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(54) **System for marking plasterboard slab packs**

System zur Markierung von Gipsplattenpackungen

Système de marquage d'ensembles de dalles en plaque de plâtre

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Description

[0001] The present invention refers to an innovative system for marking slab packs, in particular plasterboard slab packs or coated gypsum slab packs.

[0002] It is known in the field to store slabs of plasterboard in packs, made up of a pile of slabs vertically stacked one on top of the other. In order to be able to identify them in a storeroom, the packs are usually marked with a logo or writing on the side, at the lateral edges of the single slabs. The slabs have a substantial size, with a length of a few metres, so the markings must be considerably large so as to be read even from a certain distance.

[0003] To mark the slabs, inks are normally used, that are applied, for example, with a pad suitably pressed against the side of the pack. WO-A-02/094570 discloses ink marking obtained by a print head. Such a technique, however, has been found to be unsatisfactory for a series of reasons. The cost of the marking is quite high. A considerable amount of ink is used, also due to the size of the marking. It is also necessary to frequently refill the pads with new ink, thus slowing down the marking process.

[0004] Moreover, ink often leaves wipes onto the product, and can even infiltrate between the gaps normally present between the successive adjacent slabs of the pack.

[0005] Laser techniques are also known for marking products, such as bottles or the like (see for example US 6,603,136. These techniques however, have never been able to be used for marking slab packs of plasterboard. These systems of laser imprinting indeed foresee low power levels, not suitable for imprinting large markings like those necessary for the discussed products. Moreover, the relative systems for focusing the laser normally use optical type sensors, or similar, that have difficulty in reliably detecting the position of a slabs pack, in which there are more or less wide gaps between the different adjacent slabs.

[0006] DE-A-10340375 discloses a high-power laser head for coated gypsum slabs. However, this device is used to cut and/or mark the top, smooth and regular surface of a single slab.

[0007] The general purpose of the present invention is that of avoiding the aforementioned drawbacks by providing a system for marking slab packs of plasterboard which is fast and cost-effective.

[0008] A further purpose of the invention is to provide a marking system which makes it possible to obtain high quality writings or logos, with well defined outlines.

[0009] A further purpose of the invention is to provide a marking system which makes it possible to carry out the marking with maximum safety for the users of the system.

[0010] In view of such purposes it has been thought to make, according to the invention, a system for marking coated gypsum slab packs according to claim 1.

[0011] In order to clarify the explanation of the innovative principles of the present invention together with its advantages with respect to the prior art, hereafter, with the help of the attached drawings, we shall describe a possible embodiment given as an example applying such principles. In the drawings:

- figure 1 represents a perspective view of a laser device used in a system according to the present invention,
- figure 2 represents a schematic view of the system in a first advancing step of the slabs pack towards the laser device, with the laser device in a retracted idle position,
- figure 3 represents a schematic view analogous to the previous one, with the laser device advancing towards the slabs pack,
- figure 4 represents a view of the system, which is analogous to the previous one, with the laser device in the operative position to carry out the laser marking of the slabs pack.

[0012] With reference to figures 1 and 2, a system 11 for marking is shown comprising conveying means 13 of slab packs of plasterboard 14 and a laser device 12.

[0013] The slabs pack 14 is formed by a vertical pile of slabs 24, to be marked on the side edge.

[0014] The conveying means 13 can comprise, for example, a series of transport rollers adapted to make the slab packs move in sequence along a set path.

[0015] The laser device 12 is arranged laterally with respect to the conveying path of the packs and comprises a laser head 15 provided with a laser output 30 from which the laser ray for marking comes out. The laser head 15 is of the type adapted to form a focused laser beam and comprises a suitable lens at the output 30. The laser head is of the class IV type, so as to have enough power to make a marking having a certain size over a reasonably short time.

[0016] The laser device 12 is moveable between an idle position retracted from the conveying path of the packs (fig. 2), and an advanced operative position to carry out the marking (fig. 4). The movement of the device 12 occurs under the action of an actuator 20, 22 provided with a worm screw, schematically represented in the figures. It should be understood that even another type of actuator can be used instead of the worm screw actuator.

[0017] The marking device 12 comprises a support 21 on which the laser head 15 is mounted and that is moveable under the action of the actuator 20, 22.

[0018] The laser device 12 also comprises a box-shaped shielding 16 which encloses the laser output 30 of the laser head 15, and comprises a front opening 50 intended to be closed by the lateral wall of the slabs pack 14. The laser beam carries out the marking on the area covered by the shielding.

[0019] The shielding 16 is laser opaque and has the function of avoiding that the laser reflects outside the

marking area, with possible damage to things or people. Advantageously, the shielding 16 is made from Plexiglas.

[0020] The shielding is mounted on the support 21 so as to be moveable with respect to the laser head 15 in the movement direction of the head itself.

[0021] In particular, the shielding 16 is slidingly mounted along four rods 26 integral with the support 21 and arranged at the vertices of a rectangle. The shielding 16 is pushed by a spring 27 towards an end-stop position located out in front, as shown in figures 1 and 2. The shielding 16 is mounted onto the rods 26 with clearances which allow the opening of the shielding to be oriented parallel to the wall 51 of the pack 14 to be marked, even when this is not perfectly perpendicular to the axis of the rods 26 and of the worm screw 22.

[0022] On the upper face of the shielding 16 an opening is formed at which a flexible tube 19 for sucking in the fumes from burning the coated gypsum, is connected.

[0023] The laser device 12 also comprises presence sensor means 17 of the slabs pack in front of the laser head 15. Advantageously, the sensor means 17 are configured so as to ascertain whether the pack 14 has actually closed the front opening 50 of the shielding, to ensure the maximum safety in use of the system.

[0024] Advantageously, the presence sensor means of the pack comprise at least three switches 17, which are not aligned, arranged in proximity of the edge of the opening 50, adapted to detect a contact with the lateral wall of the pack 14. In a preferred embodiment of the invention, there are four switches 17, arranged at the four vertices of the rectangular opening 50, integral with the shielding 16. The electromechanical switches 17 are connected in series, so that it is sufficient for one of these to not be pressed to detect an incorrect positioning of the pack with respect to the shielding.

[0025] The laser device also comprises sensor means adapted to detect when the focal distance between the laser output 30 and the lateral wall 51 of the pack to be marked has been reached.

[0026] The focal distance sensor means comprise a sensor 18 adapted to detect a set movement of the shielding 16 with respect to the laser head 15, which corresponds to a desired distance of the laser output 30 from the wall 51 of the pack.

[0027] The sensor 18 is formed with a reference end-stop, supported by an arm 25 integral with the support 21, as clearly shown in figure 1. It should be understood that the sensor 18 could alternatively detect a movement of another feeler element moveable with respect to the laser head, different from the shielding 16.

[0028] The system also comprises control means 23 (schematically represented in figure 2), connected to the sensor means 17 and 18 adapted to control the actuation of the actuator 20 and of the laser head 15.

[0029] In particular, the control means 23 are such as to actuate the laser marking only when they detect contact through all the presence sensors 17 and they detect a correct focal distance of the pack 14 through the sensor

18.

[0030] Now we shall briefly describe the operation of the system with reference to figures 2-4.

[0031] Figure 2 shows the laser device 15 in the idle position retracted from the conveying path of the slab packs, with a slabs pack 14 which is brought in front of the laser head.

[0032] The control means 23 then control the actuation of the actuator 20, which pushes the laser device 12 forwards. The laser head 15 and the shielding 16 integrally advance until the position of figure 3 is reached, in which the switches 17 come into contact with the lateral wall 51 of the pack 14.

[0033] The control means 23 then control a further advancement of the laser device 12. In this step the shielding 16 rests against the slabs pack and does not advance, so that the laser head 15 runs inside the shielding until the position of figure 4 is reached, in which the laser output 30 is at the focal distance d from the wall 51 of the slabs pack to be marked. The correct position of the laser head is detected through the sensor 18. In this condition the marking is carried out, after which the laser device 12 is again retracted towards the idle position, ready for marking the subsequent slabs pack.

[0034] At this point it should be clear how the purposes of the present invention have been reached.

[0035] In particular, a system has been provided for marking plasterboard slab packs which allows a well defined marking to be obtained, without blurred edges.

[0036] The marking is carried out cost-effectively and quickly, thanks to the use of a class IV laser. It is indeed not necessary to use expensive marking inks.

[0037] The system also allows a high level of safety to be obtained for the users. The presence of the box-shaped shielding and of the presence sensors, indeed reduces to the minimum the possibility of reflection of the laser rays towards the surrounding area.

[0038] Moreover, the particular structure with mobile shielding with respect to the laser head allows an indication of the correct focal distance of the wall to be marked, to be reliably obtained, without requiring complex sensor systems. The system has a simple structure and does not need a lot of maintenance.

[0039] Of course, the aforementioned description of an embodiment applying the innovative principles of the present invention is given as an example of such innovative principles and therefore, it must not be taken to limit the scope of protection claimed hereby.

Claims

1. System for marking coated gypsum slab packs comprising marking means for marking slab packs (14) at the lateral edges of the single slabs (24) and conveying means (13) adapted to move slab packs (14) to the marking means, **characterised in that** said marking means comprise a laser device (12) provid-

ed with a laser head (15) of Class IV type, adapted to imprint a mark on the slabs pack (14) by means of laser, the laser device (12) being moveable between an idle position retracted from a path of slab packs (14) and an operative position advanced towards said path for imprinting the mark on the slabs pack (14), the system further comprising presence sensor means (17) adapted to detect the presence of a slabs pack (14) in front of the laser head (15) by detection of a contact with a side (51) of the slabs pack (14) defined by the lateral edges of the single slabs (24).

2. System according to claim 1, **characterised in that** the laser head (15) has a laser output (30) for emitting the laser, the laser device (12) being provided with a laser opaque box-shaped shielding (16) which contains said laser output (30) and is provided with an opening (50) intended to be closed, in the operative position of the laser device, by said side (51) of a slabs pack (14) defined by the lateral edges of the single slabs.
3. System according to claim 2, **characterised in that** the presence sensor means (17) are arranged in such a manner to detect a positioning of the slabs pack (14) such that the opening (50) of the shielding (16) is closed by the side (51) of the slabs pack.
4. System according to claim 1, **characterised in that**, for detection of the contact with the side (51) of the slabs pack (14), the presence sensor means (17) comprise at least three non-aligned switches.
5. System according to claim 2, **characterised in that** the presence sensor means (17) comprise switches arranged in proximity to the edge of the opening (50) of the shielding (16), integral with the shielding.
6. System according to claim 1, **characterised in that** it comprises focal distance sensor means (18) for sensing the focal distance between an output (30) of the laser generated by the laser head (15) and the side (51) of the slabs pack (14) to be marked.
7. System according to claim 6, **characterised in that** the focal distance sensor means (18) comprise a sensor for detecting a preset movement of a feeler with respect to the laser head (15), said feeler being adapted to contact the side (51) of the slabs pack during the movement of the laser device from the idle position to the operative position.
8. System according to claims 2 and 7, **characterised in that** the feeler is the laser opaque shielding (16) of the laser device (12).
9. System according to claim 6, **characterised in that**

it comprises control means (23) connected to the presence sensor means (17) and to the focal distance sensor means (18), adapted to control the emission of the laser ray only when a proper positioning of the slabs pack (14) with respect to the laser head (15) is detected.

10. System according to claim 1, **characterised in that** the laser head (15) is transversely moveable with respect to the conveying direction of the slabs packs (14) to mark the side (51) of a pack defined by the lateral edges of the single slabs.

15 Patentansprüche

1. System zur Markierung von Gipsplattenpackungen umfassend Markiermittel zur Markierung von Gipsplattenpackungen (14) an den seitlichen Kanten der einzelnen Platte (24) und Fördermittel (13), die dazu geeignet sind, die Gipsplattenpackungen (14) zu den Markiermitteln zu bewegen, **dadurch gekennzeichnet, dass** die Markiermittel eine Laservorrichtung (12) umfassen, die mit einem Laserkopf (15) der Klasse IV ausgestattet ist, der dazu geeignet ist, eine Markierung auf die Gipsplattenpackung (14) mittels Laser einzugravieren, wobei die Laservorrichtung (12) beweglich ist zwischen einer losen, von einer Bahn von Gipsplattenpackungen (14) zurückgezogenen Stellung und einer zur Bahn hin vorgeschobenen Arbeitsstellung zum Eingravieren der Markierung auf der Gipsplattenpackung (14), wobei das System ferner Präsenzsensormittel (17) umfasst, die dazu geeignet sind, die Präsenz einer Gipsplattenpackung (14) vor dem Laserkopf (15) durch Erfassen eines Kontakts mit einer Seite (51) der Gipsplattenpackung (14) festzustellen, die durch die Seitenkanten der einzelnen Platte (24) definiert wird.
2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der Laserkopf (15) einen Laserauslass (30) zur Laseremittierung aufweist, wobei die Laservorrichtung (12) mit einer laserstrahlenundurchlässigen, kastenförmigen Abschirmung (16) versehen ist, die den Laserauslass (30) enthält und mit einer Öffnung (50) versehen ist, die in der Arbeitsstellung der Laservorrichtung durch die Seite (51) einer Gipsplattenpackung (14) geschlossen werden sollte, die durch die Seitenkanten der einzelnen Platten definiert wird.
3. System nach Anspruch 2, **dadurch gekennzeichnet, dass** die Präsenzsensormittel (17) so angeordnet sind, dass eine Positionierung der Gipsplattenpackung (14), in der die Öffnung (50) der Abschirmung (16) durch die Seite (51) der Gipsplattenpackung geschlossen ist, erfasst wird.

4. System nach Anspruch 1, **dadurch gekennzeichnet, dass** zum Erfassen des Kontakts mit der Seite (51) der Gipsplattenpackung (14) die Präsenzsensormittel (17) mindestens drei nicht ausgerichtete Schalter umfassen. 5
5. System nach Anspruch 2, **dadurch gekennzeichnet, dass** die Präsenzsensormittel (17) Schalter umfassen, die in der Nähe der Kante der Öffnung (50) der Abschirmung (16) angeordnet und fest in die Abschirmung eingebaut sind. 10
6. System nach Anspruch 1, **dadurch gekennzeichnet, dass** es Brennweitensensormittel (18) zum Abtasten der Brennweite zwischen einem Ausgang (30) des vom Laserkopf (15) erzeugten Laserstrahls und der Seite (51) der zu markierenden Gipsplattenpackung (14) umfasst. 15
7. System nach Anspruch 6, **dadurch gekennzeichnet, dass** die Brennweitensensormittel (18) einen Sensor zum Erfassen einer voreingestellten Bewegung eines Tasters bezogen auf den Laserkopf (15) umfassen, wobei der Taster dazu geeignet ist, die Seite (51) der Gipsplattenpackung während der Bewegung der Laservorrichtung von der Ruhestellung in die Arbeitsstellung zu berühren. 20 25
8. System nach den Ansprüchen 2 und 7, **dadurch gekennzeichnet, dass** der Taster die laserundurchlässige Abschirmung (16) der Laservorrichtung (12) ist. 30
9. System nach Anspruch 6, **dadurch gekennzeichnet, dass** es Kontrollmittel (23) umfasst, die mit den Präsenzsensormitteln (17) und den Brennweitensensormitteln (18) verbunden und dazu geeignet sind, die Emission eines Laserstrahls nur dann zu betätigen, wenn eine angemessene Positionierung der Gipsplattenpackung (14) bezogen auf den Laserkopf (15) festgestellt wurde. 35 40
10. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der Laserkopf (15) transversal bezogen auf die Förderrichtung der Gipsplattenpackung (14) beweglich ist, um die durch die Seitenkanten der einzelnen Platten definierte Seite (51) einer Packung zu markieren. 45

Revendications

1. Système de marquage d'ensembles de dalles de gypse comprenant des moyens de marquage pour le marquage des dalles (14) aux bords latéraux des dalles individuelles (24) et des moyens de transport (13) adaptés pour déplacer les ensembles de dalles (14) vers les moyens de marquage, **caractérisé en** 55

ce que lesdits moyens de marquage comprennent un dispositif laser (12) pourvu d'une tête laser (15) de type de Classe IV, adaptée pour imprimer une marque sur l'ensemble de dalles (14) au moyen d'un laser, le dispositif laser (12) étant mobile entre une position de repos rétractée par rapport à une trajectoire d'ensembles de dalles (14) et une position opérationnelle avancée en direction de ladite trajectoire pour imprimer la marque sur l'ensemble de dalles (14), le système comprenant en outre des moyens capteurs de présence (17) adaptés pour détecter la présence d'un ensemble de dalles (14) devant la tête laser (15) par la détection d'un contact avec un côté (51) de l'ensemble de dalles (14) défini par les bords latéraux des dalles individuelles (24).

2. Système selon la revendication 1, **caractérisé en ce que** la tête laser (15) a une sortie laser (30) pour émettre le laser, le dispositif laser (12) étant pourvu d'un blindage en forme de boîte opaque au laser (16) qui contient ladite sortie laser (30) et est pourvu d'une ouverture (50) destinée à être fermée, dans la position opérationnelle du dispositif laser, par ledit côté (51) d'un ensemble de dalles (14) défini par les bords latéraux des dalles individuelles. 20
3. Système selon la revendication 2, **caractérisé en ce que** les moyens capteurs de présence (17) sont disposés de telle manière à détecter un positionnement de l'ensemble de dalles (14) de sorte que l'ouverture (50) du blindage (16) est fermée par le côté (51) de l'ensemble de dalles. 25
4. Système selon la revendication 1, **caractérisé en ce que**, pour la détection du contact avec le côté (51) de l'ensemble de dalles (14), les moyens capteurs de présence (17) comprennent au moins trois commutateurs non alignés. 30
5. Système selon la revendication 2, **caractérisé en ce que** les moyens capteurs de présence (17) comprennent des commutateurs disposés à proximité du bord de l'ouverture (50) du blindage (16), solidaires avec le blindage. 35
6. Système selon la revendication 1, **caractérisé en ce qu'il** comprend des moyens capteurs de distance focale (18) pour capter la distance focale entre une sortie (30) du laser généré par la tête laser (15) et le côté (51) de l'ensemble de dalles (14) à marquer. 40 45 50
7. Système selon la revendication 6, **caractérisé en ce que** les moyens capteurs de distance focale (18) comprennent un capteur pour détecter un mouvement préétabli d'un palpeur par rapport à la tête laser (15), ledit palpeur étant adapté pour entrer en contact avec le côté (51) de l'ensemble de dalles pendant le mouvement du dispositif laser à partir de la

position de repos vers la position opérationnelle.

8. Système selon les revendications 2 et 7, **caractérisé en ce que** le palpeur est le blindage opaque au laser (16) du dispositif laser (12). 5
9. Système selon la revendication 6, **caractérisé en ce qu'il** comprend des moyens de commande (23) connectés aux moyens capteurs de présence (17) et aux moyens capteurs de distance focale (18), adaptés pour commander l'émission du rayon laser uniquement lorsqu'un positionnement correct de l'ensemble de dalles (14) par rapport à la tête laser (15) est détecté. 10
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10. Système selon la revendication 1, **caractérisé en ce que** la tête laser (15) est transversalement mobile par rapport à la direction de transport des ensembles de dalles (14) pour marquer le côté (51) d'un ensemble défini par les bords latéraux des dalles individuelles. 20

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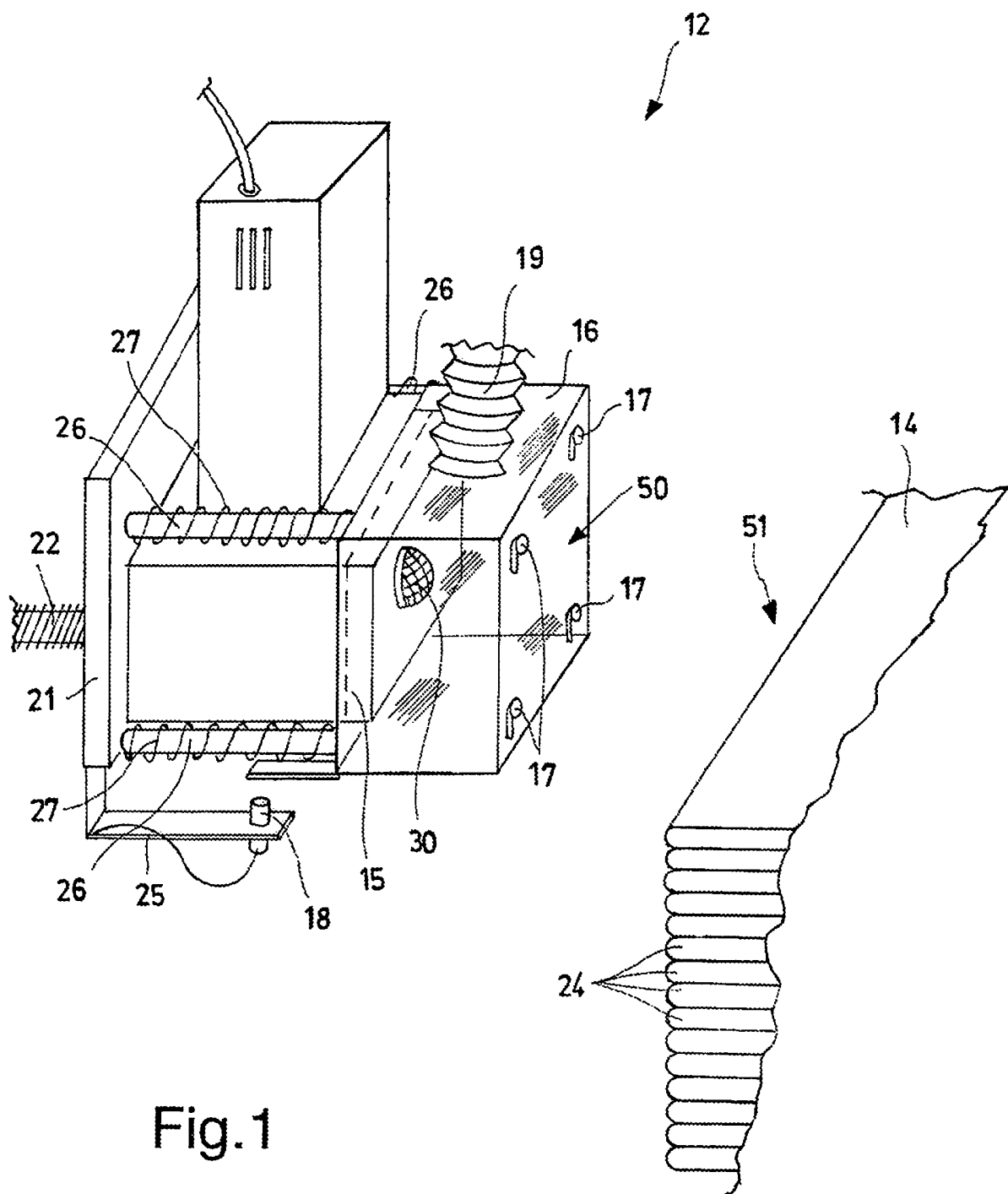


Fig.2

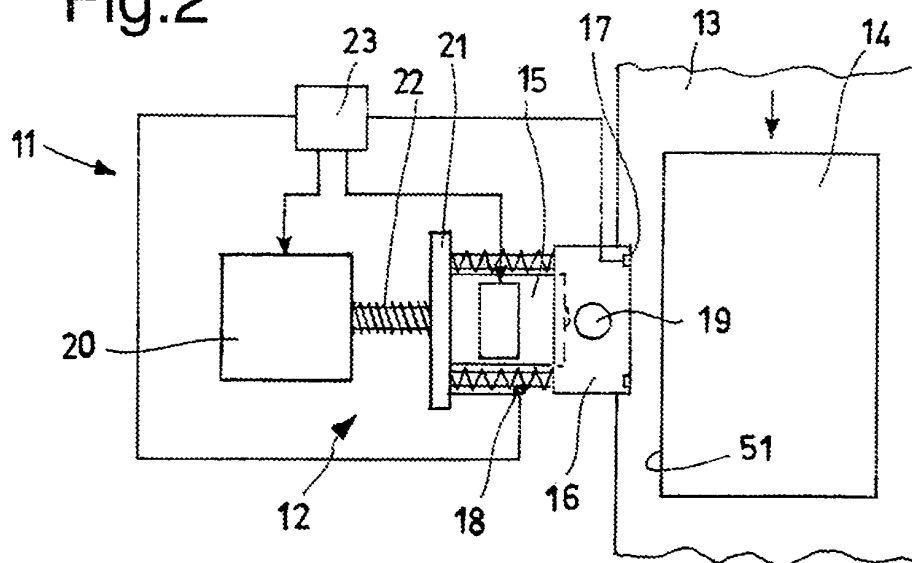


Fig.3

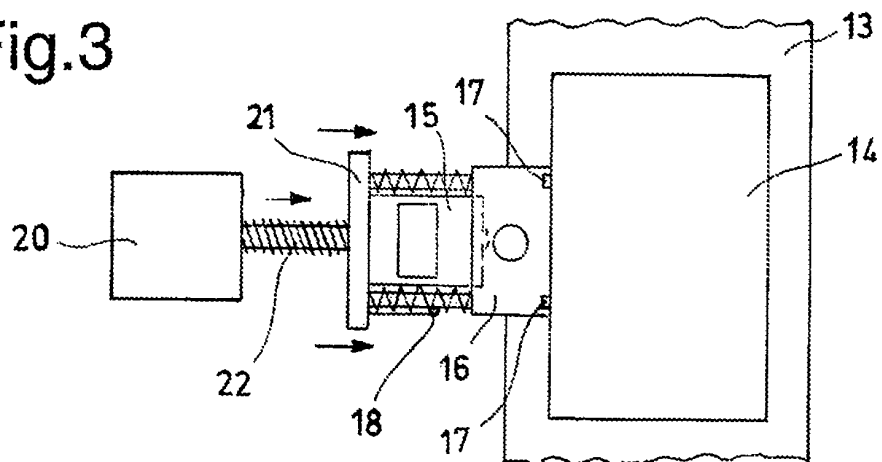
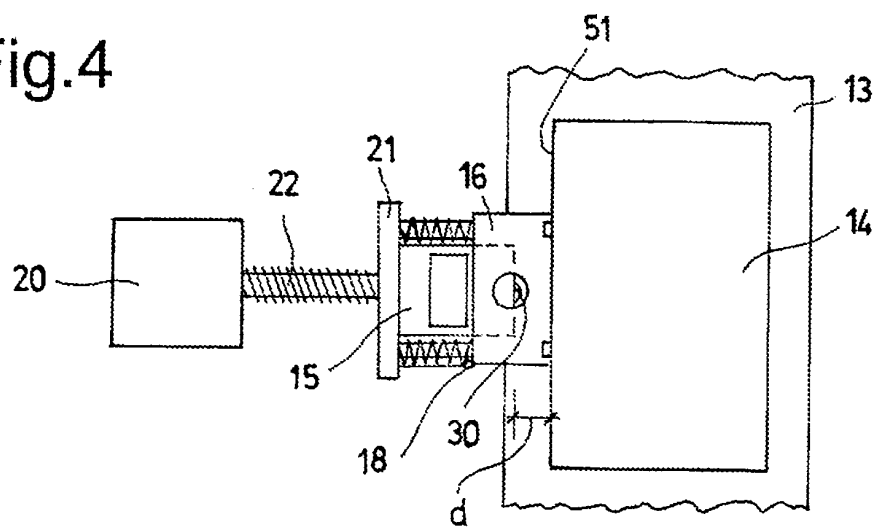


Fig.4



REFERENCES CITED IN THE DESCRIPTION

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