Sept. 30, 1969 C. D. PAQUETTE 3,469,714

STACKING MACHINE

Filed Nov. 13, 1967 8 Sheets-Sheet 1

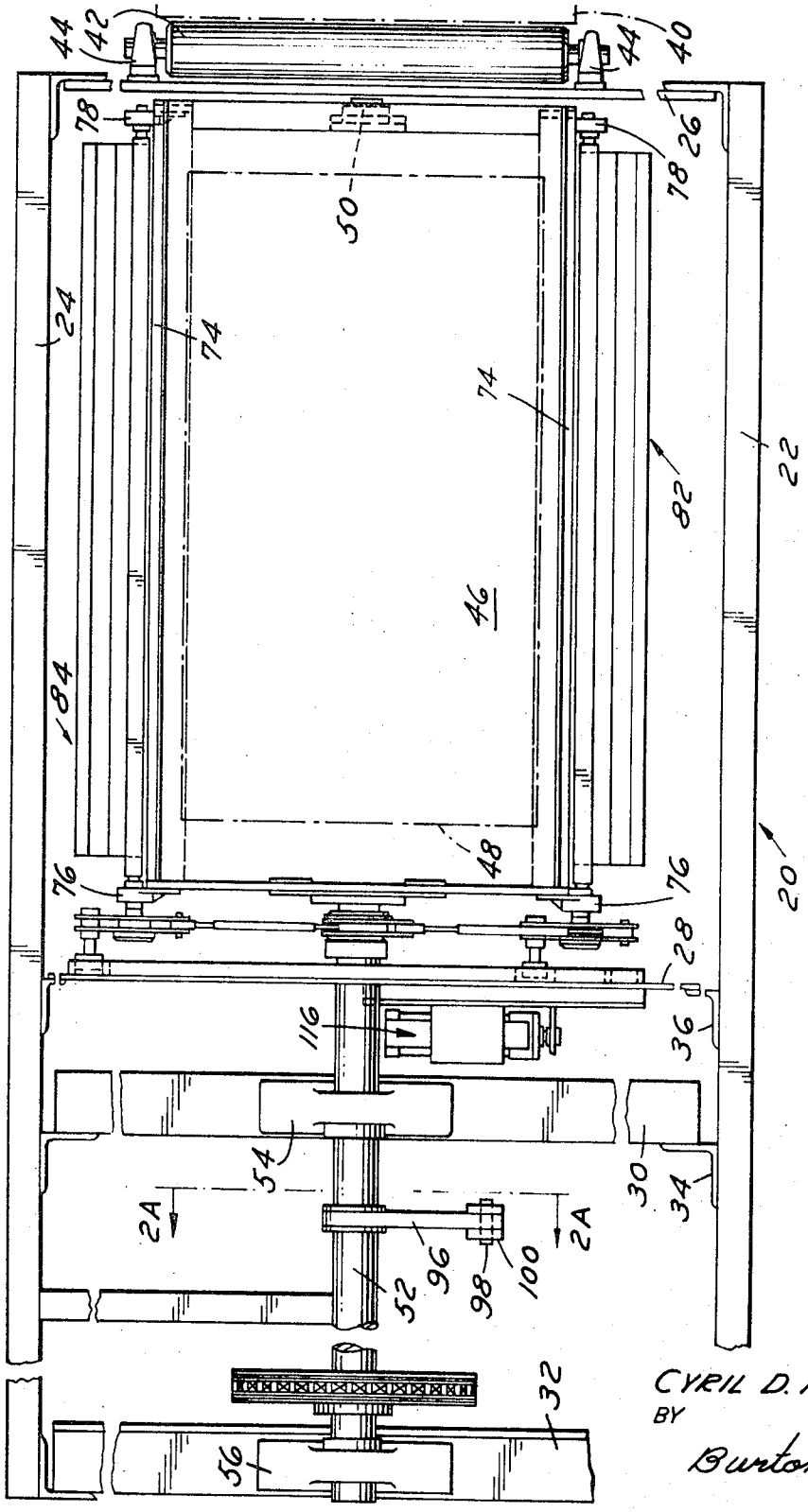


FIG. 1

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FIG. 2

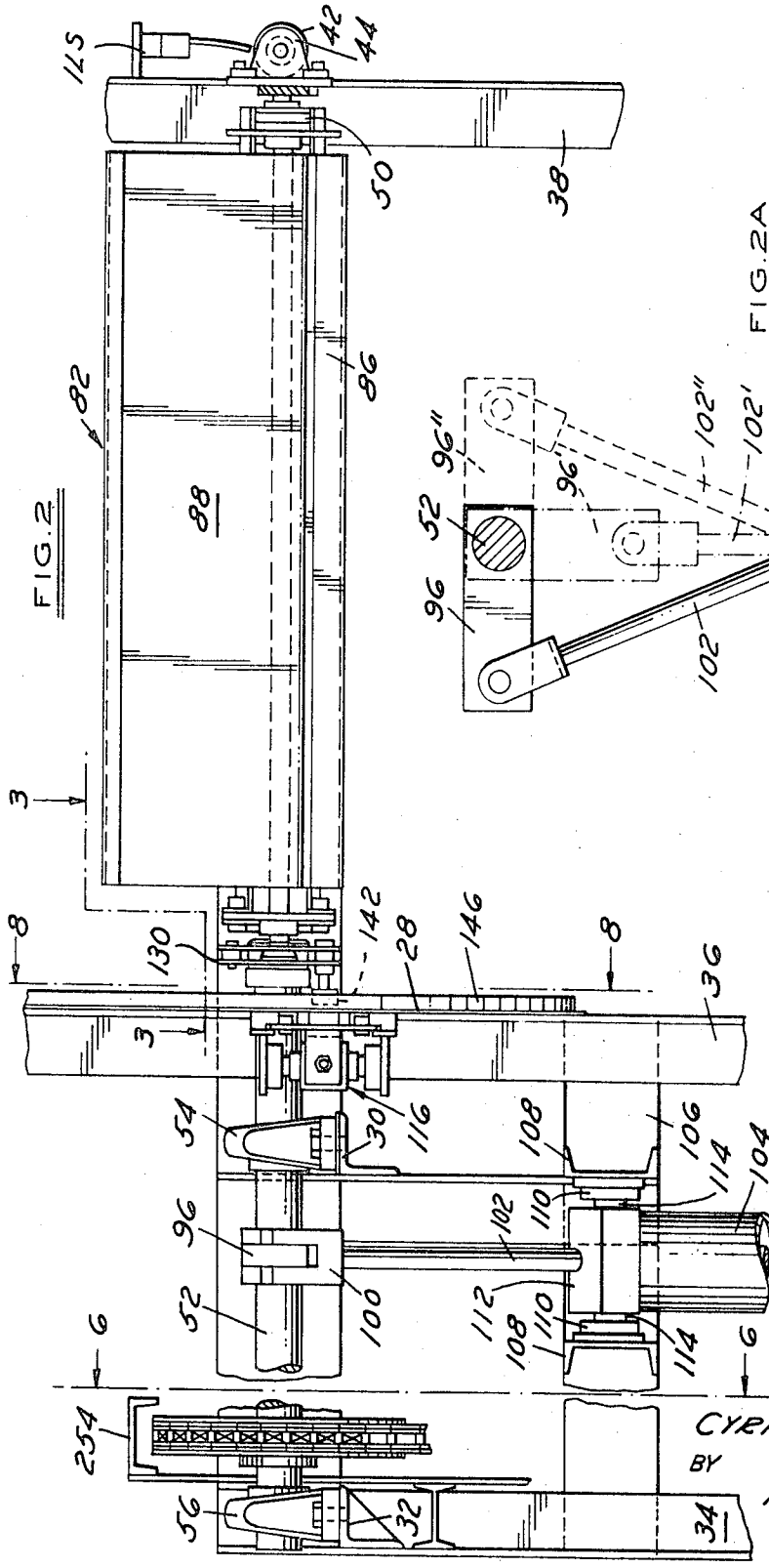


FIG. 2A

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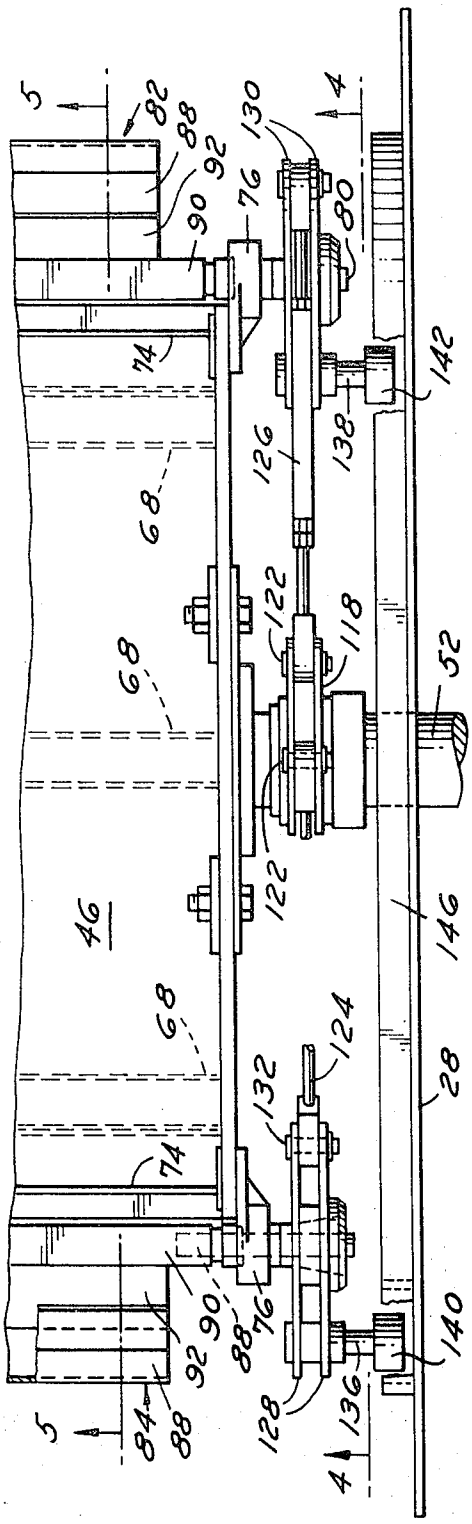


FIG. 3

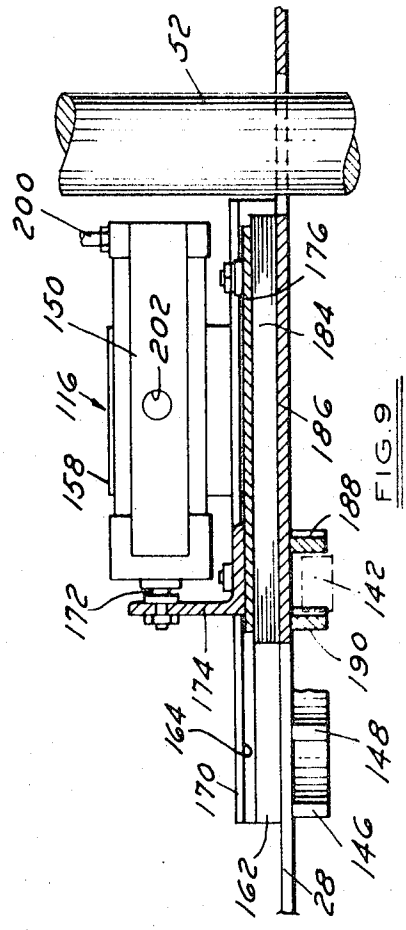


FIG. 9

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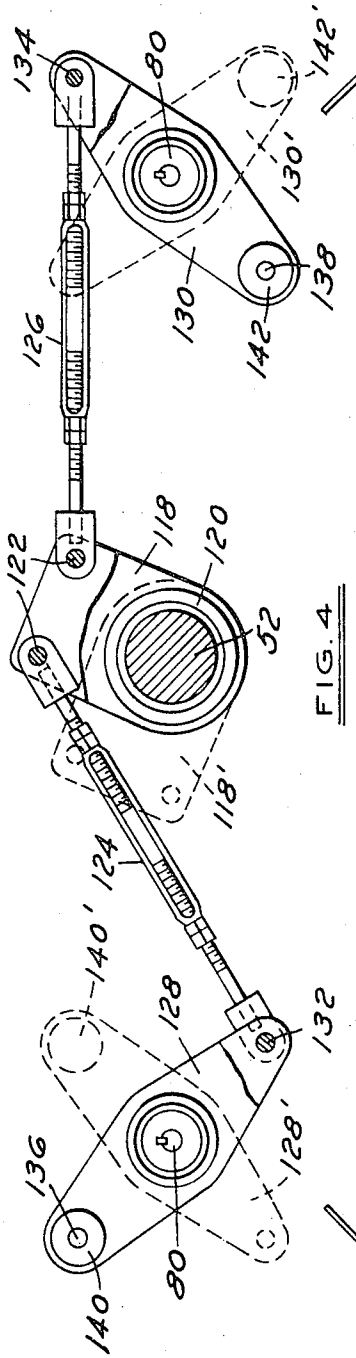


FIG. 4

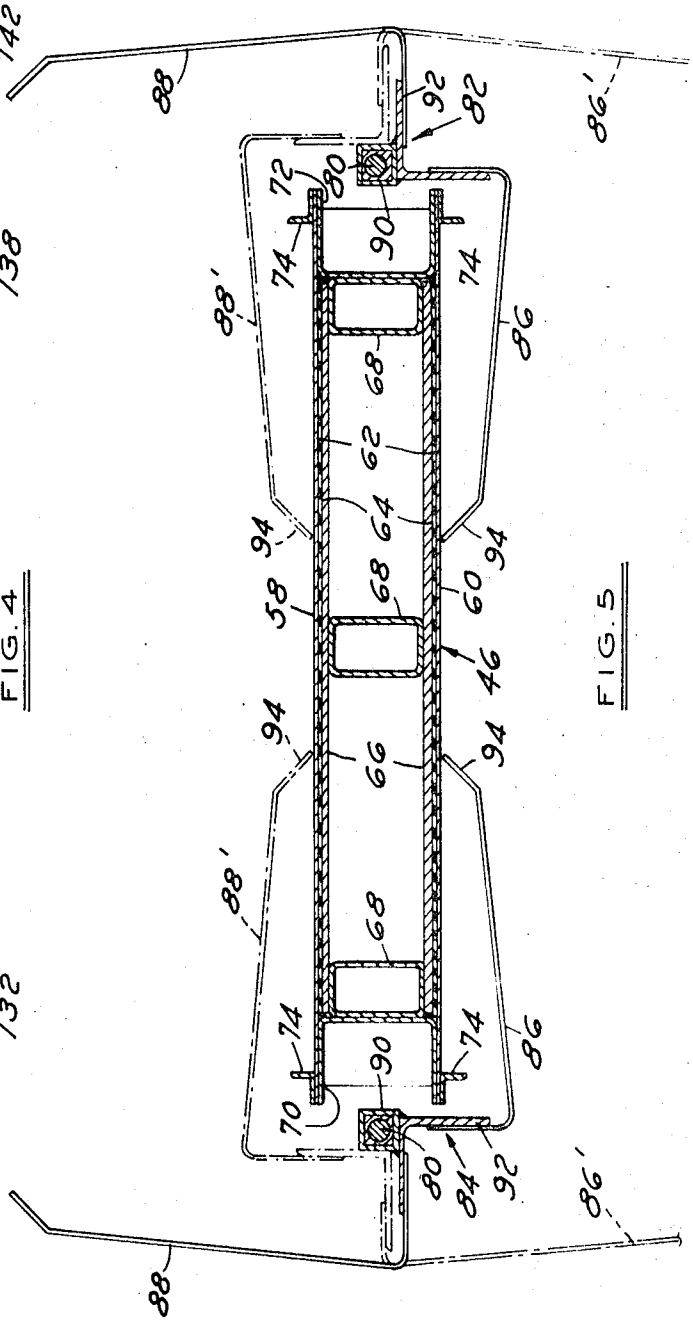


FIG. 5

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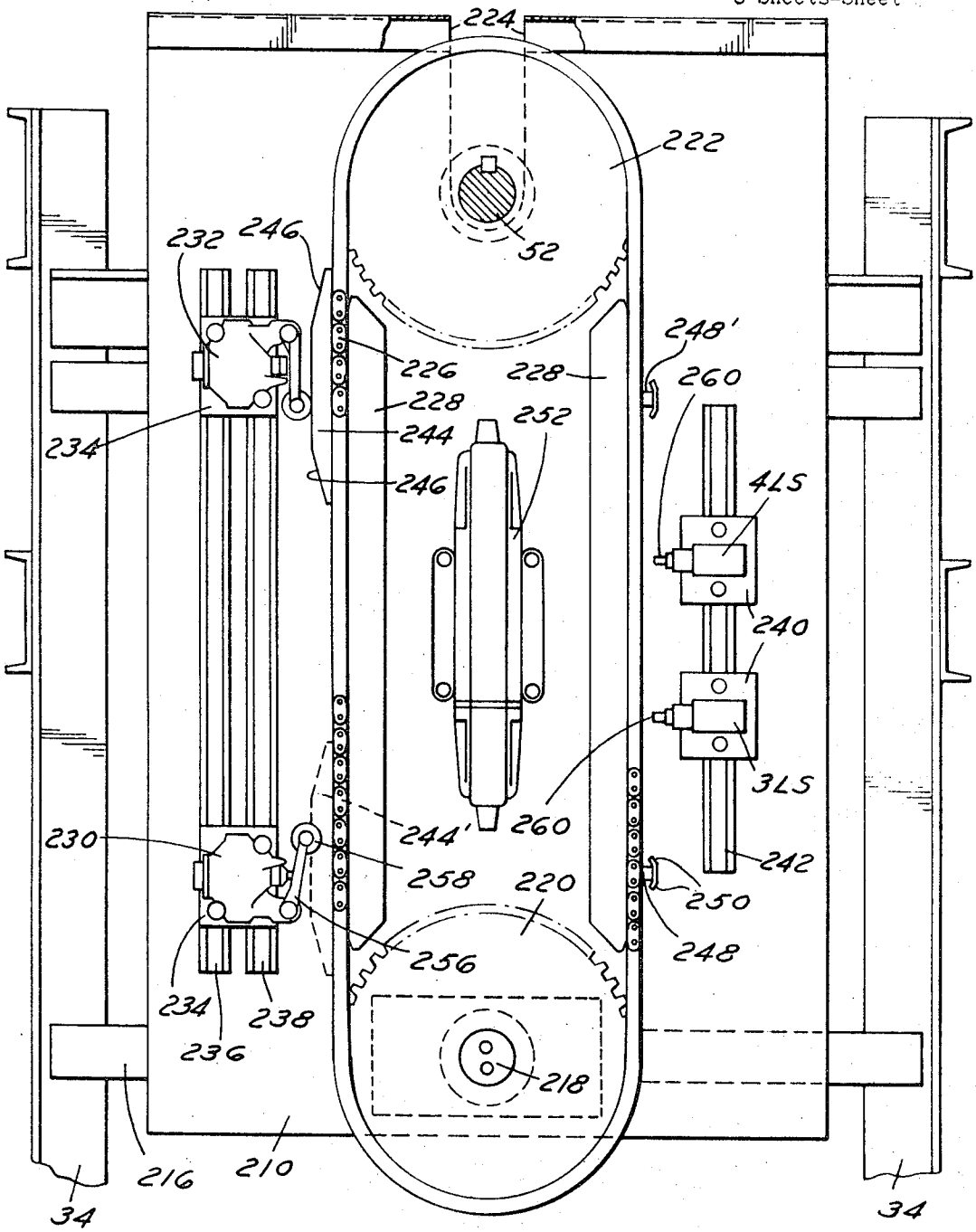


FIG. 6

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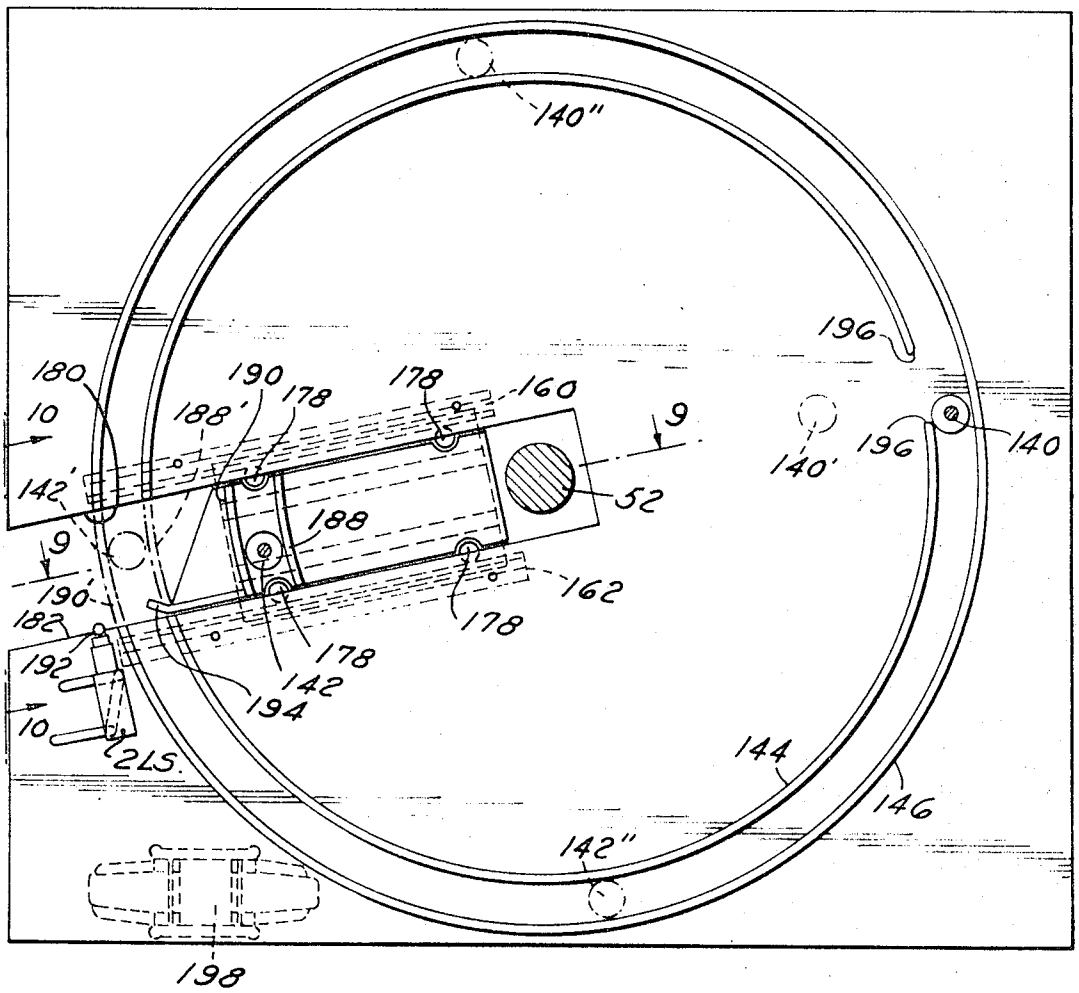


FIG. 8

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FIG. 7

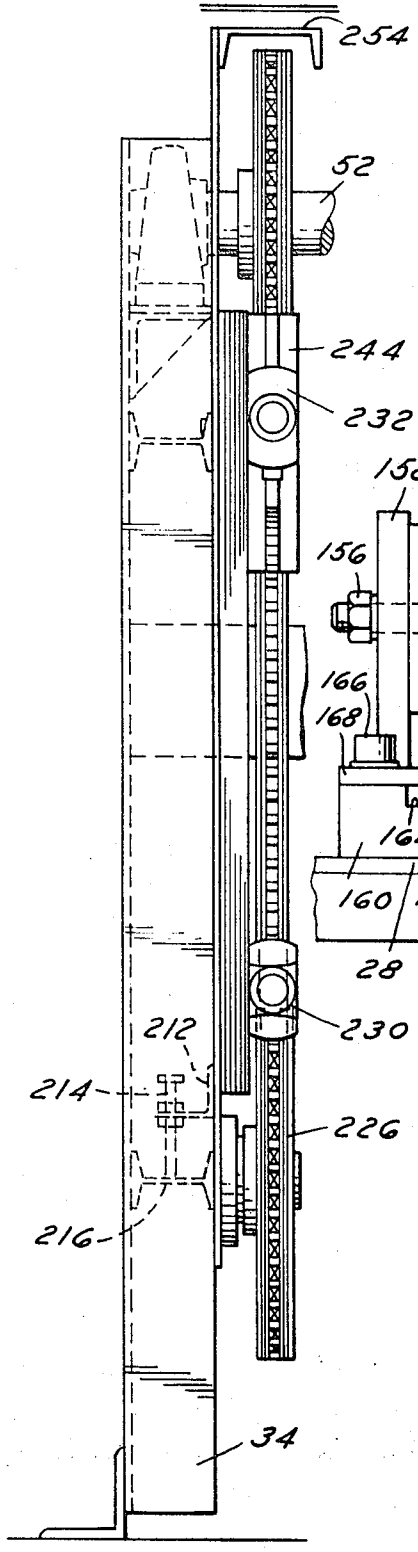
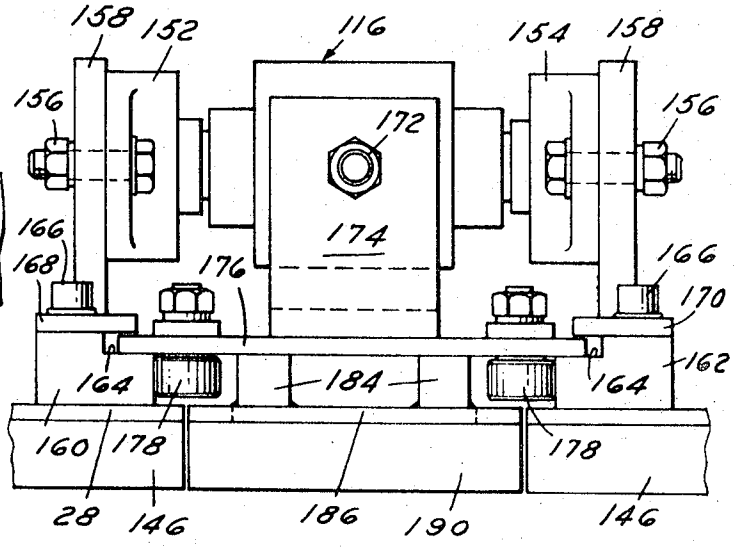


FIG. 10



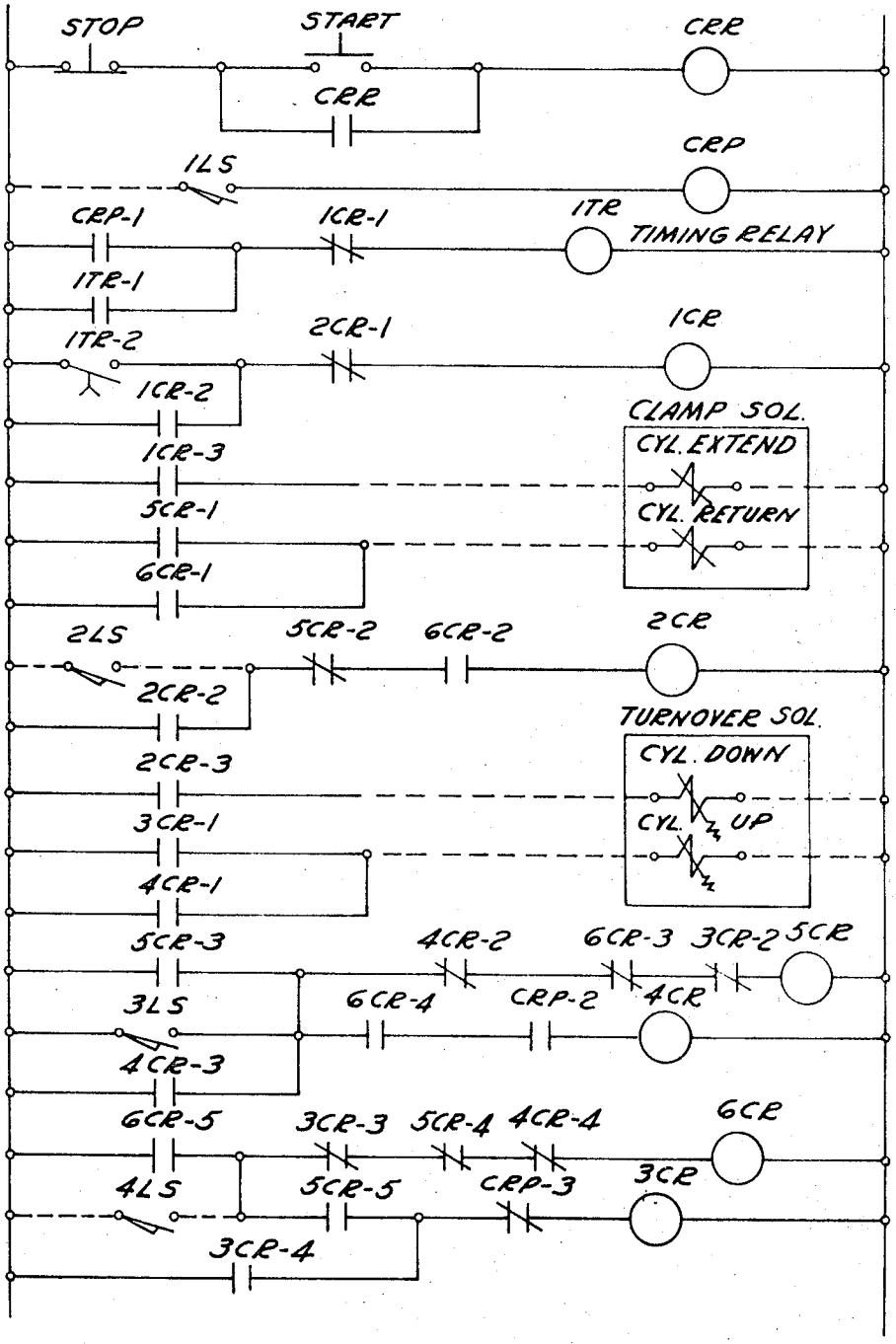
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FIG. 11



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United States Patent Office 3,469,714
Patented Sept. 30, 1969

3,469,714

STACKING MACHINE

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Filed Nov. 13, 1967, Ser. No. 682,277
Int. Cl. B65k 29/40; B65g 57/08
U.S. Cl. 214—6 6 Claims

ABSTRACT OF THE DISCLOSURE

A machine for receiving from a traveling conveyor in rapid succession sheets of material, and operable to deposit the sheets in a uniform stack for subsequent transfer to a remote location in a stacked condition, including an invertible table communicating with the downstream end of the conveyor for receiving successive sheets, means for oscillating the table through 180°, clamping means for retaining a sheet on the table during movement thereof and shiftable to release a sheet for gravity fall to the stack when the table stops, and control means for synchronizing movement of the table and the clamping means. The table upper and lower surfaces each are designed to accept the sheets of material, whereby upon movement of the table to deposit one sheet, the opposite table surface moves into position to accept the next successive sheet from the conveyor.

An object of the invention is the provision of a machine for receiving sheets from a moving conveyor in rapid succession and transferring successive sheets to a position beneath the machine, forming a stack of sheets for subsequent transfer to a remote location.

A further object is the provision of such a machine, which may be referred to as a stacking machine, having a two-sided table supported for oscillation about a horizontal axis, the table being disposed in sheet-receiving relation with a conveyor upon which the sheets travel in spaced apart relation to the stacking machine, and provided with clamping members shiftable from a clamping position retaining the sheet on the table during movement thereof to a release position permitting the sheet to drop by gravity to a stack beneath the table. One particularly advantageous feature is the provision of the two-sided table which enables delivery of a successive sheet to one side of the table while a preceding sheet is being released for deposit on the stack.

While the device described herein and illustrated in the drawings is especially adapted to handle flexible sheets of rubber or the like, it will be apparent to those skilled in the art that other materials of varied character can be handled without departure from the teachings of the invention.

Other objects, advantages and meritorious features will more fully appear from the following description, claims and accompanying drawings, wherein:

FIG. 1 is a top elevation of a stacking machine embodying the invention;

FIG. 2 is a side elevation of the machine;

FIG. 2–A is a view taken along line 2A—2A of FIG. 1 showing in schematic form the cycle of operation of the drive means for oscillating the machine;

FIG. 3 is a partial top elevation, on a larger scale, taken along line 3—3 of FIG. 2 and showing details of the table oscillating mechanism of the machine;

FIGS. 4 and 5 are sectional views taken along lines 4—4 and 5—5 respectively of FIG. 3;

FIG. 6 is a front elevation of the table oscillating control mechanism taken along line 6—6 of FIG. 2;

FIG. 7 is a side elevation of the control mechanism of FIG. 6;

FIG. 8 is a front elevation, partly in section, of the table oscillating mechanism of FIG. 3, taken along line 8—8 of FIG. 2;

FIGS. 9 and 10 are sectional views taken along lines 9—9 and 10—10 respectively of FIG. 8; and

FIG. 11 is a schematic representation of an electrical control circuit for controlling operation of the machine.

Turning now to a more detailed examination of the drawings, there is shown in top elevation in FIG. 1 and in side elevation in FIG. 2 a machine embodying the invention having a generally rectangular supporting frame 20 including longitudinally extending frame members 22, 24 and transverse frame members 26, 28, 30 and 32. The frame 20 is supported on a plurality of upright supports 34, 36 and 38 the lower ends of which rest on the building floor (not shown). The frame and supports are preferably made up of structural steel members which are welded and/or bolted together to form a rigid support for the various machine parts. The sheets to be stacked enter the machine from the right-hand end thereof as shown in FIGS. 1 and 2, and are preferably delivered on a travelling conveyor, the discharge or downstream extremity of which is indicated by a phantom line 40 in FIG. 1. Disposed in juxtaposition with the conveyor is an idler roller 42 journaled in suitable bearings 44 at its opposite ends, the bearings being mounted on transverse frame member 26. Each sheet entering the machine is guided by the idler roller 42.

Rotatably supported between frame members 26 and 38 is a table 46 adapted to receive a sheet of material shown in phantom at 48 in FIG. 1. At one end the table 46 exhibits a stub shaft journaled in a bearing 50 secured to frame member 26, while at its opposite end the table is mounted on the end of a main drive shaft 52 which is journaled in bearings 54 and 56 bolted or otherwise secured to frame members 30 and 32 respectively. Table 46 is shown in cross section in FIG. 5, and includes two identical sheet supporting surfaces 58 and 60 identical in construction, each comprising an outer layer 62 of wear-resistant material such as galvanized sheet steel or the like, an intermediate layer 64 preferably of rubber, and an inner supporting layer 66 of hardboard or other suitable material. Along opposite marginal edges and on the longitudinal centerline of the table 46 extend rectangular tubular support members 68 to reinforce and impart rigidity to the table and retain the surfaces 58 and 60 in spaced apart relation. There are in addition a pair of channels 70 and 72 running along opposite edges of the table to furnish additional support. Upstanding from opposite longitudinal marginal edges of the table surfaces 58 and 60 are L-shaped guides 74 which prevent the sheet material being handled from turning askew on the table and overhanging the table edge.

Secured to the table and projecting beyond the opposite longitudinal edges thereof are identical pairs of bearing blocks 76, 78 (FIG. 1) having bearings within which are journaled axles 80 forming pivots for clamping assemblies shown most clearly in FIG. 5 at 82 and 84. Each assembly includes two clamping arms 86 and 88 so arranged that when one is shifted into clamping engagement against a sheet on one table surface, the other is shifted away from the opposite table surface, as will more fully appear hereinafter. The clamping assemblies 82 and 84 each include an elongate tubular member 90 of square cross section fixed to axles 80 and having secured thereto as by welding an elongate angle member 92. Welded to each member 90 are the two clamping arms 86 and 88, provided with displaced outer end portions 94. As can be seen from FIG. 5, movement of each assembly through one-quarter revolution shifts the clamping arm 86 from its clamping position to its release position shown in phantom at 86', while simultaneously shifting clamping arm 88

from its release to its clamping position shown in phantom at 88'. Means are provided as hereinafter described for operating the assemblies 82 and 84 in unison and in timed relation with table movement, whereby when a sheet is received in position on the upper table surface (58 in FIG. 5), the assemblies shift to clamp such sheet by shifting arms 88 to clamping position 88', while simultaneously releasing a sheet previously received on the lower table surface (60 in FIG. 5) by shifting arms 86 to release position 86'. After the clamping arms are shifted, the entire assembly of table 46 and arm assemblies 82 and 84 is turned on shaft 52 through 180° as to be described.

FIGS. 1 and 2 show the motive means for driving the table 46 and the clamping assemblies 82 and 84, which in the illustrated embodiment are both fluid pressure operated piston-cylinder means. Fixedly mounted on main drive shaft 52 is a rigid arm 96 extending generally horizontally from the shaft when the table is in its stopped position ready to receive a sheet 48 from conveyor 40. Pivotally connected to the outer end of arm 96 on a pin 98 is a clevis 100 fixed on the outer extremity of a piston rod 102, reciprocable with its piston within air cylinder 104 (FIG. 2). A horizontal support 106 is provided with a pair of channel members 108 to each of which is secured a bearing block 110, while the head of cylinder 104 is in the form of a block 112 having pins 114 projecting from its opposite sides journaled within the bearings 110. The cylinder is pivotally suspended on these two pins, with its lower end hanging free. The pivotal axis defined by pins 114 is in substantially vertical alignment with the axis of main drive shaft 52, which is of course connected to table 46 to shift the latter.

FIG. 2–A shows schematically the cycle of operation of the table oscillating mechanism, the control system for which will be described in detail hereinafter. With table 46 disposed with one of its surfaces 58 or 60 in horizontal sheet-receiving position, arm 96 extends horizontalldy to one side or the other of drive shaft 52 as shown at 96 and 96'' in FIG. 2–A. When the control is actuated, cylinder 104 is pressurized to retract piston rod 102, carrying arm 96 in a downward arc and in turn rotating shaft 52 and table 46. As arm 96 and piston rod 102 approach a vertical position as shown at 96' and 102' in FIG. 2–A, the valve controlling operation of the piston-cylinder 104 is shifted to a neutral position, allowing the mechanism to coast or float through the dead center position. As shown as the piston rod and arm shift past their vertical position, the cylinder reversely pressurized, and the arm 96 and shaft 52 rotated through the remainder of their cycle of 180° travel. The operation of the piston cylinder 104 is exactly the same to oscillate the table in the opposite direction, as will more fully appear.

The means for shifting the clamping assemblies 82 and 84 also comprises a fluid pressure motor assembly 116 (FIGS. 1 and 2) which is mounted on one of the frame members 28 on the side thereof opposite table 46. Details of the assembly 116 and the associated mechanism for driving the clamps are shown in FIGS. 3, 4, 8, 9 and 10. Referring first briefly to FIG. 3, it can be seen that the clamping assemblies 82 and 84 are secured to the table 46 by the blocks 76 through which the stub axles 80 extend, and therefore the clamps move with the table during its oscillation about its longitudinal centerline as above set forth. FIGS. 3 and 4 show the linkage connected to the clamps for shifting them between their clamp and release positions, which includes a bracket 118 journaled on a bearing 120 encircling shaft 52, the bracket comprising two spaced parallel plates (FIG. 3) each apertured to accept a pair of pins 122 pivotally connecting links 124, 126 to the bracket, the links being in this case turnbuckles (see FIG. 4). The opposite end of each link 124, 126 is pivotally connected to one end of its respective linkage arm 128, 130 by pins 132, 134, the opposite end of each of the arms 128, 130 having a stub shaft 136, 138 projecting therefrom with rollers 140, 142 rotatably secured to the end of the shafts. The arms 128 and 130 are each keyed to one of the axles 80 projecting from the clamping assemblies 82 and 84, and therefore swingable movement of the arms 128 and 130 from their solid outline positions to the ir dotted outline positions as shown in FIG. 4 imparts swingable movement of the clamping assemblies from their solid outline to their phantom outline positions as shown in FIG. 5.

Frame member 28 is preferably of rectangular shape, as shown in FIG. 8, having fixed to one surface thereof a circular track comprising a pair of spaced circular rails 144 and 146 between which the rollers 140 and 142 project (FIGS. 3 and 8) for guided movement during oscillating of the table 46. Thus during table movement, the rollers 140 and 142 traverse the track 144, 146 and the clamping assemblies remain relatively stationary with respect to the table. When the table 46 comes to a stop and another sheet enters onto the table, the clamping assemblies are operated to clamp the sheet on the upper table surface and release the sheet clamped to the lower table surface as follows:

The motor assembly 116 is mounted on the opposite side of frame member 28 (FIGS. 8, 9 and 10) and includes a piston-cylinder 150 supported on bearings 152, 154 which are in turn bolted as at 156 to supports 158. Secured as by welding to member 28 are a pair of spaced parallel wear blocks 160 and 162 extending radially of the track 144, 146 (FIG. 8), each having a cutout 164 in its upper face, and secured to the top of each block by capscrews 166 or the like is a plate 168, 170. Piston cylinder motor 150 has a piston rod 172 bolted to an L-shaped bracket 174 which carries a slide plate 176 supported for movement in the cutouts 164 (FIG. 10) on wear blocks 160, 162. Slide 176 is apertured to receive a plurality of shafts having depending rollers 178 which engage the side walls of wear blocks 160, 162 to guide the slide 176 in its reciprocable movement.

Member 28 and track rails 144 and 146 are cut away as at 180, 182 (FIG. 8) to provide a generally rectangular slot. Depending from slide 176 and spaced therefrom by blocks 184 is a plate 186 having secured thereto a pair of track sections 188 and 190 which form a continuation of the track defined by rails 144 and 146 when shifted to the positions shown in phantom at 188' and 190' in FIG. 8. A limit switch 2LS (FIG. 8) is mounted on member 28 and has an actuating arm 192 positioned for actuation by an arm 194 projecting forwardly from assembly 116 and movable therewith. As shown in FIG. 8, inner track rail 144 is provided with a cutout shown at 196 which is disposed diametrically opposite the cutout 180, 182, for a purpose to be described. Also mounted on member 28 is a solenoid operated valve 198 connected by suitable air lines to the cylinder 150 to shift the piston within the cylinder.

Referring to FIGS. 4, 5, 8 and 9, the operation of the clamping assemblies 82 and 84 can be understood. As FIG. 8 is a view taken looking in the opposite direction to FIGS. 4 and 5, the parts appear reversed. With table 46 disposed as shown in FIG. 5, piston rod 172 is retracted, and roller 142 is entrapped between rail sections 188 and 190 spaced radially inwardly from main track 146, 148 as shown in both FIG. 8 and FIG. 9. In this position of assembly 116, the control linkage shown in FIG. 4 is in its solid outline position, and the clamping assemblies 82 and 84 of FIG. 5 are also in their solid outline position, i.e. upper arms 88 are in release or sheet-receiving position, while lower arms 86 are in their clamping position. When a sheet 48 enters the machine it comes to rest on table surface 58 (FIG. 5) and actuates control means which operates solenoid valve 198 (FIG. 8) to pressurize port 200 of cylinder 150 (FIG. 9) to extend piston rod 172.

Considering now what occurs upon extension of piston rod 172, keeping in mind that FIG. 8 and FIG. 4 are

oppositely arranged, when the piston rod extends, slide 176 is shifted along ways 164 guided by rollers 178 and carries plate 186 along with it. As shown in FIG. 9, roller 142 is embraced by track sections 188 and 190 depending from plate 186, so extension of piston rod 172 shifts the roller 142 into alignment with track sections 146, 148, or as shown in FIG. 8, from its solid outline position 142 to its phantom position 142'. As roller 142 is mounted on link arm 130 which is in turn keyed to shaft 80 (FIG. 4) of clamping assembly 82 (FIG. 5) movement of the roller shifts the clamping assembly 82 and through the linkage of FIG. 4 also shifts the clamping assembly 84. Thus the upper clamping arms 88 are shifted into clamping position 88', while the lower arms 86 are shifted to their release position 86'. Turning back to FIG. 8, movement of roller 142 causes a corresponding movement of roller 140, and rail 144 is cut away as at 196 to accommodate movement of the roller to its position shown at 140'.

With the parts in the positions above described, the table 46 will be turned 180°, inverting the table to permit the sheet on table surface to be released and positioning table surface 60 uppermost to accept the next sheet (FIG. 5). During table rotation, the clamping assemblies move with the table, but no relative movement occurs between the clamps and the table. Assuming arm 96, cylinder 104 and piston rod 102 to be in the position shown in FIGS. 1 and 2, table 46 will be rotated through its 180° arc clockwise as shown in FIG. 5, and the linkage mechanism will also rotate clockwise as shown in FIG. 4. Turning to FIG. 8, roller 142 will be guided within the track 144, 146 in a counterclockwise direction from its position 142' to a position previously occupied by roller 140 indicated at the right hand side of FIG. 8. Roller 140 will also describe a counterclockwise arc from its position at 140' to the position previously occupied by roller 142, namely between track rail sections 188 and 190. In this position the rollers are ready for cylinder 150 to be pressurized, extending piston rod 172 to shift the clamping assemblies 82 and 84. As will appear, cylinder 150 is reversely pressurized through port 202 to retract its piston rod and shift rail sections back to their positions shown in FIG. 9 and in solid outline in FIG. 8 during table movement.

Shown in FIGS. 6 and 7 is what may be termed a timing mechanism for the piston-cylinder drive 104 which turns the table 46. As pointed out above, the cylinder 104 is pressurized to retract the piston rod 102 and then reversely pressurized to extend the piston rod during each cycle of operation, that is, to turn the table 46 through its 180° rotation. As the motor must "float" through dead center, the timing mechanism operates to permit smooth operation of the cylinder through its double movement. Such mechanism is mounted on a plate 210 supported between two of the upright frame members 34. An angle bracket 212 welded to the rear surface of plate 210 is apertured to accept adjustment bolts 214 (only one shown in FIG. 7) which are supported on a horizontal beam 216, so that adjustment of the bolts 214 provides for limited vertical movement of the plate 210 for a purpose to be described.

Secured to the front surface of plate 210 near the lower edge thereof is an axle-bearing assembly 218 which carries a sprocket 220, while keyed to shaft 52 near the upper edge of plate 210 is a second sprocket 222. A sawcut 224 permits vertical adjustment of the plate with respect to shaft 52. A sprocket chain 226 is entrained over the sprockets 220 and 222, and the tension of the chain may be adjusted by shifting the plate 210 through the adjustment screws 214 above described. A pair of elongate wear bars 228 are secured tot he plate 210 and engage chain 226 to retain the latter in proper position. Sprocket 222 turns with main drive shaft 52, in turn driving chain 226.

Adjustably supported on plate 210 are a pair of air valves 230 and 232, and also a pair of limit switches 3LS and 4LS. The valves are each mounted on a plate 234 which is in turn supported on a pair of rails 236, 238 and coupled thereto by bolts or the like, the rails being formed to permit slidable movement of the valves therealong upon loosening the bolts and retaining the valves in position when the bolts are tightened. Limit switches LS3 and LS4 are similarly mounted on plates 240, which are in turn supported on a single rail 242 identical to rails 236 and 238 to permit adjustment of the switches along the rail. Secured to chain 226 on the side thereof confronting valves 230 and 232 is an elongate actuator cam 244 tapered at its opposite ends as shown at 246. On the side of chain 226 facing switches 3LS and 4LS there is fixed a switch actuating button 248 having inclined ramp portions 250 up which the switch arms ride during their actuating movement. Secured to plate 210 is a solenoid operated valve 252 for controlling supply of air under pressure to cylinder 104. A channel-shaped guard 254 projects over sprocket 222.

Valves 230 and 232 are air "cushion" valves, i.e. they restrict or cushion the flow of air from the cylinder 104 to slow the piston therein and provide a smooth stop. They are thus interposed between the solenoid operated valve 252 and the cylinder 104. Each valve has an actuating arm 256 pivoted to the valve body and carrying a roller 258 at its outer end, movement of arm 256 by engagement with cam 244 actuating the valve. Switches 3LS and 4LS have plunger type actuating arms 260 which are shifted by engagement by button 248 to close the switch contacts. With the timing mechanism positioned as shown in FIG. 6, the table 46 is as shown in FIGS. 1 and 2. Entry of a sheet 48 onto the table causes the control system to be described to actuate the clamping assemblies 82 and 84 as set forth hereinabove, and at the end of clamping mechanism travel, solenoid operated valve 252 is shifted to pressurize cylinder 104, starting retraction of the piston rod 102 to turn table 46 by rotating drive shaft 52. The shaft 52 and sprocket 222 are rotated counterclockwise as shown in FIG. 8 during this cycle of operation.

As piston rod 102 of cylinder 104 approaches its fully retracted position, button 248 contacts and shifts plunger 260 of limit switch 3LS, which shifts valve 252 to a neutral position, allowing piston rod 102 in cylinder 104 to float through dead center, and after the piston rod floats through dead center and begins to extend, button 248 shifts plunger 260 of switch 4LS, actuating the switch to reversely pressurize cylinder 104 through reverse actuation of valve 252, thereby extending piston rod 102 to complete 180° travel of table 46. As the piston rod 102 approaches its fully extended position, and table 46 nears its fully inverted position, cam 244 abuts roller 258, causing movement of switch arm 256 to actuate "cushion" valve 230, restricting exhaust from cylinder 104 to bring the table 46 to a smooth stop. The next cycle of table movement is accomplished by rotating shaft 52 in a clockwise direction as shown in FIGURE 8, and such is accomplished in the same manner as above described as far as the timing mechanism is concerned, except that switch 4LS will be first actuated to shift valve 252 to neutral position, while switch 3LS will be actuated thereafter to shift valve 252 to its position pressurizing cylinder 104 to extend piston rod 102. Near the end of the cycle, cam 244 will actuate "cushion" valve 232 to bring the table to a smooth stop. The exact action of the various components will become apparent from the description of the control system appearing herebelow.

In FIG. 11 there is shown schematically a control system for the stacking machine mechanism illustrated in FIGS. 1–10. With the controls as shown therein, the machine is at rest, the various components thereof being in their positions as shown in solid outline in FIGS. 1–10. Pushing a start button to close contacts 260 energizes relay CRR, closing its contacts CRR–1 to lock the control circuit in energized condition.

As a sheet of material to be stacked is delivered to the table 46 from conveyor 40 (FIG. 1) it strikes the depending probe-like actuating arm of limit switch 1LS (FIG. 2) which momentarily energizes relay CRP, closing its contacts CRP–1 to energize timing relay 1TR. Relay CRP drops out as soon as the sheet clears 1LS, but relay 1TR remains energized through its contacts 1TR–1 which lock it in. Relay CRP also has normally closed sets of contacts CRP–2 and CRP–3 which open during energization of the relay to prevent energization of relays 4CR and 3CR when a sheet of material is entering the machine, as will appear.

Timing relay 1TR is set to time out and close its contacts 1TR–2 when the entering sheet 48 is in the position shown in FIG. 1. Closure of 1TR–2 energizes 1CR, opening 1CR–1 to drop out relay relay 1TR, closing 1CR–2 to lockin its relay, and closing 1CR–3 to energize the solenoid in valve 198 (FIG. 8) to shift the valve to its position pressurizing port 200 of cylinder 150. This operates to extend piston rod 172, shifting roller 142 to its position shown at 142′ in FIG. 8, and in turn clamping sheet 48 on table 46 by clamp arms 88 (FIG. 5) while releasing clamp arms 86. The action of the clamping assemblies is of course accomplished through the linkage shown in FIG. 4 as previously described.

As piston rod 172 is fully extended, actuating member 194 (FIG. 8) depresses plunger 192, closing 2LS and energizing relay 2CR, whose contacts 2CR–1 open to drop out relay 1CR, 2CR–2 close locking in the relay, and 2CR–3 close to energize the solenoid which operates valve 252. The valve is shifted to its position pressurizing the upper end of cylinder 104 (FIG. 2). Referring to FIG. 2–A, arm 96 and piston rod 102 are as shown in solid outline, and as the cylinder 104 is pressurized, piston rod 102 retracts, swinging arm 96 through its arc to turn shaft 52 and rotate the table 46. When the arm and piston rod approach "dead center" position 96′ and 102′, actuator button 248 has been moved into engagement with plunger 260, closing 3LS (FIG. 6), and energizing 5CR (FIG. 11). Relay contacts 5CR–1 close, energizing solenoid operated valve 198 (FIG. 8) to pressurize pore 202 of cylinder 150, thereby retracting the track sections 188 and 190 (FIG. 9), which has no positive effect on the clamping assemblies, as rollers 140 and 142 are at this point during the cycle of operation in the positions shown at 140″ and 142″ in FIG. 8. Relay 5CR in addition has contacts 5CR–2 which now open, dropping out relay 2CR and shifting valve 252 (FIG. 6) to a neutral position which places both ends of cylinder 104 on exhaust, allowing the mechanism to float or coast through the dead center position of FIG. 2–A on its inertia. Contacts 5CR–3 also close, locking in the relay, contacts 5CR–4 open to prevent energization of relay 6CR, and 5CR–5 close to enable energization of relay 3CR.

When arm 96, piston rod 102 and cylinder 104, pass through dead center, as shown at 96′, 102′ and 104′ in FIG. 2–A, actuating button 248 approaches plunger 260 of 4LS (FIG. 6) and closes the switch a few degrees after the mechanism clears the dead center position. As relay contacts 5CR–4 are now open, 6CR cannot be energized and closure of 4LS energizes 3CR, closing its contacts 3CR–1 to actuate valve 252, pressurizing the lower end of cylinder 104 and extending piston rod 102 until the turnover mechanism reaches its position indicated at 96″ and 102″ in FIG. 2–A. Relay contacts 3CR–2 and 3CR–3 open, dropping out relay 5CR or 6CR, and contacts 3CR–4 close to lock in relay 3CR. Shaft 52 has now been rotated 180°, and table 46 has turned through its complete 180° cycle, inverting the parts shown in FIG. 5. One set of clamping arms are positioned as shown at 88′, retaining a sheet on the underside 58 of the table, while the other set of arms are in release position 86′, and tabel surface 60 is positioned to accept a following sheet from conveyor 40.

Entry of the next sheet onto table surface 60 of table 46 will again close 1LS, and the relays CRP, 1TR and 1CR will operate in the identical manner as described above to begin the next cycle. As roller 140 will now be embraced by rail sections 188 and 190 (FIG. 9), the movement of the clamping assemblies 82 and 84 will be the reverse of the first cycle, i.e. arms 88 will shift to their release position, releasing the previous sheet to fall onto the stack beneath the table, and arms 86 will shift to clamping position to retain the sheet on surface 60 for turnover. Closure of 2LS also operates to begin retraction of piston rod 102, which now causes clockwise rotation of shaft 52 as shown in FIG. 2–A, because the arm and piston rod are in an initial position shown at 96″ and 102″. Turning to FIG. 8, limit switch 4LS and then switch 3LS will be closed by button 248, the reverse order to that described above.

Closure of 4LS first will energize relay 6CR, which will perform the same function in the control circuit of FIG. 11 as relay 5CR did during the previous cycle. Likewise, subsequent closure of 3LS will energize 4CR, which performs the identical functions performed by 3CR previously. Thus the control relays 3CR, 4CR, 5CR and 6CR are provided and arranged to operate the turnover mechanism identically during each cycle irrespective of the direction of rotation, and irrespective of the order in which 3LS and 4LS are actuated. As can be seen from FIG. 11, if 3LS is closed first, 5CR is energized, the circuit to 4CR being open by normally open contacts 6CR–4, and contacts 5CR–2 are opened to deenergize relay 2CR. Subsequent closure of 4LS energizes relay 3CR, closing relay contacts 3CR–1, relay 6CR being kept from energization by the opening of contacts 5CR–4 due to the earlier energization of relay 5CR. If on the other hand 4LS closes first, 6CR is energized to drop out relay 2CR through the opening of contacts 6CR–2, the circuit of relay 3CR being open by normally open contacts 5CR–5. Subsequent closure of 3LS energizes 4CR, closing its contacts 4CR–1, and relay 5CR is held open by contacts 6CR–3, previously opened by energization of 6CR.

With the control system and the motive means shown and described above, the stacking machine will operate to oscillate the table 46 and to shift the clamping assemblies 82 and 84 in response to the entry of successive sheets into the machine, thereby automatically stacking the sheets one on top of the other underneath the table 46.

What is claimed is:

1. Apparatus for stacking sheets of material successively delivered in spaced relation along a conveyor, comprising in combination: an invertible table member in sheet receiving relation with the downstream end of the conveyor having opposed table surfaces accommodating a sheet of material; drive means coupled to the table operable to oscillate it between positions disposing first one and then the other table surface in said receiving relation with the conveyor; means mounted on the table for retaining the sheet thereon during table movement including a pair of clamping arms for each table surface each mounted on a pivot shaft extending along a marginal edge of the table, with the clamping arm being shiftable upon its shaft from a sheet retaining position overlying a table surface to a sheet releasing position generally perpendicular to the table surface and spaced beyond the marginal edge of the sheet permitting free release of the sheet for gravity delivery to a stack below the table upon stoppage of the table; and control means coupled to said drive means and to said sheet retaining means operable to control operation of said retaining means in timed sequence with the operation of said drive means and including a part responsive to entry of a sheet onto the table from said conveyor to initiate operation of said drive means.

2. The invention as defined in claim 1 characterized in that said means for retaining a sheet on the table in-

cludes linkage connecting the clamping arm pivot shafts together for conjoint movement, said clamping arms being secured to said pivot shafts and arranged thereon to shift one pair of arms into retaining position and the other pair of arms into releasing position upon movement of said linkage.

3. The invention as defined in claim 2 characterized in that drive means is operatively coupled to said linkage for shifting the clamping arms between said clamping and releasing positions, said drive means being ineffective during table movement to thereby permit said clamping arms to move with the table.

4. The invention as defined in claim 3 characterized in that said table drive means comprises a reciprocable fluid pressure motor connected to said table member for oscillating the latter and said drive means for shifting the clamping arms comprises a fluid pressure motor having a part operatively engageable with a shiftable linkage part to move the clamping arms upon actuation of the motor, with said linkage part being released from engagement with said motor part upon actuation of the table drive motor to permit movement of the clamping arms with said table.

5. Apparatus for stacking sheets of material successively delivered in spaced relation along a conveyor, comprising, in combination: a table member having opposed sheet-receiving surfaces supported for oscillation on a horizontal pivot axis and communicating at one end with the downstream end of said conveyor; arm members mounted on marginal edges of said table for movement between a clamping position engaging a sheet on the table and a release position spaced from the projected plane of a sheet on the table; at least one arm for each table surface; motive means coupled to said table to oscillate the table about said pivot axis through substantially 180 degrees; means for moving said arm members between said clamping and release positions; and control means coupled to said motive means and said arm moving means and including a part responsive to the entry of a sheet onto said table to actuate said arm moving means, shifting an arm member into clamping position engaging said sheet and substantially simultaneously shifting another arm member to release position permititng a preceding sheet to fall freely onto the stack, and a second part responsive to the movement of said arm members to actuate said motive means rotating the table through 180 degrees.

6. Apparatus for stacking sheets delivered along a conveyor comprising: a horizontal table member disposed in sheet receiving relation with said conveyor and supported on a pivot axis and having opposed article receiving surfaces; sheet retianing members mounted for pivotal movement with respect to the table between a first retaining position overlying a sheet on a table surface and a second release position spaced from the projected plane of a sheet on the table surface, at least one member being provided for each table surface; motive means operable to rotate said table through cycles of movement of substantially 180 degrees and to shift said members between said retaining and release positions; and control means coupled to said motive means including a part responsive to entry of an article onto one table surface to shift said members to retain said article on said one table surface and to release an article on the opposite table surface for free fall onto the stack, and thereafter to rotate the table through said cycle of movement of substantially 180 degrees.

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U.S. Cl. X.R.

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