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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number:
A01B 17/00, 49/02	A1	WO 87/ 05777
		(43) International Publication Date: 8 October 1987 (08.10.87)

(21) International Application Number: PCT/HU86/00019

(22) International Filing Date: 28 March 1986 (28.03.86)

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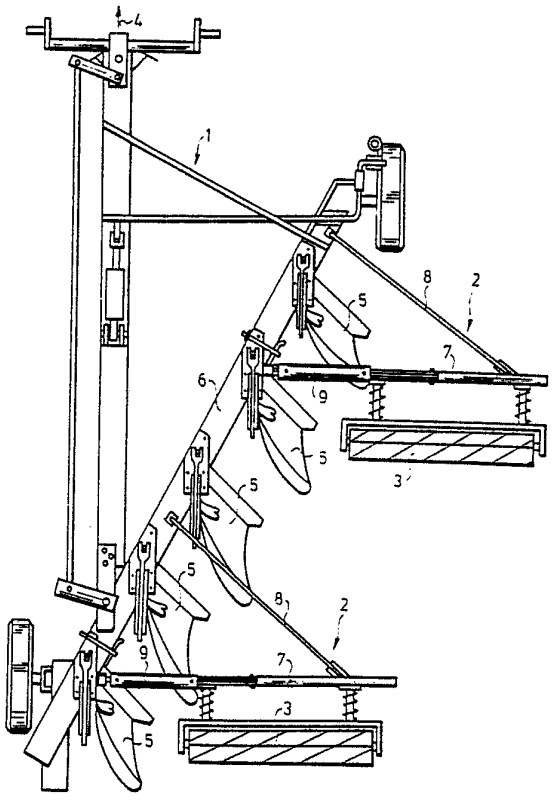
(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.

(54) Title: TILLER MACHINE

(57) Abstract

A combined tiller machine comprising a tractor, a soil turning implement connected to the tractor, and a soil spreader and packer implement. According to the improvement in this invention, a beam (7) of the soil spreader and packer implement (2) is connected to a beam (6) of the soil turning implement through a joint (13) having one degree of freedom, and the spreader and packer implement (2) is arranged beside the beam (6) of the soil turning implement directly following its working tools.



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Tiller Machine

Field of the Invention

The invention relates to a combined tiller machine comprising a tractor, a soil turning implement connected to the tractor, and a soil spreader and packer implement. The combined tiller machine as in this invention can advantageously used for tillage operations wherein the soil should quickly be closed after being cut, lifted and turned by the soil turning implement.

Prior Art

In the agronomy, the soil ploughed or otherwise cut and turned must be closed, spreaded and packed as soon as possible, the tillage operations can be considered as finished ones only after this kind of finishing operations has been done. The plough and the discing are a drastic intervention into the biological and chemical life of the soil since these operations disturb the biological and chemical rhythm and cycle of the soil. All tillage operations cause a loss in humidity, especially in the summer, which is dangerous to a greater extent if the tillage operations result in a lump structure of the soil. In this case, the lumps of the soil desiccate very quickly, in some hours or even in some minutes and, thereafter the spreading operation needs a highly increased work intensity which leeds to the wearing-away of the soil. Herein, the lump structure is not spreaded in a biological way, thus, the desired soil improvement or reclamation can not be reached.

In the simplest case, the spreader and packer operations have previously been made by a ring roller trailed by a separate tractor. However, this can be done only with 2 to 3 days after the plough because of the insufficient roller implement capacity. During this time, as it is

said above, the soil suffers a considerable deterioration and, what is more, supplementary labour-power and energy expenditure will be needed for the finishing operations.

These disadvantages are thought to be lessened by the so called coupled tilling. In this case, a havy harro a spreader or a one-row ring roller is connected to the plough. The connection between these implements and the plough is established by a chain or by an articulated rod. Thus, the connection is defined only in the direction of ploughing, the implements move sidewards and in vertical directions independently from the plough and, thus, it makes a snaking or tailing motion during the tillage operation. Because of this kind of connection, furthermore, the implement can not be lifted out from the soil. If the driver of the tractor turns carelessly, the implement can slide in between the socks of the plough which can cause the rapture or demolition of the socks or of the plough as well as that of the implement. Further disadvantage is in that the trailing of the implement necessitates a special care from the driver of the tractor. Further to this, the implement, especially the havy harrow gets often clogged or filled up with steam remains, and it can not be used with plough widths greater than 1 meter. Nevertheless, the traditional ring roller and spreader can not be connected to the ploughs as usual nowadays without an extensive reconstruction. For the havy-duty ploughs or for the ones with great cut width, one-row ring roller can not be purchased.

These kinds of coupled tilling are described in e.g. US-PS 3 991 831 and 4 095 652, DE-PS 2 055 566 and 2 251 699, and GP-PS 1 543 854. All of these known solutions are suitable only for preparation of seed-beds, i.e. for low-depth tilling and they are not suited for

plough.

Also in DE-PS 3 009 589, an example of coupled tilling is shown. Therein, a roller rotationally driven is connected to behind the soil tiller machine. In this solution, the peripheral speed is brought into harmony with the translational speed of the tractor and of the tiller machine, but the disadvantages of the coupled tilling emerge herewith, too. Further to them, extremely high trailing power is needed for the traction and drive of this roller implement which reduces the tractive power usable for the plough to a great extent. The considerable length of the trail and the lack of the possibility of lifting the implement mean further defficiencies of the known solution.

Essence of the Invention

The invention has the main object to eliminate the aforesaid disadvantages and to provide a combined tiller machine with which the cutting, lifting and turning operations as well as the spreader and packer operations can be done with one aggregate and, thus, with which the soil can be closed immediately after the turning operation. Further object is to form the combined tiller machine for having a simple and safely operable construction without the need of special care or surplus work from the driver of the machine.

According to the improvement in this invention, a beam of the soil spreader and packer implement is connected to a beam of the soil turning implement through a joint having one degree of freedom, and the spreader and packer implement is arranged beside the beam of the soil turning implement directly following its working tools.

In one of the preferred embodiments of this invention, the

spreader and packer implement is rotatable in respect to the soil turning implement around the joint by remote control, and a length-variable element paralyzing the joint is attached to the spreader and packer implement as well as to the soil turning implement.

It is also preferable, when a rectangular holder is connected to the beam of the soil turning implement by detachable connection, and the joint is formed between the rectangular holder and a holding arm of the beam of the spreader and packer implement.

Furthermore, it can be preferred in this invention, when the length-variable element paralyzing the joint is connected with its one end to the rectangular holder and with its other end to the holding arm of the beam of the spreader and packer implement. In the simplest case, the length-variable element can be formed as a hydraulic ram.

According to a preferred embodiment of this invention, the spreader and packer implement is attached to its beam by an elastical element having adjustable pre-load.

In a further preferred embodiment, the spreader and packer implement has a frame rotatable around a joint and connected to the holding arm of the beam, and the elastical element is a spring arranged between the frame and the holding arm.

Finally, it can also be preferred when the soil turning implement is a plough, and the spreader and packer implement is a plain field cylinder roller or a grated roller or a Cambridge roller or a star roller or a toothed roller or a roller with plane discs or a roller with spade harrows or a combination thereof.

Short Description of the Drawings

Further objects and details of the invention will be described hereinafter on the basis of preferred embodiments with reference to the accompanying drawing. In the drawing,

Fig. 1 shows a schematical plan view of a preferred embodiment of the combined tiller machine in this invention,

Fig. 2 is a portion of Fig. 1: the connection of the spreader and packer implement in side elevational view in somewhat greater scale,

Fig. 3 shows a side elevational view of Fig. 2 and

Fig. 4 is the same illustration as in Fig. 3 but for another embodiment.

Detailed Description of Preferred Embodiment

In the preferred embodiment of the combined tiller machine of this invention as exemplatorily shown in Fig. 1, the soil turning implememt is a plough 1 and a spreader and packer implement 2 is provided in the form of a grated roller 3. The tractor not shown in the drawings moves the plough 1 in direction of arrow 4. In this exemplified embodiment, plough 1 has five stocks 5, beside which the grated rollers 3 are arranged. The experience has shown that in the case of less than five stocks 5, only one spreader and packer implement 2 is also sufficient.

As it will be apparent from Fig. 1, the spreader and packer implement 2 is attached to a beam 6 of plough 1 holding stocks 5. Spreader and packer implement 2 has also a beam 7 which is fixed to beam 6 in rectangular position and is stiffened out by a tie rod 8 for the sake of a more favourable force impact. Tie rod 8 is articulatedly jointed to

both of beams 6 and 7.

Connection is established between beam 6 of plough 1 and beam 7 of spreader and packer implement 2 by a hydraulic ram 9, too, which serves as a lenght-variable element in this embodiment. The details of this connection are shown in Fig. 2 in side elevational view of the spreader and packer implement 2 in somewhat greater scale. Beam 7 of grated roller 3 is attached, through a detachable connection 10, to beam 6 of plough 1. Beam 7 has two portions, namely a rectangular holder 11 and a holding arm 12. With this, rectangular holder 11 is fixed to beam 6 and holding arm 12 is connected to it by a joint 13 having one degree of freedom. In this way, joint 13 makes possible only the lifting and descending of grated roller 3 but counteracts to the sideward motion or rotation around the own axis of holding arm 12.

The lifting and descenting of grated roller 3 are made possible by hydraulic ram 9, one end of which is connected through a pivot 14 to rectangular holder 11 and, thus, to beam 6 of plough 1, and a piston rod 15 of hydraulic ram 9 is connected through pivot 16 to holding arm 12 of grated roller 3. In this way, ram 9 is, at the same time, suitable for paralyzing the function of or stiffening out the joint 13. In the working position as shown in Fig. 2, beam 7 is made stiff by hydraulic ram 9 as if joint 13 was not there.

The working position as mentioned above is made more secure by providing a lock 17 which connects rectangular holder 11 and holding arm 12 to each other in the linear position of beam 7. In this preferred embodiment, the lock 17 is provided with a remote control with the help of which it can be opened by the driver from the driver cabine of the tractor without leaving the cabine. For this kind of remote

control, of course, the hydraulic ram 9 is also suited, thus, both of them can be hydraulic devices.

According to the invention, however, not only hydraulic ram 9 can be used but all kind of length-variable elements being adapted to rotate holding arm 12 in respcet of the rectangular holder 11 and to make uneffective or to paralyze the function of joint 13 in the woking position of spreader and packer element 2. An example of this alternative solution is the use of a screw spindle tension gear.

Furhter to this, a stiffening rod with constant length can be used between rectangular holder 11 and holding arm 12 which counteracts to the rotation around joint 13. In this case, there is no possibility of using remote control but the rigidness of beam 7 is made considerably greater.

In Fig. 3 and 4, the connection of grated roller 3 serving as spreader and packer implement 2 is shown for two different embodiments.

In Fig. 3, a frame 19 is connected through a pivot 18 to holding arm 12 and roller 3 is rotatably arranged in frame 19 at axis 20. To holding arm 12, a bracket 21 is perpendicularly fixed wherein an opening 23 is provided for receiving a guiding rod 22. The lower end of guiding rod 22 is fixed to frame 19. In the frame 19, bores 24 for receiving a pin 27 supporting a spring cap 26 of a pressure spring 25 are provided. In the upper end of guiding rod 22, a detention pin 28 is arranged for limiting the motion of guiding rod 22 in opening 23.

Also in Fig. 4, bracket 21 fixed to holding arm 12 as well as frame 19 pivotally holding roller 3 at axis 20 can be seen. However, frame 19 is connected by pivot 18 not to

holding arm 12 but to bracket 21, too. Herein, a tension spring 29 is attached to frame 19 in the vicinity of axis 20, and the other end of spring 29 is connected to a spindle 30. This spindle 30 has a threaded portion extending on at least a part of its length, and a nut 31 is screwed on this threaded portion. Nut 31 lies on an eye 32 fixed to holding arm 12, and spindle 30 is led through the bore of eye 32.

The embodiments of the combined tiller machine as in this invention and described hereinabove operate as follows.

As it is apparent from Fig. 1, the grated roller 3 used as spreader and packer implement 2 has a width of approximately three stocks 5, therefore, two spreader and packer implements 2 are mounted on plough 1 with the provision of the necessary overlap. The grated rollers 3 are arranged beside beam 6 of plough 1 and directly following the stocks 5 being before them. In operation, the tractor moves the tiller machine in direction of arrow 4, whereupon the soil cut, lifted and turned by stocks 5 will immediately be closed, spreaded and packed by grated rollers 3. The spreader and packer implements 2 are during this operation in their operational position as shown in Fig. 1 and 2.

For the transport on public roads as well as during operation in turns at the limits of the land in tillage or for going round a hindrance on the land, spreader and packer implements 2 should be lifted from the soil. As it is well known, spreader and packer implements 2 must be moved quite often independently from plough 1. This is made possible, in the invention, by joint 13 of beam 7. For lifting grated rollers 3, hydraulic lock 17 is opened by remote control from the driver cabin of the tractor and hydraulic ram 9 is put under pressure also by remote control for turning

holding arm 12 around joint 13 in respect to rectangular holder 11 and, thus, for lifting spreader and packer implement 2 from the soil. With this, holding arm 11 with grated roller 3 can be moved even into a vertical position.

When spreader and packer implement 2 is to be brought back into working position, hydraulic ram 9 is to be put under pressure for moving its piston rod 15 in reversed direction and for lowering holding arm 12 with grated roller 3 until holding arm 12 is in line with the horizontal portion of holder 11. In this straight position of beam 7, lock 17 is closed once again and, thus, the arrangement is made stiff enough for the tillage operation.

In Fig. 3 and 4, two possibilities for adjusting the packer force are shown. In the embodiment in Fig. 3, the packer force is exerted by pressure spring 25 arranged between bracked 21 and frame 19. If this packer force is to be made greater, then pin 27 supporting spring cap 26 is to be placed in one of bores 24 being nearer to bracket 21. With this, pressure spring 25 is made shorter and, thus, a bigger packer force will impact on the soil by grated rollers 3.

In the embodiment as shown in Fig. 4, the packer force can be increased by further tensioning spring 29. For this, nut 31 is to be further screwed in on spindle 30 and, thus, spring 29 will be longer.

As it will be clearly apparent from what have been said hereinabove, the soil tillage, i.e. cutting, lifting and turning and, thereafter, immediately closing it can be realized with a quite simple apparatus. In the praxis, it has unexpectedly been shown that the quality of the soil in tillage leaps for better with the help of the combined

tiller machine as in this invention, which emerges in the harvest results, too. It is an important advantage of the solution that the demand in tractive force is not essentially enlarged and, further to this, the implementation costs are negligible.

Claims

1. Combined tiller machine comprising a tractor, a soil turning implement connected to the tractor, and a soil spreader and packer implement, characterized in that a beam (7) of the soil spreader and packer implement (2) is connected to a beam (6) of the soil turning implement through a joint (13)having one degree of freedom, and the spreader and packer implement (2) is arranged beside the beam (6) of the soil turning implement directly following its working tools.

2. Tiller machine as claimed in Claim 1, wherein the spreader and packer implement (2) is rotatable in respect to the soil turning implement around the joint (13) by remote control, and a length-variable element paralyzing the joint (13) is atteched to the spreader and packer implement (2) as well as to the soil turning implement.

3. Tiller machine as claimed in Claim 2, wherein a rectangular holder (11) is connected to the beam (6) of the soil turning implement by detachable connection (10), and the joint (13) is formed between the rectangular holder (11) and a holding arm (12) of the beam (7) of the spreader and packer implement (2).

4. Tiller machine as claimed in Claim 3, wherein the length-variable element paralyzing the joint (13) is connected with its one end to the rectangular holder (11) and with its other end to the holding arm (12) of the beam (7) of the spreader and packer implement (2).

5. Tiller machine as claimed in Claim 4, wherein the length-variable element is formed as a hydraulic ram (9).

6. Tiller machine as claimed in any one of Claims 1 to 5, wherein the spreader and packer implement (2) is

attached to its beam (7) by an elastical element having adjustable pre-load.

7. Tiller machine as claimed in Claim 6, wherein the spreader and packer implement (2) has a frame (19) rotatable around a joint (18) and connected to the holding arm (12) of the beam (7), and the elastical element is a spring (25; 29) arranged between the frame (19) and the holding arm (12).

8. Tiller machine as claimed in any one of Claims 1 to 7, wherein the soil turning implement is a plough (1., and the spreader and packer implement (2) is a plain field cylinder roller or a grated roller (3) or a Cambridge roller or a star roller or a toothed roller or a roller with plane discs or a roller with spade harrows or a combination thereof.

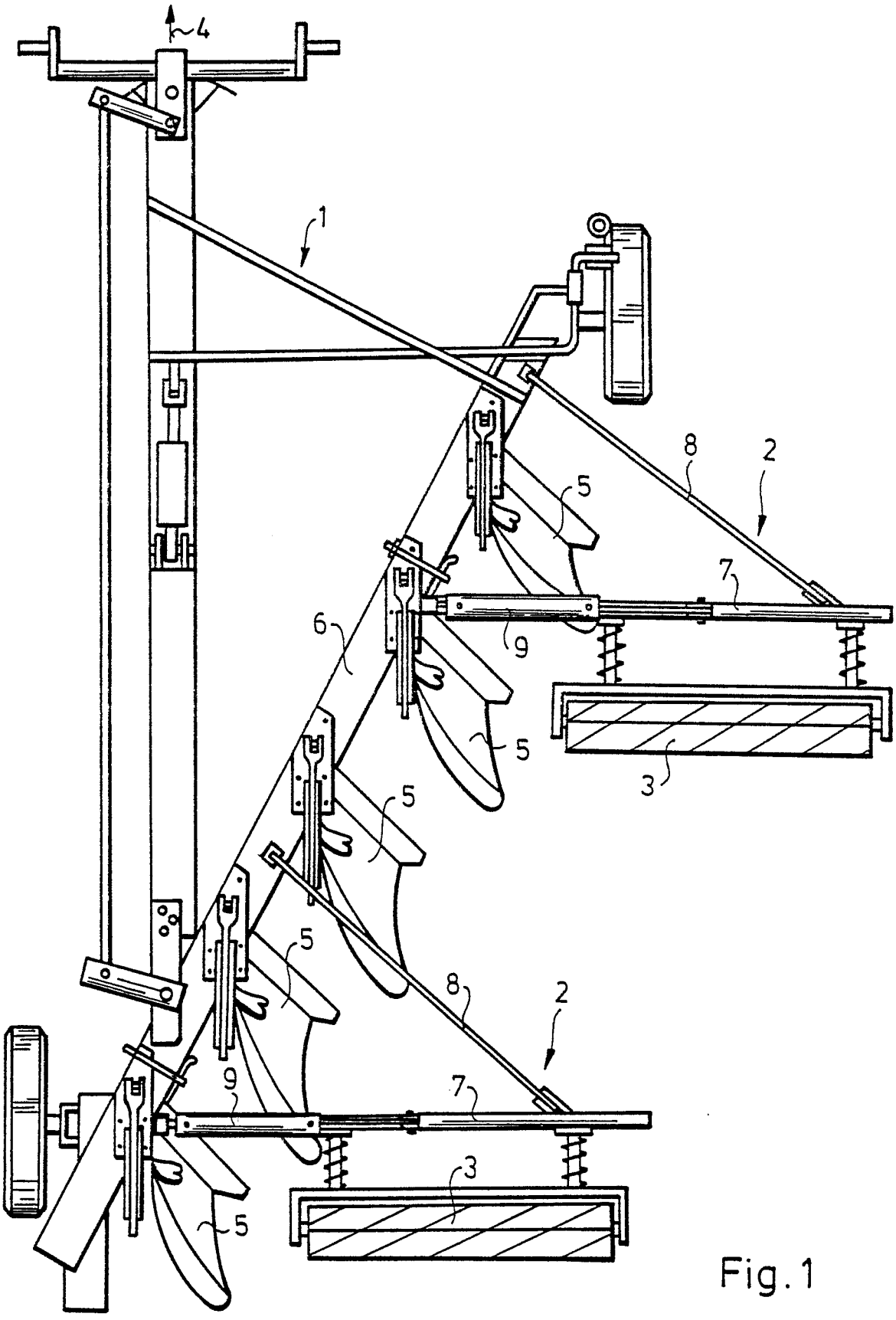


Fig.1

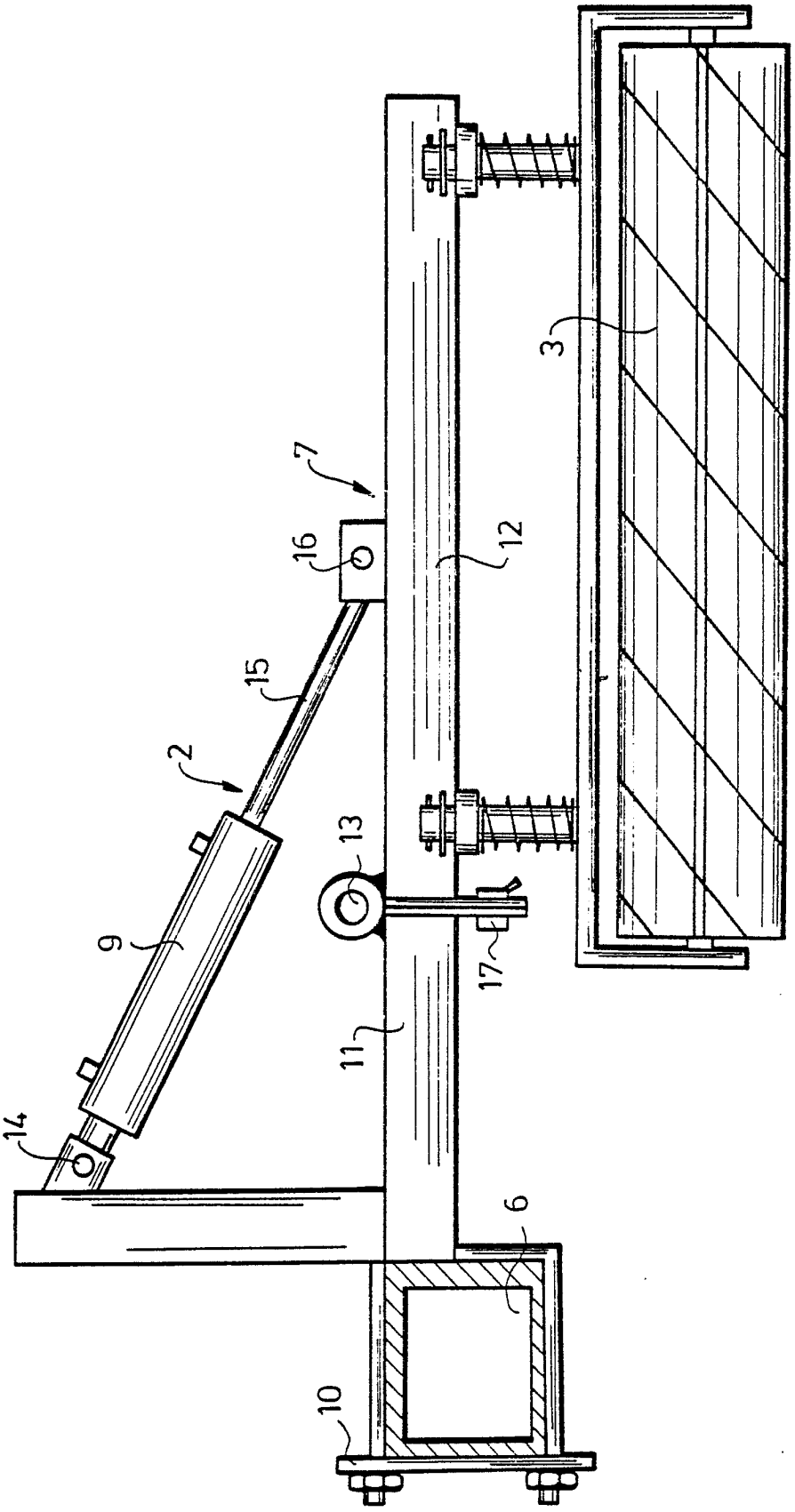


Fig.2

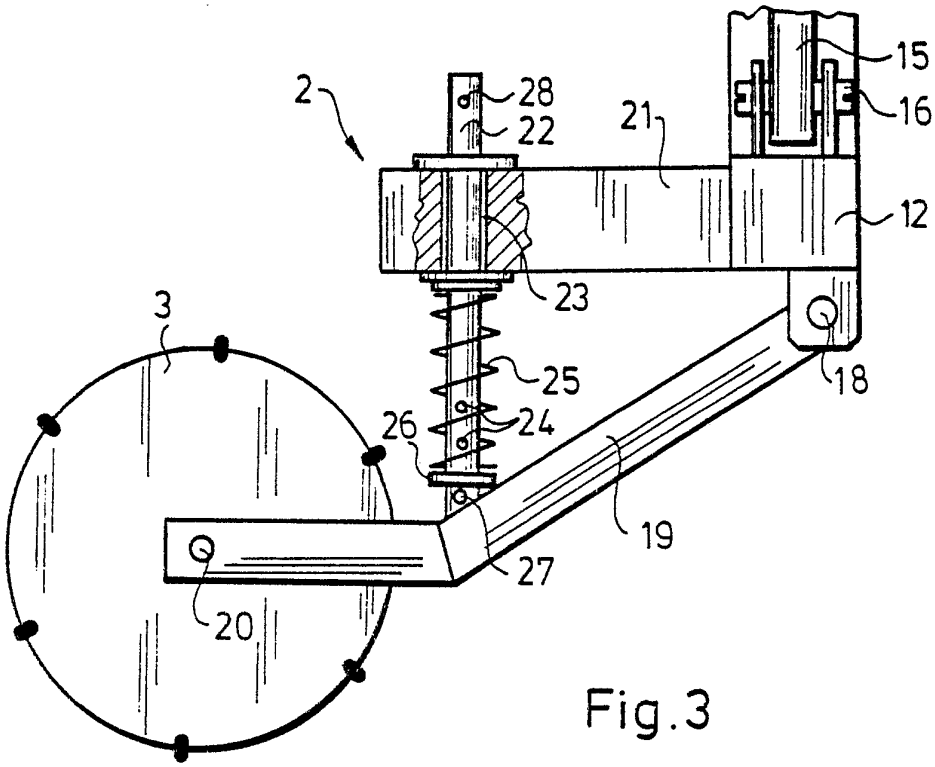

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Fig.3

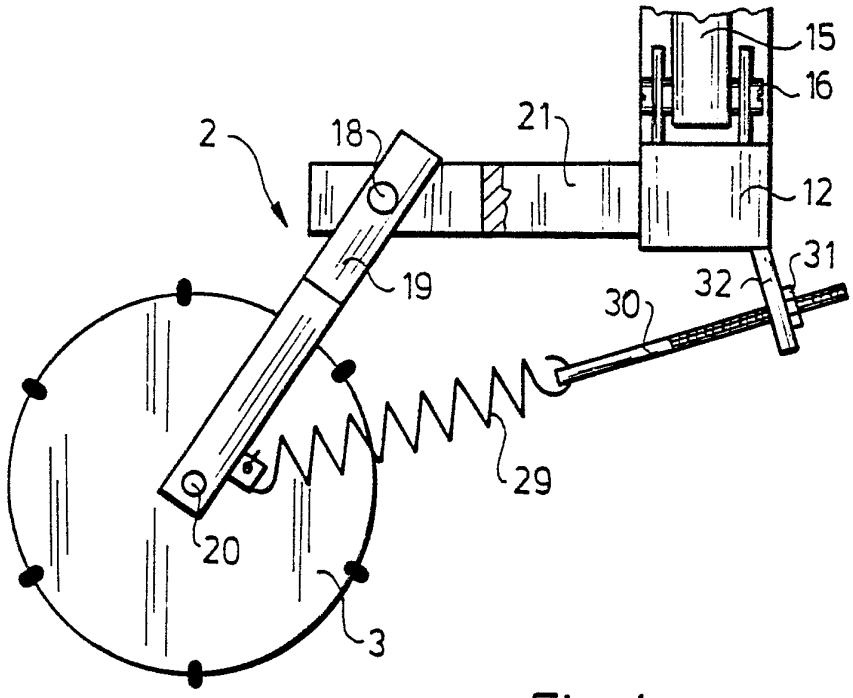

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Fig.4

INTERNATIONAL SEARCH REPORT

International Application No PCT/HU 86/00019

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: A 01 B 17/00,49/02

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int.Cl.[4]	A 01 B 15/14,17/00,25/00,29/04,31/00,49/00,49/02

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 3 490 544 (B.L.GODBERSEN) 20 January 1970 (20.01.1970), see totality.	(1)
A	DE, A1, 2 932 824 (J.GASSNER) 26 March 1981 (26.03.1981), see totality.	(1,2,3,8)
A	DE, A1, 3 333 748 (W.DOPPSTADT) 18 April 1985 (18.04.1985), see totality.	(1,2,5,6,8)
A	DE, A, 1 557 821 (RABEWERK) 02 April 1970 (02.04.1970), see totality.	(1,2,5)
A	DE, A, 2 051 599 (EGGERS) 04 May 1972 (04.05.1972), see totality.	(1)

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
26 November 1986 (26.11.1986)	05 December 1986 (05.12.1986)
International Searching Authority	**Signature of Authorized Officer**
AUSTRIAN PATENT OFFICE	

Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

Annex to the International Search Report on International Patent Application No. PCT/HU 86/00019

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
US-A -3 490 544	20/01/1970	None	
DE-A1-2 932 824	26/03/1981	None	
DE-A1-3 333 748	18/04/1985	None	
DE-A -1 557 821	02/04/1970	None	
DE-A -2 051 599	04/05/1972	None	