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(54) **Feed unit for feeding sheets to a packing line**

Vorrichtung zum Zuführen von Bögen zu einer Verpackungslinie.

Dispositif d' alimentation de feuilles vers une ligne d' emballage.

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Description

[0001] The present invention relates to a feed unit for feeding sheets to a packing line.

[0002] An automatic product packing machine comprises at least one feed unit for supplying a packing line on the machine with a succession of sheets used in the packing process. The feed units may supply the succession of sheets either by cutting the sheets off a continuous web unwound off a reel, or by withdrawing individual sheets from the bottom of a stack housed inside a hopper.

[0003] One example of a feed unit for withdrawing individual sheets from the bottom of a stack housed inside a hopper is described in Patent US-A1-4918908, in which a suction pickup roller is rolled against a sheet at a bottom end of the hopper, so that the sheet winds about the roller; once the sheet is fully wound, the pickup roller is arrested in a release position to release the sheet onto an input conveyor of the packing line; and the input conveyor is normally defined by two pickup rollers parallel and tangent to each other to engage the sheet between them.

[0004] Another example of a feed unit for withdrawing individual sheets from the bottom of a stack housed inside a hopper is described in Patent EP-Al-0970885, in which a wheel, rotating about its axis, feeds a gripping head continuously along an endless path through a loading station, where the gripping head, oscillating with respect to the wheel about an axis parallel to the wheel axis, engages a withdrawal opening in the hopper to withdraw a sheet, and through a follow-up unloading station, where the gripping head, rotating together with the wheel, feeds the sheet to a feed roller.

[0005] Feed units with hoppers as described above function correctly at relatively slow operating speeds. At fast operating speeds typical of modern packing machines, however, the sheets close to the bottom of the hopper tend to be shifted out of correct alignment by the mechanical stress exerted on the stack by the pickup device when withdrawing individual sheets. As a result, each sheet is engaged by the pickup device, and so fed to the follow-up packing line, in the wrong position, thus impairing the overall quality of the finished packages and possibly also jamming the packing line.

[0006] It is an object of the present invention to provide a feed unit for feeding sheets to a packing line, designed to eliminate the aforementioned drawbacks, and which, at the same time, is cheap and easy to produce.

[0007] According to the present invention, there is provided a feed unit for feeding sheets to a packing line, as claimed in Claim 1 and, preferably, in any one of the following Claims depending directly or indirectly on Claim 1.

[0008] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective of a feed unit for feeding sheets to a packing line in accordance with the present invention;

Figure 2 shows a front view of the Figure 1 feed unit;

Figure 3 shows a side view, with parts removed for clarity, of the Figure 1 feed unit.

[0009] Number 1 in Figure 1 indicates as a whole a feed unit for feeding sheets 2 to a packing line (not shown). Feed unit 1 comprises a vertical hopper 3 housing a stack 4 of sheet 2, and having a bottom withdrawal opening 5; and a pickup device 6 which engages withdrawal opening 5 in hopper 3 to withdraw individual sheets 2 successively from stack 4 and feed sheets 2 to the packing line. More specifically, hopper 3 comprises four fixed, L-shaped sections 7 located at the four corners of stack 4 to retain stack 4 laterally.

[0010] Pickup device 6 comprises a wheel 8 rotating about a respective central axis 9; and a suction gripping head 10 supported by wheel 8 to move cyclically along an endless path through a loading station, where gripping head 10 engages withdrawal opening 5 in hopper 3 to withdraw a sheet 2, and through a follow-up unloading station, where gripping head 10 feeds the sheet to the packing line in known manner.

[0011] In a further embodiment not shown, wheel 8 supports a number of gripping heads 10; and each gripping head 10 may be fitted to wheel 8 to oscillate, under the control of a cam actuating system, about a respective axis parallel to central axis 9 of wheel 8.

[0012] Clearly, pickup device 6 may be formed differently, e.g. as described in Patent US-A1-4918908.

[0013] At withdrawal opening 5 in hopper 3, the feed unit comprises two parallel rollers 11 located on opposite sides of stack 4, and each having a lateral surface 12 on which a bottom portion of stack 4 rests. More specifically, as shown more clearly in Figure 3, two major transverse edges of stack 4 rest on respective lateral surfaces 12 of rollers 11. A known actuating device 13 (shown schematically in Figure 2) is connected mechanically to rollers 11, and rotates each roller 11 about a respective longitudinal axis 14 of symmetry in such a direction as to push sheets 2 in stack 4 upwards (i.e. away from withdrawal opening 5, as shown in Figure 3). An alternative embodiment comprises only one roller 11 on one side of stack 4, and respective bottom end portions of fixed sections 7 are located on the opposite side of stack 4 and on a level with roller 11.

[0014] Actuating device 13 preferably rotates rollers 11 at the same adjustable given constant speed. Typically, the rotation speed of rollers 11 is adjusted as a function of the withdrawal rate of sheets 2 from withdrawal opening 5 in hopper 3 and/or as a function of the number of sheets 2 in stack 4 (and therefore of the weight of stack 4).

[0015] In the preferred embodiment shown in the accompanying drawings, the portion of lateral surface 12 of each roller 11 contacting stack 4 has a high friction coefficient achieved by knurling comprising a series of

grooves parallel to longitudinal axis 14 of symmetry. Alternatively, the portion of the lateral surface of each roller 11 contacting stack 4 may have a covering of elastic material (e.g. rubber). As shown more clearly in Figure 2, each roller 11 is so formed that its lateral surface only contacts part of stack 4. In fact, two knurled portions 15 of each roller 11 only contact part of the extension of stack 4, and are separated by a groove 16.

[0016] As shown more clearly in Figure 3, a window for the passage of each sheet 2 is defined between the two rollers 11, and through which each sheet 2 is drawn by pickup device 6 when withdrawing sheet 2. The window defined between the two rollers 11 is smaller than each sheet 2. More specifically, the minimum distance between lateral surfaces 12 of the two rollers 11, measured in a direction perpendicular to longitudinal axes 14 of symmetry of the two rollers 11, is less than the corresponding dimension of each sheet 2 measured in the same direction.

[0017] Hopper 3 may also comprise at least one fixed horizontal supporting member (not shown) located at withdrawal opening 5 and defining a bottom support of stack 4 to retain stack 4 inside hopper 3.

[0018] Clearly, the retaining sections 7 of hopper 3 need not necessarily be vertical, and may slope with respect to the vertical or be horizontal. In the latter case, feed unit 1 must comprise a push device for gradually feeding stack 4 towards withdrawal opening 5 (in the hopper 3 shown, this is achieved by force of gravity drawing sheets 2 in stack 4 downwards).

[0019] In actual use, suction gripping head 10 engages and exerts force on a sheet 2 to extract sheet 2 from withdrawal opening 5 in the hopper and through the window defined between the two rollers 11; and, since the window defined between the two rollers 11 is smaller than sheet 2, sheet 2 is inevitably deformed elastically to be extracted from hopper 3. Moreover, if bottom supporting members of stack 4 are provided, sheet 2 must be detached from the supporting members by the action of gripping head 10.

[0020] Tests have shown that the action of rollers 11 provides for realigning sheets 2 in stack 4 close to withdrawal opening 5 in hopper 3. That is, if sheets 2 close to withdrawal opening 5 are shifted out of correct alignment by the mechanical stress exerted on stack 4 by pickup device 6 when withdrawing individual sheets 2, the action of rollers 11 provides for realigning sheets 2. The action of rollers 11 has also been found to have a separating effect on sheets 2 in stack 4 close to withdrawal opening 5 in hopper 3, thus assisting detachment of sheets 2 from stack 4. That is, sheets 2 in stack 4 tend to adhere to one another, thus making it difficult to extract each sheet 2 from withdrawal opening 5 in hopper 3. The action of rollers 11, on the other hand, tends to separate sheets 2 close to the withdrawal opening, thus counteracting any adhesion phenomena of sheets 2.

[0021] Feed unit 1 as described above may be used for supplying sheets 2 of any type, e.g. blanks for producing rigid packages, sheets of wrapping material for producing soft packages, or labels or stamps applied to the inside or outside of packages.

Claims

1. A feed unit for feeding sheets to a packing line; the feed unit (1) comprising a hopper (3) housing a stack (4) of sheets (2) and having a withdrawal opening (5); and a pickup device (6) which engages the withdrawal opening (5) in the hopper (3) to withdraw a single sheet (2) from the stack (4) and feed the sheet (2) to the packing line; the feed unit (1) **being characterized by** comprising, at the withdrawal opening (5) in the hopper (3), at least one roller (11) having a lateral surface (12) on which a bottom edge of the stack (4) rests; and actuating means (13) for rotating the roller (11) about a respective longitudinal axis (14) of symmetry in such a direction as to push the sheets (2) in the stack (4) away from the withdrawal opening (5).

2. A feed unit as claimed in Claim 1, wherein the actuating means (13) rotate the roller (11) at a given constant speed.

3. A feed unit as claimed in Claim 2, wherein the actuating means (13) provide for adjusting the rotation speed of the roller (11).

4. A feed unit as claimed in Claim 3, wherein the actuating means (13) provide for adjusting the rotation speed of the roller (11) as a function of the withdrawal rate of the sheets (2) from the withdrawal opening (5) in the hopper (3).

5. A feed unit as claimed in Claim 3, wherein the actuating means (13) provide for adjusting the rotation speed of the roller (11) as a function of the number of sheets (2) in the stack (4).

6. A feed unit as claimed in any one of Claims 1 to 5, wherein the portion of the lateral surface (12) of the roller (11) contacting the stack (4) has a high friction coefficient.

7. A feed unit as claimed in Claim 6, wherein the portion of the lateral surface (12) of the roller (11) contacting the stack (4) has a covering of elastic material.

8. A feed unit as claimed in Claim 7, wherein the portion of the lateral surface (12) of the roller (11) contacting the stack (4) has knurling.

9. A feed unit as claimed in Claim 8, wherein the knurling comprises a series of grooves parallel to the longitudinal axis (14) of symmetry.

10. A feed unit as claimed in any one of Claims 1 to 9, wherein the roller (11) is so formed that its lateral surface (12) only contacts part of the bottom edge of the stack (4).

11. A feed unit as claimed in Claim 10, wherein the roller (11) is so formed that two separate portions (15) of its lateral surface (12) contact the bottom edge of the stack (4).

12. A feed unit as claimed in any one of Claims 1 to 11, wherein two parallel rollers (11) are provided, are located on opposite sides of the stack (4), and each comprise a lateral surface (12) on which a bottom edge of the stack (4) rests; the actuating means (13) rotating each roller (11) about a respective longitudinal axis (14) of symmetry in such a direction as to push the sheets (2) in the stack (4) away from the withdrawal opening (5).

13. A feed unit as claimed in Claim 12, wherein a window for the passage of each sheet (2) and defined between the two rollers (11) is smaller than each sheet (2).

14. A feed unit as claimed in Claim 13, wherein the minimum distance between the lateral surfaces (12) of the two rollers (11), measured in a direction perpendicular to the longitudinal axes (14) of symmetry of the two rollers (11), is less than the corresponding dimension of each sheet (2) measured in the same direction.

15. A feed unit as claimed in any one of Claims 1 to 14, wherein the hopper (3) comprises a number of fixed sections (7) for laterally retaining the stack (4).

16. A feed unit as claimed in any one of Claims 1 to 15, wherein the hopper (3) comprises at least one fixed supporting member located at the withdrawal opening (5) and defining a support for the stack (4) to retain the stack (4) inside the hopper (3).

17. A feed unit as claimed in any one of Claims 1 to 16, wherein the hopper (3) is a vertical hopper (3); the actuating means (13) rotating the roller (11) about its longitudinal axis (14) of symmetry in such a direction as to push the sheets (2) in the stack (4) upwards.

18. A feed unit as claimed in any one of Claims 1 to 17, wherein the pickup device (6) comprises a wheel (8) rotating about a respective central axis (9); and at least one suction gripping head (10) supported by the wheel (8) to move cyclically along an endless path through a loading station, where the gripping head (10) engages the withdrawal opening (5) in the hopper (3) to withdraw a respective sheet (2), and through a follow-up unloading station, where the gripping head (10) feeds the sheet (2) to the packing line.

Patentansprüche

1. Eine Zuführeinheit um Sheets zu einer Verpakkungslinie zuzuführen, wobei die Zuführeinheit (1) einen Vorratsbehälter (3)mit einem Stapel (4) von Sheets (2) umfasst und eine Entnahmeöffnung (5) und eine Entnahmevorrichtung (6), welche mit der Entnahmeöffnung (5) in dem Vorratsbehälter (3) in Eingriff steht, um ein einzelnes Sheet (2) von dem Stapel (4) zu entnehmen und der Verpackungslinie zuzuführen; **dadurch gekennzeichnet, dass** die Zuführeinheit (1) umfasst: an der Entnahmeöffnung (5) in dem Vorratsbehälter (3) zumindest eine Rolle (11) mit einer seitlichen Oberfläche (12), auf der eine untere Kante des Stapels (4) ruht, und Antriebsmittel (13) um die Rolle (11) um eine zugehörige Längs-Symmetrieachse (14) in einer solchen Richtung zu rotieren um die Sheets (2) in dem Stapel (4) von der Entnahmeöffnung (5) weg zu drücken.

2. Eine Zuführeinheit gemäß Anspruch 1, wobei die Antriebsvorrichtung (13) die Rollen (11) mit einer vorgegebenen konstanten Geschwindigkeit rotiert.

3. Eine Zuführeinheit gemäß Anspruch 2, wobei die Antriebsvorrichtung (13) ausgerüstet ist, die Geschwindigkeit der Rotation der Rollen (11) zu regulieren.

4. Eine Zuführeinheit gemäß Anspruch 3, wobei die Antriebsvorrichtung (13) ausgerüstet ist, die Rotationsgeschwindigkeit der Rollen (11) in Abhängigkeit von der Entnahmegeschwindigkeit der Sheets (2) durch die Entnahmeöffnung (5) des Vorratsbehälters (3) zu bestimmen.

5. Eine Zuführeinheit gemäß Anspruch 3, wobei die Antriebsvorrichtung (13) ausgerüstet ist, die Rotationsgeschwindigkeit der Rollen (11) in Abhängigkeit von der Anzahl der Sheets (2) in dem Stapel (4) zu bestimmen.

6. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 5, wobei der Bereich, der seitlichen Oberfläche (12) von der Rolle (11) welcher den Stapel (4) berührt, einen hohen Reibkoeffizienten aufweist.

7. Eine Zuführeinheit gemäß Anspruch 6, wobei der Teil der seitlichen Oberfläche (12) der Rolle (11), welcher den Stapel (4) berührt, eine Bedeckung mit einem elastischen Material aufweist.

8. Eine Zuführeinheit gemäß Anspruch 7, wobei der Teil der seitlichen Oberfläche (12) der Rolle (11), welcher den Stapel (4) berührt, eine Rädelung auf-

weist.

9. Eine Zuführeinheit gemäß Anspruch 8, wobei die Rädelung eine Anzahl von Vertiefungen parallel zu der Längs-Symmetrieachse (14) aufweist.

10. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 9, wobei die Rolle (11) so ausgeformt ist, dass ihre seitliche Oberfläche (12) nur Teile von der unten gelegenen Kante des Stapels (4) berührt.

11. Eine Zuführeinheit gemäß Anspruch 10, wobei die Rolle (11) so ausgeformt ist, dass zwei getrennte Bereiche (15) von ihrer seitlichen Oberfläche (12) die unten gelegene Kante des Stapels (4) berührt.

12. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 11, wobei zwei parallele Rollen (11) vorgesehen sind, welche an gegenüberliegenden Seiten des Stapels 4 befindlich sind und jeweils eine seitliche Oberfläche aufweisen, auf welcher eine untere Kante des Stapels (4) ruht, und eine Antriebsvorrichtung (13) jede Rolle (11) um eine bestimmte Längs-Symmetrieachse (14) in einer Richtung rotiert, um die Sheets (2) in dem Stapel (4) von der Entnahmeöffnung (5) wegzuschieben.

13. Eine Zuführeinheit gemäß Anspruch 12, wobei ein Fenster, das für die Durchführung eines jeden Sheets (2) zwischen den beiden Rollen (11) definiert ist, kleiner ist als jedes Sheet (2).

14. Eine Zuführeinheit gemäß Anspruch 13, wobei der minimale Abstand zwischen den seitlichen Oberflächen (12) der zwei Rollen (11), gemessen in einer Richtung senkrecht zu der Längs-Symmetrie-Achse (14) der beiden Rollen (11), kleiner ist als das entsprechende Maß eines jeden Sheets (2), gemessen in der gleichen Richtung.

15. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 14, wobei der Vorratsbehälter (3) eine Anzahl von befestigten Bereichen (7) zum seitlichen Halten des Stapels (4) aufweist.

16. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 15, wobei der Vorratsbehälter (3) zumindest einen befestigten Unterstützungsbereich aufweist, welcher sich bei der Entnahmeöffnung (5) befindet und eine Unterstützung für dien Stapel (4) bildet, um den Stapel (4) in dem Vorratsbehälter (3) zu halten.

17. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 16, wobei der Vorratsbehälter (3) ein vertikaler Vorratsbehälter (3) ist, die Antriebsvorrichtung (13) die Rollen (11) um ihre Längs-Symmetrie-Achse in einer solchen Richtung rotiert, dass die Sheets (2) des Stapels (4) nach oben gedrückt werden.

18. Eine Zuführeinheit gemäß einem der Ansprüche 1 bis 17, wobei die Entnahmevorrichtung (6) ein Rad (8) zur Drehung um eine entsprechende Zentralachse (9) aufweist, und dass zumindest ein Saüggreifkopf (10) von dem Rad (8) geführt wird, um sich zyklisch entlang einer Endlosbahn durch einen Ladebereich zu bewegen, wobei der Greifkopf (10) in Eingriff mit der Entnahmeöffnung (5) des Vorratsbehälters (3) steht, um ein bestimmtes Sheet (2) zu entnehmen und mit einer nachfolgenden Entladestation, wo der Greifkopf (10) das Sheet (2) zu der Verpackungslinie zuführt.

Revendications

1. Dispositif d'alimentation de feuilles vers une ligne d'emballage ; le dispositif d'alimentation (1) comprenant une trémie (3) logeant une pile (4) de feuilles (2) et ayant une ouverture de retrait (5) ; et un dispositif de prise automatique (6) qui met en prise l'ouverture de retrait (5) dans la trémie (3) afin de retirer une seule feuille (2) de la pile (4) et d'alimenter la feuille (2) vers la ligne d'emballage ; le dispositif d'alimentation (1) étant **caractérisé en ce qu'**il comprend, au niveau de l'ouverture de retrait (5) dans la trémie (3), au moins un galet (11) ayant une surface latérale (12) sur laquelle une arête inférieure de la pile (4) repose ; et des moyens de commande (13) destinés à faire tourner le galet (11) autour d'un axe longitudinal respectif (14) de symétrie dans une direction destinée à pousser les feuilles (2) dans la pile (4) pour les éloigner de l'ouverture de retrait (5).

2. Dispositif d'alimentation selon la revendication 1, dans lequel les moyens de commande (13) font tourner le galet (11) à une vitesse constante donnée.

3. Dispositif d'alimentation selon la revendication 2, dans lequel les moyens de commande (13) permettent d'ajuster la vitesse de rotation du galet (11).

4. Dispositif d'alimentation selon la revendication 3, dans lequel les moyens de commande (13) permettent d'ajuster la vitesse de rotation du galet (11) en tant que fonction du taux de retrait des feuilles (2) à partir de l'ouverture de retrait (5) dans la trémie (3).

5. Dispositif d'alimentation selon la revendication 3, dans lequel les moyens de commande (13) permettent d'ajuster la vitesse de rotation du galet (11) en tant que fonction du nombre de feuilles (2) dans la pile (4).

6. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 5, dans lequel la partie de la surface latérale (12) du galet (11) entrant en contact avec la pile (4) a un coefficient de frottement élevé.

7. Dispositif d'alimentation selon la revendication 6, dans lequel la partie de la surface latérale (12) du galet (11) entrant en contact avec la pile (4) a un revêtement de matière élastique.

8. Dispositif d'alimentation selon la revendication 7, dans lequel la partie de la surface latérale (12) du galet (11) entrant en contact avec la pile (4) a un moletage.

9. Dispositif d'alimentation selon la revendication 8, dans lequel le moletage comprend un ensemble de rainures parallèles à l'axe longitudinal (14) de symétrie.

10. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 9, dans lequel le galet (11) est formé de telle manière que sa surface latérale (12) n'entre en contact qu'avec une partie de l'arête inférieure de la pile (4).

11. Dispositif d'alimentation selon la revendication 10, dans lequel le galet (11) est formé de telle manière que deux parties séparées (15) de sa surface latérale (12) entre en contact avec l'arête inférieure de la pile (4).

12. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 11, dans lequel deux galets parallèles (11) sont fournis, sont situés au niveau de côtés opposés de la pile (4) et chacun comprend une surface latérale (12) sur laquelle une arête inférieure de la pile (4) repose ; les moyens de commande (13) faisant tourner chaque galet (11) autour d'un axe longitudinal respectif (14) de symétrie dans une direction destinée à pousser les feuilles (2) dans la pile (4) pour les éloigner de l'ouverture de retrait (5).

13. Dispositif d'alimentation selon la revendication 12, dans lequel une fenêtre pour le passage de chaque feuille (2) et définie entre les deux galets (11) est plus petite que chaque feuille (2).

14. Dispositif d'alimentation selon la revendication 13, dans lequel la distance minimale entre les surfaces latérales (12) des deux galets (11), mesurée dans une direction perpendiculaire aux axes longitudinaux (14) de symétrie des deux galets (11), est inférieure à la dimension correspondante de chaque feuille (2) mesurée dans la même direction.

15. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 14, dans lequel la trémie (3) comprend un certain nombre de sections fixes (7) pour retenir latéralement la pile (4).

16. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 15, dans lequel la trémie (3) comprend au moins un élément de support fixe situé au niveau de l'ouverture de retrait (5) et définissant un support pour la pile (4) pour retenir la pile (4) à l'intérieur de la trémie (3).

17. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 16, dans lequel la trémie (3) est une trémie verticale (3) ; les moyens de commande (13) faisant tourner le galet (11) autour de son axe longitudinal (14) de symétrie dans une direction destinée à pousser les feuilles (2) dans la pile (4) vers le haut.

18. Dispositif d'alimentation selon l'une quelconque des revendications 1 à 17, dans lequel le dispositif de prise automatique (6) comprend une roue (8) tournant autour un axe central respectif (9) ; et au moins une tête de préhension à ventouse (10) supportée par la roue (8) afin de se déplacer de façon cyclique le long d'une trajectoire sans fin au travers d'un poste de chargement, où la tête de préhension (10) met en prise l'ouverture de retrait (5) dans la trémie (3), afin de retirer une feuille respective (2) et au travers d'un poste de déchargement complémentaire, où la tête de préhension (10) alimente la feuille (2) vers la ligne d'emballage.

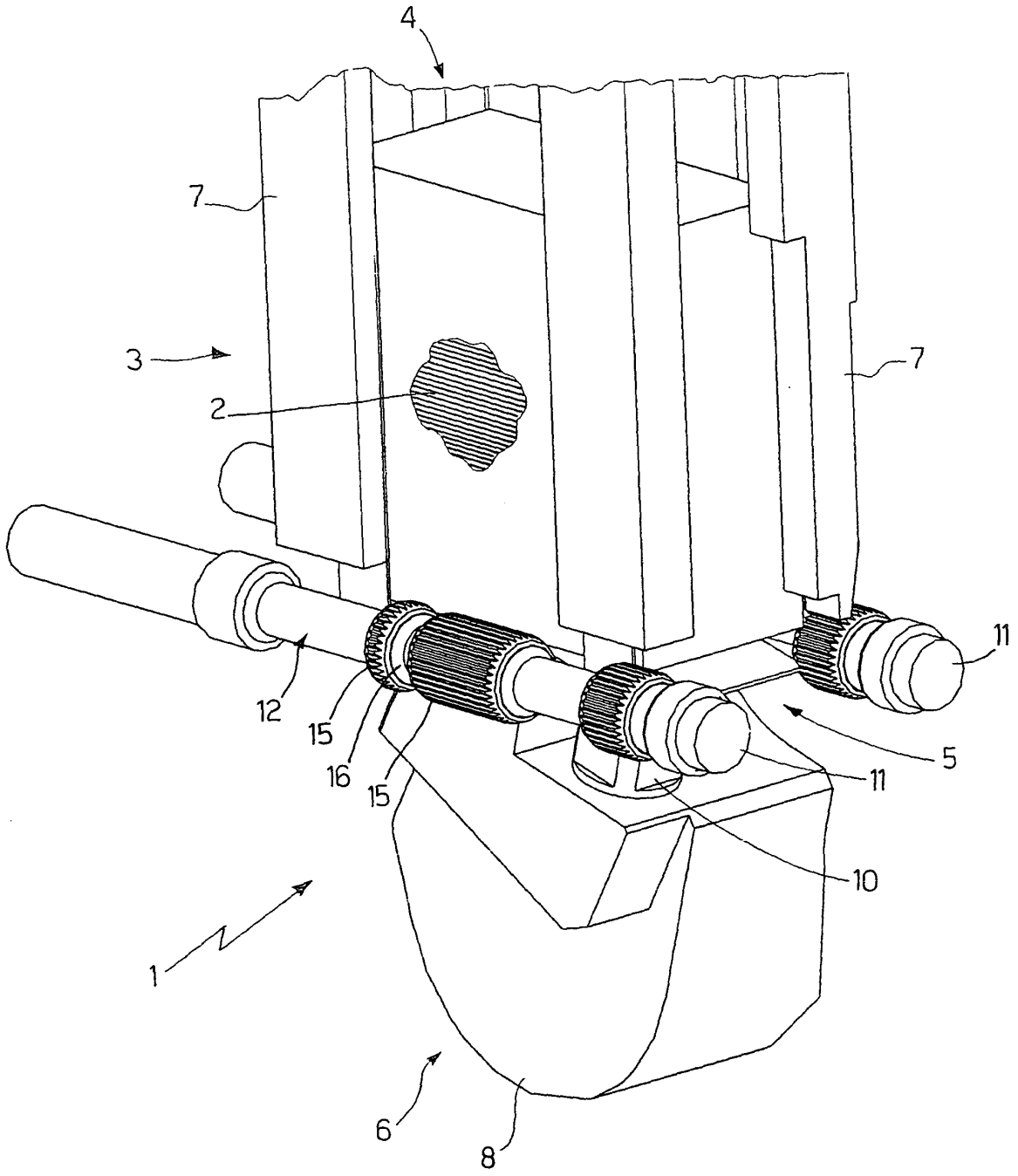


Fig.1

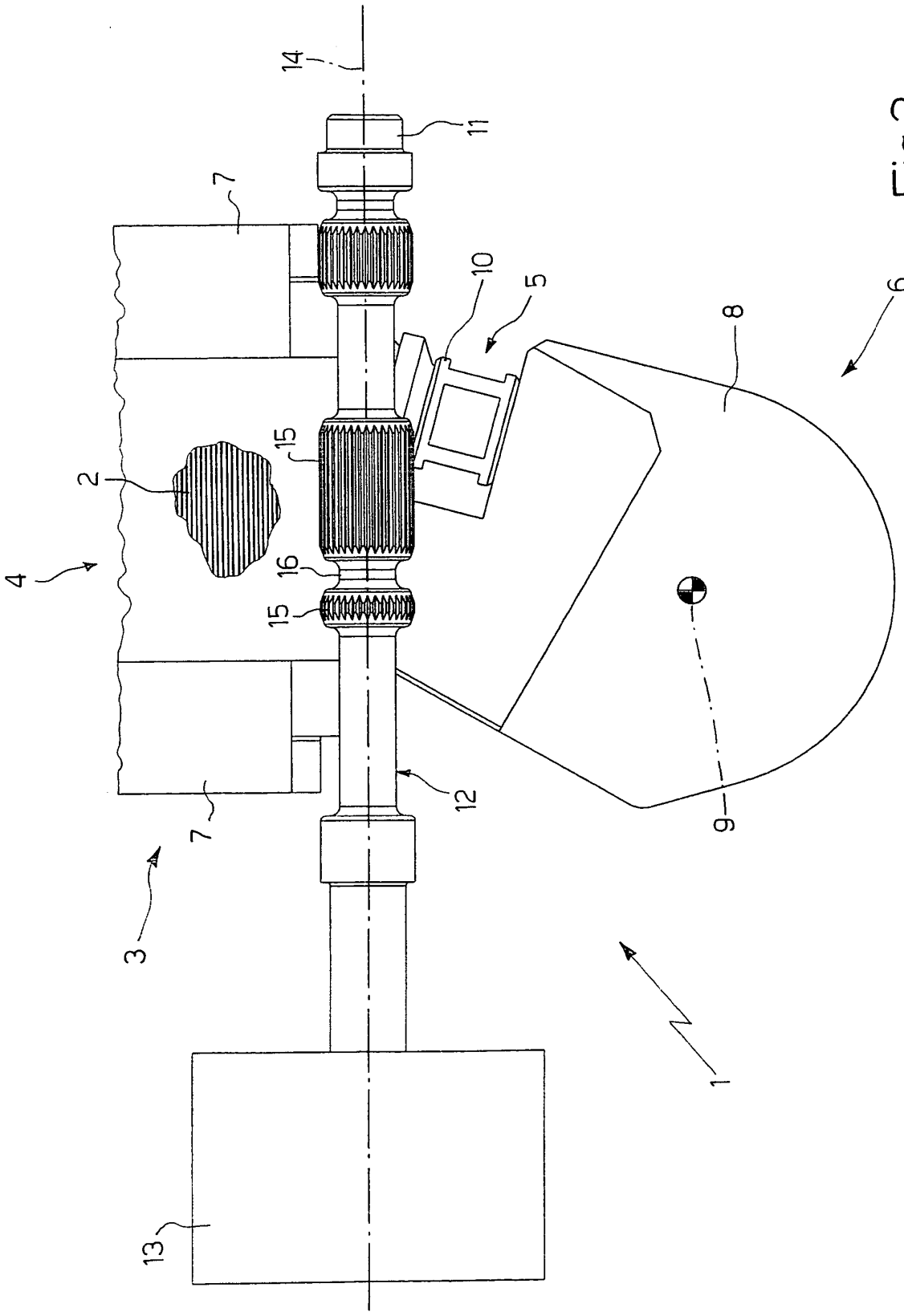


Fig.2

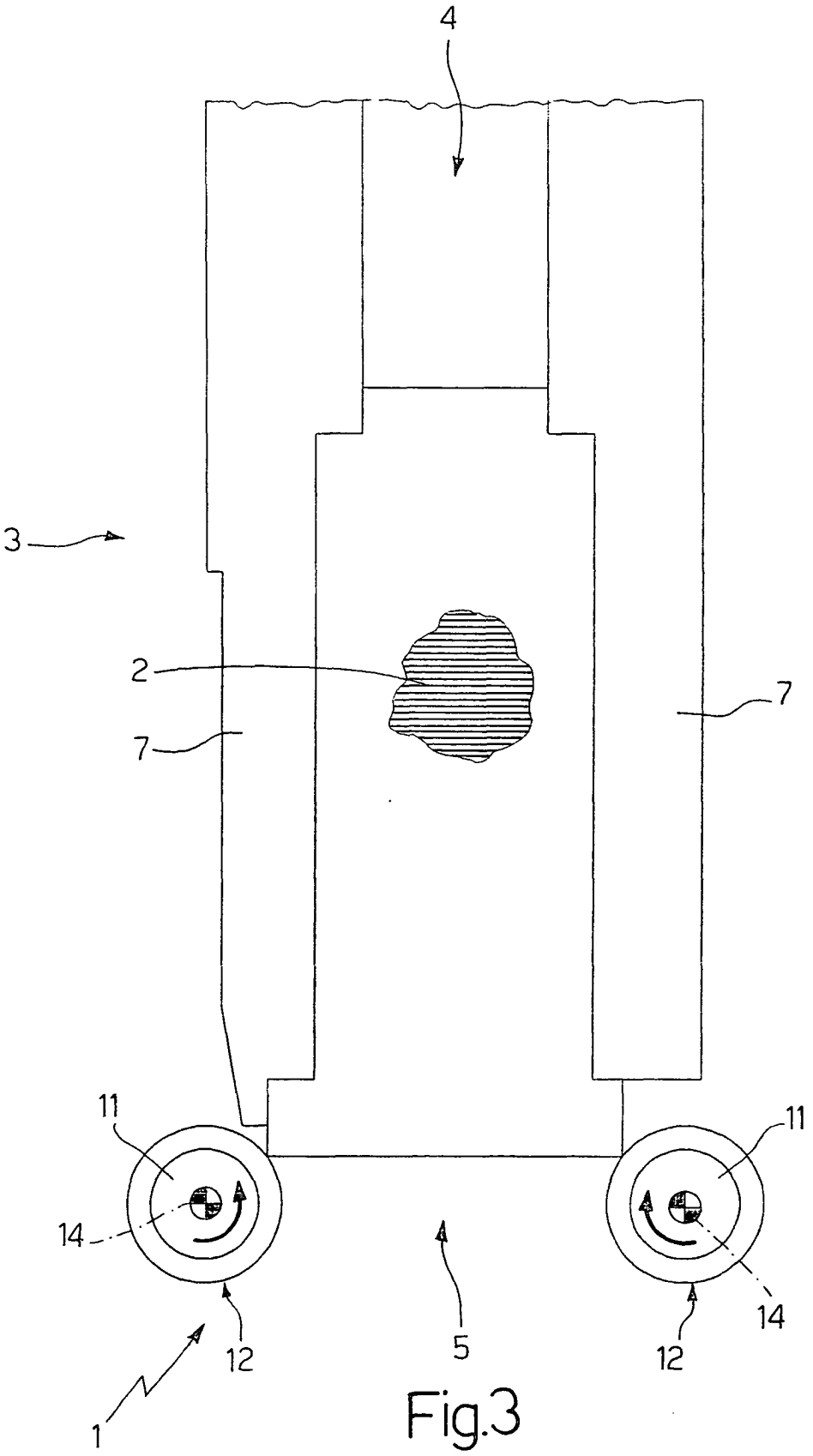


Fig.3