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(54) **Method for sizing natural- or synthetic-stone elements, particularly ceramic tiles, and machine for carrying out the method**

Verfahren zum Formatieren von Natur- oder Kunststein-Elementen, insbesondere keramische Fliesen, und Maschine zum Anwenden dieses Verfahrens

Procédé pour mettre à dimension des éléments en pierre naturelle ou synthétique, en particulier de carreaux en céramique, et machine pour la mise en oeuvre du procédé

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EP 0 865 870 B1

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Description

[0001] The invention relates to a method and a machine for sizing elements made of natural or synthetic stone, particularly ceramic tiles, as defined in the pre-characterising portions of claims 1 and 11 and as such disclosed in DE-A-4136252.

[0002] The state of the art comprises a method which entails sorting the tiles or product elements in general, before grading, according to at least two sizes (with reference to the dimensions of the format). The sizing operation is performed on both pairs of sides of each element, in two successive steps, by intermediate rotation through 90°, by means of grinding machines with diamondized grinding wheels, installed bilaterally with respect to the transfer line of said elements and, only in the case of porcelainized gres tiles, generally by associating it with the requirement of said material to be mostly dressed on the exposed face, with the consequent compulsory need for water cooling.

[0003] As regards the production of single-fired tiles, the adoption of sizing in the production would entail the installation of a new plant, owing to the need to use diamondized grinding wheels, since the possibility of dry sizing, using grinding wheels of the carborundum type, must be discarded at the outset due to the rate at which they wear, which entails frequent adjustments of the stroke of the corresponding spindle.

[0004] The sizing method currently performed has first of all a drawback due to the use of diamondized grinding wheels, since it entails that the product absorbs water, or cooling liquid in general, and that therefore it is necessary to wait for the product to dry before packaging in order to prevent soaking of the container, which is generally made of paper-like material.

[0005] Another severe drawback is the need to adopt a plurality of sizes of the product in order to contain the tolerance range within each size class, in order to comply with the planned tolerances in the use of the product.

[0006] The adoption of a plurality of sizes is disadvantageous, mainly owing to the consequent multiplication of the number of articles caused by dividing each size into various color shades during the grading of the product.

[0007] For example, for a square tile having a nominal side of 200 mm, two sizes become necessary: one for the range 199-200, the other for the range 200-201.

[0008] In practice, this multiplication of the articles causes a disadvantageous increase in the number of operations, in the number of packages and in the spaces required: this occurs in the management of the plants, of the store and of sales, with a highly onerous increase in production and service costs.

[0009] On the other hand, the adoption of sizing and of optional dry squaring is not substantially feasible, owing to the extent and rate of the wear of non-diamondized grinding wheels, for example of the carborundum type, which can be used in dry processes but in-

deed force frequent stops to adjust the axial position of the spindle.

[0010] This prior state of the art is susceptible of considerable improvements as regards the possibility of eliminating the above mentioned drawbacks.

[0011] The above leads to a need to solve the problem of finding a sizing method which allows first of all to avoid dividing the product that has the same nominal dimensions into various sizes and to obtain automatic and continuous sizing. Another aspect of the problem is to reduce the waiting time for packaging, which is necessary to avoid soaking of the containers. Another aspect of the problem is the overcoming of the severe consequences of actions required to cope with the rapid wear of dry grinding wheels, in order to make them conveniently usable in sizing.

[0012] The invention solves the above problem by the method as claimed in claim 1 and the machine as claimed in claim 11. The dependent claims describe preferred embodiments of the invention. The method is for the dry sizing of natural- or synthetic-stone elements, optionally associated with squaring, eliminating the plurality of sizes; as regards the additional aspect of eliminating the drawbacks due to the rapid wear of the grinding wheels, the method provides for automatically compensating for said wear without any interruption of the process.

[0013] In particular, the sizing method entails:

- centering the element which is moving for processing in a first plant section which advantageously has a plurality of consecutive stations, each of which is generally constituted by two mutually opposite motorized grinding wheels, each of which is assigned the task of removing thickness from each edge until finishing is achieved by reaching the preset size;
- checking said size, related to a first pair of sides, by means of a measurement and comparison apparatus;
- rotating through 90° the element at the exit of the first plant section, for the alternation of the second pair of sides;
- centering the element being processed in the second plant section;
- optionally positioning, for squaring, one of said elements or a plurality of elements, simultaneously with centering, in the second plant section;
- insertion between the successive pairs of grinding wheels, for sizing the second pair of sides, where necessary;
- geometric checking of the squaring by measuring the angle or by comparing the length of the diagonals;
- dimensional checking of the size of the second pair of sides.

[0014] As to the compensating for the wear of the grinding wheels, which advantageously constitute a

pair, the following is preferably provided:

- at time intervals advantageously preset according to the degree of precision of the size, to the workability characteristics of the element being processed and to the wear characteristics of the grinding wheel, each grinding wheel is backed off to measure the value of, and then compensate for, the wear that has occurred during the previous time interval;
- the backoff value of each grinding wheel must be enough to clear the control path of a control means bilaterally interposed between the working front and the front of said grinding wheel;
- the front of each grinding wheel returns to the working front by moving by an extent which is equal to the extent of the backoff, including the value of the grinding thickness of the edge assigned to said grinding wheel, plus the wear that has occurred in the previous time interval;
- the fraction of workload that has been neutralized in the backoff of one pair of grinding wheels is assigned to the next pair of grinding wheels;
- the fraction of workload that is neutralized in the backoff of the last pair of grinding wheels can be assigned to the preceding pair;
- according to a variation of the program, control of compensation of the wear of the last pair of grinding wheels of each plant section can be assigned to the size control section of the corresponding plant section; wear compensation is controlled by reading the size of the element being processed.

[0015] The advantages achieved by the present invention are: the elimination of the need to resort to more than one size, with a very significant simplification in terms of processing, storage, administration and transport and a consequent considerable cost reduction; the possibility to use dry sizing and squaring, eliminating the waiting times and the associated costs for the drying of the items before placing them in the packages; the production -- by means of the squaring and of the subsequent checks -- of elements which are geometrically precise and particularly adapted for laying without gaps; the elimination of wet sizing and squaring, with the consequent elimination of the waiting times for the drying of the element being processed; the possibility of performing processing directly at the exit of the kiln, i.e., online, differently from what occurs in wet sizing and optional squaring, which must be performed in an adapted environment, separately from the production line: therefore, a further cost reduction; the possibility to work both with glazed products and with non-glazed products, consequently expanding the product range; higher productivity.

[0016] Some embodiments of the invention are illustrated, merely by way of non-limitative example, in the accompanying five drawings, wherein:

figure 1 is a partially sectional side view of the moving element of the machine according to the invention, installed so that it can slide axially in a direction which is normal to the direction of the line and guided on a fixed support, in the backed-off inactive position;

figure 2 is a view, similar to figure 1, with the moving element in the forward active position;

figures 3 and 4 are views of a similar machine, but on a support which oscillates longitudinally between the two end positions;

figure 5 is a plan view of a generic sizing and squaring plant, with the individual sizing machines in the active position;

figure 5a is a schematic plan view, illustrating the presetting of the device for compensating the wear of the element sizing grinding wheel;

figure 6 is a plan view, similar to figure 5, which highlights the difference between the front working positions of each grinding wheel in order to illustrate them more clearly;

figure 7 is an enlarged-scale perspective view of an element being sized in a plant section;

figure 8 is a block diagram of a sizing and squaring plant according to the invention.

[0017] The reference numeral 1 designates a motor, for example an electric one, from a spindle 2 of which a shaft 3 protrudes. The shaft 3 supports a grinding wheel 4 or abrasive tool for dry working, made for example of carborundum, which is adapted to grind the edge of an element 5 being processed and to perform any squaring. The reference numeral 6 designates a sensor, for example of the fiber-optic photocell type, which is arranged transversely and bilaterally in a position which is proximate to the edge of the element to be ground and at a distance from said ground edge. The reference signs S1, S2, S3, ... SN designate the thicknesses of the edge of an element being processed that each grinding wheel must remove for sizing, where S1 is equal to zero or greater than zero (figure 5a). The reference numeral 7 designates at least one sleeve which supports, so that it can slide in a longitudinally guided manner, the motor 1 on at least one guide 8. The reference numeral 9 designates a linear actuator, for example of the step type, which actuates the movement of the at least one sleeve 7. The reference numeral 10 designates the supporting frame. The reference numeral 11 (figure 3) designates at least one pair of oscillating elements, for example leaf springs, which support the motor 1, protrude from a base 12 and are actuated by a linear actuator 13. The reference numeral 14 designates conveyor belts or elements for conveying the elements being processed. The reference numerals 15, 16 and 17 designate the frames of the machine sections that compose the plant. The reference numerals 18 and 19 designate the devices for measuring and checking, respectively, the size of a pair of edges and for measuring and checking the size

of the other pair and the squaring. The reference numeral 20 designates the device for centering the elements being machined. The reference numeral 21 designates the device for presetting for squaring, which in each instance can act on the rear edge or on the front edge of said elements. The reference numeral 22 (figure 8) designates the first section of the sizing plant. The reference numeral 23 designates the second section, which optionally also comprises squaring; the reference numerals 24, 25 designate the two measurement and control sections with optional automatic feedback to perform the necessary corrections of the active position of the grinding wheel or wheels, advantageously on the last pair thereof which is part of the machines 1. The reference numerals 26 and 27 designate the device for optional correction after comparison between the read measurement and the reference measurement.

[0018] The sizing method is carried out as follows. Sizing of the first pair of sides of the element 5 being processed occurs in the first plant section 15, where the element 5, conveyed by the line 14, is centered in the device 20 for centering with respect to the longitudinal axis of said first section, after positioning the pairs of grinding wheels 4, which work dry and are rotationally actuated by the motors 1 and moved into position by the respective linear actuators 9 or 13, so that each one reaches the working front according to a preset program, determining the distance d from the front of the corresponding plant section. The various and subsequent pairs of grinding wheels 4 gradually reduce the width of the element 5 until one reaches the dimension that corresponds to the preset size, which is checked by the device 18, while said element 5 continues through the rotation station (the so-called carousel) and then enters the second plant section 17. Here the element 5 undergoes an additional centering operation which is simultaneous with, or subsequent to, a positioning step for squaring, which is performed one element at a time by sets of elements 5, with subsequent insertion between the pairs of grinding wheels 4 which are adapted to perform, where necessary, simultaneously with squaring, also the sizing of the other dimension of the second pair of sides of the element being processed. This is followed by dimensional checking of the second size and by geometric checking of squareness, by measuring the angle or by comparing the lengths of the diagonals.

[0019] As regards the machine, in execution of the method related to the compensation of the wear of the grinding wheels 4, compensation occurs mainly as follows. At preset time intervals, depending on the degree of precision of the size, on the workability characteristics of the element 5 and on the wear characteristics of the grinding wheel, the linear actuator backs off each grinding wheel 4 by an extent which is sufficient to clear the path related to the sensor 6 and then returns the grinding wheel to the working front, and so forth.

[0020] During the cycle for compensating the wear of

one pair of mutually opposite grinding wheels 4, or even of a single grinding wheel, the fraction of workload that is neutralized during backoff is assigned to the next pair of grinding wheels 4 or to the next grinding wheel, except for the last fraction, which can be assigned to the preceding grinding wheel or pair of grinding wheels.

[0021] According to a variation of the program, it is possible to assign control of the wear of the last grinding wheel or pair of grinding wheels to the section 18 for size control of the corresponding plant section. In this case, compensation of the wear of the grinding wheel or pair of grinding wheels 4 is actuated by reading the size of the element 5 being processed.

[0022] When each grinding wheel 4 reaches its wear limit, an adapted sensor, not shown, produces the back-off of said grinding wheel, the issuing of an adapted alarm and operational presetting for tool replacement. During replacement, the workload related to the grinding wheel is assigned to other grinding wheels, as in the case of wear compensation.

[0023] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A method for sizing elements made of natural or synthetic stone, particularly ceramic tiles, which comprises the sizing and optional squaring, on both pairs of sides, of each natural- or synthetic-stone element (5) in two successive steps by means of an intermediate rotation through 90° , **characterized in that** sizing and optional squaring are achieved by means of a dry grinding process with continuous compensation of the wear of at least one grinding wheel (4).
2. The method according to claim 1, **characterized in that** a single size is used for the dimensions of each element (5).
3. The method according to claim 1, **characterized in that** it comprises the steps of:
 - sizing the element (5) in a first plant section, with subsequent removal of thickness of each edge of a pair of sides until finishing occurs by reaching the size;
 - checking the dimensions of the size by measurement and comparison;
 - rotating through 90° ;
 - centering the element (5) in a second plant section and performing optional squaring;

- sizing the second pair of sides, where necessary;
 - geometrically checking the squaring, if performed;
 - checking the dimensions of the size of the second pair of sides; compensation of the wear of the at least one grinding wheel (4) being provided.
4. The method according to claim 1, **characterized in that** the wear of the at least one dry grinding wheel (4) is compensated according to time intervals which are preset according to the degree of precision of the element (5) being processed and to the wear characteristics of the grinding wheel.
5. The method according to claim 4, **characterized in that** wear compensation on the at least one grinding wheel (4) is performed after backing off from the working front in order to measure the value of the wear.
6. The method according to claim 5, **characterized in that** the grinding wheel backoff value between the working front and the front of said grinding wheel (4) is sufficient to clear the control path of an interposed control means.
7. The method according to claim 6, **characterized in that** the front of each grinding wheel (4) returns to the working front by moving by an extent which is equal to the extent of the backoff, including the value of the grinding thickness of the edge of the element (5), plus the wear that has occurred in the previous time interval.
8. The method according to claim 7, **characterized in that** the work load fraction of one pair of grinding wheels (4) is assigned to the next pair of grinding wheels (4).
9. The method according to claim 7, **characterized in that** the workload fraction that is neutralized in the backoff of one pair of grinding wheels (4) is assigned to the preceding pair of grinding wheels (4).
10. The method according to claim 3, **characterized in that** control of the compensation of the wear of the last pair of grinding wheels (4) of each one of said first and second plant sections is assigned to the size control section of the corresponding plant section: wear compensation being actuated by reading the size of the element being processed.
11. A machine for sizing elements made of natural or synthetic stone, particularly ceramic tiles, **characterised in that** it comprises at least one dry abrasive tool (4) which is made to rotate about its own axis and moves axially with respect to an element (5) being processed, first dry grinding means for first pair of sides of said element (5) being processed, second dry grinding means for second pair of sides of said element (5) being processed and continuous compensation means of the wear of at least one dry abrasive tool (4).
12. The machine according to claim 11, **characterized in that** at least one sensor (6) is interposed - with its own path - between said element (5) being processed and each one of said abrasive tools (4).
13. The machine according to claim 12, **characterized in that** said abrasive tool (4), rotationally actuated by a motor (1), is allowed to slide axially on at least one guide (8) by means of a linear actuator (9) which is supported on a frame (10).
14. The machine according to claim 13, **characterized in that** said abrasive tool (4) rotationally actuated by the motor (1) is allowed to slide axially by means of a linear actuator (13) which acts on a pair of oscillating elements (11).
15. A plant for treating natural or synthetic stone elements, particularly ceramic tiles, **characterized in that** it comprises a machine as defined in claim 11.
16. The plant according to claim 15, **characterized in that** it comprises elements (14) for conveying the natural- or synthetic-stone elements (5) which are sized and/or squared by dry abrasive tools (4), after passing through a centering device (20) and optionally a squaring device (21), with subsequent measurement and control sections with optional automatic feedback.
17. The plant according to claim 15, **characterized in that** it further comprises a device (26, 27) for size correction after comparison between the read measurement and the reference measurement, said device being present in each one of plant sections (15, 17) of said plant.

Patentansprüche

1. Verfahren zum maßgerechten Bearbeiten von Elementen aus Natur- oder Kunststein, insbesondere von keramischen Fliesen, welches die Bearbeitung auf Maß (Maßbearbeitung) und die optionale Bearbeitung auf rechte Winkel (Winkelbearbeitung) an beiden Seitenpaaren eines jeden Natur- oder Kunststeinelementes (5) in zwei aufeinanderfolgenden Schritten mittels einer Zwischendrehung um 90° umfaßt, **dadurch gekennzeichnet, daß** eine Maßbearbeitung und eine optionale Winkelbe-

arbeitung mittels eines Trockenschleifprozesses mit kontinuierlicher Kompensierung des Verschleißes von wenigstens einer Schleifscheibe (4) erreicht werden.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** ein einziges Maß für die Abmessungen eines jeden Elementes (5) verwendet wird.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** es die Schritte umfaßt:

- Maßbearbeitung des Elementes (5) in einer ersten Anlagensektion, mit aufeinanderfolgendem Entfernen der Breite einer jeden Kante eines Seitenpaares, bis bei Erreichen des Maßes eine Endbearbeitung stattfindet;
- Prüfen der Maßabmessungen durch Messen und Vergleichen;
- Drehen um 90°;
- Zentrieren des Elementes (5) in einer zweiten Anlagensektion und Durchführen der optionalen Winkelbearbeitung;

- Maßbearbeitung des zweiten Seitenpaares, wo erforderlich;
- geometrisches Prüfen der Winkelbearbeitung, falls diese durchgeführt wird;
- Prüfen der Maßabmessungen des zweiten Seitenpaares; wobei eine Kompensierung des Verschleißes der wenigstens einen Schleifscheibe (4) vorgesehen wird.

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** der Verschleiß der wenigstens einen Trockenschleifscheibe (4) in Zeitintervallen kompensiert wird, die entsprechend dem Grad der Genauigkeit des bearbeiteten Elementes (5) und den Verschleißcharakteristika der Schleifscheibe voreingestellt werden.

5. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, daß** eine Verschleißkompensierung an der wenigstens einen Schleifscheibe (4) nach dem Zurückziehen von der Bearbeitungsfront durchgeführt wird, um die Größe des Verschleißes zu messen.

6. Verfahren nach Anspruch 5, **dadurch gekennzeichnet, daß** das Zurückziehmaß der Schleifscheibe zwischen der Bearbeitungsfront und der Front dieser Schleifscheibe (4) ausreichend ist, um den Kontrollweg einer dazwischen eingebrachten Kontrolleinrichtung freizugeben.

7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, daß** die Front einer jeden Schleifscheibe (4) zu der Bearbeitungsfront zurückgestellt wird, in-

dem man diese um einen Betrag bewegt, welcher gleich dem Betrag des Zurückziehweges einschließlich der Größe der Schleifdicke bei der Kante des Elementes (5) plus dem Verschleiß ist, welcher im vorausgehenden Zeitintervall eingetreten ist.

8. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, daß** der Arbeitslastanteil eines Paares von Schleifscheiben (4) an das nächste Paar von Schleifscheiben (4) zur Berücksichtigung weitergegeben wird.

9. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, daß** der Arbeitslastanteil, welcher bei dem Zurückziehen eines Paares von Schleifscheiben (4) neutralisiert wird, an das vorangehende Paar von Schleifscheiben (4) zur Berücksichtigung weitergegeben wird.

10. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, daß** eine Kontrolle der Kompensierung des Verschleißes des letzten Paares von Schleifscheiben (4) einer jeden der genannten ersten und zweiten Anlagensektionen an die Maßkontrollsektion der entsprechenden Anlagensektion zur Berücksichtigung weitergegeben wird: wobei eine Verschleißkompensierung durch Ablesen der Größe des bearbeiteten Elementes bewirkt wird.

11. Maschine zum Maßbearbeiten von Elementen aus Natur- oder Kunststein, insbesondere keramischen Fliesen, **dadurch gekennzeichnet, daß** sie wenigstens ein Trockenabrasivwerkzeug (4) umfaßt, welches zu einer Drehung um seine eigene Achse veranlaßt wird und sich axial mit Bezug auf ein bearbeitetes Element (5) bewegt, ferner erste Trockenschleifmittel für ein erstes Seitenpaar dieses bearbeiteten Elementes (5), zweite Trockenschleifmittel für ein zweites Seitenpaar des bearbeiteten Elementes (5) und Mittel für eine kontinuierliche Kompensierung des Verschleißes von wenigstens einem Trockenabrasivwerkzeug (4).

12. Maschine nach Anspruch 11, **dadurch gekennzeichnet, daß** wenigstens ein Sensor (6) - mit einem eigenen Weg - zwischen das bearbeitete Element (5) und jedes der Abrasivwerkzeuge (4) eingebracht wird.

13. Maschine nach Anspruch 12, **dadurch gekennzeichnet, daß** das Abrasivwerkzeug (4), welches durch einen Motor (1) drehangetrieben wird, die Möglichkeit hat, sich axial auf wenigstens einer Führung (8) mittels eines linearen Stellantriebes (9) zu verschieben, welcher auf einem Rahmen (10) gelagert ist.

14. Maschine nach Anspruch 13, **dadurch gekennzeichnet, daß** das Abrasivwerkzeug (4), welches durch den Motor (1) drehangetrieben wird, die Möglichkeit hat, sich axial vermittels eines linearen Stellantriebes (13) zu verschieben, welcher auf ein Paar oszillierender Elemente (11) wirkt. 5
15. Anlage zum Bearbeiten von Natur- oder Kunststeinelementen, insbesondere keramischen Fliesen, **dadurch gekennzeichnet, daß** sie eine Maschine umfaßt, wie sie im Anspruch 11 definiert ist. 10
16. Anlage nach Anspruch 15, **dadurch gekennzeichnet, daß** sie Elemente (14) zum Fördern der Natur- oder Kunststeinelemente (5) umfaßt, die durch Trockenabrasivwerkzeuge (4) maßbearbeitet und/oder winkelbearbeitet werden, nachdem sie durch eine Zentriervorrichtung (20) und optional durch eine Winkelbearbeitungsvorrichtung (21) hindurchgelaufen sind, mit nachfolgenden Meß- und Kontrollsektionen mit optionaler automatischer Signalführung (englisch: feedback). 20
17. Anlage nach Anspruch 15, **dadurch gekennzeichnet, daß** sie ferner eine Vorrichtung (26, 27) für eine Maßkorrektur nach einem Vergleich zwischen der abgelesenen Messung und der Bezugsmessung umfaßt, wobei diese Vorrichtung in jeder einzelnen der Anlagensektionen (15, 17) der Anlage vorgesehen ist. 25
- Revendications**
1. Procédé pour mettre à dimension des éléments en pierre naturelle ou synthétique, en particulier des carreaux en céramique, qui comprend la mise à dimension et l'équerrage optionnel, des deux paires de côtés, de chaque élément de pierre naturelle ou de pierre synthétique (5) en deux étapes successives au moyen d'une rotation intermédiaire jusqu'à 90°, **caractérisé en ce que** la mise à la dimension et l'équerrage optionnel sont réalisés au moyen d'un procédé de meulage à sec avec la compensation continue de l'usure d'au moins une roue de meule (4). 35
2. Procédé selon la revendication 1, **caractérisé en ce qu'une** seule taille est utilisée pour les dimensions de chaque élément (5). 40
3. Procédé selon la revendication 1, **caractérisé en ce qu'il** comprend les étapes de : 45
- mise à la dimension de l'élément (5) dans une première partie de l'installation, avec retrait ultérieur d'épaisseur de chaque bord d'une paire de côtés jusqu'à la finition une fois que la taille est atteinte ;
 - contrôle des dimensions de la taille par mesure et comparaison ;
 - rotation jusqu'à 90° ;
 - centrage de l'élément (5) dans une seconde partie de l'installation et réalisation d'équerrage optionnel ;
 - mise à la dimension de la seconde paire de côtés, quand cela est nécessaire ;
 - contrôle géométrique de l'équerrage, s'il est effectué ;
 - contrôle des dimensions de la taille de la seconde paire de côtés ; compensation de l'usure d'au moins la roue de meulage (4) qui est fournie.
4. Procédé selon la revendication 1, **caractérisé en ce que** l'usure d'au moins la roue de meulage à sec (4) est compensée selon des intervalles de temps qui sont fixés à l'avance selon le degré de précision de l'élément (5) qui est traité et les caractéristiques d'usure de la roue de meulage.
5. Procédé selon la revendication 4, **caractérisé en ce que** la compensation de l'usure d'au moins la roue de meulage (4) est effectuée après le mouvement arrière par rapport au front de travail afin de mesurer la valeur de l'usure. 30
6. Procédé selon la revendication 5, **caractérisé en ce que** la valeur de mouvement arrière de la roue de meulage entre la partie frontale de travail et l'avant de ladite roue de meulage (4) est suffisante pour dégager le passage de contrôle d'un moyen de contrôle interposé.
7. Procédé selon la revendication 6, **caractérisé en ce que** la partie avant de chaque roue de meulage (4) revient à la partie frontale de travail en se déplaçant sur une distance qui est égale à la distance du mouvement arrière, y compris la valeur de l'épaisseur du meulage du bord de l'élément (5), plus l'usure qui est survenue au cours de l'intervalle de temps précédent.
8. Procédé selon la revendication 7, **caractérisé en ce que** la partie de la charge de travail d'une paire de roues de meulage (4) est affectée à la paire suivante de roues de meulage (4).
9. Procédé selon la revendication 7, **caractérisé en ce que** la partie de la charge de travail qui est neutralisée dans le mouvement arrière d'une paire de roues de meulage (4) est affectée à la paire précédente de roues de meulage (4).
10. Procédé selon la revendication 3, **caractérisé en ce que** le contrôle de la compensation de l'usure

de la dernière paire de roues de meulage (4) de chacune desdites première et seconde sections de l'installation est affecté à la section de contrôle dimensionnel de la section de l'installation correspondante : la compensation de l'usure étant déclenchée en lisant la dimension de l'élément en cours de traitement. 5

en ce qu'elle comprend également un dispositif (26, 27) pour corriger la dimension après comparaison entre la mesure de lecture et la mesure de référence, ledit dispositif étant présent dans chacune des sections de l'installation (15, 17) de ladite installation.

11. Machine pour mettre à dimension des éléments en pierre naturelle ou synthétique, en particulier des carreaux en céramique, **caractérisée en ce qu'elle** comprend au moins un outil abrasif à sec (4) qui tourne autour de son axe et se déplace dans le sens axial par rapport à un élément (5) en cours de traitement, un premier moyen de meulage à sec pour la première paire de côtés dudit élément (5) en cours de traitement, un second moyen de meulage à sec pour la seconde paire de côtés dudit élément (5) en cours de traitement, et des moyens de compensation continue de l'usure d'au moins un outil abrasif à sec (4). 10 15 20

12. Machine selon la revendication 11, **caractérisée en ce qu'au moins un capteur** (6) est interposé - avec son propre passage - entre ledit élément (5) en cours de traitement et chacun desdits outils abrasifs (4). 25

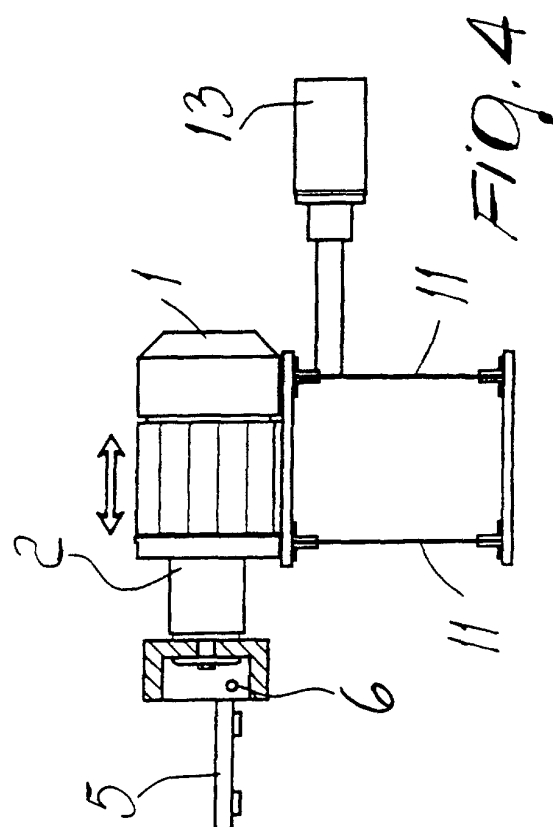
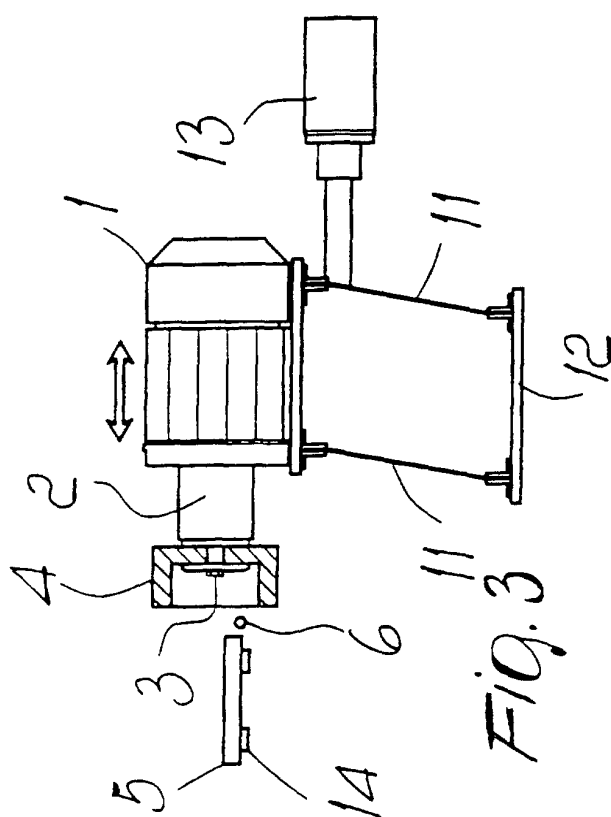
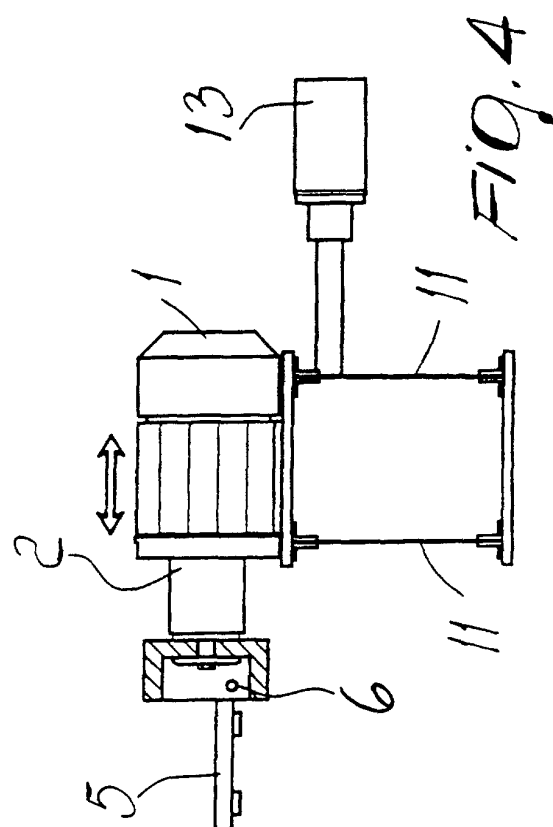
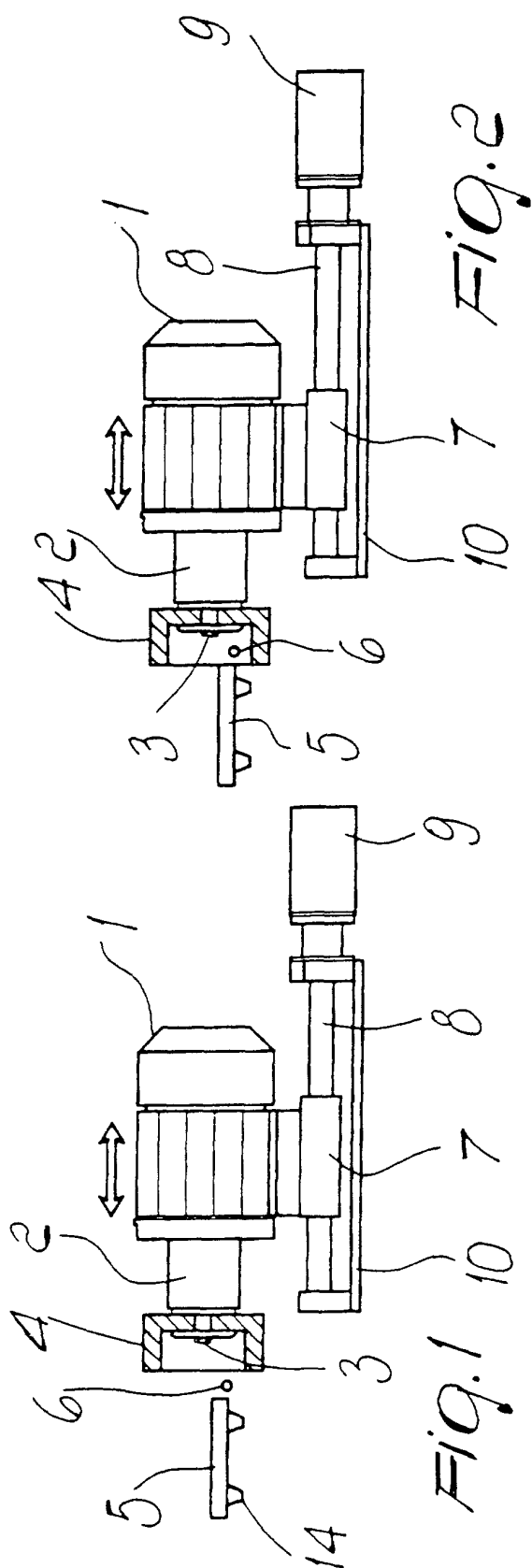
13. Machine selon la revendication 12, **caractérisée en ce que** ledit outil abrasif (4), activé de façon rotative par un moteur (1), peut coulisser dans le sens axial sur au moins un guide (8) au moyen d'un déclencheur linéaire (9) qui est supporté sur un cadre (10). 30 35

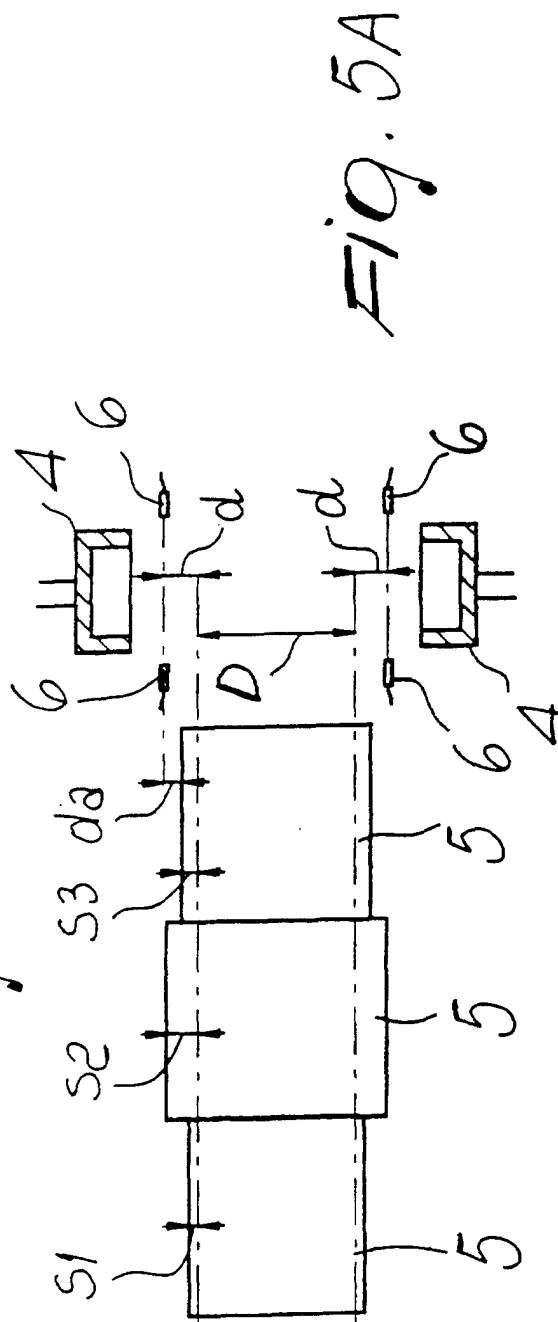
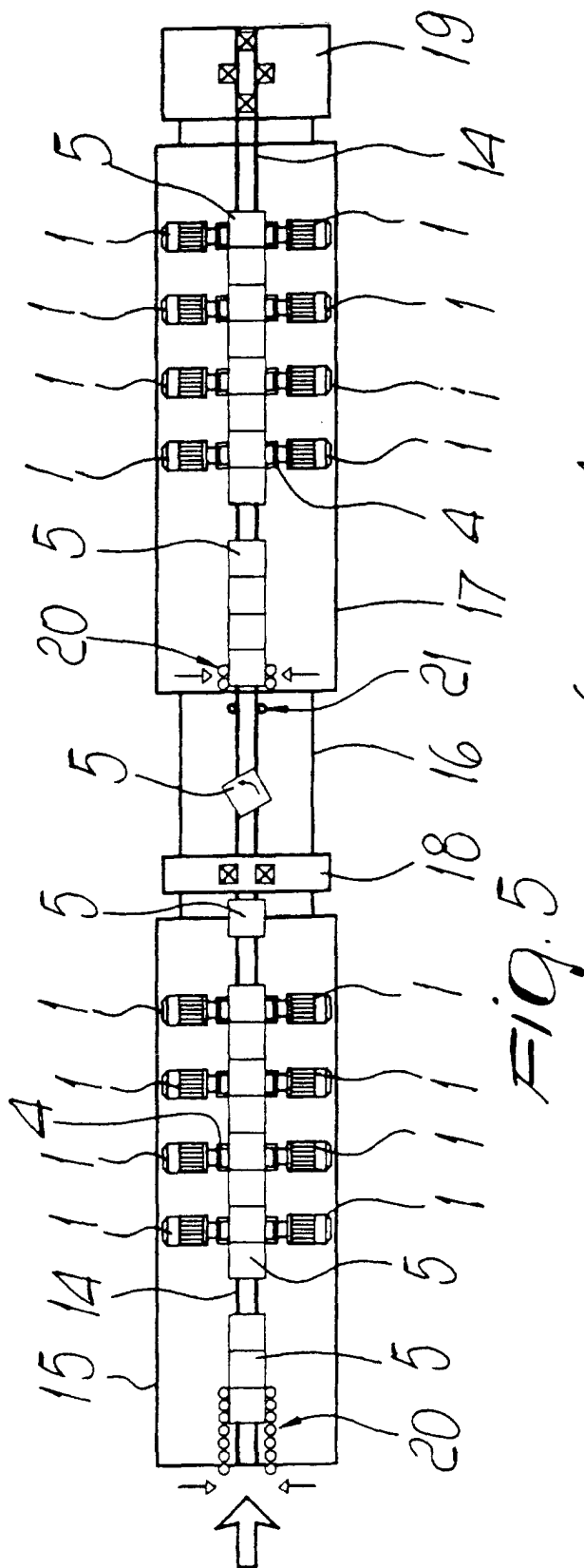
14. Machine selon la revendication 13, **caractérisée en ce que** ledit outil abrasif (4) déclenché de façon rotative par le moteur (1) peut coulisser dans le sens axial au moyen d'un déclencheur linéaire (13) qui agit sur une paire d'éléments oscillants (11). 40

15. Installation pour traiter des éléments en pierre naturelle ou synthétique, en particulier des carreaux en céramique, **caractérisée en ce qu'elle** comprend une machine telle qu'elle est définie dans la revendication 11. 45

16. Installation selon la revendication 15, **caractérisée en ce qu'elle** comprend des éléments (14) pour transporter les éléments en pierre naturelle ou synthétique (5) qui sont mis à dimension et/ou équerrés par des outils abrasifs à sec (4), après être passés dans un dispositif de centrage (20) et optionnellement dans un dispositif d'équerrage (21), avec des sections de mesure et de contrôle ultérieures avec une réaction automatique optionnelle. 50 55

17. Installation selon la revendication 15, **caractérisée**





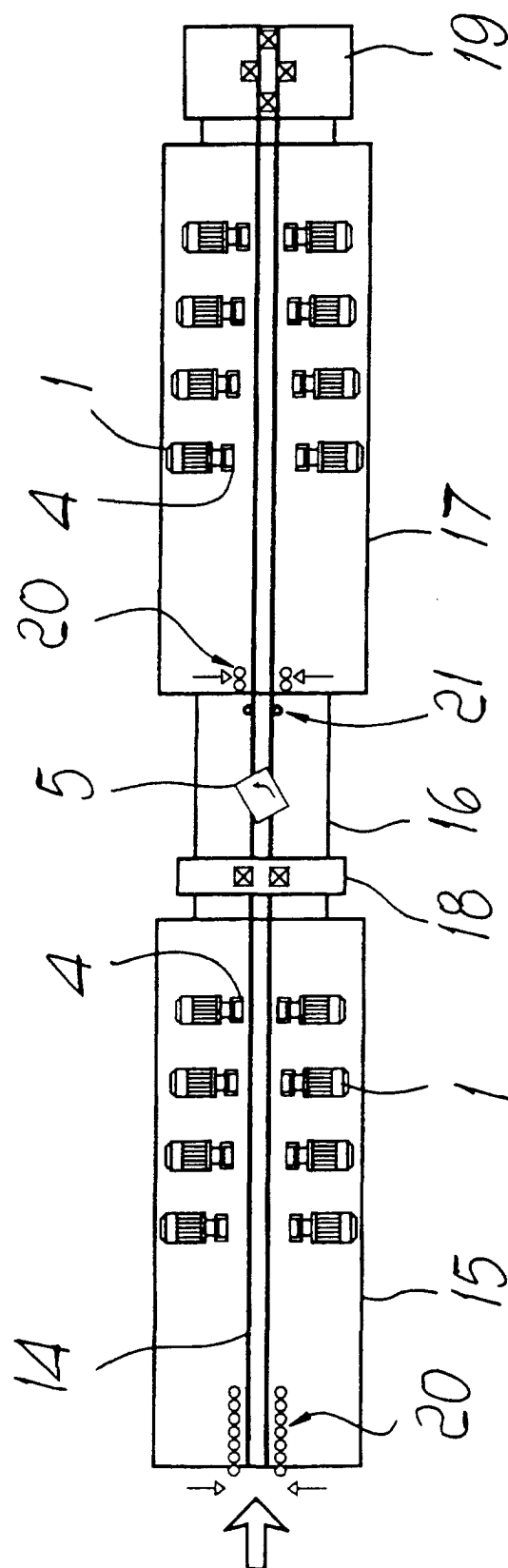
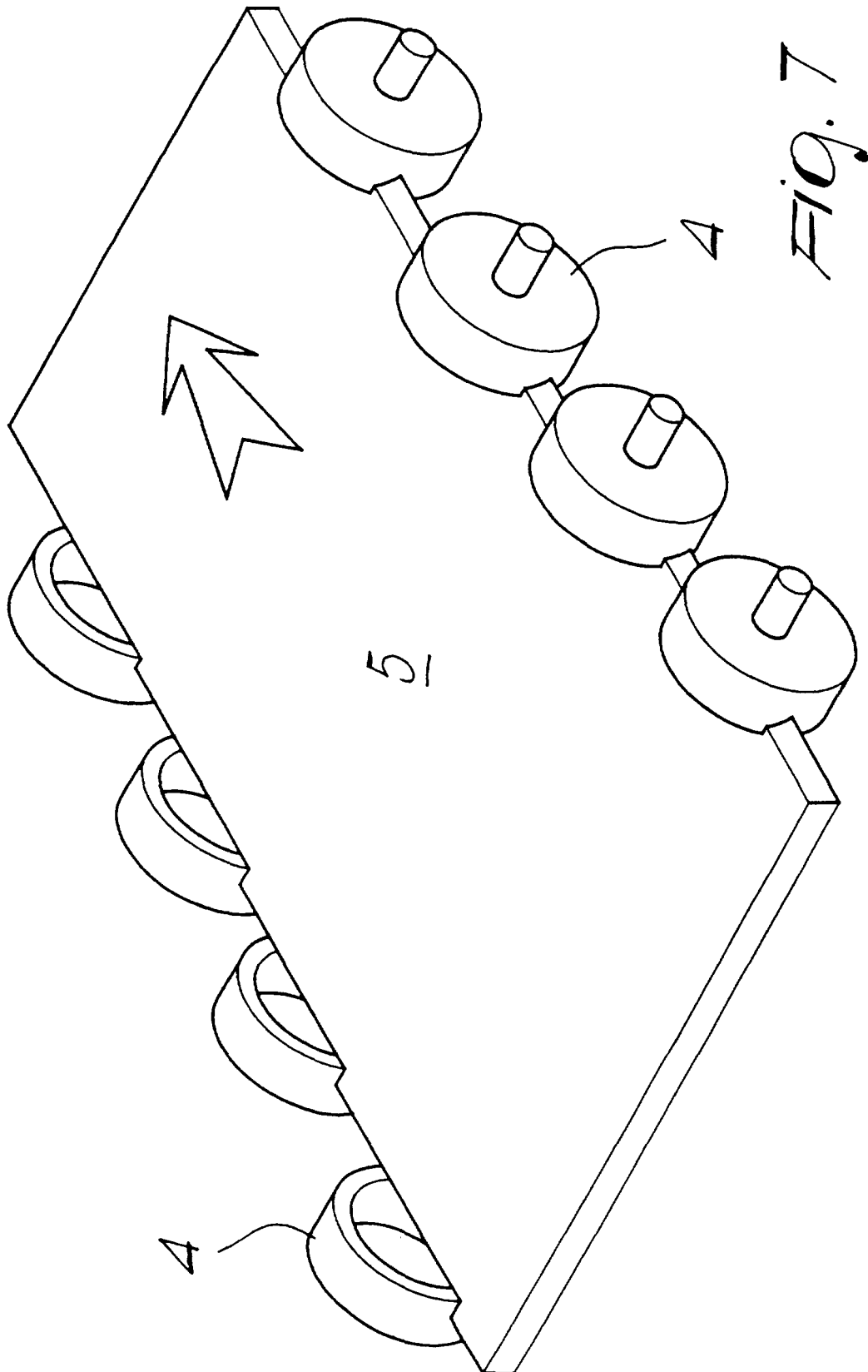


Fig. 6



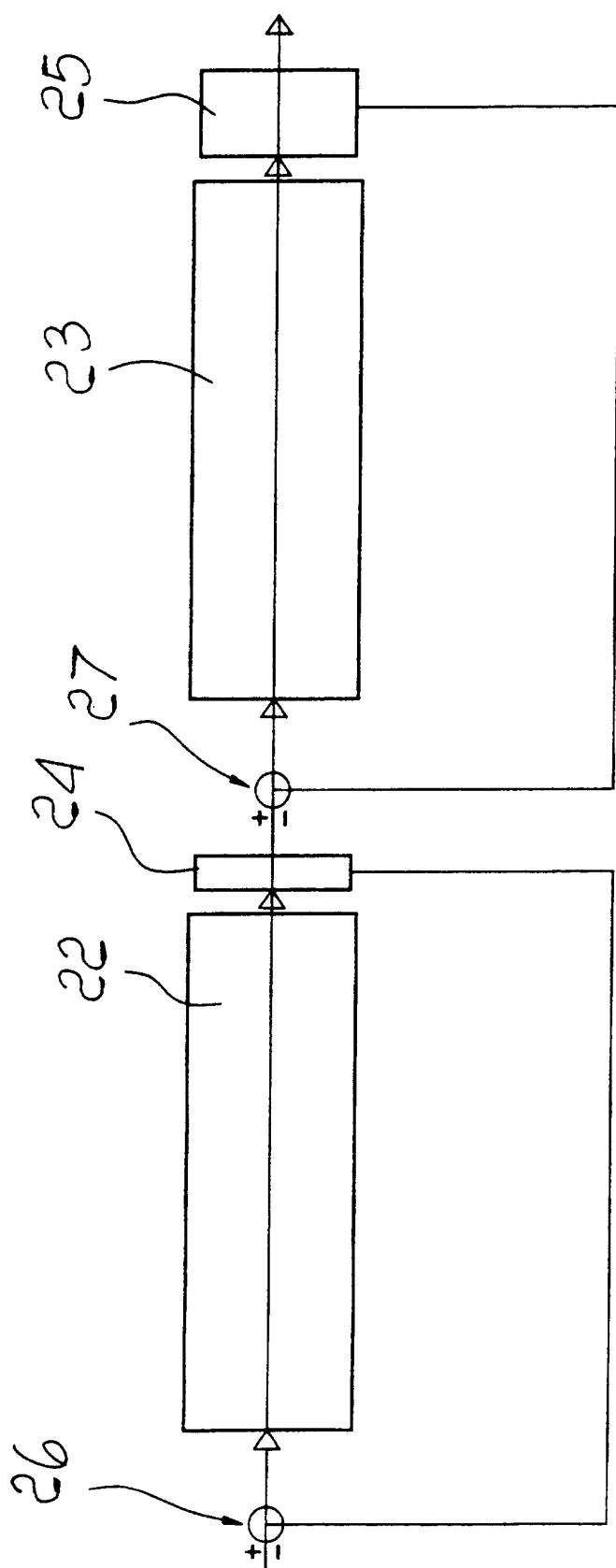


Fig. 8