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(54) DEVICE FOR THE DETECTION OF BREAKING OF A FIBRE WEB

VORRICHTUNG ZUR ERKENNUNG VON FASERBAHNBRÜCHEN

DISPOSITIF DE DETECTION DE RUPTURE D'UNE BANDE FIBREUSE

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Description

[0001] The present invention relates to a device for the detection of breaking of a fibre web, which can be used in machinery used for processing webs.

[0002] It is well-known that the processing of flock fibre to obtain a web is first performed on blow room machines, destined to produce a fibre still in flock form but partially cleansed, destined for processing on the carding machine, which comes off in the form of a web.

[0003] The web then undergoes further processing, downline from carding, for example in a draw frame, a lap winder or combing machine, for the main purpose of obtaining a cleaner web with as regular a gauge as possible and well paralleled fibres.

[0004] During processing on the machines downline of the carding machine, and especially on the draw frame, the lap winder or combing machine, it is extremely important to immediately detect breaking of the web, so as to promptly stop the machine from running, reunite the sections and resume processing.

[0005] In this sector it is therefore extremely important to have a device which detects breaking of the web suitable to immediately detect such breaking, but also suitable to reliably detect such, in other words when the breaking effectively arises.

[0006] In fact, machine downtime affects both production costs and the quality of the web, especially the repeatability of the desired production features of the web (degree of cleanliness, regularity of the gauge).

[0007] Numerous detection devices exist which are known in the art.

[0008] For example, document CH 383228 shows a machine receiving two webs from two cans and a device for the detection of breaking formed by a fixed cylinder and a mobile cylinder, which holds the web against the fixed cylinder by means of a spring. The breaking of the web causes contact between the cylinders, closing a circuit which signals the breakage.

[0009] Document DE 1 172 167, shows a detection device formed by a light emitter and a receiver. The beam emitted is interrupted by the web when intact. When the web breaks, the ray of light reaches the receiver, which signals the breaking.

[0010] Document GB 886,525 shows a lever identification device, wherein the yarn, when intact, keeps a hinged lever in a raised position, against gravity. Following breaking of the yarn, the lever rotates, striking against a plate, which blocks the machine.

[0011] Document US 3,330,007 shows a pile-operated detection device, composed of a frame and a lever, separated electrically from the frame when the web is intact. Following breaking of the web, the web continually fed by the rollers upline piles up under the lever, raising it and putting it in contact with the frame. The blocking circuit is thus closed.

[0012] Document JP-59-168138 shows a detection device comprising optic fibres and a receiver. When the yarn breaks, the beam of light emitted by the fibres is collected by the receiver, which sends a blocking signal.

[0013] Document US 5,023,976 shows a detection device composed of bars bearing sensors, one for each web fed in.

[0014] Other patent documents show further detection devices, functionally similar to those described above. For example, JP-U-49127507 and US 1,589,648.

[0015] A further known detection device comprises a plurality of small, freely moving rollers lying on the web, supported by rotating cylinders placed below the web. When one of the webs breaks, the relative roller falls onto the cylinder below it, closing the blocking circuit.

[0016] However the solutions known of today have some drawbacks.

[0017] The solutions in which a component is pressed against the web by a spring, give rise to an action resisting the advancement of the web, which translates into undesired drawing of it. The same happens when the device has small rollers supported by the web and by the rotating rollers under it. As is said in the trade "false draws" are generated.

[0018] The solutions which foresee the use of light sources alone in which interruption of the beam determines a block signal are not very reliable in that the webs, travelling at very high speeds tend to fluctuate, so that it is possible for a beam of light to be interrupted by a fluctuating but intact web. On the other hand, again for such type of devices, it is possible for the web to break but on account of the fluctuations, the broken ends of the section of web upline and downline of the breakage do not intercept the luminous beam so that no blocking signal is generated.

[0019] The aim of the present invention is to create a detection device which overcomes the drawbacks spoken of with reference to the known art, at the same time satisfying the aforesaid requirements.

[0020] Such purpose is achieved by a detection device made according to claim 1. The dependent claims describe embodiment variations.

[0021] The characteristics and advantages of the detection device according to the present invention will be evident from the description given below, made by way of an indicative and non-limiting example according to the attached figures, wherein:

figure 1 shows a perspective view of a device according to an embodiment of the present invention;
figure 2 shows a lateral view of the detection device of figure 1; and
figure 3 illustrates an overhead view of the detection device in figure 1;
figure 4 shows a perspective view of a detection device according to a further embodiment of the present invention;
figure 5 represents a lateral view of the detection device in figure 4; and
figure 6 illustrates an overhead view of the detection

device in figure 4.

[0022] With reference to the attached figures, reference numeral 1 globally denotes a device for the detection of breaking of a fibre web according to the present invention.

[0023] The detection device 1 comprises a frame 2, to which the components of the device are connected, which can be joined to a machine for mounting the said device to the machine.

[0024] Preferably, the frame 2 comprises a flat bottom wall 4, a side wall 6, joined to the bottom wall 4 and jutting out from it, for example perpendicularly, and an exit wall 8, joined to the lateral wall and inclined so as to be practically parallel to the bottom wall.

[0025] The frame 2 comprises in addition lateral ends 9a, 9b which define the device transversally.

[0026] The device 1 has an entrance area 10, where the web goes into after coming out of processing by other devices or machinery upline of the detection device, for example from a carding machine.

[0027] Furthermore, the device has an exit area 12, where the web comes out of before being directed towards further processing, performed by further devices or machines downline of the detection device 1, for example to the draft unit of a draw frame.

[0028] From the entrance area 10 towards the exit area 12, the web moves along a direction of movement X, in a direction of advancement.

[0029] The device 1 comprises at least one detection element 20, free to move so as to be suitable to move by falling, in a falling direction Y, from an area of normal functioning 22, when the web is intact, to a signalling area 24, when the web incurs a breakage.

[0030] In other words, the detection element 20 is supported by the web in transit between the entrance area 10 and the exit area 12, so as to remain in the area of normal functioning 22, above the web itself.

[0031] Below the web rather is the signalling area 24, which the detection element 20 enters by falling when the web breaks.

[0032] The detection element 20 is of such a weight as to be supported in the normal functioning area 22 solely by the web in transit.

[0033] The detection element 20, in fact, is sufficiently light to be supported by the web itself in transit, without the assistance of rotating rollers below the web itself.

[0034] For example, the detection element 20 is an internally hollow body, for example made from non-conductive material, such as a plastic material.

[0035] The detection element 20 is of a suitable geometric shape to facilitate its rolling over the web in transit.

[0036] For example, having defined a transversal direction T as a direction perpendicular to the direction of movement X and to the direction of falling Y, the detection element 20 is a body having a circular transversal cross-section.

[0037] Preferably, the detection element 20 is an essentially spherical body.

[0038] Furthermore, the device 1 comprises means of detection to detect the presence of said detection element 20 in the signalling area 24.

[0039] For example, the means of detection comprise an emitter 30 of a detection signal, such as a beam of light, and a receiver 32.

[0040] In conditions of normal functioning, the signal emitted by the emitter 30 reaches the receiver 32 undisturbed; when, following breaking of the web, the detection element 20 loses its support and falls into the signalling area 24, this obstructs the passage of the signal from the emitter to the receiver, in that it is made in such a form, size and material as to be opaque to said signal.

[0041] The receiver 32, not receiving any detection signal, emits a blocking signal to stop the machine.

[0042] In further embodiments, the means of detection comprise two electrically uncoupled electric elements which, when the detection element falls, become electrically connected, thus closing the blocking circuit.

[0043] It may be noted however that the means of detection are positioned at a height such as to be disengaged structurally from the detection element 20 when said detection element is supported by the.intact web. In other words, the detection element is supported only by the web, without the help of other organs, for example belonging to such means of detection.

[0044] The device 1 comprises, in addition, means of positioning to limit the movement of the detection element between the entrance area 10 and the exit area 12.

[0045] In other words, the means of positioning limit the movement of the detection element in the direction of movement X of the web.

[0046] Said means of positioning comprise a number of rods 40, 140 extending mainly along the falling direction Y of the detection element 20, arranged so as to form a cage for the detection elements.

[0047] The area of normal functioning 22 and the signalling area 24 are defined between said rods 40, 140 in the direction of falling Y.

[0048] Furthermore said means of positioning limit the movement of the detection element 20 in the transversal direction T.

[0049] Said rods 40, 140 are spaced along the transversal direction T.

[0050] Specifically, said rods 40, 140 are sized and spaced so as to prevent the passage of the detection element 20 between them, and also, preferably, to prevent contact between one detection element and the one transversally alongside it.

[0051] According to one embodiment, the means of positioning comprise two rows of rods 40 spaced along the direction of movement X of the web, wherein each row has rods spaced out in the transversal direction T (figures 1 to 3).

[0052] Each detection element 20 is limited in its movement by four rods 40, moving inside the cage formed by these.

[0053] In a further embodiment variation, the means of positioning comprise shaped rods 140 which have at least one concave side 142 such as to accommodate the detection element 20 partially to limit its movement (figures 4 to 6).

[0054] Specifically, the shaped rod 140 has a normal cross-section, obtained with a plane perpendicular to the direction of falling Y of the detection element 20, having a concave indentation on the side of the detection element, forming said concave side 142.

[0055] Preferably, in addition, the shaped rod 140 has at least one rounded head 144, at least above such indentation.

[0056] For example, the shaped rod 140 has a cross-section in the shape of an "8", with two heads 144 at the extremities, joined by a neck 146 thinner than the heads, which makes the concave side 142.

[0057] Advantageously, the shaped heads help the web to slide along and limit the occurrence of undesired winding.

[0058] According to a further embodiment, the device 1 comprises means of cleaning suitable to free the operating area of the detection device from any residues which may have detached from the web while running through.

[0059] Preferably, the means of cleaning comprise means of suction comprising at least one nozzle 150 connected to a suction device.

[0060] For example, the nozzle 150 is positioned on the bottom 4 of the frame 2 of the device 1, in the transversal band occupied by the rods 40, 140, preferably in line with the optic eye of the detection device.

[0061] According to one embodiment variation, the means of cleaning comprise a blowing mechanism suitable to blow away the residues from the operating area of the detection device.

[0062] Preferably, in addition, the device 1 comprises means of guidance suitable to guide the web between the entrance area 10 and the exit area 12.

[0063] For example, the means of guidance comprise a bar upline 50 and a bar downline 52 extending mainly in a transversal direction T, spaced along the direction of movement X. For example, the bars 50, 52 are circular cylindrical.

[0064] It may be noted that a plane tangent to the external surface of said bars 50, 52 defines a plane of movement of the web and that the signalling area 24 is defined below the tangent plane, in the direction of falling Y of the detection element 20.

[0065] Preferably, in addition, the means of guidance comprise a diverter bar 60, positioned upline of the upline bar 50, extending mainly in a transversal direction T.

[0066] Preferably, the bars 50, 52 are attached to the sides 9a, 9b, while the rods 40, 140 are attached to the bottom wall 4.

[0067] Preferably, in addition, the device 1 comprises a number of detection elements 20, positioned alongside each other transversally, each element being destined to be supported by its respective web.

[0068] Innovatively, the detection device according to the present invention makes it possible to overcome the drawbacks of the known state of the art.

[0069] Specifically, the web does not suffer from false draws caused by heavy organs supported by it or pressed against it. The web is, therefore, free to run along.

[0070] Advantageously, in addition, the spherical elements have an accentuated propensity to roll freely in that they minimise the points of contact with the surrounding means of positioning.

[0071] According to a further advantageous aspect, the device makes it possible to limit undesired windings of the web.

[0072] In addition, the device satisfies the requisites highlighted previously, in that it detects breaking only when this actually happens, in that the fluctuations of the web in transit do not influence the means of detection.

Claims

1. Device for the detection (1) of breaking of a fibre web, comprising:

- an entrance area (10), where the web coming out of a device upline of said detection device goes into;
- an exit area (12), where the web comes out of, directed towards a device downline of said detection device, the web in transit from the entrance area to the exit area defining a direction of movement (X);
- at least one detection element (20), freely-moving so as to be suitable to move by falling, in a direction of falling (Y), from an area of normal functioning (22), when the web is intact, to a signalling area (24) when the web breaks, a transversal direction (T) being defined as a perpendicular direction to the direction of movement (X) and the direction of falling (Y), wherein said at least one detection element (20) has such a weight as to be supported in said normal functioning area (22) exclusively by the web in transit and a geometric shape for rolling over the web in transit;
- means of positioning to limit the movement of the detection element (20) between the entrance area (10) and the exit area(12) and in said transversal direction (T);
- means of detection (30, 32) to detect the presence of said detection element (20) in the signalling area (24);

characterized in that said means of positioning comprise a number of rods (40,140), extending mainly in the falling direction (Y) of the detection element (20), between which the area of normal functioning and the signalling area are defined,

and spaced along the transversal direction (T).

2. Device according to claim 1, wherein the means of detection are positioned at such a height as to be structurally disengaged from the detection element (20) when said detection element (20) is supported by the intact web.

3. Device according to claim 1 or 2, wherein said means of detection comprise an emitter (30) to emit a detection signal and a receiver (32) to receive said detection signal, wherein the detection element (20) is at least partially opaque to said detection signal.

4. Device according to claim 3, wherein the detection element (20) is made of plastic material and said emitter (30) emits a luminous beam as a detection signal.

5. Device according to any of the previous claims, wherein the detection element (20) is a hollow body.

6. Device according to any of the previous claims, wherein the detection element (20) is made in electrically non-conductive material.

7. Device according to claim 6, wherein said material is a plastic material.

8. Device according to any of the previous claims, wherein the detection element (20) is a body having a circular transversal cross-section.

9. Device according to claim 7, wherein the detection element (20) is an essentially spherical body.

10. Device according to any of the previous claims, wherein the rods (140) are shaped and have at least one concave side (142) such as to partially accommodate the detection element (20) to limit its movement.

11. Device according to claim 10, wherein the shaped rod (140) has at least one rounded head (144), at least a side the concave side (142).

12. Device according to any of the previous claims, comprising means of guidance (50, 52) to guide the web between the entrance area (10) and the exit area (12).

13. Device according to claim 12, wherein the means of guidance comprise a bar upline (50) and a bar downline (52), extending mainly in a transversal direction (T), spaced along the direction of movement (X).

14. Device according to any of the previous claims, comprising means of cleaning (150) to free the operating area of the means of detection (30, 32) from residues of the web running along.

15. Draw frame or lap winder or combing machine or roving frame or spinning unit comprising at least one device for the detection of breaking of a fibre web according to any of the claims 1 to 14.

Patentansprüche

1. Vorrichtung zur Erkennung von Faserbahnbrüchen, die umfasst:

   - einen Eingangsbereich (10), in den die Bahn, die aus zwei Vorrichtungen vor der Erkennungsvorrichtung herauskommt, hineingeht;
   - einen Ausgangsbereich (12), aus dem die Bahn herauskommt, wobei sie in Richtung einer Vorrichtung nach der Erkennungsvorrichtung geleitet wird, wobei die Bahn unterwegs von dem Eingangsbereich zu dem Ausgangsbereich eine Bewegungsrichtung (X) definiert;
   - wenigstens ein Erkennungselement (20), das sich frei bewegt, so dass es geeignet ist, sich zu bewegen, indem es in eine Fallrichtung (Y) von einem normalen Funktionsbereich (22), wenn die Bahn intakt ist, zu einem Meldungs- bzw. Signalisierungsbereich (24) fällt, wenn die Bahn reißt, wobei eine Transversalrichtung (T) als eine Richtung senkrecht zu der Bewegungsrichtung (X) und der Fallrichtung (Y) definiert ist, wobei das wenigstens eine Erkennungselement (20) ein derartiges Gewicht, dass es in dem normalen Funktionsbereich (22) ausschließlich von der durchlaufenden Bahn gehalten wird, und eine geometrische Form hat, um über die durchlaufende Bahn zu rollen;
   - Positionierungsmittel zum Begrenzen der Bewegung des Erkennungselements (20) zwischen dem Eingangsbereich (10) und dem Ausgangsbereich (12) in der Transversalrichtung (T);
   - Erkennungsmittel (30, 32) zur Erkennung des Vorhandenseins des Erkennungselements (20) in dem Signalisierungsbereich (24);
   dadurch gekennzeichnet, dass die Positionierungsmittel eine Anzahl von Stangen (40, 140) umfassen, die sich hauptsächlich in der Fallrichtung (Y) des Erkennungselements (20) erstrecken, zwischen denen der normale Funktionsbereich und der Signalisierungsbereich definiert sind, und die entlang der Transversalrichtung (T) beabstandet sind.

2. Vorrichtung nach Anspruch 1, wobei die Erkennungsmittel auf einer derartigen Höhe positioniert werden, dass sie konstruktiv von dem Erkennungs-

element (20) gelöst werden, wenn das Erkennungselement (20) von der intakten Bahn gehalten wird.

3. Vorrichtung nach Anspruch 1 oder 2, wobei die Erkennungsmittel (30) einen Sender (30) zum Aussenden eines Erkennungssignals und einen Empfänger (32) zum Empfangen des Erkennungssignals umfassen, wobei das Erkennungselement (20) wenigstens teilweise undurchlässig für das Erkennungssignal ist.

4. Vorrichtung nach Anspruch 3, wobei das Erkennungselement (20) aus Kunststoffmaterial gefertigt ist und der Sender (30) einen Leuchtstrahl als ein Erkennungssignal aussendet.

5. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das Erkennungselement (20) ein hohler Körper ist.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das Erkennungselement (20) aus elektrisch nicht leitendem Material gefertigt ist.

7. Vorrichtung nach Anspruch 6, wobei das Material ein Kunststoffmaterial ist.

8. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das Erkennungselement (20) ein Körper mit kreisförmigem transversalem Querschnitt ist.

9. Vorrichtung nach Anspruch 7, wobei das Erkennungselement (20) ein im Wesentlichen kugelförmiger Körper ist.

10. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Stangen (140) geformt sind und wenigstens eine konkave Seite (142) haben, so dass sie das Erkennungselement (20) teilweise aufnehmen, um seine Bewegung zu begrenzen.

11. Vorrichtung nach Anspruch 10, wobei die geformte Stange (140) wenigstens neben der konkaven Seite (142) wenigstens einen abgerundeten Kopf (144) hat.

12. Vorrichtung nach einem der vorhergehenden Ansprüche, die Führungsmittel (50, 52) umfasst, um die Bahn zwischen dem Eingangsbereich (10) und dem Ausgangsbereich (12) zu führen.

13. Vorrichtung nach Anspruch 12, wobei die Führungsmittel eine vorgelagerte Stange (50) und eine nachgelagerte Stange (52) umfassen, die sich hauptsächlich in einer Transversalrichtung (T) erstrecken, die entlang der Bewegungsrichtung (X) beabstandet sind.

14. Vorrichtung nach einem der vorhergehenden Ansprüche, die Reinigungsmittel (150) umfasst, um den Arbeitsbereich der Erkennungsmittel (30, 32) von Resten der entlang laufenden Bahn zu befreien.

15. Streckwerk oder Schleifenwickler oder Kämmmaschine oder Vorspinnmaschine oder Spinneinheit, der/die wenigstens eine Vorrichtung zur Erkennung von Faserbahnbrüchen nach einem der Ansprüche 1 bis 14 umfasst.

Revendications

1. Dispositif pour la détection (1) de rupture d'une bande fibreuse comprenant :

une zone d'entrée (10) dans laquelle entre la bande sortant d'un dispositif en amont dudit dispositif de détection ;
une zone de sortie (12) de laquelle la bande sort, dirigée vers un dispositif en aval dudit dispositif de détection, la bande en transit de la zone d'entrée à la zone de sortie définissant une direction de déplacement (X) ;
au moins un élément de détection (20), se déplaçant librement afin de pouvoir se déplacer en tombant, dans une direction de chute (Y), d'une zone de fonctionnement normal (22), lorsque la bande est intacte, jusqu'à une zone de signalisation (24) lorsque la bande se casse, une direction transversale (T) étant définie comme étant une direction perpendiculaire à la direction de déplacement (X) et la direction de chute (Y), dans lequel ledit au moins un élément de détection (20) a un poids tel qu'il est supporté dans ladite zone de fonctionnement normal (22) exclusivement par la bande en transit et une forme géométrique pour le retournement de la bande en transit ;
des moyens de positionnement pour limiter le déplacement de l'élément de détection (20) entre la zone d'entrée (10) et la zone de sortie (12) et dans ladite direction transversale (T) ;
des moyens de détection (30, 32) pour détecter la présence dudit élément de détection (20) dans la zone de signalisation (24) ;
caractérisé en ce que lesdits moyens de positionnement comprennent un certain nombre de tiges (40, 140) s'étendant principalement dans la direction de chute (Y) de l'élément de détection (20), entre lesquelles la zone de fonctionnement normal et la zone de signalisation sont définies et espacées le long de la direction transversale (T).

2. Dispositif selon la revendication 1, dans lequel les moyens de détection sont positionnés à une hauteur

telle qu'ils sont structurellement dégagés de l'élément de détection (20) lorsque ledit élément de détection (20) est supporté par la bande intacte.

3. Dispositif selon la revendication 1 ou 2, dans lequel lesdits moyens de détection comprennent un émetteur (30) pour émettre un signal de détection et un récepteur (32) pour recevoir ledit signal de détection, dans lequel l'élément de détection (20) est au moins partiellement opaque audit signal de détection.

4. Dispositif selon la revendication 3, dans lequel l'élément de détection (20) est réalisé à partir de matière plastique et ledit émetteur (30) émet un faisceau lumineux en tant que signal de détection.

5. Dispositif selon l'une quelconque des revendications précédentes, dans lequel l'élément de détection (20) est un corps creux.

6. Dispositif selon l'une quelconque des revendications précédentes, dans lequel l'élément de détection (20) est réalisé avec un matériau électriquement non conducteur.

7. Dispositif selon la revendication 6, dans lequel ledit matériau est une matière plastique.

8. Dispositif selon l'une quelconque des revendications précédentes, dans lequel l'élément de détection (20) est un corps ayant une section transversale circulaire.

9. Dispositif selon la revendication 7, dans lequel l'élément de détection (20) est un corps essentiellement sphérique.

10. Dispositif selon l'une quelconque des revendications précédentes, dans lequel les tiges (140) sont formées et ont au moins un côté concave (142) afin de loger partiellement l'élément de détection (20) afin de limiter son déplacement.

11. Dispositif selon la revendication 10, dans lequel la tige formée (140) a au moins une tête arrondie (144), au moins à côté du côté concave (142).

12. Dispositif selon l'une quelconque des revendications précédentes, comprenant des moyens de guidage (50, 52) pour guider la bande entre la zone d'entrée (10) et la zone de sortie (12).

13. Dispositif selon la revendication 12, dans lequel les moyens de guidage comprennent une barre en amont (50) et une barre en aval (52) s'étendant principalement dans une direction transversale (T), espacées le long de la direction de déplacement (X).

14. Dispositif selon l'une quelconque des revendications précédentes, comprenant des moyens de nettoyage (150) pour libérer la zone de fonctionnement des moyens de détection (30, 32) des résidus de la bande s'étendant le long de cette dernière.

15. Banc d'étirage ou réunisseuse de bandes ou peigneuse ou banc à broches ou métier à filer, comprenant au moins un dispositif pour la détection de rupture d'une bande fibreuse selon l'une quelconque des revendications 1 à 14.

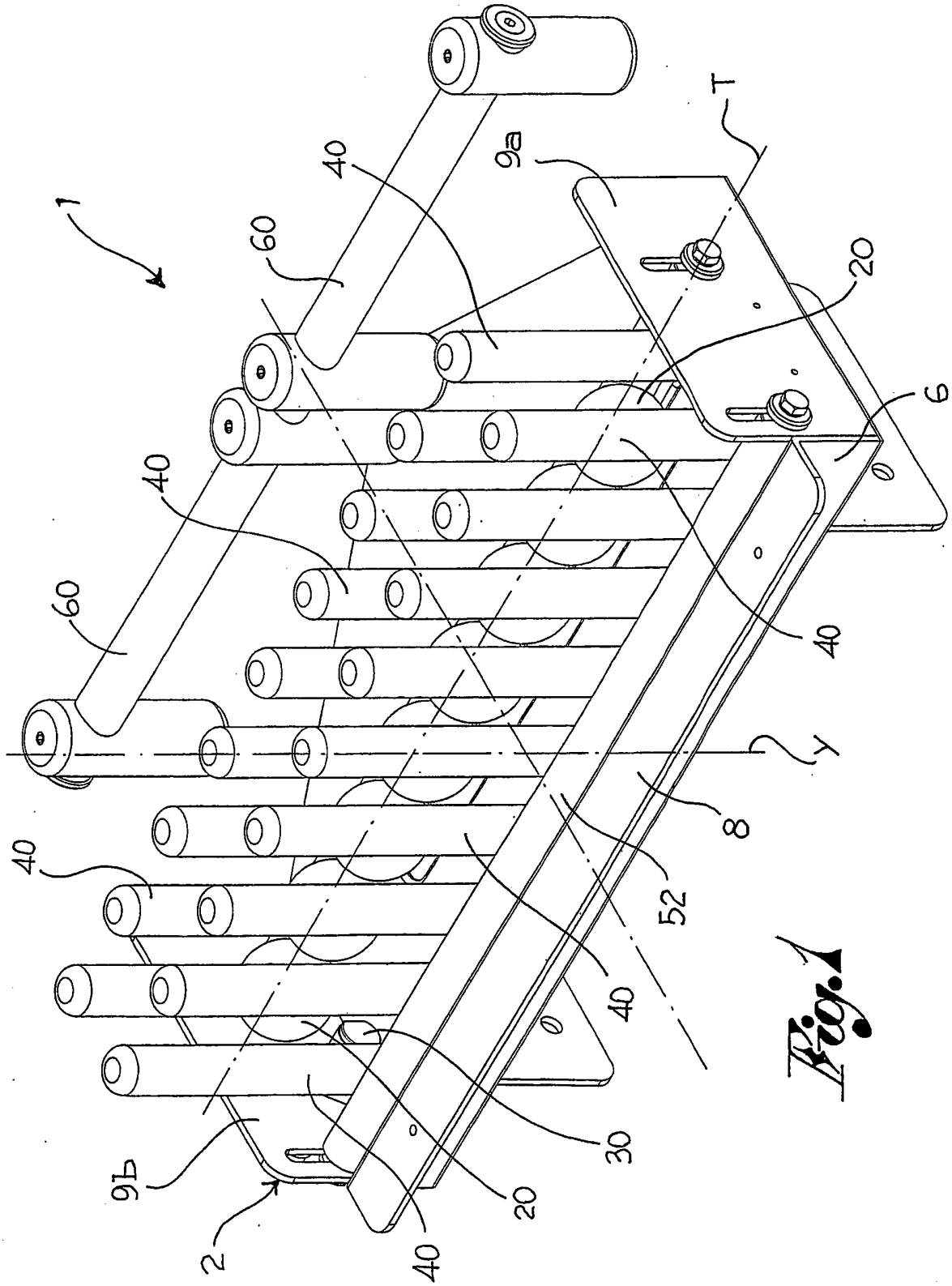


Fig.1

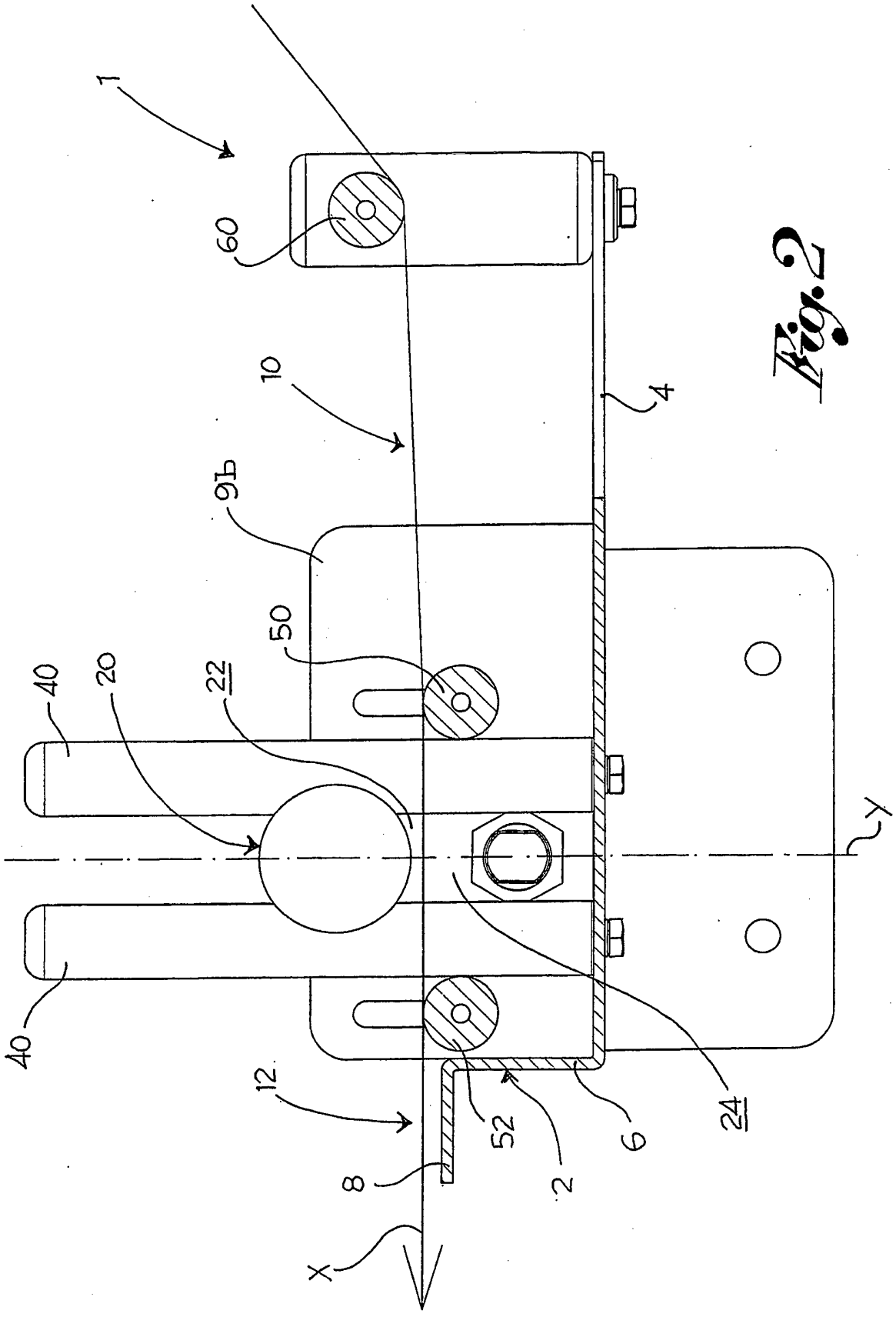


Fig.2

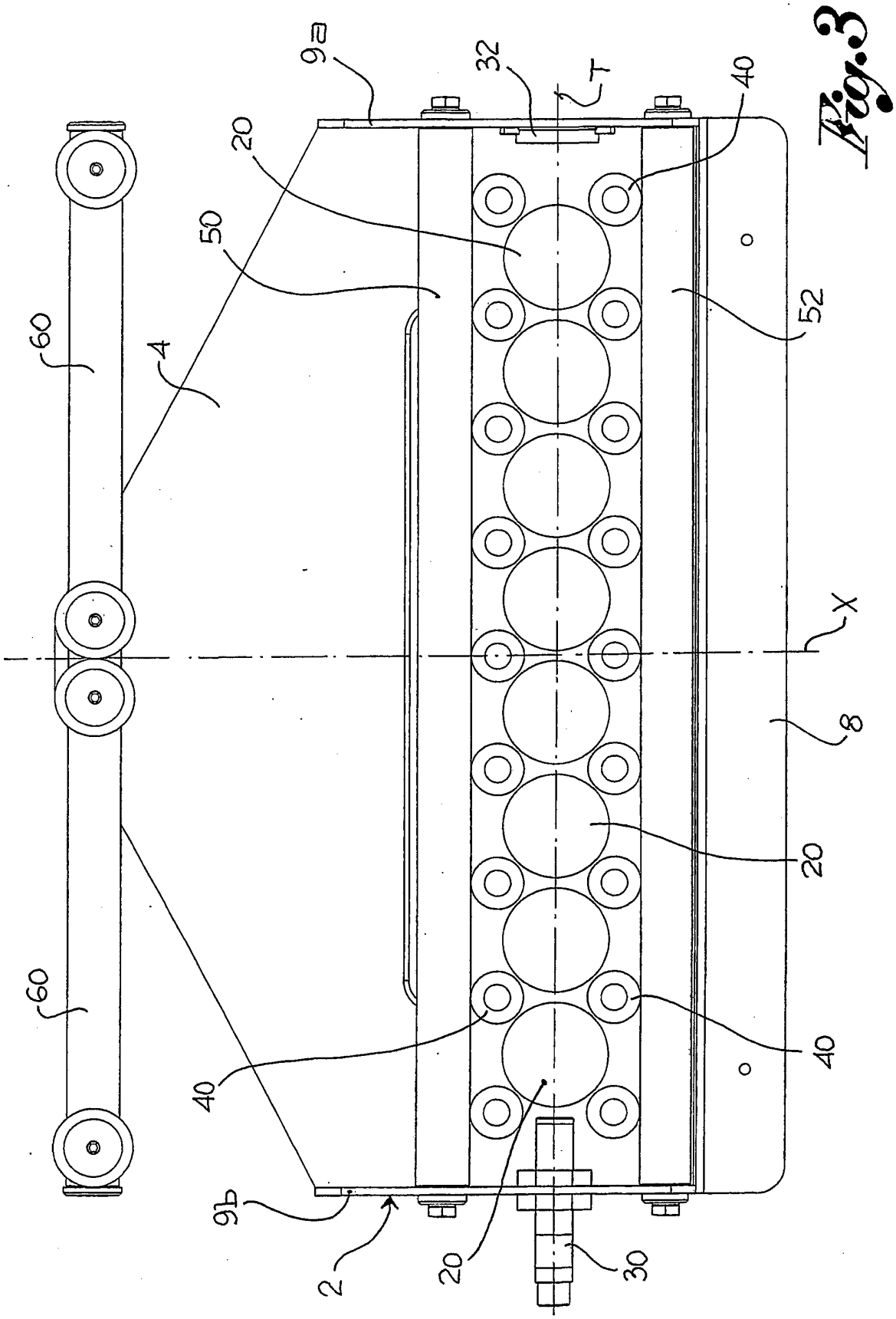


Fig.3

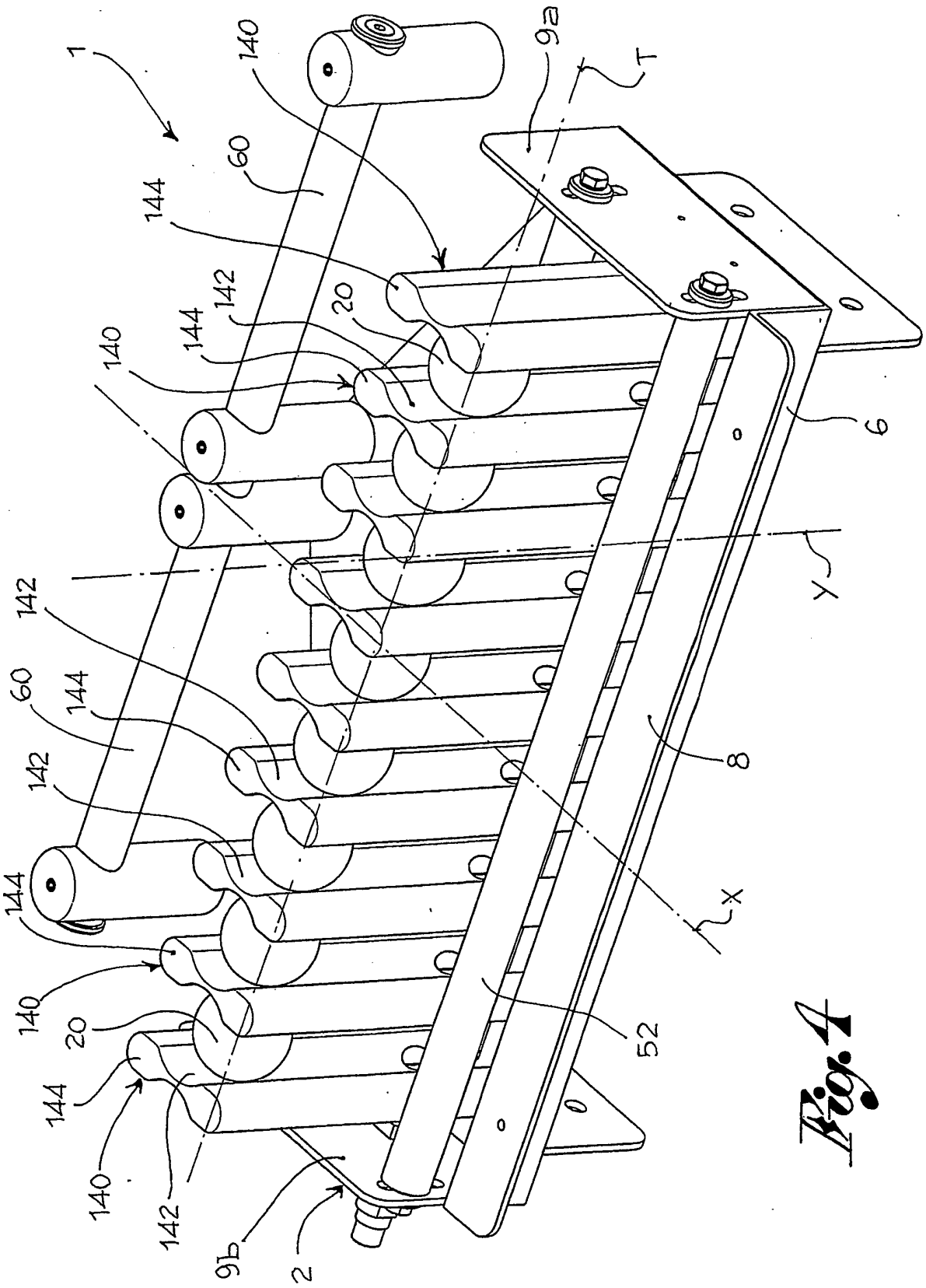

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Fig. 4

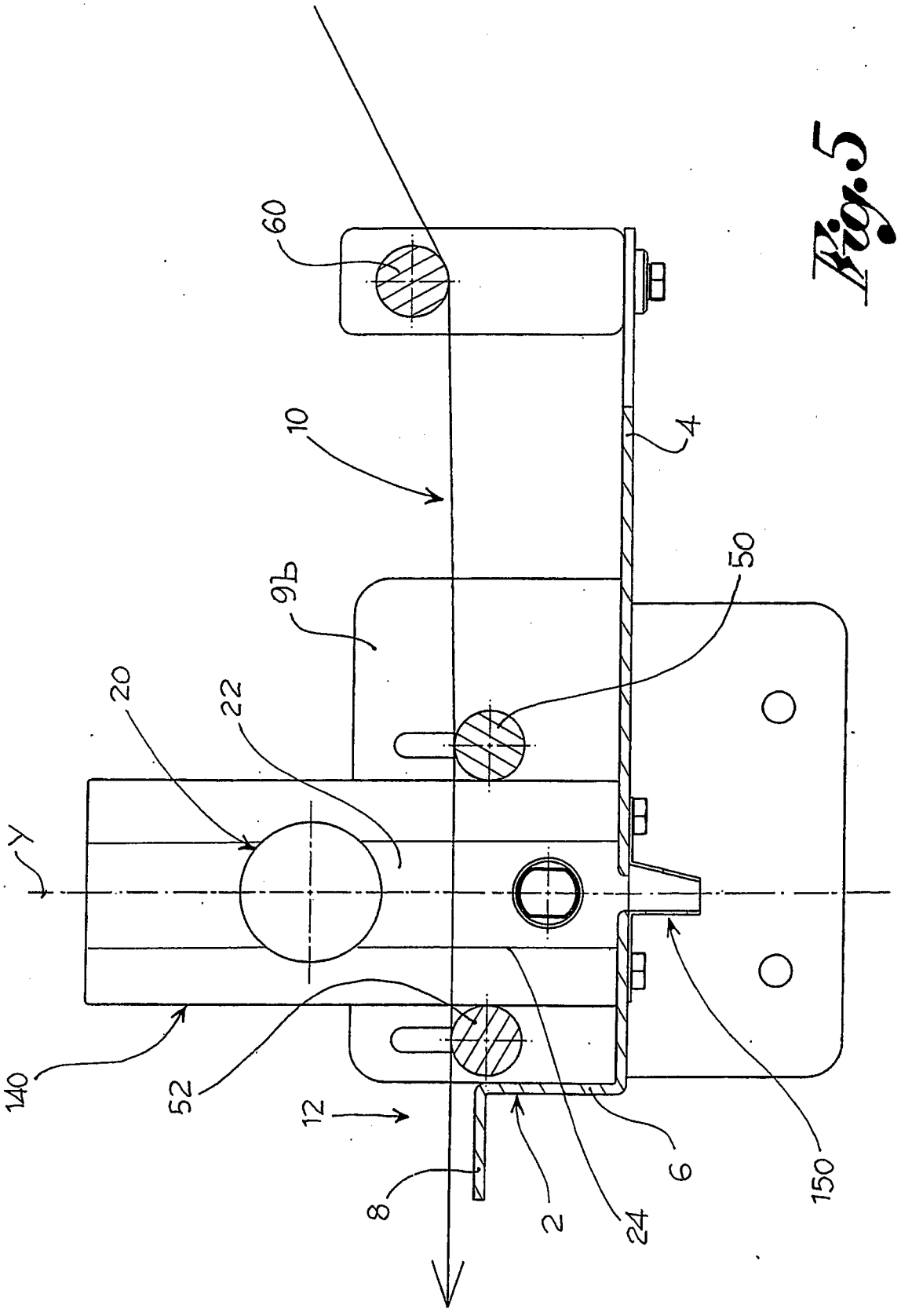


Fig.5

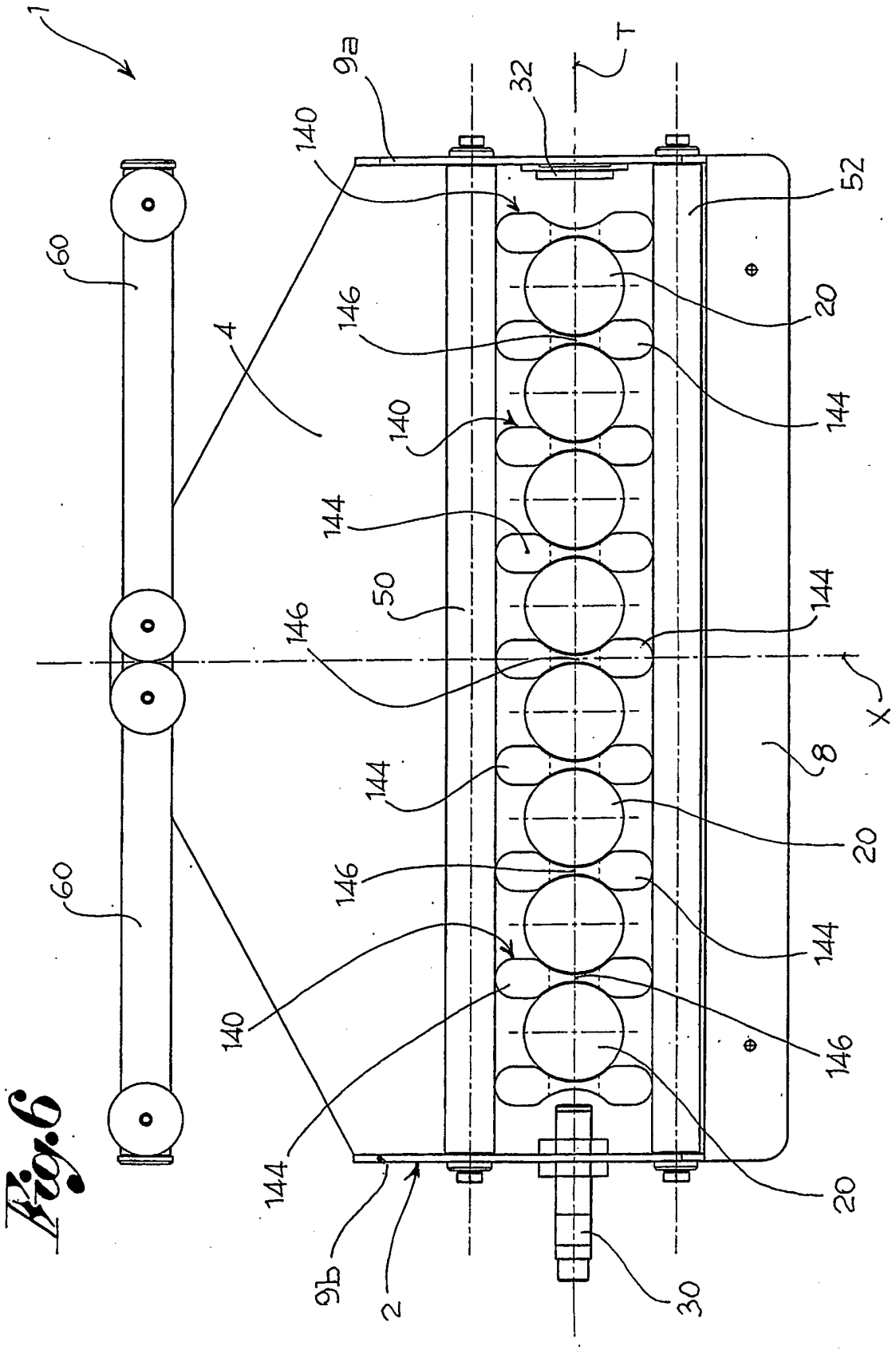

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Fig.6

REFERENCES CITED IN THE DESCRIPTION

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