

April 10, 1962

H. E. ZACHOW

3,028,979

SHEET PACK STACKING APPARATUS

Filed March 27, 1956

9 Sheets-Sheet 2

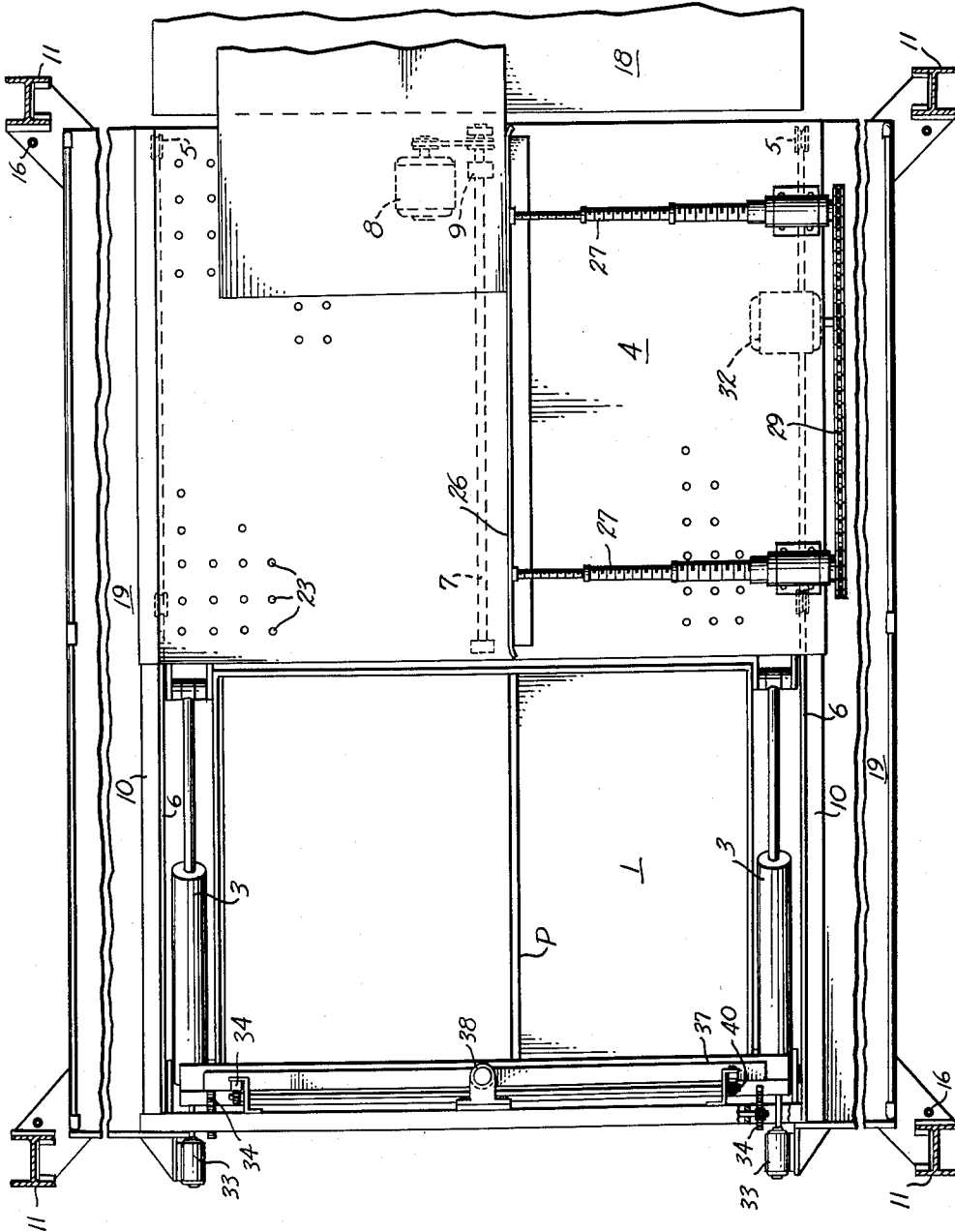


Fig. 2.

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9 Sheets-Sheet 3

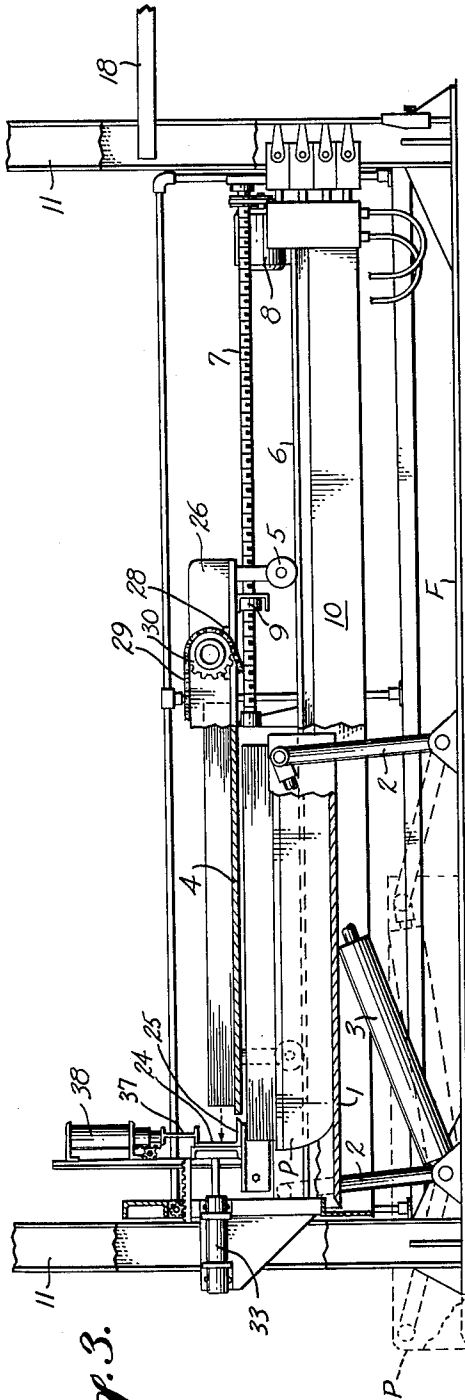


Fig. 3.

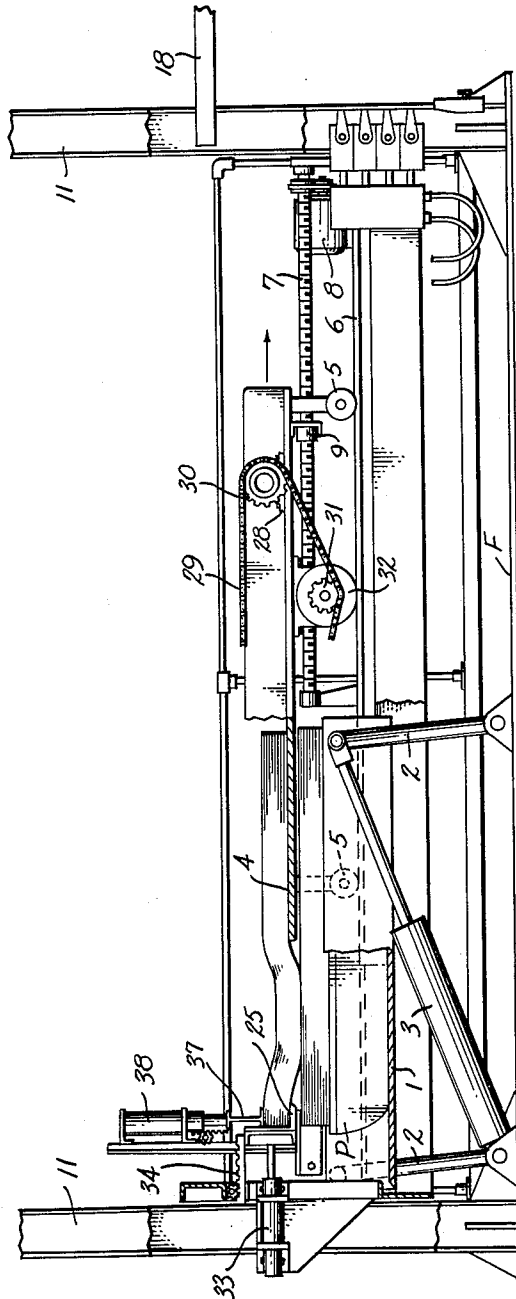


Fig. 4

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9 Sheets-Sheet 4

Fig. 7.

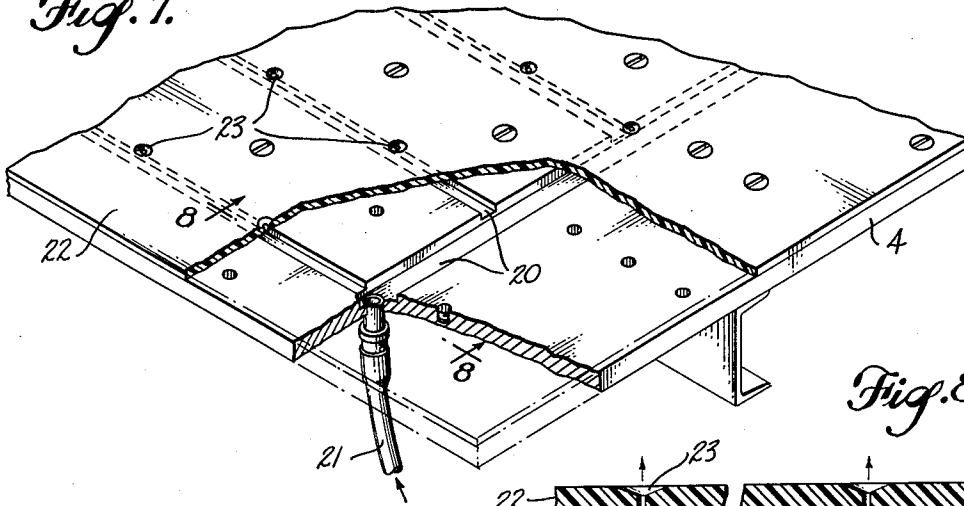


Fig. 8.

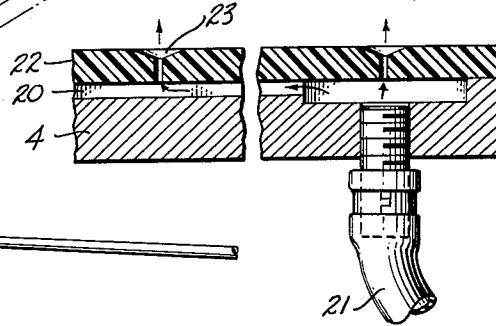
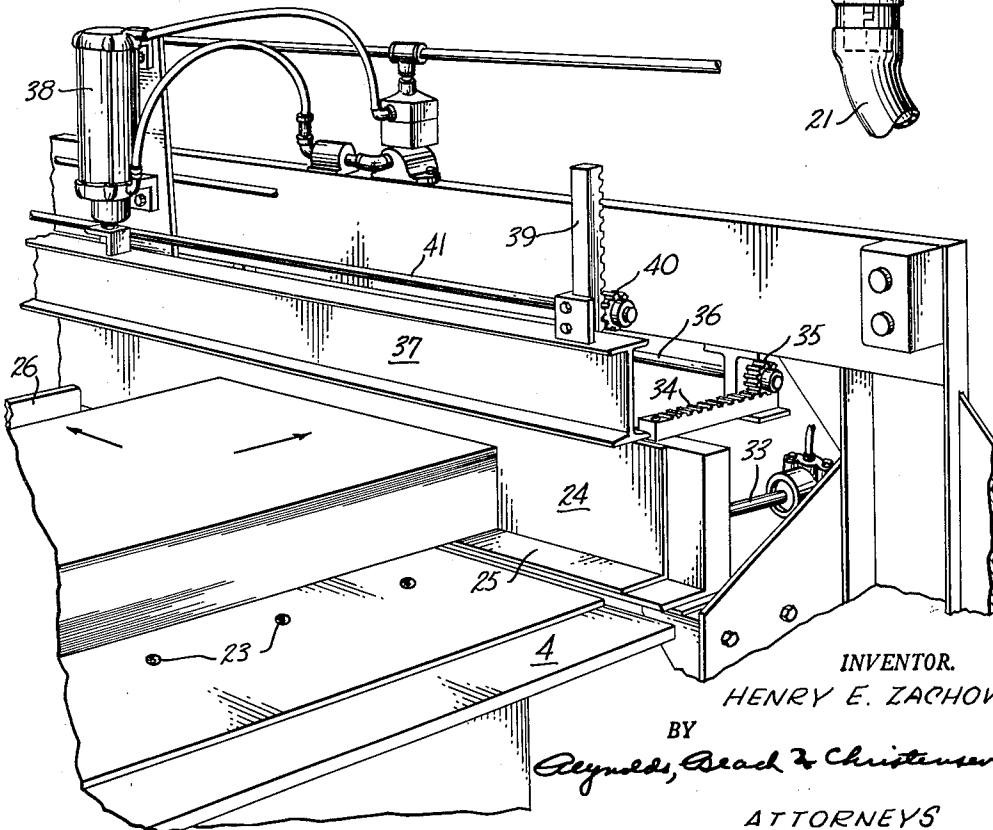


Fig. 5.



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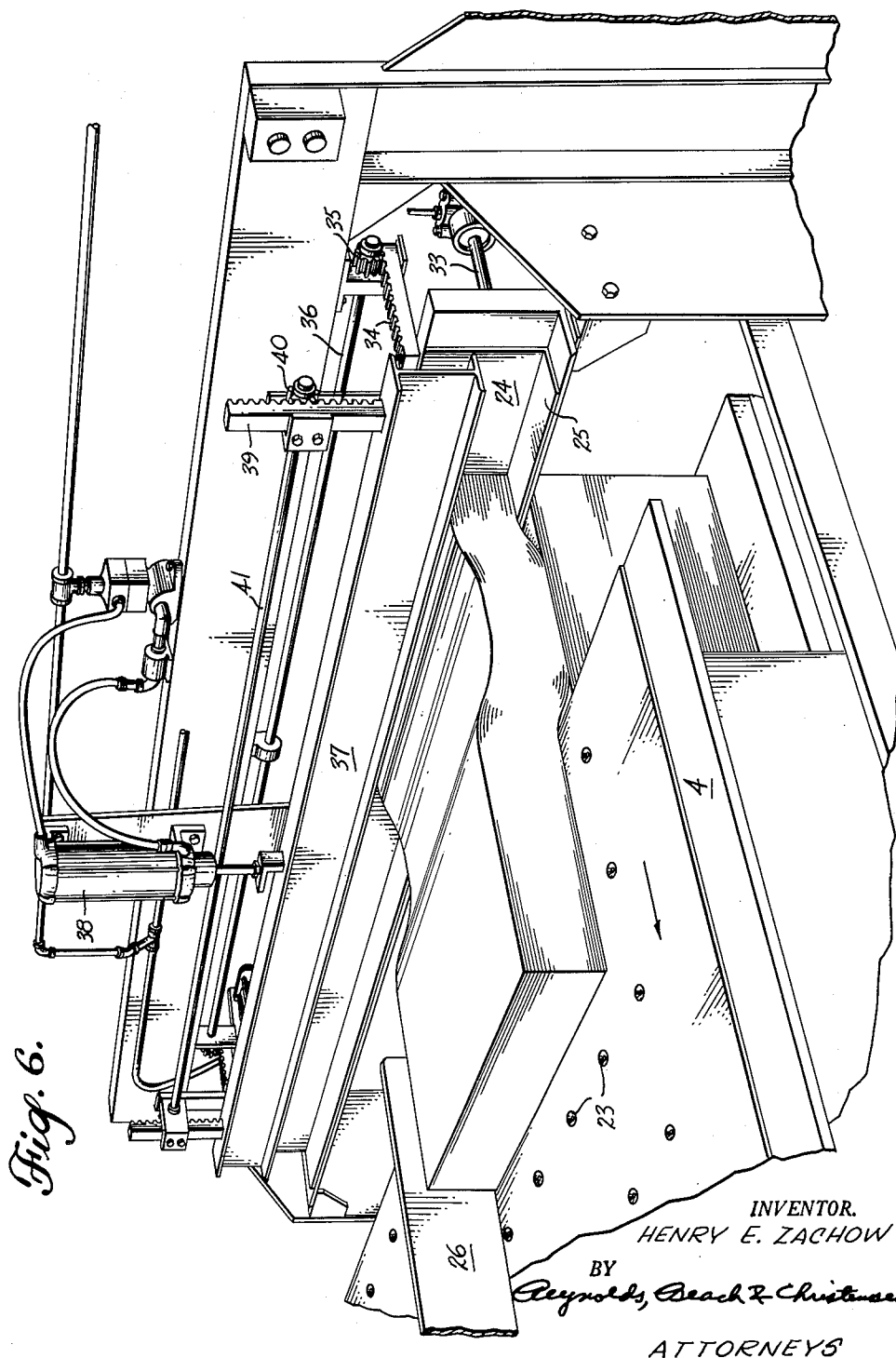
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9 Sheets-Sheet 5



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9 Sheets-Sheet 6

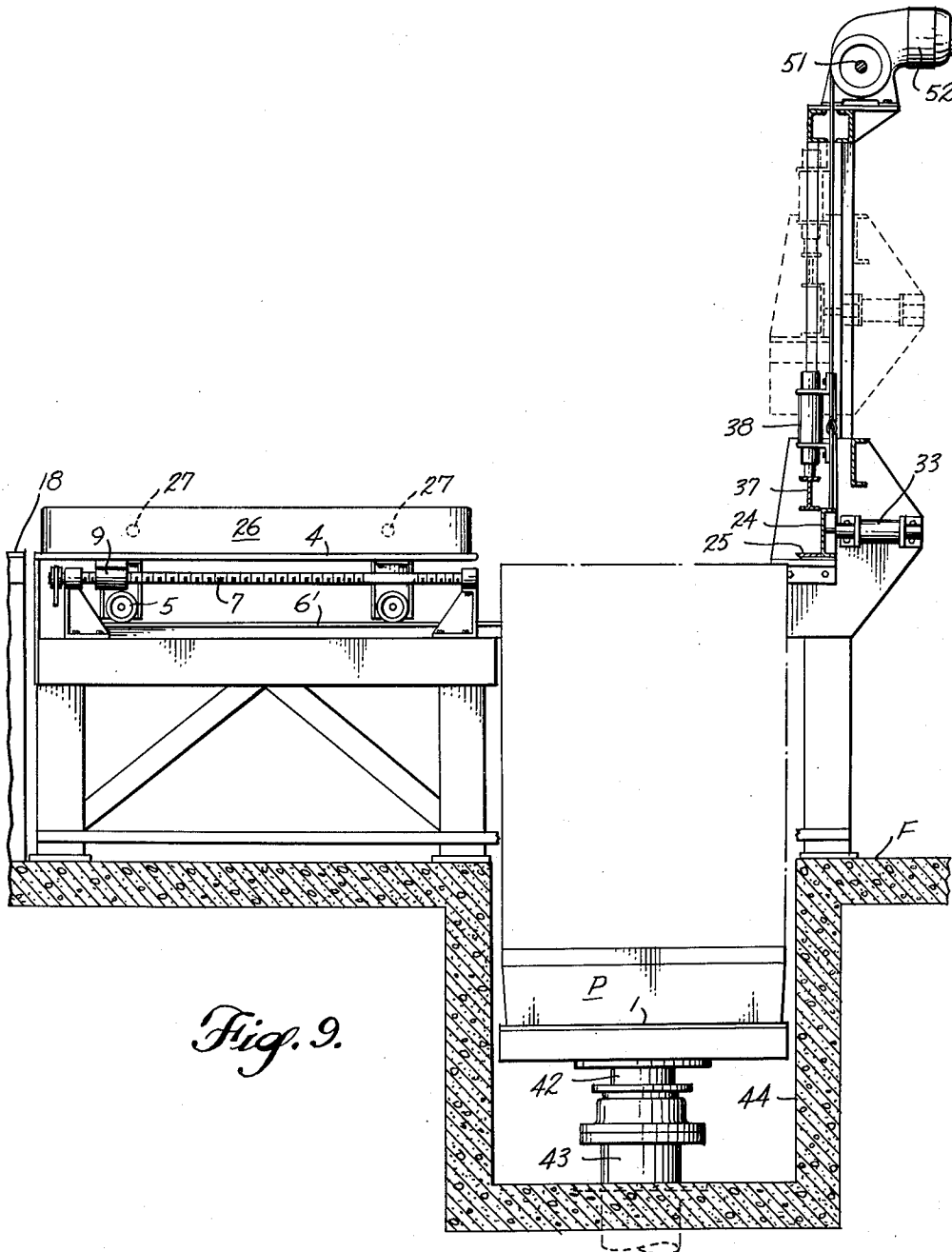


Fig. 9.

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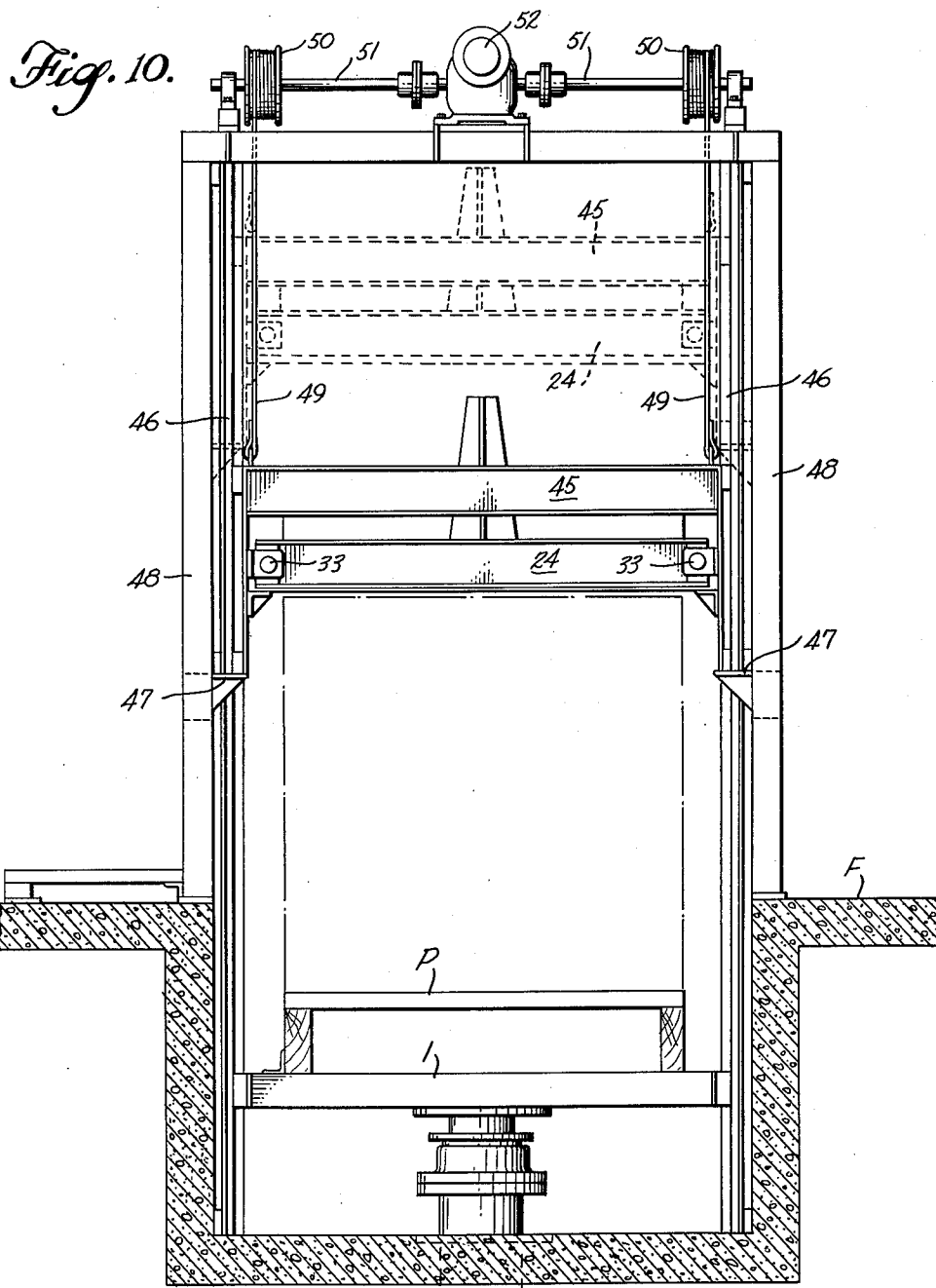
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SHEET PACK STACKING APPARATUS

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9 Sheets-Sheet 7



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SHEET PACK STACKING APPARATUS

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9 Sheets-Sheet 8

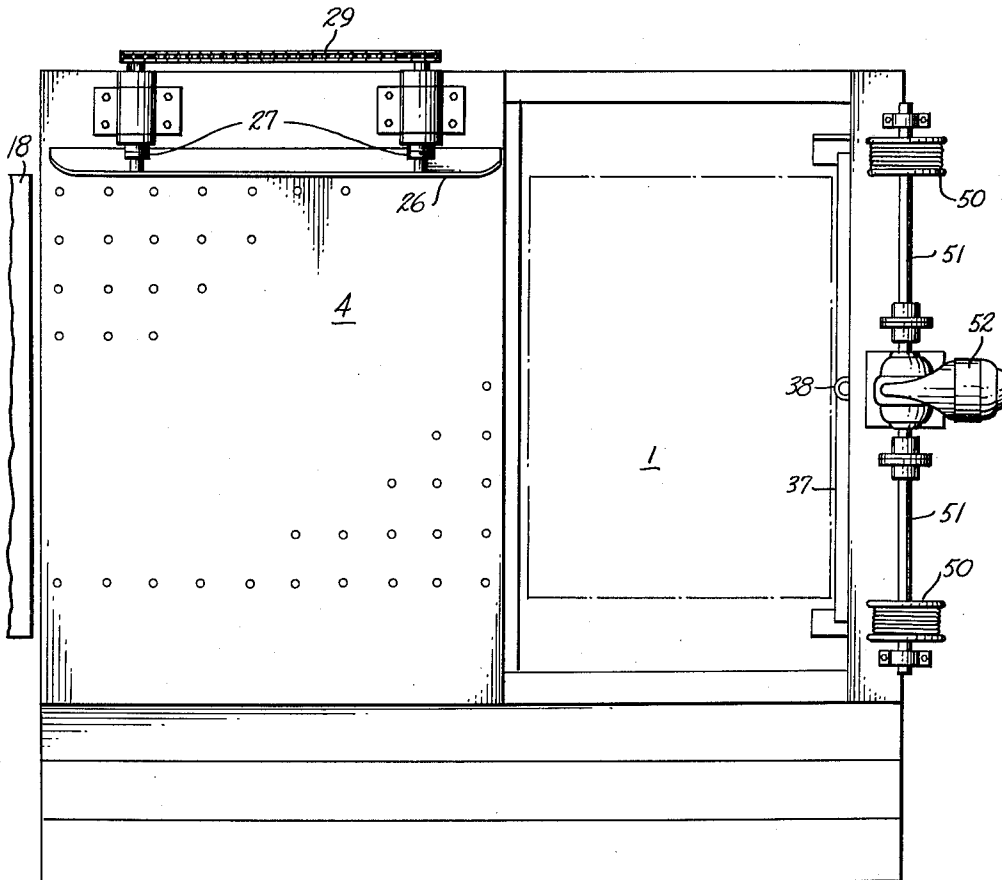


Fig. 11.

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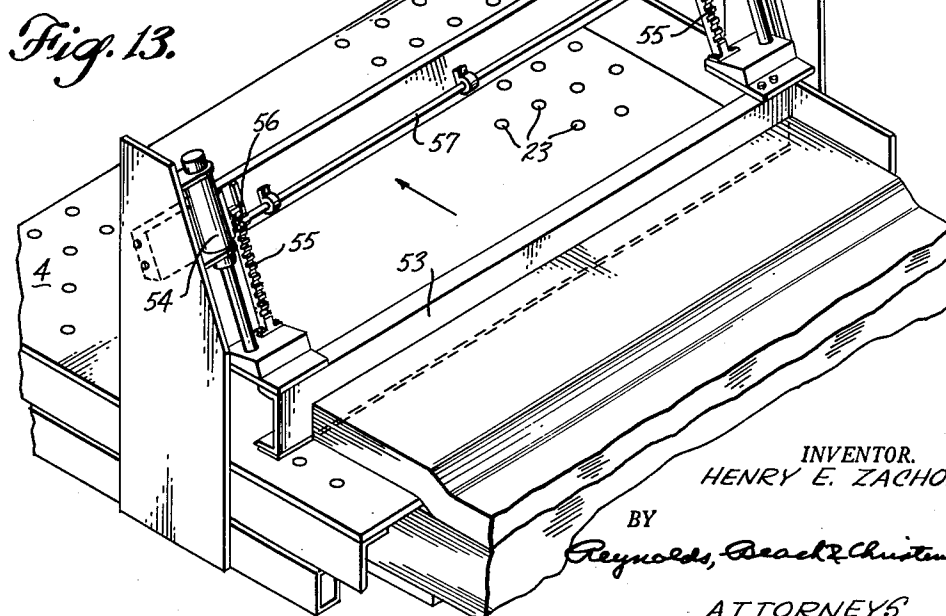
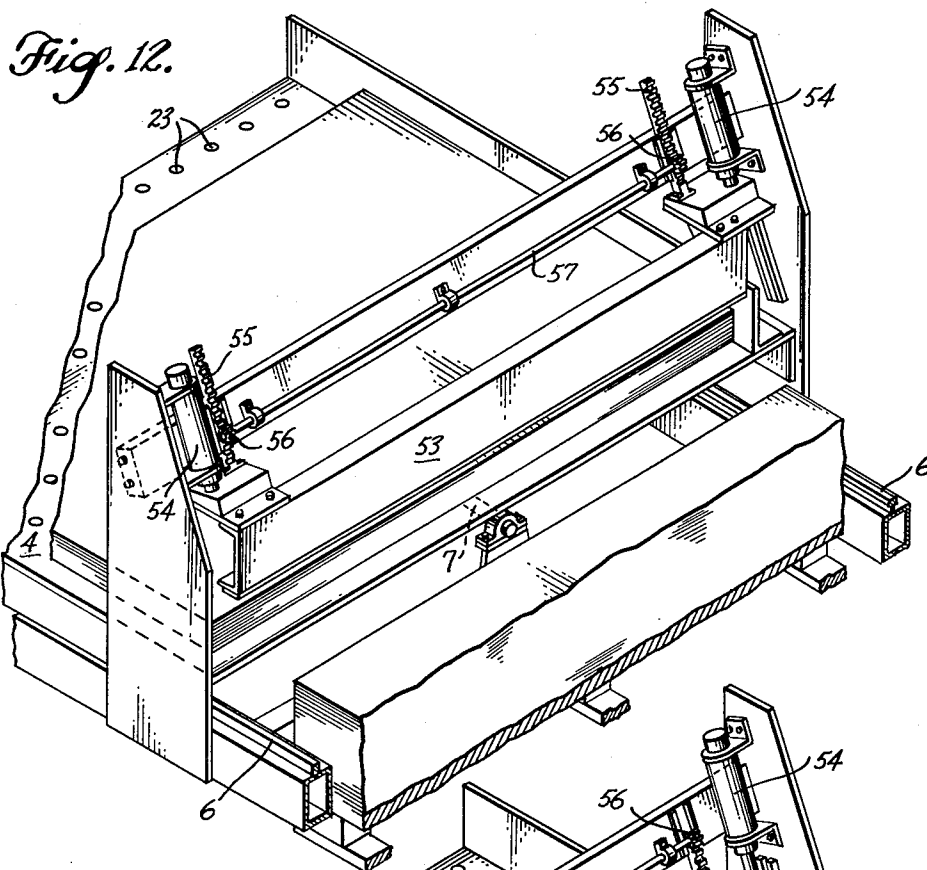
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SHEET PACK STACKING APPARATUS

Filed March 27, 1956

9 Sheets-Sheet 9



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SHEET PACK STACKING APPARATUS

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Filed Mar. 27, 1956, Ser. No. 574,153

6 Claims. (Cl. 214-6)

This invention relates to apparatus for stacking packs of sheets all of the same size with their edges even and is particularly useful for stacking packs of paper sheets in a stack for shipment.

Heretofore paper has been stacked manually, which is a time consuming procedure both because of the size, weight and flimsy character of paper sheets which make them difficult to handle and because of the sliding tendency of slick-surfaced paper which makes it difficult to keep the sheets in registry and the resistance to sliding of paper which does not have a slick surface, such as newsprint, which increases the difficulty of placing in exact registry sheets which are uneven.

A principal object of the present invention, therefore, is to provide sheet-stacking apparatus which can be used to stack sheets with a minimum of manual handling. In such manual handling as is required it is also an object to avoid the necessity of workmen supporting the weight of the paper or other sheet material.

More specifically, it is an object to place trimmed packs of sheets, one after another, on a sheet stack support so as to build up a stack of sheets of any desired height in which the sheets are in exact registry with their edges even.

A further object is to provide such sheet stacking mechanism which can be operated rapidly to form a stack of sheets, such operation of the apparatus being much faster than customary hand stacking operations.

A more specific object is to transport a pack of sheets into vertical registry with a stacking location and to deposit the pack of sheets onto a stack being formed in accurate registry with the stacking location. Such depositing preferably is accomplished by carrying the pack into the proper stacking position and then holding the pack in such position while the structure supporting it is withdrawn from beneath the pack.

In such apparatus it is an object to provide mechanism to support packs of sheets or cuts of paper being stacked in a manner enabling each pack to be moved readily into a position such that when it is deposited on the stack it will be in exact registry with the stacking location.

Several forms of apparatus capable of accomplishing these objects are illustrated in the accompanying drawings. Such apparatus includes a sheet stack support which preferably enables a stack of sheets to be accumulated on a pallet. The sheets are deposited on the sheet stack support in packs or cuts. Each pack is carried by a pack support, and the pack support and stack support are movable relatively both horizontally and vertically. Thus, for example, the pack support may be a carriage movable to place a pack of sheets in predetermined position above the stack support. As the stack of sheets increases by accumulation of packs of sheets on it, the vertical spacing of the pack support and the stack support is increased progressively either by the pack support being raised intermittently by increments or by the stack support being lowered intermittently by increments. Mechanism is provided for holding the sheet pack against edgewise movement relative to the stack support during relative horizontal movement of the pack support and the stack support for depositing a pack on the stack support. Such mechanism may take the form of a pack clamp or a barrier.

FIGURE 1 is a side elevation view of the sheet stacking mechanism with parts broken away.

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FIGURE 2 is a transverse sectional view through the sheet stacking mechanism taken on line 2-2 of FIGURE 1.

FIGURE 3 is a side elevation view of the lower portion of the sheet stacking mechanism with parts in positions different from the positions shown in FIGURE 1, parts being broken away, and FIGURE 4 is a similar view with parts in still a different position.

FIGURE 5 is a top perspective view of a portion of the stacking location area of the apparatus, the remainder of the apparatus being broken away, and FIGURE 6 is a generally similar view showing parts in different operative positions.

FIGURE 7 is a top perspective view of a fragment of a sheet pack supporting carriage with parts broken away, and FIGURE 8 is a sectional view of a fragment of such carriage taken on line 8-8 of FIGURE 7.

FIGURE 9 is a side elevation view of a modified form of sheet stacking apparatus, and FIGURE 10 is a side elevation view of such apparatus taken perpendicular to FIGURE 9.

FIGURE 11 is a plan view of the sheet stacking apparatus shown in FIGURES 9 and 10.

FIGURE 12 is a top perspective view of a modified form of sheet depositing mechanism, parts being broken away, and FIGURE 13 is a similar view showing parts in different operative positions.

Paper and other flimsy sheet material frequently was shipped in stacks, and it is highly desirable that the sheets in the stack be piled evenly. Such a stack of sheets may be supported on and even bound to a pallet which can be transported by a fork lift truck. The problem is to load the sheet material on such a pallet or stack it evenly, quickly and easily. With the apparatus of the present invention packs of sheets may be transported from a shear or trimming machine, shifted into a position above a stack support, squared in such position, and then deposited on the stack support. Successive packs of sheet material may thus be accumulated in vertical registry until a stack of the desired height has been formed, whereupon the stack can be removed and a new stack started.

The preferred form of sheet stacking apparatus to be operated for this purpose is shown in FIGURES 1 to 8, inclusive, of the drawings. In this particular form it is desired to have the stack formed on a pallet P which is placed on the stack supporting platform 1. To afford sufficient clearance for part of the stacking mechanism without the necessity of providing any recess in the floor, it is preferred that the stack support be mounted for movement upward into an elevated position shown in full lines in FIGURES 1, 3 and 4 during the sheet stack accumulating operation. The stack supporting platform is lifted into this upper position by being supported on parallel links 2, swingable by a fluid pressure jack 3 extending diagonally across the deformable parallelogram formed by the floor F, the links 2 and the platform structure 1.

When a stack of sheets has been accumulated on the stack supporting platform, the fluid jack 3 can be contracted to lower the platform into the broken-line position shown in FIGURE 3. The amount of vertical movement effected by the supporting links 2 of the stack supporting platform is not critical except that the links should be long enough to accommodate below the level of the pallet on platform 1 the structure required to support the sheet pack carriage 4. This carriage is mounted on wheels 5 running on tracks 6, which guide the carriage for movement between a position above and in registry with the sheet stack supporting platform and a position offset from the platform, the carriage being in such offset position in FIGURE 1. Horizontal relative movement between the sheet pack carriage and the

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sheet stack platform can be effected by driving the carriage along the track 6 by the feed screw 7, which is rotated by motor 8 to traverse the nut 9 mounted on carriage 4.

The carriage transports a pack of sheets or cut of paper from the position offset from the sheet stack support shown in FIGURE 1 to a position overlying the stack support as shown in FIGURE 3, and then the carriage is retracted from such superposed position into the offset position again, as illustrated in FIGURE 4, while the sheet pack or paper cut is held against edgewise movement while the carriage is being withdrawn. When the carriage has been pulled completely from beneath the pack of sheets, such pack will have been deposited on the sheet stack support whether directly in contact with such support or resting on a pack of sheets previously deposited. In either case it is desirable that during such sheet pack depositing operation the pack not be required to drop very far. Since a considerable number of sheet packs is accumulated one upon another to build up a stack of sheets of the height desired, it will therefore be necessary to provide mechanism for varying the relative elevations of the sheet stack support and the sheet pack support.

In the apparatus shown in FIGURES 1 to 4, inclusive, relative vertical movement of the stack supporting platform 1 and the pack supporting carriage 4 is effected by mounting the tracks 6 for the carriage on an elevator platform 10. This platform is guided for vertical movement by the posts 11 the upper ends of which are interconnected by beams 12. An elevator drive motor 13 is hung from these beams and drives the line shaft 14 on which cable drums 15 are mounted at opposite ends of the elevator frame. Cables 16 wound on these drums pass upward over pulleys 17 and then downward alongside the posts 11 and are attached to the respective corners of the elevator platform 10 to support it for raising and lowering movement.

The stack supporting platform 1 is located adjacent to one end of the elevator frame and a sheet pack feed table 18 is located at the opposite end of the frame. Such feed table may be simply a stationary shelf at a convenient height or may be a conveyor of the roll or belt type. From such feed table packs of sheets or cuts of paper are transferred to the carriage 4, as shown in FIGURE 1, and this operation may be accomplished manually by a workman standing on the walkway 19, which is supported from and alongside the elevator platform 10. Such walkways may be provided along opposite sides of the elevator platform, extending parallel to the tracks 6. Such tracks and the side beams 10 are spaced apart sufficiently far, as shown in FIGURE 2, so that the wheeled carriage 4 will straddle the platform 1 and its supporting mechanism including links 2 and the fluid actuators 3.

While mechanical feed means could be provided to transfer packs of sheets such as cuts of paper from the feed table 18 to the carriage 4, a workman standing on a walkway 19 can effect such a transfer without great effort and without supporting any appreciable proportion of the weight of such a pack if air flotation mechanism is provided on the carriage at least and preferably also on the feed table. Such air flotation mechanism may be constructed as shown in FIGURES 7 and 8. In the surface plate of carriage 4 a grid of upwardly opening grooves 20 is formed. Into this groove grid at one or more locations air under a small pressure is blown through the air hoses 21. These hoses are of a length sufficient to remain connected between a stationary support and a reciprocable carriage in whatever horizontal or elevational position the carriage may be.

A cover plate 22 is secured to the grooved plate 4 of the carriage for covering the air distributing grid of grooves 20. This cover plate has holes 23 distributed over its surface, preferably in a regular pattern, which

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holes are in communication with the air distribution grooves 20, as shown in FIGURES 7 and 8. The upper ends of these holes are countersunk to form a widely flaring discharge opening for the comparatively small bore communicating with one of the air distribution grooves 20. Air discharged from the orifices 23 will therefore be sprayed over a substantial area encircling the apertures even when the upper surface of the carriage is clear. When such apertures are covered by a pack of sheets, the area of air distribution will be increased greatly because of the inability of the air to escape directly upward. The fields of air discharge from the various apertures 23 will overlap under those circumstances.

The apertures 23 are small enough so that each one produces considerable resistance to flow of air through it even though it is uncovered. The pressure and volume of air delivered by the air hoses 21 to the distribution grooves 20 will be sufficient so that a substantial amount of air will be discharged through apertures 23 which are covered by a pack of sheets, as shown in FIGURE 2, even though most of the apertures are uncovered. The more apertures covered, however, the greater will be the quantity of air discharged from each covered aperture. The pressure of the air supplied through hoses 21 will be sufficient so that the air thus discharged from the apertures beneath a pack of sheets will completely or nearly counterbalance the weight of such pack. The air sprays discharged by the apertures will not lift the pack of sheets very far above the upper surface of the carriage, however, because as the pack is moved upward the restriction of the air sprays is reduced, and consequently the pressure exerted by them decreases. The sustaining effect of the air sprays is sufficient, however, to enable the pack of sheets to be slid edgewise by a workman from the feed table onto the carriage with little effort.

Assuming that the pack supporting carriage 4 and the stack supporting platform 1 are in proper elevational relationship for deposit of a pack of sheets from the platform onto the stack support, as shown in FIGURES 3 and 4, it is necessary to provide holding means which will hold the pack of sheets against edgewise movement as the carriage is withdrawn from beneath the pack in depositing it on the stack support. In the apparatus shown in FIGURES 1 to 6, inclusive, such holding means is in the form of a clamp for clamping the edge of the sheet pack farthest from the feed table 18.

The pack edge clamp is shown best in FIGURES 3, 4, 5 and 6 as including a stop or gauge plate 24 disposed vertically and having a lower flange 25. This clamp is carried by the elevator platform 10 and is located so that the horizontal flange 25 is at a level just below the upper surface of the carriage 4 as shown best in FIGURE 3. Cooperating with this gauge plate is a gauge bar 26 extending in a direction perpendicular to the gauge plate 24. This gauge bar overlies the carriage 4 and is supported by it as shown in FIGURES 1 and 6, for example. The gauge bar is adjustable relative to the carriage transversely of the direction of carriage movement depending upon the width of the sheets in that direction.

The position of the gauge bar 26 can be set on the carriage 4 in accordance with the width of the sheets to be handled by adjusting mechanism incorporating telescoping screw jacks 27 spaced lengthwise of the gauge bar and preferably connected to it adjacent to its respective ends. These jack screws are supported adjacent to one edge of the carriage 4 by suitable bearings 28 and are driven conjointly in the same direction by a chain 29 encircling sprockets 30 on the jack screws and a drive sprocket 31 driven by motor 32 suspended beneath the carriage.

The stop plate 24 also is mounted for movement transversely of its length at least to some extent. Such movement is effected by actuators 33, which may be of the fluid operated piston and cylinder type, mounted on struc-

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ure supported by an end beam of the elevator platform 10 so as to be elevated with the carriage. That the stop plate 24 will always be maintained in a position perpendicular to the direction of reciprocation of carriage 4 is insured by interconnecting the opposite ends of the stop plate by equalizing rack and pinion mechanism. Such mechanism includes the racks 34 carried by opposite ends of the stop plate, with which mesh pinions 35 interconnected by shaft 36. The limits of movement of the stop plate toward and away from the carriage 4 are fixed by the stroke of the actuators 33.

Clamp means are associated with the gauge plate 24 and include a vertically movable beam 37. This beam is reciprocated vertically by an actuator 38, which may be a fluid pressure piston and cylinder type or an electric torque motor or a screw type, which is supported from the gauge plate structure as shown best in FIGURE 4 and engages the clamping beam 37 substantially midway between its ends. Maintenance of the clamp beam in horizontal position as it is shifted vertically is assured by additional equalizing rack and gear mechanism including the racks 39 extending vertically upward from locations near the opposite ends of the beam 37 with which racks are engaged pinions 40. These pinions are interconnected by the shaft 41. This clamping beam is shown in its uppermost released position in FIGURE 5 and has been moved downward by the actuator 38 into sheet pack clamping position in the illustration of FIGURE 6.

In operation of the stacking mechanism the sheet stack support platform 1 would first be swung upward into the position shown in FIGURE 1. A pack of sheets would then be drawn endwise from the feed table 18 shown in FIGURE 1 onto the carriage 4 by a workman standing on the walkway 19 when the carriage was in its reciprocated position adjacent to the feed table, as illustrated in FIGURE 1. To facilitate this operation air would be ejected through the apertures 23 of the carriage and through corresponding apertures in the feed table if such apertures are provided there. When the sheet pack has been moved fully onto the carriage, the discharge of air from such apertures may be discontinued if desired. It is assumed that motor 32 has been driven in one direction or the other as appropriate to locate the gauge bar 26 on the carriage 4 in the position appropriate for the size of sheets being stacked and the size of the pallet P on the sheet stack support.

Next motor 8 is energized to rotate screw 7 for traversing the nut 9 to the left as seen in FIGURE 1 along this screw for the purpose of moving the carriage 4 from the position of FIGURE 1 into its position farthest to the left, as seen in FIGURE 3. At this time the stop plate 24 will have been shifted to its position closest to the carriage by energization of the actuators 33, and the clamp beam 37 will be raised to its clamp-open position, as also shown in FIGURE 3. With air being ejected from the apertures 23 in the carriage 4 a workman will next slide the sheet pack edgewise while suspended by the force of the ejected air until one edge of the sheet pack has been engaged with the gauge bar 26, and an adjacent edge has been engaged with the stop plate 24, as shown in FIGURE 5, with all the sheets in the pack even.

The next step is to lower the clamp beam 37 onto the sheet pack by energization of actuator 38, as shown in FIGURES 4 and 6. While an edge of the sheet pack is thus clamped to hold the sheets of the pack in registry and to hold the pack as a whole in registry with the stack of sheets below it or the sheet stacking position below it, the carriage 4 is moved away from the clamp in the direction indicated by the arrow in FIGURE 4 by operating the carriage drive motor 8 in the opposite direction to turn screw 7 reversely. As the carriage is withdrawn from beneath the pack of sheets, such pack will be held progressively onto the stack support either

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directly or on sheets already stacked on such support. This operation is illustrated in FIGURES 4 and 6.

After the carriage has been withdrawn completely from beneath the sheet pack in this manner, the actuator 38 will be reversed to raise the clamp beam 37 again into the position shown in FIGURE 5 for releasing the sheet pack edge. Operation of actuators 33 can then be reversed to retract the stop plate 24 from the position shown in FIGURES 3 and 4 to that of FIGURE 1, so that the edge of the sheet pack which had been gripped can lie directly on the sheet stack support or other sheets previously deposited on it in precise registry. The next pack of sheets can then be placed on the carriage 4 preparatory to repeating the sheet pack depositing operation described.

In order to prevent movement of each pack of sheets on carriage 4 out of registry with previously stacked sheets or the desired sheet stacking location after such pack of sheets has been gripped by the clamp beam 37, it is important that the carriage 4 be located closely above the top of the sheet stack already formed, as shown in FIGURE 3, when the carriage is withdrawn from beneath the sheet pack as shown in FIGURE 4. Consequently, mechanism is provided to effect relative vertical movement of the sheet pack supporting carriage 4 and the sheet stack supporting platform 1 as packs are accumulated on the sheet stack support. Such relative vertical movement is effected in the type of apparatus shown in FIGURES 1 to 4, inclusive, by movement of the elevator 10.

When it is desired to load another pack of sheets onto the carriage 4 when it is at the side of the elevator 10 adjacent to the feed table 18, the top of the carriage should be level with such feed table, as shown in FIGURE 1, or slightly below it. If when the carriage is in this position the top of the sheet stack previously accumulated is below the top of the carriage, the elevator 10 should be lowered, such as to the position of FIGURES 3 and 4, after the sheet pack has been loaded on it. When this sheet pack has been deposited on the top of the sheet stack in the manner described and the carriage returned to the side of the elevator adjacent to the feed platform 18, the elevator will be raised again into the position of FIGURE 1 to place the carriage 4 substantially in registry with the feed table. As the height of the sheet stack increases, it will become necessary to raise the elevator from the position which it occupies while the carriage is being loaded from the feed table 18 instead of lowering it. In fact, for control purposes it may be desirable always to establish the proper location of the elevator for deposit of a sheet pack from the carriage to the sheet stack on upward movement of the elevator. In that case the elevator can be lowered lower than necessary and then raised slightly to place the carriage in its proper position if desired when the top of the sheet stack is lower than the top of the carriage as it is in FIGURES 1, 3 and 4. In any case the elevator movement is controlled automatically to stop with the top of the carriage in each instance the same distance above the top of the stack portion which has been formed. The thickness of a sheet pack or variation in thickness of successive packs, does not affect the control of the elevation of the carriage with reference to the top of the sheet stack.

In the type of sheet stacking apparatus shown in FIGURES 9 to 11, relative vertical movement of the pack supporting carriage 4 and the stack supporting platform 1 while building the stack is effected by progressively lowering the stack supporting platform instead of raising the carriage. In this instance, therefore, the tracks 6' guiding the carriage are at an elevation such that the top of the carriage will always be in the proper elevational relationship to the feed table 18.

The stack supporting platform 1, on the contrary, is mounted on the ram 42 of a hydraulic elevator incorporating the cylinder 43. This elevator is installed in a pit 44 so that the platform 1 can be lowered to a posi-

tion a substantial distance below the floor F. In this instance the stop plate 24, flange 25, clamp bar 37 and actuators 33 and 38 will all be mounted on a vertically shiftable frame 45 guided for vertical movement in ways 46. The lower position of the gauge plate and clamp mechanism is established by engagement of the sliding frame 45 with stop brackets 47 mounted on posts 48, which also carry the ways 46. The sliding frame is moved vertically by hoisting cables 49 wound on drums 50, which are driven by a line shaft 51 powered by the motor 52.

As described in connection with the apparatus shown in FIGURES 1 to 8, inclusive, the carriage 4 will have on it a similar type of gauge bar 26, adjustable by screw jacks 27 which are driven by the chain 29. Also, as shown in detail in FIGURES 7 and 8, the carriage 4 may be provided with air discharge apertures 23, as indicated in FIGURE 11, and similar apertures may be provided in the feed table 18.

In general the method of utilizing the apparatus shown in FIGURES 9 to 11 is quite similar to that of the apparatus previously described. A pack of sheets will be transferred from the feed table 18 to the carriage 4 with the gauge bar 26 in the position properly adjusted for the width of the sheets to be stacked. The carriage will then be driven to the right, as seen in FIGURE 9, by rotation of feed screw 7 while the gauge plate 24 is shifted into its position farthest to the left. When the carriage has been moved into its position farthest to the right, the pack of sheets will be shifted while sustained by air discharged from the carriage so that the edges will be even and will abut the gauge bar 26 and the gauge plate 24. The sheet edges of the pack are then clamped by lowering the clamp beam 37 and the sheet edges are thus held clamped while the carriage 4 is withdrawn to the left into the position shown in FIGURE 9. During such withdrawal the pack of sheets will be deposited on top of the stack being built on platform 1. When the carriage is completely withdrawn, the clamp beam 37 will be raised by actuator 38 and actuators 33 will be energized to withdraw the stop plate 24. Thereupon the elevator 42, 43 may be lowered until the new top of the stack is just below the bottom of the carriage 4. The carriage may then be moved to the right again for the purpose of depositing another pack of sheets on the stack.

When the elevator 42, 43 has been lowered progressively as successive packs of sheets are deposited on it until a stack of the desired height has been accumulated on it, the elevator will be raised while the carriage 4 is in its position at the left as seen in FIGURE 9 until the platform 1 is level with the floor F. The motor 52 will then be energized to rotate shaft 51 and wind cables 49 on the drums 50 to move the stop plate 24 and clamp mechanism 37, 38 upwardly into the broken line positions shown in FIGURE 9. A lift truck moving along floor F can then approach the platform 1 between the uprights 48 shown in FIGURE 10 to lift the pallet P and its load off the elevator and remove it. A new pallet is then placed on the elevator for accumulating a new stack on it in the same manner. The first step will be to raise the elevator until the top of the pallet is just slightly below the bottom of the platform of carriage 4.

In the apparatus types described each pack of sheets has been held against edgewise movement by a clamp gripping an edge of the pack while the carriage 4 was withdrawn from beneath the pack. In FIGURES 12 and 13 an alternative type of holding mechanism is shown. In this instance, instead of the leading edge of the pack being clamped and held, a barrier plate 53 is lowered behind the trailing edge of the pack before the carriage is withdrawn. In FIGURE 12 the carriage 4 is shown as carrying a pack of paper about to be moved forward over a stack of sheets. Such movement is effected below the barrier plate 53 which is held in raised position by fluid

piston and cylinder actuators 54 at opposite ends of the plate. After the carriage has been moved to the right over the stack of sheets and is ready to be withdrawn to the left, the actuators 54 will be energized to depress the barrier plate 53 into the position shown in FIGURE 13, so that its lower edge will bear lightly on the carriage 4. As the carriage is moved in the direction indicated by the arrow in FIGURE 13 the edge of the sheet pack will engage the barrier plate to prevent the stack from moving, so that it will be deposited progressively on the stack of sheets as the carriage is withdrawn. Exact parallelism of the barrier plate 53 with the carriage surface will be assured by providing equalizing mechanism including the racks 55 which are secured to the supporting mechanism of the barrier plate at its opposite ends, and pinions 56 fixed or the type shown in FIGURES 9 to 11, inclusive.

It will be evident that the general operation of the sheet stacking mechanism incorporating the barrier plates 53 instead of clamps will be the same as previously described. It will also be evident that such barrier plate mechanism may replace the clamping mechanism described in either the type of apparatus shown in FIGURES 1 to 6, inclusive, or the type shown in FIGURES 9 to 11, inclusive.

I claim as my invention:

1. Sheet pack stacking apparatus comprising sheet stack supporting means, a carriage operable to support a sheet pack, carriage supporting means operable to support and guide said carriage for movement between a position substantially directly above said sheet stack supporting means and a position offset from said stack supporting means, clamping means operable, when in partially overlying relationship with a stack of sheets on said sheet stack supporting means, to grip a pack of sheets on said carriage when in its position directly above said stack supporting means and further operable to hold the sheet pack against movement with said carriage as said carriage is shifted to such offset position, means operable to actuate said clamping means to release such sheet pack when said carriage has reached such offset position, retracting means connected to said clamping means and effecting movement thereof away from overlying relationship to such stack of sheets on said sheet stack supporting means after said carriage has reached such offset position, and means operable to deliver a sheet pack onto said carriage when it is disposed in such offset position.

2. Sheet pack stacking apparatus comprising sheet stack supporting means, a carriage operable to support a sheet pack, spaced track means extending along opposite sides of said sheet stack supporting means and operable to support and guide said carriage for movement between a position substantially directly above said sheet stack supporting means and a position offset from said sheet stack supporting means to one side thereof, a clamp operable to grip a pack of sheets on said carriage when in its position directly above said stack supporting means and further operable to hold the sheet pack against movement with said carriage as said carriage is shifted to such offset position, means operable to effect lowering movement of said sheet stack supporting means as sheet packs are accumulated on said stack supporting means, stationary means at the side of said stack supporting means opposite the offset position of said carriage, and means supporting said clamp from said stationary means substantially level with said carriage and operable to effect movement of said clamp between a position partially overlying a stack of sheets on said sheet stack supporting means and a position displaced from overlying relationship to such stack of sheets on said sheet stack supporting means in the direction opposite the direction of movement of said carriage to its offset position.

3. Sheet pack stacking apparatus comprising sheet stack supporting means, a sheet pack support, means operable to effect substantially horizontal relative movement of said sheet stack supporting means and said sheet pack support between a first relationship in which said

sheet pack support is substantially directly above said sheet stack supporting means and a second relationship in which said sheet pack support is offset from said sheet stack supporting means, means operable to effect relative movement of said sheet pack support and said sheet stack supporting means from such first relationship to such second relationship, clamping means operable to grip the sheet pack and prevent its edgewise movement relative to said sheet stack supporting means during such relative movement of said sheet pack support and said sheet stack supporting means from such first relationship to such second relationship, and movable supporting means supporting said clamping means and effecting movement thereof between a position partially overlying a stack of sheets on said sheet stack supporting means and a retracted position displaced from overlying relationship to such stack of sheets on said sheet stack supporting means.

4. Sheet pack stacking apparatus comprising sheet stack supporting means, a carriage operable to support a sheet pack, carriage supporting means operable to support and guide said carriage for movement in one direction between a position substantially directly above said sheet stack supporting means and a position offset from said sheet stack supporting means, clamping means operable to hold the sheet pack against movement with said carriage as said carriage is shifted to such offset position and bodily movable along a path parallel to the movement of said carriage, and retracting means connected to said clamping means and effecting movement thereof away from such sheet pack in the direction opposite to such movement of said carriage after said carriage has reached such offset position.

5. Sheet pack stacking apparatus comprising sheet stack supporting means, a carriage operable to support a sheet pack, carriage supporting means operable to support and guide said carriage for movement between a position substantially directly above said sheet stack supporting means and a position offset from said sheet stack supporting means to one side thereof, gripping means located adjacent to the side of said sheet stack supporting means remote from the offset position of said carriage and operable to grip a pack of sheets on said carriage when in its position directly above said sheet stack supporting means and further operable to hold the sheet pack against movement

with said carriage as said carriage is shifted away from said gripping means to such offset position, and means operable to actuate said gripping means to release such sheet pack when said carriage has reached such offset position.

6. Sheet pack stacking apparatus comprising sheet stack supporting means, a sheet pack supporting carriage, gauge means mounted on said sheet pack supporting carriage and operable to locate a pack of sheets in predetermined position thereon, moving means operatively connected to said sheet pack supporting carriage and operable to effect movement thereof while carrying a sheet pack thereon in engagement with said gauge means from a position offset from said sheet stack supporting means to a position in which said sheet pack supporting carriage is substantially directly above said sheet stack supporting means and to retract said sheet pack supporting carriage from such latter position to its first position offset from said sheet stack supporting means, and holding means operable after a sheet pack has been transported by said sheet pack supporting carriage in engagement with said gauge means into such position directly above said sheet stack supporting means to prevent edgewise movement of such pack of sheets relative to said sheet stack supporting means during retraction of said sheet pack supporting carriage and said gauge means to leave such sheet pack in predetermined position supported by said sheet stack supporting means.

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