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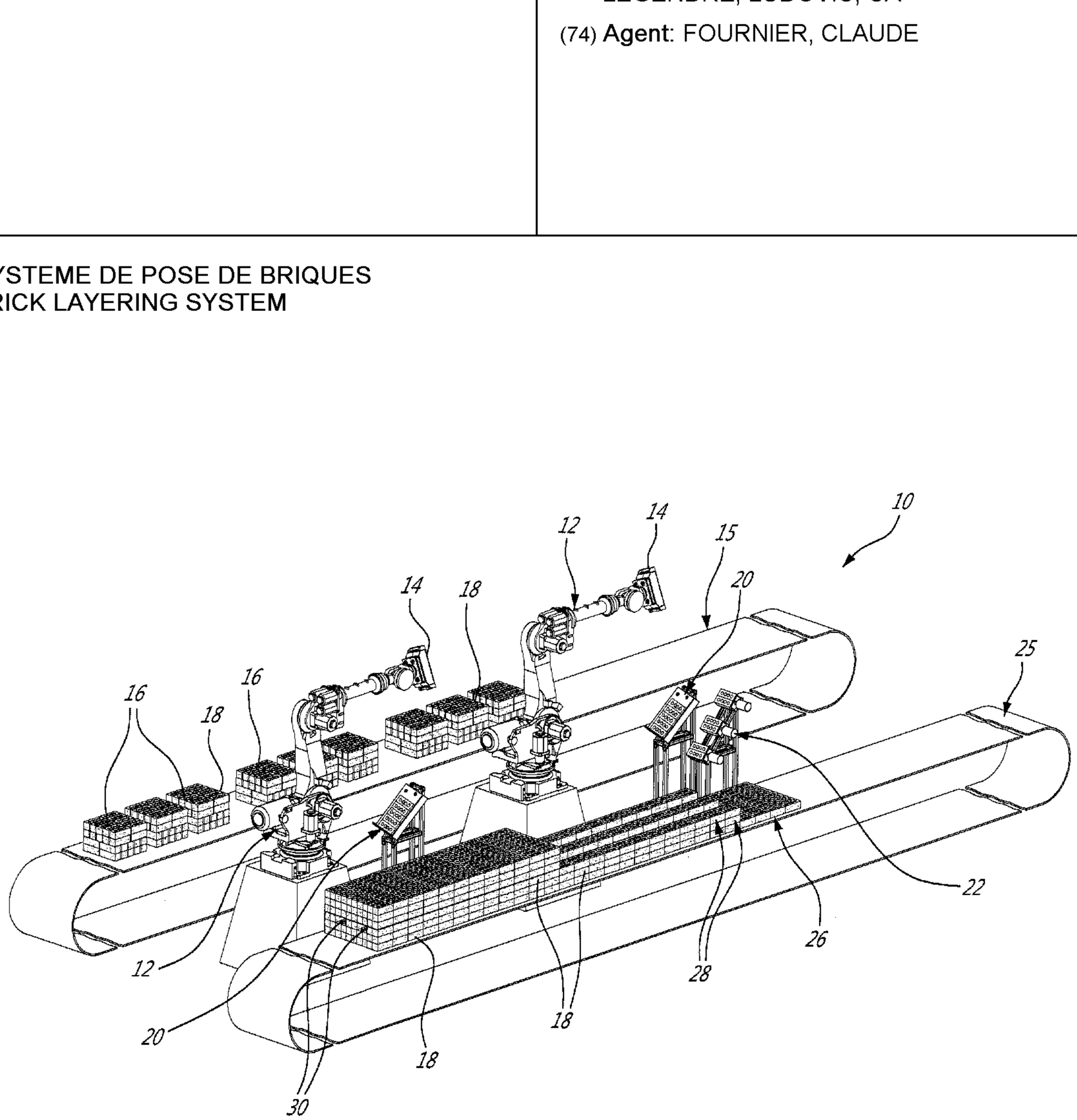
(54) Title: BRICK LAYERING SYSTEM



(57) Abrégé/Abstract:
A brick layering system comprises brick manipulation means equipped with a tool suitable to pick a row of bricks; and at least one of i) a first subsystem positioned within reach of the brick manipulation means for indexing the row of bricks and for removing gaps therein and ii) a second subsystem for creating gaps in the row of bricks.

Abstract

A brick layering system comprises brick manipulation means equipped with a tool suitable to pick a row of bricks; and at least one of i) a first subsystem positioned within reach of the brick manipulation means for indexing the row of bricks and for removing gaps therein and ii) a second subsystem for creating gaps in the row of bricks.

TITLE

Brick Layering System

BACKGROUND

[0001] The present disclosure concerns brick manufacturing and handling. More specifically, the present disclosure is concerned with a brick layering system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] In the appended drawings:

[0003] Figure 1 is a perspective view of a brick layering system according to an illustrated embodiment;

[0004] Figure 2 is a perspective view of subsystem for indexing bricks and for removing gaps therebetween according to an illustrated embodiment; the subsystem being illustrated with a row of bricks before removal of the gaps therebetween;

[0005] Figure 3 is a perspective view of the subsystem from Figure 2, showing the row of bricks after removal of the gaps therebetween; and

[0006] Figures 4 to 7 are perspective views showing the operation of a subsystem for indexing bricks and for creating gaps therebetween according to an illustrated embodiment.

DETAILED DESCRIPTION

[0007] In the following description, similar features in the drawings have been given similar reference numerals, and in order not to weigh down the figures, some elements are not referred to in some figures if they were already identified in a precedent figure.

[0008] The use of the word “a” or “an” when used in conjunction with the term “comprising” in the claims and/or the specification may mean “one”, but it is also consistent with the meaning of “one or more”, “at least one”, and “one or more than one”. Similarly, the word “another” may mean at least a second or more.

[0009] As used in this specification and claim(s), the words “comprising” (and any form of comprising, such as “comprise” and “comprises”), “having” (and any form of having, such as “have” and “has”), “including” (and any form of including, such as “include” and “includes”) or “containing” (and any form of containing, such as “contain” and “contains”), are inclusive or open-ended and do not exclude additional, un-recited elements.

[0010] An illustrated embodiment of a brick layering system 10 will now be described with reference to Figure 1.

[0011] The system 10 includes a pair of robot arms 12, each equipped with a vacuum gripper 14, an infeed conveyor 15 that brings first piles 16 of bricks 18 adjacent the robot arms 12, a pair of indexing and gap removing subsystems 20, each within reach of a respective robot arm 12, a gap creating subsystem 22, and an outfeed conveyor 25 that receives bricks from the robot arms 12 in a predetermined organized manner after processing on either of the subsystems 20 and 22.

[0012] The input of the system 10 are first piles 16 of bricks that can have one or more layers of bricks 18. All bricks 18 in a layer are generally parallel, but such is not necessarily the case for two (2) bricks 18 in different layers.

[0013] The output of the system 10 is a continuous or discontinuous pile of bricks 18 formed from a plurality of layers 26 and 28 that are either generally continuous (layers 26) or that includes predetermined gaps 30 therein (see layers 28). Such gaps 30 allows forks or other similar components of a machinery to be inserted within the output pile(s).

[0014] The infeed and outfeed conveyors 15 and 25 can be of any type of conveyors, including without limitations belt conveyors, chain conveyors, etc. According to another embodiment (not shown), any one or both of the conveyors 15-25 are replaced by an output table or any other means adapted to receive the bricks 18. According to still another embodiment, anyone of the conveyors 15-25 is replaced by a plurality of conveying means.

[0015] Since conveying systems are believed to be well known in the art, they will not be described herein in more detail for concision purposes.

[0016] The robot arms 12 are in the form of conventional robot arms, such as without limitations FANUC's M410 or R2000, or any similar robot arms offered by other manufacturers such as ABB, Kuka or Motoman.

[0017] The vacuum gripper 14 is configured for selectively picking and releasing a layer of bricks 18, including or not gaps, slip sheets or wood or plastic boards therebetween. For example, the vacuum gripper 14 can be a universal foam type gripper.

[0018] According to another embodiment (not shown), the vacuum gripper 12 is replaced by a clamping or squeezing device or by another type of gripper.

[0019] Since the operations of a robot and of a vacuum gripper are believed to be well known in the art, they will not be described herein in more detail for concision purposes.

[0020] It is to be noted that a single robot arm or more than two can alternatively be used. According to another embodiment (not shown), anyone or both of the robot arms 12 are replaced by a gantry system, a human equipped with an exoskeleton or by any manipulation means equipped with a tool suitable to pick at least a row of bricks that includes gaps therein.

[0021] The indexing and gap-removing subsystem 20 will now be described in more detail with reference to Figures 2 and 3.

[0022] The subsystem 20 includes a slanted rectangular plate 32 that is secured to a trestle 34 using for example welding or fasteners. The lower longitudinal edge of the plate 32 is provided with a first flange 36 that defines a mechanical stop. Similarly, one of the lateral side edge of the plate 32 is provided with a second flange 38 that defines a mechanical stop.

[0023] The plate 32 is so mounted to the trestle 34 as to define a first angle of about sixty (60) degrees with the horizontal. The plate 32 is further titled from a second angle of about thirty (30) degrees from the vertical towards its side that includes the second flange 38.

[0024] A person skilled in the art will now appreciate that when a row of bricks 18 including gaps therebetween is deposited onto the surface 32, the bricks

18 will automatically be moved one against the other and biased towards both flanges 36 and 38 under the force of gravity (see Figure 3). In addition to removing any gaps 40 between two adjacent bricks 18, the bricks 18 becomes registered with the side flange 38. Knowing the exact position of the side flange 38 and dimension of the bricks 18 allows the robot arm 12 to precisely know the position of the row of bricks 18 that can then be picked up by the arm 12 with tool 14 so as to be precisely positioned on the output conveyor 25.

[0025] It is to be noted that the first and second angles can be varied depending, for example, on the shape, size or texture of the bricks 18, and on the configuration and size of the row of bricks 18 picked up on the infeed conveyor 15.

[0026] According to another embodiment, the plate 32 is in the form of a screen or includes apertures to contribute clearing debris or dust deposited by the bricks 18 thereon. Also, the flanges 36 and 38 are not limited to being flat rectangular portions extending along the full length of the respective side of the plate 32. For example, any one of the flange 36 and 38 may extend only from a portion of the respective side. According to still another embodiment (not shown), one of both of the flanges 36 and 38 includes apertures. The trestle 34 can be of any shape and size.

[0027] Also, the flanges 36 and 38 can be replaced or complemented for example by protrusions, pins, bumps, mechanical stoppers, and or brushes.

[0028] According to a non-illustrated embodiment, the plate 32 can be movably mounted to the trestle 34 or to any support structure via actuators that allow modifying the orientation of the plate 32 by changing one or both of the first and second angles thereof.

[0029] According to still another embodiment, the subsystem 20 includes one or more pneumatic pusher (not shown) to bias the bricks 18 towards the flanges 36 and/or 38.

[0030] With reference now to Figures 4 to 7, the gap creating subsystem 22 will now be described.

[0031] The subsystem 22 comprises a plurality of plates 42-46 that are slidably mounted to a supporting structure such as a trestle 34. More specifically, the subsystem 22 includes a pair of tracks 48 that slidably receives the plates 42-46 via cursors (not shown) which are secured to the plates 42-46 thereunder. The middle and higher plates 44 and 46 are slidably movable towards and away the lowest plate 42 via a respective cylinder 47 and 49 mounted therebetween.

[0032] The lowest longitudinal edge of the plate 42 is provided with a first flange 50 that defines a mechanical stop. A same lateral side edge of each plate 42-46 is provided with a lateral side flange 52-56, together defining a mechanical stop.

[0033] The height of the plates 42-46 are such as to be generally the same as the total width of two contiguous bricks 18, the reason of which will become more apparent furtherin.

[0034] A cylinder 58 equipped with a contact pad 60 is secured to each plate in such a way that the contact pad 60 is movable towards and away the respective lateral flange 52-56.

[0035] The operation of the gap creating subsystem 22 will now be described with reference to Figures 4 to 7.

[0036] A row of bricks 18 is picked up by the robot arm 12 on the infeed conveyor 15 and released onto the plates 42-46 (see Figure 4). It is to be noted that the plates 42 and 46 are then positioned contiguous by the cylinders 47 and 49.

[0037] As described with reference to the subsystem 20, the bricks 18 on the plates 42-46 automatically moves one against the other and are biased towards the bottom flange 50 under the force of gravity (see Figure 5).

[0038] With reference to Figure 6, the cylinders 58 are then actuated, causing their contact pads 60 to force the bricks 18 laterally in contact with the side flanges 52-56 (see arrows 62).

[0039] While the biasing force continues to be exerted onto the bricks 18 (see arrows 62 on Figure 6), the two cylinders 47 and 49 are actuated to separate the plates 42-46 and create the predetermined gaps 30 between the bricks (see arrows 64).

[0040] The robot arm 12 is then used to move and activate its tool 14 onto the bricks 18 while they are maintained in position in the subsystem 22. When the vacuum gripper 14 holds its grip onto the bricks 18, the cylinders 58 release their contact onto the bricks 18 and the arm 12 can then move to position the bricks 18 at a selected position onto the outfeed conveyor 25.

[0041] The gap creating subsystem 22 can of course be modified to receive more or less bricks 18 than illustrated or to receive bricks having different geometry than shown. Moreover, the subsystem 22 can be adapted and/or controlled to create gaps differently than shown.

[0042] It is to be noted that the robot arms 12 can further be used with its tool 14 to pick up a slip-sheet or another layer separating element and to position it on the output pile of bricks.

[0043] Although a brick layering system has been described hereinabove by way of illustrated embodiments thereof, it can be modified. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that the scope of the claims should not be limited by the preferred embodiment, but should be given the broadest interpretation consistent with the description as a whole.

Claims

1. A brick layering system comprising:

brick manipulation means equipped with a tool suitable to pick a row of bricks; and

at least one of i) a first subsystem positioned within reach of the brick manipulation means for indexing the row of bricks and for removing gaps therein and ii) a second subsystem for creating gaps in the row of bricks.

2. A system for indexing a row of bricks and for removing gaps therein as described herein.

3. A system for creating gaps in a row of bricks as described herein.

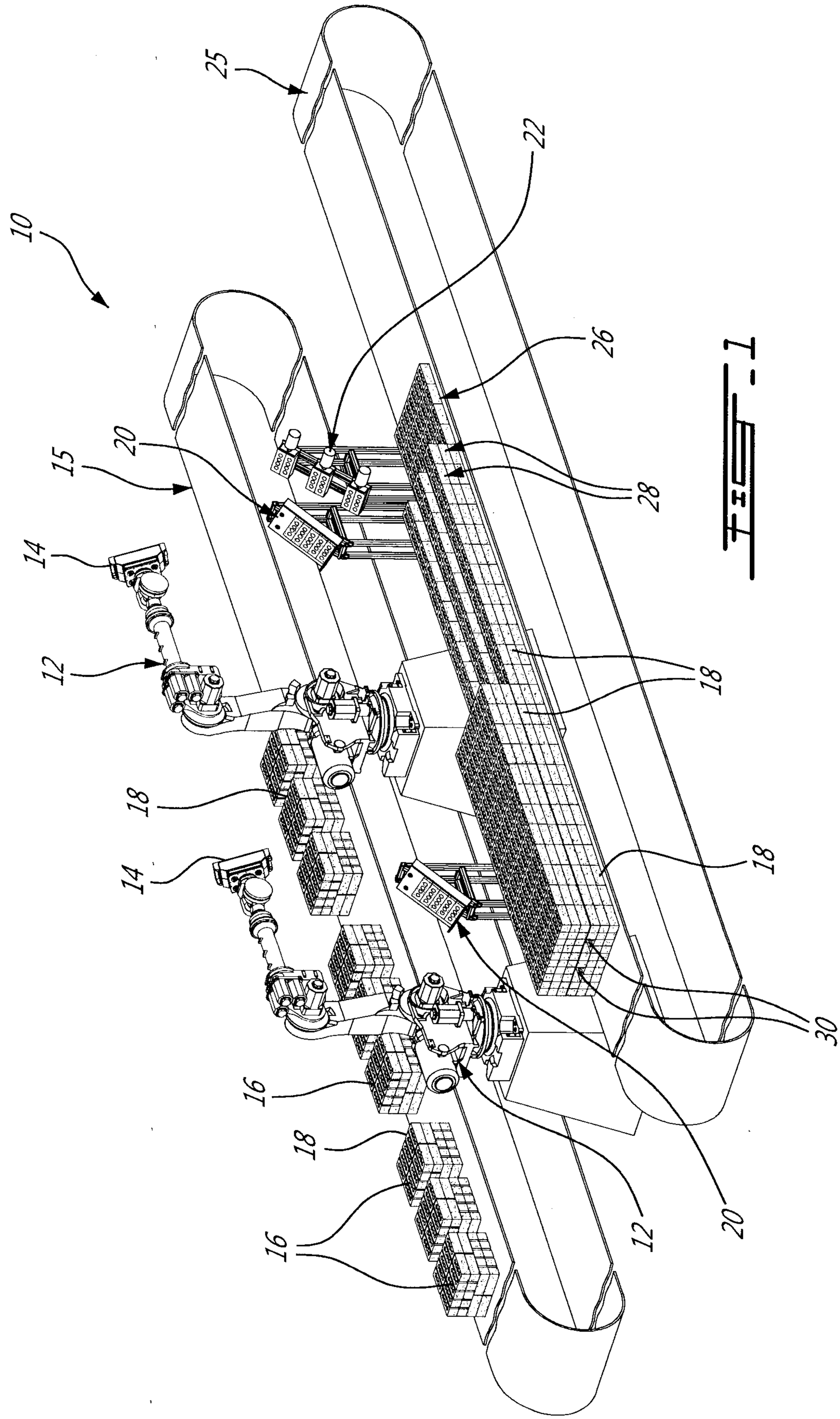


FIG. 1

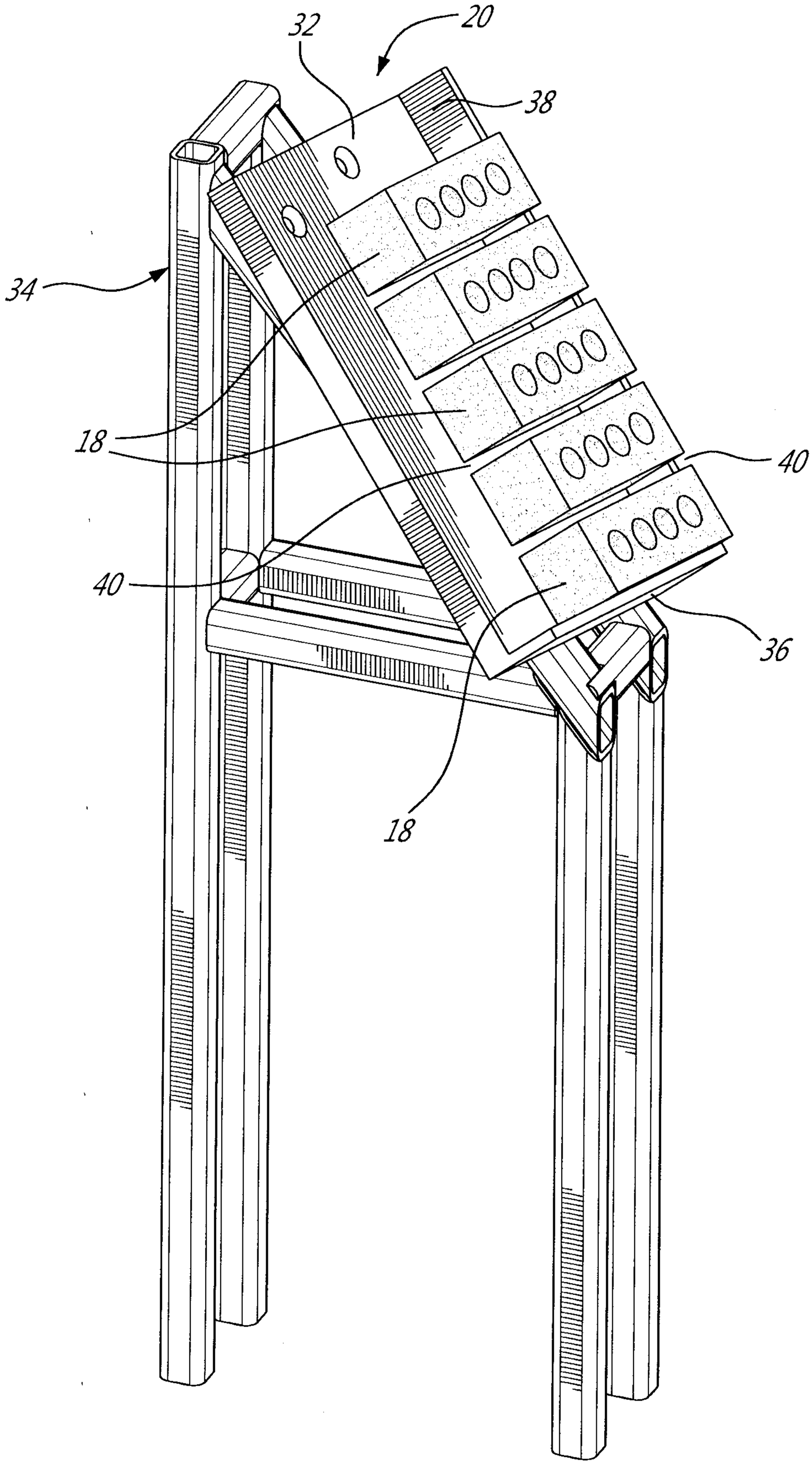


Fig. 2

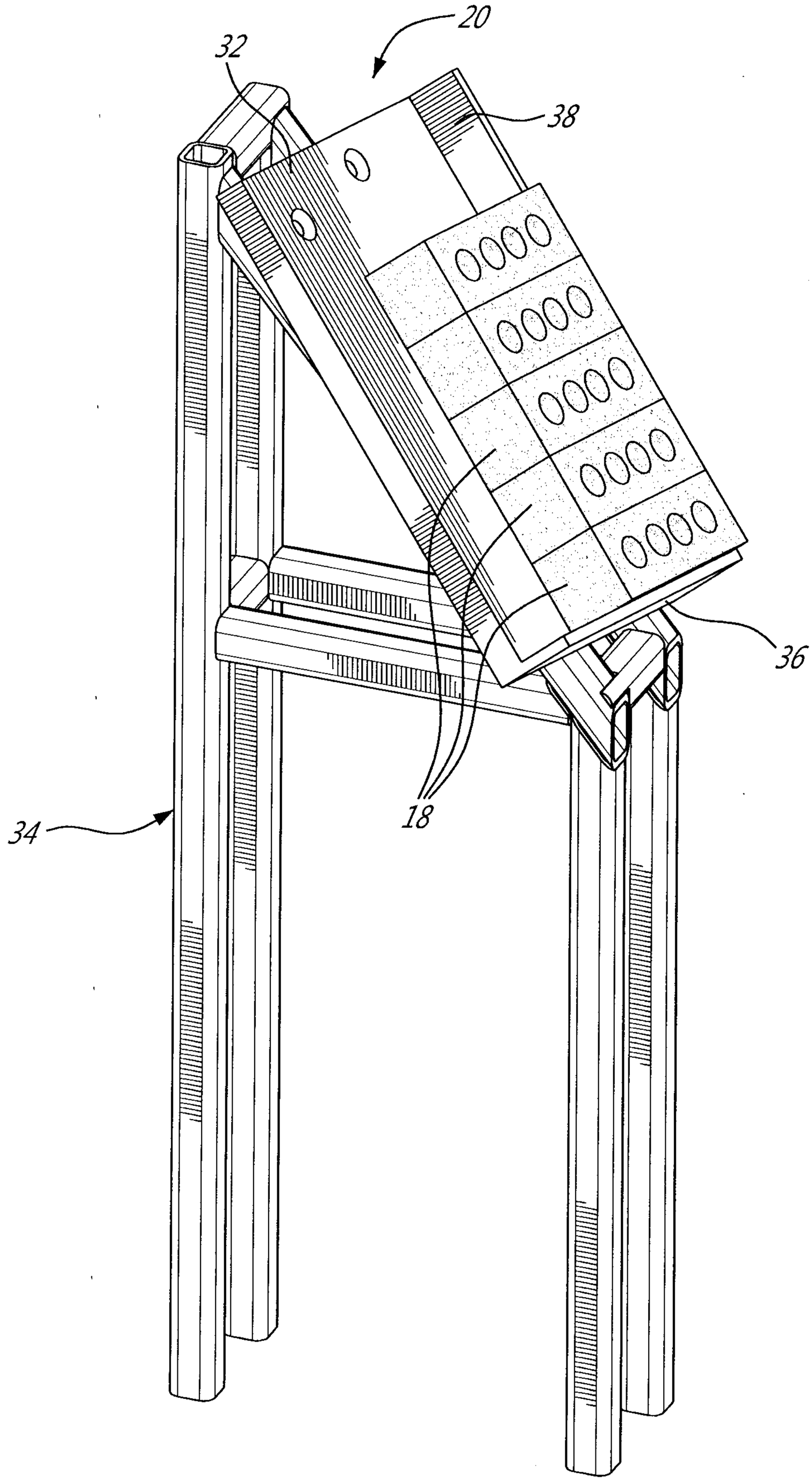


FIG. 3

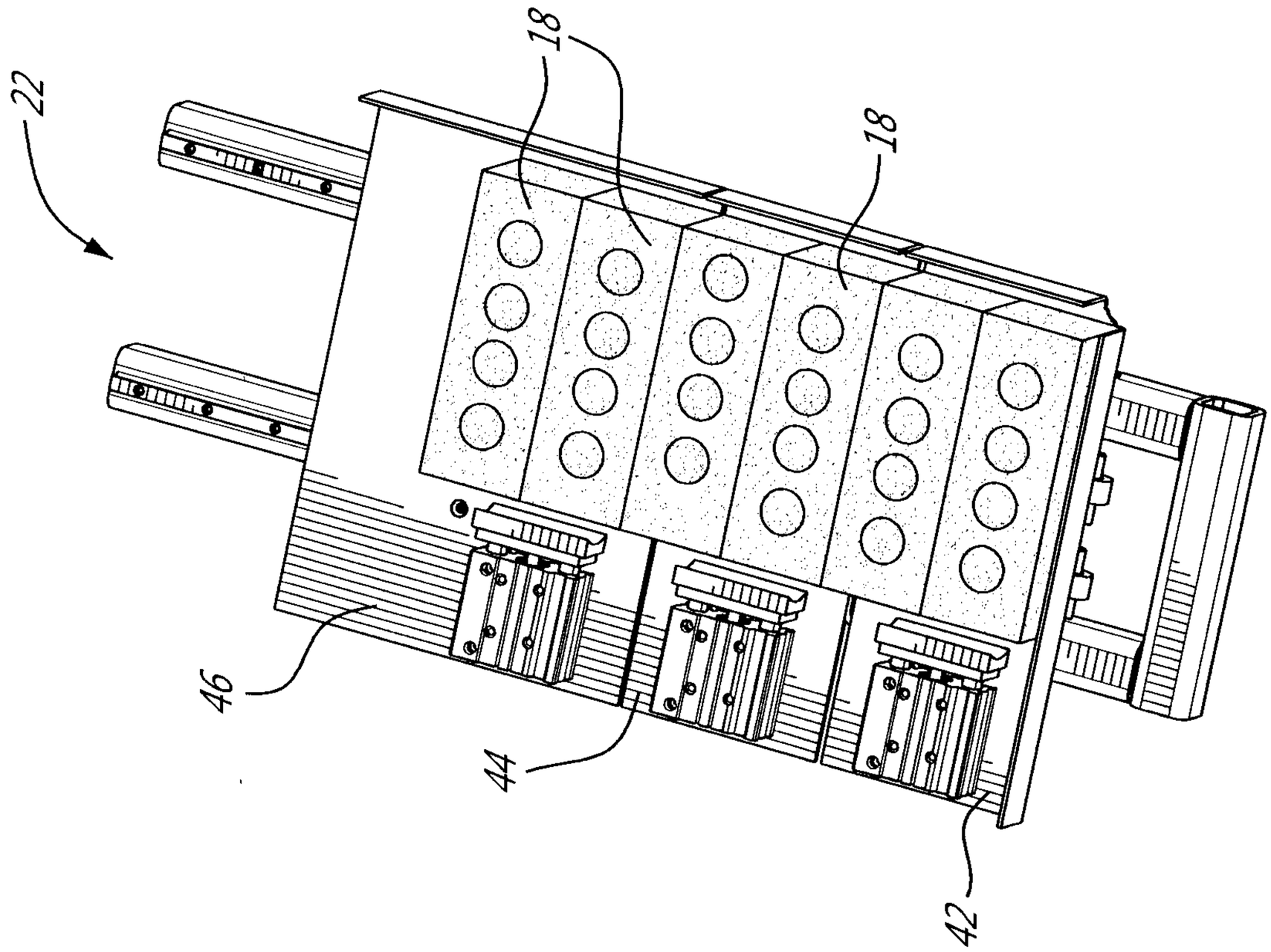


FIG. 5

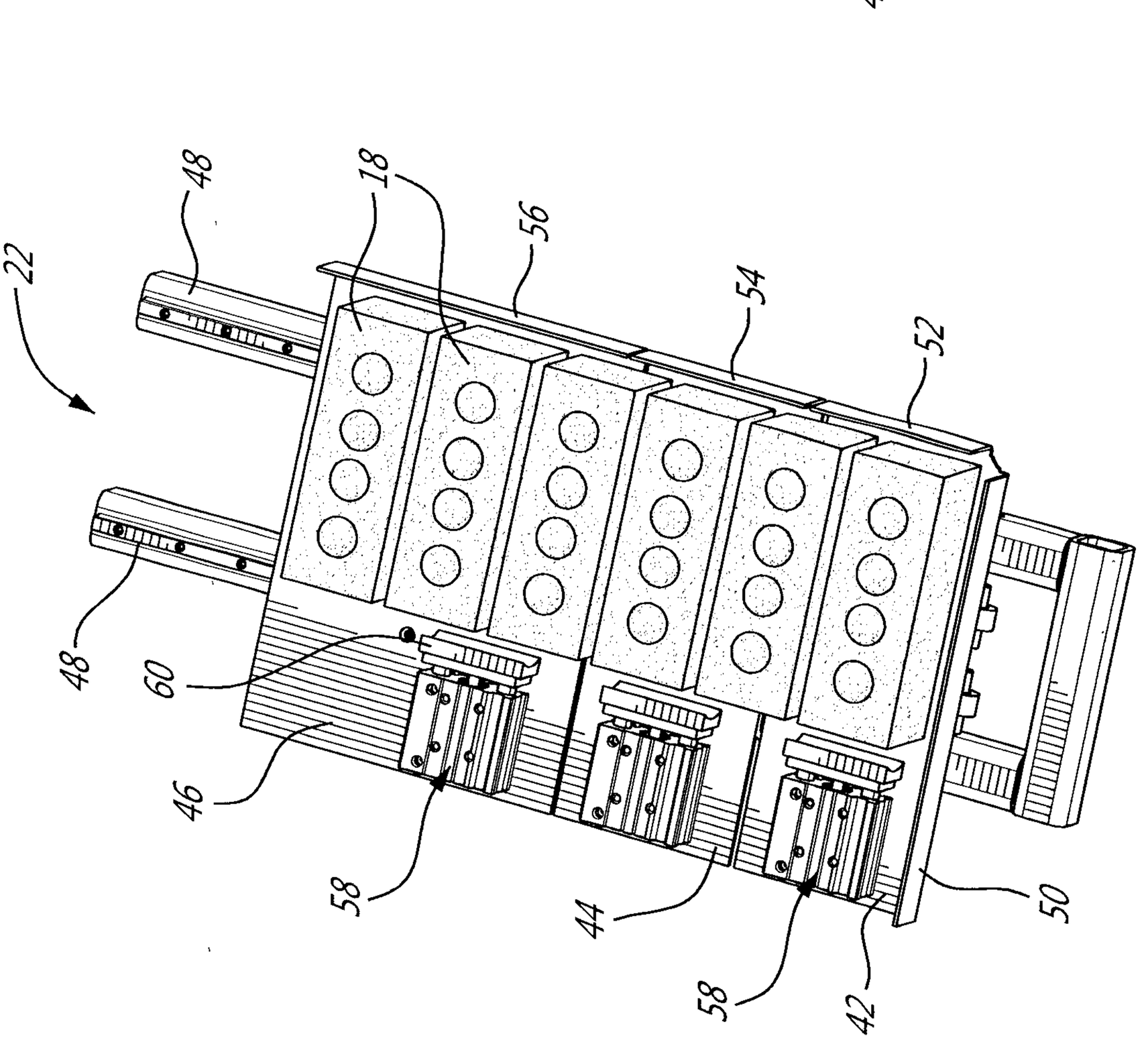


FIG. 4

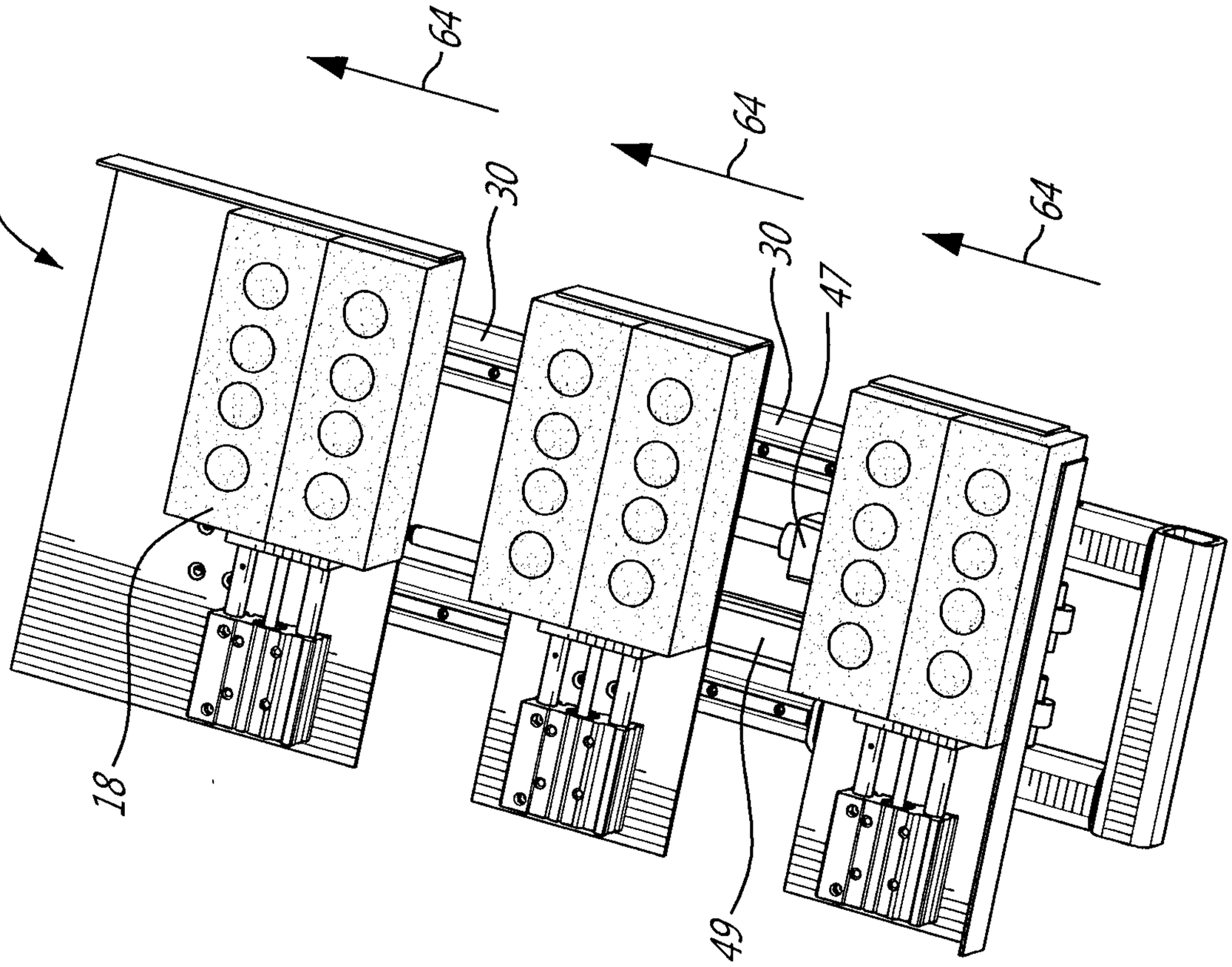


Fig. 7

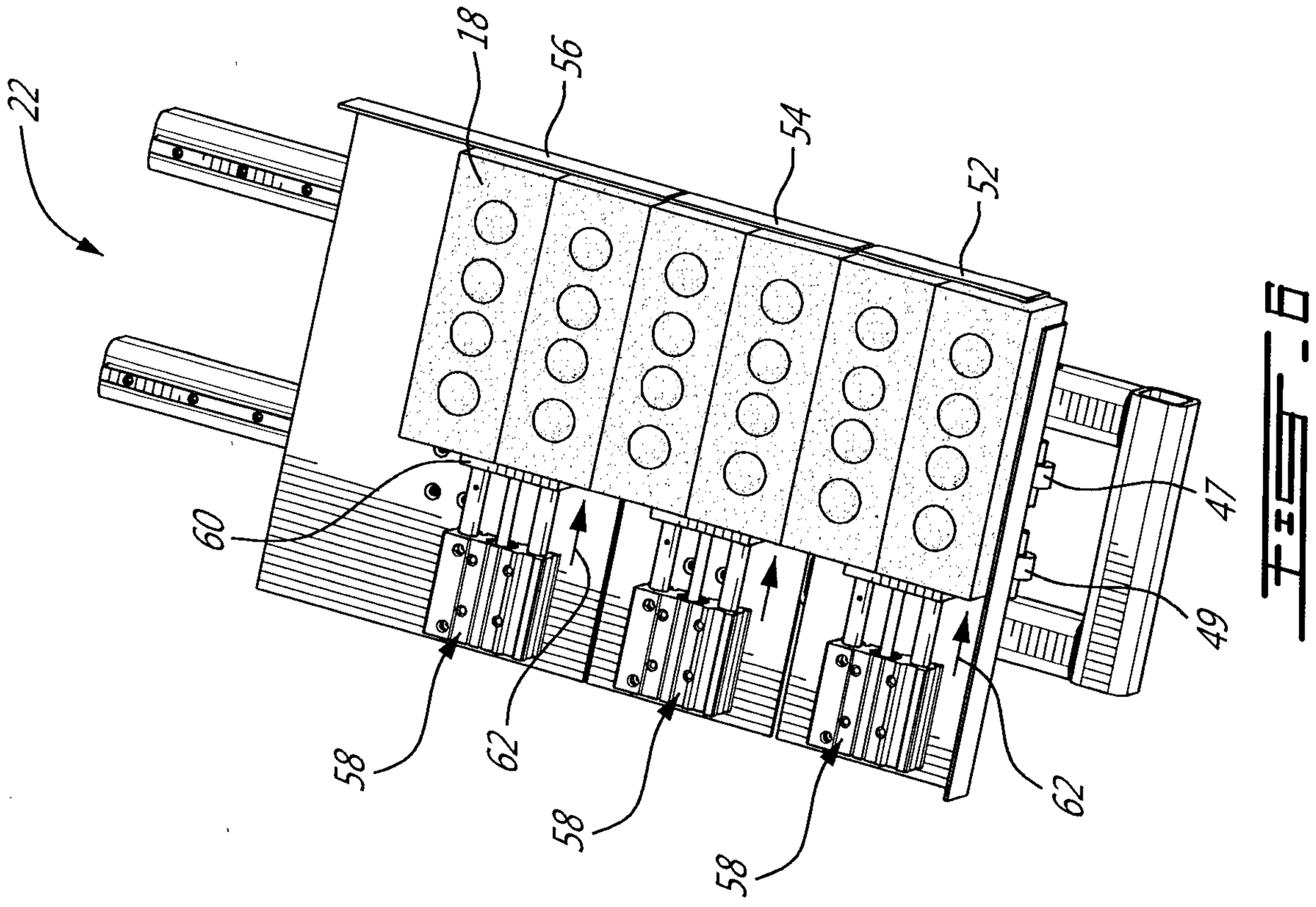
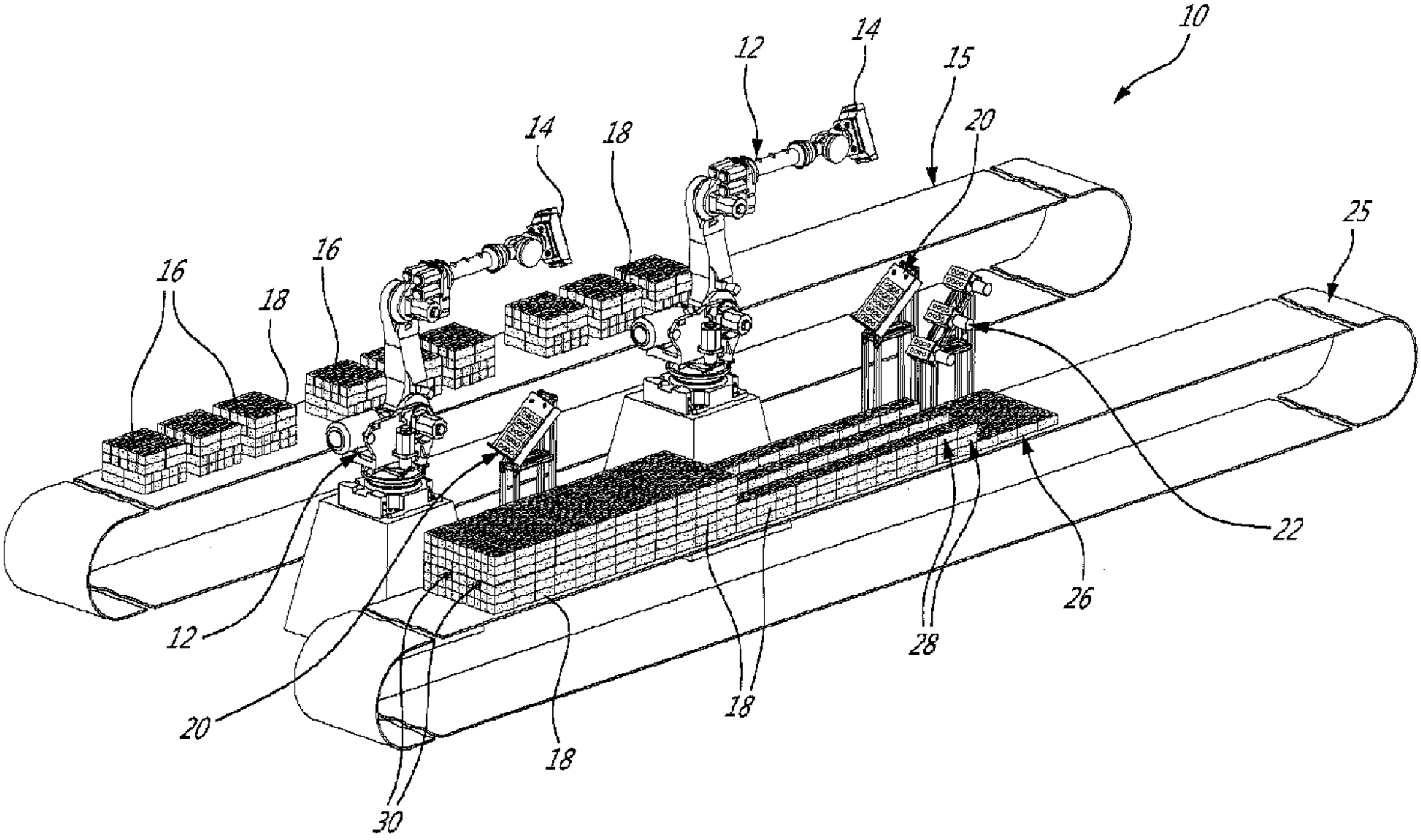


Fig. 8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