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(54) **Machine for detecting and levelling ground depressions, by spreading of suitable material, particularly fit for the maintenance of sport grounds**

Vorrichtung zum Entdecken und Planieren von Bodensenkungen durch Aufbringen von geeignetem Material, insbesondere zum Unterhalten von Sportanlagen

Dispositif pour détecter et niveler des dépressions de terrain par épandage d'un matériau approprié, en particulier pour l'entretien des terrains de sports

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Description

[0001] The invention concerns a machine particularly fit for the maintenance of sport grounds, able to detect ground depressions and level them by spreading suitable filling material, without modifying the due slopes.

[0002] Currently the game ground depressions, caused by settling and treading, are manually filled with a shovel or with a net hauled by a device, and passed over the material previously put down.

[0003] For closing small holes the manual intervention is effective, while for the substantial depressions such a intervention requires a lot of time and it would be difficult and inaccurate for obtaining also the modification of the expected slopes.

[0004] Document FR 2 653 456 discloses a machine for detecting and levelling ground depressions, by spreading of suitable material, wherein it includes a container provided with a distributing device of the material to be distributed, a rotating spreader placed under said distributing device and a ground touching device fit to operate said distributing device for the automatic spreading of the material in correspondence of the detecting of ground depression.

[0005] The purpose of the present invention is to make more precise, more rapid and easy the levelling of game grounds.

[0006] The machine according to the invention as defined in claim 1 can be hauled and driven by a small tractor, is equipped with a bucket rotating from the loading to distribution positions of the filling material, with a regulating device of the material to be distributed, with a rotating spreader and with a ground touch device, which provides the automatic material spreading, when a depression of substantial dimensions is detected.

[0007] The touch device is adjustable, in such a way to allow the regulation of intervention threshold. In particular it is also possible to spread uniformly the filling material on the whole field, or to repeat this operations with time, without covering and choking the grass, in correspondence of a wide depression.

[0008] The invention is described in detail, with reference to the attached drawings in which:

- figure 1 shows a side view of the machine, with the bucket at loading position;
- figure 2 shows a schematic view of the partially sectioned machine, with the bucket lifted in operative position;
- figure 3 shows a schematic top view of the machine, with some sectioned parts;
- figure 4 shows a view of the touch device and the related mechanism;
- figure 5 shows a top view of a part of the touch device;
- figure 6 shows a side view of an enlarged detail of the mechanism operated by the touch device.

[0009] In these figures, numeral 1 indicates the draw-bar, which is coupled to a small tractor, numeral 2 a cardan joint shaft, to be connected to the tractor power takeoff, numeral 3 indicates the wheels. Numeral 4 indicates a bucket, supported by articulated arms 5, hinged at 6 to the frame, figure 2.

[0010] The arms 5 can be lowered or lifted by means of hydraulic jacks 7, to bring the bucket in loading position, as in figure 1, or in working position, as in figure 2. The filling material, contained in the lifted bucket 4, goes down through a lower opening 8 of this latter, in a controlled way, when a finned distributing cylinder 9 is rotated, figures 2 and 3.

[0011] The distributing device 9 is hinged at 10 and is operated by a gearmotor 11, figure 3, by means of a gearing chain 12. When the distributing device 9 is in a stopped position its fins, opportunely disposed, do not allow the material passage.

[0012] The material dropping from the distributing device 9 in a controlled way, as further explained, is spread onto the ground by a spreader made up of a finned conic disk 13, figures 2 and 3, that is rotated by means of the shaft 2, connected to the power takeoff of the tractor hauling the machine along the ground to be levelled.

[0013] The spreader rotates continuously, while the filling material is dropped from the distributing device 9 only when necessary.

[0014] For this purpose a ground touch device is provided so as to locate automatically the zones in which the material has to be deposited. A shaft 14, entirely independent from the examined mobile group, is provided with two wheels 15 at the ends, whose distance determines the width of the ground area where the control is made.

[0015] In the central part of the machine two touching wheels 16 are provided that, together with related brackets 17 hinged in 18, lift and lower depending on the conformation of the ground to be levelled. The shaft 14, supporting the two end wheels 15, is supported by brackets 19, hinged in 20.

[0016] The touching wheels 16, by means of the oscillating brackets 17 and a base 21 integral therewith, act on a rod 22 that is longitudinally moved on supports 23, as better evident in figure 4 and in the detail of figure 6. On the rod 22 is splined an adjustable sleeve 24, placed in such a way to start up the switch 25, causing the start or the stop of the rotating distributing device 9 and therefore the spreading of the filling material.

[0017] For avoiding the spreading of the material also into small diameter holes, the distributing device activation is also checked by a timer, or however by a circuit giving the input only if the touching wheel movement is prolonged for pre-established time.

[0018] Varying the position of the sleeve 24 and the timer delay it is possible to define the machine automatic intervention ways, depending on the ground type and on the treatment to be done. In such a way the complete filling of a deep depression can be avoided, avoiding the

choking of the grass. It is also possible to spread the filling material onto the whole ground.

[0019] Numeral 26 indicates an actuator for the touching device lifting during the machine transfer.

[0020] The distributing container of the filling material is constituted by the bucket 4 itself, placed in position over the spreader 13.

[0021] The distributing device 9 can be operated by means of a circuit controlled by a sensor, placed in such a way to detect the touching device position.

5. Machine according to anyone of preceding claims, **characterized in that** the rotating spreader (13) and the jacks (7) for lifting and lowering arms (5) supporting said bucket (4) are operated by the tractor hauling said machine.
6. Machine according to anyone of preceding claims, **characterized in that** the touching device assembly is lifted by means of an actuator (26) during the transfer of said machine.

Claims

1. Machine for detecting and levelling ground depressions, by spreading of suitable material, particularly fit for the maintenance of sport grounds, including a bucket (4) provided with a distributing device (9) of the material to be distributed, a rotating spreader (13) and a ground touching device fit to operate said distributing device (9) for the automatic spreading of the material in correspondence of the detecting of ground depression by means of said touching device, said machine being **characterized in that** the bucket (4) is designed to be rotated from the loading to the distribution positions of the filling material, that, during the levelling operation, acts also as container and for distributing said material with the distributing device (9), the distributing device (9) being placed over the rotating spreader (13) in the distribution position of the bucket (4).
2. Machine according to anyone of preceding claims, **characterized in that** said touching device is constituted by two end wheels (14), whose distance determines the width of the depression detecting area, and one or two inner touching wheels (16), that detect the ground undulations and, by means of position sensors (24, 25), operate said distributing device (9), when the difference in level exceed a pre-defined value.
3. Machine according to anyone of preceding claims, **characterized in that** said touching device is adjustable, in such a way to allow the regulation of the intervention threshold; and **that**, by adjusting the touching device, is also possible to spread uniformly on the whole ground the filling material, or to repeat the operation with time.
4. Machine according to anyone of preceding claims, **characterized in that**, for avoiding that also small diameter holes can cause the material spreading, the distributing device (9) operation is also checked by a timer, or by a circuit that gives the input to the distributing device (9) only if the movement of touching wheels (16) is prolonged for pre-established time.

Patentansprüche

1. Maschine zum Detektieren und Nivellieren von Bodensenkungen durch Ausbreiten geeigneten Materials, insbesondere geeignet für die Pflege von Sportanlagen, mit einem Eimer (4), der mit einer Verteilvorrichtung (9) des zu verteilenden Materials versehen ist, einem rotierenden Ausbreiter (13) und einer Bodenkontaktvorrichtung, geeignet zum Betätigen der Verteilvorrichtung (9) zum automatischen Ausbreiten des Materials in Übereinstimmung mit dem Detektieren von Bodensenkungen mittels der Kontaktvorrichtung, **dadurch gekennzeichnet, dass** der Eimer (4) so ausgelegt ist, dass er aus der Belade- in die Verteilposition des Füllmaterials gedreht wird, welches während des Nivellervorganges auch als Behälter und zum Verteilen des Materials mit der Verteilvorrichtung (9) wirkt, wobei die Verteilvorrichtung (9) über dem rotierenden Ausbreiter (13) in der Verteilposition des Eimers (4) angeordnet ist.
2. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Kontaktvorrichtung gebildet wird von zwei Endrädern (14), deren Abstand die Breite des Bodensenkungen detektierenden Bereiches bestimmt, und einem oder zwei inneren Kontaktirädern (16), die Bodenwellungen detektieren und mittels Positionssensoren (24, 25) die Verteilvorrichtung (9) betätigen, wenn der Niveauunterschied einen vorgegebenen Wert unterschreitet.
3. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Kontaktvorrichtung so verstellbar ist, dass der Zwischenraumgrenzwert geregelt werden kann, und dass es durch Verstellen der Kontaktvorrichtung möglich ist, das Füllmaterial auf dem gesamten Boden gleichförmig auszubreiten oder den Vorgang mit der Zeit zu wiederholen.
4. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass**, um zu vermeiden, dass auch Löcher kleinen Durchmessers das Ausbreiten von Material verursachen, der Be-

trieb der Verteilvorrichtung (9) durch eine Zeitsteuervorrichtung oder durch eine Schaltung geprüft wird, die ein Eingangssignal an die Verteilvorrichtung (9) nur dann angibt, wenn die Bewegung der Kontaktierräder (16) während einer vorgegebenen Zeit andauert.

5. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der rotierende Ausbreiter (13) und die Stellglieder (7) zum Anheben und Absenken von den Eimer (4) tragenden Armen (5) durch den Traktor betätigt werden, der die Maschine zieht.
6. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Kontaktiervorrichtungsanordnung mittels eines Aktuators (26) während des Transports der Maschine angehoben wird.

Revendications

1. Machine pour détecter et niveler des dépressions de terrain par épandage d'un matériau approprié, en particulier pour l'entretien de terrains de sport, comprenant un godet (4) pourvu d'un dispositif (9) de distribution du matériau à distribuer, un épandeur rotatif (13), et un dispositif de contact du terrain adapté pour activer ledit dispositif de distribution (9) pour l'épandage automatique du matériau, en fonction de la détection d'une dépression de terrain au moyen dudit dispositif de contact, ladite machine étant **caractérisée en ce que** le godet (4) est conçu pour être mis en rotation à partir de la position de chargement vers la position de distribution du matériau de remplissage, qui, pendant l'opération de nivellement, agit également comme conteneur et pour distribuer ledit matériau au moyen du dispositif de distribution (9), le dispositif de distribution (9) étant placé au-dessus de l'épandeur rotatif (13) dans la position de distribution du godet (4).
2. Machine suivant l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit dispositif de contact est constitué par deux roues d'extrémité (14), dont la distance détermine la largeur de la zone de détection de dépression, et par une ou deux roues intérieures de contact (16), qui détectent les ondulations du terrain et, au moyen de détecteurs de position (24, 25), activent ledit dispositif de distribution (9), lorsque la différence de niveau dépasse une valeur prédéfinie.
3. Machine suivant l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit dispositif de contact est réglable, de telle sorte à permettre le réglage du seuil d'intervention, et **en**

ce que, par réglage du dispositif de contact, il est également possible d'épandre uniformément le matériau de remplissage sur la totalité du terrain, ou de répéter l'opération avec le temps.

4. Machine suivant l'une quelconque des revendications précédentes, **caractérisée en ce que**, pour éviter que des trous de petit diamètre puissent aussi entraîner l'épandage de matériau, l'activation du dispositif de distribution (9) est également contrôlée par un compteur de temps, ou par un circuit qui délivre un signal d'entrée au dispositif de distribution uniquement si le mouvement de roue de contact (16) est prolongé pendant une durée pré-établie.
5. Machine suivant l'une quelconque des revendications précédentes, **caractérisée en ce que** l'épandeur rotatif (13) et les vérins (7) prévus pour soulever et abaisser des bras (5) supportant ledit godet (4) sont activés par l'engin tractant ladite machine.
6. Machine suivant l'une quelconque des revendications précédentes, **caractérisée en ce que** l'ensemble formant dispositif de contact est relevé au moyen d'un actionneur (26) durant le transfert de ladite machine.

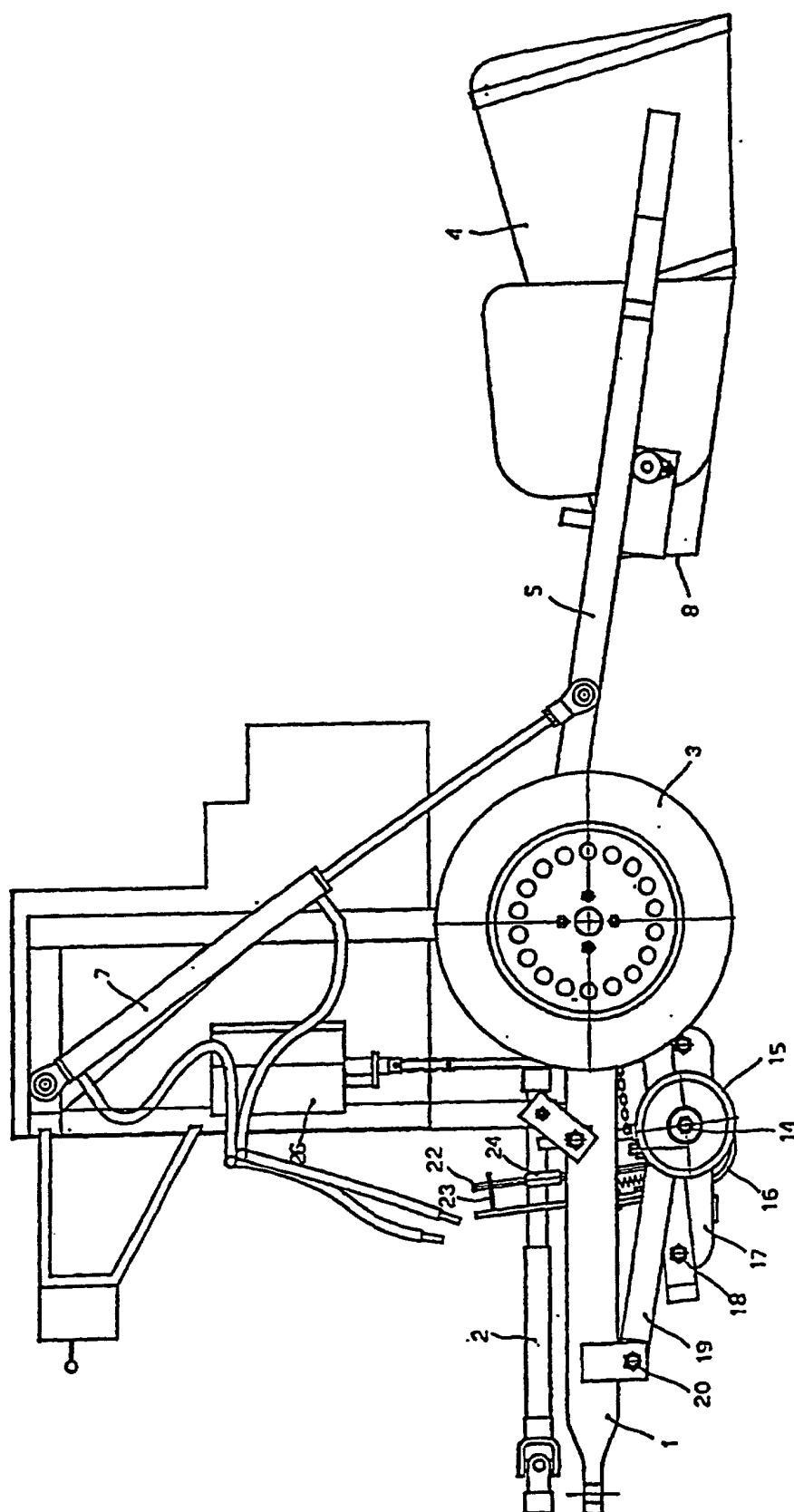


FIG. 1

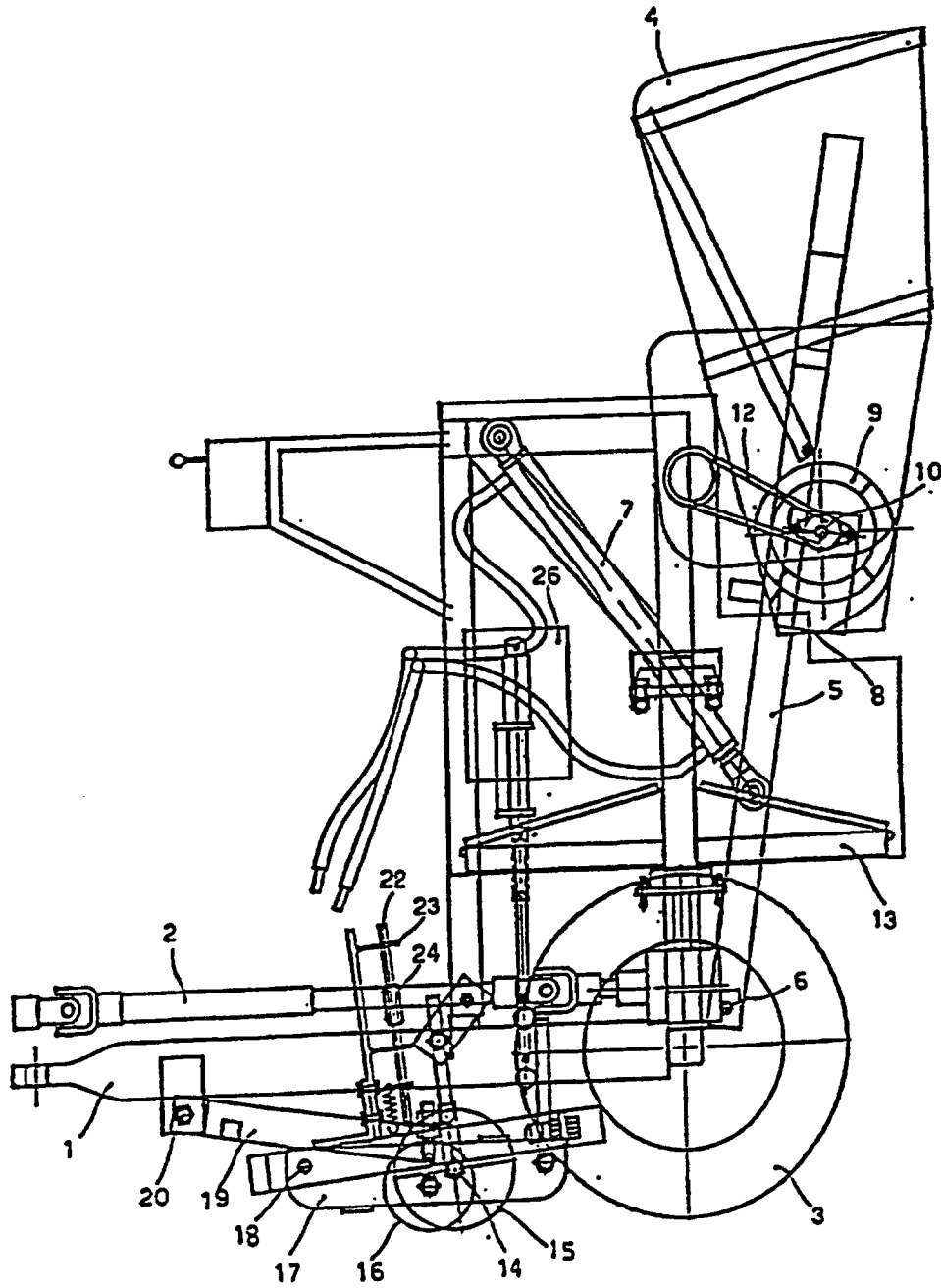


FIG. 2

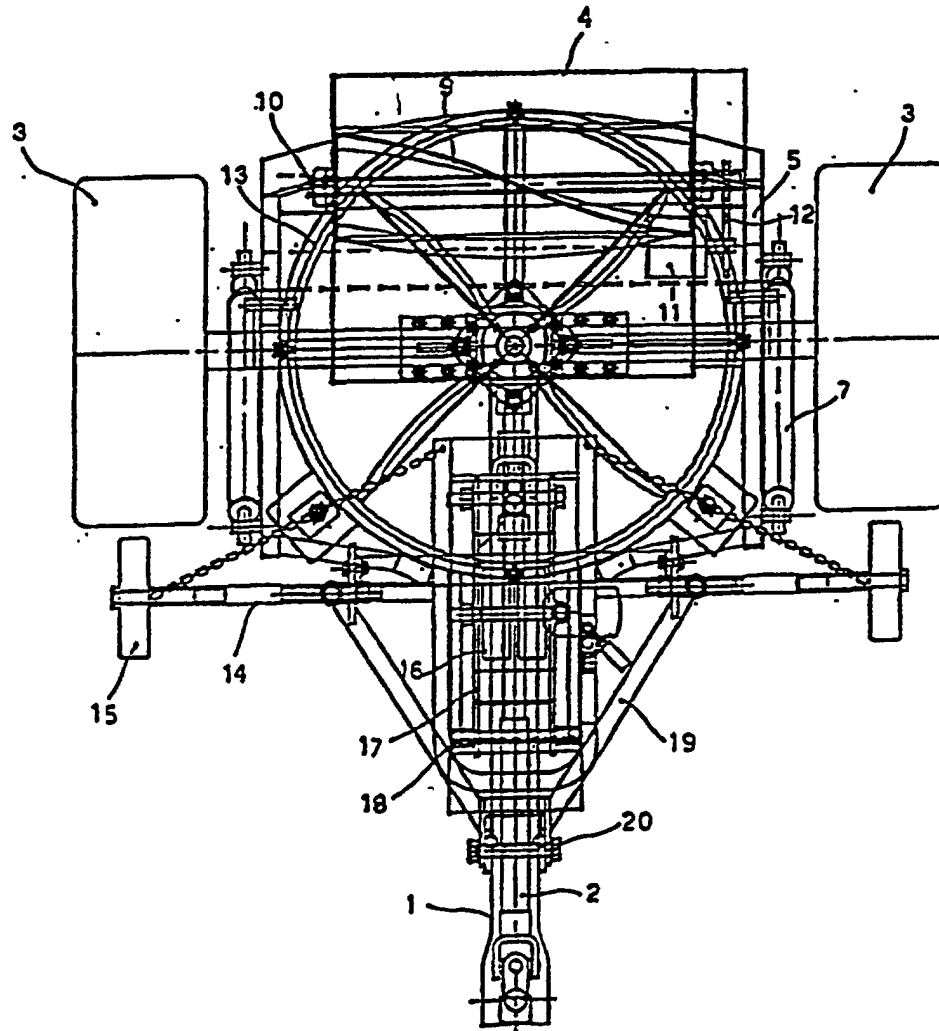


FIG. 3

FIG. 4

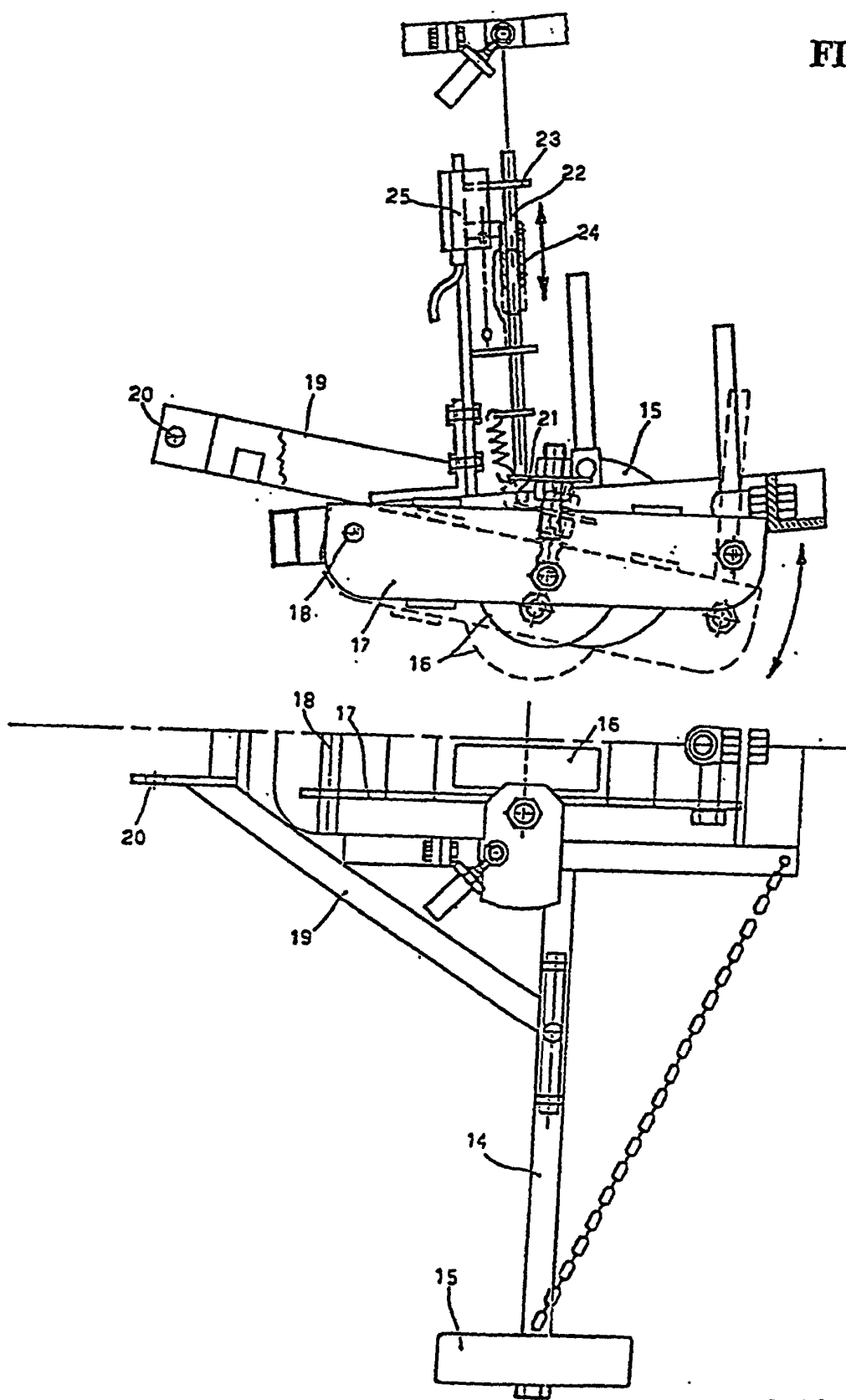


FIG. 5

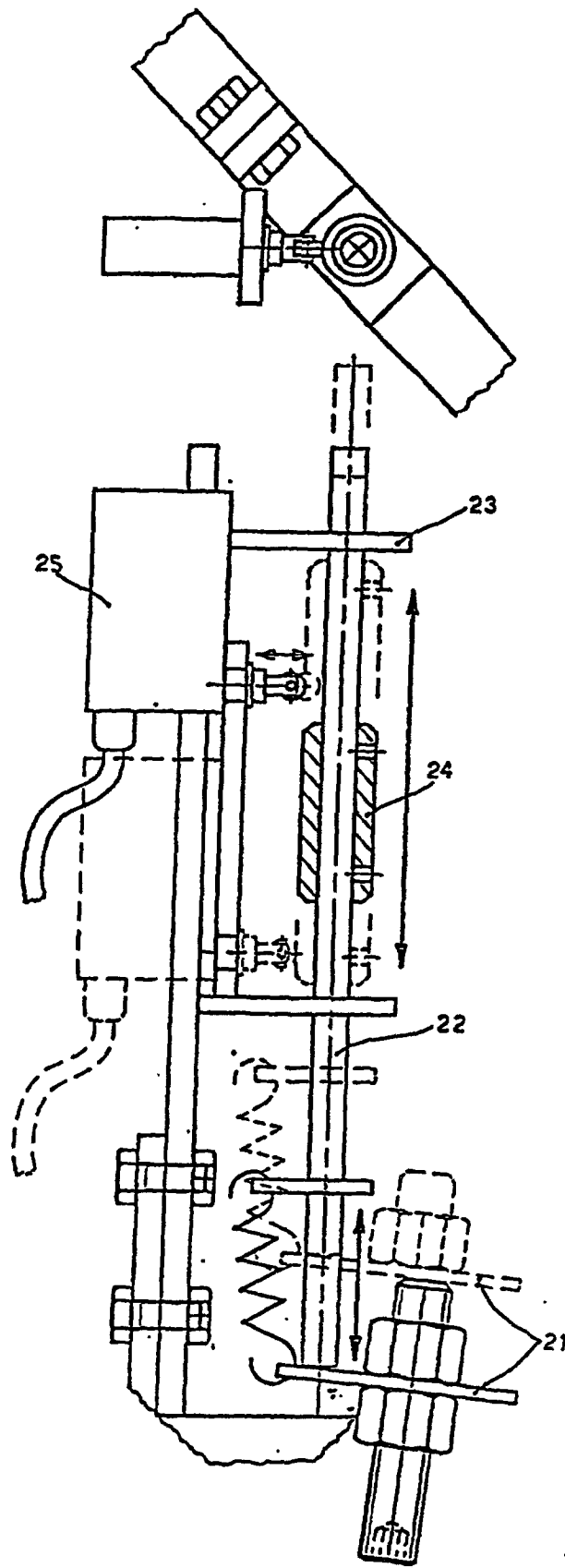


FIG. 6