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(54) Drilling and milling machine for applying metal elements to furniture pieces

(57) A drilling and milling machine for applying metal elements to furniture pieces comprises supporting means for supporting a workpiece by an operating head in a working station, driving means for driving the workpiece along the supporting means from at least a working station supplying position and from the working po-

sition to an unloading position, and clamping means for clamping the workpiece in said working station, characterized in that said driving means comprise suction cup means designed for affecting only a surface of the workpiece, while leaving the perimetrical and top edges of the workpiece free.

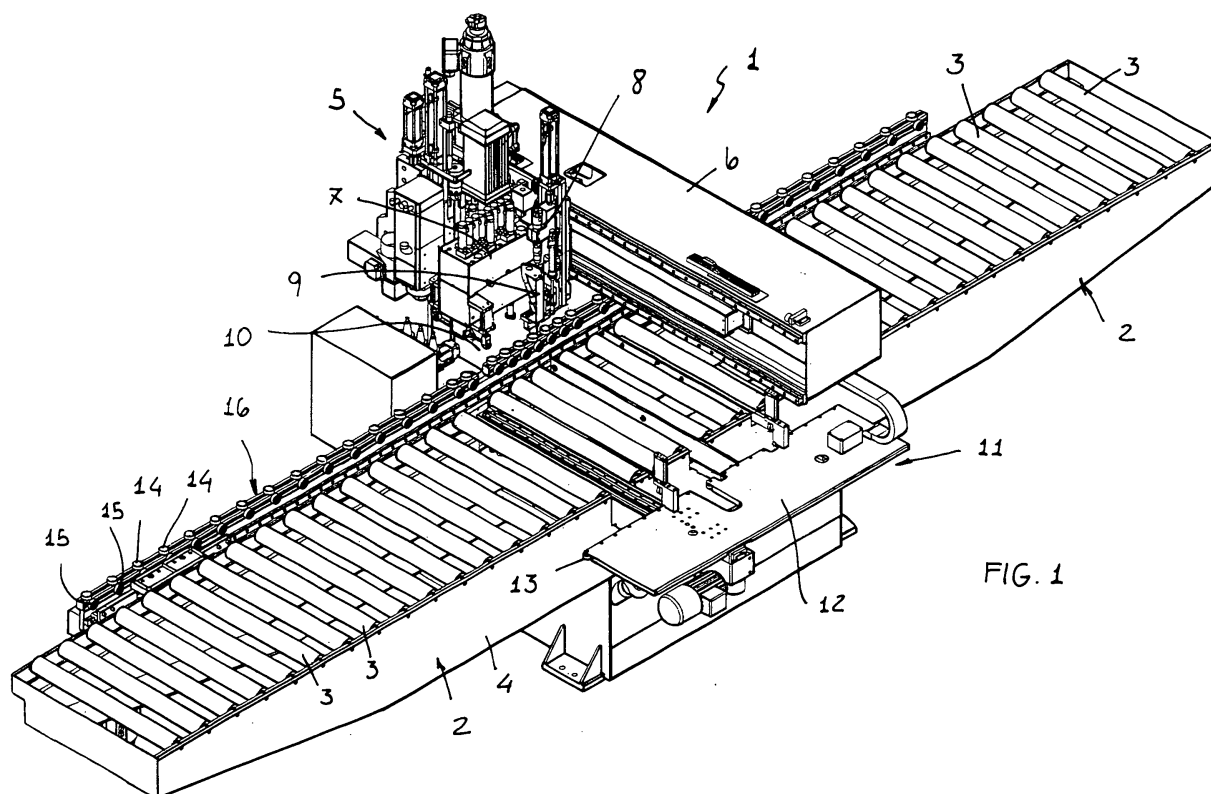


FIG. 1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a drilling and milling machine, which has been specifically designed for applying metal elements or fixtures to furniture pieces.

[0002] As is known, furniture pieces conventionally comprise panels having a parallelepiped configuration, which panel, in order to make a finished furniture article, must be subjected to a plurality of drilling and/or milling operations, as suitably spaced from one another.

[0003] Some or all of the thus made holes or milled portions are provided for receiving metal elements or fixtures, usually comprising metal inserts such as ring nuts, coupling elements, hinges and so on, to allow an individual panel to be coupled to other panels for forming a furniture article, an equipped wall or other construction.

[0004] In prior drilling and milling machines for furniture articles, each panel is engaged by gripping means on a side edge thereof, and is driven along a supporting and handling device, usually including a roller assembly.

[0005] A drawback of the gripper driving and locating system is that the grippers would occupy regions of the panel which could be affected by the drilling or milling operations, thereby rendering the panel assembling a rather difficult operation.

SUMMARY OF THE INVENTION

[0006] Accordingly, the aim of the present invention is to provide such a drilling and milling machine, for making furniture articles, which comprises a panel driving system specifically designed for overcoming the above mentioned drawback of prior drilling and milling machines.

[0007] Within the scope of the above mentioned aim, a main object of the present invention is to provide such a drilling and milling machine including a workpiece driving system, designed for driving the workpieces or panels so as to leave the edges of the panels substantially free in order not to hinder further panel processing operations.

[0008] Another object of the present invention is to provide such a drilling and milling machine including a workpiece or panel driving system allowing the individual panels to be accurately located, without damaging said panels.

[0009] According to one aspect of the present invention, the above mentioned aim and objects, are achieved by a drilling and milling machine, specifically designed for applying metal elements or fixtures to furniture pieces, said machine comprising supporting means for supporting a workpiece by an operating head in a working station, driving means for driving said workpiece through said supporting means, from at least a

supplying position to the working station and from the working position to an unloading position, and clamping means for clamping said workpiece in said working station, characterized in that said driving means comprise suction cup means designed for affecting only a surface of the workpiece, while leaving the perimetrical edges and top edge of said work piece substantially free.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention, which is illustrated, by way of an indicative, but not limitative, example in the accompanying drawings, where:

Figure 1 is a general perspective view illustrating the drilling and milling machine according to the invention;

Figure 2 is an enlarged-broken away perspective view of the driving device included in the drilling and milling machine according to the present invention; Figure 3 is a front elevation view illustrating the suction cup device included in the drilling and milling machine according to the present invention;

Figure 4 is a perspective view illustrating the suction cup device;

Figure 5 is a side elevation view of the suction cup device; and

Figure 6 is a top plan view of the suction cup device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] With reference to the number references of the above mentioned figures, the drilling and milling machine according to the present invention, which has been generally indicated by the reference number 1, comprises a supporting device, designed for supporting one or more panels or workpieces to be processed, said supporting device comprising roller assemblies 2 including a plurality of idle rollers 3, coupled to a supporting framework 4.

[0012] The supporting device is adapted to support a workpiece, not shown, which typically comprises a panel to which metal elements or fixtures must be applied by an operating head 5 which can be displaced on a cross guide 6 traversing the top of the supporting device.

[0013] The operating head 5, in particular, comprises, in a per se known manner, a tool exchanging device 7, a screwing on and off device 8, an insert supplying device 9 for supplying insert elements, not specifically shown, to be applied to the workpiece.

[0014] On a working bench 10, in a working position of the operating head 5, the subject machine further comprises a clamping device 11 for clamping the workpiece to be processed.

[0015] Said clamping device 11 comprises an aligning element, arranged in front of the bench 10, on the other side of the workpiece supporting device, and comprises moreover a plate 12 including a plurality of transversally movable vertical axis rollers 13, which can be driven in the longitudinal direction of the supporting device 2, so as to clamp the workpiece in its working position, as counterurged by guiding rollers 14 and 15 of a translating device 16.

[0016] The translating or deriving device 16 is designed for driving the workpiece on the roller assemblies, or transport device 2, and comprises a longitudinally extending guide 17 which extends along a side of the transport device and comprises guide rollers, respectively 14 having a vertical axis and 15 having a horizontal axis, adapted to respectively engage the outer edge and bottom edge of the workpiece.

[0017] The longitudinal guide 17 slidably supports a floating suction cup device 18, designed for sliding along the guide 17 and for clamping the workpiece to drive it, along the roller assemblies, to a set working position, and being furthermore designed for unloading said workpiece.

[0018] The floating suction cup device 18, which is shown in a more detailed manner in figures 3-6, comprises a suction cup assembly 19, supported by a slide 20 which can be slidably driven along the mentioned longitudinal guide 17.

[0019] The driving of the slide 20 and, accordingly, of the suction cup assembly 19 along the guide 17 is controlled by a motor-reducing unit 21, driving a belt coupled to said slide 20.

[0020] As shown, the suction cup assembly 19 is supported by said slide 20 through a guide carriage 23, so as to be vertically displaced with respect to said slide, as controlled by a pneumatic piston 22.

[0021] Thus, the vertical displacement of the suction cup assembly 19 allows the suction cups included therein to be moved toward the bottom surface of the piece.

[0022] Moreover, in order to overcome or compensate for possible workpiece aligning unevennesses, the suction cup assembly is coupled to the vertical guide carriage 23 through a horizontal guide 24 designed for allowing the suction cup assembly to be horizontally and transversely driven with respect to the workpiece longitudinal driving direction.

[0023] The suction cup assembly is centered by a pair of spring urged pusher elements 25, which essentially comprise a small plunger operating against a coaxial coil spring, said pusher elements being adapted to hold at a centered position said suction cup assembly, while allowing, owing to the elastic properties of the spring, a slight cross displacement, in both directions with respect to the middle longitudinal line, in order to compensate for possible workpiece unevennesses, due, for example, to a non perfectly rectilinear edge thereof.

[0024] As shown, the suction cup assembly 19 comprises, in this embodiment, two suction cups 26, but, as

it should be apparent to one skilled in the art, it could be also comprise a single suction cup or three or more suction cups, depending on requirements.

[0025] As disclosed, in this embodiment the suction cup assembly 19 comprises a double tray construction 27, designed for defining two recesses and comprising an edge 32 including a gasket 28 made of rubber or any other suitable resilient materials.

[0026] In each said recess or cavity, a ball shutter element 29 is provided, said ball shutter element comprising a ball 30 adapted to obstruct a hole, as said ball is urged by an urging spring 31.

[0027] The shutter element 29, as shown, is coupled to a suction source, or vacuum source through suitable ducts 33 thereby, as a panel is contacted by the suction cup assembly, the lower surface of said panel will be caused to bear on said gasket 28, thereby deforming it so as to contact the ball 30 which will be downward driven, thereby partially freeing the hole and providing a negative pressure in the cavity of the suction cup 26.

[0028] Upon having processed the workpiece and having removed it from the working station, said workpiece or panel will be disengaged by lowering the suction cup assembly 19, by a control piston 22.

[0029] As the panel does not further downward press on the ball 30, the latter will again obstruct the suction hole, as urged by the urging spring 31, thereby automatically shutting off the suction operation.

[0030] As it should be apparent, the suction cup assembly 19 is adapted to engage a workpiece and drive it, along the roller assemblies, to the working or processing bench.

[0031] At the end of the working process, the suction cup assembly will drive the workpiece rightward with reference to figure 1, to the following unloading position thereof.

[0032] Advantageously, said suction cup assembly 19 comprises a double chamber, so as to allow the individual suction cups 26 thereof to be supplied in a mutual independent manner.

[0033] The operating speed and accelerations, as the workpiece is driven, are suitable adjusted to allow an accurate locating of the workpiece to a set working position, and in order to prevent the workpiece from being damaged.

[0034] The workpiece driving adjusting is performed by a driving control system, comprises a cam assembly or set 34, controlling three microswitches.

[0035] A first microswitch reduces the workpiece feeding speed, a second microswitch controls the assembly so as to be properly located at a starting position thereof, and a third microswitch operates as a safety control element, i.e. a limit switch, operating to stop the assembly in the case in which limit positions would be exceeded.

[0036] The driving control system comprises moreover a pair of wheel pusher elements 35, designed for operating on the top surface of the work piece to hold it

in its working position, in cooperation with a second pair of pusher wheel elements 36 of the plate aligner 12.

[0037] Each said pusher element 35 comprises a pair of photocells 37 and 38 provided for respectively detecting the inlet and outlet of the workpiece edge, in order to control the operation of the pusher elements.

[0038] As the machine according to the present invention is switched on to operate, the workpiece, typically a wood or other material panel used for making furniture articles, is caused to slide along said roller assemblies from a supplying or feeding position, at the left with reference to figure 1, to a working position at the operating head 5, by operating the suction cup assembly 19.

[0039] The latter, as disclosed, affects only the bottom surface of the panel while leaving the side edges and top edge of the panel free.

[0040] As the panel is arranged on the roller assembly, the suction cup assembly 19 is raised and brought to contact the panel bottom surface, thereby automatically providing a negative pressure, through the above disclosed ball shutter elements.

[0041] Accordingly, the panel is brought to its working position, where on the panel are performed all the necessary processing operations, which are performed by the mentioned operating head.

[0042] At the end of the working operations, the panel is driven by the suction cup assembly along the roller assembly, rightward with reference to figure 1, to an unloading position or a following processing station.

[0043] Thus, it should be apparent that the machine according to the present invention provides, owing to the provision of the disclosed suction cup assembly, great advantages, since the perimetrical edges of the panel are left fully free, thereby preventing the panel from hindering further processing operations.

[0044] Thus, it is not necessary to program the driving pattern of the panel, as it is necessary in prior panel drilling and milling machines and, moreover, it is not necessary to relocate the panel for performing the desired processing operations thereon.

[0045] A further advantage of the machine according to the invention is that, owing to the specifically designed suction cup assembly, it is possible to accurately drive the panel without damaging it, owing to the self-centering characteristics and self-adjusting properties of the assembly during the driving thereof.

[0046] It has been found that the invention fully achieves the intended aim and objects.

[0047] In fact, the subject drilling and milling machine allows to easily apply metal elements and fixtures to the panels for forming the furniture pieces, in a manner which does not damage the panels or obstruct the processing steps.

[0048] In practicing the invention, the used materials, as well as the contingent size and shapes, can be any, depending on requirements and the status of the art.

Claims

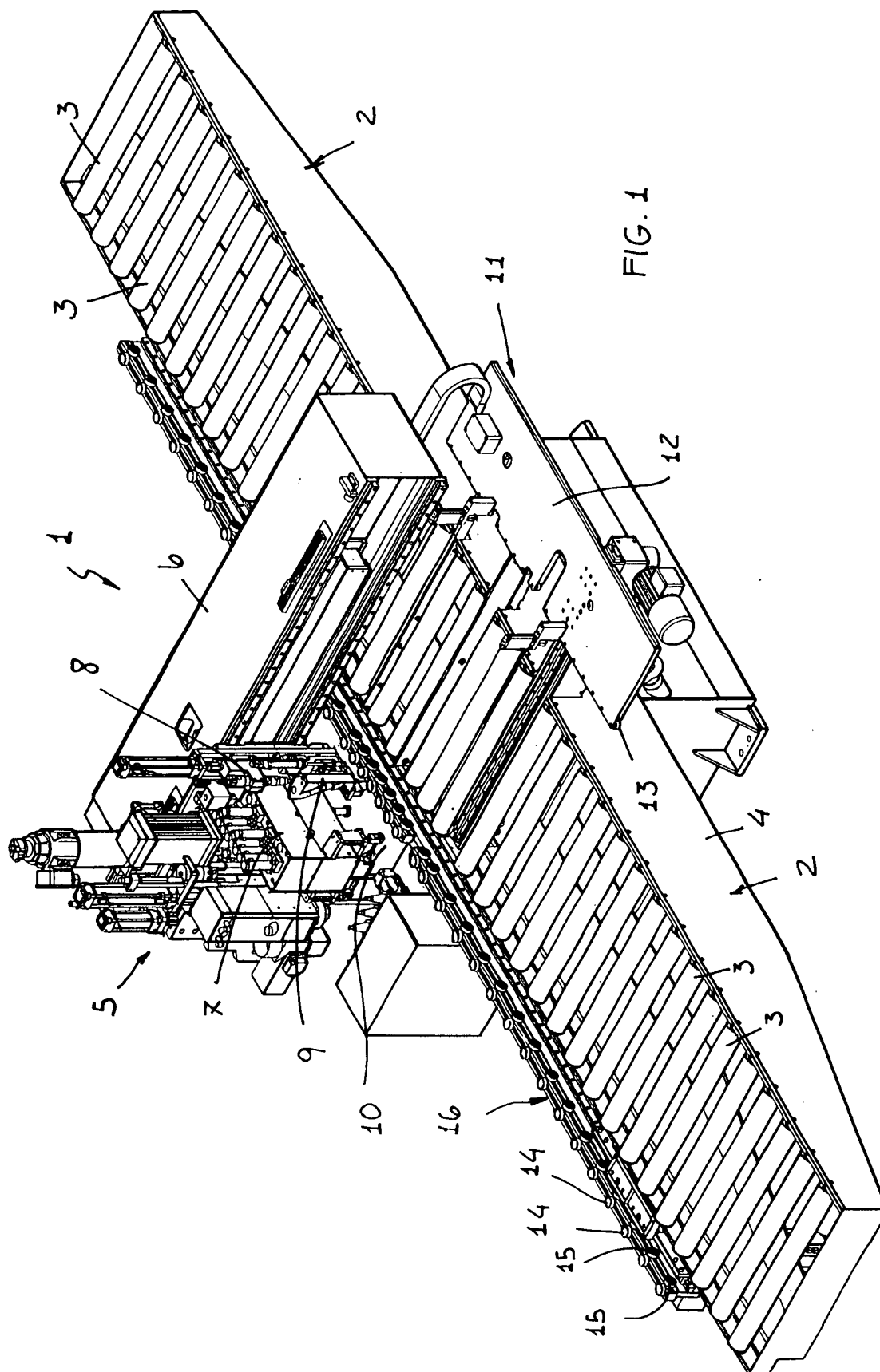
1. A drilling and milling machine, for applying metal elements or fixtures to furniture article elements, comprising supporting means for supporting a workpiece to be machined by an operating head in a working station, driving means for driving said workpiece along said supporting means from at least a supplying position to the working station and from the working position to an unloading position, and clamping means for clamping said workpiece in said working station, **characterized in that** said driving means comprise suction cup means adapted to affect only a surface of the workpiece while leaving the perimetrical edges and top edge of said workpiece free.
2. A machine, according to Claim 1, **characterized in that** said driving means comprise a translating device, for translating the workpiece on said supporting means and including a longitudinal guide extending along a side of said supporting means comprising roller assemblies, said translating device comprising guide rollers, respectively having a vertical axis and a horizontal axis, for respectively engaging the outer edge and bottom edge of said workpiece.
3. A machine according to Claim 2, **characterized in that** said longitudinal guide slidably supports thereon a floating suction cup device, adapted to slide along said longitudinal guide and to hold the workpiece for driving it along said roller assemblies, to a working position and then adapted to unload said workpiece.
4. A machine, according to one or more of the preceding claims, **characterized in that** said floating suction cup device comprises a suction cup assembly supported by a slide slidable along said longitudinal guide.
5. A machine, according to one or more of the preceding claims, **characterized in that** the translating movement of said slide, and hence of said suction cup assembly, along said guide is controlled by a motor reducing unit driving a belt coupled to said slide.
6. A machine, according to one or more of the preceding claims, **characterized in that** said suction cup assembly is supported by said slide through a guide carriage, so as to allow said suction cup assembly to be vertically driven with respect to said slide, as controlled by a pneumatic piston.
7. A machine, according to one or more of the preceding claims, **characterized in that**, in order to com-

pensate for possible alignment unevennesses of said workpiece, said suction cup assembly is coupled to said vertical guide carriage through a horizontal guide adapted to allow said suction cup assembly to be horizontally driven, and transversely driven with respect to said workpiece longitudinal driving direction.

8. A machine, according to one or more of the preceding claims, **characterized in that** said suction cup assembly is centered by a pair of spring pusher elements, essentially comprising a small piston operating against a coaxial coil spring, said pusher elements holding in a centered position said suction cup assembly while allowing, owing to the resilient properties of said spring, a slight cross displacement of said suction cup assembly, in both directions, with respect to a longitudinal middle line, in order to compensate for possible workpiece unevennesses.
9. A machine, according to one or more of the preceding claims, **characterized in that** said suction cup assembly comprises a double tray construction defining two cavities and comprising an edge engaged by a rubber gasket, in each said cavity being arranged a shutter element coupled to a vacuum source.
10. A machine, according to one or more of the preceding claims, **characterized in that** said ball shutter element comprises a ball adapted to shut off a hole and that said shutter element is coupled to a suction source by coupling pipes, thereby, as a panel contacts said suction cup assembly, the bottom surface of said panel is caused to bear on said gasket by deforming up to reach said ball, which is downward driven thereby partially freeing said hole and providing a vacuum in the cavity of the suction cup.
11. A machine, according to one or more of the preceding claims, **characterized in that** said suction cup assembly comprises a double chamber, to allow the suction cups to be independently supplied.
12. A machine, according to one or more of the preceding claims, **characterized in that** said machine comprises a control system for adjusting the driving of said workpiece.
13. A machine, according to one or more of the preceding claims, **characterized in that** said control system comprises a cam assembly driving three microswitches, of which a first microswitch decreases the workpiece feeding speed, a second microswitch controls the arrangement of said assembly at a starting position and a third microswitch operates as a safety control element, i.e. a limit switch.

14. A machine, according to one or more of the preceding claims, **characterized in that** said driving control system comprises a pair of wheel pusher elements operating on the top surface of said workpiece to hold said workpiece in its working position in cooperation with a second pair of wheel pusher elements of a plate aligner.

15. A machine, according to one or more of the preceding claims, **characterized in that** each of said pusher elements comprises a pair of photocell for detecting respectively the inlet and outlet of the edge of said workpiece in order to control the operation of said pusher elements.
16. A machine, according to one or more of the preceding claims, **characterized in that** said means for clamping said workpiece in its working position comprise an aligner, arranged in front of the operating head, at an opposite position of the roller assembly, and comprising a plate including a plurality of rollers having a vertical axis and transversely movable with respect to the longitudinal extension of the roller assembly thereby clamping the workpiece in its clamping position, as counterbiased by the guide rollers of the translating device.
17. A machine, according to one or more of the preceding claims, **characterized in that** said machine comprises one or more of the disclosed and/or illustrated features.



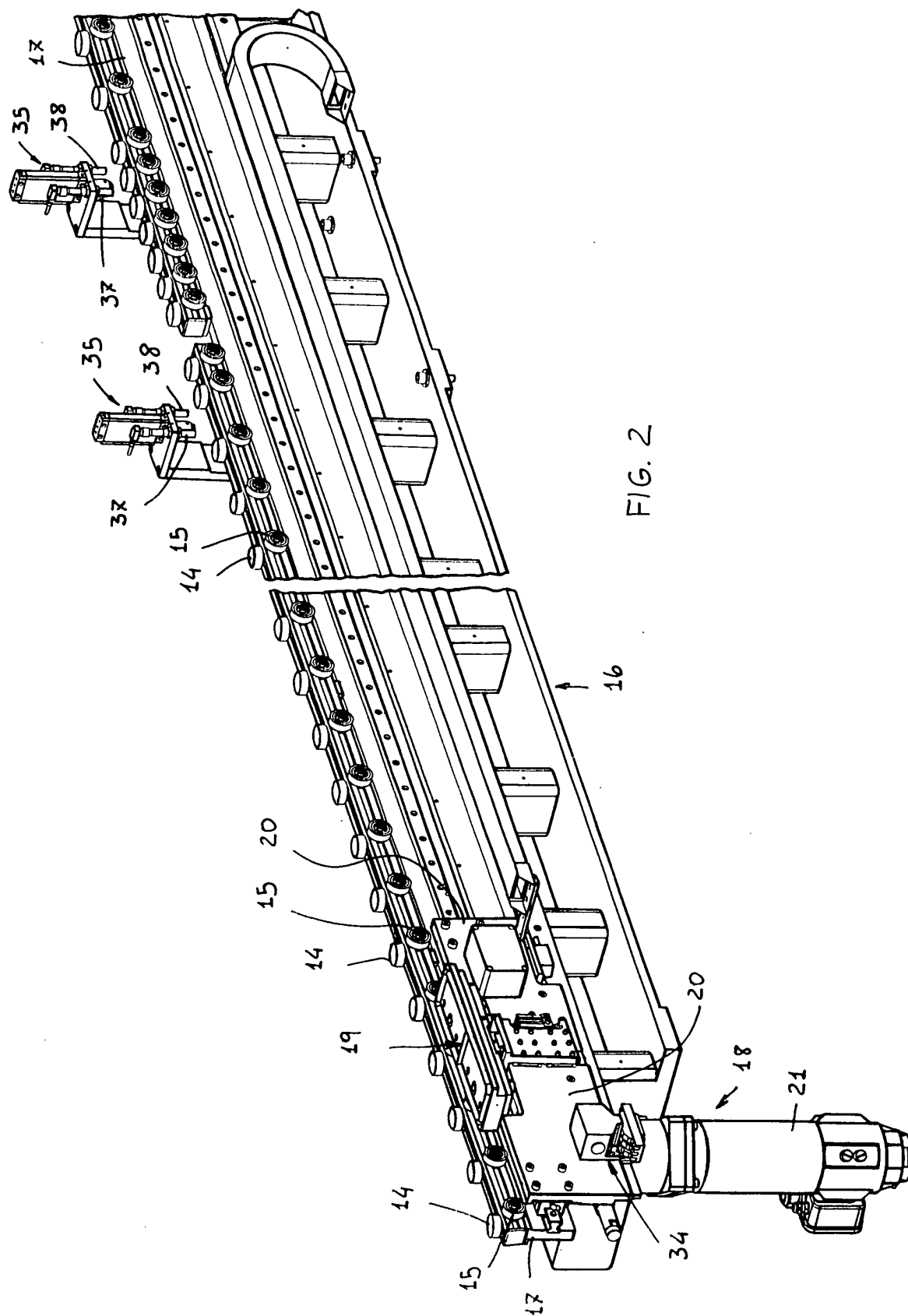


FIG. 2

