

Jan. 27, 1970

F. J. PEARNE ET AL

3,491,901

BRICK STACKER

Filed Feb. 14, 1967

5 Sheets-Sheet 2

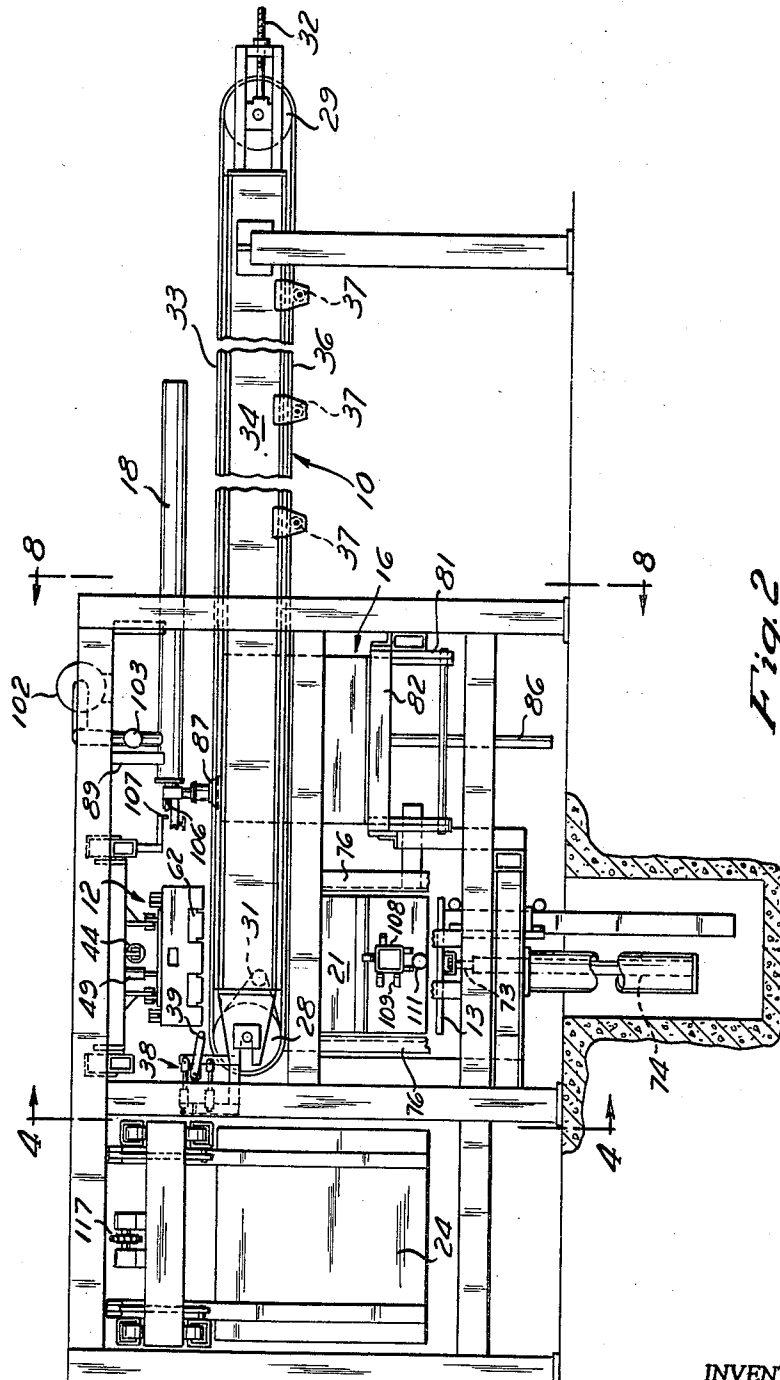


Fig. 2

INVENTORS
FLORENTIN J. PEARNE,
FRANK S. PEARNE,
FREDERICK G. ROBSON,
& JACK R. DUNCAN

BY
MCNENNY, FARRINGTON, PEARNE & GORDON
Attorneys

Jan. 27, 1970

F. J. PEARNE ET AL

3,491,901

BRICK STACKER

Filed Feb. 14, 1967

5 Sheets-Sheet 3

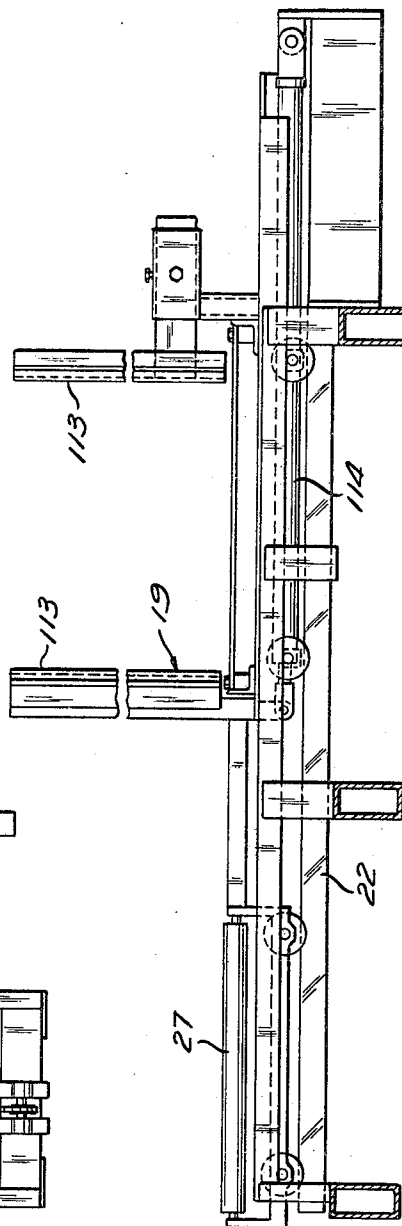
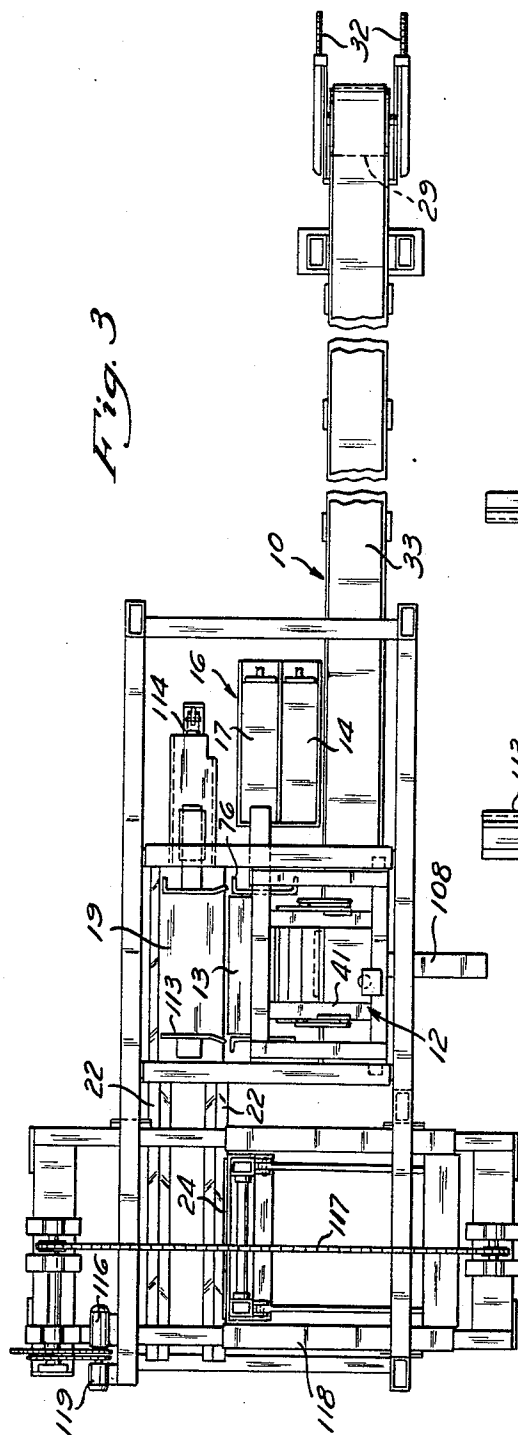


Fig. 9

INVENTORS

FLORENTIN J. PEARNE,
FRANK S. PEARNE,
FREDERICK G. ROBSON,
& JACK R. DUNCAN

BY

M'NENNY, FARRINGTON, PEARNE, & GORDON

W. H. Fair ATTORNEYS

Jan. 27, 1970

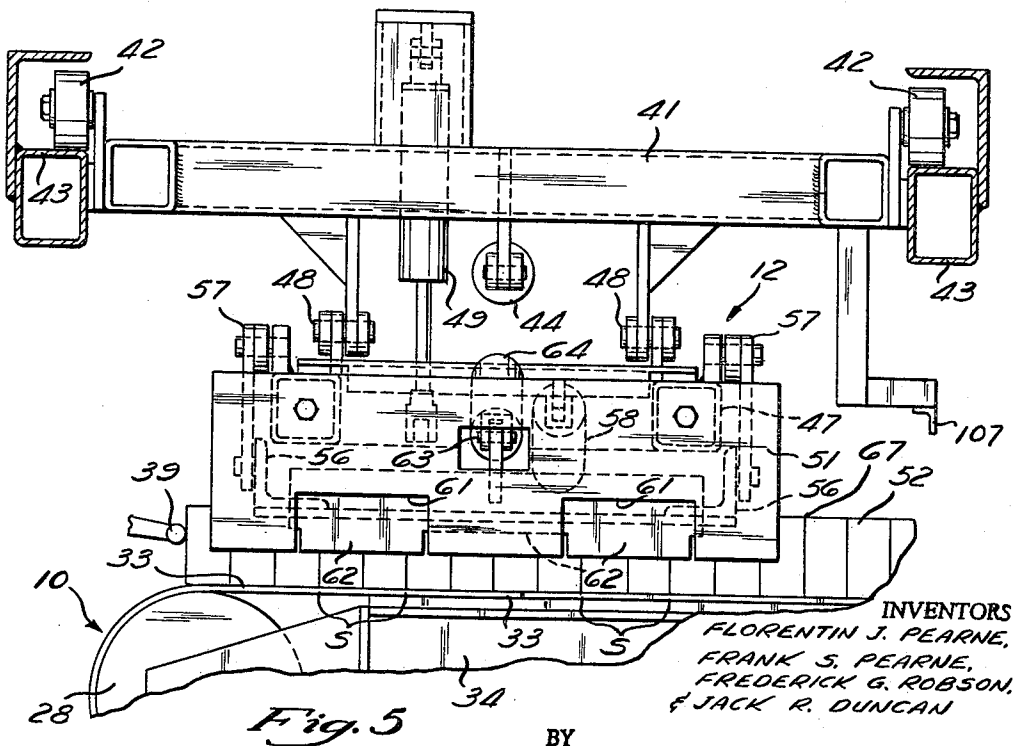
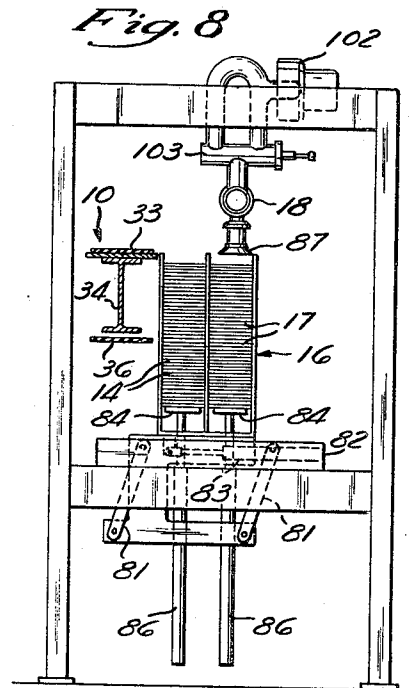
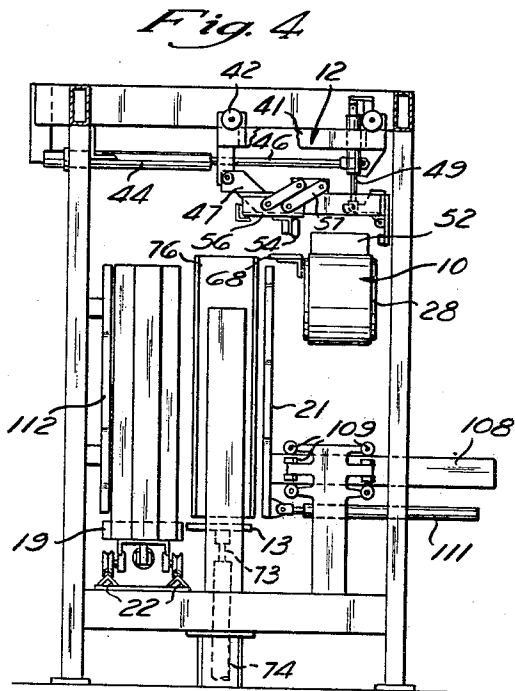
F. J. PEARNE ET AL

3,491,901

BRICK STACKER

Filed Feb. 14, 1967

5 Sheets-Sheet 4



INVENTORS
FLORENTIN J. PEARNE,
FRANK S. PEARNE,
FREDERICK G. ROBSON,
& JACK R. DUNCAN

BY
M'KENNY, FARRINGTON, PEARNE & GORDON
Attorneys

Jan. 27, 1970

F. J. PEARNE ET AL

3,491,901

BRICK STACKER

Filed Feb. 14, 1967

5 Sheets-Sheet 5

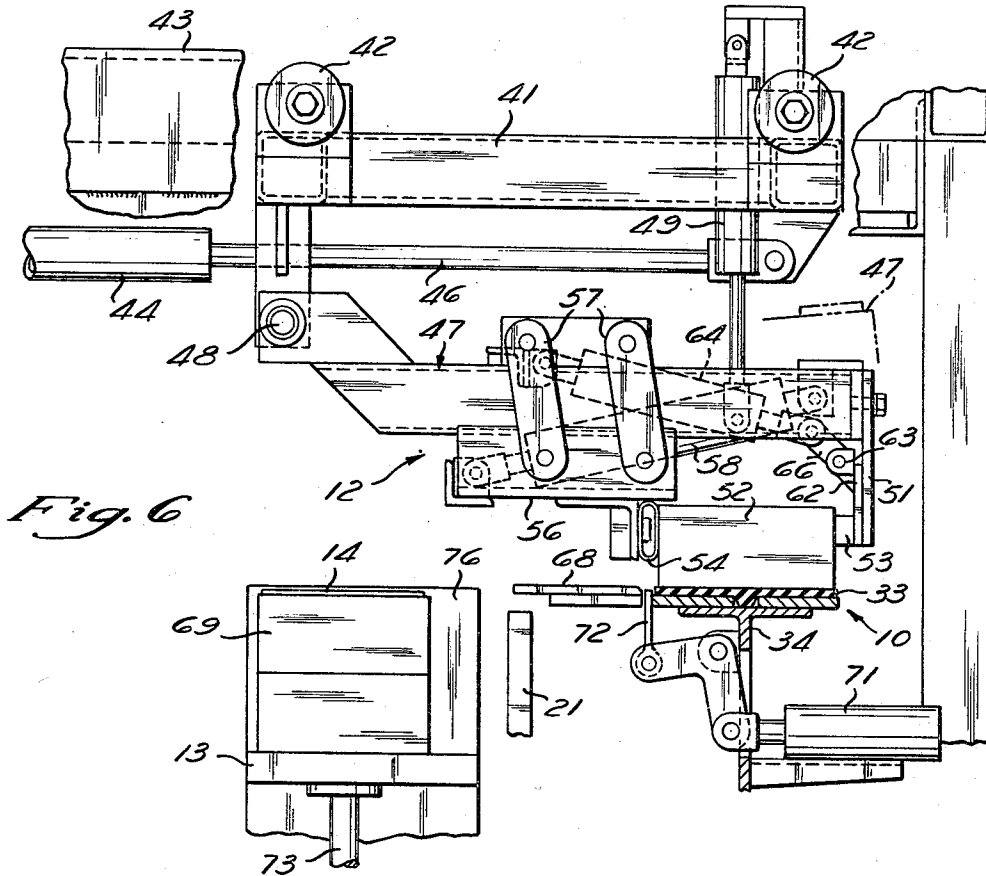


Fig. 6

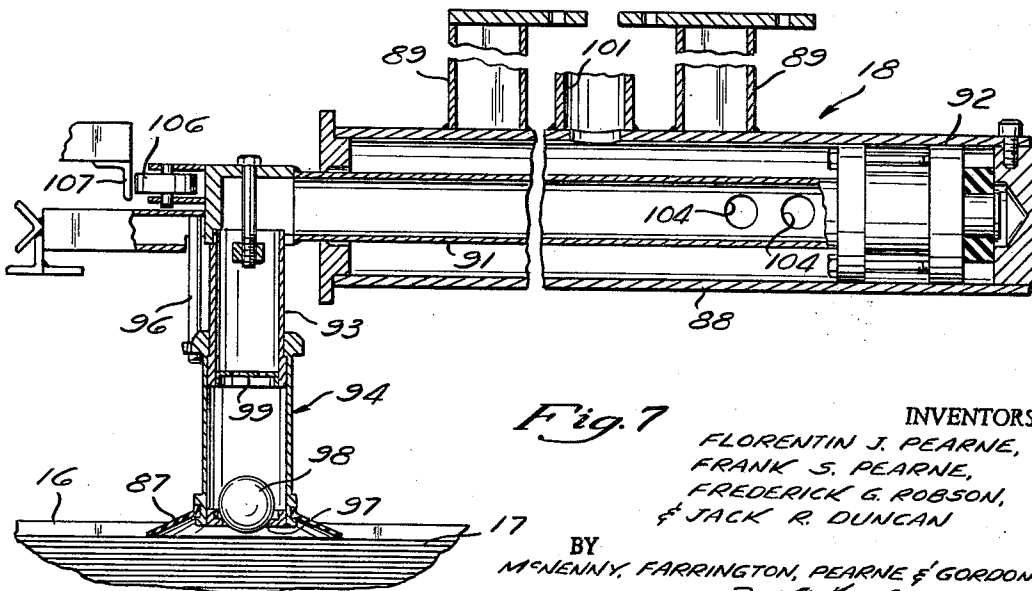


Fig. 7

INVENTORS

FLORENTIN J. PEARNE,
FRANK S. PEARNE,
FREDERICK G. ROBSON,
& JACK R. DUNCAN

BY

McNENNY, FARRINGTON, PEARNE & GORDON
ATTORNEYS

1

3,491,901

BRICK STACKER

Florentin J. Pearne, Alhambra, Frank S. Pearne, San Gabriel, Frederick G. Robson, Long Beach, and Jack R. Duncan, Corona, Calif., assignors to Pearne and Lacy Machine Company, Inc., Los Angeles, Calif., a corporation of California

Filed Feb. 14, 1967, Ser. No. 616,125

Int. Cl. B65g 57/20, 57/10; B65h 3/08

U.S. Cl. 214-6

9 Claims

ABSTRACT OF THE DISCLOSURE

An automatic brick stacking machine for forming stacks of bricks adapted to be subsequently strapped and tied in packages suitable for the convenient storage, handling and shipping of the brick. The machine includes a conveyor which delivers the brick to a stacking station adjacent to a vertically movable platform or elevator. A gripper transfer removes rows of brick each containing predetermined numbers of brick from the conveyor and positions the rows on the elevator. The elevator is then lowered and succeeding rows are placed on the preceding rows until a stack having the desired number of rows is formed. Separator sheets are automatically positioned between at least some of the rows as the stack is formed on the elevator. The gripper transfer provides predetermined rows with voids, so that spaces are provided in the stack to receive the fork of a lift truck, or the like, so that the finished package can be handled with conventional material handling equipment. After the stack is formed on the elevator, a pusher moves the stack to a shuttle car which in turn delivers the stack to a conveyor along which the stack is moved to a strapping or tying machine (not disclosed).

Field of invention

This invention relates generally to machines for automatically handling articles and more particularly to a machine for automatically stacking bricks, or the like, so that they may be packaged for convenient handling with conventional material handling machines.

Background of invention

In the past it has been customary in many instances to store, ship, and otherwise handle the brick in a loose condition. The handling of brick in a loose condition presents problems of storage since large areas are required for the storage of the brick. Also, in such a procedure the brick are often damaged and the expense of handling is high.

In the co-pending application, Ser. No. 441,496, filed Mar. 22, 1965, now Patent Number 3,392,851, assigned to the assignee of the present invention, a machine is disclosed which is operable to automatically form stacks of bricks, or the like. These stacks are arranged so that they can be strapped and tied into unitary packages each containing a large number of bricks. The packages are provided with voids adapted to receive the fork of a lift truck or other material handling equipment, so that the package can be handled easily by conventional material handling equipment without requiring the use of pallets, skids, or the like. The present application performs the same general function as this co-pending application. However, the structure and function of the illustrated machine incorporating the present invention is simplified to reduce manufacturing costs, improve operating reliability and reduce the maintenance cost of the machine.

2

Summary of invention

In a machine incorporating the present invention a conveyor is provided which delivers brick to a stacking station in an abutting relationship. A vertically movable elevator or platform is located adjacent to the conveyor at the stacking station and a gripper transfer is provided which is operable to transfer rows of brick from the conveyor to the elevator. The gripper transfer grips the rows of brick on the conveyor and moves the rows laterally to a position over the elevator. The rows are then released onto the elevator which then drops down so that a subsequent row can be positioned on the preceding row until a stack of the required height is formed.

The gripper transfer provides simplified gripping means for gripping the brick and for moving the row of brick horizontally to the release position over the elevator. The gripper transfer is arranged so that voids are automatically formed in predetermined rows by leaving selected bricks on the conveyor for later transfer to the elevator. Because the transfer of brick from the conveyor to the elevator is lateral with respect to the conveyor it is not necessary to raise the gripped brick even when rows containing voids are transferred.

A mechanism is also provided to position separator sheets between at least some of the rows on the elevator during the stacking operation. The separator sheet transfer mechanism utilizes vacuum both for the gripping of the top separator sheet in the supply stack, and for the power source to move the gripped sheet into position on the elevator. Automatic sequencing of gripping and movement of the separator sheets is provided since the actuating vacuum does not build up until the vacuum gripping occurs.

As soon as the desired stack is formed on the elevator the entire stack is pushed onto a shuttle car which delivers the stack to the conveyor leading to the strapping machine. The transfer of the completed stack from the elevator to the shuttle car occurs as soon as the stack is completed to clear the elevator quickly so that the elevator is in condition to receive the subsequent stack.

Objects of invention

It is an important object of this invention to provide a novel and improved machine operable to form stacks of similar articles which are suitable for convenient handling and shipping.

It is another important object of this invention to provide a novel and improved stacking machine arranged to automatically receive articles from a conveyor or the like and form stacks of such articles wherein the stacks consist of a plurality of rows with each row containing a plurality of abutting articles and wherein voids are automatically formed in predetermined rows.

It is another important object of this invention to provide a novel and improved stacking machine operable to form stacks consisting of rows of block-like articles wherein separator elements are automatically positioned between predetermined rows.

It is another important object of this invention to provide a stacking machine for block-like articles including a novel and improved gripper transfer operable to grip rows of such articles and transfer such rows from a conveyor to a stacking platform.

It is still another object of this invention to provide a machine for stacking block-like articles incorporating novel and improved means for positioning separator elements between selected rows in the stack formed in the machine.

It is still another object of this invention to provide a machine for stacking block-like articles on a stacking platform wherein a novel and improved combination is

provided in which the stacks are transferred to a shuttle car for movement out of the machine so that the stacking platform is immediately cleared to receive a subsequent stack.

It is still another object of this invention to provide a novel and improved stacking machine for block-like articles including a stack conveyor operable to combine the stacks formed by the machine with stacks formed by similar machines and deliver the output of machines to a strapping or tying machine.

Further objects and advantages will appear from the following description and drawings, wherein:

FIGURE 1 is a schematic perspective view of a machine illustrating the general arrangement of the principal sub-assemblies (in this figure some of the sub-assemblies have been moved from their proper positions so that the structure can be better illustrated);

FIGURE 2 is a side elevation of the stacking machine;

FIGURE 3 is a plan view of the stacking machine;

FIGURE 4 is an end elevation of the stacking machine taken generally along 4—4 of FIGURE 2;

FIGURE 5 is an enlarged fragmentary end elevation of the gripper transfer;

FIGURE 6 is an enlarged fragmentary side elevation of the gripper transfer;

FIGURE 7 is an enlarged fragmentary side elevation in longitudinal section of the separator sheet transfer actuator;

FIGURE 8 is an end elevation taken generally along 8—8 of FIGURE 2; and,

FIGURE 9 is an enlarged fragmentary side elevation of the shuttle car.

In all of the figures various structural elements have been either cutaway or removed to provide a clearer illustration of the various assemblies and sub-assemblies of the machine.

Referring to FIGURE 1, the illustrated embodiment of this machine includes a power driven belt conveyor 10 which operates to deliver a line of abutting bricks to a stacking station 11. Located at the stacking station 11 is a gripper transfer assembly 12 which is operable to grip a row of bricks resting on the conveyor 10 and transfer such bricks to a position over a vertically movable stacking platform 13.

The platform 13 is raised to a position immediately below the gripped row of bricks when the first row of each stack is transferred. Therefore, such row drops only a small fraction of an inch when it is released by the gripper transfer 12. The platform 13 then automatically lowers to position the upper surface of the row resting thereon in a plane immediately below the lower surface of the subsequent row of bricks moved over the platform by the transfer assembly 12. The machine is arranged to operate through repeating cycles with the platform 13 progressively lowering as rows are deposited thereon by the transfer assembly 12 until a full stack of bricks having a predetermined number of rows are positioned on the platform 13.

The gripper transfer 12 is arranged to automatically produce voids 15 in predetermined rows in the stack 20. Normally the voids are formed in the row adjacent to the bottom row and are located and sized to receive the fork of a lift truck or other conventional material handling equipment.

A veneer board 14 is placed between the second and third rows to support the bricks above the voids 15 and chip boards 17 are positioned between the other rows within the stack to protect the bricks within the rows and to tie the stack together.

A board hopper 16 provides the supply of veneer boards 14 and chip boards 17. The hopper 16 is shiftable from a first position in which the veneer boards 14 are located under a transfer actuator 18 and a second position in which the chip boards are positioned under the transfer actuator 18. The transfer actuator 18 is arranged to lift

the top veneer board 14 or chip board 17 from the board hopper 16 and automatically carry such board to a position over the top row resting on the platform 13 and then release such board so that it rests on such top row.

The operations of the gripper transfer assembly 12 and the transfer actuator 18 are arranged so that the transfer actuator 18 performs its operation while the gripper transfer 12 is clear of the platform 13.

The machine is arranged to automatically operate through repeating cycles until the required number of rows to form a complete stack are located on the platform 13. At that time, the platform 13 is horizontally aligned with the bottom of a shuttle car 19. The pusher 21 then operates to slide the entire stack from the platform 13 onto the shuttle car 19 thereby clearing the platform quickly so that it may be raised back up and a subsequent stack can be formed. While the subsequent stack is being formed on the platform the shuttle car 19 is moved longitudinally along rails 22 into alignment with a roller or slide plate conveyor 23 which is adapted to carry the completed stacks out of the machine to a strapping machine (not shown). A pusher 24 operates to slide the stack from the shuttle car 19 onto the conveyor 23 so that the shuttle car can return to receive the subsequent stack.

In some instances two or more similar stacking machines are located at spaced points along a single conveyor system so that the combined output of the similar machines can feed to a single strapping machine. In such machines the stacks from the remote machine move along a roller or slide plate conveyor 26, across a roller or slide plate conveyor section 27, and along the conveyor 23 to the strapper. The conveyor section 27 is carried by the shuttle car and is positioned, as illustrated, between the conveyors 23 and 26 when the shuttle car is in the stack receiving position.

Referring now to FIGURES 2 and 3, the belt conveyor 10 includes a drive pulley 28 at one end and a tensioning pulley 29 at the other end. A suitable drive motor 31 is connected to drive the pulley 28. Tensioning screws 32 provide adjustment of the tensioning of the belt. The upper reach 33 is supported along its length by an I-beam 34, best illustrated in FIGURE 8. The lower reach 36 is supported by spaced roller assemblies 37.

Bricks are loaded onto the upper reach 33 of the conveyor 10 at any location remote from the stacking position 11. Any suitable means for loading of the conveyor can be used, however, it is preferable to provide an automated power loading system for positioning the bricks on the conveyor 10.

A stop assembly 38 is mounted adjacent to the stacking station and is provided with a stop arm 39 extending over the upper reach 33 of the conveyor 10. The bricks are carried along the upper reach between lateral guides (not shown) until the stop arm 39 prevents further movement with the belt. This causes the bricks to form a row 52 of abutting and aligned bricks at the stacking station 11. The stop assembly 38 is spring loaded against the bricks and is provided with a switch which is operated when the force on the arm 39 is sufficiently high to indicate that the column of abutting bricks is at least as long as the row to be transferred. This switch is connected into the control of the gripper transfer 12 to prevent operation of the gripper transfer when insufficient bricks are located at the stacking station to form a full row for transfer by the gripper transfer assembly.

The gripper transfer assembly 12 is best illustrated in FIGURES 5 and 6. It includes a main carriage 41 supported by rollers 42 for reciprocating motion along track members 43 carried by the machine frame. The power for reciprocating the carriage 41 is provided by an actuator 44 mounted at one end on the frame of the machine and provided with a piston 46 connected to the main carriage 41. Extension of the piston 46 moves the main carriage 41 to the position illustrated in FIGURE 6 wherein the

gripper is located over the upper reach 33 of the conveyor and the retraction of the piston 46 moves the gripper mechanism to a position over the vertically movable platform 13.

A pivoted carriage 47 is pivotally mounted at 48 on the main carriage 41 and is operated between a lowered operative position illustrated in FIGURES 5 and 6 and a raised position illustrated in phantom in FIGURE 6 by a piston and cylinder actuator 49 connected between the main carriage 41 and the pivoted carriage 47. The pivoted carriage 47 is provided with a fixed depending flange 51 which extends down beside the line of bricks 52 on the upper reach 33 remote from the platform 13 when the pivoted carriage 47 is in the operative position illustrated. Gripping pads 53 are mounted on the flange 51 and are positioned to engage and grip one end face of the bricks in the line 52.

A movable gripping element 54 is carried by a swinging frame 56 mounted on the pivot frame 47 by parallelogram links 57. An actuator 58 is connected between the pivot frame 47 and the swinging frame 56 and is operable to move the swinging frame between the gripping position illustrated in FIGURE 6 and a retracted position illustrated in FIGURE 4. The gripping element 54 is a resilient tubular element which is compressed against the adjacent end face of the row of bricks 52 when the swinging frame 56 is in the clamping position of FIGURE 6. The gripping element 54 therefore compensates for variations in the length of the individual bricks and insures proper gripping of all of the brick in a row to be transferred.

Voids are automatically provided in selected rows of bricks so that the finished stack can be handled by the fork of the lift truck or the like. In order to provide such voids the flange 51 is formed with two spaced openings 61, best illustrated in FIGURE 5, which are normally closed by pivoted doors 62. The doors 62 are pivoted on the flange 51 for rotation about the pivot 63. An actuator 64 is connected between the pivot carriage 47 and an arm 66 and is operable to pivot the doors 62 to the closed position illustrated or to the horizontal position above the row of bricks 52. The doors 62 are provided with gripper pads 53 which cooperate with the gripper pads 53 on the flange 51 when the doors are closed to engage each brick in the row to be transferred. In the illustrated embodiment, when the doors 62 are open, two bricks in the row at each door, as indicated at S in FIGURE 5, remain ungripped and when the transfer assembly is operated such bricks remain on the conveyor leaving the desired spaces in the transfer row. When voids are to be formed a stop 72 is raised by an actuator 71 to hold the bricks S against movement with the gripped bricks. When voids of different sizes are required the size of the doors 62 and the size of the stops are changed to provide the proper size of void.

The operation of the gripper transfer 12 is as follows. The cycle begins when the elements are in the position of FIGURE 4. At this point in the cycle of operation the actuators 44, 49 and 58 are extended. If the row to be transferred does not require voids, the actuator 64 is retracted to close the doors 62. As soon as the stop arm 39 indicates that sufficient bricks are present in the row 52 and as soon as the other portions of the machine controls indicate that transfer can be made, the two actuators 44 and 58 are operated in a retraction direction. This brings the gripper pad 53 into engagement with one side and the gripper element 54 into engagement with the other side of the row of bricks. The gripping is completed when the elements reach the position of FIGURE 6.

Continued retraction of the actuator 44 causes the fourteen bricks to the left of the point 67 in FIGURE 5 to be carried to the left as viewed in FIGURE 6 across a fixed table 68 to a position immediately above the veneer board 14 on the row 69 previously set on the platform 13. In this instance the row 69 is the row with voids. When the row carried by the gripper transfer is

properly positioned above the platform 13 and any preceding rows resting thereon, the actuator 58 is extended to release the gripping of the row and the actuator 49 is retracted to raise the grippers up clear of the row. At this point in the operation, the actuator 44 extends to move the gripper transfer assembly back to its pick-up position and the platform 13 lowers to again position the top of the uppermost row in the proper position to receive a separator board and a subsequent row. When the actuator 44 is extended so that the flange 51 is past the row 52 the actuator 49 extends, returning the elements to the position of FIGURE 4 for recycling.

In the event that a row having voids therein is to be transferred, the actuator 64 is retracted and the stop plate actuator 71 is actuated to raise a stop plate 72. The stop plate is proportioned to block only the bricks which remain ungripped and prevent their being dragged along with the gripped row. Aside from the operation of these two actuators the cycle is the same and in the illustrated embodiment ten bricks are transferred leaving two voids in the transfer row.

The platform 13 is mounted on the piston 73 of an elevator actuator 74 so that it is vertically movable between fixed guiding side plates 76 between an uppermost position in which the upper surface of the platform 13 is substantially aligned with the table 68 and a lowermost position in which the upper surface of the platform 13 is aligned with the bottom of the shuttle car 19.

The structure and the operation of the separator board actuator 18 can best be understood by referring to FIGURES 1, 7 and 8. The board hopper 16 is mounted at opposite ends on parallelogram links 81 which are pivoted at their upper ends on a frame member 82 and on their lower ends on extensions of the hopper 16. An actuator 83 is connected to reciprocate the hopper 16 between a first position wherein the actuator 18 is over the chip boards 17 and a second position in which the actuator 18 is over the veneer boards 14. The hopper itself is divided into two chambers one of which is supplied with chip boards and the other of which is supplied with veneer boards. The bottom of each chamber is provided by a vertically movable plate 84 (see FIGURE 8) supported on the piston of an associated actuator 86. The actuators 86 are arranged to extend to bring the uppermost chip board or veneer board in the associated section of the hopper 16 into engagement with a vacuum nozzle 87 on the actuator 18. As the chip boards and veneer boards are used the actuators 86 extend until the supply of the associated boards is exhausted.

The structure of the transfer actuator 18 is best illustrated in FIGURE 7. This actuator includes a cylinder 88 mounted on the frame of the machine by support members 89. A tubular piston 91 is reciprocable in the cylinder 88 and is provided with a piston head assembly 92 at its inner end. Projecting downwardly from the outer end of the piston 91 is a tubular guide 93 which telescopes into a vacuum pick-up assembly 94.

The vacuum pick-up assembly 94 is vertically movable along the tube 93 between an extended position illustrated in FIGURE 7 and an upper position wherein its upper end is adjacent to the outer end of the piston 91. A guide pin 96 assists in guiding the vacuum pick-up assembly. A rubber pick-up cup 87 is mounted on the lower end of the assembly 94 along with a valve seat 97. A lightweight check valve 98 is trapped between the valve seat 97 and an apertured retainer 99 mounted in the lower end of the tube 93. Vacuum or pressure can be selectively provided to the cylinder 88 through a port 101 from a motor driven fan 102 and a control valve 103. When pressure is supplied to the port 101 the piston assembly 92 carries the piston 91 to the right or retracted extreme position illustrated. This pressure is carried into the tubular piston through ports 104, so pressure is present in the vacuum pick-up assembly 94 causing the check valve 98 to seal against the seat 97.

When a separator board is to be gripped and transferred the valve 103 is operated to supply vacuum to the actuator through the port 101. When this occurs the check valve 98 is lifted from its seat and the topmost chip board or veneer board is gripped by vacuum. The vacuum then causes the vacuum pick-up assembly 94 to telescope upwardly to lift the uppermost board clear of the hopper 16 so it may be transferred to a position over the row on the platform 13. When the vacuum pick-up assembly 94 reaches its uppermost position the vacuum in the cylinder 88 builds up to a higher level and the piston commences to extend to carry the vacuum gripped board to a position over the uppermost row on the platform 13. The various controls are arranged so that the vacuum is applied to the actuator 18 before the gripper transfer assembly 12 moves back to its pick-up position. This insures that the minimum time will be required for the complete extension of the chip board actuator 18. A roller stop 106 on the piston 91 engages a stop bar 107 carried by the main carriage 41 of the gripper transfer assembly 12 if the gripper transfer is still in the release position when the actuator 18 starts to extend. This holds the actuator against extension until the gripper transfer 12 moves clear of the actuator 18. Therefore, the actuator 18 extends to its fully extended position as soon as the gripper transfer 12 is clear of its release position above the elevator 13. Therefore, a separator board is carried to a position over the row on the elevator as soon as possible.

As soon as the actuator is in the full extended position it is pressurized by the valve 103 so that the board is released onto the row of brick. The vacuum pick-up assembly 94 extends to guide the board to its proper position. The valve 98 seats at this time, so pressure can build up to a value sufficient to cause the piston 91 to again retract to a position over the board hopper. The raising of the vacuum pick-up assembly 94 raises the separator above the upper surface of the top row of bricks so that the board can be positioned before the platform 13 lowers.

The usual practice is to arrange the controls of the actuators 83 and 86 so that a veneer board is deposited on the row of bricks having voids therein and chip boards 17 are positioned on other rows within the stack as it is formed. The controls may be arranged so that chip boards are placed on all of the rows or, if desired, so that chip boards are only placed on selected rows to provide tying of the stack.

When the stack is fully formed the platform 13 is flush with the bottom of the shuttle car 19 as illustrated in FIGURE 4. The pusher 21 is carried by a guide bar 108 which extends through spaced rollers 109 so that the pusher plate 21 is supported for horizontal reciprocation between the retracted position illustrated and an extended position wherein the pusher 21 slides the stack onto the shuttle car 19. An actuator 111 provides the power for operating the pusher 21. A stationary plate 112 is mounted on the machine frame adjacent to the side of the shuttle car 19 to stabilize the stack as the pusher 21 extends to push the stack onto the shuttle car. The shuttle car is also provided with side plates 113 which cooperate to support the stack on the shuttle car.

An actuator 114 is connected to move the shuttle car between the receiving position adjacent to the elevator platform 13 and a delivery position in alignment with the roller conveyor 23. When the shuttle car is in the delivery position the pusher 24 is operated to push the stack off of the shuttle car onto the conveyor 23 for delivery to the tying machine (not illustrated). The roller conveyor 23 may be of the type illustrated in the copending application Ser. No. 441,496 cited above.

The power for operating the pusher 24 is provided by motors 116 and 119 which are connected to drive a chain 117. The chain 117 is connected to reciprocate a carriage 118 on which the pusher 24 is mounted. The motor 116 provides relatively high thrust at a relatively low pusher

speed and the second motor 119 provides higher pusher speed but lower thrust. When a single machine is used to feed a single strapper only the high thrust motor 116 is used since the pusher operating distance is small and high thrust is required to move the stack into proper position in the strapper. However, when two machines are used to supply a single strapper the high speed motor 119 is used to rapidly push the stack along the conveyor 26 and then the high thrust low speed motor 116 is operated to complete the pushing of the stack into the strapper. The two motors 116 and 119 illustrated are hydraulic and the control valves are arranged so that the slow speed motor merely recirculates fluid when the high speed motor is powering the pusher.

Operation

The operation of the machine is as follows. Bricks are carried along the conveyor 10 to form a row 52 against the stop member 39, as best illustrated in FIGURE 5. The gripper transfer assembly 12 then operates to grip a row of bricks from the line 52 and carries such row to a position over the elevator platform 13. The row is then released and the gripper transfer returns to its pick-up position to pick-up a subsequent row. The elevator is automatically lowered so that the uppermost row resting thereon is properly positioned to receive the subsequent row.

The transfer actuator 18 operates to position a separator board of the appropriate type on the row while the elevator is dropping. The use of the vertically movable vacuum pick-up assembly 94 raises the separator board high enough so that it may be positioned on the row even before the topmost row is lowered to the receiving position. By providing simultaneous operation higher speeds can be achieved. Appropriate voids are formed in the stack at the desired locations and veneer boards 14 are placed over the rows with voids so that sufficient strength will be provided to support the subsequent rows.

When the stack is completed the pusher 21 is operated to slide the stack onto the shuttle car and is retracted so that the platform 13 can be raised immediately to receive a subsequent row. The shuttle car is then moved to the delivery position while the subsequent stack is being formed and the pusher 24 slides the stack off of the shuttle car onto the conveyor for delivery to the strapping machine. When two or more machines are provided to feed a single tying machine or strapper the controls for the pushers 24 and shuttle cars 19 are interconnected to insure that one stack will not interfere with the movement of another stack and so that the pusher is properly positioned before the shuttle car moves to its delivery position.

The various sub-assemblies are arranged to operate simultaneously whenever possible so that the cycle time of the machine may be maintained as short as possible. For example, the row 52 of bricks is carried to the stacking position while the transfer gripper is carrying the preceding row to a position over the platform 13 so that a subsequent row can be gripped as soon as the gripper transfer returns to the gripping position. The separator board actuator 18 partially extends before the gripper transfer returns to its pick-up position so that a minimum time is required for the placing of the separator board on the top row. Also, the placement of the separator board may occur while the elevator 13 is lowering. Consequently, the chip board transfer actuator 18 can be retracted clear of the elevator 13 almost as soon as the elevator reaches its lowered receiving position for the subsequent row.

The use of a shuttle car permits the unloading of the elevator 13 so a subsequent stack can be formed as soon as possible. Further, the shuttle car and freeway pusher 24 permit the machine to be operated in conjunction with a similar adjacent machine so that two or more similar

machines can be operated to supply a single strapping machine.

Suitable control switches are connected to the controls of the various actuators and are located to sense the related operations so that proper sequencing is assured. In some cases photoelectric cells are used to determine the position of elements. For example, a photoelectric cell determines the proper position of the upper surface of the topmost row on the platform 13. The various actuators may be either hydraulic or pneumatic and the various rotary motors may be either electric, pneumatic, or hydraulic, depending upon the type of power available in a particular installation.

Although a preferred embodiment of this invention is illustrated, it is to be understood that various modifications and rearrangements of parts may be resorted to without departing from the scope of the invention disclosed herein.

We claim:

1. A machine for stacking rows of similar articles in superposed relationship wherein said rows have a predetermined length comprising a stop, gathering means operable to form a line of abutting aligned articles against said stop and extending in one direction therefrom, said line having a length at least equal to the length of said rows, a platform laterally positioned beside a line formed on said gathering means, a transfer carriage, power operated grippers on said carriage, said carriage being movable with substantially straight-line movement between a gripping position in which said grippers are in position to grip articles in said line and a release position in which said grippers are in said position to release articles over said platform, said grippers being operable to individually grip and support articles in said line so that the gripped articles constitute one of said rows of said predetermined length, said carriage and grippers being operable to grip said article on said gathering means and to directly move said articles to a position over said platform along a substantially straight-line path, said grippers being operable to release said row while said carriage is in said release position, said platform being operable to a lower position after a row is placed thereon so that the upper surface of the uppermost row thereon is spaced below the plane of the lower surface of a subsequent row being transferred thereto by said grippers so that a subsequent row may be positioned on a preceding row, said grippers being operable to place said subsequent row directly on said preceding row in superposed relation, said grippers including portions intermediate the ends of the grippers movable between an operative position in which they grip selected articles intermediate the ends of the line of articles and a retracted position clear of said selected articles to leave selected articles intermediate the ends of selected rows on said gathering means when said carriage is moved to said release position, said gathering means being operable to move said selected articles toward said stop to incorporate such selected articles in a subsequent line.

2. A machine as set forth in claim 1 wherein means are provided to move an entire stack of rows off said platform when a stack consisting of a predetermined number of rows is on said platform.

3. A machine as set forth in claim 1 wherein blocking means movable between a blocking position and a retracted position are provided to retain said ungripped articles on said conveyor.

4. A machine as set forth in claim 3 wherein said grip-

ping means includes opposed gripping elements, and one gripping element includes sections movable to a retracted position clear of said articles to leave said ungripped articles on said conveyor.

5. A machine as set forth in claim 1 wherein at least two opposed gripping elements are provided and at least one element is powered for movement toward and away from the other element for gripping and release of said articles.

6. A machine as set forth in claim 1 wherein a separator board transfer is provided to position separator boards on rows resting on said platform.

7. A machine for stacking block-like articles comprising a conveyor operable to form a line of abutting aligned articles, a platform spaced from said line, and article transfer means operable to stack rows of articles by moving in a substantially straight line between a pick-up position at said conveyor in which it grips a row of articles and a delivery position at said platform in which it positions said row on said platform, a supply of separator boards, and a separator board transfer operable to remove a separator board from said supply and position such board on said row, said separator board transfer operating to commence movement of said separator board toward said row before said article transfer means moves clear of said platform, said article transfer means and separator transfer being provided with interengaging stop means operable to prevent completion of the movement of said separator board transfer toward said row until said article transfer is clear of said platform.

8. A machine for stacking rows of similar articles as set forth in claim 1 wherein said gathering means is a horizontally extending conveyor, said substantially straight-line of movement being substantially horizontal and substantially perpendicular to the length of said conveyor.

9. A machine as set forth in claim 1 wherein said grippers include one gripper element which is substantially fixed with respect to said carriage and a second gripper element which is movable toward and away from said one gripper element, said second gripper element being movable to a raised position above said line while said carriage moves from said released position to said gripping position.

References Cited

UNITED STATES PATENTS

2,956,381	10/1960	Chauuin et al.	
3,388,815	6/1968	Lingl.	
3,392,851	7/1968	Pearne et al.	
3,404,788	10/1968	Thomas et al.	
732,221	6/1903	Potuin.	
2,710,696	6/1955	Fontaine et al.	
2,883,074	4/1959	Boehl et al.	
2,933,207	4/1960	Edmonds et al.	
3,262,594	7/1966	Teago	214—652
3,270,897	9/1966	Lingl.	

FOREIGN PATENTS

914,957	1/1963	Great Britain.
---------	--------	----------------

GERALD M. FORLENZA, Primary Examiner

ROBERT J. SPAR, Assistant Examiner

U.S. Cl. X.R.

294—62, 103