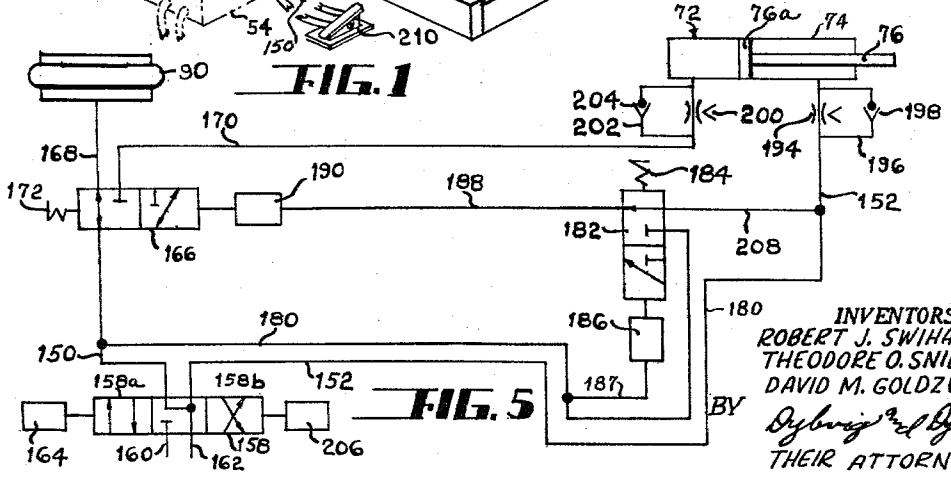


FIG. 5

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TURNTABLE MECHANISM

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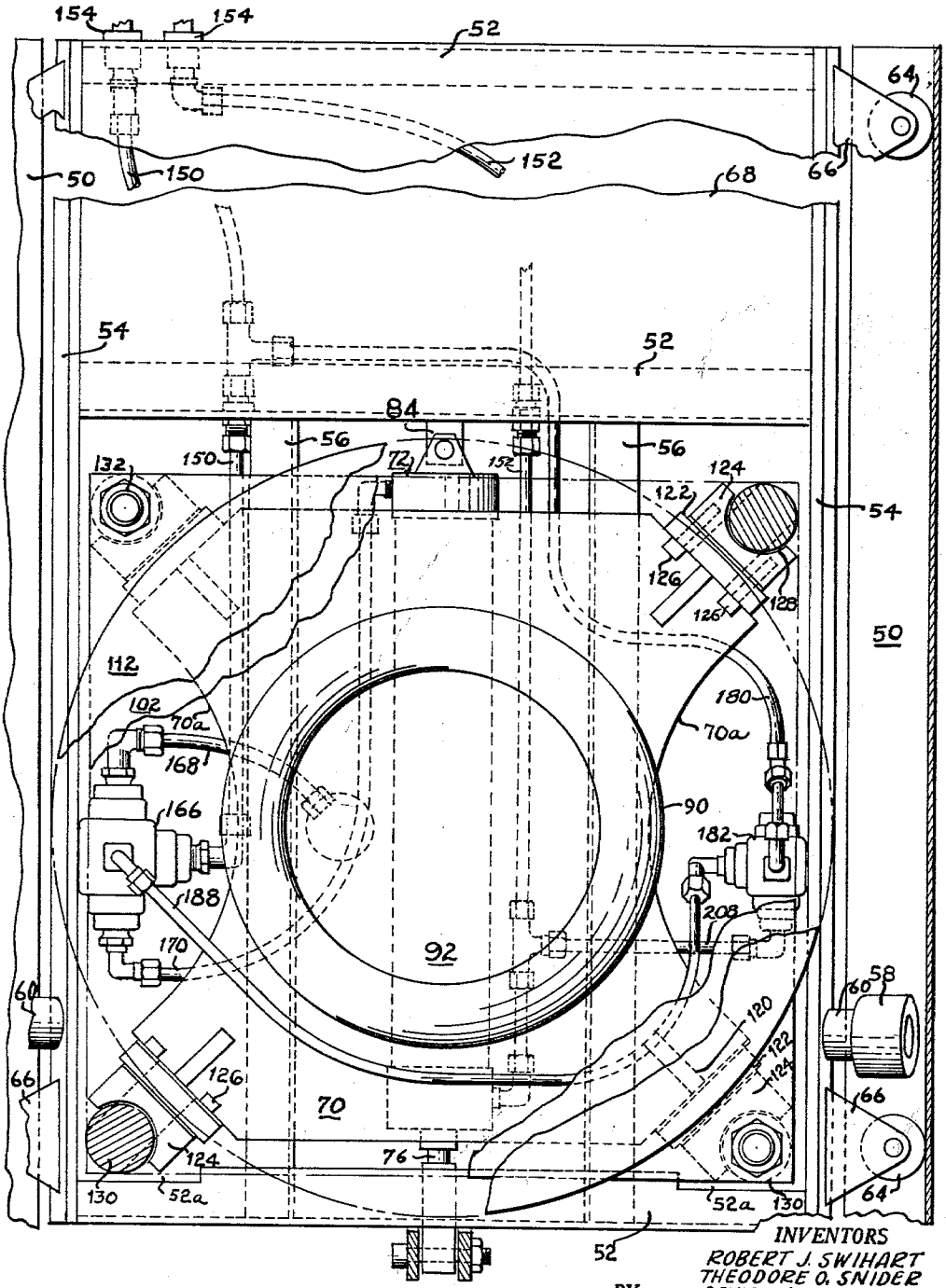


FIG. 2

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TURNTABLE MECHANISM

Filed Sept. 8, 1961 3 Sheets-Sheet 3

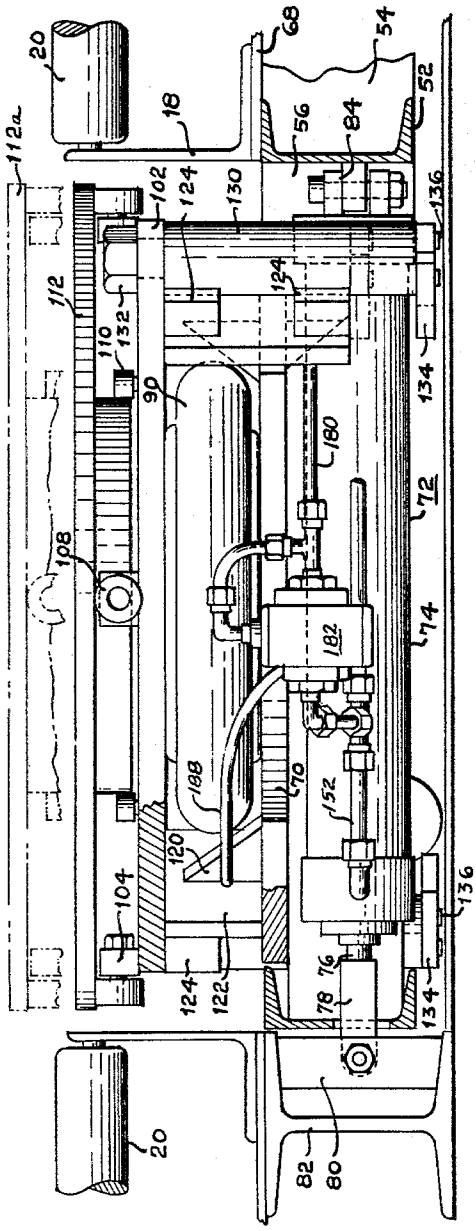


FIG. 3

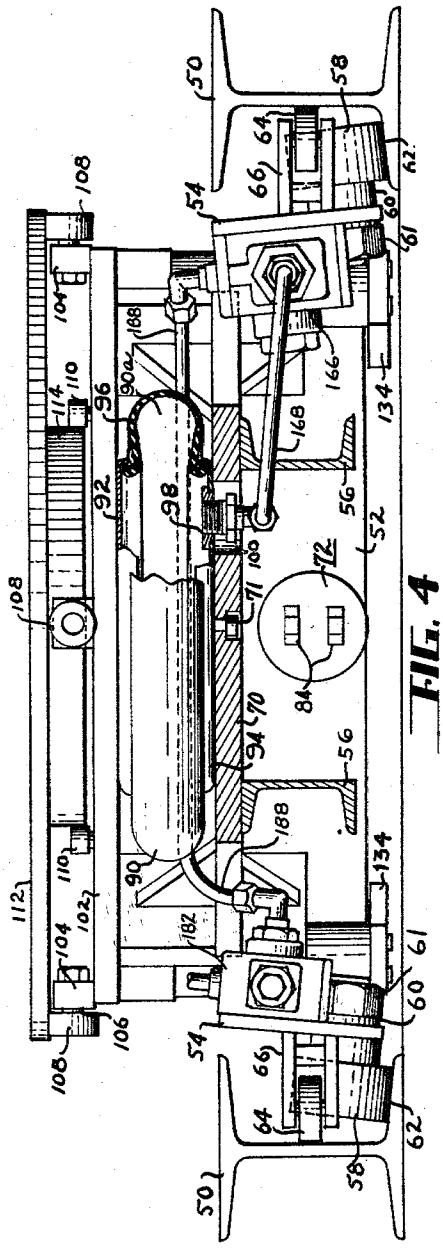


FIG. 4

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3,174,631

TURNTABLE MECHANISM

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3 Claims. (Cl. 214—1)

This invention relates to a turntable mechanism and more particularly to a turntable mechanism usable in a compression strapping machine. It will be apparent, however, that the turntable mechanism may be used in numerous other embodiments.

An object of this invention is to provide an improved turntable mechanism adapted to elevate a load above a platform and move the load on the platform.

A more specific object of this invention is the provision of an improved fluid operated turntable mechanism.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

Referring to the drawings:

FIGURE 1 is a perspective view of a turntable mechanism made in accordance with this invention mounted on a platform of a compression strapping machine.

FIGURE 2 is a plan view, with portions broken away, of the turntable mechanism.

FIGURE 3 is a side elevational view, with portions broken away, of the turntable mechanism.

FIGURE 4 is a front elevational view, with portions broken away, of the turntable mechanism, as viewed from the right in FIGURE 3.

FIGURE 5 is a schematic illustration of the pneumatic circuit used to operate the turntable mechanism made in accordance with this invention.

In FIGURE 1, a turntable mechanism, designated 10, is shown as mounted within a platform 12 of a compression strapping machine, generally designated 14. The platform 12 comprises a base 16 upon which are mounted, by brackets 18, a plurality of conveyor rollers 20.

The compression strapping machine 14 is adapted to press and strap various types of loads. Often, for example, a load of cardboard will be placed upon a pallet (not shown) and conveyed to the platform 12. The machine 14 includes an upper platen 22 slidably mounted upon a pair of upright posts 24 placed at the rear corners of the base 16 of the platform 12. A pair of pneumatic or hydraulic actuators 26 are mounted upon the support posts 24 and connected to the platen 22. The details of the strapping machine are of no importance to this invention except that it should be realized that a mechanism is provided to course a strap, such as that designated 28, through a first upper guide 30 mounted upon the top of the platen 22, through a second guide 32 extending on the underside of the platen 22 and subsequently around further guides or guide chutes 34 and 36 to the rear of the machine and within the platform 12.

When a load is placed on the strapping machine, a strap 28 is coursed around the load. A portion of the strap adjacent the forward end of the guide 30 is pulled outwardly from the guide, as indicated by dotted lines 28*a*, and attached to the end portions of the strap, designated 28*b*, received from the forward portion of the platform guide 36. The portions of the straps 28*a* and 28*b* are fastened together and the end of the strap 28*a* is cut by a clamping device schematically illustrated at 38. The strapping device 38 may be conventional and forms no part of this invention. If the load is mounted upon a pallet, it usually is desirable to pass the strap through an opening in the pallet so that the strap does not extend underneath the pallet. Accordingly, a bayonet mechanism, generally designated 40, is mounted to the rear of the strapping machine. The bayonet mechanism 40 is adapted to grasp the strap as it moves downwardly through the guide chute 34 and pull the strap through the pallet. If desired, several strap guides and bayonets may be provided, thus enabling several straps to be fastened to a load simultaneously.

When using a strapping machine such as that described above, it is often desirable to rotate the load while positioned on the platform, so as to strap the load in more than one position or direction. Normally, loads to be strapped are too heavy and bulky to be manually rotated while on the platform. Therefore, the practice has developed of providing some means for rotatably supporting the load to be strapped. This function is provided by the turntable mechanism 10 made in accordance with this invention. The turntable mechanism 10 must not only be capable of elevating the load above the platform but also must be capable of moving the load forwardly of the platform. The reason for this is that the load, whether palletized or not, often cannot be rotated so long as it is placed centrally of the platform because the support posts 24 will act as obstructions to rotation of the load. The turntable mechanism 10 will now be described in detail.

As shown in FIGURE 1, the turntable mechanism 10 is mounted centrally of the platform 12. As shown best in FIGURES 2 and 4, a pair of spaced parallel I-beams 50, which extend parallel to the sides of the platform 12, are mounted in the platform immediately adjacent the mechanism 10. As will be described below, the I-beams 50 provide a track upon which the mechanism 10 may slide or roll.

The turntable mechanism 10 includes a generally rectangular base formed by three spaced, parallel channel members 52 which extend parallel to the front and rear sides of the platform 12 and a pair of spaced, substantially parallel side walls or side plates 54 attached to the ends of the channels 52 and interconnecting them. A plurality of wheels 58 are attached to the side plates 54 by stud axles in axle housings 60 fixed to the side plates 54 by nuts 61. The wheels 58 are adapted to roll along the top surface of the bottom flanges 62 on the I-beams 50. In order to guide the movement of the turntable mechanism 10 with respect to the I-beams 50, a plurality of guide rollers 64, attached to the side plates 54 by brackets 66, are engaged with the internal surfaces of the web portions of the I-beams 50. As shown best in FIGURE 4, the side plates 54 lie at a slight angle to the vertical so that the axles within the housings 60 are supported at right angles to the sidewalls 54, yet the wheels 58 are engaged over their entire peripheral surface with the I-beam flanges 62.

The structure comprising the channel members 52 and the side plates 54 along with the wheels 58 constitute what may be referred to as a turntable carriage. Normally, the carriage is in a retracted position, shown in full lines in FIGURE 1, wherein the forwardmost channel member 52 forms a portion of the front wall of the platform 12. To show the carriage in FIGURE 1, a section of rollers 20 mounted forwardly of the carriage has been removed. As seen to the right in FIGURE 3, a roller support plate 68 is mounted on top of the side plates 54 and the two forwardmost channel members 52. The plate 68 serves as a support for the section of rollers 20 and their brackets 18 mounted on the carriage.

The turntable carriage described above may be moved back and forth along the track formed by the I-beams 50 by means of an actuator 72 including a cylinder 74 and a piston rod 76 movable therein which is attached by a bracket 78 to a support plate 80 (FIGURE 3)

mounted on an I-beam 82 which extends through the platform 12 immediately behind the retracted turntable mechanism 10. The other end of the actuator 72 is connected by a clevis 84 to the center channel member 52. The member 72 constitutes a double acting pneumatic actuator which, when energized, will move the turntable carriage forwardly along the guide track formed by the I-beams 50 and may also be energized to retract the turntable carriage. The circuitry for energizing the actuator 72 is interlocked with the mechanism for elevating the turntable and will be described in detail below. For convenience, the circuitry and the various components thereof are described herein as air operated. However, it will be appreciated by those skilled in the art that hydraulic components could be used instead of pneumatic.

A carriage base plate 70 is mounted rearwardly on the turntable carriage on a pair of spaced parallel channel members 56 interconnecting the two rearmost channel members 52. As shown best in FIGURE 4, an air mount 90 is supported centrally of the carriage base plate 70 as by one or more bolts 71. The term air mount, as used herein and in the trade, refers to that type of lifting device employing a chamber that expands upon the application of fluids, whether compressible or incompressible, thereto. Such an air mount is shown in FIGURE 4 as comprising a pair of upper and lower parallel plates 92, 94, each connected by interlocking peripheral flanges to a generally ring-shaped expansible member 96, which in configuration resembles an automobile tire. The lower plate 94 is directly connected to the base plate 70. Air under pressure is supplied to an expansible chamber 90*a*, defined by the upper and lower plates 92, 94 and the expansible member 96, by means of an air coupling 98 attached to the lower plate 94 and projecting through an aperture 100 cut in the support plate 70. The construction of air mounts, such as that designated at 90, is well known in the art and there are diverse forms of commercially available air mounts. Accordingly, the specific construction of the air mount 90 forms no part of this invention.

A rectangular turntable support plate 102 is mounted, as by bolts (not shown) on the top of the upper plate 92 of the air mount 90. The plate 102 provides a base for several spaced axle support brackets 104 which receive stub axles 106 that in turn support a plurality of peripheral support rollers 108 adapted to rotate about a horizontal axis. In addition, a plurality of inner rollers 110 are attached to the top of the support plate 102 for rotation about a vertical axis. The rollers 108 support a disc-shaped turntable 112 having a central annular flange 114 depending therefrom, the outer surface of which is engaged by the rollers 110. Thus, the turntable 112 is freely rotatable upon the rollers 108 yet held in a fixed position with respect to the plate 102 by the rollers 110. As will be apparent to those skilled in the art, this structure for rotatably supporting the turntable 112 provides a practically frictionless support.

When air under pressure is supplied to the air mount 90, its upper plate 92 is raised and accordingly, the plate 102 and the turntable 112 are raised. In order to guide the turntable 112 as it is being raised, the corners of the carriage base plate 70 are cut at an angle and triangular braces 120 are welded to the top and bottom surfaces of each of the cut corners (see FIGURE 2). A pair of guide blocks 124 are mounted, as by screws 126 (FIGURE 2), on each of four support plates 122 that are welded to the braces 120. Each guide block 124 is cut out to provide a generally semi-circular pocket 128 adapted to receive a cylindrical guide rod 130. There are four guide rods 130, each having a reduced screw threaded portion at its upper end which projects through an aperture in a corner of the plate 102. Each guide rod 130 is retained in a fixed position with respect to the plate 102 by a threaded nut 132 on top of the plate 102

engaged with a screw threaded portion of the rod 130. The guide structure including the guide rods 130 and the guide blocks 124 retain the plate 102 and the turntable 112 in a horizontal plane even should the load being lifted by the turntable be unbalanced.

The top surface of the turntable 112 is supported in a horizontal plane slightly beneath the horizontal plane defined by the tops of the conveyer rollers 20. Upon supply of air under pressure to the air mount 90, the turntable 112 is raised to the dotted line position 112*a*, illustrated in FIGURE 3, so as to elevate a load thereon slightly above the top plane of the platform 12. As an example, in practice the turntable 112 may be ¼" below the top plane of the platform. When in its lowered or full line position in FIGURE 3, the air mount 90 can expand so as to elevate the turntable 112 by 1¾" so that the load is elevated to a position 1½" above the platform 12. To insure that the load is not raised too high, a stop plate 134 is threadedly engaged with a reduced screw threaded portion 136 integral with the bottom of each of the guide rods 130. When the turntable is elevated, the stop plates 134 engage the bottom surfaces of the guide plates 122 and the lower guide blocks 124. Of course, the turntable 112 can never be lowered beyond the elevation at which the bottom surface of the plate 102 engages the top surface of the guide plates 122 and the upper guide blocks 124.

From the above description, it is seen that a structure has been provided whereby a turntable mounted on a carriage may be raised to elevate a load above the platform and the carriage may be moved along the track formed in the platform. In operation, a load is first conveyed to a central portion of the platform. Air under pressure is supplied to the air mount to elevate the load above the platform 12. After the load has been elevated, the carriage may be moved from its initial, retracted position, which position is shown in FIGURE 1, forwardly of the platform along the track defined by the I-beams 50. When the carriage reaches its forwardmost position on the platform, the load may then be manually rotated without striking the obstruction provided by the posts 24 at the rear of the platform. After rotation of the load, the carriage may then be returned rearwardly along the track to its initial central position, the turntable and the load subsequently being lowered. Of course, it is understood that the load must be elevated above the platform to enable rotation because the load normally would be too heavy to rotate when engaged with the platform 12. The actuator 72 for moving the carriage and the air mount 90 for elevating the turntable are energized, or supplied with air under pressure, by pneumatic circuitry which will now be described in detail.

Referring to FIGURES 1 and 2, a pair of air supply lines 150 and 152 are attached by suitable couplings 154 to the forwardmost channel member 52. The lines 150 and 152 are connected to a three position valve 158 shown schematically in FIGURE 5. The construction of the valve 158 may be entirely conventional and accordingly is not described herein. Air under pressure from any suitable regulated source is directed to the valve 158 through an air line 160. A second air line 162 directed to the valve 158 provides exhaust. In FIGURE 5, the valve 158 is in a center position wherein both the air lines 150 and 152 are connected to the exhaust 162. In this central position, the turntable mechanism is in its lowered position, shown in FIGURE 1. To elevate the turntable and move the carriage, the section of the valve 158 to the left as viewed in FIGURE 5, which section is designated 158*a*, is moved to the right by a suitable control mechanism designated 164. When moved to the right, the pressure line 160 is connected to the air line 150 while the exhaust 162 is connected to the air line 152. Air under pressure is thus transmitted through the line 150 to a directional or slave valve 166.

As is evident from FIGURE 5, the slave valve 166 is

connected through an air line 168 to the air mount 90 and through an air line 170 to one end of the actuator 72. The slave or directional valve 166 is thus adapted to direct air under pressure either to the air mount 90 or to one end of the actuator 72. A weak biasing spring 172 biases the valve 166 into position to connect the air line 150 to the air line 168 to supply air to the air mount 90. Thus, when the valve 158 is first moved to the right, as viewed in FIGURE 5, air under pressure is supplied to the air mount 90 to raise the turntable 112.

While air is supplied to the air line 168, air under pressure is also supplied to an air line 180, one end of which is directly connected to the air line 150. The air line 180 is connected at its other end to a master or selection valve 182. A heavy spring 184 biases the valve 182 into a first position, shown in FIGURE 5, wherein the air line 180 is blocked. Thus, as the expansible air chamber in the air mount 90 is being expanded, the air line 180 is ineffective for all practical purposes. However, when a predetermined pressure is reached within the chamber in the air mount 90, an air pilot 186, connected between the line 180 and the valve 182 by an air line 187, presses against the valve 182 to overcome the bias of the spring 184 whereupon the valve 182 is moved into a second position wherein the lower part of the valve 182 connects the air line 180 to an air line 188. The air pilot 186, which controls the position of the valve 182, is simply an air actuator including a piston connected to the lower end of the valve 182. The piston does not operate, however, until the pressure in the air mount 90 is sufficiently high that the force of the air against the piston overcomes the bias of the spring 184. Since the air mount 90 has a large lifting area, the turntable 112 and the load are elevated above the platform 12 before the air mount pressure is so large that the bias of the spring 184 is overcome.

The line 188 is connected to a second air pilot 190 which is identical in construction to the first air pilot 186, but in this case is connected to the slave or directional valve 166. Since the spring 172 is a rather weak spring, the air pilot 190 operates rapidly to move the valve 166 to the left, as viewed in FIGURE 5, wherein air under pressure is supplied from the line 150 to the line 170. When the valve 166 is so positioned, the line 168 connected to the air mount 90 is blocked. Thus, air can neither enter nor leave the air mount 90. Upon connection between the air lines 150 and 170, the cylinder 74 of the actuator 72 is moved to the left viewed in FIGURE 5. Note that the piston rod 76, since fixed to the plate 80, cannot move. As viewed in FIGURE 3, relative movement between the piston rod 76 and the cylinder 74 causes the carriage to move to the right. The air line 152 is connected to the other or right side of the actuator 72 as viewed in FIGURE 5. Accordingly, as the cylinder 74 is moving to the left, the piston head, designated 76*a* in FIGURE 5, forces air from the right side of the cylinder to the exhaust line 162. By use of the pneumatic circuitry described above, it is seen that the mere manual positioning of the valve 158 to supply air under pressure to the air line 150 causes the air mount 90 to expand and raise the turntable 112. Immediately thereafter, the carriage automatically moves from its initial position on the platform forwardly of the platform.

It has been found that the carriage tends to move too rapidly when air under pressure is introduced to the left end of the actuator 72 as viewed in FIGURE 5. Accordingly, the air line 152 is constricted by a constrictor 194. A by-pass line 196, including a ball check valve 198, is placed in parallel with the constrictor 194. A similar constrictor 200 is attached to the air line 170 and again a by-pass, designated 202, including a ball check valve 204, is connected in parallel therewith. When air under pressure is introduced into the line 170, it passes through the by-pass line 202 into the left side of the actuator 72. However, the ball check valve 198 in the line 152 blocks passage of exhaust air through the by-pass line 196. Accordingly, air under pressure is supplied, without restriction, to the left side of the actuator 72 but the air on the right side of the actuator cannot pass as rapidly to exhaust through the line 152. Thus, the relative movement of the piston rod 76 and the cylinder 74 is dampened.

After the turntable mechanism has been moved forwardly, of the platform 12, the load on the turntable 112 may be freely rotated. Since the air line 168 has been blocked, the turntable 112 remains in an elevated position during forward movement of the carriage on the platform 12. After rotation of the load, the turntable mechanism 10 is returned rearwardly along its track to its initial or central position on the platform. To return the turntable mechanism, all the operator need do is actuate another control member, schematically illustrated at 206, in order to place the rightmost section of the valve 158, which section is designated 158*b*, into communication with the air lines 150 and 152. When this is done, the pressure line 160 is connected to the line 152 while the exhaust line 162 is connected to the line 150. Thus, the connections of the air lines 150 and 152 to the pressure and exhaust lines are reversed. Air under pressure is supplied through the line 152 to the right side of the actuator 72 whereupon the piston head 76*a* is biased to the left, as viewed in FIGURE 5, to return the turntable mechanism centrally of the platform. Again, the movement of the piston is dampened due to the constrictor 200 placed in the line 170. It is apparent that the air pilot 186 will be connected to the exhaust line 162 when the valve section 158*b* is moved to the left. When this occurs, the spring 184 will bias the valve 182 back to its initial position. In order to retain pressure upon the air pilot 190, an air line 208 is connected between the air line 152 and the valve 182. When the valve 182 is in the position shown in FIGURE 5, air under pressure is supplied through the lines 208 and 188 to the air pilot 190. The valve 166 is therefore retained in the position wherein the lines 150 and 170 are connected while the line 168 to the air mount 90 is blocked. The turntable mechanism 112 is thus returned along the track to its initial position on the platform before it lowers.

In order to lower the turntable 112, the valve 158 is returned to its central position, which is the position illustrated in FIGURE 5. As mentioned before, both the lines 150 and 152 are then connected to the exhaust line 162. When this occurs, the air pilot 190 is connected to exhaust so that the spring 172 biases the valve 166 to the position shown in FIGURE 5. The air mount 90 is then connected to exhaust to permit the turntable 112 to lower by gravity. Note that the valve 158 is now in its initial position as are the valves 166 and 182. Accordingly, the circuitry is in condition to repeat the operations described above. No attempt has been made in this application to disclose the specific structure of the valves or the air pilots because this structure is conventional. In addition, the connection of the air line 160 to air under pressure is not shown. However, it will be understood by those skilled in the art that any suitable regulated source of air under pressure could be used.

From the foregoing, it can be seen that a turntable mechanism of unusually simple structure has been provided by this invention. The simplicity of the circuitry is to be especially noted since it requires only three valves, two of them being operated by pilots. The control of the circuitry is equally simple. One need only to vary the position of the valve 158 to elevate the turntable and to cause the carriage to move forwardly along the track formed in the platform 12. The valve 158 may be foot controlled, as by the foot pedal 210 shown in FIGURE 1, with a suitable holding mechanism (not shown) so that only one operator is needed. Thus, the operator can move the valve 158 to the right, wherein it is held by the holding mechanism, rotate the load on

the turntable **112**, and subsequently return the valve **158** on the left to reverse the connection of the pressure and exhaust lines **160** and **162** to the air lines **150**, **152**. After the operator has observed that the turntable mechanism has been moved rearwardly along the track to its initial or central position on the platform, the operator releases the foot pedal **210** to allow a return spring (not shown) to return the valve **158** to its center position wherein both lines **150** and **152** are connected to the exhaust line **162** whereupon the turntable lowers to its original position. Thus, once the foot pedal **210** is released, the turntable cannot again be elevated without manipulation of the control mechanism **164**.

It should also be apparent from the foregoing that the circuitry, while simple, can be either pneumatic or hydraulically operated. The air mount **90**, as mentioned before, can be operated by fluids other than air. Usually, the use of either liquids or air will depend upon the type of circuitry used to operate the press through the actuators **26**. While a slight change in the structure of the valves and the pilots may be required to use fluids other than air, no change in the circuitry illustrated in FIGURE 5 would be required.

As is apparent from FIGURES 2, 3 and 4, the air pilot and valve members **186**, **190**, **182** and **172** are connected to the side plates **54** on the carriage base. For compactness, the sides of the base support plate **70** are cut away as indicated at **70***a* to provide arcuate pockets for the valve and air pilot members. Similarly, the ends of the rearmost channel member **52** are cut away, as indicated at **52***a* in FIGURE 2, to provide sufficient room for the rear guide blocks **124** and the associated guide rods **130**.

The specific structure of the valves **158**, **166** and **182**, the air pilots **186** and **190** and the manual control mechanism **164**, **206** for the valve **158** is not disclosed herein. It will be understood by those versed in the art that such structures are well known and commercially available.

Although the presently preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims. For example, the turntable mechanism need not necessarily be located within the platform of a compression strapping machine. It could be placed in other machines or in the conveyor system adjacent a strapping machine or the like. For purposes of this application, the term platform is intended to refer to any structural member that serves as a support in which a turntable mechanism could be mounted.

Having thus described our invention, we claim:

1. Apparatus for rotatably supporting a load on a platform, comprising: a track formed in said platform, a carriage on said track; an air mount having a chamber expansible upon application of fluid thereto supported by said carriage; a turntable mounted on said air mount in a position wherein the top surface of said turntable lies substantially in the plane of said platform, said turntable being elevated above the platform upon expansion of said chamber; a double acting fluid actuator interconnecting said platform and said carriage, said fluid actuator being adapted to move said carriage along said track; fluid supply means connected to said expansible chamber and to said fluid actuator and adapted to be connected to a source of fluid under pressure, said supply means including first valve means selectively operable to direct fluid under pressure to said expansible chamber and to one end of said actuator, first biasing means biasing said first valve means in a position wherein fluid is directed to said chamber, second valve means placed in parallel relationship with said expansible chamber, second biasing means biasing said second valve means into a position wherein passage of fluid therethrough is blocked, first valve positioning means connected to said first valve means adapted to overcome said first biasing means, second valve positioning means connected to said second valve means adapted to overcome said second biasing means, said second valve positioning means being responsive to expansion of said chamber to overcome said second biasing means whereby said second valve means is positioned to direct fluid under pressure to said first valve positioning means after said chamber has expanded, said first positioning means thereupon positioning said first valve means to direct fluid under pressure to one end of said actuator and simultaneously to block passage of fluid to or from said chamber whereby said actuator moves said carriage along said track after expansion of said chamber, control valve means including means to reverse the supply of fluid under pressure and the exhaust for exhausting fluid from said one end of said actuator and simultaneously connecting the other end of said actuator to fluid under pressure whereby said actuator returns said carriage along said track to its initial position, said second valve means including means to hold said first valve means in a position wherein passage of fluid to and from said expansible chamber is blocked while said carriage is being returned to its initial position, and said control valve means including means to exhaust fluid from all portions of said supply means whereupon said first valve means is biased by said first biasing means into a position wherein said expansible chamber is connected to an exhaust line to permit lowering of the turntable after return of the carriage.

2. Apparatus for rotatably supporting a load on a platform, comprising: a track formed in said platform, a carriage on said track; an air mount including an expansible chamber supported by said carriage; a plate supported by said air mount and elevating upon expansion of said chamber; guide means interconnecting said plate and said carriage guiding said plate as said chamber expands; a turntable mounted for rotation on said plate in a position wherein the top surface of said turntable lies substantially in the plane of said platform, said turntable being elevated with said plate such that the top surface of said turntable is above the platform upon expansion of said chamber; and fluid supply means connected to said expansible chamber and adapted to be connected to a source of fluid under pressure for directing fluid to said chamber to elevate the turntable.

3. The combination of claim 2 wherein a plurality of roller elements are mounted on said plate, said turntable being engaged by said roller elements for rotation with respect to said plate.

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