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(54) Title. MOWER TRANSPORT TRAILER

(57) Abstract

A transport trailer for an agricultural mowing machine (11) comprises a trailer frame (31), a set of transport wheels (33) mounted on the frame (31) to support the trailer frame and also a mowing machine when loaded thereon, a pair of adjustable loading ramps (34) spaced apart along the length of the trailer frame (31) and each corresponding to a respective one of the ground wheels of the mowing machine and being adjustable between ground engaging positions which allow loading of the mowing machine and raised positions suitable for transport of the mowing machine, and bearers (35), connected to the ramps (34) and arranged to move the ramps to the raised transport position after loading of the mowing machine by being engaged by parts of the mowing machine as the latter is adjusted to its lowered position.

MOWER TRANSPORT TRAILER

This invention relates to a transport trailer for an agricultural mowing machine.

The type of agricultural mowing machine or "mower" with which the invention is concerned is a towed machine having a frame, a drawbar pivotally mounted on the frame and projecting forwardly therefrom to be coupled with the rear of a propelling vehicle (usually an agricultural tractor), a set of ground wheels supporting the frame, a cutter bar mounted on the frame and extending substantially perpendicular to the mowing direction, and a housing mounted on the frame and arranged to guide a standing crop of grass to the cutter bar, and to direct the mown grass cut by the cutter bar to form a swath.

The cutter bar comprises an assembly of rotary mower discs spaced apart along the length of the cutter bar, and arranged to be driven by a drive train which receives power input from a PTO shaft driven by the tractor. Usually, a "conditioning" rotor is arranged above the cutter bar, and comprises a shaft-driven arrangement of rotary tines which assist in picking-up mown crop and passing it upwardly and rearwardly within the housing (so as to "condition" the grass), prior to depositing the grass on the ground as a swath.

The construction and operation of mower discs and conditioners will be well know to those of ordinary skill in the art, and need not be described in any more detail herein.

The draw bar which allows the mowing machine to be towed behind a tractor can be mounted on the mower frame at one side thereof, and in the mowing position of the draw bar the mowing machine is located in a laterally offset position relative to the tractor so that the tractor can run alongside the standing crop while the mowing machine carries out its mowing operation, ie the tractor does not run on the uncut crop. However, when the mowing machine is being towed behind the tractor along the

public highway, it is necessary to adjust the drawbar so that the mowing machine is located directly behind the tractor in order to reduce the overall width of the tractor/mower combination.

It is also known to mount the drawbar substantially centrally of the frame, ie approximately mid-way along the length of the cutter bar, and this drawbar will extend directly behind the tractor in the transport position, but can be laterally adjusted to one side or the other depending upon mowing requirements.

The effective cutting width of a mower depends upon the length of the cutter bar, and the number of mower discs arranged along its length, and obviously it is desirable to increase the cutting width as much as possible, to provide economies in fuel consumption, labour costs and tractor usage time. However, increasing the cutting width of a mower for use in a field makes or causes problems in adjusting the machine to a transport position of reduced overall width of the tractor/mower combination for movement through a field entrance and along the public highway.

Therefore, with existing designs of mower, the widest disc mower allowed on the public highways in Europe is believed to be an 8 disc machine, to meet maximum width requirement on the public highway of 3 metres. There is a continuing demand from customers to provide increased mowing capacity since, eg an increase to a 10 disc mower would increase the cutting width during each pass by about 25%, and without a corresponding increase in fuel consumption. A standing crop of grass will be able to be cut in less time, reflecting lower labour cost and reduced tractor usage time.

However, with current mowing machine technology, there does not, as yet, exist any easy means for converting larger width mowers for transport purposes.

The present invention addresses this need, and provides a simple transport trailer design which can be used in order to transport a wide disc mower along the public highway.

Furthermore, the trailer of the invention utilises power operated components of the mowing machine to assist in the loading of the machine on the trailer, thereby reducing the complexity of the design of the trailer so as to minimise costs of construction.

According to the invention there is provided a transport trailer for an agricultural mowing machine, in which the mowing machine comprises:

a machine frame;

a drawbar pivotally mounted on the frame and projecting forwardly therefrom to be coupled with the rear of a propelling vehicle;

a set of adjustable ground wheels supporting the frame, said wheels being adjustable relative to the frame between a lowered mowing position of the machine and a raised position of the machine out of contact with a standing crop of grass which is to be mown;

a cutter bar mounted on the frame and extending substantially perpendicular to the mowing direction; and

a housing mounted on the frame and arranged to guide a standing crop of grass to the cutter bar, and to direct the mown crop cut by the cutter bar to form a swath;

and in which the transport trailer comprises:

a trailer frame having a longitudinal axis;

a set of transport wheels mounted on the frame to support the frame and a mowing machine when loaded thereon;

a pair of adjustable loading ramps spaced apart along the length of the frame and each corresponding to a respective one of the ground wheels of the mowing machine, said ramps being adjustable between lowered ground-engaging positions ready to allow loading of the mowing machine and raised positions suitable for transport of the mowing machine; and

bearers connected to the ramps and arranged to move the ramps to the raised transport position after loading of the mowing machine, said bearers being engageable by parts of the mowing machine as the latter is adjusted to its lowered position.

Therefore, the invention provides a simple design of transport trailer which receives a mowing machine in a direction transverse (preferably perpendicular) to the transport direction of the trailer, but with forward movement of the mowing machine in a direction parallel to its normal mowing direction, whereby subsequent transport of the mowing machine when mounted on the trailer is in a direction perpendicular to its mowing direction, ie the mowing machine is transported in a direction in which its sides (when mowing) now become its front and rear ends with respect to the transport direction of the trailer, so that the mowing machine presents a considerably reduced transport width to the combination of trailer/mower.

Furthermore, the trailer design is simple, in that the power required to adjust the ramps to the raised position is derived from the motive energy (and technical components) which are already present in the mowing machine to carry out its normal function.

In this respect, it should be borne in mind that the ground wheels of a disc mower are usually adjustable between a lowered position of the machine when mowing is being carried out, and to a raised position in which the cutter bar is moved out of contact with the standing crop, so that the machine can be manoeuvred within the field after it has carried out each pass along the standing crop which is to be cut. To achieve lowering of the machine frame and the cutter bar to the mowing position, it is necessary to carry out relative upward adjustment of the ground wheels, whereas upward movement of the cutter bar out of contact with the crop is caused by relative downward adjustment of the ground wheels.

Therefore, the mowing machine will usually be loaded onto the transport trailer with the ground wheels of the mowing machine in the lowered position, ie with the machine frame raised, and with the ramps in the lowered position the mowing machine is easily pulled by a tractor so that the wheels move into engagement with the ramps. The drawbar of the mower will be in a laterally adjusted position, but with at least a small component of forward direction of the drawbar, so that forward movement of the tractor can cause the mowing machine to move in its normal mowing direction and so as to move into engagement with the ramps. The tractor will be laterally offset relative to the trailer while this adjustment takes place.

The ground wheels of the mowing machine will then be raised, causing corresponding lowering movement of the mower frame, and which then brings part of the mower into engagement with the bearers which are connected to the ramps.

Preferably, each ramp has a receiving "well" or recess in which the respective ground wheel of the mower can be received, and can be held stably as it is loaded, and this stable holding of the wheels also occurs after adjustment of the ramps to the raised positions.

The bearers preferably comprise bearing plates or platforms arranged to be downwardly engaged by any suitable parts of the mowing machine during its lowering movement, and which could include engagement by support arms of the ground wheels of the mowing machine which form part of a pivotal adjustment mechanism for the ground wheels.

Therefore, upon lowering movement of the mower, component parts of the mower already present for the mowing operation can be power operated, and to cause necessary upward adjustment of the ramps (with the ground wheels engaged therein) by operation of the bearers connected to the ramps.

In a preferred arrangement, the ramps are pivotally mounted on the frame for adjustment about pivot axes extending parallel to the longitudinal axis of the frame.

Preferably, the ramps are coupled together for joint movement, and in one convenient arrangement a longitudinally extending shaft is mounted in the frame and is secured at each end to a respective ramp.

The frame may also include a laterally ofi et (relative to the longitudinal axis) load bearing platform arranged to be engaged by the cutter bar upon lowering movement of the mower. Therefore, with respect to the longitudinal axis of the trailer, at one side of this axis the mower is supported by the ground wheels engaged in the ramps, and by vertical support for the mower via engagement with the bearers, whereas on the opposite side of the axis there is support of the cutter bar by the load bearing platform.

Preferably, the drawbar of the mowing machine is mounted on the frame of the mowing machine at a position approximately mid-way along the length of the cutter bar, and the drawbar will be adjusted to a laterally displaced position of the mower with respect to the tractor during mowing operations, and also during the loading of the mower on the trailer.

Once the mower has been loaded on the trailer, the tractor can then move forwardly, with the drawbar in a fixed position of adjustment, whereby the mower can then be transported through a field entrance and along the public highway, (with the mower in a position of minimum transport width), in a direction which will be approximately perpendicular to its normal mowing direction.

During the forward movement of the tractor so as to tow the trailer and mower behind it, the axle(s) of the transport wheels of the trailer will move through approximately 90°, and

to assist the accompanying rotation of the trailer frame, preferably a support is provided at one end of the trailer frame (which will be the rear end when in the transport position), and which can make engagement with the ground during the turning movement of the trailer frame, so as to assist this movement. In a preferred arrangement, a small wheel may be provided at this end of the trailer frame, having a pivot axis extending generally parallel to the longitudinal axis of the trailer frame, ie perpendicular to the axle of the transport wheels of the trailer frame, to assist the turning movement of the trailer frame.

In practice, initially the load of the mower on the trailer may tend to apply a downward component of force on this support wheel, and therefore the wheel can assist the rotation of the trailer frame, but as the trailer frame adjusts itself to take up a transport position directly behind the tractor, the weight of the mower is no longer transferred to the rear end of the trailer frame, and the support wheel will then lift out of engagement with the ground.

A preferred embodiment of transport trailer according to the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic and perspective illustration of a transport trailer according to the invention, for use in transporting an agricultural mowing machine;

Figure 2A, B and C shows successive stages in the loading, adjustment, and transport of an agricultural mowing machine via the transport trailer shown in Figure 1;

Figure 3 is a detailed plan view of one type of agricultural mowing machine which can be loaded, and then transported on a transport trailer according to the invention;

Figure 4 shows the turning movement carried out by the trailer frame after loading with the mowing machine, so that the trailer can take up a transport position directly behind the tractor;

Figure 5 is a side view of the mowing machine (also an end view of the trailer), as the mower is loaded onto the trailer with the ground wheels of the mower in a lower position of adjustment so as to raise the mower frame; and

Figure 6 is a view, similar to Figure 5, showing the mower after adjustment, by raising of its ground wheels, so as to take up a stable loaded position on the trailer.

The type of agricultural mowing machine or "mower" with which the invention is concerned is a towed machine having a frame, a drawbar pivotally mounted on the frame and projecting forwardly therefrom to be coupled with the rear of a propelling vehicle (usually a tractor), a set of ground wheels supporting the frame, a cutter bar mounted on the frame and extending substantially perpendicular to the mowing direction, and a housing mounted on the frame and arranged to guide a standing crop of grass to the cutter bar, and to direct the mown grass cut by the cutter bar to form a swath.

Figure 3 shows one example of a type of agricultural mowing machine which can be used with a transport trailer according to the invention, and Figure 3 shows tractor 10 pulling mowing machine 11 along the ground in a laterally offset position, via an adjustable drawbar 12. Drawbar 12 is pivotally mounted on the frame of the machine at a position substantially mid-way along the length of cutter bar 13, (having a row of mower discs 14 arranged along its length), and the drawbar 12 can be adjusted between a central position, as shown, in which the machine 11 can be towed directly behind the tractor 10, or either one of the two laterally adjusted positions as shown. However, it will be noted that the illustrated embodiment of

machine 11 has ten mower discs 14, and this will increase the cutting width more than the normal European maximum transport width on public highways (3 metres), and therefore means must be provided to allow the mower 11 to be transported in a transport position of reduced transport width, and it is an object of the invention to facilitate this.

However, for the North American market, where such maximum transport widths may not apply, the new design of mowing machine 11 as shown, ie with increased cutting width, may be transported along the public highway in a position directly behind the tractor, when permitted.

The mower 11 has, in addition to drawbar 12, cutter bar 13 and a mower disc 14, a general support frame comprising suitable mounting beams and frame components, and designated generally by reference 15, and a set of ground wheels 16 which can be raised and lowered relative to the frame 15, for the purposes of adjusting the overall height of the mower 11 relative to the ground. When mowing is being carried out, the wheels 16 will be adjusted to a raised position, via pivoting of their support arms 17 (see Figures 5 and 6) but at the end of a pass along a standing crop, the cutter bar is raised out of contact with the crop, by raising of the mower frame following lowering movement of the support arms 17, (as shown by reference 16a in Figure 5 showing the lowered position of the wheel). The mower 11 also has a housing having a forward housing part 18 and a rear part 19, and which have the function of guiding a standing crop of grass to the cutter bar 13 (the housing part 18), and to direct the mown grass cut by the cutter bar 13 (the rear housing part 19) to form a swath 20 (see Figure 3).

Referring now to Figures 1 and 2, a transport trailer according to the invention is designated generally by reference 30, and is shown in Figure 2, via sequences A, B and C, wherein mower 11 is loaded onto the trailer with the mower frame in the raised position; after loading is self-adjusted so as to cause

adjustment of the trailer frame to form a stable support for the mower 11; and then subsequent manoeuvring of the tractor 10, as shown in sequence C, allows the tractor/trailer/mower combination to travel through a field entrance and along a public highway in a position of reduced transport width of the mower 11.

The trailer 30 comprises a frame formed by a longitudinal support beam 31 and a transversely extending support beam 32 which supports a wheel axle which carries a set of transport wheels 33. A pair of adjustable loading ramps 34 are spaced apart along the length of the longitudinal beam 31, and located one at each end thereof, and with each ramp 34 corresponding to a respective one of the ground wheels 16 of the mower 11.

The ramps 34 are adjustable between lowered ground-engaging positions, as shown in Figure 1 and Figure 2A, and raised positions suitable for transport of the mower 11, as shown in Figures 2B and C.

Bearers 35 are connected to the ramps 34, and arranged to move the ramps 34 from the lowered position to the raised transport position, after loading of the mower 11, these bearers 35 being engageable by parts of the mower 11 as the mower self adjusts to a lowered position after loading on the trailer.

Figure 2A shows tractor 10 loading mower 11 onto the trailer 30, with the drawbar 12 in a laterally adjusted position having a small component of forward direction, and the mower 11 is easily adjusted onto the trailer 30 by pulling the mower 11 up the ramps 34. The mower 11 is therefore loaded onto the trailer 30 by moving in its normal forward mowing direction, but after loading is completed, the mower is then transported by the trailer 30 in a position of substantially reduced transport width, as shown in Figure 2C. Thus, once the mower 11 has been loaded, what would be its normal sides 36 and 37, (when in a mowing position), now become the front and rear ends

respectively of the mower when in the transport position.

Furthermore, the trailer design is simple, in that no power operated components are required, since the power required to adjust the ramps 34 to the raised position (as will be described below) is derived from the motive energy (and technical components) which are already present in the mower 11 to carry out its normal function.

Thus, the mower 11 is loaded onto the trailer 30, as shown in Figure 2A, with the wheels 16 of the mower 11 in the lowered position, and the geometry of the frame construction of the trailer 30 is such that the normal rest position of the ramps 34 will be the ground engaging position as shown. However, once the ground wheels 16 have become stably located within "wells" or recesses 38 of the ramps 34, the ground wheels 16 are then raised, which causes corresponding lowering of the housing and frame of the mower 11, as shown diagrammatically in Figure 2B.

The bearers 35, in the illustrated example, comprise bearing plates or platforms arranged to be downwardly engaged by the lowering movement of the mower 11, so as to cause upward adjustment of the ramps 34 with the mower wheels 16 engaged therewith.

The ramps 34 are pivotally mounted on the trailer frame, for adjustment about pivot axes extending parallel to the longitudinal axis of longitudinal beam 31. Furthermore, the ramps 34 are coupled together for joint movement by being mounted one at each end of a longitudinally extending shaft 39 which is mounted in the trailer frame.

The trailer frame also includes a load-bearing platform 40 which is engaged by the cutter bar 13 of the mower 11 upon lowering movement of the mower 11.

The mower 11 therefore is supported in a stable condition on the frame of the trailer 30, after lowering adjustment of the mower, in that, with respect to the longitudinal axis of the trailer frame, the mower wheels 16 are located to one side and are held in the wells 38 of the ramps 34, (and also the adjustable wheel support arms 17 bear downwardly onto the bearers 35), whereas on the opposite side of the longitudinal axis the cutter bar 13 is supported by the platform 40.

Upon loading of the mower 11, as shown in Figure 2B, followed by downward adjustment, there will be a tendency for the weight of the mower 11 to be transferred towards the mower side 37, and which may tend to cause the trailer frame to pivot downwardly at the end corresponding to mower side 37, and therefore a support is provided at this end of the trailer frame. In the preferred arrangement, this comprises a small wheel 41, which will be pressed downwardly into contact with the ground, and then during the subsequent manoeuvring of the trailer frame from the position shown in Figure 2B to that shown in Figure 2C, the small wheel 41 assists the turning movement of the trailer frame. However, once the trailer frame has reached the "in-line" position shown in Figure 2C, the weight of the mower is then transferred more to the drawbar 12 and the tractor, and the trailer frame pivots forwardly so as to lift the wheel 41 out of contact with the ground.

Referring now to Figures 5 and 6, this shows in detail side view of mower 11, and view from one end of the trailer 30. Figure 5 shows ramps 34 in the ground engaging position, and with the mower ground wheels 16 in the lowered position shown by reference 16A, (and consequently the mower frame in the raised position), so that the mower 11 can be easily loaded onto the trailer, as shown schematically in Figure 2A. The wheel support arms 17 are then pivoted upwardly to the lowered position of the mower, as shown in Figure 6, and this brings the support arms 17 into downward engagement with the bearers 35, which causes upward pivoting of the ramps 34. In addition,

the cutter bar 13 is lowered from the raised position shown in Figure 5 to the lowered position shown in Figure 6, and in which it will then bear downwardly on the offset load bearing platform 40 of the trailer frames. This will be a stable position for the mower, although if required, additional clamps may be provided (not shown) to clamp the mower in the loaded position, and including clamping the mower wheels 16 in the wells 38 of the ramps 34.

CLAIMS

1. A transport trailer (30) for an agricultural mowing machine (11), in which the mowing machine comprises:

a machine frame (15);

a drawbar (12) pivotally mounted on the frame (15) and projecting forwardly therefrom to be coupled with the rear of a propelling vehicle (10);

a set of adjustable ground wheels (16) supporting the frame, said wheels being adjustable relative to the frame between a lowered mowing position of the machine (11) and a raised position of the machine out of contact with a standing crop to be mown;

a cutter bar (13) mounted on the frame and extending substantially perpendicular to the mowing direction; and

a housing (18,19) mounted on the frame and arranged to guide a standing crop of grass to the cutter bar (13), and to direct the mown crop cut by the cutter bar (13) to form a swath (20);

and in which the transport trailer (30) comprises:

a trailer frame (31) having a longitudinal axis;

a set of transport wheels (33) mounted on the frame (31) to support the frame and a mowing machine (11) when loaded thereon;

a pair of adjustable loading ramps (34) spaced apart along the length of the trailer frame (31) and each corresponding to a respective one of the ground wheels (16) of the mowing machine (11), said ramps (34) being adjustable between lowered ground-engaging positions ready to allow loading of the mowing machine (11) and raised positions suitable for transport of the mowing machine (11); and

bearers (35) connected to the ramps (34) and arranged to move the ramps to the raised transport position after loading of the mowing machine (11), said bearers (35) being engageable by parts (17) of the mowing machine (11) as the latter is adjusted to its lowered position.

2. A transport trailer according to claim 1, in which each ramp (34) has a recess (38) in which the respective ground wheel (16) of the mower (11) can be received.

3. A transport trailer according to claim 2, in which the bearers (35) comprise bearing plates or platforms which are connected to the respective ramps (34).

4. A transport trailer according to any one of claims 1 to 3, in which the ramps (34) are pivotally mounted on the frame (31) for adjustment about pivot axes (39) extending parallel to the longitudinal axis of the frame (31).

5. A transport trailer according to claim 4, in which the ramps (34) are coupled together for joint movement.

6. A transport trailer according to claim 5, in which a longitudinally extending shaft (39) is mounted in the frame (31) and is secured at each end to a respective ramp (34).

7. A transport trailer according to any one of claims 1 to 6, in which the frame (31) includes a laterally offset load bearing platform (40) arranged to be engaged by the cutter bar (13) of the mower (11), upon lowering movement of the mower.

8. A transport trailer according to any one of claims 1 to 7, in which the drawbar (12) of the mower (11) is mounted on the frame (15) of the mower at a position approximately mid-way along the length of the cutter bar (13).

9. A transport trailer according to any one of claims 1 to 7, in which the drawbar (12) of the mower (11) is mounted on the frame (15) at one side of the frame corresponding to a respective one of the ends of the cutter bar (13).

10. A transport trailer according to any one of claims 1 to 9, in which a support (41) is provided at one end of the

trailer (30), and which is engageable with the ground during turning movement of the trailer frame (31).

11. A transport trailer according to claim 10, in which said support comprises a small wheel (41) having a pivot axis extending generally parallel to the longitudinal axis of the trailer frame (31).

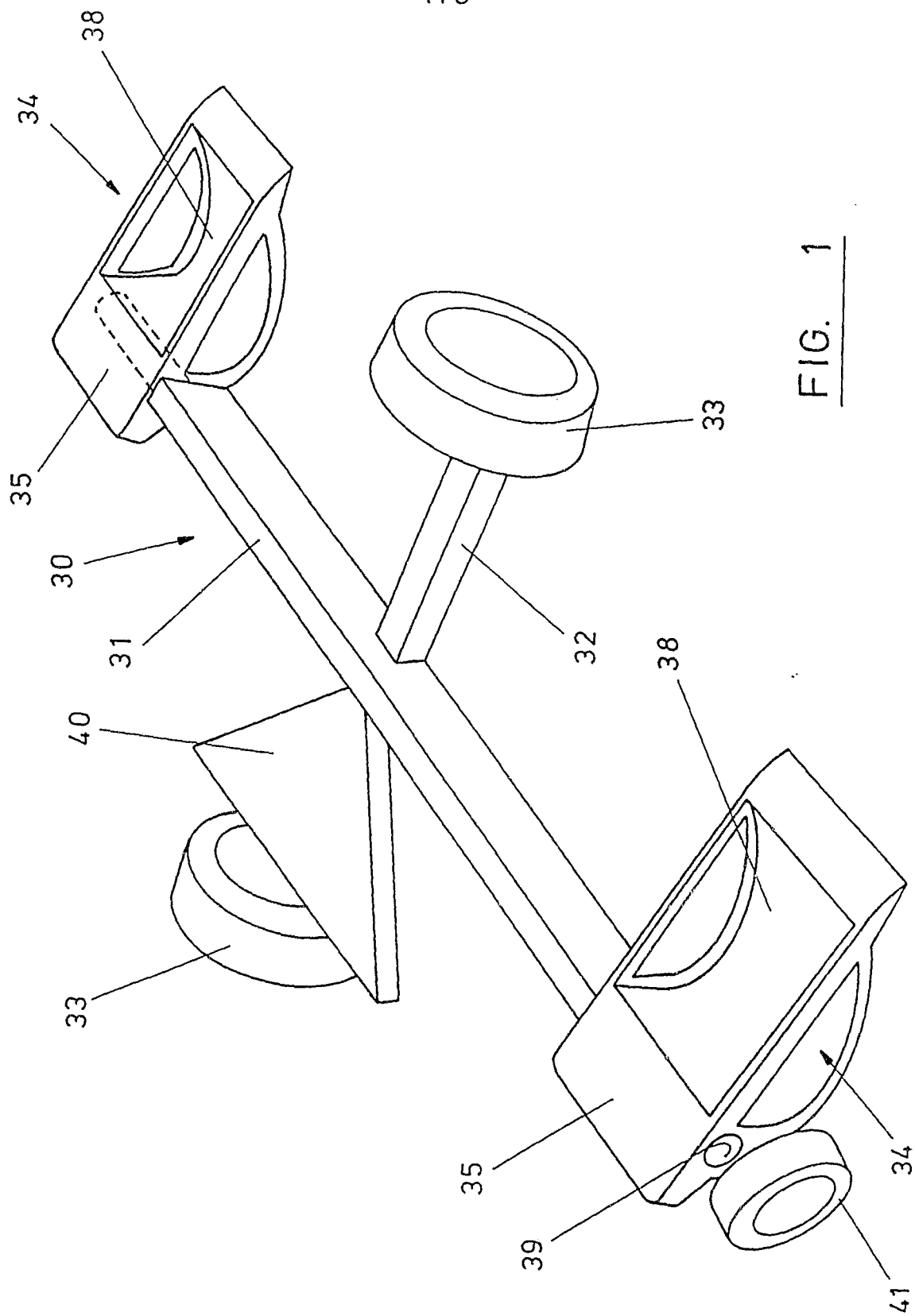


FIG. 1

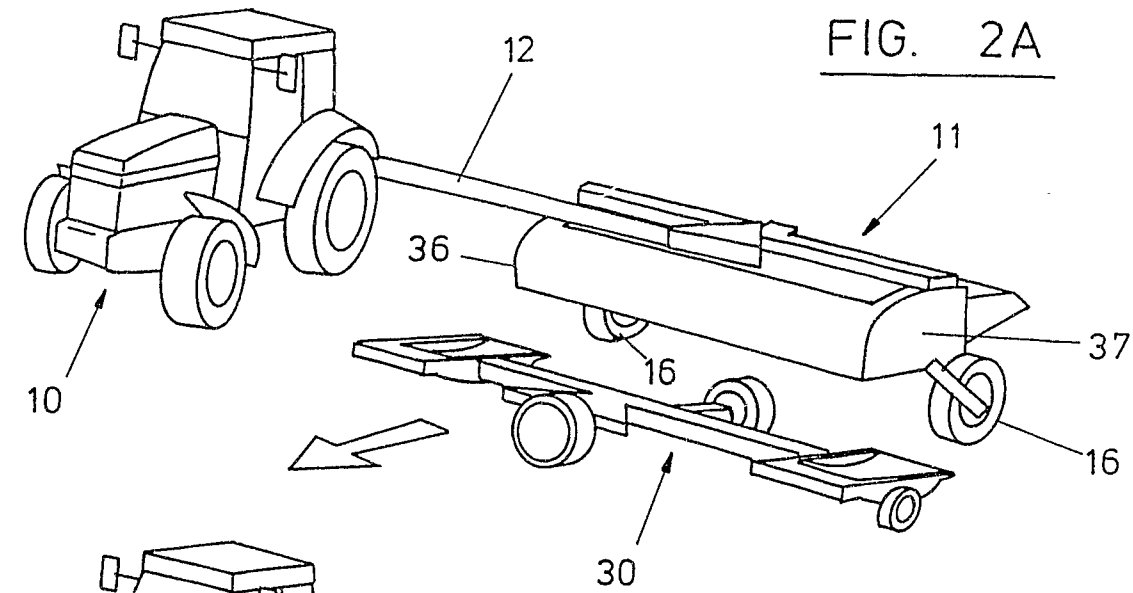


FIG. 2A

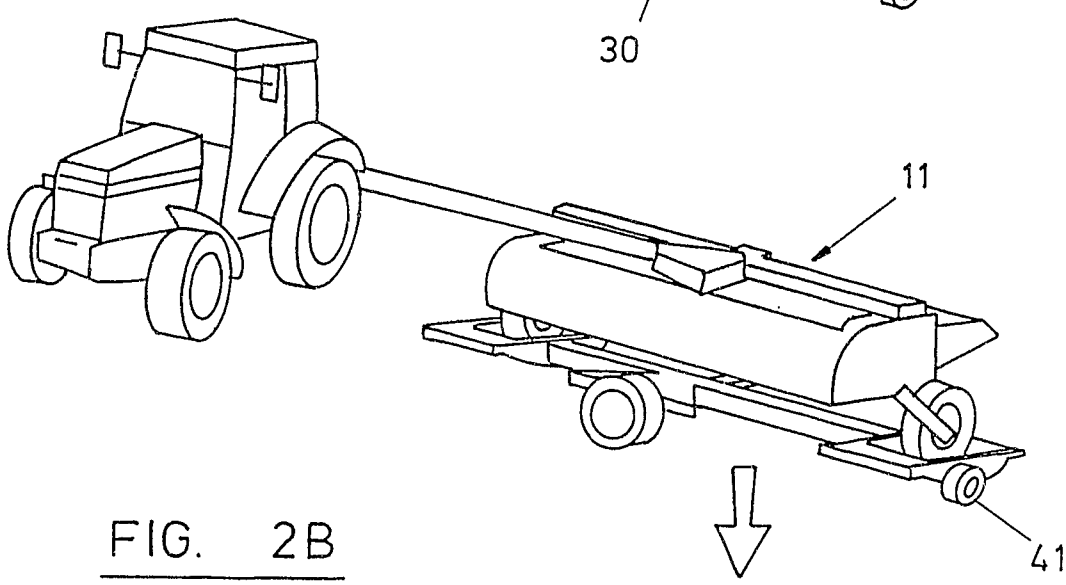


FIG. 2B

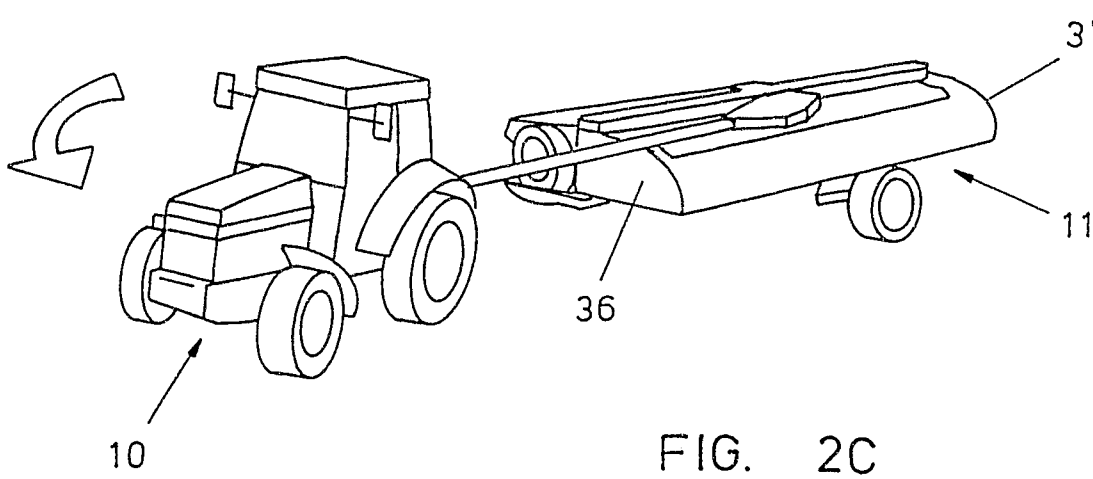


FIG. 2C

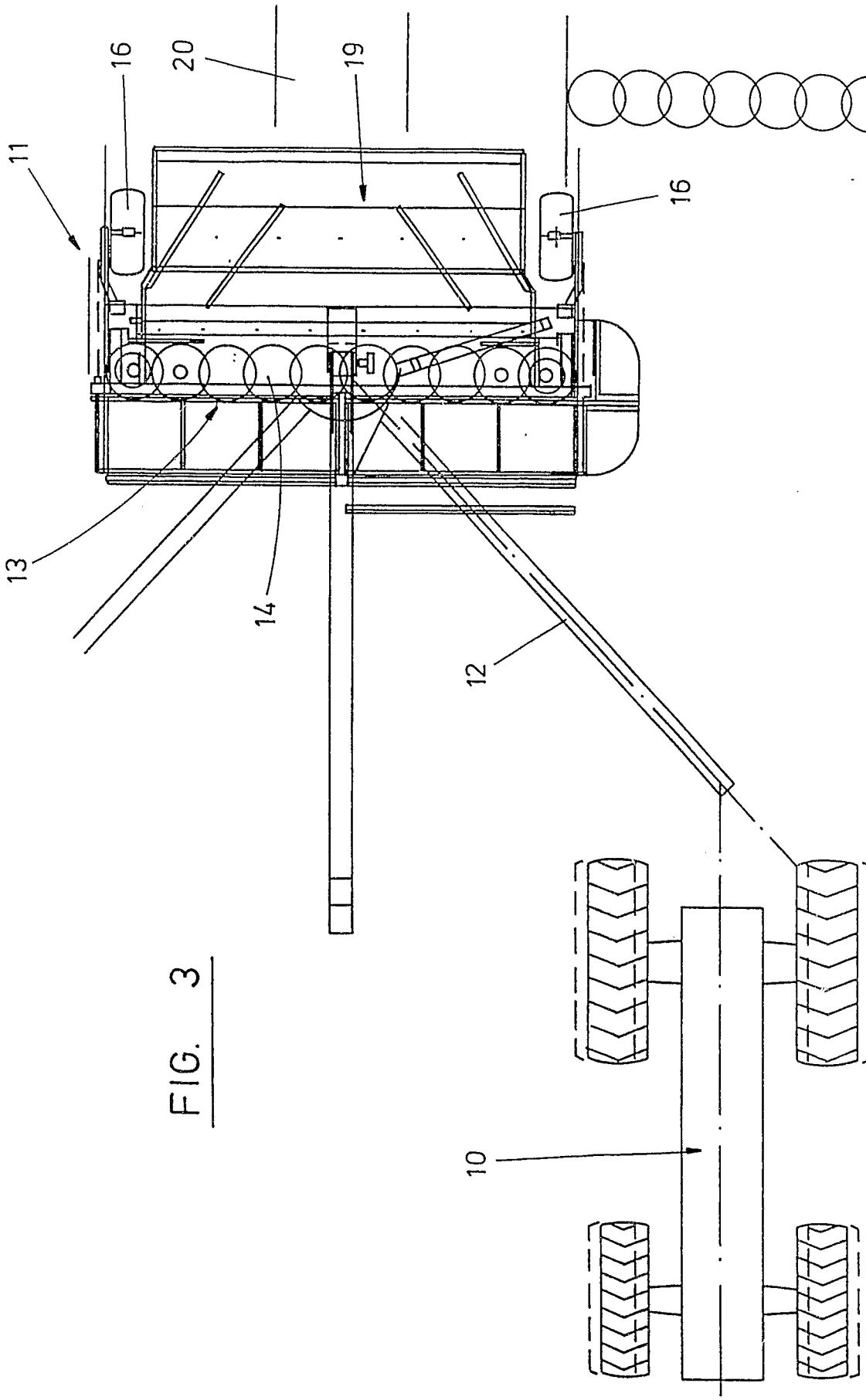


FIG. 3

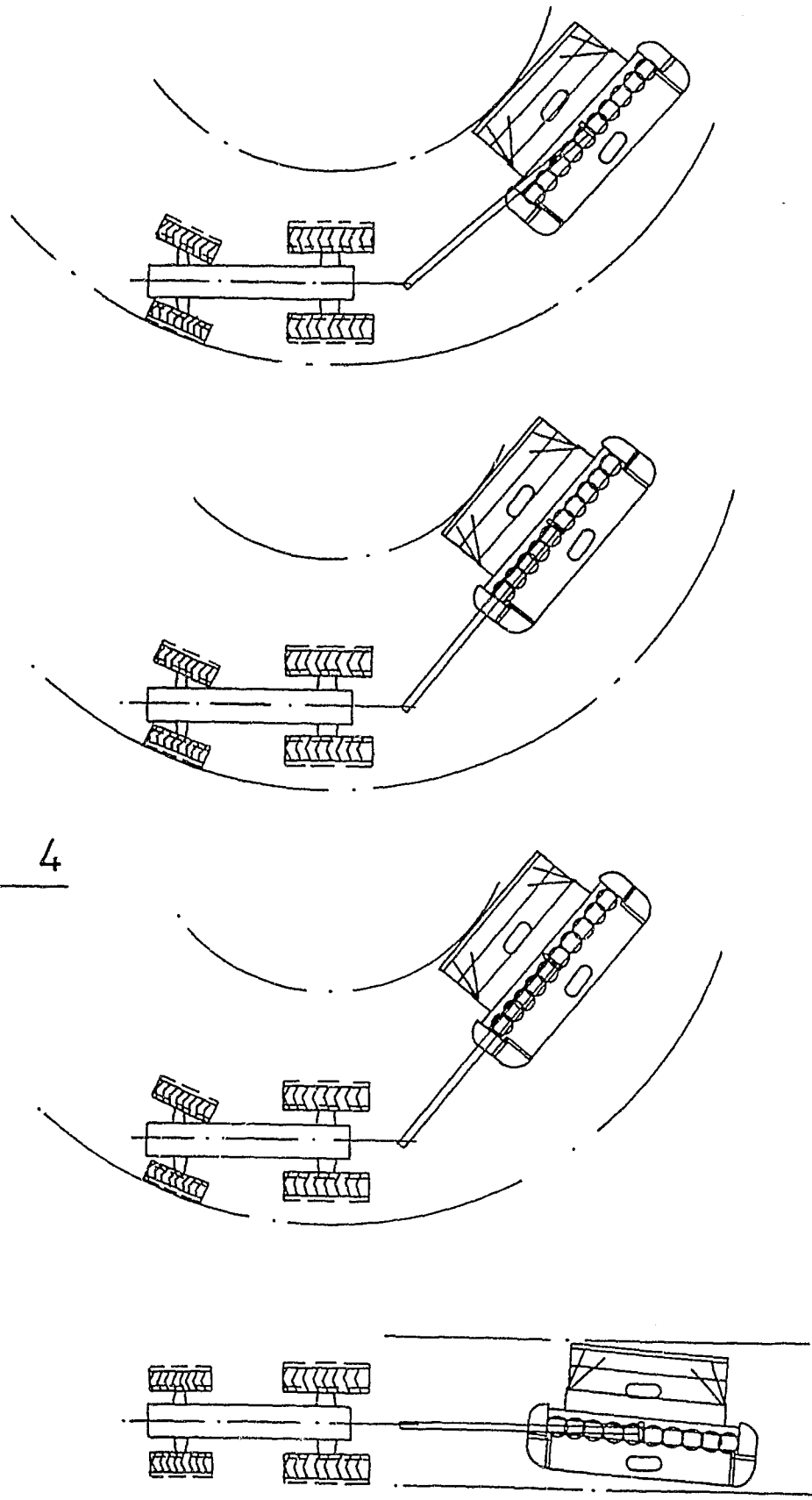


FIG. 4

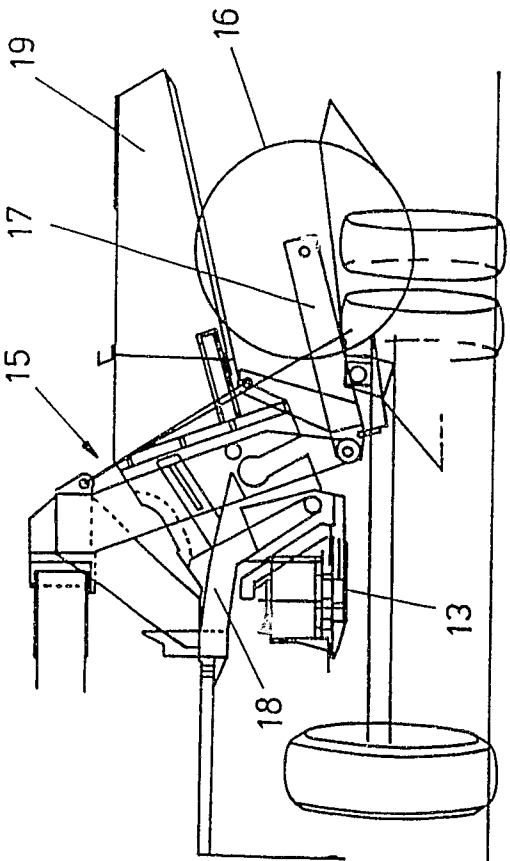
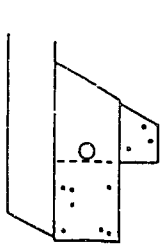


FIG. 6



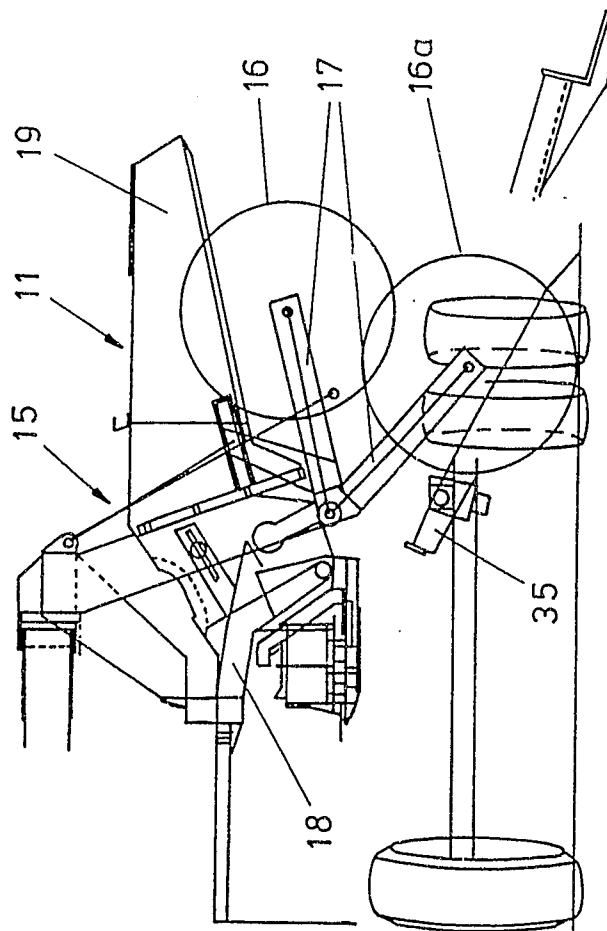
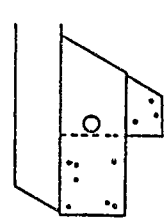


FIG. 5



INTERNATIONAL SEARCH REPORT

Inter .onal Application No
PCT/GB 98/01470

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01B73/00 A01D75/22

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01B A01D B60P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	EP 0 784 916 A (DEERE) 23 July 1997 see column 5, line 11 - column 6, line 18 see column 10, line 26 - column 13, line 25 see abstract; figures 1-6,9	1-4,7,8, 10
A	US 4 607 996 A (KOCH) 26 August 1986 see column 3, line 12 - column 4, line 47 see abstract; claims; figures	1-4,8,10
A	US 4 558 560 A (KOCH) 17 December 1985 see the whole document	1-3,8
A	EP 0 764 396 A (FREUDENDAHL) 26 March 1997 see column 4, line 46 - column 5, line 5; figures 1,6	9

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
12 October 1998	20/10/1998

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Interl. ...nal Application No
PCT/GB 98/01470

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	FR 690 298 A (KORUM ET AL) 7 October 1930 see the whole document -----	1,9

1

INTERNATIONAL SEARCH REPORT

...formation on patent family members

Intern nal Application No
PCT/GB 98/01470

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 784916 A	23-07-1997	CA 2195008 A	17-07-1997
US 4607996 A	26-08-1986	NONE	
US 4558560 A	17-12-1985	CA 1243236 A	18-10-1988
EP 764396 A	26-03-1997	DK 101495 A	14-03-1997
FR 690298 A	07-10-1930	NONE	