United States Patent

Maier et al.

[15] **3,640,056**

[45] **Feb. 8, 1972**

[54] HAY-HARVESTING IMPLEMENTS

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[22] Filed: **Oct. 13, 1969**

[21] Appl. No.: **865,800**

[30] **Foreign Application Priority Data**

Nov. 6, 1968 Germany ..... P 18 07 318.2

[52] **U.S. Cl.** **56/370**

[51] **Int. Cl.** **A01d 79/00**

[58] **Field of Search** 56/27, 366, 365, 370

[56] **References Cited**

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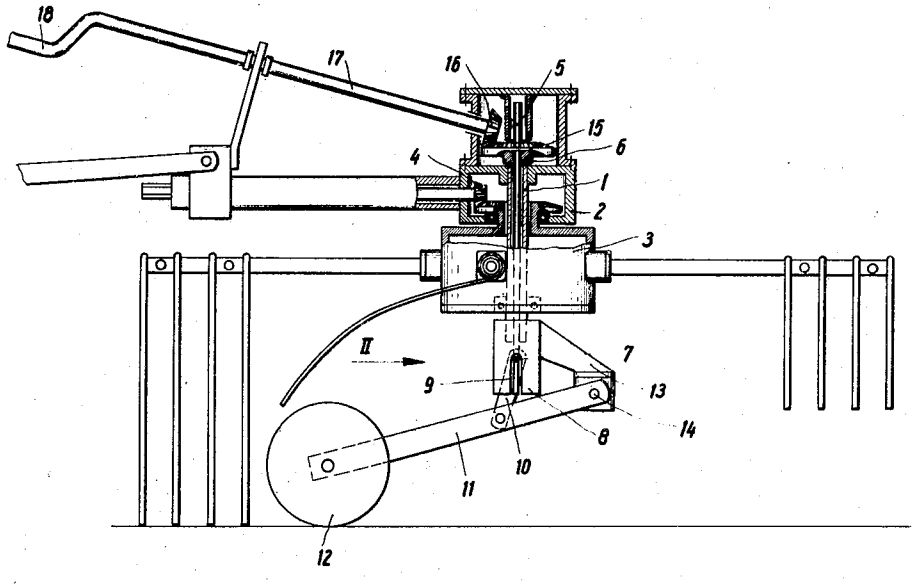
[57] **ABSTRACT**

A hay-harvesting machine of the type using a tined body rotating about a vertical axis, comprises a ground-engaging wheel mounted on a pivoting support arm whose inclination can be changed, for adjusting the ground clearance of the implement, by means of a threaded rod, which can be turned to cause it to move vertically, and whose lower end is guided in bearing means and is connected with the arm by means of one or more links in a pivoting manner.

8 Claims, 3 Drawing Figures



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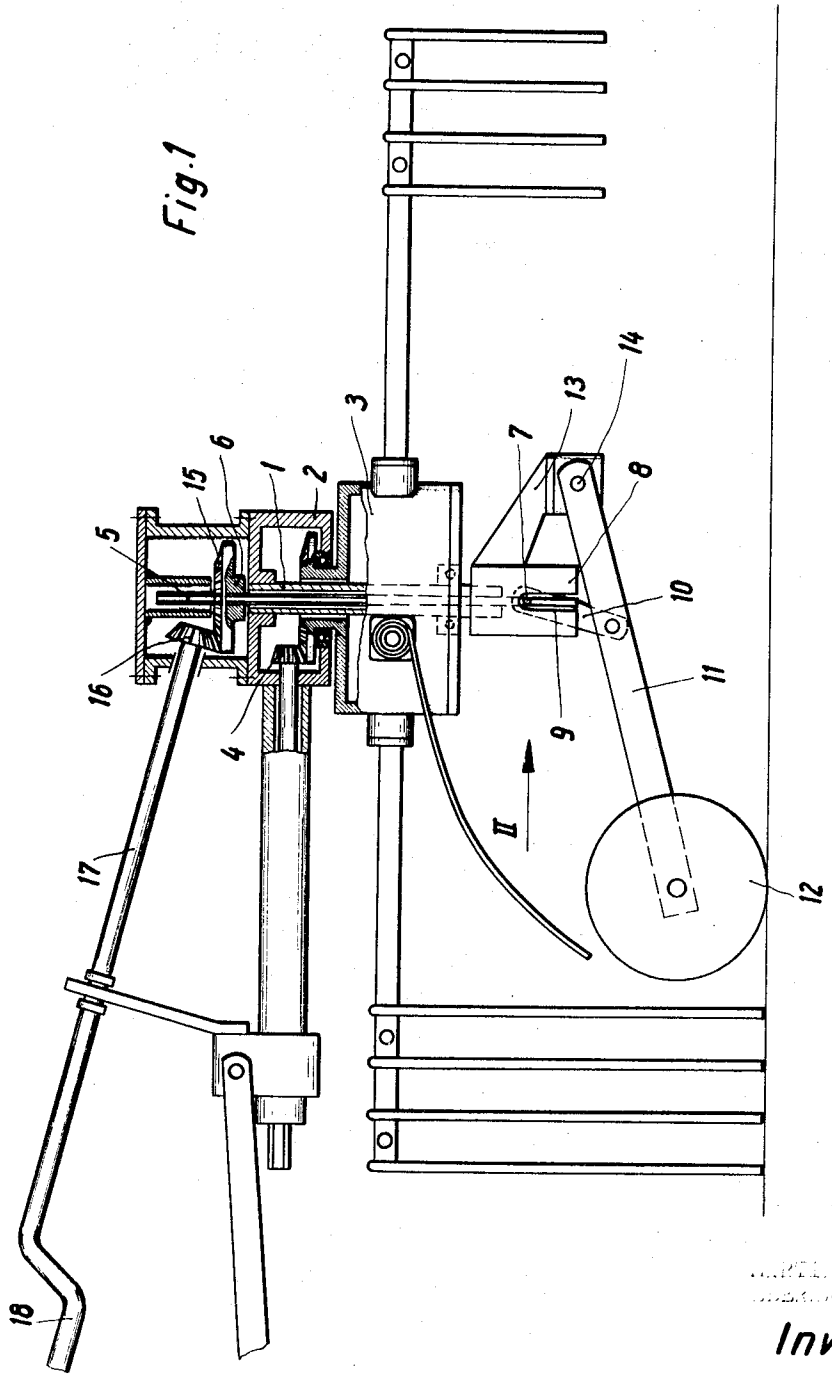
SHEET 1 OF 2

Fig.1



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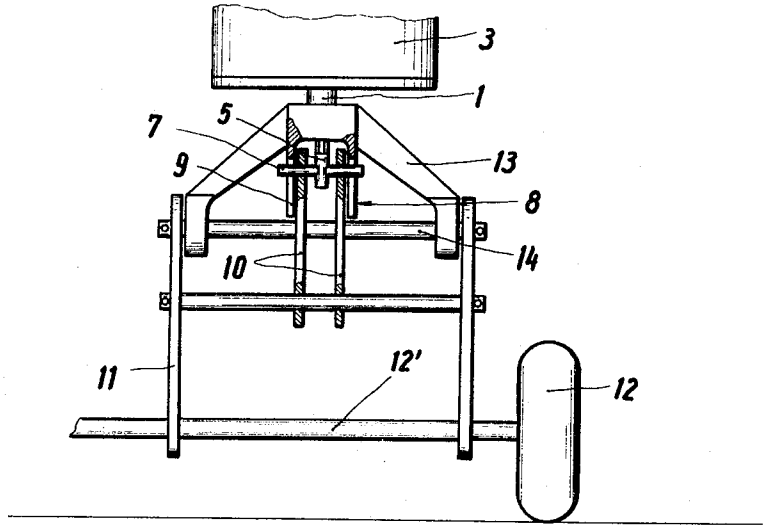

Fig. 2

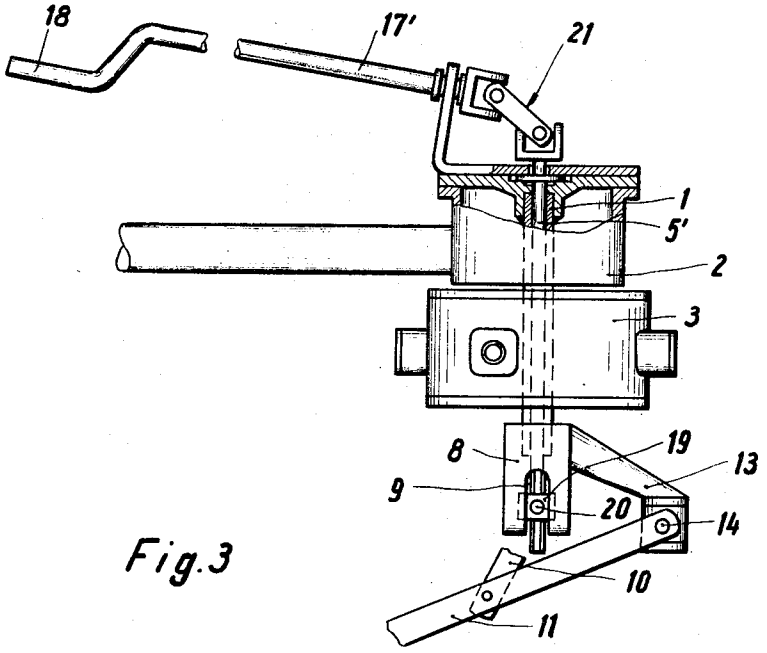

Fig. 3

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HAY-HARVESTING IMPLEMENTS

FIELD OF INVENTION

The present invention relates to hay-making implements and more particularly to a device for setting the ground clearance of a hay-harvesting implement comprising at least one tined body arranged to be driven about an approximately vertical shaft and arranged to be supported by means of a support wheel journaled on a pivoting support arm, a threaded spindle being connected with the arm and passing through a hollow vertical shaft of the tined body, for vertical adjustment.

PRIOR ART

A hay-harvesting machine of this type has already been proposed in which the support wheel is arranged at the end of a two-armed carrier, which is journaled on a projecting arm on the stationary hollow shaft for vertical pivoting movement. The other end of the two-armed carrier is provided with a rotating nut part which can be shifted slightly in the longitudinal direction of the carrier and surrounds the threaded spindle passing through the hollow shaft. The upper end of the threaded spindle is extended in an upward direction from the tined body and provided with a handcrank. By rotating the handcrank the support wheel can be pivoted about the pivot point of the two-armed carrier so that the tined body can be adjusted in relation to the body. The disadvantage of this arrangement is that the support forces transmitted by the carrier to the threaded spindle operate exclusively in the axial direction of the threaded spindle when the carrier is perpendicular to the threaded spindle. In other positions of the carrier and the wheel, transverse forces arise which exert a bending force on the threaded spindle. The consequence is an increased danger of breakage or the necessity, if this danger is to be avoided, of providing an oversize spindle.

SUMMARY OF THE INVENTION

One object of the present invention is to construct an adjusting device of the above-described type in such a manner that the forces required for holding the wheel in position do not appear as transverse forces in the threaded spindle and only act in the axial direction of the spindle.

An important feature of the invention resides in that the end of the threaded spindle adjacent to the wheel is supported by means of a bearing fixed to a frame of the machine and is connected in a pivoting manner by one or more links with the arm carrying the support wheel.

A further important feature of the invention resides in that the upper end of the threaded spindle is passed through a nut which can rotate about the axis of the threaded spindle and is prevented from shifting axially, while the other end has a bolt passing through it which is perpendicular to the axis of the threaded spindle, the bolt extending on both sides from the spindle and fitting into vertical slots on both sides of the threaded spindle in the direction of movement of the support wheel stationary plates. The bolt guided in the slot prevents a rotation of the threaded spindle and transmits the transverse forces to the plates.

In accordance with a further feature of the invention the carrying arm is pivoted in a projection from the stationary plates for movement about a horizontal axis perpendicular to the direction of travel and on the carrying arm the links are connected, at a distance from its pivot axis, which are themselves connected in a pivoting manner with the bolt of the threaded spindle. By rotation of the spindle nut the threaded spindle is axially displaced and the wheel is pivoted so that the ground clearance of the hay-harvesting machine and its hay-contacting tines is changed.

It is particularly convenient if the spindle nut forms part of, or is in the form of, a bevel gear which is coaxial with the axis of rotation and is in engagement with a further bevel gear which can be operated by means of a hand crank on a rod. Operation of the handcrank serves to adjust the height of the machine.

In accordance with a further embodiment of the invention the threaded spindle is journaled in the hollow shaft of the tined body so that it can rotate but cannot be shifted axially and at its lower end is fitted into a spindle nut which is guided in the vertical slots of the stationary plates and is connected via the links with the support wheel. The transverse forces are transmitted by the spindle nut to the plates. By rotating the threaded spindle the spindle nut is moved axially in the slots of the plates and via the links of the carrying arm with is pivoted the support wheel.

For the drive of the threaded spindle the crank rod is connected by means of a single or double universal joint with the threaded spindle.

For reasons of safety and in order to improve ease of manipulation, the handcrank can be arranged outside the circle of rotation of the tined body.

Preferably the handcrank can be actuated from the tractor seat.

BRIEF DESCRIPTION OF VIEWS OF DRAWING

Further substantial features and details of the invention will be found in the following description, referring to the accompanying drawings which show two embodiments of the invention.

FIG. 1 is a side view of the hay-harvesting machine with the ground-clearance setting device, partially in section.

FIG. 2 is a view of the machine looking in the direction of the arrow II of FIG. 1.

FIG. 3 is a side view of a further embodiment of the setting device, partially in section.

DETAILED DESCRIPTION

The diagrammatic drawing shows a hay-harvesting machine with a vertical hollow shaft 1 which is rigidly connected with a frame 2 of the machine. On the frame 2 and on the hollow shaft 1 a tined body 3 is arranged for rotation. The tined body 3 is driven via bevel gearing 4 about the hollow shaft 1 from the PTO-shaft of the tractor.

The hollow shaft 1 has a threaded spindle 5 passing through it whose upper end, in the embodiment in accordance with FIGS. 1 and 2, passes through a threaded nut 6. The nut 6 is journaled so as to be coaxial in relation to the hollow shaft 1 in the frame 2 of the hay-harvesting machine but is prevented from moving axially.

The lower end of the threaded spindle 5 which extends down below the hollow shaft 1 has a bolt 7 which is transverse in relation to the spindle axis and extends from the spindle to both sides to form trunnions. Two plates 8 are connected with (fixed to) the lower end of the hollow shaft 1. The two plates 8 are vertical and parallel to the direction of travel. They lie on both sides of the threaded spindle 5 as shown in FIG. 2. The plates 8 have vertical slots 9 in which the free ends of the bolt 7 are guided. On each end of the bolt 7, a link 10 is pivoted which is connected with a carrying arm 11 of a support wheel 12 or alternatively with a pair of arms of a support wheel shaft 12'. That end of the carrying arm or arms 11 which is removed from the support wheel 12 or the shaft 12' is attached to a projection 13 of the plates 8 fixed to the hollow shaft 1 for pivoting movement about a horizontal pin 14 which is transverse in relation to the direction of travel. By rotation of the spindle nut 6, the threaded spindle 5 is moved axially and the carrying arm or arms with the support wheel or wheels 12 is swung about the pin 14.

The nut 6 has a bevel gear 15 coaxial to the spindle axis and meshing with a bevel gear 16 which is rigidly connected with a rod 17 extending so as to be within the reach of the tractor driver. The free end of the rod 17 is made in the form of a handcrank 18. By actuating the handcrank 18 the nut 6 is turned so that the ground clearance of the hay-harvesting machine can be set.

With the embodiment of the invention shown in FIG. 3 the threaded spindle 5' is arranged so as to be able to rotate but is prevented from moving axially. The lower end of the threaded

spindle 5' fits into a nut 19. In the slot 9 of the vertical plates 8 the spindle nut 19 is arranged so that it can move axially but is prevented from rotating. On trunnions 20 of the nut 19, which fit into the slot 9, the links 10 are arranged. These links are connected with the carrying arm or arms 11 of the support wheel 12.

Via a double universal joint 21 the upper end of the threaded spindle 5' is connected with the rod 17'. By actuating the handcrank 18 the threaded spindle 5 is turned and the nut is moved axially in the slots 9 so that the carrying arms 11 with the support wheels 12 are swung about the axis 14.

The support force needed for holding the support wheels 12 is transferred by the links 10 to the threaded spindle 5. Since the links 10 are not directed in the axial direction of the threaded spindle, transverse forces arise which are transferred by the trunnions 20 and the bolt 7 in the slots 9 to the plates 8. The threaded spindle is therefore not subjected to any bending forces and can therefore be made less stout than would otherwise be required. The various parts whose size depends upon the size of the threaded spindle, such as ball bearings and the like, can thus be smaller.

We claim:

1. In a hay-harvesting implement comprising a frame, a tined body arranged to rotate about an upright axis, ground-engaging sheel means arranged to support the body, a vertical threaded spindle coaxially extending inside the tined body and arranged to be turned for bringing about axial movement, and support arm means carrying the wheel means and connected with a lower end of the spindle, the improvement which comprises: bearing means guiding the lower end of the spindle, the bearing means being rigidly connected with the frame of the implement; link means pivotally connecting the lower end of the spindle and the carrying arm; an axially fixed rotary nut mounted on an upper end of the spindle; trunnions fixed to the lower end of the spindle; and vertical plates to each side of the spindle, the vertical plates having vertical slots into which the trunnions extend.

2. In a hay-harvesting implement comprising a frame, a tined body arranged to rotate about an upright axis, ground-engaging wheel means arranged to support the body, a vertical threaded spindle coaxially extending inside the tined body and arranged to be turned for bringing about axial movement, and support arm means carrying the wheel means and connected with a lower end of the spindle, the improvement which comprises: bearing means guiding the lower end of the spindle, the bearing means being rigidly connected with the frame of the implement; link means pivotally connecting the lower end of the spindle and the carrying arm; a frame part to which the arm is pivotally attached for movement about a pivot axis perpendicular to the direction of travel of the implement, and link means connecting with trunnions with the arm in a pivotal manner.

3. An implement as defined in claim 1 further comprising bevel gear means attached to the nut, further bevel gear means meshing with the first-mentioned bevel gear means, and a crank connected with the second-mentioned bevel gear means.

4. In a hay-harvesting implement comprising a frame, a tined body arranged to rotate about an upright axis, ground-engaging wheel means arranged to support the body, a vertical threaded spindle coaxially extending inside the tined body and arranged to be turned for bringing about axial movement, and support arm means carrying the wheel means and connected with a lower end of the spindle, the improvement which comprises: bearing means guiding the lower end of the spindle, the bearing means being rigidly connected with the frame of the implement; link means pivotally connecting the lower end of the spindle and the carrying arm;, said threaded spindle being axially fixed while being capable of rotating; a nut surrounding the lower end of the threaded spindle and arranged to be raised and lowered by rotation of the threaded spindle; vertical plates on either side of the lower end of the threaded spindle, the vertical plates having vertical slots in them, trunnions on the nut extending into the vertical slots; and links pivotally connected with the trunnions and with the arm carrying the ground-engaging wheel means.

5. An implement as defined in claim 4 further comprising a generally horizontal rod with a cranked end arranged to be turned manually, and universal joint means connecting the rod with the threaded spindle for rotation of the threaded spindle by turning the crank end of the rod.

6. An implement as defined in claim 5, in which the cranked end of the rod is clear of the circle of rotation of the tined body.

7. An implement as defined in claim 6, in which the cranked end of the rod can be actuated from the seat of a tractor propelling the implement.

8. A hay-harvesting implement comprising a support; a tined body rotatably mounted on said support and having a generally vertical axis; means on said support offset from said axis and defining a fulcrum; a spindle extending along said axis and provided at a lower end with a pivot; screw thread means cooperating with an upper end of said spindle for vertically displacing said pivot; a support arm swingably mounted on said fork at one end thereof and provided at its other end with a support wheel; a link articulated to said arm intermediate its ends and swingably mounted on said pivot for translating axis movement of said pivot into an angular displacement of said arm about said fulcrum; and guide means on said support constraining said pivot to movement parallel to said axis.

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