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CLEAT STACKER

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Fig. 12

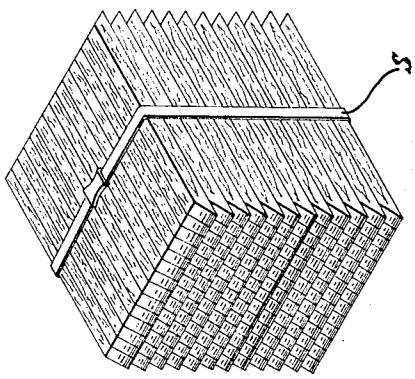
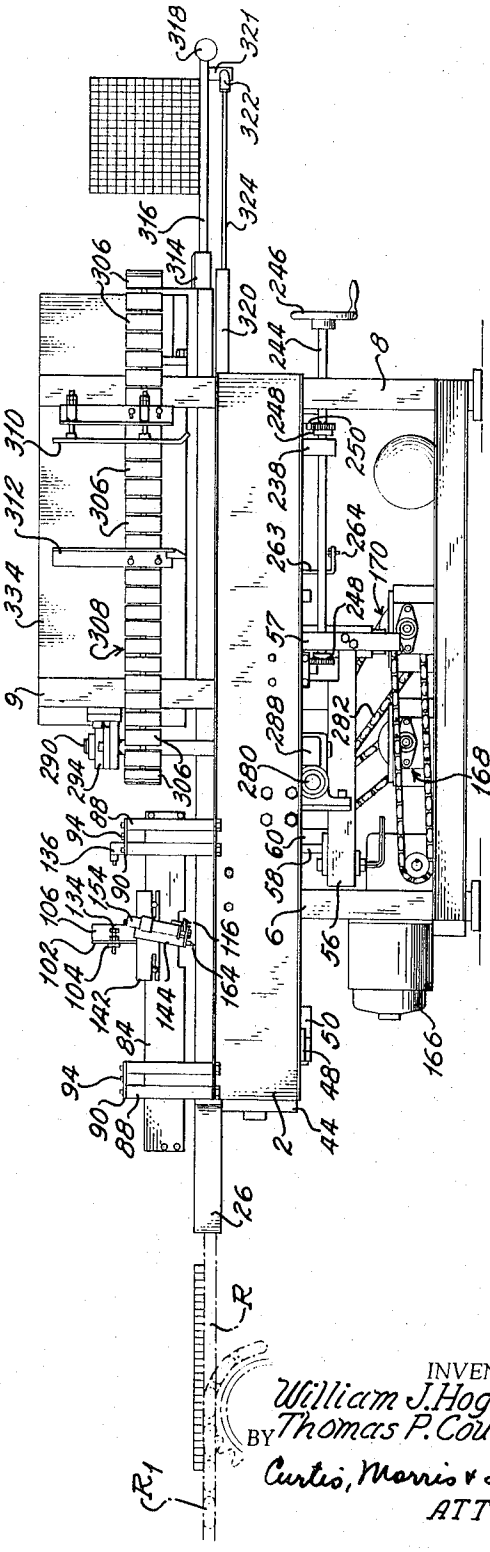


Fig. 1



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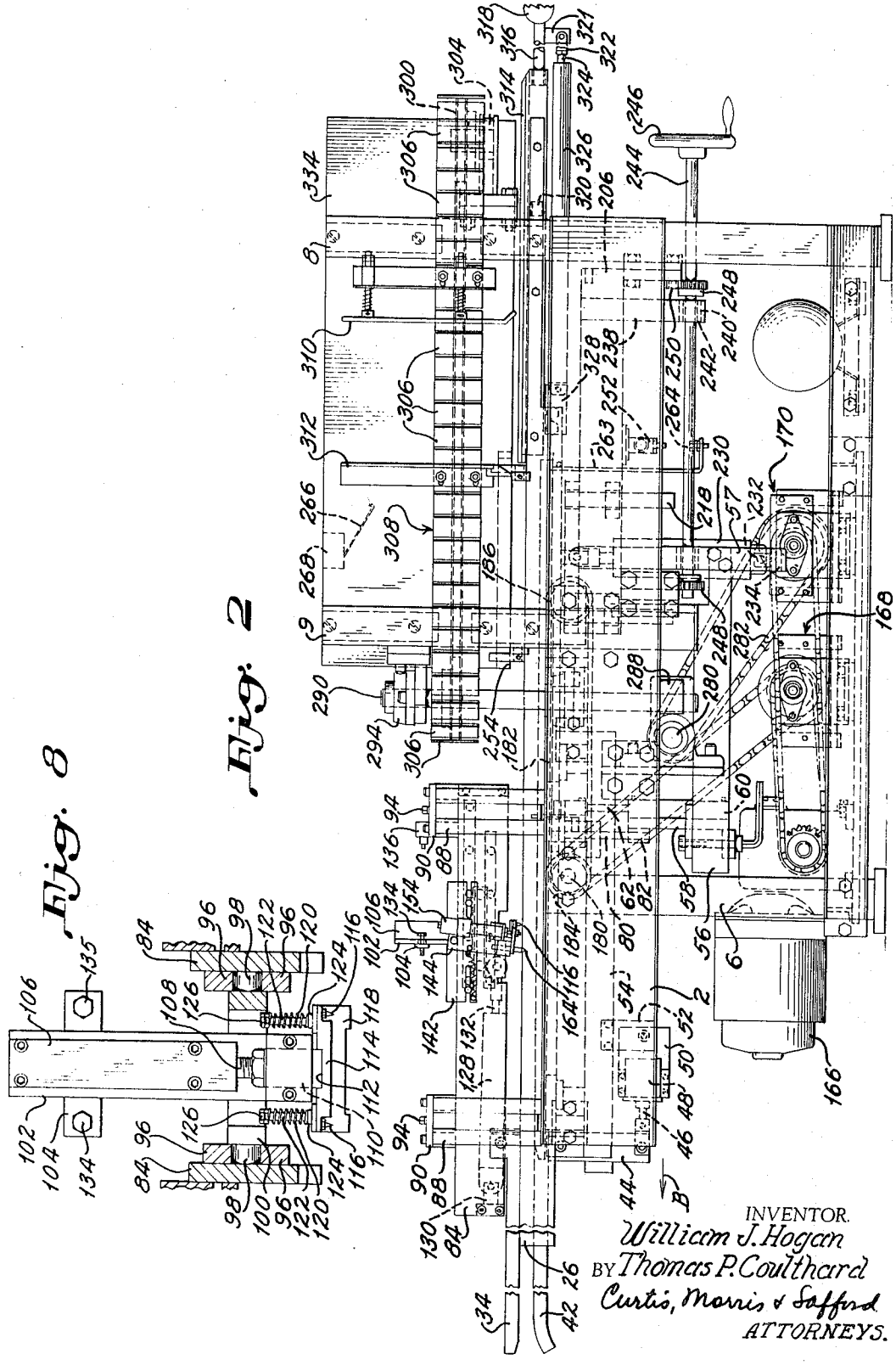
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CLEAT STACKER

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Fig. 2

Fig. 8



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CLEAT STACKER

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Fig. 1

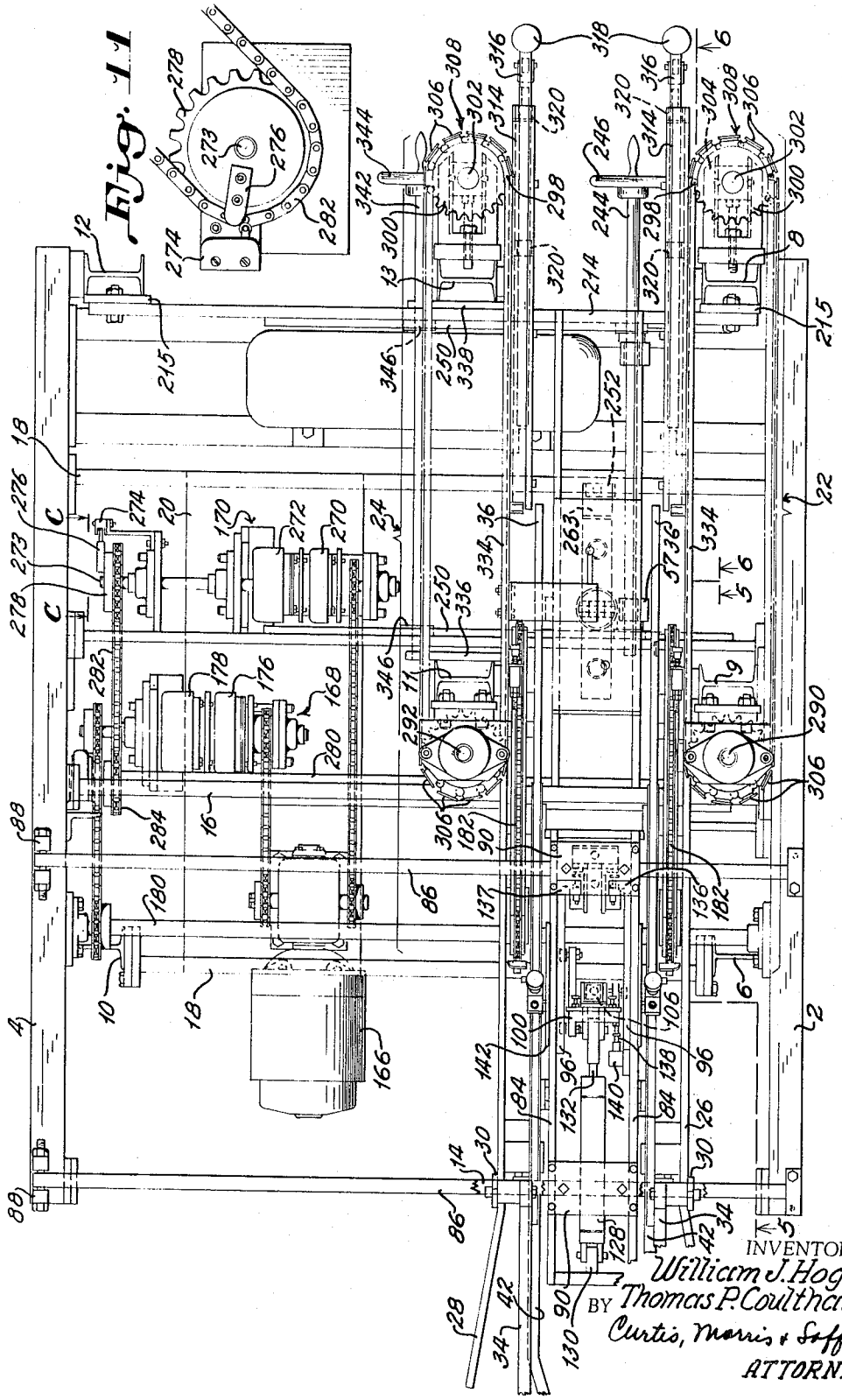


Fig. 3

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CLEAT STACKER

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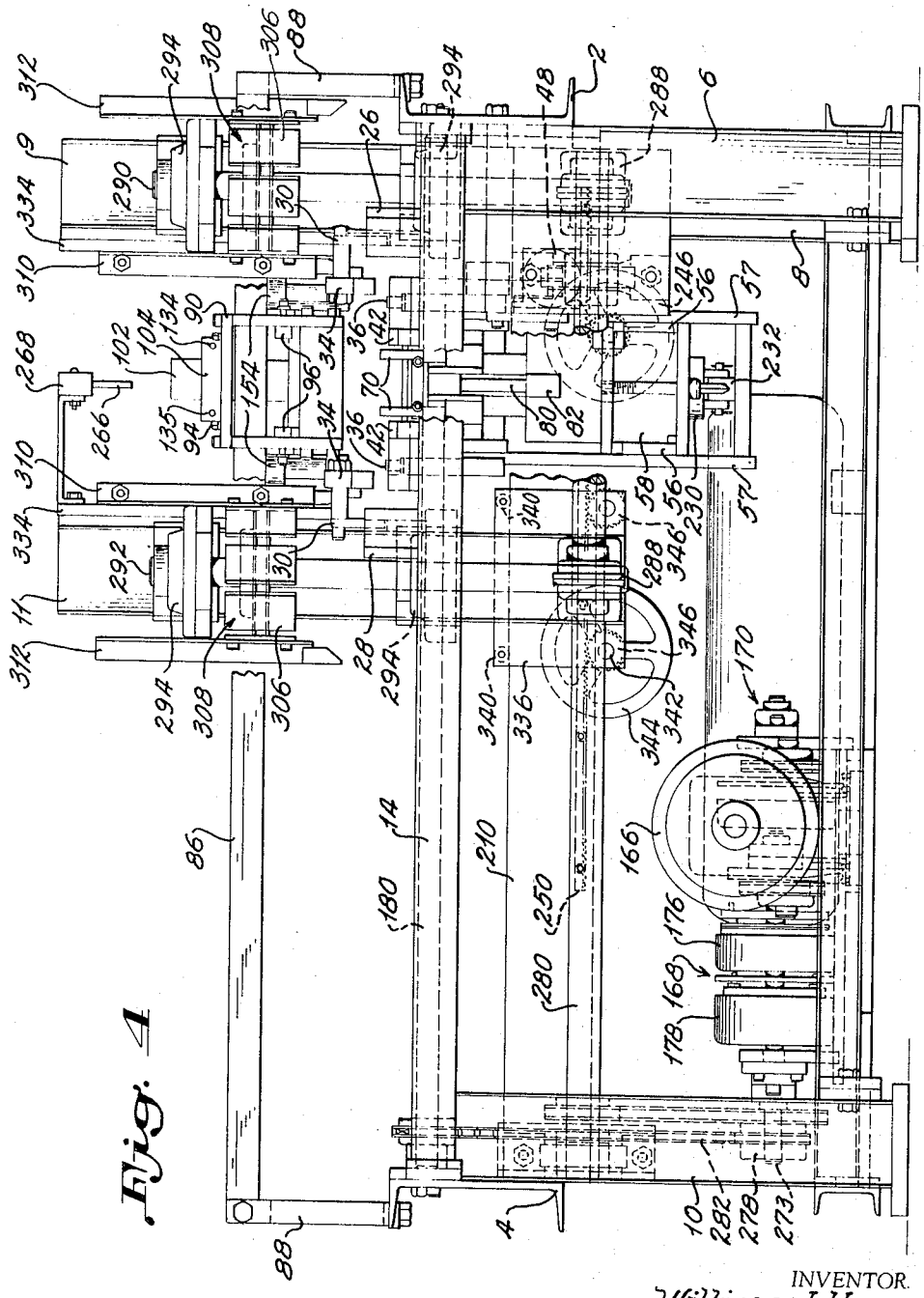


Fig. 4

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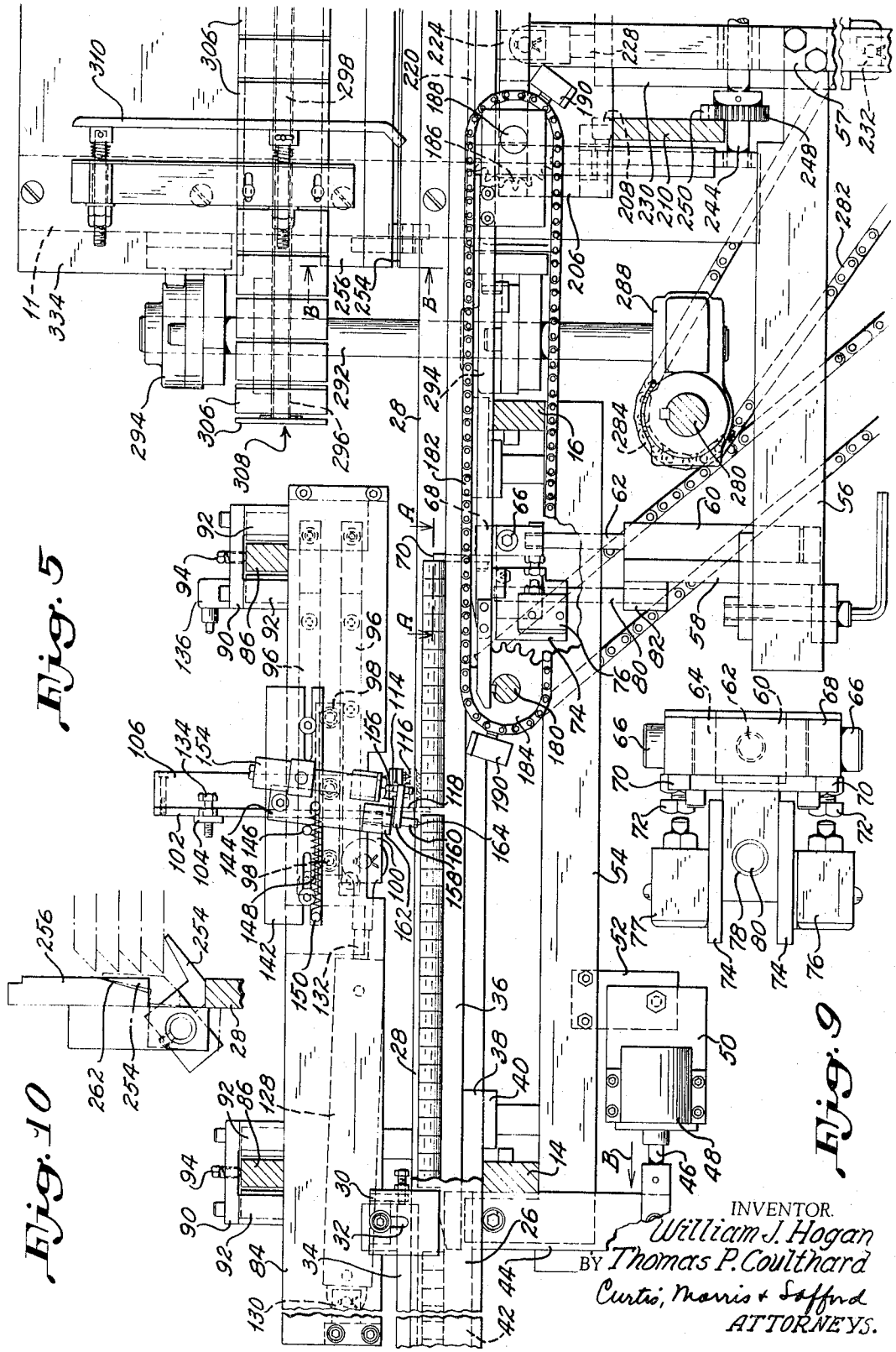


Fig. 5

Fig. 10

Fig. 9

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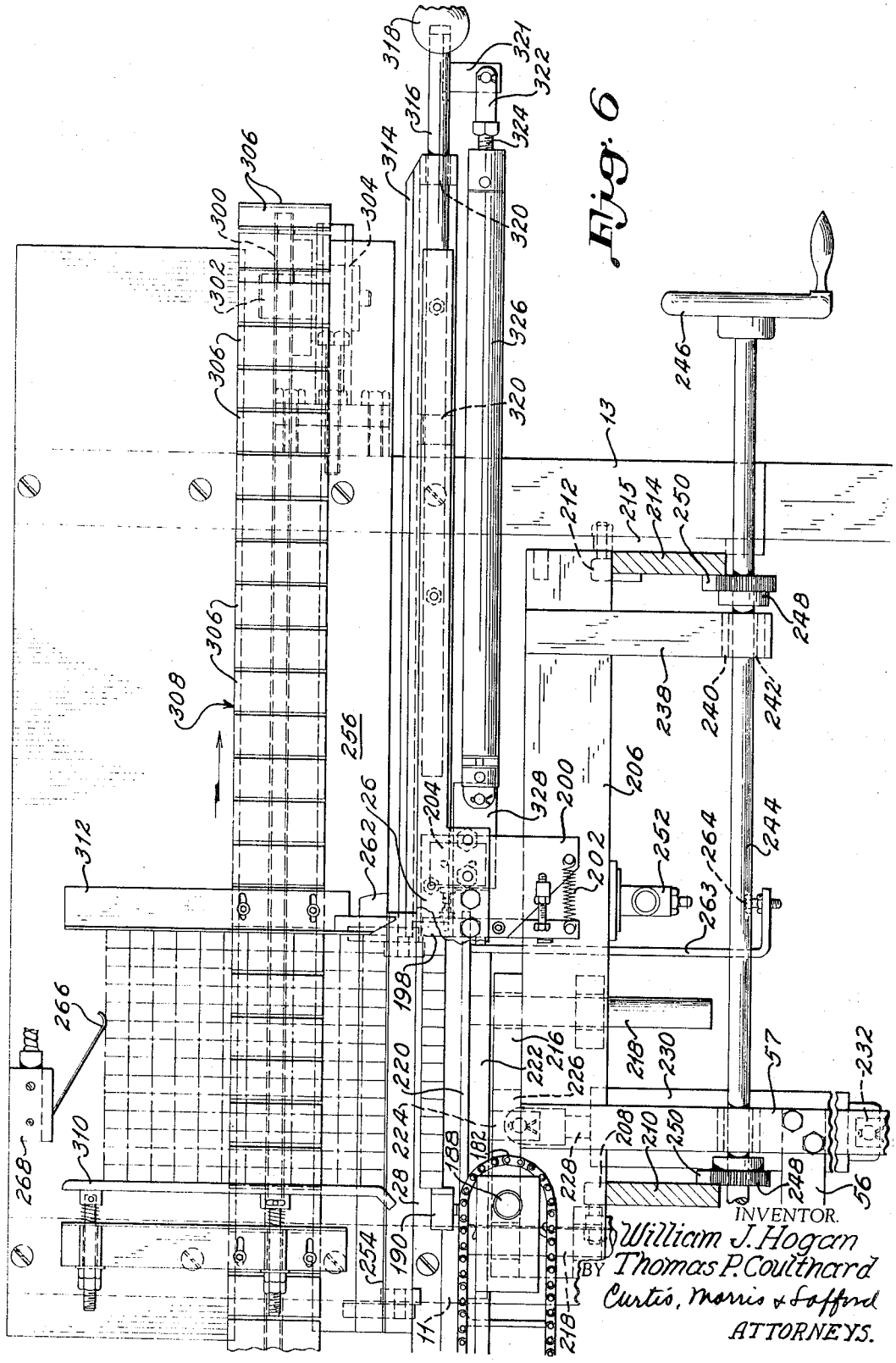


Fig. 6

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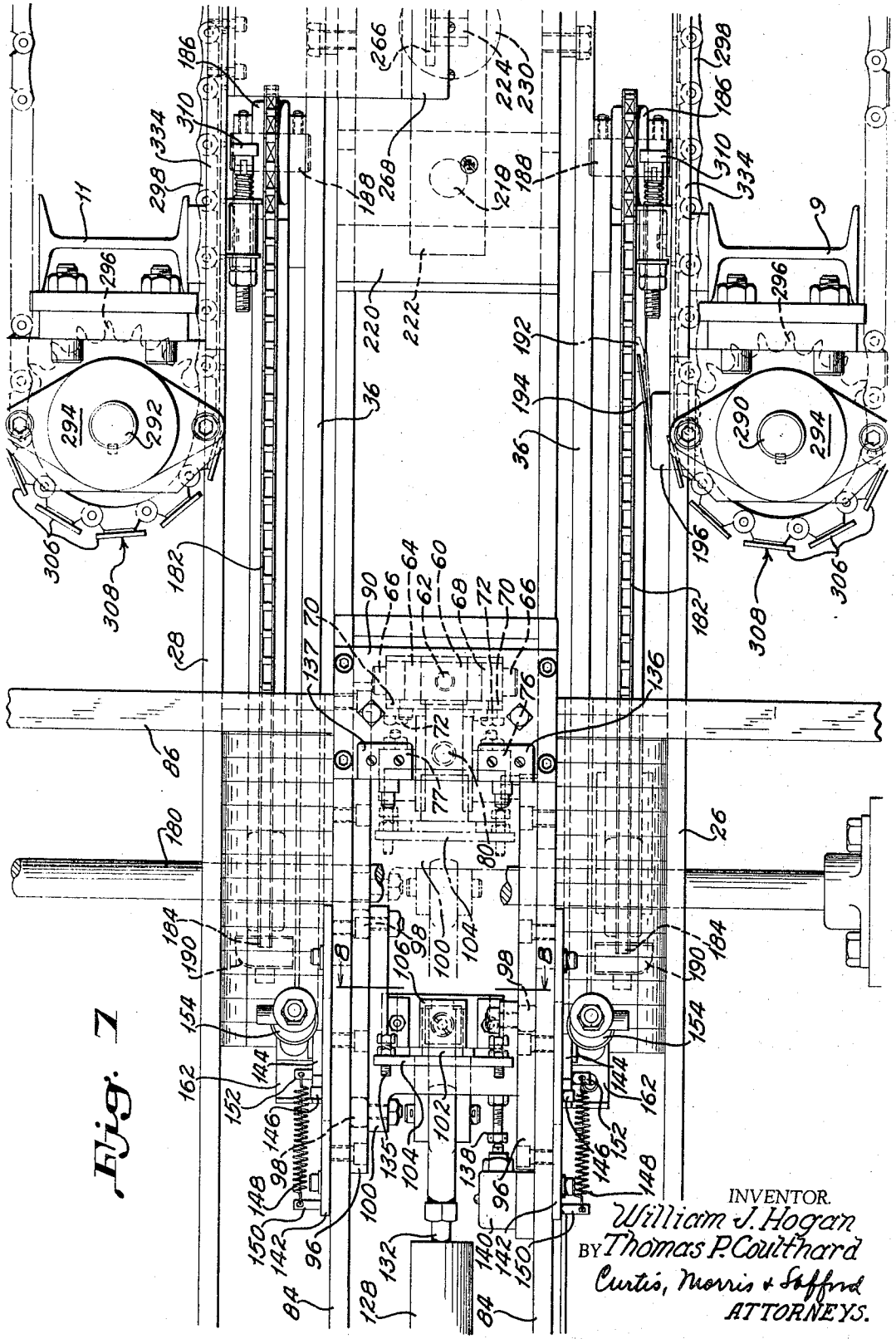


Fig. 7

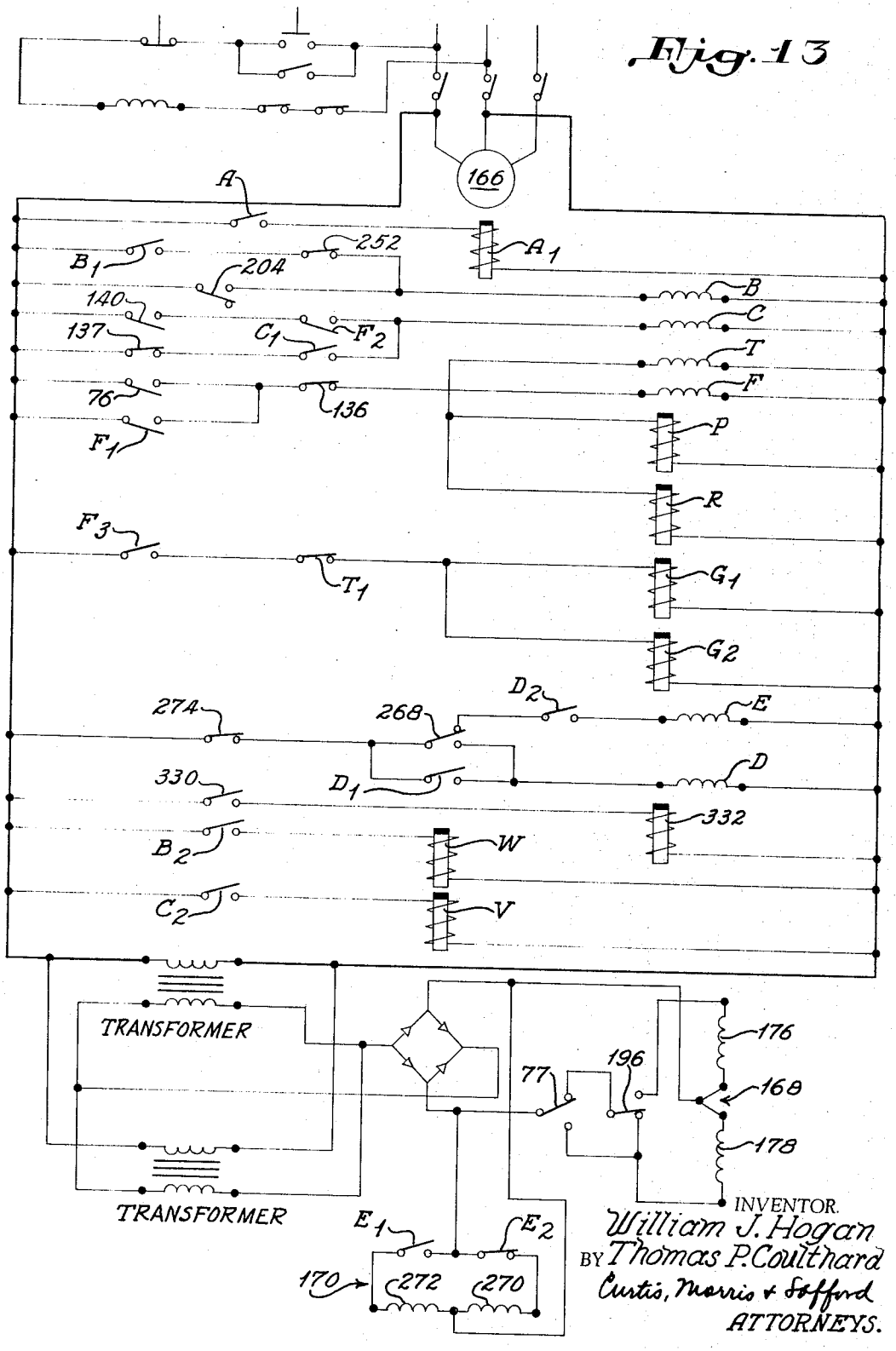
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CLEAT STACKER

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Fig. 13



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United States Patent Office 3,305,104 Patented Feb. 21, 1967

3,305,104

CLEAT STACKER

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Filed June 4, 1964, Ser. No. 372,601
5 Claims. (Cl. 214—6)

The present invention relates to a machine for stacking cleats, for example mitered cleats of the type used in wirebound boxes, in bundles comprising a plurality of layers of equal numbers of cleats arranged side by side, so that the cleats may be securely strapped for convenient handling, shipment and storage. The machine is particularly adapted for receiving the cleats directly from the cleat saws, for example mitering saws, from which the cleats issue continually in a column, arranged side by side and moving at right angles to the long axes of the cleats.

The machine selects from the leading end of the column successive groups of cleats containing equal numbers of contiguous cleats; in the illustrative machine shown and described herein, this selected group of cleats is moved into the machine at an accelerated rate, while the movement of the succeeding cleats in the column is interrupted. When the selected group of cleats arrives at the proper location in the machine, their forward movement is stopped and a cleat-lifting element engages and lifts them upwardly into the lower end of a cleat stacking hopper having at its lower end latches which move out of the path of the upwardly moving cleats to permit them to pass into the hopper and then move back into position to support the cleats in the hopper. This operation is repeated until the desired number of layers of cleats has accumulated in the hopper, whereupon a switch is automatically actuated to cause the stack of cleats to be pushed laterally out of the hopper and supported at a bundling station where they are exposed for securing of a strap around the bundle. Cleat delivery elements, driven under control of the operator, may also be provided for delivering the strapped bundle out of the machine.

In the drawings:

FIGURE 1 is a more or less diagrammatic longitudinal view of the right-hand side of a machine embodying features of the invention, positioned at the delivery end of the conveyor chain of a miter cleat sawing machine.

FIGURE 2 is an elevational view showing, at a somewhat enlarged scale, the right-hand side of the machine of FIGURE 1.

FIGURE 3 is a top plan view of the portion of the machine shown in FIGURE 2, at the same scale as FIGURE 2.

FIGURE 4 is an elevational view of the receiving end of the machine, as viewed from the side appearing at the left in FIGURE 2, at a further slightly enlarged scale.

FIGURE 5 is a vertical section view, on a still larger scale, taken on the line 5—5 of FIGURE 3 with some parts broken away to reveal the inner construction.

FIGURE 6 is a vertical section view, on the same scale as FIGURE 5, taken on the line 6—6 of FIGURE 3, with slight overlapping with the portion of the machine shown in FIGURE 5 to facilitate visualization of the relation of the two figures to the overall machine.

FIGURE 7 is a fragmentary top plan view at an enlarged scale, of the portion of the machine shown in FIGURE 5.

FIGURE 8 is a fragmentary vertical section view taken on the line 8—8 FIGURE 7.

FIGURE 9 is an enlarged fragmentary elevational view of the mechanism indicated by arrow A—A of FIGURE 5.

FIGURE 10 is a fragmentary elevational view of the mechanism indicated by arrow B—B of FIGURE 5, showing in full lines and broken lines the extended and retracted positions, respectively, of the latch members at the bottom of the hopper.

FIGURE 11 is an enlarged, fragmentary elevational view of the mechanism indicated by arrow C—C of FIGURE 3.

FIGURE 12 is an isometric view of a stack of cleats, as assembled in the hopper of the machine and secured by a manually attached steel strap.

FIGURE 13 is a schematic wiring diagram of the electrical control circuit of the machine.

As shown in FIGURES 1, 2, 3, and 4, the supporting framework of the present machine includes channel members 2 and 4 extending longitudinally at either side of the machine with channel member 2 secured to vertical posts 6 and 8 at the right-hand side of the machine (the nearer side as viewed in FIGURES 1, 2, and 3) and channel member 4 secured to vertical posts 10 and 12 at the left-hand side of the machine. The structure is substantially braced crosswise and lengthwise by support members of the several mechanisms of the machine, as will be noted hereinafter as these mechanisms are described, as well as by transversely extending braces 14 and 16 (FIGURE 3) and by transverse members 18 which support a partial floor 20.

As may be seen in FIGURES 3 and 4, adjacent the inner face of channel member 2 there is a cleat delivery mechanism generally designated 22, and opposed thereto is a duplicate but reversed mechanism generally designated 24 which may be adjusted transversely of the machine to accommodate between the two mechanisms cleats of various lengths.

The ends of incoming cleats are maintained in alignment by guide plates 26 and 28 extending the full length of the machine, guide member 26 being secured to the inner faces of posts 8 and 9 and guide member 28 being secured to the inner faces of posts 11 and 13 of the transversely adjustable delivery mechanism 24. As shown in FIGURE 3, guide plates 26 and 28 are flared at their input ends to guide the cleats into proper alignment between them and, near the point where the flaring commences, they support upwardly projecting brackets 30 which, as shown in FIGURE 5, are vertically slotted to receive bolts for adjustably supporting pivotally mounted presser members 34 which project horizontally outward and rest upon the incoming cleats. To support the cleats near their ends as they enter and move within the machine, they are provided elongated rails 36 which, as shown in FIGURE 5, are adjustably supported by pads 38 at the underside thereof which cooperate with pads 40 secured to the upper surface of base members 54 to form clamps which are adjustably secured about the transverse brace members 14 and 16 (see also FIGURE 3).

As shown in FIGURE 5, to the outer face of the upwardly projecting portion at the left-hand ends of the base members 54 are pivotally mounted the right-hand ends of cleat support rails 42 whose upper surface is aligned with that of a pair of rails R (FIGURE 1) projecting from the output end of the delivery chains R_1 of the cleat forming saws.

As also shown in FIGURE 5, projecting downwardly from the pivotally mounted right-hand ends of the cleat support rails 42 are integral legs 44 whose lower ends are pivotally connected to the piston rods 46 of air cylinders 48 mounted on plates 50 which are pivotally attached to hanger members 52 projecting downwardly from base members 54. In the event of a cleat jam, the air cylinders 48 are actuated by manual operation of an electric switch A (FIGURE 13) which energizes a solenoid A_1 to cause

compressed air to flow into air cylinders 48. This moves their piston rods 46 and the attached depending legs 44 outwardly, in the direction indicated by arrow B in FIGURES 2 and 5, raising the outer ends of cleat support rails 42 above the path of the incoming column of cleats, thereby preventing the further feeding of cleats into the machine.

As shown in FIGURES 2, 4, and 5, located in the lower part of the machine are a pair of spaced horizontal base members 56, the right-hand ends being bolted to the lower ends of a pair of vertically extending hangers 57 of the cleat-lifting mechanism to be described hereinafter. Adjustably mounted adjacent the outwardly projecting lefthand ends of base members 56 is a vertical plate member 58 provided with clamping elements for supporting an air cylinder 60 whose piston rod 62 has threaded into its upper end the head portion of a T-shaped body member 64 (FIGURE 9). Pivotally attached to said head portion by bolts 66 in an inverted U-shaped member 68 to which is secured a pair of spaced fingers 70, which project upwardly into the path of the cleats as they move into the machine on the rails 36. Adjacent the lower ends of the legs of the inverted U-shaped member 68 are threaded a pair of adjustable switch-actuating screws 72. To either side of the stem portion of the T-shaped body member 64 are attached plates 74 which support electric switches 76 and 77 (FIGURE 9). Said stem portion is provided with a bushed hole 78 through which slidably extends a rod 80 fixed in and projecting upwardly from a block 82 (FIGURE 5) which is secured at the upper end of the face of the plate member 58 opposite to that on which air cylinder 60 is mounted.

When a solid column of cleats, extending all the way back to the driven input conveyor R_1 (FIGURE 1) has accumulated in the machine, sufficient pressure is imposed against the fingers 70 (FIGURE 5) to cause the inverted U-shaped member 68 to rock clockwise, and its screws 72 (FIGURE 9) to depress the plungers of switches 76 and 77.

Additional mechanism which cooperates with that just described is best shown in FIGURES 3, 5, and 7. This mechanism includes a pair of spaced side walls 84 suspended above and to the left of fingers 70 by a pair of transversely extending bars 86 supported at the upper ends of arms 88 secured to and extending upwardly from the upper flanges of channel members 2 and 4 (FIGURES 1, 2, and 3). The side walls 84 are adjustably secured on bars 86 by plates 90 which are bolted to the upper ends of spacers 92, which straddle bars 86, with their lower ends bolted to the upper faces of side walls 84. The side walls 84 are fixed in proper transverse position by set screws 94 (FIGURE 5) threaded through plates 90 and bearing against the upper edges of the bars 86.

As best shown in FIGURE 8, secured to the inner face of the right-hand portion of each of the side walls 84 (FIGURES 5, 7, and 8) are a pair of horizontal rails 96 which are vertically spaced to receive between them rollers 98 attached to a carriage assembly 100 (also shown in FIGURE 3) which supports at its center an upstanding plate 102 (FIGURE 7) with a cross arm 104 thereon. Attached to the right-hand face of plate 102, as viewed in FIGURE 5, is an air cylinder 106 which, as shown in FIGURE 8, has threaded on the downwardly projecting end of its piston rod 108 a block 110 whose lower end rests within a shallow groove 112 in the upper surface of a horizontal plate 114 having threaded into and projecting downwardly from its lower surface adjacent either end a series of spaced spikes 116. Also projecting downwardly from plate 114 is an inverted L-shaped push member 118 which is resiliently mounted on plate 114 by compression springs 120 coiled about upstanding studs 122 threaded in the upper surface of plate 114, said springs being interposed between bosses 124 at the upper surface of push member 118 and nuts 126 adjustably threaded on studs 122.

As may be seen in FIGURES 2, 3, and 5, pivotally secured to the left-hand end of carriage assembly 100 is the piston rod 132 of an air cylinder 128 which is pivotally anchored to a transverse brace member 130 extending between the side walls 84. At the right-hand end of the movement of the carriage assembly 100 by the air cylinder 128, adjustable screws 134 and 135 carried by cross arm 104 contact and actuate electric switches 136 and 137 mounted atop the aforementioned plate member 90 at the right-hand end of side walls 84 (FIGURES 5 and 7). At the left-hand end of the travel of the carriage assembly 100, which is its normal position of rest, an adjustable screw 138 threaded in the left-hand face of the body portion of carriage assembly 100 is in actuating engagement with the plunger of an electric switch 140 mounted on the inner face of the nearer side wall 84.

As may be seen in FIGURES 2, 5, and 7, attached to the outer faces of side walls 84 opposite the normal, retracted position of carriage assembly 100 is a pair of longitudinally adjustable plates 142. Pivotally mounted and extending downwardly from plates 142 are arms 144 which are yieldably retained with their lower ends inclined slightly toward the left, and with their left-hand edges bearing against studs 146 threaded in the outer face of adjustable plates 142, by tension springs 148 hooked about studs 150 threaded in the lower left-hand portions of plates 142 and about studs 152 threaded in arms 144. Also supported on arms 144 are air cylinders 154 which have adjustably mounted on the lower ends of their piston rods 156 flat bars 158 having projecting from their lower faces short rods 160 whose upper end portions are slidably supported in guide blocks 162 fastened to plates 144 and whose downwardly ends have threaded therein sharpened spikes 164.

To describe the operation of the mechanism described up to this point, let it be assumed that the start switch (FIGURE 13) has been manually actuated, energizing main drive motor 166 (also shown in FIGURES 1, 2 and 3), thereby driving the magnetic clutch and brake units 168 and 170 through appropriate sprocket and chain connections.

As may be seen in FIGURE 13, actuation of switch 76 by pressure of the cleats against fingers 70 (FIGURES 5 and 9) energizes several circuit elements including coil T of a time delay relay, relay coil F, solenoid valve P and solenoid valve R. Energization of solenoid valve P supplies compressed air to air cylinder 106 (FIGURE 5), causing its piston rod 108 to move downwardly and drive spikes 116 into the upper surface of the trailing cleat of a selected group of cleats at the leading end of the column of cleats to the left of fingers 70, the number of cleats in said selected group depending upon the adjusted position of carriage assembly 100.

Energization of solenoid valve R reverses the air connections to air cylinder 60 (FIGURE 5), causing its piston rod 62 to move downwardly and retract fingers 70 from the path of the selected group of cleats.

Energization of relay coil F closes its contacts F_1, F_2, and F_3. Contacts F_1 form a holding circuit around switch 76, thus holding relay coil F energized through the normally closed switch 136, even after release of the switch 76. Contacts F_2 close a circuit to energize relay coil C through an electric switch 140 (see also FIGURE 7) which is initially held closed by the adjustable screw 138 at the left end of carriage assembly 100. Contacts F_3 close a circuit to energize solenoids G_1 and G_2 through contact T_1 of coil T of the time delay relay, thereby supplying compressed air to cylinders 154 (FIGURES 5 and 7) causing their piston rods 156 to move downwardly and drive their spikes 164 into the leading cleat of the supply column of cleats immediately following the selected group of cleats mentioned above. Solenoids G_1 and G_2 remain energized until the present time of the time delay relay expires and contacts T_1 open, deenergiz-

ing solenoids G_1 and G_2, and thereby reversing the air connections to air cylinders **154**, and causing their piston rods **156** to retract, thus releasing their spikes **164** from the leading cleat of the supply column of cleats.

Energization of relay coil C closes its contacts C_1 and C_2. Contacts C_1 complete a holding circuit for the relay coil C through the normally closed switch **137**. Contacts C_2 close a circuit to energize solenoid C_3, thereby supplying compressed air to cylinder **128** (FIGURE 5), causing its piston rod **132** to project outwardly and move carriage member **100** and the attached cleat pushing element with its spikes **116** imbedded in the trailing cleat of the selected group of cleats a short distance into the machine on rails **36** at an accelerated rate, while the spikes **164** of the cleat stopping element actuated by air cylinder **154** momentarily retard further movement of the supply column of cleats. The switch **140**, which is initially held closed by the adjustable screw **138** on carriage assembly **100**, while the carriage assembly is in its retracted position, serves the function of preventing multiple operation of the air cylinder **128** with resulting multiple movement of carriage assembly **100** due to vibrational closing of electrical switch **76**.

As the carriage **100** completes its stroke, switches **136** and **137** (FIGURES 3 and 5) are respectively actuated by adjustable screws **134** and **135** (FIGURE 8) on cross bar **104**. As shown in FIGURE 13, opening of electrical switch **136** causes the time delay relay coil T to be deenergized, permitting contacts T_1 to reset. Coil F is thereby deenergized, opening its contacts F_1, F_2, and F_3. Opening of contacts F_1 breaks the holding circuit for coil F, and the opening of contacts F_2 and electric switch **137** breaks the circuit to relay coil C, thus opening its contacts C_1 and S_2. Opening of contacts F_3 prevents solenoids G_1 and G_2 from being energized upon resetting of the normally closed contacts T_1 of the time delay relay T.

Opening of switch **136** also deenergizes solenoids P and R. The deenergization of solenoid P reverses the air connections to air cylinder **128** (FIGURE 5), causing its piston rod **132** and the associated mechanism to retract to their initial positions. The deenergization of solenoid R reverses the connections to air cylinder **60**, causing its piston rod **62** to move upward slowly due to a flow control valve (not shown) in the air line, thus projecting the fingers **70** into the path of the supply column of cleats.

The opening of contacts F_2 and of switch **137** breaks the holding circuit to relay coil C, opening its contacts C_1 and C_2. Opening of contacts C_2 breaks the circuit to solenoid V, thereby reversing the air connections to air cylinder **128** (FIGURE 5) causing its piston rod **132** to retract, withdrawing carriage **100** to its left-hand position.

As stated hereinabove, the clockwise rocking of fingers **70** by pressure of the oncoming cleats actuates electric switches **76** and **77**, deenergizing brake **176** and energizing clutch **178** (FIGURE 3) of magnetic clutch and brake unit **168**. Said clutch has a driving connection, through sprockets and chains, to a shaft **180**, which rotates in a clockwise direction as viewed in FIGURE 5, and drives a pair of spaced, short conveyor chains **182** (FIGURE 3, 5 and 7) which are trained about sprockets **184** keyed to shaft **180** and sprockets **186** rotatably supported on short shafts **188**. Conveyor chains **182** bear push blocks **190** (FIGURE 5) which are arranged to contact the cleat at the trailing end of the selected group of cleats and carry them forward within the machine to a transfer station, at which point a lug **192** (FIGURE 7) attached to the outer face of chain **182**, adjacent the right-hand side of the machine, contacts a spring finger **194** and actuates an electric switch **196** mounted on guide member **26**. As shown in FIGURE 13, actuation of switch **196** throws its movable contact to the upper position, deenergizing clutch **178** and energizing brake **176** of the magnetic clutch and brake unit **168** (FIGURE 3) and stopping movement of the conveyor chains **182**. Simultaneously therewith, the cleat at the leading end of the selected group of cleats contacts finger **198** (FIGURE 6) pivotally mounted on the inner face of a bracket **200** bolted to the inner face of guide member **26** at the right-hand side of the machine (FIGURE 6). This causes finger **198** to rock clockwise against the resistance of a tension spring **202** and actuate an electric switch **204** mounted on the inner face of bracket **200**. As shown in FIGURE 13, the resulting closure of switch **204** completes the circuit to relay coil B causing its contacts B_1 and B_2 to close.

Contacts B_1 complete a holding circuit for relay coil B. Contacts B_2 complete a circuit for solenoid valve W which supplies air to an air cylinder **230** (FIGURE 6) causing it to actuate a cleat lifting mechanism now to be described.

As best shown in FIGURE 6, the cleat lifting mechanism includes a pair of spaced side walls **206** which are suitably braced and are adjustably supported at their lower left-hand ends by a pair of spaced, freely rotating rollers **208** riding upon a transverse brace bar **210** secured to the inner faces of channel members **2** and **4** (FIGURES 3 and 4) and at their right-hand ends by a pair of freely rotating rollers **212** riding upon a transverse brace bar **214** attached to plates **215** (FIGURE 3) secured to the inner side of posts **8** and **12**. Fastened to the upper surfaces of the left-hand portions of the side walls **206** (FIGURE 6) is a horizontal support plate **216** (FIGURE 6) provided with bushed holes in which are slidably mounted vertical guide rods **218** whose upper ends are secured to a push plate **220** fastened to the upper surface of a backing plate **222**. The backing plate **222** has integrally attached to its undersurface a short, depending leg **224** extending freely downward through a large diameter hole **226** in support plate **216**. Pivotally attached to the lower end of leg **224** is the upper end of the piston rod **228** of an air cylinder **230** whose lower end is pivotally anchored to the upstanding portion **232** of a transverse brace member **234** (FIGURE 2) which is bolted to the inner faces of the hanger members **57** whose upper ends are secured to the outer faces of side walls **206**.

As shown in FIGURE 6 adjacent its opposite end, the nearer side wall **206** has integrally secured to its outer face a hanger member **238** which has attached to its inner face at its lower end a block **240** with bushed holes **242**. Hanger member **57** is provided with a similar bushed hole and rotatably mounted in said holes is an adjusting shaft **244** having keyed to its outer, right-hand end a hand wheel **246**. Shaft **244** also has keyed to it at spaced positions along its length a pair of pinion gears **248** meshing with racks **250** secured along the bottom edges of the inner faces of transverse braces **210** and **214** to provide means whereby the sidewall **206** and the attached mechanism may be adjusted transversely of the machine to accommodate cleats of different lengths. When this mechanism is properly positioned, the push plate **220** is centered transversely of the cleats and projects beyond the first and last cleat of the selected group of cleats.

When air is supplied to air cylinder **230**, its piston rod **228** moves upwardly, causing push plate **220** to contact and raise the group of cleats thereon past a latch member **254** (FIGURES 6 and 10) which is pivotally mounted on an elongated flat bar **256** fastened to the inner faces of posts **11** and **13** of the cleat delivery mechanism generally designated **24** in FIGURE 3. A similar latching assembly (not shown) is also carried by the cooperating cleat delivery mechanism generally designated **22** in FIGURE 3.

As may be seen in FIGURE 10, the latch member **254** is of such shape as to lie within an angular recess **262** in the lower portion of bar **256** when the latch member is moved upwardly by the row of cleats to allow them to pass by. Then latch member **254** returns freely to its normal position to rest atop guide member **28**. The latch member on the opposite bar **256** operates in similar fashion, normally resting on guide member **26**.

As shown in FIGURE 6, projecting downwardly from the rearward end of base plate **222** is an elongated

L-shaped bracket 263. As piston rod 228 of air cylinder 230 reaches the end of its upward stroke, an adjustable screw 264 in the lower end of bracket 263 actuates switch 252. As shown in FIGURE 13, actuation of switch 252 breaks the circuit to relay coil B, opening its contacts B_1 and B_2. Opening of contacts B prevents the circuit from resetting, and the opening of contacts B_2 deenergizes solenoid W, thereby reversing the air connections to air cylinder 230 (FIGURE 6), causing its piston rod 228 and push plate 220 to retract, lowering the group of cleats so that it comes to rest upon latch members 254, as shown in FIGURE 10.

To accommodate cleats of different lengths, posts 11 and 13 (FIGURES 3 and 6) and the attached cleat delivery mechanism 24, are transversely movable as a unit, by means of an adjusting mechanism including flange members 336 and 338 (FIGURES 3 and 4) secured to the inner face of posts 11 and 13 respectively, and having adjacent their upper corners freely rotating rollers 340 (FIGURE 4) riding upon transverse brace bars 210 and 214 (FIGURE 6). Adjacent the lower corners of the flange members 336 and 338 are bushed holes in which is rotatably supported an adjusting shaft 342 having keyed to its outer end a hand wheel 344. Adjusting shaft 342 also has keyed to it pinion gears 346 meshing with racks 250 secured to the lower edges of brace bars 210 and 214.

The operation of lifting successive selected groups of cleats in the hopper assembly above the latch members 254 is repeated until the stack of cleats in the hopper assembly contains a predetermined numbers of layers and, as the final group is added to the stack and while piston rod 228 of air cylinder 230 is at the upward end of its stroke, a spring finger 266 (FIGURES 2 and 6) is contacted by the upper surface of the stack of cleats, actuating an electric switch 268 (FIGURE 6). As shown in FIGURE 13, actuation of switch 268 closes the circuit to energize relay coil D and close its contacts D_1 and D_2. Closure of contacts D_1 completes a holding circuit for relay coil D in parallel with switch 268. Closure of contacts D_2 permits relay coil E to be energized when the piston rod 228 (FIGURE 6) of air cylinder 230 and the attached push plate 220 retract to their initial lower position, allowing switch 268 to return to its normal position. Energization of coil E closes its contacts E_1 and opens its normally closed contacts E_2, thereby opening the circuit to the brake 270 (FIGURE 3) of magnetic clutch and brake unit 170 and energizing its clutch 272. After one revolution of the shaft 273, a switch 274 is actuated by a short finger 276 attached to the outer face of sprocket 278 also shown in FIGURE 11. Clutch 272 imparts clockwise rotation to shaft 280 (FIGURE 5) through the chain 282 which is trained about the clutch sprocket 278 and the sprocket 284 keyed to shaft 280.

Mounted on shaft 280 adjacent the left-hand side of posts 9 and 11 are gear boxes 288 (FIGURES 2, 4 and 5) driving the lower ends of vertical shafts 290 and 292, rotating shaft 290 clockwise as viewed in FIGURE 3, and shaft 292 counter-clockwise. The shafts 290 and 292 are journaled in bearings 294 (FIGURES 2 and 5) secured to posts 9 and 11 and have keyed adjacent their upper ends sprockets 296 (FIGURES 5 and 7) which have chains 298 trained about them and about sprockets 300 free to rotate on short upstanding shafts 302 fixed in adjustable clamping elements 304 secured to the outer faces of posts 8 and 13 (FIGURE 6) at the output end of the machine. Chains 298 have attached to their outer faces short, vertical plates 306, forming belt-like conveyors generally designated 308 (FIGURES 5, 6 and 7).

As shown in FIGURES 6 and 7, mounted to the faces of plate 306 are spring loaded flange members 310 and fixed flanged members 312 which are adjustably spaced therefrom and cooperate with similar spaced flanges (not shown) on the other cleat delivery mechanism 22 (FIGURE 3) to form the hopper arrangement which laterally confines the stack of cleats until it is completed. During the one revolution of clutch 272 of magneic clutch and brake unit 170, the belt-like conveyors 308 move the completed stack of cleats toward the right-hand end of the machine supported on elongated rails 314 (FIGURES 3 and 6) mounted at the inner faces of guide members 26 and 28, with the stack of cleats being guided endwise by wide vertical plates 334 to a point near the right-hand ends of the travel of the belt-like conveyors 308. When the stack of cleats reaches this point, the conveyors 308 are stopped by the actuation of switch 274 (FIGURES 3 and 11), as previously described. As shown in FIGURE 13, actuation of switch 274 breaks the circuit to relay coil D, opening its contacts D_1 and D_2. Opening of contacts D_2 deenergizes relay coil E, which opens its contacts E_1 and closes its contacts E_2, disengaging clutch 272 (see also FIGURE 3) of magnetic clutch and brake unit 170 and applying brake 270.

As shown in FIGURES 1 and 3, supported near the output end of the machine is a pair of horizontal supporting rods 316. Since the structure and function of the two rods are similar, only the rod at the left-hand side of the machine need be described.

Rod 316 has a protector ball 318 at its outer end and is supported for longitudinal sliding movement in bushed holes of blocks 320 secured to the underside of bar 314. Adjacent the outer end of rod 316 there is secured a depending short leg 321 to which is pivotally fastened a clevis member 322 threaded on the end of the piston rod 324 of an air cylinder 326 which extends horizontally beneath a cutaway portion of guide member 28, with its forward end pivotally anchored to a plate member 328 fastened to the lower portion of guide member 28 at the end of its cutaway portion within the machine. A foot switch 330 (shown only in FIGURE 13) is positioned on the floor for actuation by foot pressure applied by the operator prior to binding the pile of cleats into bundle form, for example by placing a steel strap *S* about the bundle, as shown in FIGURE 12.

As may be seen in FIGURE 13, actuation of switch 330 energizes solenoid valve 332, reversing the air connections to air cylinder 326 (FIGURE 6) causing its piston rod 324 to retract and withdraw delivery rod 316 to the position shown in FIGURES 2, 3 and 6. Thus the operator is permitted to step in close to the pile of cleats while performing the bundling operation, and upon completion thereof, to step aside from the path of rods 316, simultaneously removing pressure from foot switch 330. As shown in FIGURE 13, this deenergizes solenoid valve 332 (FIGURE 13) reversing the air connections to air cylinder 326 (FIGURE 6), and piston rod 324 and the attached rod 316 to move outwardly to their normally extended positions. During the next cycle of the belt-like conveyors 308, the stack of cleats being moved thereby will contact the strapped bundle of cleats and move it outwardly onto the extended rods 316, as shown in FIGURE 1, for removal by the operator.

It will thus be apparent that the present invention provides a practical apparatus for mechanically stacking cleats so that they may be strapped or otherwise secured to form a convenient package for handling in multiple. However, it should be emphasized that the particular embodiment of the invention which is described herein and shown in the accompanying drawings is intended as merely illustrative of the principles of the invention and not as exhaustive or restrictive of the scope thereof, which is defined only by the appended claims.

We claim:

1. A machine for stacking cleats comprising a cleat support for slidably supporting said cleats for movement into said machine side by side in a horizontal column, a cleat engaging finger positioned to be engaged and actuated by the leading cleat in said column under the pressure of the oncoming cleats when there has accumulated on said cleat support a solid column of cleats extending back to a driven input conveyor, cleat pushing

means movable to engage the trailing cleat in a selected group of cleats at the leading end of said column and push said selected group of cleats further along said cleat support ahead of the cleats behind them in said column a distance at least equal to the column-wise length of said selected group of cleats, cleat pusher drive means for driving said cleat pushing member, said cleat pusher drive means being controlled by actuation of said cleat engaging finger, a cleat lifting member normally positioned below the level of said selected group of cleats and being reciprocably mounted for engagement with successive selected groups of cleats to raise said cleats upwardly, a cleat hopper mounted above said cleat lifting member for receiving through its lower end and supporting in a vertical stack said successive selected groups of cleats, latch means at the lower end of said hopper and movable between a cleat supporting position for engagement with the bottom layer of cleats in said stack and a retracted position out of the path of the cleats being moved upwardly into said hopper by said cleat lifting member, cleat lifter drive means for actuating said cleat lifting member, cleat lifter control means for controlling said cleat lifter drive means, said cleat lifter control means being arranged for actuation upon arrival of said selected group of cleats in proper position above said cleat lifting member.

2. A machine for stacking cleats comprising a cleat support for slidably supporting said cleats for movement into said machine side by side in a horizontal column, a cleat engaging finger positioned to be engaged and actuated by the leading cleat in said column under the pressure of the oncoming cleats when there has accumulated on said cleat support a solid column of cleats extending back to a driven input conveyor, cleat pushing means movable to engage the trailing cleat in a selected group of cleats at the leading end of said column and push said selected group of cleats further along and cleat support ahead of the cleats behind them in said column a distance at least equal to the column-wise length of said selected group of cleats, cleat pusher driver means for driving said cleat pushing means, a cleat stopping member movably mounted for movement between a cleat stopping position at which it engages and stops the movement of the leading cleat of the supply group of cleats immediately following said selected group of cleats in said column and a retracted position clear for said column of cleats, cleat stopper drive means for driving said cleat stopping member for movement between said cleat stopping position and said retracted position, said cleat pusher drive means and said cleat stopper drive means being controlled by actuation of said cleat engaging finger, a cleat lifting member normally positioned below the level of said selected group of cleats and being reciprocably mounted for engagement with successive selected groups of cleats to raise said cleats upwardly, a cleat hopper mounted above said cleat lifting member for receiving through its lower end and supporting in a vertical stack said successive selected groups of cleats, latch means at the lower end of said hopper and movable between a cleat supporting position for engagement with the bottom layer of cleats in said stack and a retracted position out of the path of the cleats being moved upwardly into said hopper by said cleat lifting member, cleat lifter drive means for actuating said cleat lifting member, and cleat lifter control means for controlling said cleat lifter drive means, said cleat lifter control means being arranged for actuation upon arrival of said selected group of cleats in proper position above said cleat lifting member.

3. A machine for stacking cleats comprising a cleat support for slidably supporting said cleats for movement into said machine side by side in a horizontal column, a cleat engaging finger mounted for movement between a cleat engaging position in the path of the leading cleat in said column and a retracted position clear of said path, cleat finger drive means for moving said cleat engaging finger between said cleat engaging position and said retracted position, said cleat finger drive means being controlled by actuation of said cleat engaging finger to move said cleat engaging finger from said cleat engaging position to said retracted position, cleat pushing means movable to engage the trailing cleat in a selected group of cleats at the leading end of said column and push said selected group of cleats further along said cleat support ahead of the cleats behind them in said column a distance at least equal to the column-wise length of said selected group of cleats, cleat pusher drive means for driving said cleat pushing means, said cleat pusher drive means being controlled by actuation of said cleat engaging finger, a cleat lifting member normally positioned below the level of said selected group of cleats and being reciprocably mounted for engagement with successive selected groups of cleats to raise said cleats upwardly, a cleat hopper mounted above said cleat lifting member for receiving through its lower end and supporting in a vertical stack said successive selected groups of cleats, latch means at the lower end of said hopper and movable between a cleat supporting position for engagement with the bottom layer of cleats in said stack and a retracted position out of the path of the cleats being moved upwardly into said hopper by said cleat lifting member, cleat lifter drive means for actuating said cleat lifting member, and cleat lifter control means for controlling said cleat lifter drive means, said cleat lifter control means being arranged for actuation upon arrival of said selected group of cleats in proper position above said cleat lifting member.

4. A machine for stacking cleats comprising a cleat support for slidably supporting said cleat for movement into said machine side by side in a horizontal column, a cleat engaging finger mounted for movement between a cleat engaging position in the path of the leading cleat in said column and a retracted position clear of said path, cleat finger drive means for moving said cleat engaging finger between said cleat engaging position and said retracted position, cleat pushing means movable to engage the trailing cleat in a selected group of cleats at the leading end of said column and push said selected group of cleats further along said cleat support ahead of the cleats behind them in said column a distance at least equal to the column-wise length of said selected group of cleats, cleat pusher drive means for driving said cleat pushing means, a cleat stopping member movably mounted for movement between a cleat stopping position at which it engages and stops the movement of the leading cleat of the supply group of cleats immediately following said selected group of cleats in said column and a retracted position clear of said column of cleats, cleat stopper drive means for driving said cleat stopping member for movement between said cleat stopping position and said retracted position, said cleat engaging finger being connected to control operation of said cleat finger drive means, said cleat pusher drive means said cleat stop drive means, whereby actuation of said cleat engaging finger causes movement of said cleat engaging finger to retracted position, movement of said cleat stopping member into cleat stopping position, and pushing of said selected group of cleats by said cleat pushing member, a cleat lifting member normally positioned below the level of said selected group of cleats and being reciprocably mounted for engagement with successive selected groups of cleats to raise said cleats upwardly, a cleat hopper mounted above said cleat lifting member for receiving through its lower end and supporting in a vertical stack said successive selected groups of cleats, latch means at the lower end of said hopper and movable between a cleat supporting position for engagement with the bottom layer of cleats in said stack and a retracted position out of the path of the cleats being moved upwardly into said hopper by said cleat lifting member, cleat lifter drive means for actuating said cleat lifting member, and cleat lifter control

means for controlling said cleat lifter drive means, said cleat lifter control means being arranged for actuation upon arrival of said selected group of cleats in proper position above said cleat lifting member.

5. A machine for stacking cleats comprising a cleat support for slidably supporting said cleats for movement into said machine side by side in a horizontal column, a cleat engaging finger mounted for movement between a cleat engaging position in the path of the leading cleat in said column and a retracted position clear of said path, cleat finger drive means for moving said cleat engaging finger between said cleat engaging position and said retracted position, cleat pushing means movable to engage the trailing cleat in a selected group of cleats at the leading end of said column selected and push said selected group of cleats further along said cleat support ahead of the cleats behind them in said column a distance at least equal to the column-wise length of said selected group of cleats, cleat pusher drive means for driving said cleat pushing means, a cleat stopping member movably mounted for movement between a cleat stopping position at which it engages and stops the movement of the leading cleat of the supply group of cleats immediately following said selected group of cleats in said column and a retracted position clear of said column of cleats, cleat stopper drive means for driving said cleat stopping member for movement between said cleat stopping position and said retracted position, said cleat engaging finger being connected to control operation of said cleat finger drive means, said cleat pusher drive means and said cleat stop drive means, whereby actuation of said cleat engaging finger causes movement of said cleat engaging finger to retracted position, movement of said cleat stopping member into cleat stopping position, and pushing of said selected group of cleats by said cleat pushing means, a cleat lifting member normally positioned below the level of said selected group of cleats and being reciprocably mounted for engagement with successive selected groups of cleats to raise said cleats upwardly, a cleat hopper mounted above said cleat lifting member for receiving through its lower end and supporting in a vertical stack said successive selected groups of cleats, latch means at the lower end of said hopper and movable between a cleat supporting position for engagement with the bottom layer of cleats in said stack and a retracted position out of the path of the cleats being moved upwardly into said hopper by said cleat lifting member, cleat lifter drive means for actuating said cleat lifting member, cleat lifter control means for controlling said cleat lifter drive means, said cleat lifter control means being arranged for actuation upon arrival of said selected group of cleats in proper position above said cleat lifting member, cleat delivery means movably mounted for engaging said stack of cleats and moving it laterally out of said hopper, cleat delivery drive means for driving said cleat delivery means, and a cleat stack sensing means mounted at the upper end of said hopper for actuation when said stack of cleats reaches a predetermined height, said cleat stack sensing means being connected for control of said cleat delivery drive means.

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