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(54) PUNCHING MACHINE

STANZMASCHINE

MACHINE D'EMBOUTISSAGE

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Description

Field of Invention

[0001] The invention relates to a punching machine, which is generally used for punching metal sheets and other items made of several materials, and is able to convey the punched items toward the processing lines, sorted by size.

Background art

[0002] From US 4 690 021 A there is known a punching machine according to the preamble of claim 1.

[0003] A punching machine is known to comprise a base that supports a work table and an operating head that extends above the work table and carries a plurality of punches, which are adapted to be actuated as needed by a pressure cylinder accommodated in the operating head.

[0004] A die is known to be placed within the work table in vertically aligned relationship to the operating head, and to carry counter-punches which cooperate with the corresponding upper punches for punching metal sheets or other items.

[0005] The work table is equipped with a gripper assembly with moving grippers that grasp the sheet, typically at one edge thereof, and systematically move it between the operating head and the counter-punch die, for carrying out punching operations according to a program that is preset in a programmable electronic memory that is typically present in a punching machine.

[0006] More in detail, when a punching machine carries out punching operations, e.g. in a sheet of metal or another material, it creates a plurality of workpieces with a predetermined and programmable contour which, after forming, are still attached to the original sheet by means of thin connecting bridges, that are purposely formed during punching to prevent the workpieces from separating from the original metal sheet after forming and punching, and fall onto the work table in a messy heap.

[0007] Typically, once the entire metal sheet has been punched according to an operating program, it is discharged from the work table either by an operator or by specially designed automatic gripping and displacing devices.

[0008] Then, in both cases, an operator will use a cutting tool to cut the bridges and finally separate the formed workpieces from the base metal sheet.

[0009] Also, the operator manually collects the separated workpieces and, after sorting them by size, discharges them onto respective conveyors that will transfer them to further workstations.

[0010] This prior art suffers from certain drawbacks.

[0011] A first drawback is that the action of an operator or a special automatic gripping and displacing device is required both for picking up the workpieces from the work table and depositing them onto a conveyor for transfer to other work destinations, and for separating the formed workpieces from the base metal sheet.

[0012] A second drawback is that the operator shall also manually remove the residual portion of the metal sheet from which the formed workpieces have been separated, to clear the work table for a new punching step.

[0013] In this respect, it shall be noted that the metal sheets that may be used for forming workpieces using punching machines often have large perimeter dimensions, some having 1000 x 1000 mm long sides or even more, and that their thicknesses range from a few tenths of a millimeter to a few millimeters, whereby these metal sheets are quite heavy for manual or automatic handling, both for preparing them to punching and for removing them after punching.

[0014] A third drawback is that, once the operator has cut the bridges, apparent traces of the latter remain on the workpieces as flashes that, though small, require further finishing to remove these flashes and any trace thereof.

[0015] A further drawback of prior art punching machines is that the finished workpieces separated from the base metal sheets that can be discharged from the work table have a size of not more than 500 x 500 mm.

Disclosure of the invention

[0016] The object of the invention is to improve the prior art.

[0017] Another object of the invention is to provide a punching machine that requires no manual action by the operators, and no automatic devices for handling and removing the sheets of material, or the semi-finished items to be punched.

[0018] A further object of the invention is to provide a punching machine that allows the formed workpieces to be automatically conveyed in selectable discharge directions, which can be particularly selected according to their size.

[0019] Another object of the invention is to provide a punching machine that forms workpieces without requiring additional finishing operations.

[0020] In one aspect the invention relates to a punching machine as defined in the features of claim 1.

[0021] The invention affords the following advantages:

- forming workpieces that require no further finishing;
- conveying the formed workpieces on conveyor lines, after sorting them by size;
- avoiding any manual action by the operators and any automatic device for handling metal sheets and items that have to be punched or have been already punched.

Brief description of the drawings

[0022] Further characteristics and advantages of the invention will be more apparent from the detailed descrip-

tion of a preferred, non-exclusive embodiment of a punching machine, which is shown as non-limiting example in the annexed drawings, in which:

FIG. 1 is a schematic and perspective view of a base of a punching machine of the invention in a step of preparation to punching;
FIG. 2 is a schematic and perspective view of the base of Figure 1, in a step of discharge of a large punched workpiece;
FIG. 3 is a schematic and perspective view of a base of a punching machine of the invention in a step of preparation to the discharge of small punched workpieces;
FIG. 4 is a schematic and perspective view of a base of a punching machine of the invention in a step of discharge of small punched workpieces;
FIG. 5 is a schematic sectional view of the base of Figure 1, as taken along a plane *V-V;*
FIG. 6 is a schematic sectional view of the base of Figure 2, without the punched workpiece, as taken along a plane *VI-VI;*
FIG. 7 is a schematic sectional view of the base of Figure 6, with the addition of a punched workpiece;
FIG. 8 is a schematic sectional view of the base of a punching machine in a possible second embodiment.

Detailed description of a preferred embodiment

[0023] Referring to the above mentioned figures, numeral 1 designates the base of a punching machine.

[0024] The base 1 comprises a support frame 2, that supports a work table 3 on which items in sheet form 5 to be punched have to be laid and displaced.

[0025] The displacement of sheet items 5 occurs by means of a moving gripper device 3c in the work table 3, which is designed to grasp and release the sheet items 50 and place them under the punching devices.

[0026] A horizontal support surface 4 is defined in the work table 2 and has a die therein accommodating a series of counter-punches 6 that cooperate with corresponding punches held within an operating head 7, as is typically provided in a punching machine.

[0027] Both the punches and the counter punches may be arranged within respective housing devices, known as punch holders, which contain a predetermined number thereof, each being automatically selectable as needed.

[0028] The punches, the punch holders and the dies form together the above mentioned punching devices.

[0029] An opening 8 is formed in the work table 3, for receiving a movable section 9 that can move in two directions of movement, namely a direction of translation coplanar with the work table 3 and a direction of inclination to the latter, as better described below.

[0030] The opening 8 has a quadrangular perimeter and the movable section 9 also has a quadrangular perimeter, such that the perimeter sides of both are mutually parallel.

[0031] More in detail, Figure 3 shows that one of the sides of the movable section 9, namely the side that is considered as the front side, as it is parallel to the front edge 3a of the work table 3 and designated by numeral 10, has a recess 10a, whose purpose will be described below.

[0032] The movable section 9 is mounted to slide guide means 11 and is slidably driven between a punch position and a discharge position, for discharging the punched workpieces having a restricted size, the term restricted size being intended to designate a size of the order of 200 x 200 mm or less.

[0033] The movable section 9 is driven for horizontal displacement by a fluid-dynamic actuator unit 12 which is interposed between one rear side 13 of the movable section 9, opposite to the front side 10, and the frame 2.

[0034] Furthermore, the movable section 9, for discharging formed and punched workpieces having a large size, i.e. larger than that the above mentioned size, is also adapted to be inclined in a direction of inclination, as shown in Figures 2, 6, 7, by pivoting about hinges (or guides) 14, with parallel and coaxial axes of rotation, oriented perpendicular to the front 10 and rear 13 sides of the movable section 9.

[0035] The direction of inclination of the movable section 9 allows the latter to pivot toward the underlying part of the work table 3 to discharge the large punched and formed workpieces onto an evacuation conveyor 15 which is arranged in the base 1 for this purpose.

[0036] The inclination movement of the movable section 9 is obtained using an actuator unit, not shown but known to the skilled person.

[0037] Referring now to Figures 3 to 7, a chute 16 is also shown below the work table 3, in vertically aligned relationship to the recess 10a, for conveying punched and formed workpieces having a small size, toward a collection container located at the discharge edge of the chute 16 and adapted to be removed for cyclic discharge.

[0038] As shown in the figures, the length of the movable section 9 between the two front 10 and rear 13 sides is smaller than the corresponding length of the opening 8, to allow the movable section 9 to move therein between a punch position and a discharge position.

[0039] More in detail, in Figures 1 and 5 the movable section 9 is shown in the punch position, in which it extends the support surface 4 in substantially seamless fashion, whereas in Figures 3 and 4 the movable section 9 is shown in a displaced position toward the rear portion of the opening 8, i.e. the rear edge 3b of the work table 3, and opens a passage 18 through which the small punched and formed workpieces may fall and be conveyed from the chute 16 into the collection container 17.

[0040] However, when the punched and formed workpieces have a large size, as shown in Figures 1, 2, 7, while the movable section 9 remains in its position toward the front edge 3a, it pivots downwards about the hinges

14 and becomes itself a chute for discharging the large workpieces onto the conveyor 15.

[0041] In view of facilitating the displacements of large-sized punched and formed workpieces, the movable section 9 consists of a plurality of rollers 19, powered by a motor unit 20, which are supported in parallel relationship, between the front side 10 and the rear side 13, thereby forming a movable surface 9a which, when the movable section 9 is in the punch position or in a small-workpiece discharge position, is substantially coplanar with the support surface 4 of the work table 3.

[0042] Handling of particularly large workpieces 5, as shown in Figure 8, may be also ensured, in a second embodiment of the invention, by also forming the end portion of the support surface 4 by additional rollers 19', identical to those that are part of the movable section 9.

[0043] In this case, the rollers 19' are rotatably driven by a motor unit 20' and form, with the rollers 19 of the movable section 9, a moving carpet, allowing particularly long workpieces to slide thereon toward a lateral discharge edge 3c of the work table 3.

[0044] In short, the movable section 9 has three operating positions overall, i.e. a punch position, in which it is entirely displaced toward the front edge 3a of the work table 3, a large-workpiece discharge position, in which it still remains in the punch position, but is pivoted toward a lower portion of the work table 3, and a small-workpiece discharge position, in which it is coplanar with the support surface 4, but retracted toward the rear side 13, thereby forming the passage 18.

[0045] The selection of the work positions of the movable section 9 is automatically made by the electronic program of a computer that controls the operation of the punching machine according to the working cycle that has been set, to obtain small- or large-sized punched and formed workpieces.

[0046] More in detail, when an operator selects a punching operation in the program to repetitively obtain large-sized workpieces, the movable section 9 is held in the normal punching position, i.e. coplanar with the support surface 4 of the work table 3 during completion of the punching steps and then, each time a punching cycle is completed, it is rotated toward the underlying portion of the work table 3 to discharge the large-sized punched and formed workpieces onto the conveyor 15.

[0047] The discharge step is facilitated by rotating the powered rollers 19 that turn the support surface of the movable section 9 into a moving carpet.

[0048] In order to reduce friction with the punched workpieces to be discharged, the rollers 19 have radial and flexible bristles on their respective outer surfaces, to provide a point-like contact between the latter and the lower surface of each punched workpiece.

[0049] Once this discharge step has been completed, the rotation of the rollers 19 is stopped, and the movable section 9 is moved back upwards to its position coplanar with the work table 3, for a new punching cycle.

[0050] When dealing with very large punched and formed workpieces, e.g. having a size of 1,000 x 3,000 mm, the work table 3 consists of a substantially seamless succession of the rollers 19' that form a substantially continuous moving carpet and the rollers 19 of the movable section 9, the latter being powered to provide a motorized carpet for moving these very large workpieces toward the lateral discharge edge 3c.

[0051] When an operator selects a punching operation in the program, to repetitively obtain small-sized workpieces, after the punching and forming step, the movable section 9 is caused to slide to a programmed extent toward the rear edge 3b of the work table 3, thereby creating the passage 18.

[0052] This passage, which is considerably wider at the recess 10a of the front side 10, is used to drop the small workpieces onto the underlying chute 16, that conveys them into the collection container 17.

[0053] It will be appreciated that the workpieces formed by a punching machine having the movable section 9, do not need to be held attached to the sheets of their respective base items after punching and forming, unlike in prior art punching machines, because both large-and small-sized punched workpieces are discharged from the work table 3 immediately after being formed.

[0054] The invention was found to fulfill the intended objects.

[0055] The invention so conceived is susceptible to a number of changes and variants within the inventive concept.

[0056] Furthermore, all the details may be replaced by other technically equivalent parts.

[0057] In practical implementation, any materials, shapes and sizes may be used as needed, without departure from the scope of the following claims.

Claims

1. A punching machine which comprises:

- A base (1) which has a work table (3) which defines an horizontal resting surface (4) on which an item (5) to be punched is designed to be placed for obtaining punched items;
- An operating head that is arranged upon said work table (3) and equipped with punching means to punch said item;

said work table (3) comprising at least one opening (8) having a perimeter inside which a movable section (9) of said work table (3) is fitted which defines a supplementary movable surface (9a) of said resting surface (4) and which can be moved by moving means (11, 12) between a punching position and a downloading position of said punched items, **characterized in that** said movable section (9) has moving means (11, 12) in a configuration co-planar with said work table (3).

2. A punching machine as claimed in claim 1, wherein said movable section (9) comprises inclining means (14) into an inclining direction around a rotation axis with respect of said work table (3).

3. A punching machine as claimed in claim 1 or 2, wherein said movable section (9) has at least one dimension lower than a corresponding dimension of said opening (8), so as to define a downloading passage (18) between said resting surface (4) of said work table (3) and a below zone of the latter in said downloading position.

4. A punching machine as claimed in anyone of preceding claims wherein said movable section (9) comprises a plurality of parallel roll means (19) having rotation axes parallel to said resting surface (4) of said work table (3) and defining said movable surface (9a).

5. A punching machine as claimed in claim 4, wherein said roll means comprise a plurality of reciprocally drown up rollers (19) and rotationally powered by power means (20), said rollers (19) having their outer surfaces equipped with outwardly projecting flexible bristles defining said movable surface (9a).

6. A punching machine as claimed in claim 3, wherein in said below zone collecting and transport means (15, 17) away from said base (1) are housed.

7. A punching machine as claimed in claim 1, wherein said perimeter is quadrangular and has one front side facing said operating head and one opposing rear side.

8. A punching machine as claimed in claims 1 and 6, wherein said movable section (9) comprises a quadrangular platform having sides parallel to the sides of said quadrangular perimeter and which is contained in the inside of the latter, alternatively movable between said punching position and said downloading position.

9. A punching machine as claimed in anyone of preceding claims, wherein a front side (10) of said movable section (9) has a passing through recess (10a) for punched items.

10. A punching machine as claimed in claim 10, wherein said moving means comprise:

- horizontal guiding means (11) on which slide means fixed to said movable section (9) are slidingly arranged, and
- actuating means (12) fitted between said base (1) and said movable section (9).

11. A punching machine as claimed in anyone of preceding claims, wherein below said work table (3) a channeling chute (16) of said punched items toward said collecting and transport means (15, 17) is arranged.

Patentansprüche

1. Stanzmaschine, die umfasst:

- eine Basis (1), die einen Arbeitstisch (3) aufweist, der eine horizontale Auflagefläche (4) definiert, auf der ein zu stanzender Artikel (5) platziert werden soll, um gestanzte Artikel zu erhalten;
- einen Betriebskopf, der auf dem Arbeitstisch (3) angeordnet und mit Stanzmitteln zum Stanzen des Artikels ausgestattet ist;

wobei der Arbeitstisch (3) mindestens eine Öffnung (8) mit einem Umkreis umfasst, an dessen Innenseite ein beweglicher Abschnitt (9) des Arbeitstisches (3) eingesetzt ist, der eine ergänzende bewegliche Oberfläche (9a) der Auflagefläche (4) definiert und der durch Bewegungsmittel (11, 12) zwischen einer Stanzposition und einer Herunterladeposition der gestanzten Artikel bewegt werden kann, **dadurch gekennzeichnet, dass** der bewegliche Abschnitt (9) Bewegungsmittel (11, 12) in einer koplanaren Ausbildung mit dem Arbeitstisch (3) aufweist.

2. Stanzmaschine nach Anspruch 1, wobei der bewegliche Abschnitt (9) Neigungsmittel (14) in eine Neigungsrichtung um eine Drehachse in Bezug auf den Arbeitstisch (3) umfasst.

3. Stanzmaschine nach Anspruch 1 oder 2, wobei der bewegliche Abschnitt (9) mindestens eine Dimension aufweist, die kleiner ist als eine entsprechende Dimension der Öffnung (8), um so einen Herunterladedurchlass (18) zwischen der Auflagefläche (4) des Arbeitstisches (3) und einer unteren Zone des letztgenannten in der Herunterladeposition zu definieren.

4. Stanzmaschine nach einem der vorstehenden Ansprüche, wobei der bewegliche Abschnitt (9) eine Vielzahl von parallelen Walzenmitteln (19) umfasst, die Drehachsen parallel zur Auflagefläche (4) des Arbeitstisches (3) aufweisen und die bewegliche Oberfläche (9a) definieren.

5. Stanzmaschine nach Anspruch 4, wobei die Walzenmittel eine Vielzahl von sich auf- und abwärts bewegender Walzen (19) umfassen und durch Antriebsmittel (20) in Drehung versetzt werden, wobei die Walzen (19) an ihren Außenflächen mit nach außen

ragenden, flexiblen Borsten ausgestattet sind, die die bewegliche Oberfläche (9a) definieren.

6. Stanzmaschine nach Anspruch 3, wobei in der unteren Zone Sammel- und Transportmittel (15, 17) fern der Basis (1) untergebracht sind.

7. Stanzmaschine nach Anspruch 1, wobei der Umkreis viereckig ist und eine Vorderseite, die dem Betriebskopf zugewandt ist und eine gegenüberliegende Rückseite aufweist.

8. Stanzmaschine nach einem der Ansprüche 1 und 6, wobei der bewegliche Abschnitt (9) eine viereckige Plattform umfasst, mit Seiten, die zu den Seiten des viereckigen Umkreises parallel sind, und die in der Innenseite des letztgenannten enthalten ist, die abwechselnd zwischen der Stanzposition und der Herunterladeposition beweglich ist.

9. Stanzmaschine nach einem der vorstehenden Ansprüche, wobei eine Vorderseite (10) des beweglichen Abschnitts (9) eine hindurchgehende Vertiefung (10a) für gestanzte Artikel aufweist.

10. Stanzmaschine nach Anspruch 10, wobei die Bewegungsmittel umfassen:

- horizontale Führungsmittel (11), an welchen Gleitmittel, die an dem beweglichen Abschnitt (9) fixiert sind, gleitfähig angeordnet sind, und
- Betätigungsmittel (12), die zwischen der Basis (1) und dem beweglichen Abschnitt (9) eingesetzt sind.

11. Stanzmaschine nach einem der vorstehenden Ansprüche, wobei unter dem Arbeitstisch (3) eine Kanalisierungsrutsche (16) der gestanzten Artikel zu den Sammel- und Transportmitteln (15, 17) angeordnet ist.

Revendications

1. Machine à poinçonner qui comprend :

- une base (1) qui a une table de travail (3) qui définit une surface de repos horizontale (4) sur laquelle un article (5) à poinçonner est conçu pour être placé afin d'obtenir des articles poinçonnés ;
- une tête opérationnelle qui est agencée sur ladite table de travail (3) et équipée de moyens de poinçonnement pour poinçonner ledit article ;

ladite table de travail (3) comprenant au moins une ouverture (8) ayant un périmètre à l'intérieur duquel est ajustée une section mobile (9) de ladite table de travail (3) qui définit une surface mobile supplémentaire (9a) de ladite surface de repos (4) et qui peut être déplacée par des moyens de déplacement (11, 12) entre une position de poinçonnement et une position de transfert desdits articles poinçonnés, **caractérisée en ce que** ladite section mobile (9) a des moyens de déplacement (11, 12) dans une configuration coplanaire avec ladite table de travail (3).

2. Machine à poinçonner selon la revendication 1, dans laquelle ladite section mobile (9) comprend des moyens d'inclinaison (14) dans une direction d'inclinaison autour d'un axe de rotation par rapport à ladite table de travail (3).

3. Machine à poinçonner selon la revendication 1 ou 2, dans laquelle ladite section mobile (9) a au moins une dimension inférieure à une dimension correspondante de ladite ouverture (8), de manière à définir un passage de transfert (18) entre ladite surface de repos (4) de ladite table de travail (3) et une zone inférieure de celle-ci dans ladite position de transfert.

4. Machine à poinçonner selon l'une quelconque des revendications précédentes, dans laquelle ladite section mobile (9) comprend une pluralité de moyens de rouleaux parallèles (19) ayant des axes de rotation parallèles à ladite surface de repos (4) de ladite table de travail (3) et définissant ladite surface mobile (9a).

5. Machine à poinçonner selon la revendication 4, dans laquelle lesdits moyens de rouleaux comprennent une pluralité de rouleaux ensevelis en va-et-vient (19) et entraînés de manière rotative par des moyens de puissance (20), lesdits rouleaux (19) ayant leurs surfaces extérieures équipées de poils flexibles faisant saillie vers l'extérieur définissant ladite surface mobile (9a).

6. Machine à poinçonner selon la revendication 3, dans laquelle, dans ladite zone inférieure, des moyens de collecte et de transport (15, 17) sont reçus de manière éloignée de ladite base (1).

7. Machine à poinçonner selon la revendication 1, dans laquelle ledit périmètre est quadrangulaire et comporte un côté avant faisant face à ladite tête opérationnelle et un côté arrière opposé.

8. Machine à poinçonner selon les revendications 1 et 6, dans laquelle ladite section mobile (9) comprend une plate-forme quadrangulaire ayant des côtés parallèles aux côtés dudit périmètre quadrangulaire et qui est contenue à l'intérieur de celle-ci, en étant mobile alternativement entre ladite position de poinçonnement et ladite position de transfert.

9. Machine à poinçonner selon l'une quelconque des revendications précédentes, dans laquelle un côté avant (10) de ladite section mobile (9) a un évidement de passage traversant (10a) pour des articles poinçonnés.

10. Machine à poinçonner selon la revendication 10, dans laquelle lesdits moyens de déplacement comprennent :

- des moyens de guidage horizontal (11) sur lesquels des moyens coulissants fixés à ladite section mobile (9) sont agencés de manière coulissante, et
- des moyens d'actionnement (12) montés entre ladite base (1) et ladite section mobile (9).

11. Machine à poinçonner selon l'une quelconque des revendications précédentes, dans laquelle, sous ladite table de travail (3), est agencée une glissière de canalisation (16) desdits articles poinçonnés en direction desdits moyens de collecte et de transport (15, 17).

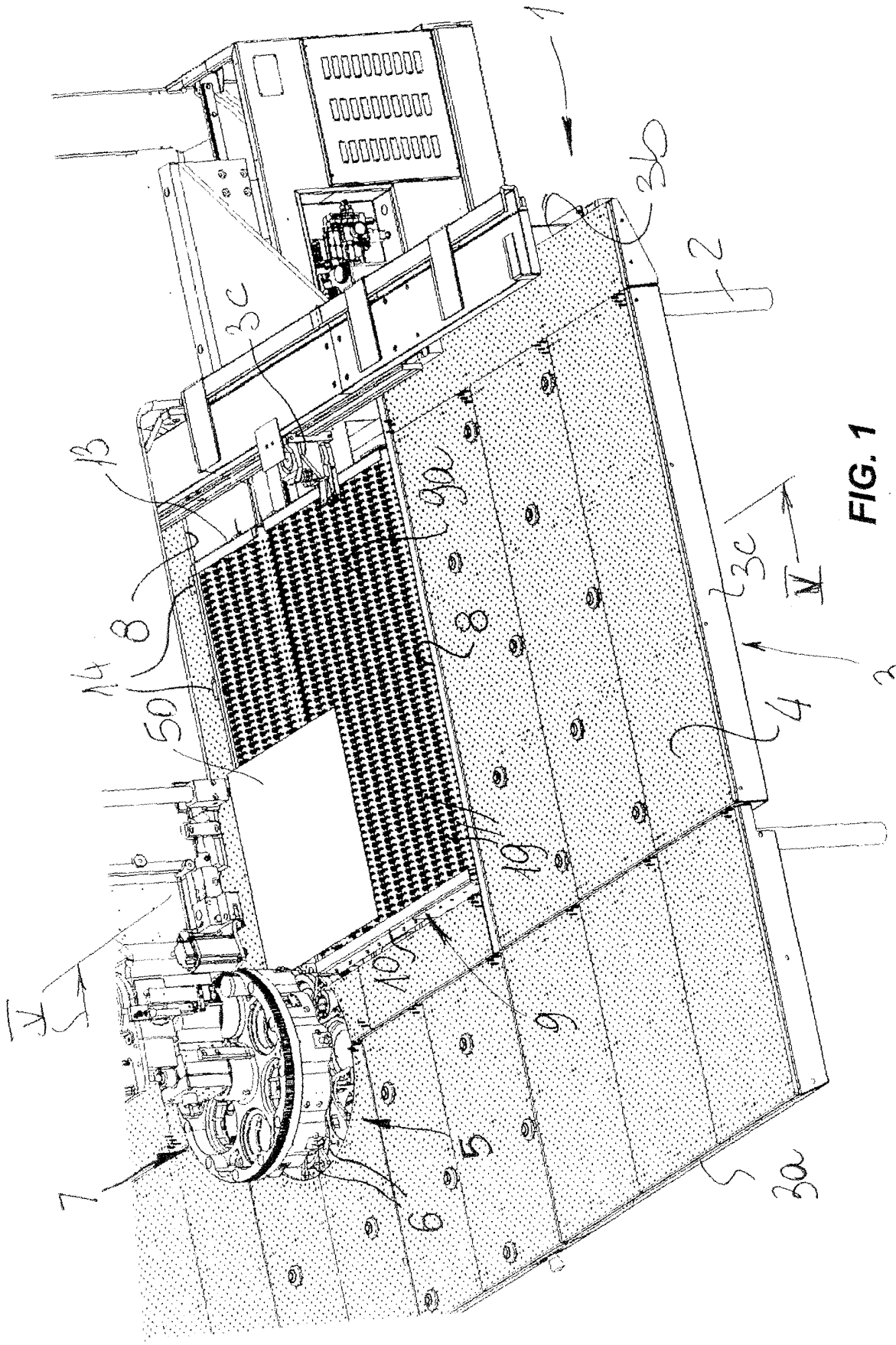

FIG. 1

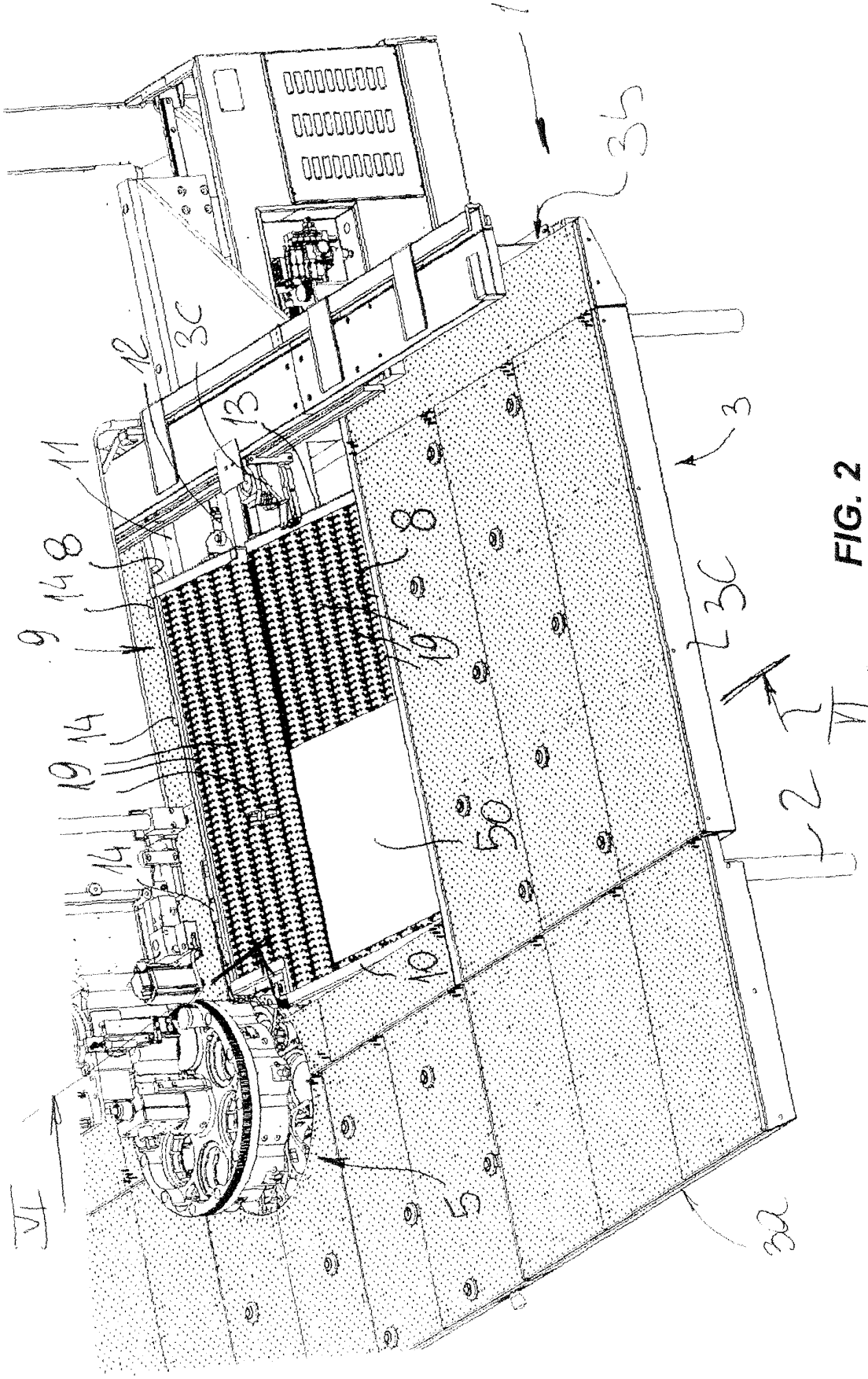

FIG. 2

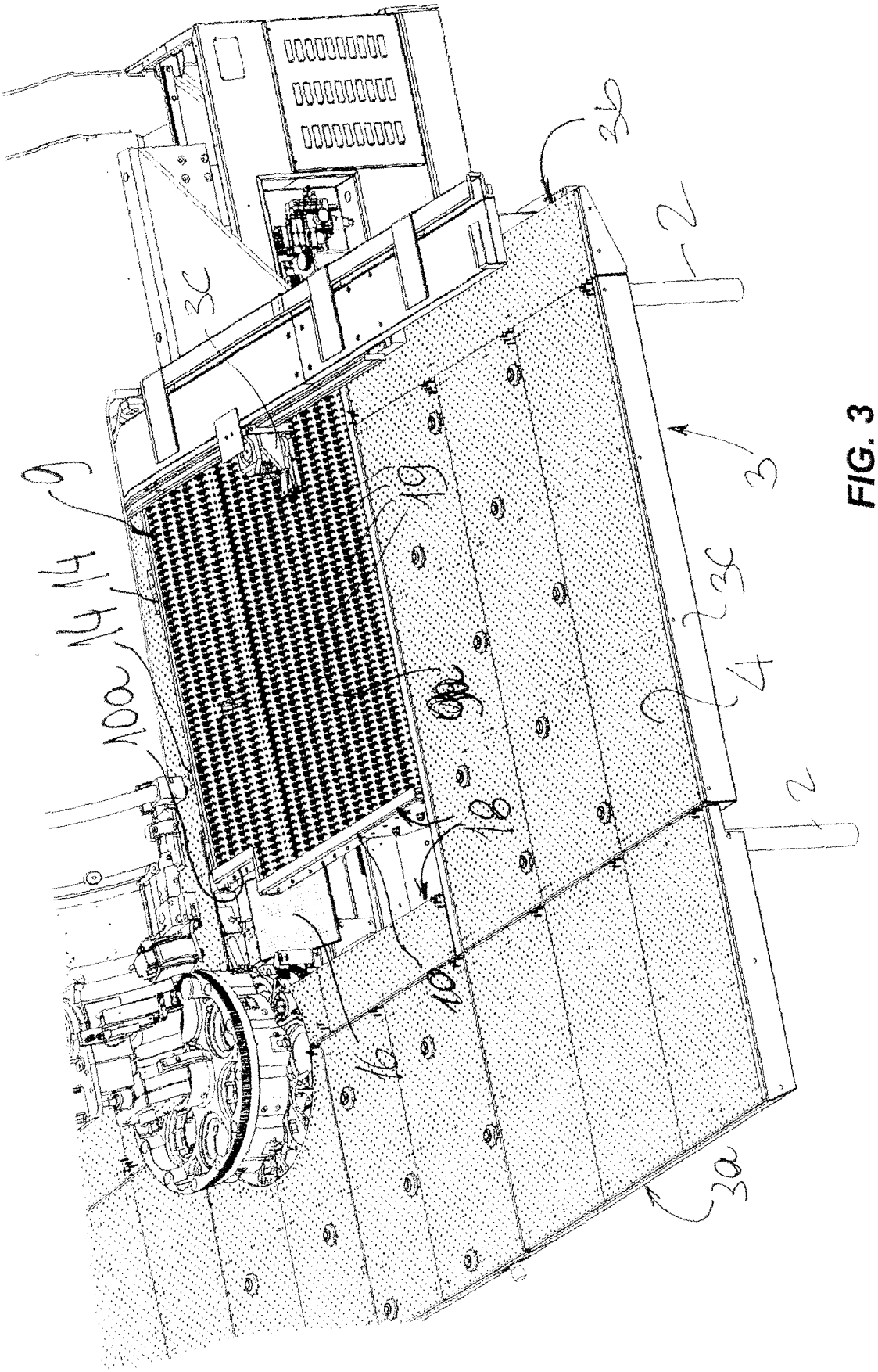

FIG. 3

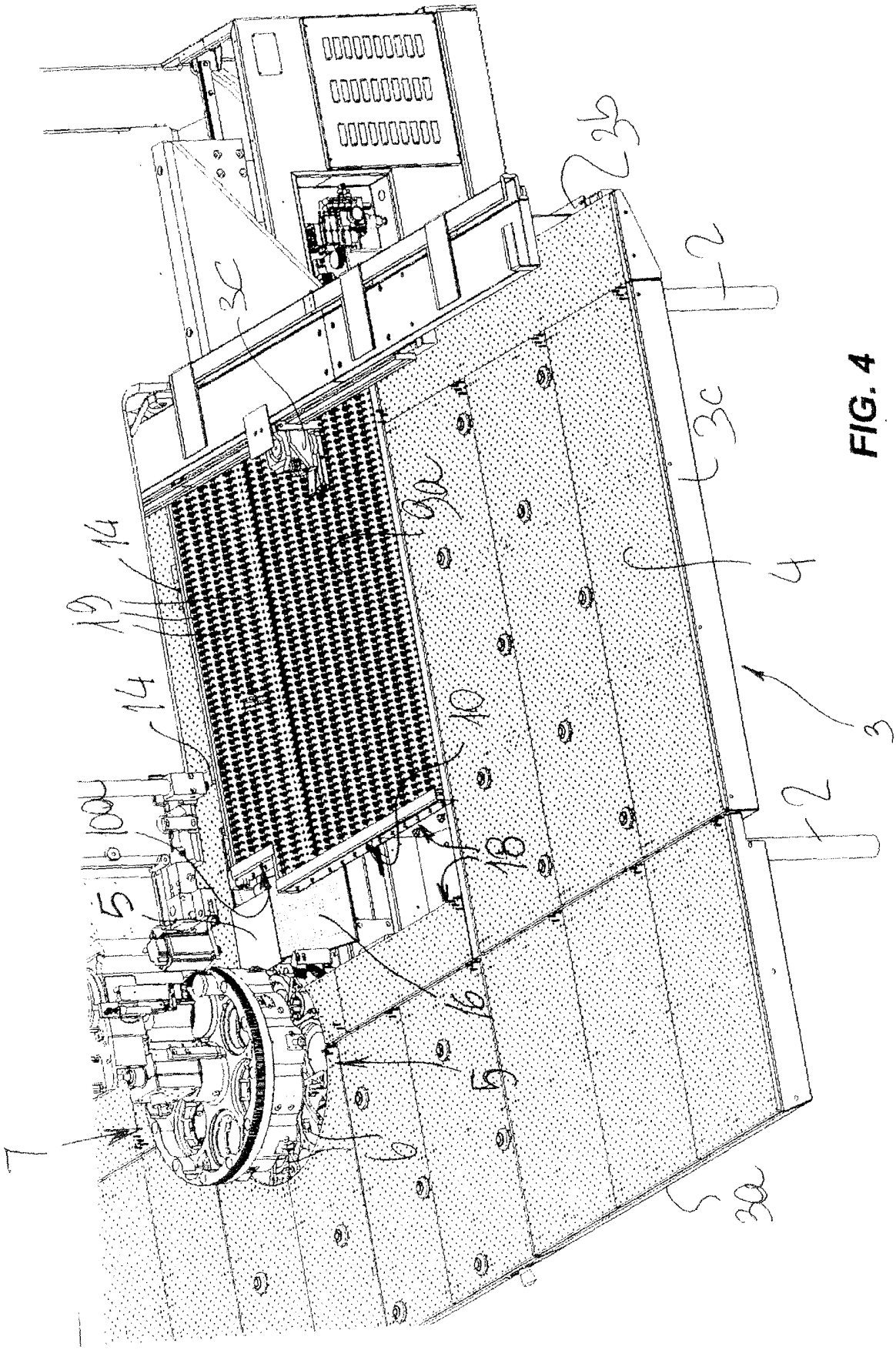

FIG. 4

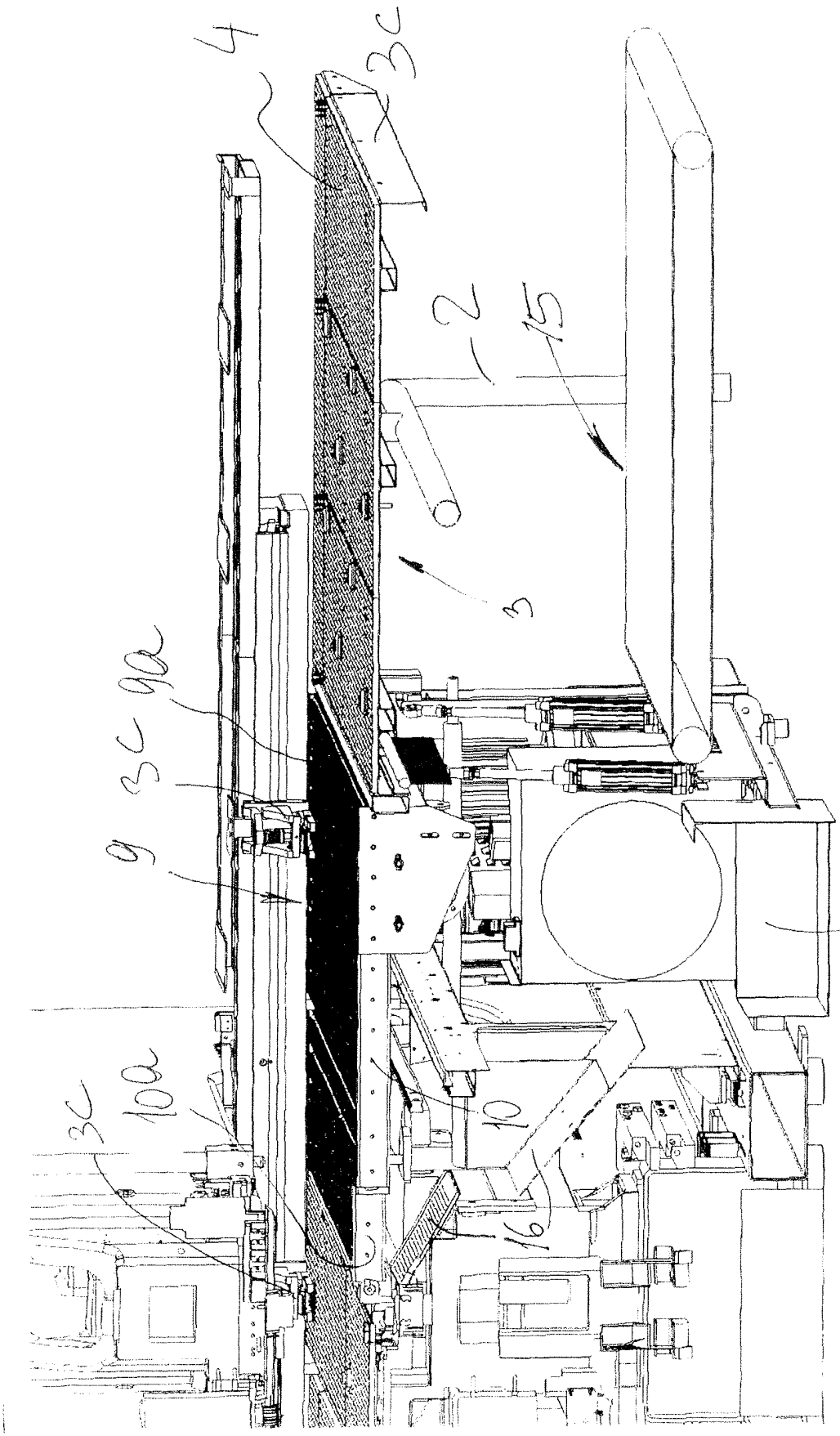

FIG. 5

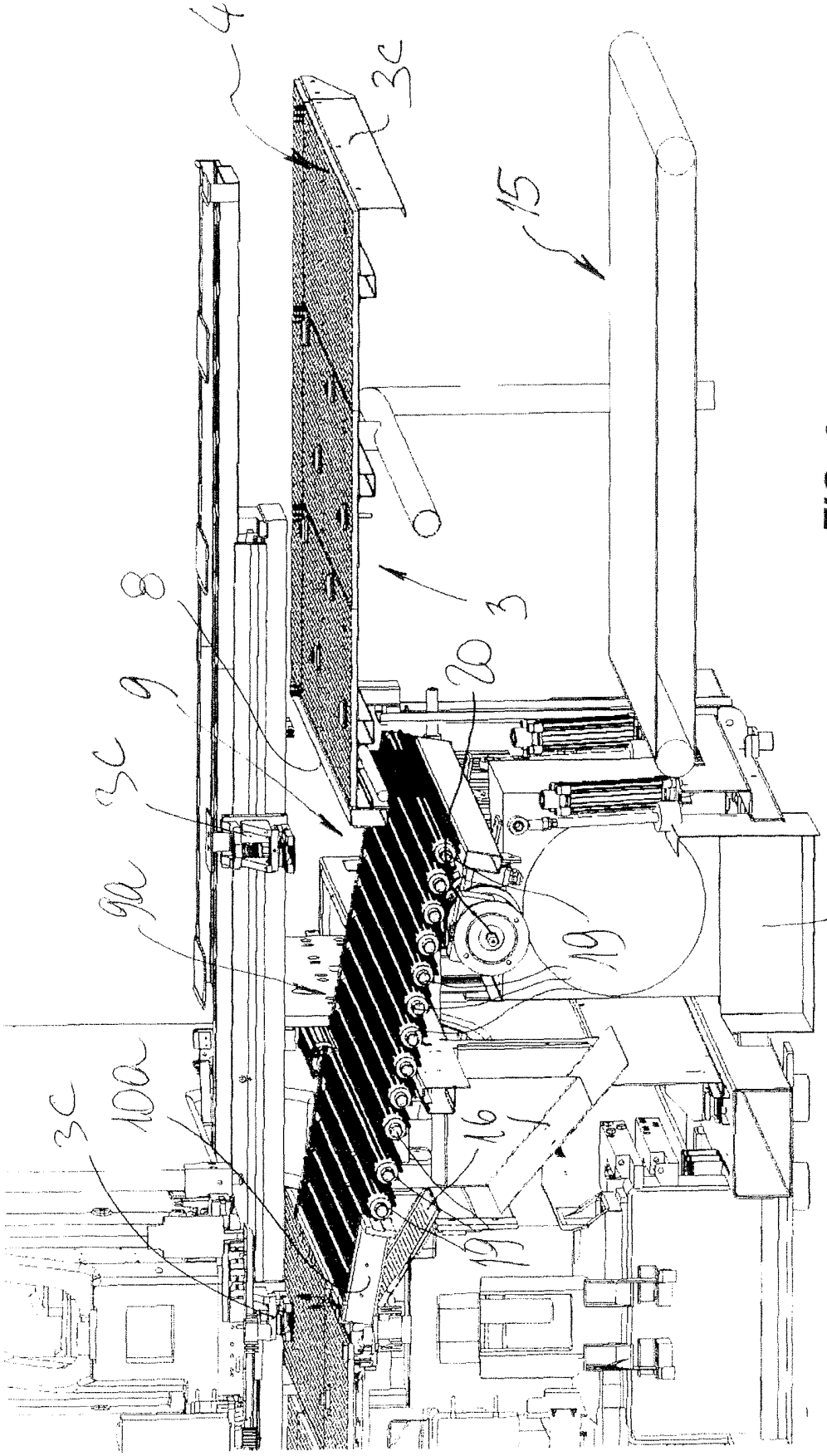

FIG. 6

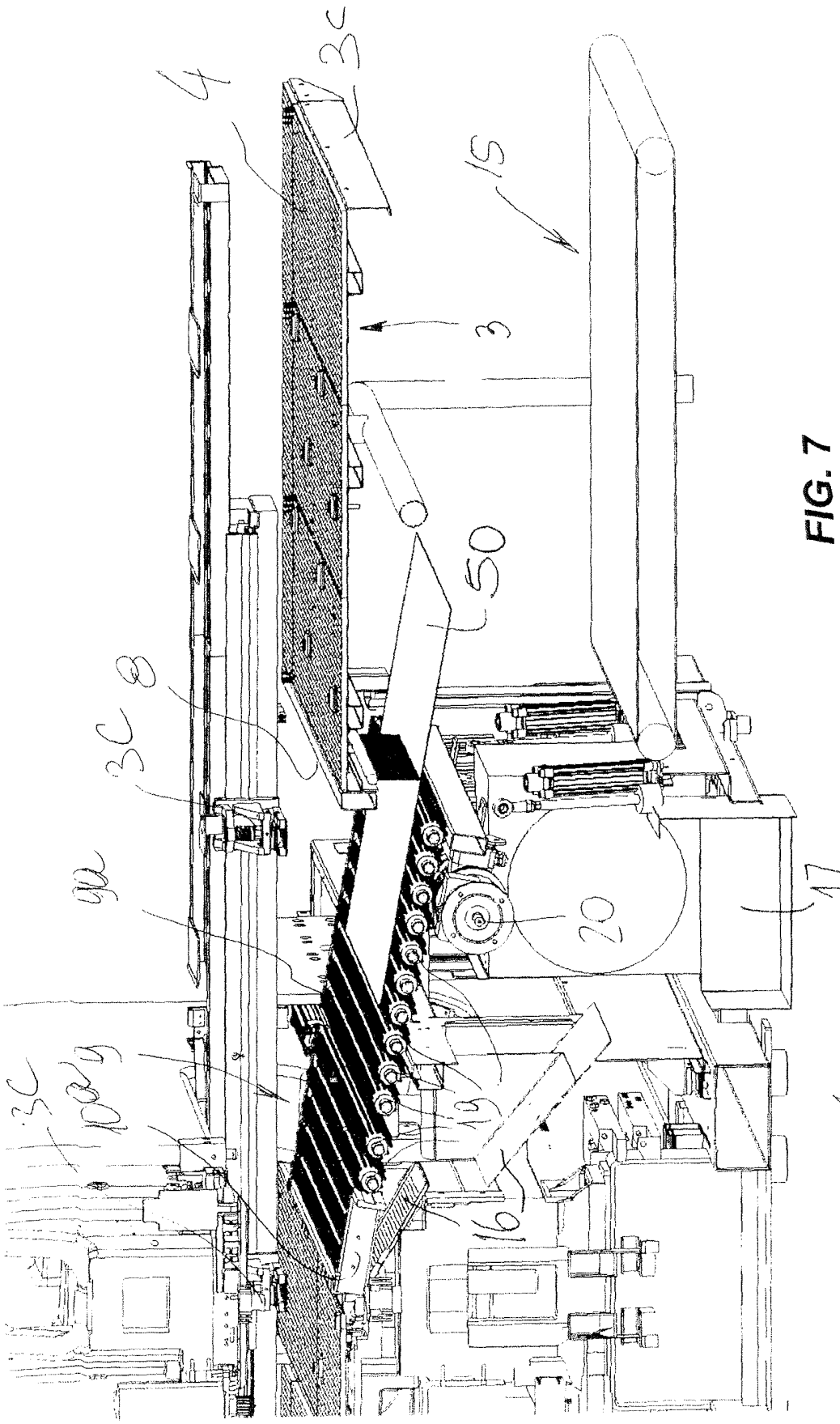

FIG. 7

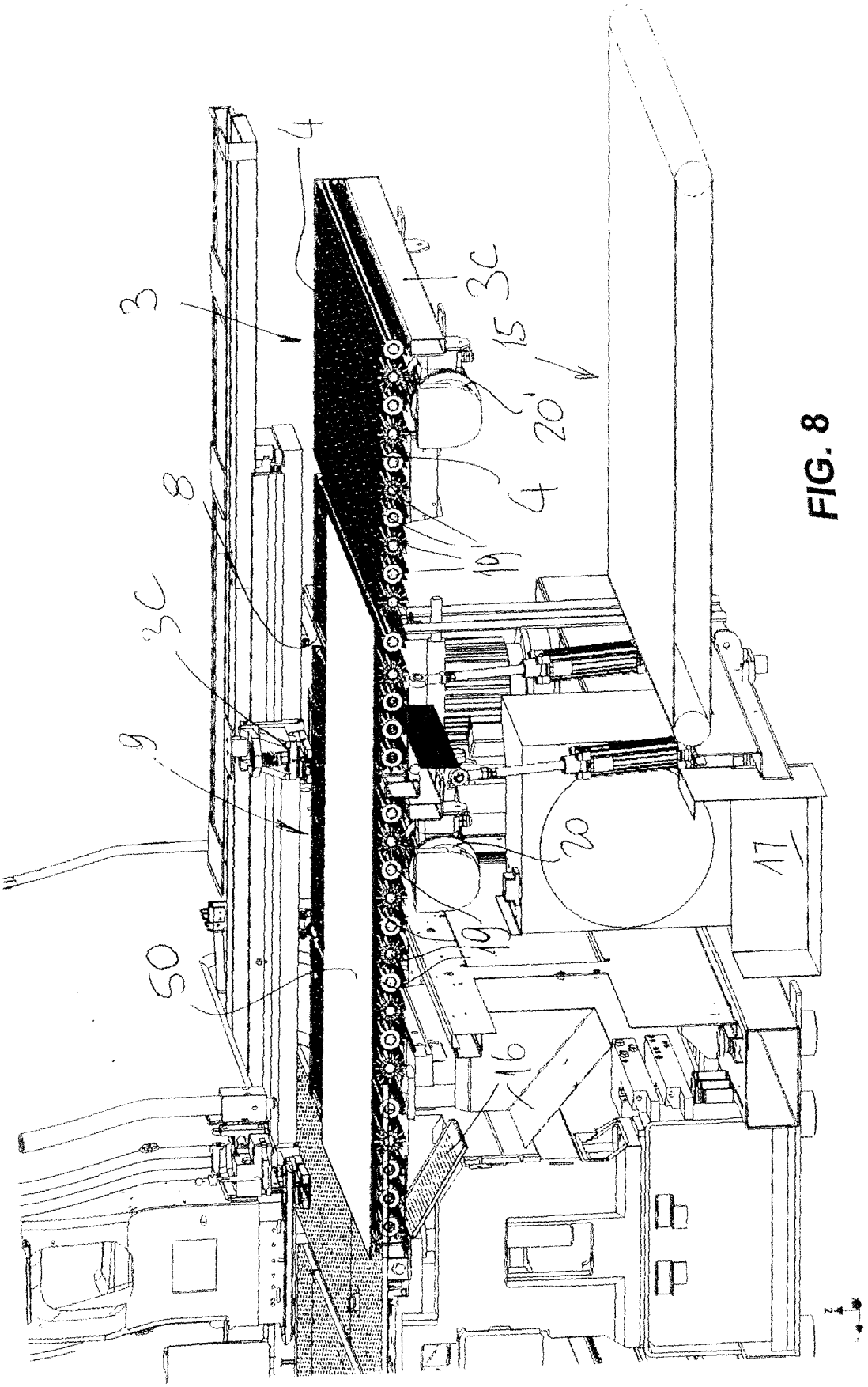

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4690021 A **[0002]**