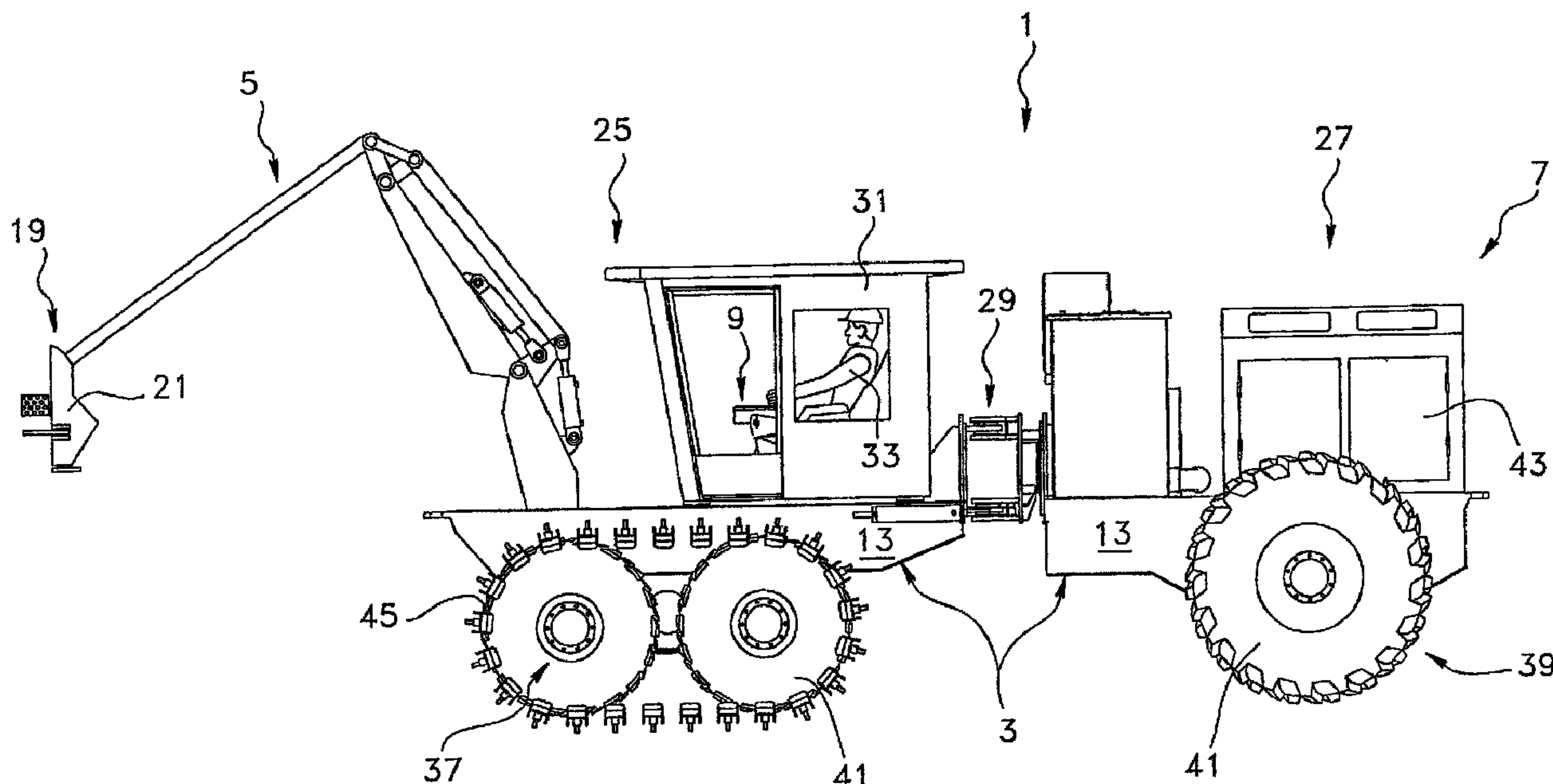




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 (54) Title: MOBILE SILVICULTURAL APPARATUS AND METHOD FOR OPERATING THE SAME



(57) **Abrégé/Abstract:**

A mobile silvicultural apparatus for use in a land of trees comprising mature trees and immature trees. The apparatus includes a steerable wheeled support frame, an articulated boom, a motor system, and a control system. The steerable wheeled support frame has a horizontally extending ground-clearing section, and first and second opposite vertical side sections. The ground-clearing and side sections define a tunnel-shaped passage through which the immature trees are allowed to pass as the support frame travels thereover. The articulated boom is mounted to the support frame for selectively manipulating the mature trees. The motor system is used for imparting motion to the support frame and the control system is used for controlling the steerable support frame, the motor system, and the articulated boom.

ABSTRACT

A mobile silvicultural apparatus for use in a land of trees comprising mature trees and immature trees. The apparatus includes a steerable wheeled support frame, an articulated boom, a motor system, and a control system. The steerable wheeled support frame has a horizontally extending ground-clearing section, and first and second opposite vertical side sections. The ground-clearing and side sections define a tunnel-shaped passage through which the immature trees are allowed to pass as the support frame travels thereover. The articulated boom is mounted to the support frame for selectively manipulating the mature trees. The motor system is used for imparting motion to the support frame and the control system is used for controlling the steerable support frame, the motor system, and the articulated boom.

MOBILE SILVICULTURAL APPARATUS AND METHOD FOR OPERATING THE SAME

Field of the invention

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The present invention relates to a silvicultural apparatus. More particularly, the present invention relates to a mobile silvicultural apparatus for use in a land of trees in order to carry out various harvesting applications and also relates to the method for operating the same.

10

Background of the invention

Known in the art is a silvicultural process which is referred to as "pre-commercial thinning" and which essentially consists in selectively thinning a land comprising mature trees and immature trees in order to keep only certain types of trees, mainly the immature trees, in order to carry out a commercially viable harvesting while allowing a proper regeneration of the land.

It is also known in the art that it is often difficult, dangerous, and expensive to perform pre-commercial thinning with motor-manual teams, especially when, for example, natural regeneration is dense and/or working grounds are not leveled. In such adverse circumstances, the risk of work accidents is high and manual operations are uneconomical. It would be therefore very useful to provide an apparatus and method for operating the same in order to carry out pre-commercial thinning in such adverse circumstances which would be safer, more efficient, and more cost-effective than what is possible with motor-manual teams.

25

Also known in the art are two main processes for harvesting trees, namely the tree length harvesting process and the cut-to-length harvesting process.

30

The tree length harvesting process essentially consists in cutting trees with a mechanical tree feller, piling them on the cutting grounds, after which they are skid onto the side of the trails where they are then branched out.

5 The cut-to-length harvesting process essentially consists in cutting the tree stems with a multi-functional tree feller, branching out said stems and then cutting them to length on the cutting grounds. Afterwards, a transporter carries out the picking of the cut logs along the side of the trails.

10 These two main harvesting processes are designed so that equipment must often pass over the same tracks of a trail. In fact, by doing so, one tries to minimize the damages caused to the regeneration and to the soil by concentrating the passages at the same locations. Hence, with these harvesting processes, the surface protected is a function of the distance between the
15 passages. Thus, it is often difficult to protect more than 75 % of the land considering that the articulated booms which carry the harvester heads have a physical length limit and considering also that after several repeated passages along the same strips of land, both the soil and the regeneration along these strips are often destroyed by the machinery traveling thereover. This
20 phenomenon is known as rutting. Furthermore, this resulting effect goes against one of the main principles in silviculture which consists in maintaining a good regeneration distribution coefficient. In fact, if one destroys 25 % of the surface land after a harvest, the corresponding regeneration distribution coefficient is thus necessarily less than 75 %, whereas it is often greater than 75 % before the
25 harvest even took place.

 Therefore, in view of the above, it would be very useful to provide an apparatus and method for operating the same which when used for the above-mentioned harvesting processes, would enable to obtain a better regeneration
30 distribution coefficient when compared to what is possible with some of the prior art.

Another harvesting process known in the art is often referred to "pre-commercial clearing" which essentially consists in selectively clearing a land having brush and young trees in order to keep only certain types of trees, and removing the rest of the undesired brush and trees.

5

Selective clearing is a silvicultural process, which is generally done manually by workers equipped with portative brush clearing machines. The work involves selecting the stems of trees that are to be kept according to predetermined quantity and quality standards, and then cutting the rest of the brush with the portative brush clearing machine as workers walk on the field. It has been found that such a manual clearing technique requires an enormous amount of time and a large number of workers, especially if the surface to be cleared is large, thereby rendering this type of harvesting process cumbersome, time-consuming, and cost ineffective. Therefore, there is a need for an apparatus and method for operating the same which would enable to carry out improved selective clearing.

US patent No. 4,355,670 granted on October 26, 1982, to OHRBERG et al. discloses a vehicle having a clearing head located at the front of the vehicle for fragmenting woody material. The hydraulically adjustable clearing head includes a horizontally disposed cylindrical drum.

US patent No. 4,236,554 granted on December 2, 1980, to NICHOLSON, discloses a tractor having a front feller and chipper. The feller includes an elongated bladed rotary felling cutter head having its length extending transversely of the tractor between lower front portions. The chipper includes a chipping cutter head spaced upwards and rearward from the feller.

Also known to the Applicant are the following US patents describing different harvesting devices: 3,754,603; 4,232,719; 4,390,134; 4,537,362; and 5,526,637.

None of the above-mentioned patents seem to disclose or even suggest a mobile silvicultural apparatus and method for operating the same which would overcome several of the above-mentioned problems associated with the prior art.

5 Summary of the invention

An object of the present invention is to provide a silvicultural apparatus and method associated thereto which would satisfy some of the above-mentioned needs, and would thus be an improvement over the harvesting devices and
10 methods known in the art.

In accordance with the present invention, the above object is achieved by a mobile silvicultural apparatus for use in a land containing trees, the apparatus comprising:

15 a steerable wheeled support frame comprising a horizontally extending ground-clearing section, and first and second opposite vertical side sections, the ground-clearing and side sections defining a tunnel-shaped passage through which trees of a certain type are allowed to pass as the support frame travels thereover;

20 manipulating means mounted to the support frame for selectively manipulating trees of the land;

motor means for imparting motion to the support frame; and

control means for controlling the steerable support frame, the motor means, and the manipulating means.

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Preferably, the manipulating means comprise an articulated boom mounted to the support frame for selectively manipulating mature trees.

30 Preferably, the tunnel-shaped passage has a smooth configuration in order to minimize damages to immature trees passing through the tunnel-shaped passage as the ground clearing section of the support frame travels over said immature trees.

Preferably also, the articulated boom comprises a harvester head selected from the group consisting of a multi-functional tree feller and a grapple for grappling a tree.

5 Preferably also, the steerable wheel support frame comprises front and rear units and a universal joint coupling the front unit to the rear unit.

Preferably also, front and rear wheeled assemblies are mounted respectively to the front and rear units of the support frame. These front and rear
10 wheeled assemblies preferably comprise hydrostatic motor-wheels.

According to the present invention, there is also provided a silvicultural method for harvesting mature trees in the land of trees comprising mature trees and immature trees, the method comprising the steps of:

- 15 a) providing the above-mentioned apparatus;
b) driving the apparatus of step a) along a first strip of the land;
c) stopping the apparatus at different locations along said strip of land;
and
d) felling and harvesting mature trees located around said different
20 locations.

Preferably, the silvicultural method comprises the additional steps of:

- e) providing a mobile silvicultural apparatus according to a transporting embodiment of the invention;
25 f) driving the apparatus of step e) along said strip of land; and
g) picking up at each of said different locations the harvested mature trees and transporting the same outside the land.

Preferably also, the silvicultural method comprises the step of:

- 30 h) sequentially repeating steps a) to g) along additional strips of land substantially parallel to said first strip of land until a desired portion of the land is harvested.

Preferably also, the silvicultural method comprises, prior to performing a first sequence of steps a) to g), a step of determining a distance between each said strips of land, said distance being determined such that a minimum amount
5 of said strips is required to harvest the desired portion of the land.

The invention and its advantages will be better understood upon reading the following non-restrictive description of preferred embodiments thereof, made with reference to the accompanying drawings.

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Brief description of the drawings

Figure 1 is a side elevational view of the mobile silvicultural apparatus according to a preferred embodiment of the invention.

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Figure 2 is a side elevational view of the mobile silvicultural apparatus according to another preferred embodiment of the invention.

Figure 3 is a front elevational view of the mobile silvicultural apparatus
20 shown in Figure 1.

Figure 4 is a rear elevational view of the mobile silvicultural apparatus shown in Figure 1.

25 Figure 5 is a schematic of the silvicultural method according to a preferred embodiment of the invention.

Detailed description of preferred embodiments of the invention

30 In the following description, the same numerical references refer to similar elements. The embodiments shown in the figures are preferred.

Moreover, although the present invention was primarily designed for tree harvesting purposes, it could be used in different fields for other purposes, such as for agricultural applications, as apparent to a person skilled in the art. For this reason, expressions such as "harvesting" and/or "trees" and any other references
5 and/or other expressions equivalent thereto should not be taken as to limit the scope of the present invention and include all other objects and all other purposes with which the present invention could be used and may be useful.

In addition, although the preferred embodiments of the mobile silvicultural
10 apparatus as shown comprise various components such as an articulated boom, hydrostatic motor-wheels, a diesel engine, hydraulic pumps, a cabin, receiving means, etc., not all of these components are essential to the invention and thus should not be taken in their restrictive sense, i.e. should not be taken as to limit the scope of the present invention. It is to be understood, as also apparent to a
15 person skilled in the art, that other suitable components and cooperations thereinbetween may be used for the mobile silvicultural apparatus according to the present invention, as will be explained hereinafter, without departing from the scope of the invention.

Moreover, expressions such as "trees" and "stems", as well as any
20 equivalent expressions and/or compound words thereof, may be used interchangeably in the context of the present description. The same applies for any other mutually equivalent expressions, such as "land" and "ground" for example, as well as "harvested" and "manipulated", as also apparent to a person
25 skilled in the art.

Furthermore, it is to be understood that the expression "to pass" from expressions such as "through which the immature trees are allowed to pass as the support frame travels thereover", as used in the context of the present
30 description, obviously does not imply that the trees used with the present invention are mobile, *per se*. As it is very well known, normal trees which are rooted to the ground are not mobile *per se*, but may seem to be mobile from a

relative point of view if a mobile structure such as the support frame of the silvicultural apparatus, and more specifically its ground clearing section, passes over fixed and stationary objects, such as the above-mentioned trees for example. Indeed, it is very well known in the art that there may be a relative
5 motion between the two which can be considered as the trees "passing by" the support frame, knowing very well that these same trees are not mobile and securely rooted to the ground. Hence, in the context of the present description, the expression "to pass" and any other references and/or other expressions equivalent thereto should not be taken in its restrictive sense, i.e. from an inertial
10 point of view, but rather in a broader sense, i.e. from a relative point of view, as apparent to a person skilled in the art and also as a result of common sense.

Furthermore, it is to be understood that the expression "mature trees" as used in the context of the present description refers to harvestable trees of
15 commercial value whereas "immature trees" refer to trees which are young and too small yet to have an immediate commercial value but which nevertheless represent future tree population.

Broadly described, the mobile silvicultural apparatus 1 according to the
20 preferred embodiments of the invention as illustrated in the accompanying drawings, particularly Figures 1 and 2, is a mobile silvicultural apparatus 1 for use in a land of trees comprising mature trees and immature trees (both not shown). The apparatus 1 comprises a steerable wheeled support frame 3, an articulated boom 5, motor means 7, and control means 9. The steerable wheeled support
25 frame comprises a horizontally extending ground-clearing section 11, and first and second opposite vertical side sections 13. As better shown in Figures 3 and 4, the ground-clearing 11 and side sections 13 define a tunnel-shaped passage 15 through which the immature trees are allowed to pass as the support frame 3 travels thereover. The articulated boom 5 is mounted to the support frame 3 for
30 selectively manipulating the mature trees. The motor means 7 are used for imparting motion to the support frame 3 and the control means 9 are used for

controlling the steerable support frame 3, the motor means 7, and the articulated boom 5.

As also better shown in Figures 3 and 4, the tunnel-shaped passage 15 preferably has a smooth configuration in order to minimize damages to the immature trees passing through the tunnel-shaped passage 15 as the ground-clearing section 11 of the support frame 3 travels over the immature trees. It should be understood that, according to the present invention, the tunnel-shaped passage 15 may take on different cross-sectional geometries depending on the particular applications of the mobile silvicultural apparatus 1, as apparent to a person skilled in the art.

Preferably also, the ground-clearing section 11 of the support frame 3 is positioned between about 0.5 to about 1.5 meters from ground 17. It is worth mentioning here that the ground-clearing section 11 of the support frame 3 may be positioned at different heights from ground 17 depending on the particular applications of the mobile silvicultural apparatus 1, as also apparent to a person skilled in the art.

Referring now back to Figures 1 and 2, the articulated boom 5 comprises a harvester head 19 which is selected from the group consisting of a multi-functional tree feller 21 and a grapple 23 for grappling a tree, depending on the particular function of the mobile silvicultural apparatus 1. It is to be understood also that the expression "articulated boom 5" as used in the context of the present description does not necessarily restrict itself to a boom 5 *per se*, but also includes any other type of device which could be used with the mobile silvicultural apparatus 1 according to the present invention, in order to carry out different harvesting processes, as also apparent to a person skilled in the art.

As better shown in Figures 1 and 2, the steerable wheeled support frame 3 preferably comprises front and rear units 25, 27 and a universal joint 29 for coupling the front unit 25 to the rear unit 27. It is worth mentioning that other

suitable joining means may be used for hingedly coupling the front unit to the rear unit, as also apparent to a person skilled in the art. These joining means may have one or several degrees of freedom depending on the particular applications of the mobile silvicultural apparatus and the type and geometry of terrain that it must travel over.

As also shown in Figures 1 and 2, the front unit 25 of the support frame 3 preferably comprises a cabin 31 for housing an operator 33 of the mobile silvicultural apparatus 1.

10

According to the preferred embodiment of the invention as shown in Figure 1, the articulated boom 5 is preferably mounted onto the front unit 25 of the support frame 3 and comprises a harvester head 19 provided with a multi-functional tree feller 21. According to this particular embodiment, the mobile silvicultural apparatus 1 acts mainly as a tree harvesting apparatus 1.

15

Referring now to the mobile silvicultural apparatus shown in Figure 2, the rear unit 27 of the support frame 3 preferably comprises receiving means 35 for receiving selectively manipulated mature trees. According to this particular embodiment, the articulated boom 5 is preferably mounted onto the rear unit 27 of the support frame 3 and is provided with a grapple 23 for grappling a tree and unloading the same into the receiving means 35. According to this particular embodiment of the invention, the mobile silvicultural apparatus 1 acts mainly as a picking apparatus 1 for harvested trees.

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As better shown in Figures 1-4, the mobile silvicultural apparatus 1 according to the present invention preferably comprises front and rear wheeled assemblies 37, 39 mounted respectively to the front and rear units 25, 27 of the support frame 3. The front wheeled assembly 37 preferably comprises left and right front wheels 41 mounted respectively to the vertical side sections 13 of the front unit 25 whereas the rear wheeled assembly 39 preferably comprises left and right rear wheels 41 mounted respectively to the vertical side sections 13 of the

30

rear unit 27. The wheels 41, whether front and/or rear, are preferably hydrostatic motor-wheels 41 and the motor means preferably comprise a diesel engine 43 operating hydraulic pumps operatively connected to these hydrostatic motor-wheels 41 for driving the same. It is worth mentioning that each wheeled
5 assembly 37, 39 may comprise one or several wheels 41, and each wheeled assembly 37, 39 may be pivotable with respect to the support frame 3, so as to enable the mobile silvicultural apparatus 1 to travel over different adverse terrains, such as rocks and/or the like for example, as apparent to a person skilled in the art. Furthermore, either the front and/or the rear wheeled assemblies
10 37, 39 may be the driving wheeled assemblies of the mobile silvicultural apparatus 1 and may be provided with suitable accessories to ensure proper traction of the apparatus 1 along the land of trees to be harvest, as also apparent to a person skilled in the art. Hence, the front and rear wheeled assemblies 37, 39 and the motor means 7 used therewith are not necessarily limited to the ones
15 described herein and may vary greatly depending on the particular applications of the mobile silvicultural apparatus 1, without departing from the scope of the present invention.

The diesel engine 43 may be mounted either on the rear unit 27 of the
20 support frame 3, as better shown in Figure 1, or on the front unit 25 thereof, as better shown in Figure 2, depending on the particular applications of the mobile silvicultural apparatus 1, as apparent to a person skilled in the art.

Irrespectively of these preferred embodiments, the hydrostatic motor-wheels 41 are preferably provided with chain treads 45 for, among other
25 advantages, increasing the traction of the mobile silvicultural apparatus 1 along adverse terrain of the land comprising the trees to be harvested.

According to another aspect of the present invention and as shown
30 schematically in Figure 5, there is also provided a silvicultural method for harvesting mature trees in a land of trees comprising mature trees and immature trees. The method comprises the steps of a) providing the above-mentioned and

discussed mobile silvicultural apparatus 1; b) driving the apparatus 1 of step a) along a first strip of the land; c) stopping the apparatus 1 at different locations along the strip of land; and d) felling and harvesting mature trees located around each of said different locations.

5

Preferably, the silvicultural method comprises the additional steps of e) providing an apparatus 1 according to the present invention such as the one illustrated in Figure 2; f) driving the apparatus 1 of step e) along the strip of land; and g) picking up at each of said different locations the harvest mature trees and transporting the same outside the land.

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Preferably also, the silvicultural method comprises the step of h) sequentially repeating steps a) to g) along additional strips of land substantially parallel to the first strip of land until a desired portion of the land is harvested.

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Preferably also, the above-mentioned silvicultural method comprises, prior to performing a first sequence of step a) to g), a step of determining a distance between each said strips of land, the distance between determined such that a minimum amount of said strips is required to harvest the desired portion of the land.

20

As may now be appreciated, the mobile silvicultural apparatus 1 according to the present invention is an improvement over the prior art in that it enables, due to its design and different components possible as explained hereinabove, to carry out pre-commercial thinning in adverse circumstances in a safer, more efficient, and more cost-effective manner than what is possible with motor-manual teams. Furthermore, the present invention is also advantageous in that, due to particularly but not limitedly the tunnel-shaped passage 15 and the articulated boom 5 of the mobile silvicultural apparatus 1, it enables to carry out tree length and cut-to-length harvesting processes while providing a better regeneration distribution coefficient than what is possible with some of the devices of the prior art. Moreover, the present invention, as explained herein, is also advantageous in

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that it provides an easy, fast, and cost-effective manner of carrying out different harvesting processes, such as selective clearing for example.

Of course, numerous modifications can be made to the above-described
5 embodiments without departing from the scope of the invention as described in
the appended claims.

WHAT IS CLAIMED IS:

1. A mobile silvicultural apparatus for use in a land containing trees, the apparatus comprising:

5 a steerable wheeled support frame comprising a horizontally extending ground-clearing section, and first and second opposite vertical side sections, the ground-clearing and side sections defining a tunnel-shaped passage through which trees of a certain type are allowed to pass as the support frame travels thereover;

10 manipulating means mounted to the support frame for selectively manipulating trees of the land;

motor means for imparting motion to the support frame; and

control means for controlling the steerable support frame, the motor means, and the manipulating means.

15

2. A mobile silvicultural apparatus according to claim 1, wherein the manipulating means comprise an articulated boom mounted to the support frame for selectively manipulating mature trees.

20

3. A mobile silvicultural apparatus according to claim 1 or 2, wherein the tunnel-shaped passage has a smooth configuration in order to minimize damages to immature trees passing through the tunnel-shaped passage as the ground-clearing section of the support frame travels over said immature trees.

25

4. A mobile silvicultural apparatus according to any one of claims 1 to 3, wherein the ground-clearing section of the support frame is positioned between about 0.5 to about 1.5 meters from ground.

30

5. A mobile silvicultural apparatus according to any one of claims 2 to 4, wherein the articulated boom comprises a harvester head selected from the group consisting of a multi-functional tree feller and a grapple for grappling a tree.

6. A mobile silvicultural apparatus according to any one of claims 1 to 5, wherein the steerable wheeled support frame comprises front and rear units and a universal joint coupling the front unit to the rear unit.

5 7. A mobile silvicultural apparatus according to claim 6, wherein the front unit of the support frame comprises a cabin for housing an operator of the mobile silvicultural apparatus.

10 8. A mobile silvicultural apparatus according to claim 6 or 7, wherein the articulated boom is mounted onto the front unit of the support frame and comprises a harvester head provided with a multi-functional tree feller.

15 9. A mobile silvicultural apparatus according to claim 6 or 7, wherein the rear unit of the support frame comprises receiving means for receiving selectively manipulated mature trees.

20 10. A mobile silvicultural apparatus according to claim 9, wherein the articulated boom is mounted onto the rear unit of the support frame and is provided with a grapple for grappling a tree and unloading the same into the receiving means.

25 11. A mobile silvicultural apparatus according to any one of claims 6 to 10, comprising front and rear wheeled assemblies mounted respectively to the front and rear units of the support frame.

25

30 12. A mobile silvicultural apparatus according to claim 11, wherein the front wheeled assembly comprises left and right front wheels respectively mounted to the vertical side sections of the front unit; and wherein the rear wheeled assembly comprises left and right rear wheels mounted respectively to the vertical side sections of the rear unit.

13. A mobile silvicultural apparatus according to claim 12, wherein the front wheels are hydrostatic motor-wheels.

14. A mobile silvicultural apparatus according to claim 12 or 13, wherein the
5 rear wheels are hydrostatic motor-wheels.

15. A mobile silvicultural apparatus according to claim 13 or 14, wherein the motor means comprise a diesel engine operating hydraulic pumps operatively connected to the hydrostatic motor-wheels for driving the same.

10

16. A mobile silvicultural apparatus according to claim 15, wherein the diesel engine is mounted on the rear unit of the support frame.

17. A mobile silvicultural apparatus according to claim 15, wherein the diesel
15 engine is mounted on the front unit of the support frame.

18. A mobile silvicultural apparatus according to any one of claims 13 to 17, wherein the hydrostatic motor-wheels are provided with chain threads.

20 19. A mobile silvicultural apparatus for use in a land of trees comprising mature trees and immature trees, the apparatus comprising:

a steerable wheeled support frame comprising alignable front and rear units and a universal joint coupling the front unit to the rear unit, each of the front and rear units having a horizontally extending ground-clearing section positioned
25 between about 0.5 to about 1.5 meters from ground, and first and second opposite vertical side sections, the ground-clearing sections and side sections defining a tunnel-shaped passage through which the immature trees are allowed to pass as the support frame travels thereover; the tunnel-shaped passage having a smooth configuration in order to minimize damages to the immature
30 trees passing through the tunnel-shaped passage as the ground-clearing sections of the support frame travel over said immature trees;

an articulated boom mounted to the support frame for selectively manipulating the mature trees, and comprising a harvester head selected from the group consisting of a multi-functional tree feller and a grapple for grappling a tree;

5 a cabin mounted on the front unit for housing an operator of the mobile silvicultural apparatus;

front and rear wheeled assemblies mounted respectively to the front and rear units of the support frame, the front wheeled assembly comprising left and right hydrostatic front motor-wheels respectively mounted to the vertical sections
10 of the front unit; and the rear wheeled assembly comprising left and right rear wheels mounted respectively to the vertical sections of the rear section;

motor means for imparting motion to the support frame, the motor means comprising a diesel engine operating hydraulic pumps operatively connected to the hydrostatic front motor-wheels for driving the same; and

15 control means for controlling the steerable support frame, the motor means, and the articulated boom.

20. A mobile silvicultural apparatus according to claim 19, wherein the articulated boom is a multi-functional tree feller and the diesel engine is mounted
20 on the rear unit.

21. A mobile silvicultural apparatus according to claim 19, wherein:
the articulated boom is a grapple for grappling a tree;
the rear unit comprises receiving means for receiving a tree grappled by
25 the articulated boom; and
the diesel engine is mounted on the front unit.

22. A silvicultural method for harvesting mature trees in a land of trees comprising mature trees and immature trees, the method comprising the steps of:
30 a) providing an apparatus as defined in claim 20;
b) driving the apparatus of step a) along a first strip of the land;
c) stopping the apparatus at different locations along said strip of land; and

d) felling and harvesting mature trees located around each of said different positions.

23. A silvicultural method according to claim 22, comprising the additional
5 steps of:

e) providing an apparatus as defined in claim 21;

f) driving the apparatus of step e) along said strip of land; and

g) picking up at each of said different locations the harvested mature trees
10 and transporting the same outside the land.

24. A silvicultural method according to claim 23, comprising the step of:

h) sequentially repeating steps a) to g) along additional strips of land
substantially parallel to said first strip of land until a desired portion of the land is
15 harvested.

25. A silvicultural method according to claim 24, comprising, prior to
performing a first sequence of step a) to g), a step of determining a distance
between each said strips of land, said distance being determined such that a
20 minimum amount of said strips is required to harvest the desired portion of the
land.

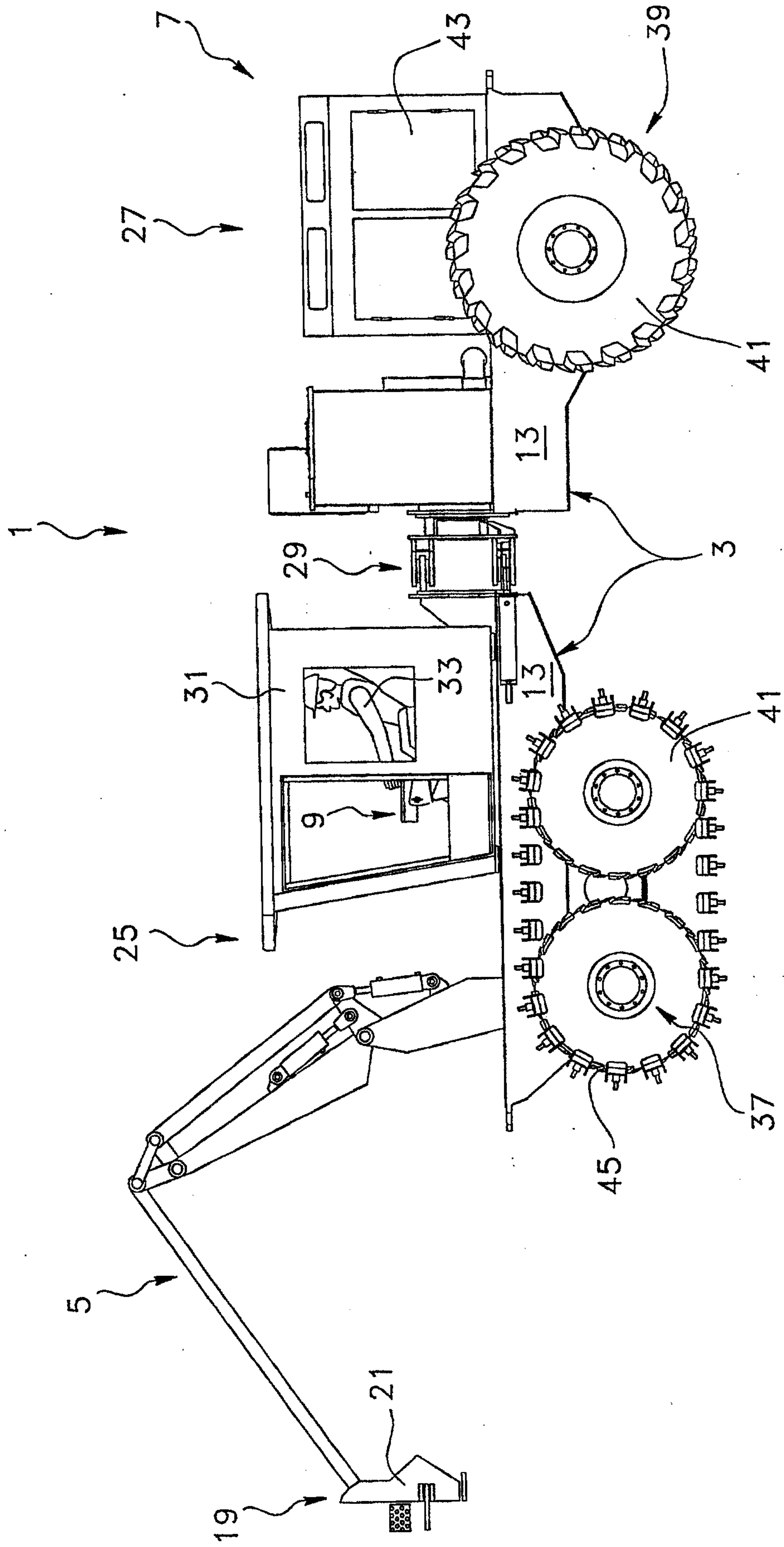


FIG. 1

FIG. 2

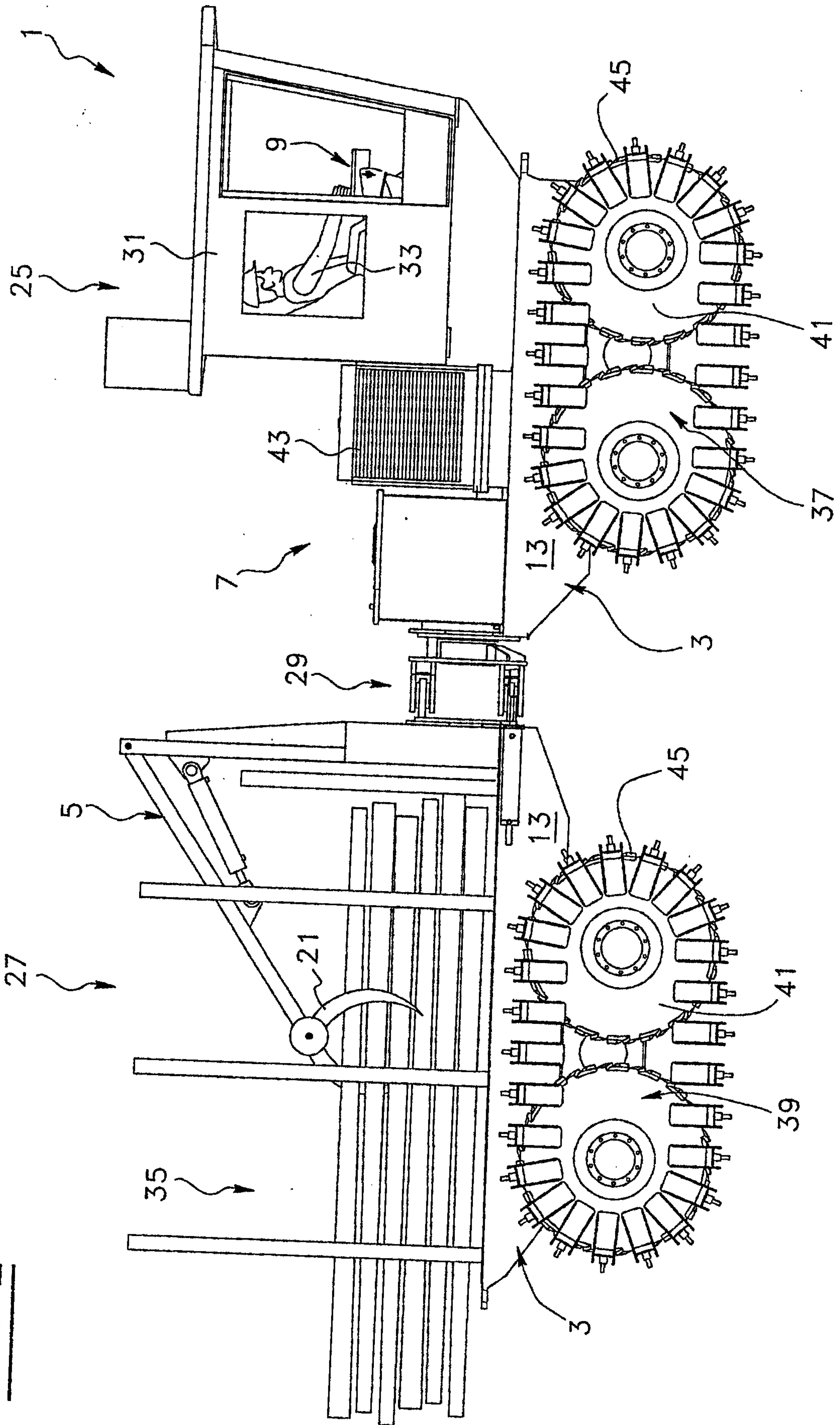
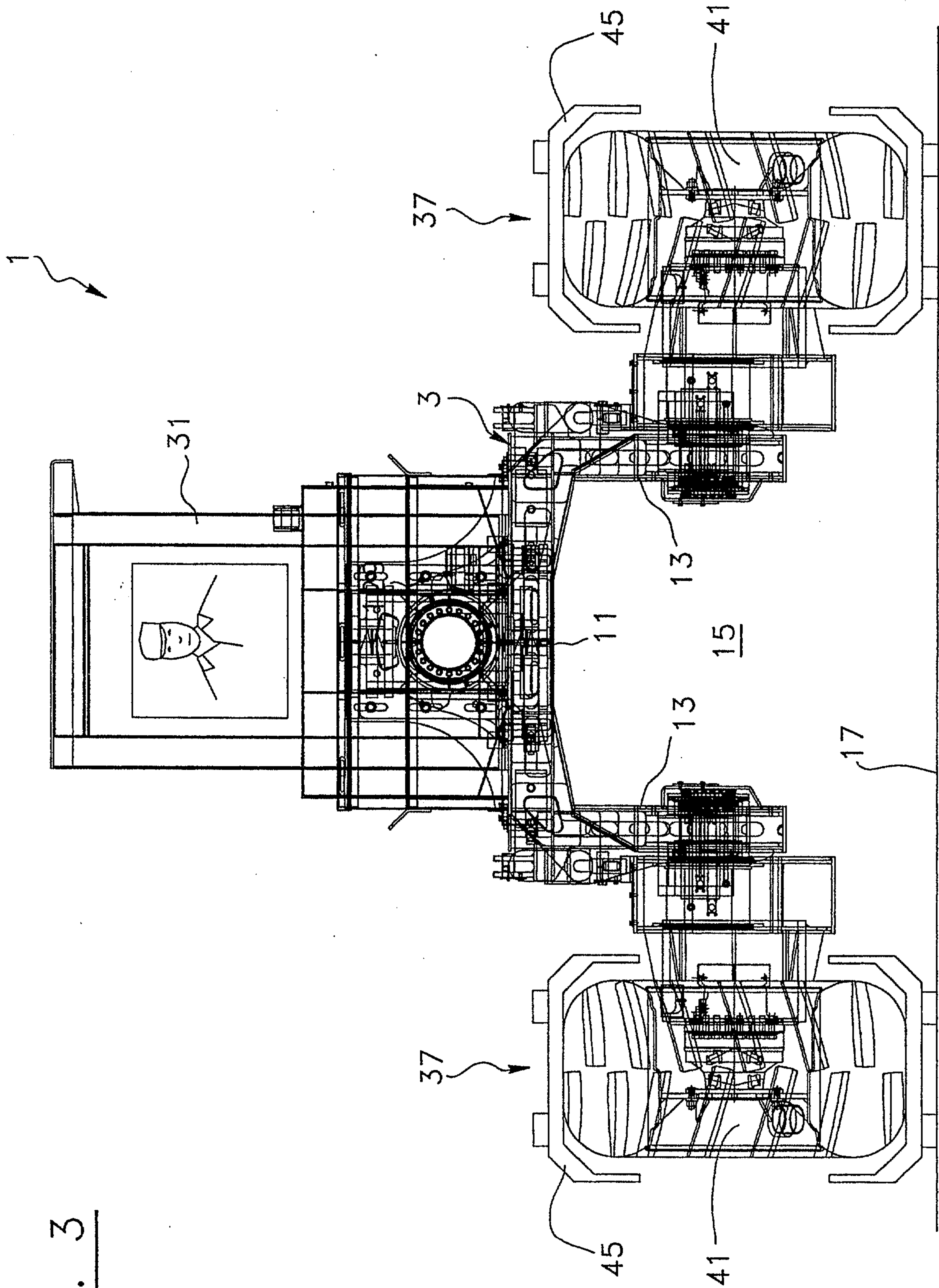


FIG. 3



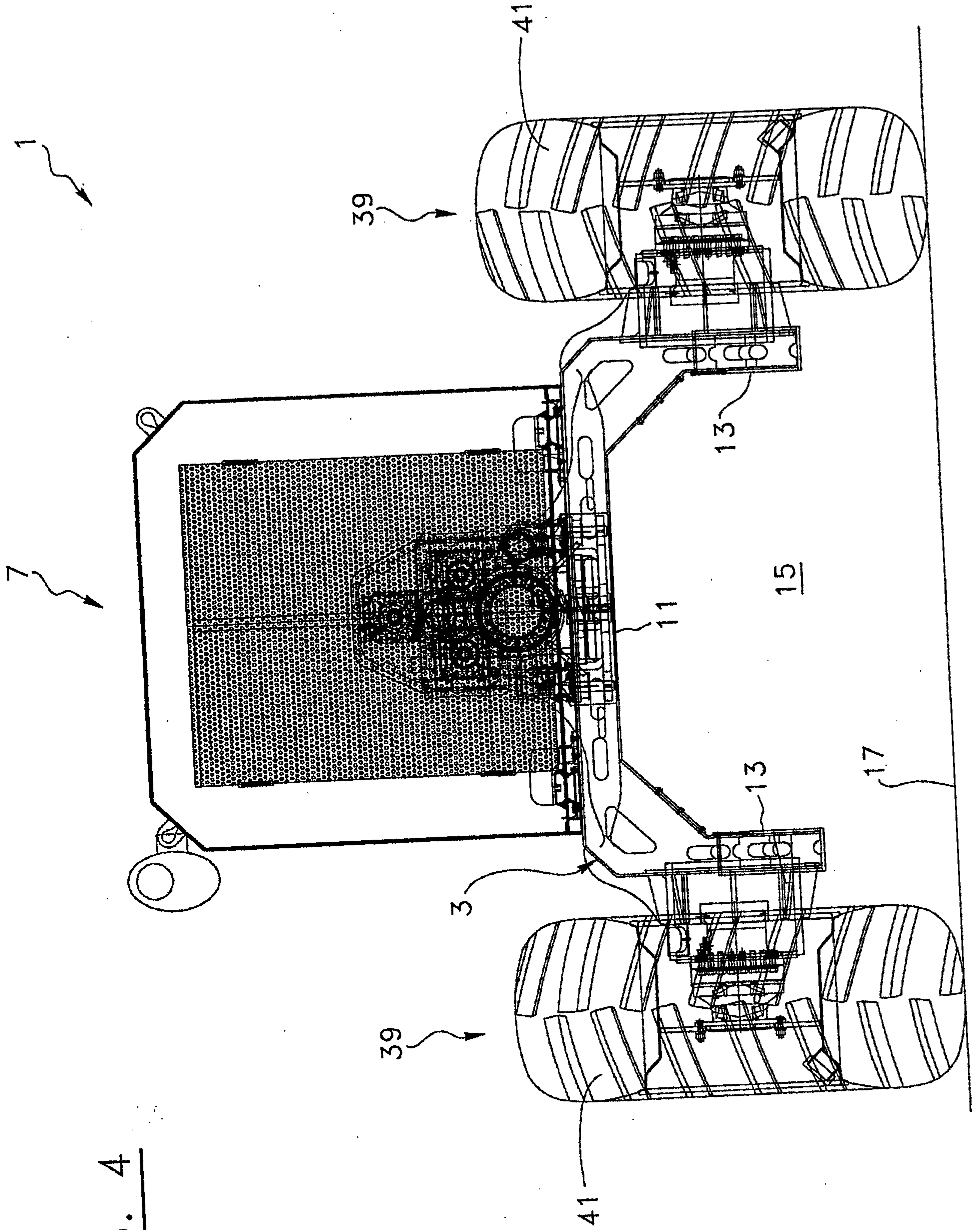


FIG. 4

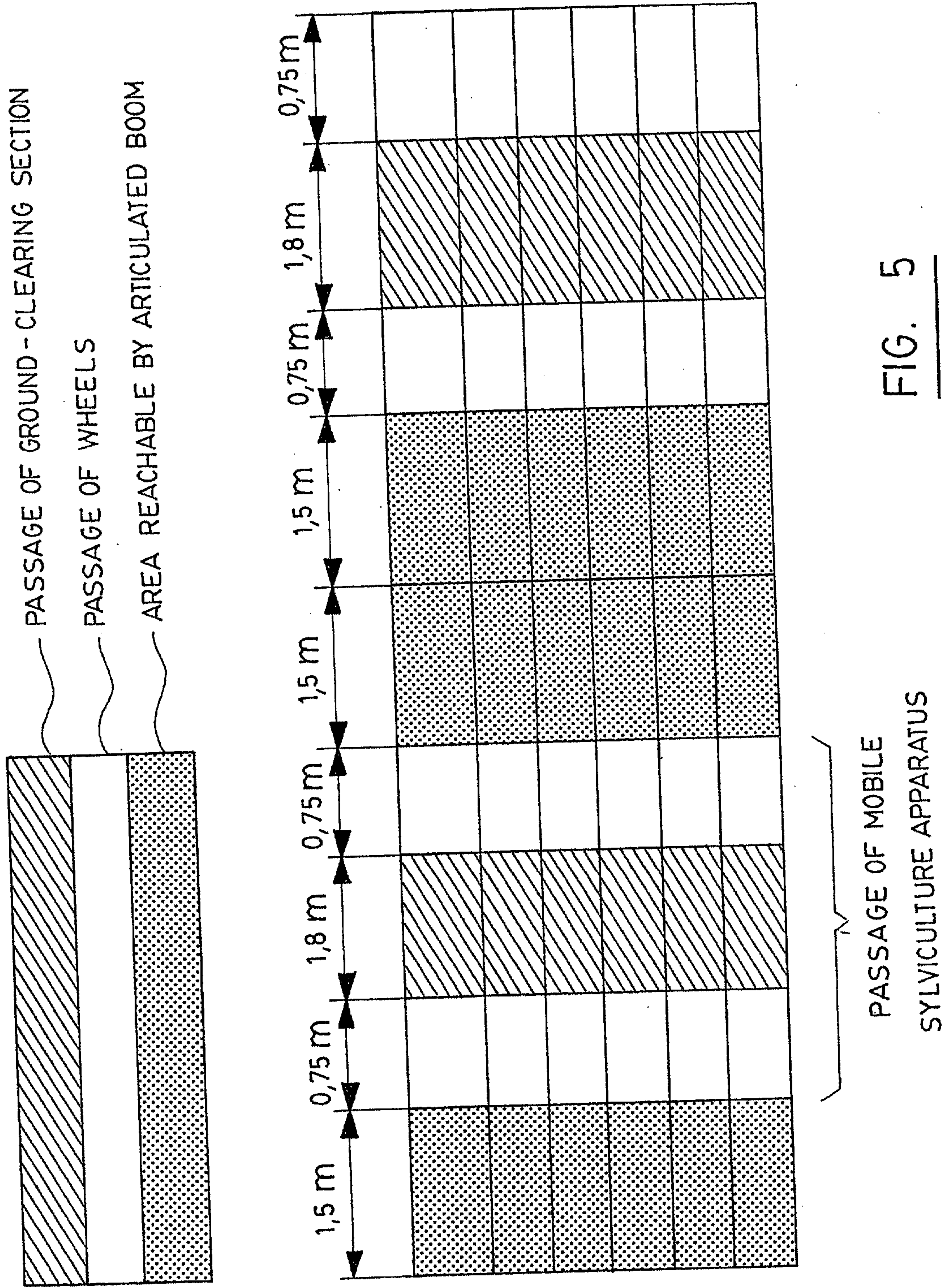


FIG. 5

