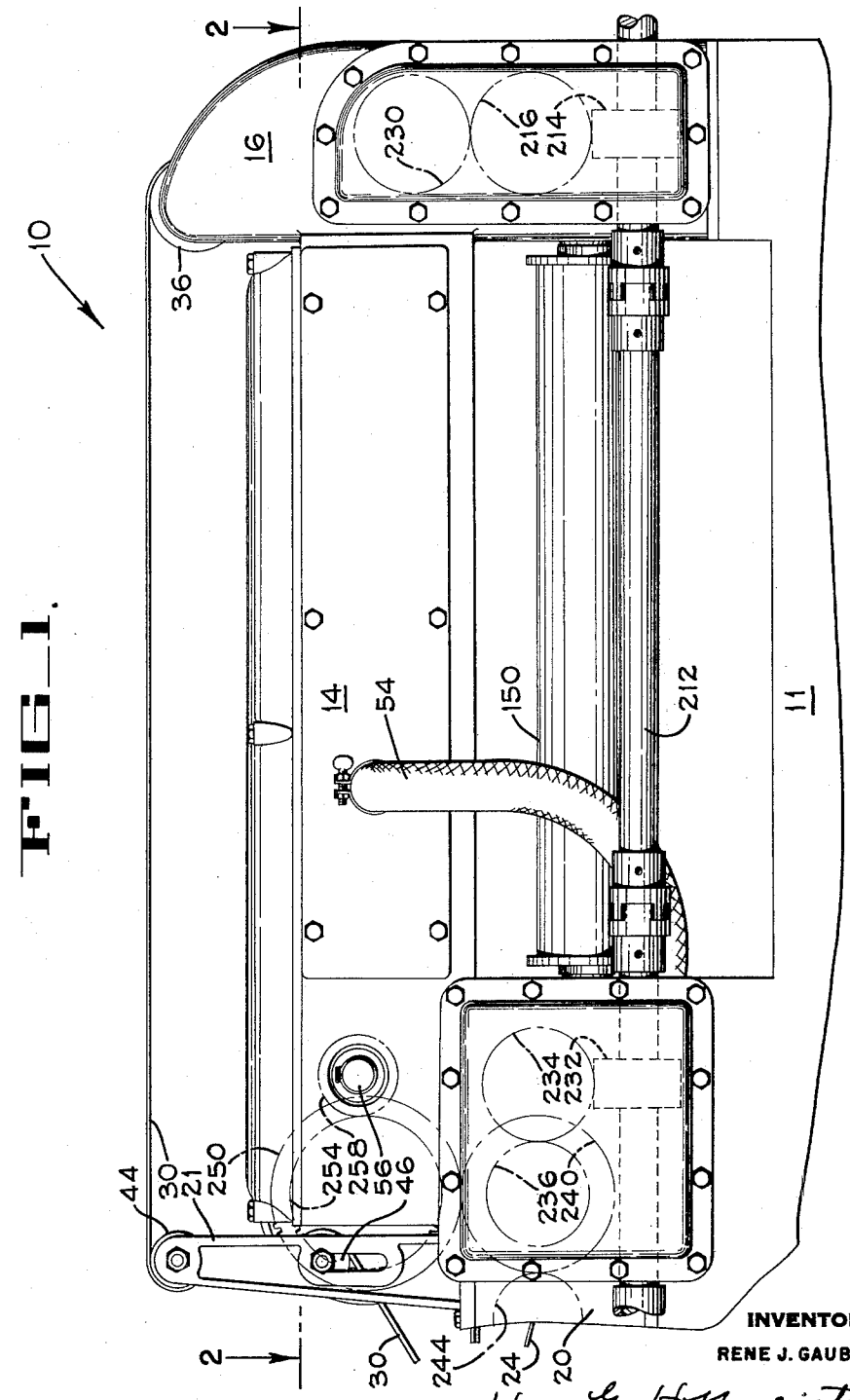
March 13, 1962 R. J. GAUBERT 3,024,921

STACKING MECHANISM

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FIG. 1.



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STACKING MECHANISM

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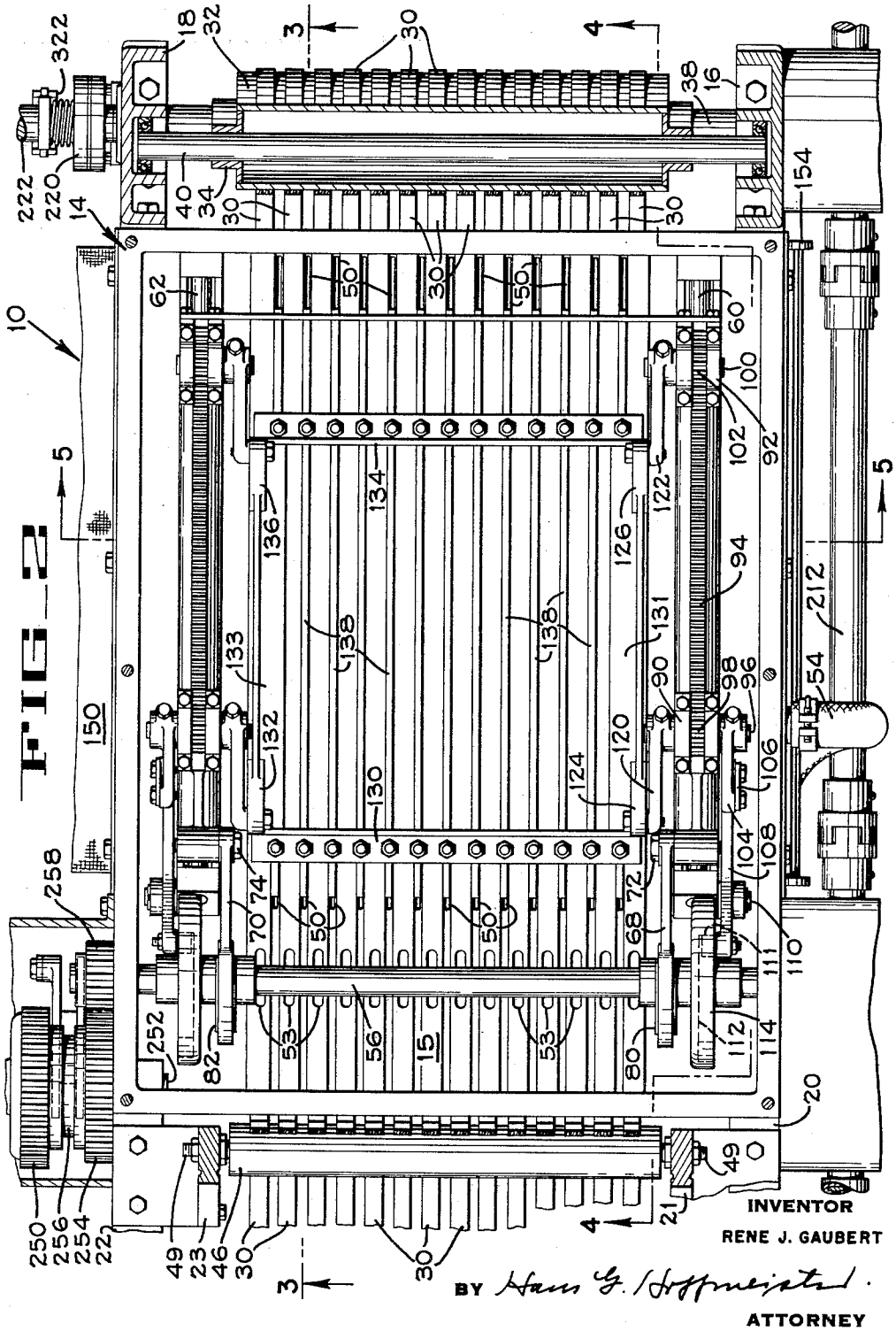


FIG. 2

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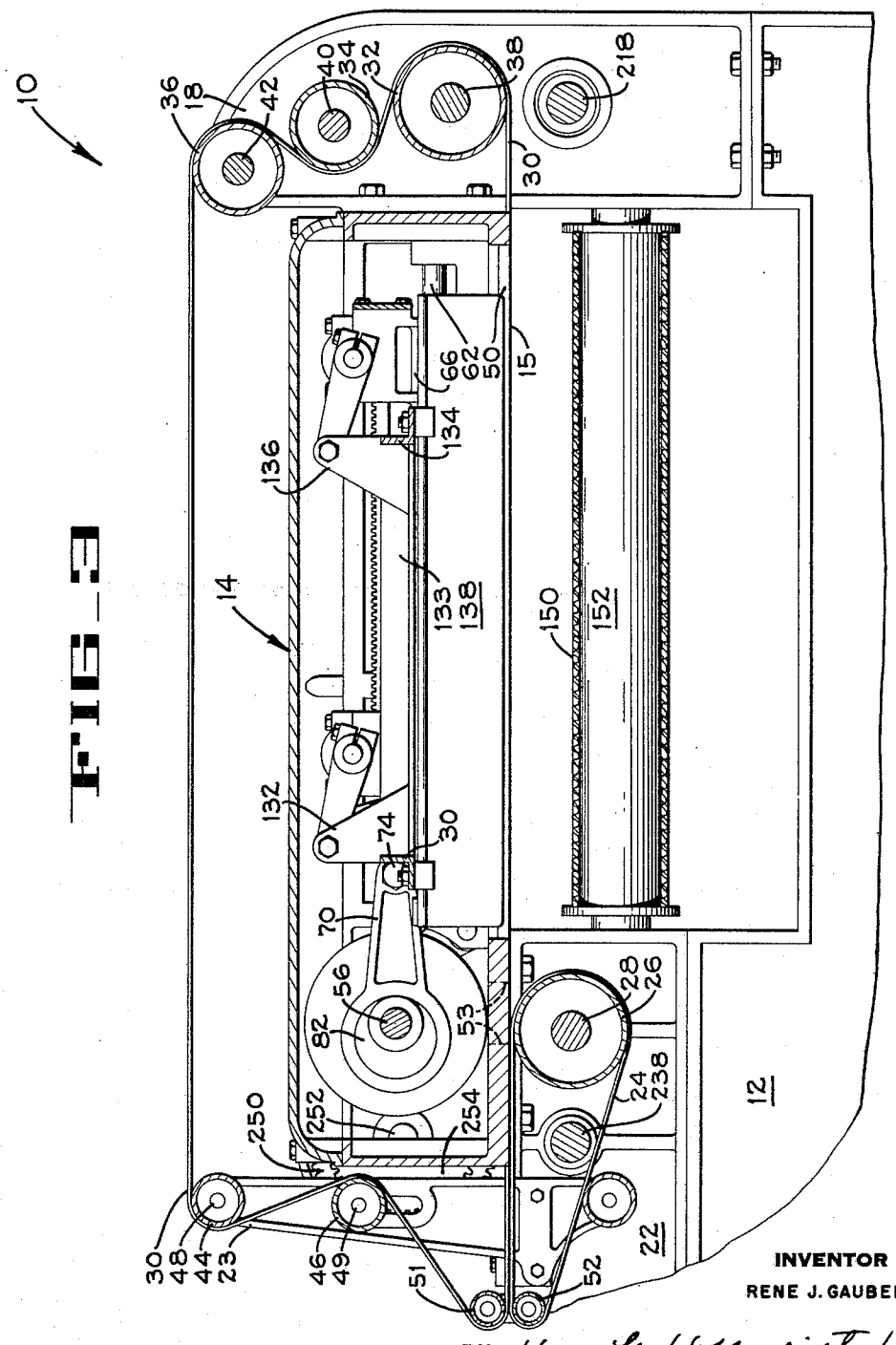
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STACKING MECHANISM

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FIG. 3



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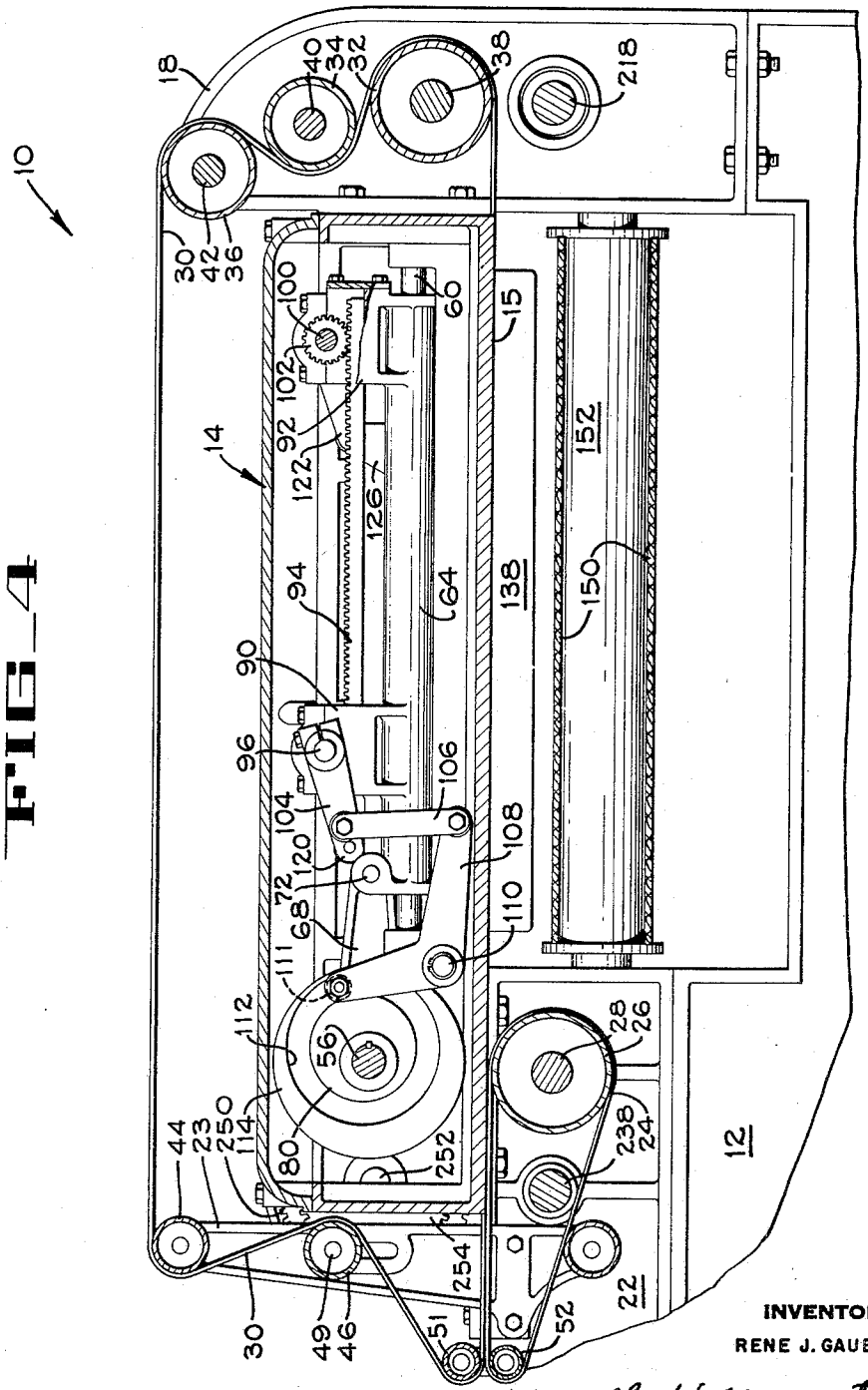
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STACKING MECHANISM

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FIG_4



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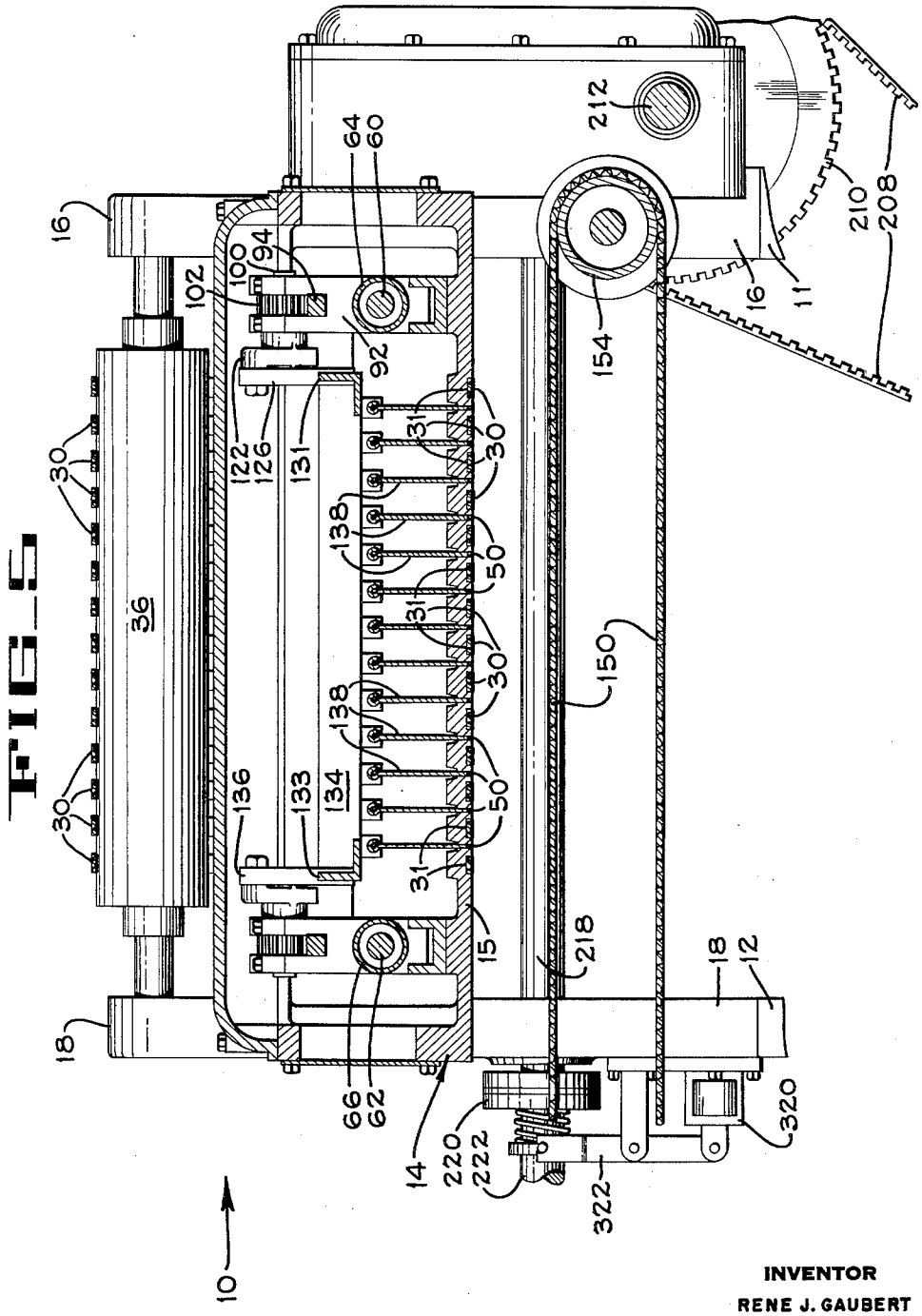


FIG. 5

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STACKING MECHANISM

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FIG. 6

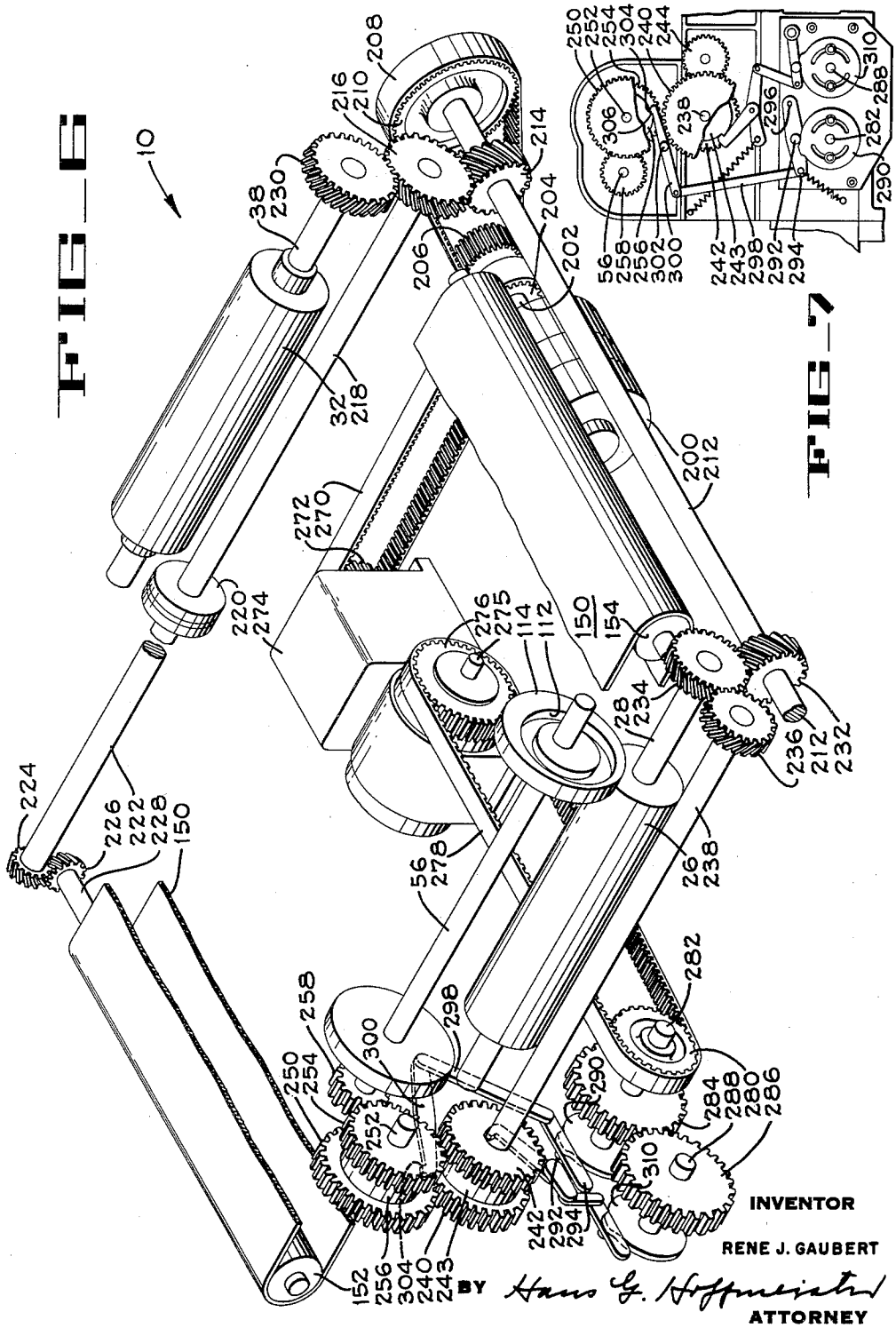


FIG. 7

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3,024,921

STACKING MECHANISM

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7 Claims. (Cl. 214—6)

This invention pertains to apparatus for handling sheet material, and more particularly to a machine for receiving a succession of bags or sheets and arranging them in an orderly group or stack.

One object of the present invention is to provide a novel and efficient machine for stacking bags or sheets made of sleazy or flimsy material such as cellophane, Pliofilm, paper, light cardboard, or the like.

Another object of the present invention is to provide an improved mechanism adapted to receive bags or sheets presented to it successively and to arrange them in stacked relation.

Another object is to provide a mechanism for stacking sheet material articles presented successively thereto and for arranging them in groups each of which contains a predetermined number of the articles.

Another object is to provide a stacking machine adapted to handle sheet material articles in a wide variety of sizes without requiring adjustment.

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

FIG. 1 is a side elevation of the stacking mechanism of the present invention.

FIG. 2 is a horizontal section taken on lines 2—2 of FIG. 1.

FIGS. 3 and 4 are longitudinal vertical sections taken on lines 3—3 and 4—4, respectively, of FIG. 2.

FIG. 5 is a transverse vertical section taken on lines 5—5 of FIG. 2.

FIG. 6 is a schematic perspective of the drive mechanism for the stacking apparatus.

FIG. 7 is a fragmentary side elevation illustrating a cam mechanism for controlling the initiation of the stacking cycle.

The stacking mechanism **10** of the present invention comprises a pair of side frame members **11** and **12** (best shown in FIG. 5), and a generally rectangular housing **14** fixed at one of its ends to a pair of brackets **16** and **18** mounted on the side frame members **11** and **12**, respectively, and at its other end to a pair of brackets **20** (FIGS. 1 and 2) and **22** (FIGS. 3 and 4) mounted on the side members **11** and **12**, respectively. A plurality of spaced, parallel conveyor belts **24** (FIGS. 3 and 4) are disposed below the end of the housing **14** at the receiving end of the stacking mechanism **10** and are trained around a suitable drum **26** mounted on a shaft **28** rotatably supported by suitable bearings mounted on the brackets **20** and **22**, and around a second drum **52** rotatably supported between the brackets **20** and **22**. A second group of conveyor belts **30** (FIGS. 1–5) extend beneath the housing **14** and are trained around suitable drums **32**, **34**, **36** mounted on shafts **38**, **40**, **42**, respectively, which in turn are supported in suitable bearings mounted in the brackets **16** and **18**. Belts **30** are also trained around drums **44** and **46** fixed to shafts **48** and **49**, respectively, rotatably mounted in suitable bearings fixed to the brackets **21** and **23**, and around a drum **51** rotatably supported by the brackets **20** and **22**.

As hereinabove mentioned the two sets of belts **24** and **30** are trained around the two vertically spaced parallel drums **51** and **52**, respectively (FIGS. 3 and 4), which are located at the material receiving end of the stacking mechanism **10** adjacent a transverse shearing mechanism (not shown) so that the sheets or bags to be stacked

are received between the upper reaches of the belts **24** and the lower reaches of the belts **30**. The sheets to be stacked thus travel between the sets of belts **24** and **30** until the drum **26** is reached. The sheets or bags are advanced beyond this point by the upper set of belts **30**, since in accordance with the present invention the sheets or bags are held against the under surface of the belts **30** by atmospheric pressure. For this purpose, a partial vacuum is maintained within the housing **14** in a manner described hereinbelow.

The housing **14** is in the form of a rectangular box (FIGS. 1–5) having a plurality of longitudinally extending grooves **31** (FIG. 5) formed in the under surface of its bottom wall within which the lower runs of the belts **30** are individually guided. The thickness of each belt is somewhat greater than the depth of its associated groove, so that the plane occupied by the under surfaces of all the lower runs of the belts **30** is below the bottom wall **15** of the housing **14**. This assures that the sheets or bags will be pressed more firmly against the belts **30** than against the housing bottom **15**, and thus will be advanced along the stationary under surface of the housing **14** by the moving belts.

A slot **50** (FIGS. 2, 3, and 5) is formed in the housing bottom **15** between each two adjacent belt guiding grooves **31**. These slots **50** are parallel to the grooves **31** and extend completely through the bottom wall **15**. Additional slots **53** through the bottom wall **15** are provided in rows (one such row being shown in FIG. 2) adjacent the ends of the housing **14**. A conduit **54** (FIGS. 1 and 2) is connected between the housing **14** and a suitable source of vacuum (not shown) so that the pressure within housing **14** is maintained at less than atmospheric pressure, and the air tending to enter through the slots **50** and **53** holds the sheets or bags against the under surface of the conveyor belts **30**.

A cam shaft **56** (FIGS. 2, 3 and 4) extends transversely within the housing **14** and is rotatably mounted in suitable bearings. Two slide rails **60** and **62** (FIG. 5) are fixedly mounted within the housing **14** adjacent and parallel to the side walls thereof. As shown in FIGS. 2–5, sleeves **64** and **66** are slidably mounted on the rails **60** and **62**, respectively. Connecting rods **68** and **70** (FIG. 2) are pivotally connected to the sleeves **64** and **66**, respectively, by suitable pins **72** and **74**. The opposite ends of the connecting rods **68** and **70** embrace suitable eccentric disc cams **80** and **82** fixed to the cam shaft **56**.

The mechanisms carried by the two sleeves **64** and **66** are identical in structure and only that carried by the sleeve **64** will be described in detail. As shown in FIGS. 2, 4, and 5, two U-shaped brackets **90** and **92** are formed integral with the sleeve **64** and extend upwardly therefrom in spaced apart relation longitudinally thereof. A rack **94** extends longitudinally of the sleeve **64** and is slidably mounted between the legs of each of the brackets **90** and **92**. A shaft **96** extends transversely between the upstanding legs of the bracket **90** and a spur gear **98** is fixed to the shaft and meshes with the rack **94**. A similar shaft **100** extends between the upper ends of the upstanding legs of the bracket **92** and a spur gear **102** is fixed to the shaft **100** and meshes with the teeth of the rack **94**. The two gears **98** and **102** are of the same size. A crank lever **104** (FIG. 4) is fixed to the outer end of the shaft **96**. The outer end of the crank **104** is connected by a link **106** to one end of a bell crank **108**. The bell crank **108** is rotatably mounted on a suitable stub shaft **110** fixed with respect to the housing **14**. The opposite end of the bell crank **108** carries a cam roller **111** which rides within a cam groove **112** on a face cam **114** fixed to the cam shaft **56**.

From the mechanism just described it may be seen that when the cam shaft 56 rotates, the sleeves 64 and 66 will be reciprocated by the action of the eccentric disc cams 80 and 82. Simultaneously therewith the shafts 96 and 100 will be rotationally and coextensively oscillated by the action of the cam 114 on the bell crank 108 since the shafts 96 and 100 are interconnected for conjoint movement through the action of the sliding rack 94 which meshes with the similar spur gears 98 and 102 fixed to the shafts 96 and 100, respectively.

A crank arm 120 (FIG. 2) is fixed to the inner end of the shaft 96 and a similar crank arm 122 is fixed to the inner end of the shaft 100. The outer ends of the crank arms 120 and 122 are pivotally connected to brackets 124 and 126, respectively. The brackets 124 and 126 are both connected to a longitudinally extending member 131 (FIGS. 2 and 5). A pair of corresponding brackets 132 and 136 (FIG. 2) at the opposite side of the machine are connected to a similar longitudinally extending member 133 (FIGS. 2 and 5). Two transversely extending members 130 and 134 (FIG. 2) are connected between the members 131 and 133 adjacent the ends thereof. A plurality of bag or sheet discharge plates or blades 138 (FIGS. 2–5) are fixed to the under sides of the members 130 and 134 in parallel spaced relation with each other. Each of the blades 138 is in register with one of the slots 50 in the bottom wall 15 of the housing 14.

When the cam 114 causes oscillation of the shafts 96 and 100 in the manner described hereinabove, the blade frame comprising members 130, 131, 133 and 134 is moved downwardly to project the blades 138 through the slots 50 to engage the sheet or bag and move the same away from the undersurface of the conveyor belts 30 a distance sufficient to break the suction effect which until this time was holding them against the undersurface of the belts 30. It will be appreciated that the physical presence of the blades 138 within the slots 50 decreases the air flow therethrough thus diminishing the suction effect to aid in the release of the sheet or bag therefrom. At the same time the blades 138 are moved forwardly with the sheet or bag by the sleeves 64 and 66 due to their being reciprocated by the action of the cams 80 and 82. The sheet will now drop onto a conveyor belt 150 (FIGS. 2–5) which extends transversely beneath the housing 14 and is trained around suitable drums 152 (FIGS. 3, 4, and 6) and 154 (FIGS. 5 and 6).

The drive mechanism for the various units described above is best understood with reference to FIG. 6 and comprises a drive motor 200 the output shaft 202 of which is provided with two peripherally toothed drive pulleys 204 and 206. The drive pulley 206 is connected by a timing belt 208 to a peripherally toothed pulley 210 mounted on a main drive shaft 212, which extends longitudinally of the stacking machine 10 adjacent one side thereof. A helical gear 214 is fixed to the shaft 212 and drives a helical gear 216 fixed to a transversely extending shaft 218 which through a suitable electrically operated clutch 220 drives a shaft 222 in coaxial alignment with the shaft 218. A helical gear 224 fixed to the shaft 222 meshes with and drives a helical gear 226 fixed to a shaft 228 which extends longitudinally of the machine 10 and is spaced laterally outward beyond the opposite side thereof. The drum 152 of the conveyor belt 150 is affixed to the shaft 228. Thus, the conveyor belt 150 is operated only when the electrically operated clutch 220 is engaged.

A gear 230 meshes with the gear 216 and drives the transverse shaft 38 on which the driving drum 32 for the conveyor belts 30 is mounted. A helical gear 232 fixed to the main drive shaft 212 drives a helical gear 234 fixed to the transverse shaft 28 on which the driving drum 26 for the conveyor belts 24 is mounted.

A gear 236 meshes with the gear 234 and is fixed to one end of a transversely extending shaft 238 (FIGS. 6 and 7) and a gear 240 is fixed to the opposite end of the shaft 238. A gear 242 is rotatably mounted on the shaft 238 and is adapted to be temporarily connected to the gear 240 by a one revolution clutch 243. The gear 242 meshes with an idler gear 244 (FIG. 7) which is part of the gear train for the shearing mechanism (not shown), so that the shearing mechanism will be operated and a single sheet or bag will be delivered to the belts 24 and 30 each time the single revolution clutch 243 is engaged.

The gear 240 meshes with a gear 250 (FIGS. 6 and 7) rotatably mounted on a stub shaft 252 suitably supported by the frame of the machine 10. A second gear 254 is rotatably mounted on the stub shaft 252 and is adapted to be connected to and rotated by the gear 250 by means of a one revolution clutch 256. The gear 254 meshes with a gear 258 fixed to the previously mentioned cam shaft 56 whereby the push-off blades 138 are actuated.

The second drive pulley 204 on the motor shaft 202 drives a timing belt 270 which in turn drives a toothed pulley 272 on the input shaft of a change speed mechanism 274. The output shaft 275 of the change speed mechanism 274 carries a toothed pulley 276 that drives a timing belt 278 which meshes with a toothed pulley 280 on a cam shaft 282 rotatably mounted on the frame of the machine 10. A gear 284 fixed to the cam shaft 282 meshes with and drives a gear 286 fixed to a second cam shaft 288 rotatably mounted on the frame of the machine 10.

A cam 290 (FIGS. 6 and 7) is adjustably connected to the cam shaft 282 for rotation therewith and is adapted to actuate a cam roller 292 rotatably mounted on the central portion of a lever 294 pivotally mounted at one of its ends on a pin 296 fixed to the frame of the machine 10. The opposite end of the lever 294 is pivotally connected to one end of a link 298 the other end of which is connected to a clutch actuating pawl 300. The pawl 300 is pivotally mounted on a pin 302 fixed to the frame of the machine 10. The pawl 300 is provided with a latch finger 304 adapted to engage a suitable clutch actuating abutment 306 on the above mentioned one revolution clutch 256. Consequently, each time the cam 290 makes one revolution it actuates the one revolution clutch 256 to cause a single revolution of the cam shaft 56 to actuate the push-off plates 138.

A cam 310 (FIG. 7) which is adjustably secured to the cam shaft 288 actuates the one revolution clutch 243 whereby the shaft 238 is adapted to be connected to the gear 240 of the shearing mechanism. Therefore, each time the cam 310 makes one revolution it actuates the single revolution clutch 243 to cause a single cycle of operation of the shearing mechanism, and since the gears 284 and 286 are the same size, the push-off blades 138 and the shearing mechanism will both be actuated once each time the cam shaft 282 makes a full revolution.

From the foregoing description it may be seen that the push-off blades 138 of the stacking mechanism 10 are driven by the same drive as are the conveyor belts 24 and 30 and therefore are driven at the same relative speed, but at intervals the length of which is controlled by the change speed mechanism 274. Therefore, the frequency of operation of the push-off blades 138 can be varied to accommodate sheets or bags of different lengths.

A suitable counting mechanism (not shown) may be provided to count the number of cycles of the stacking mechanism, and to automatically momentarily energize a solenoid 320 (FIG. 5) to move a clutch arm 322 so as to actuate the electrically operated clutch 220 after a predetermined number of cycles of operation of the push-off blades 138. This causes movement of the belt 150 a short distance so that the bags being stacked will be separated into separate piles each containing a number of units determined by the setting of the counting mechanism.

While a particular embodiment of the invention has been shown and described, it will be understood that the apparatus is capable of modification and variation with-

out departing from the principles of the invention and that the scope of the invention should be limited only by the scope and proper interpretation of the claims appended hereto.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. A sheet stacking mechanism comprising a plurality of parallel conveyor belts, a vacuum chamber mounted with its bottom wall above said conveyor belts, said bottom wall having longitudinally extending slots therein between said conveyor belts through which air tending to enter said vacuum chamber holds the sheets to be stacked against the under side of said conveyor belts for movement therewith, means mounted within said vacuum chamber in alignment with said longitudinally extending slots and adapted to be projected downwardly into and through said slots for decreasing the air flow through said slots and moving said sheets individually downwardly away from the suction zone of said slots to remove said sheets from said conveyor belts, and means for actuating said means for moving said sheets downwardly.

2. A stacking mechanism for sheet material articles comprising a plurality of parallel conveyor belts, a vacuum chamber mounted above said conveyor belts, a horizontal conveyor belt extending transversely beneath said parallel conveyor belts in the region beneath said vacuum chamber, the bottom of said vacuum chamber having longitudinal slots therein between said parallel conveyor belts through which air tends to enter said vacuum chamber and thereby holds the sheet material articles to be stacked against the under side of said parallel conveyor belts for movement therewith, means mounted within said vacuum chamber in alignment with said slots and adapted to be projected downwardly into and through said slots for decreasing the air flow through said slots and moving said sheets individually downwardly away from the suction zone of said slots so that said sheets will drop into an orderly stack overlying each other on said transversely extending conveyor belt, and means for periodically actuating said means for moving said sheets downwardly.

3. A stacking mechanism for sheet material articles comprising a conveying mechanism, a vacuum chamber mounted above said conveying mechanism and having slots in the bottom thereof through which air tends to enter said vacuum chamber and thereby holds the articles to be stacked against the under side of said conveying mechanism, a blade frame mounted in said vacuum chamber for vertical movement with respect thereto, a plurality of vertically disposed parallel blades mounted on said blade frame in alignment with the slots, cam means for moving said frame vertically to project said blades downwardly into and through said slots to decrease the air flow through said slots and move said articles downwardly away from the suction zone of said slots so that said articles will drop from said conveying mechanism, and means for actuating said cam means.

4. A stacking mechanism for sheet material articles comprising a conveying mechanism, a vacuum chamber mounted above said conveying mechanism and having longitudinally extending slots in the bottom thereof through which air tends to enter said vacuum chamber and thereby holds articles to be stacked against the under side of said conveying mechanism, a blade frame mounted in said vacuum chamber for both reciprocatory movement longitudinally thereof and vertical movement with respect thereto, a plurality of vertically disposed parallel blades mounted on said blade frame in alignment with the slots in said chamber bottom, cam means for reciprocating said frame longitudinally, cam means for moving said frame vertically to project said blades downwardly into and through said slots to decrease the air flow through said slots and move said articles downwardly away from said slots so that said articles will drop away from said conveying mechanism, and means for simultaneously actuating both of said cam means.

5. A stacking mechanism for sheet material articles comprising a plurality of parallel conveyor belts, a vacuum chamber mounted above said conveyor belts and having longitudinally extending slots in the bottom thereof between said conveyor belts through which air tends to enter said vacuum chamber and thereby holds articles to be stacked against the under side of said conveyor belts, a blade frame mounted in said vacuum chamber for vertical movement with respect thereto, a plurality of vertically disposed parallel blades mounted on said blade frame in alignment with the slots in said chamber bottom, cam means for moving said frame vertically to project said blades downwardly into and through said slots to decrease the air flow through said slots and push said articles downwardly away from the suction zone of said slots so that said articles will drop from said conveyor belts, and means for actuating said cam means.

6. A stacking mechanism for sheet material articles comprising a conveying mechanism, a vacuum chamber mounted above said conveying mechanism, a horizontal conveyor belt extending transversely beneath said conveying means and beneath said vacuum chamber, said vacuum chamber having longitudinally extending slots in the bottom thereof through which air tends to enter said vacuum chamber and thereby holds the articles to be stacked against the under side of said conveying mechanism, a blade frame mounted in said vacuum chamber for both reciprocatory movement longitudinally thereof and vertical movement with respect thereto, a plurality of vertically disposed parallel blades mounted on said blade frame in alignment with the slots, cam means for reciprocating said frame longitudinally, cam means for moving said frame vertically to project said blades downwardly into and through said slots to decrease the air flow through said slots and remove said sheets from said conveying mechanism, and means for actuating said cam means.

7. A stacking mechanism for sheet material articles comprising a plurality of parallel conveyor belts, a vacuum chamber mounted above said conveyor belts, a horizontal conveyor belt extending transversely beneath said parallel conveyor belts in the region beneath said vacuum chamber, the bottom of said chamber having longitudinally extending slots therein between said parallel belts through which air tends to enter said vacuum chamber and thereby holds articles against the under side of said parallel conveyor belts, a blade frame mounted in said vacuum chamber for both reciprocatory movement longitudinally thereof and vertical movement with respect thereto, a plurality of vertically disposed parallel blades mounted on said blade frame in alignment with the slots in said chamber bottom, cam means for reciprocating said frame longitudinally, cam means for moving said frame vertically to project said blades downwardly into and through said slots to decrease the air flow through said slots and push said articles away from the slots so that said articles will drop into an orderly stack overlying each other on said transversely extending belt, and means for periodically actuating said cam means.

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