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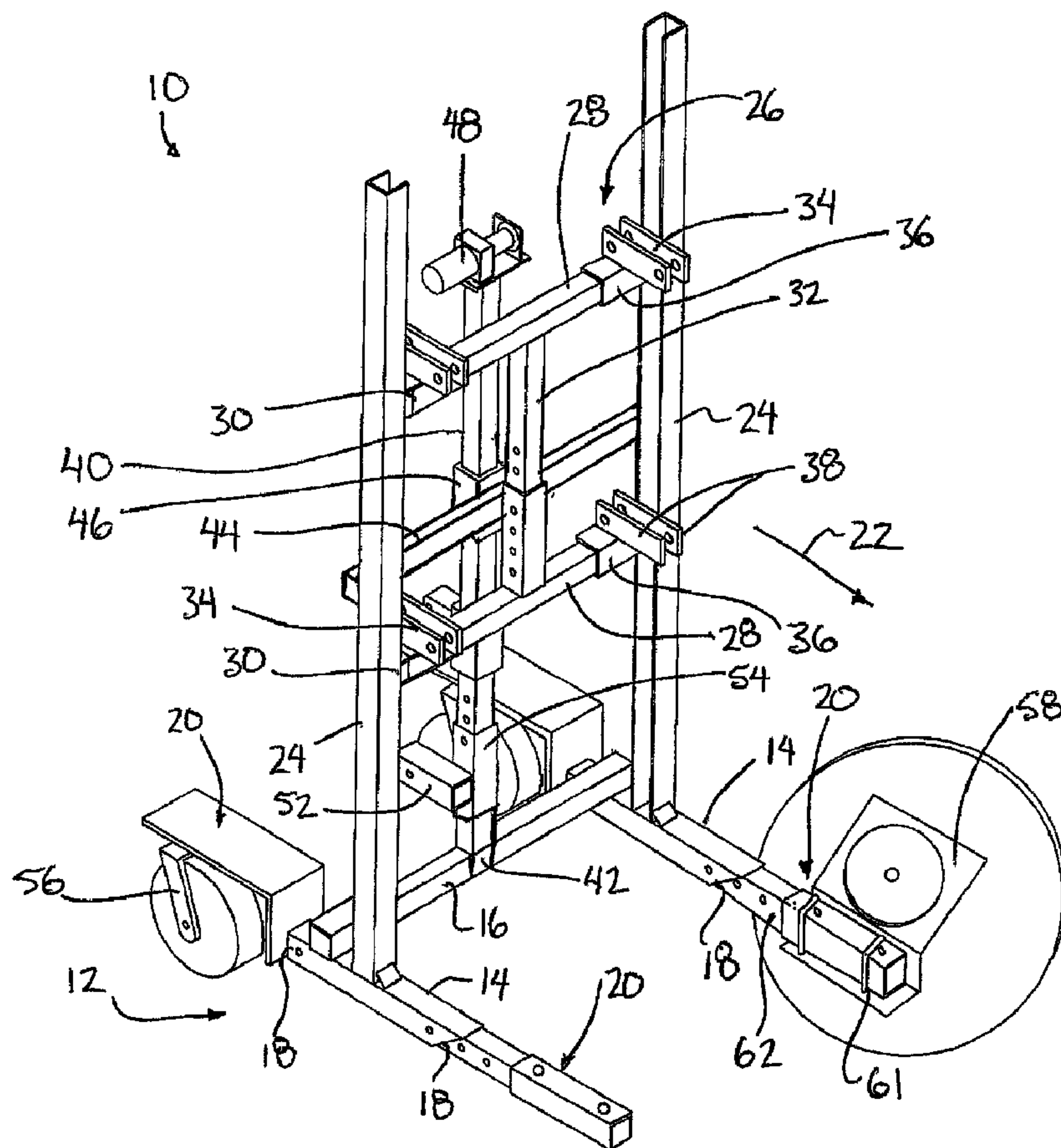
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(54) Title: MULTIPLE CONFIGURATION IMPLEMENT CARRIER KIT



(57) Abrégé/Abstract:

This invention relates to an assembly kit composed of quickly easily interchangeable modular components that can be reconfigured in a number of different ways into a number of different versions of a self supporting frame on wheels to form a

(57) **Abrégé(suite)/Abstract(continued):**

multimode and multifunction implement carrier. The purpose is: i) to take advantage of a number of different propulsion means, and ii) to accommodate more suitably a wider range of dependent attached small equipment implements than are presently possible on current known related versions of machines referred to as implement carriers, for example utility tractors, front end loader machines and hydraulic boom excavators.

ABSTRACT

This invention relates to an assembly kit composed of quickly easily interchangeable modular components that can be reconfigured in a number of different ways into a number of different versions of a self supporting frame on wheels to form a multimode and multifunction implement carrier. The purpose is: i) to take advantage of a number of different propulsion means, and ii) to accommodate more suitably a wider range of dependent attached small equipment implements than are presently possible on current known related versions of machines referred to as implement carriers, for example utility tractors, front end loader machines and hydraulic boom excavators.

MULTIPLE CONFIGURATION IMPLEMENT CARRIER KIT

FIELD OF THE INVENTION

The present invention relates to a kit of parts for assembly into multiple different configurations of an implement carrier.

5 BACKGROUND

Current known related versions of machines referred to as implement carriers, for example utility tractors, front end loader machines and hydraulic boom excavators typically are very specific for use on one particular task or type of task to be accomplished. Such existing prior art examples which, while not viewed as dedicated
10 implement carriers are about the only machines referred to at present by such term or classification.

Canadian Patent Document 2,432,863 belonging to Luc Belzile and Peter Dale describes a multipurpose load bearing assembly for all terrain vehicles. It is limited however to under-chassis mount on ATVs so is in essence single not multi-mode and it is
15 not an assembly kit which can be adapted to different uses.

Other patents in Canada and the USA researched at CIPO (Canadian Intellectual Property Office) and USPTO (U.S. Patent and Trademark Office) relate only to specific forklift and implement (tool) carriers or improvements thereto and are not multi-mode multi-purpose etc. nor modular assembly kits either and so are far removed.

20 Several existing models of electric tractors of a single conventional configuration (mostly scaled down agricultural examples) but equipped as implement carriers with 3 point hitches (swing bars and electric linear screws, etc. for lift) and miscellaneous specific tool attachment systems and perhaps individual wheel motors, bidirectional operational modes, are generally limited in the number of functions that they
25 can perform also.

2a

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a kit of parts for assembling into a multiple-configuration implement carrier for supporting a plurality of different implements thereon, the kit of parts comprising:

5 a support frame comprising:

a base including two generally horizontal tubular members, each having respective open ends, and a crossbar supporting the tubular members parallel and spaced apart from one another; and

10 at least one upright extending generally vertically upward from the base and including at least one tool mount arranged to support at least some of the plurality of implements thereon spaced above the base;

a plurality of first wheel mounts having respective first wheels of a first configuration and having respective stems arranged to be slidably received in the open ends of the tubular members of the base; and

15 a plurality of second wheel mounts having respective second wheels of a second configuration different from the first configuration of the first wheels and having respective frame members arranged to be slidably received in the open ends of the tubular members of the base;

20 the stems of the first wheel mounts and the frame members of the second wheel mounts being interchangeable with one another in the open ends of the tubular members of the support frame such that the first wheels and the second wheels are arranged to fully support the support frame in a self supporting manner for rolling movement along the ground in a first configuration of the wheels in which a first one of the implements is arranged to be supported on the frame and in a second configuration of the
25 wheels, different from the first configuration, in which a second one of the implements is

2b

arranged to be supported on the frame.

By providing a frame arranged to support the wheels in various configurations, a greater number of different modes of the frame can be achieved for use with a greater number of implements. The purpose is: i) to take advantage of a number of
5 different propulsion means, and ii) to accommodate more suitably a wider range of dependent attached small equipment implements than are presently possible on known equipment and implement carriers.

Unlike conventional possibly existing examples of related implement carriers, the invention described herein is an assembly kit of modular mechanical and electrical
10 units. This offers a key flexibility; it allows select components, component modules, and combinations of these "modules" to be recombined in different configurations.

On the propulsion side, the machine can accept various power sources from human effort to separate independent vehicle, (whether pulled, pushed or mounted) to an

integral on-board power supply ranging from the battery electric example described here to most others. The self propelled battery powered mode and its several configurations (described later) is especially promising in potential with increasing public environmental awareness (pollution and global warming) and therefore renewed interest in clean energy.

5 On the task or function side the machine can change to an optimized version specific to task. The configuration is thus completely custom assembled and optimized for each situation. For example mowers etc. are preferred at front and plows must be pulled. Grader blade can be pulled or pushed as a dozer/snow plow.

10 The separation of fuel supply, motive force, and quick interconnection options of these (electric and other) components allows freedom for substantial innovative reconfiguration from the traditional and conventional power train layout and steering options (e.g. front motor rear drive wheels etc.) of common internal combustion models. And the quick change from a spent battery pack module to a fresh one on another pallet or platform can be little more than a matter of swapping fork loads in at least this “thinking
15 outside the box” forklift based example.

 Then, like a real life version the familiar Meccano™ or Lego™ sets of the toy world, the coupling together of these various modules easily and quickly assembles a variety of configurations: each one optimized to a different task, from the same kit bag of interchangeable modular components referred to herein as the Tultruk. And not just on this
20 “Tultruk” invention; many of these same component elements and modules are usable elsewhere on remote alien machinery. With uniform mating interfaces and connections the motor or PTO module can drive power tools or equipment at a work site, and the substantial mobile battery pack alone is an alternative or auxiliary power supply etc.

 Related existing “prior art” examples of implement carriers are simple
25 derivatives of machines designed as conventional agricultural tractors, or construction

earthwork equipment, excavators, loaders, etc. so their implement carrier function may be considered as secondary in purpose, an afterthought to the machine's primary function. Unlike the present day machines referred to as implement carriers, this invention is therefore a break from tradition as it is designed from the onset as an implement carrier; 5 the primary purpose of its many different configurations is solely to provide total support to the operation of its dependent implements, i.e. lift, transport, auxiliary power, tool orientation, etc. The invention therefore rather than being an incremental improvement in the existing art is a substantial digression from the constraints of traditional implement carriers. A similar revolution in thinking occurred about a hundred years ago as designers 10 abandoned their view of the automobile as simply a "horseless carriage".

The kit is built to engage both the industry standard 3 point hitch mounting frame configuration albeit in a rigid mount as well as novel mounting adaptations. Although most existing 3 point hitch implements tolerating a rigid mounting can be thus accomodated, no drawings of such obvious application are provided. Articulated lift bars of 15 such systems can of course be devised or existing add-ons ("Dirtworks" etc.) installed.

Other quick attachment means as well are incorporated. The mounting holes in its forks make double use of the forks as common implement mounting brackets as well in some adapted or custom designed implements as in the grader/harrow combination "garrow" or the sliding sleeves of the tree spade.

20 Angle bracket adapters (of plowshare attachment etc.) further reduce most common earthwork draft and other implements to just the relevant tool bit or tool bar.

In addition to that, the stripped down chassis can be mounted with suitable adapters as a forklift attachment onto other common motorized carrier apparatus—tractor 3 point hitch or front end loader frame, truck snow plow lift frame, even the front or rear 25 bumper of e.g. a pickup truck all terrain vehicle etc.

A carriage and forks alone form a simple forks attachment mounted on a tractor 3 point hitch or loader frame.

Some of the kits component units such as the wheel options both powered/unpowered main wheels and casters, booster beam, battery pack, electric
5 motors, reduction gearcases and controls, towbars, etc. in addition to use on the "Tultruk", can be easily detached at their often unique "Quikclamp" "Quiklatch" or "Quikpin" and used separately elsewhere on other alien machinery with compatible attachment interfaces.

As described herein, the first and second configurations of the wheels may be: i) different in lateral spacing relative to one another in a direction transverse to a
10 longitudinal direction of rolling movement of the wheels; ii) different in orientation of a longitudinal direction of rolling movement relative to one another; and/or different in longitudinal spacing relative to one another in a longitudinal direction of rolling movement of the wheels.

Preferably the wheels are mounted on the frame such that the wheels are
15 interchangeable with one another.

The wheels may include at least one caster wheel having a variable direction of rolling movement and at least one fixed wheel having a fixed direction of rolling movement, in which both said at least one caster wheel and said at least one fixed wheel are arranged to be supported on the frame in more than one configuration, and in which
20 the wheels are interchangeable with one another.

In some embodiments, the frame is arranged to be self supporting on the wheels in the first configuration of the wheels and at least partially supported on a hitch of a towing vehicle in the second configuration of the wheels.

Preferably at least some of the wheels are supported on the frame by
25 telescoping members arranged to be supported for sliding movement relative to the frame.

When the frame is arranged to be partially or fully supported on a vehicle, the wheels may be arranged to be removed from the frame.

When the kit is provided in combination with first and second implements arranged for different functions, the first implement is preferably supported on the frame in the first configuration of the wheels and the second implement is preferably supported on the frame in the second configuration of the wheels.

Examples of implements of existing 3 point hitch type or special design that may be selected from groups comprising but not limited to:

1) agriculture earthwork types such as a mouldboard plowshare, rototiller, draft toolbar types such as cultivator, harrow, seeder, rockrake, sprayers, etc.

2) construction types such as: an earth (post hole) auger, pipe or cable puller plow, chain trencher, a barrel mixer (for concrete), tree spade, a dump bucket, etc.

3) landscaping and grounds maintenance types such as: lawnmowers, snow plows, snowblowers, grader blades, etc.

4) general purpose types such as pallet forks on which others such as bins and platforms, etc. rest to provide mobility and power thereto.

The frame may be comprised of a plurality of first frame members comprising elongate members having an outer dimension of prescribed dimension and a plurality of second frame members comprising elongate members having an inner dimension substantially equal to the prescribed dimension, in which each of the plurality of first frame members being arranged for telescoping connection with each of the plurality of second frame members.

A lift carriage is preferably supported for lifting movement along the upright, the lift carriage being arranged to support at least one of the implements thereon.

The lift carriage may comprise a pair of vertically spaced apart rails spanning

generally horizontally and arranged to support the implement thereon. A vertical space between the rails is preferably arranged to be adjustable.

When the frame is arranged to be supported on a vehicle, the lift carriage is preferably movable for lifting movement relative to the vehicle.

5 The lift carriage preferably includes a 3 point hitch connection arranged to support a 3 point hitch mounted implement thereon.

 The lift carriage preferably further includes a plurality of clevis mounts supported thereon, in which at least some of the clevis mounts are vertically and horizontally spaced from one another, at least some of the clevis mounts are adjustable in
10 height relative to one another, and at least some of the clevis mounts are supported on the lift carriage for relative sliding movement in a generally horizontal direction relative to one another.

 There may be provided a winch or other lifting device operable between the frame and the lift carriage in a first mode to apply a lifting force to the lift carriage and in a
15 second mode to apply a downward force to the lift carriage.

 There may be provided a pair of horizontal lift forks supported on carriage parallel and spaced apart from one another, the lift forks being arranged to support simultaneously at least one of the implements thereon.

 When each lift fork comprises a mounting member arranged to be supported
20 in an upright orientation on the carriage and a lift member extending generally horizontally from one end of the mounting member, the mounting member is preferably mountable on the lift carriage in a first configuration in which the lift member extends from a top end of the mounting member and a second configuration in which the left member extends from a bottom end of the mounting member.

25 The lift forks may have mounting apertures at spaced positions therealong so

as to be arranged to support simultaneously at least one of the implements thereon using fasteners cooperating with the mounting apertures.

The lift forks may include sleeve members slidably supported thereon, the sleeve members being arranged to support implements thereon.

5 When there is provided a hitch member supported on the frame, the hitch member is preferably positioned on the upright opposite the carriage.

There may be provided a sleeve mounted on the upright to extend in a generally horizontal orientation and a hitch member arranged to be slideably received in the sleeve for selective separation from the upright.

10 There may be provided electric motors for driving one of either lifting of the lift carriage relative to the frame or rolling of the frame relative to the ground. The electric motors are preferably powered by batteries arranged to be supported and distributed anywhere on board but preferably on the forks.

15 When there is provided i) a drive for driving rolling movement of the frame across the ground, ii) an operator's controller (not the electronic motor controller) for operating the drive, and iii) a seat for supporting an operator thereon, the controller and the seat are preferably arranged to be selectively supported on the upright.

20 Preferably there is provided at least one modular motor unit arranged to drive rotation of one of the wheels, the modular motor unit being mountable in a first position engaged for driving one of the wheels and in a second position engaged for driving a different one of the wheels.

When there is provided a lift carriage supported for lifting movement along the upright, the modular motor unit may be mountable in a third position for driving the lifting movement of the lift carriage along the upright.

25 When there is provided a pair of modular motor units arranged to be

interchangeably engaged with a respective pair of the wheels for driving rotation of the respective pair of wheels, the modular motor units may be operable to selectively drive the respective pair of the wheels at different rates of rotation in either direction such that the frame is steerable and operable in a skid steer mode relative to the ground.

5 There may be provided a drive for driving rolling movement of the frame across the ground and a hitch ball arranged to be selectively supported on the frame for towing a trailing implement behind the assembled kit.

 According to another aspect of the present invention there is provided a kit for assembling a multiple-configuration tool carrier for receiving and retaining removable
10 tools, comprising:

 at least one mast member;

 at least two support braces for mounting on the at least one mast member;

 first wheel mounting means for attachment to a lowermost of the at least two support braces;

15 at least one first wheel assembly for connection to the first wheel mounting means;

 extensibly adjustable leg members for mounting on opposite ends of the lowermost of the at least two support braces;

20 second wheel mounting means for attachment to the extensibly adjustable leg members spaced from the at least two support braces;

 at least one second wheel assembly for connection to the second wheel mounting means; and

25 at least one tool-receiving member for connecting to any of the at least two support braces, comprising tool-mounting means thereon for removably receiving and retaining tools.

The extensibly adjustable leg members may be selectively mountable in a first configuration wherein the leg members are extensible in a forward direction or in a second configuration wherein the leg members are extensible in a rearward direction.

The tool-mounting means may comprise a plurality of apertures for receiving
5 engagement members of a tool.

One of first wheel assembly or the second wheel assembly preferably comprise caster wheels.

There may be provided a winch assembly for selectively mounting on one of the mast member and any of the at least two support braces, whereby the tool-receiving
10 member is for connecting to any of the at least two support braces by means of the winch assembly. Preferably the winch assembly is for selectively raising and lowering the tool-receiving member relative to the at least two support braces.

There may be provided two mast members for positioning in a horizontally spaced orientation, such that, when assembled, the lower ends of the two mast members
15 are connected by the lowermost of the at least two support braces.

According to another aspect of the present invention there is provided a multiple-configuration tool carrier comprising:

at least one mast member;

at least two support braces mounted on the at least one mast member;

20 first wheel mounting means attached to a lowermost of the at least two support braces;

at least one first wheel assembly connected to the first wheel mounting means;

extensibly adjustable leg members mounted on opposite ends of the lowermost of the at least two support braces and selectively orientatable in a forward direction or a rearward direction;

second wheel mounting means attached to the extensibly adjustable leg members spaced from the at least two support braces;

at least one second wheel assembly connected to the second wheel mounting means; and

at least one tool-receiving member connected to any of the at least two support braces, comprising mounting means thereon for removably receiving and retaining tools;

wherein in a first configuration the extensibly adjustable leg members are oriented in a forward direction; and

wherein in a second configuration the extensibly adjustable leg members are oriented in a rearward direction.

According to yet another aspect of the present invention there is provided a multiple-configuration tool carrier comprising a vertically-adjustable toolreceiving member and generally horizontally disposed selectively-orientatable leg members;

wherein in a first configuration, the tool-receiving member is disposed at a first height relative to the leg members and the leg members are oriented in a forward direction; and ,

wherein in a second configuration, the tool-receiving member is disposed at a second height relative to the leg members, the second height spaced from the first height, and the leg members are oriented in a rearward direction.

Some embodiments of the invention will now be described in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the kit assembled as an implement carrier in a manual push forklift mode.

Figure 2, Figure 3 and Figure 4 are respective rear elevational, top plan and side elevational views of the implement carrier according to Figure 1.

Figure 5 is a side elevational view of the assembled implement carrier in which the wheels have been interchanged with one another in relation to Figure 4.

Figure 6A is a side elevational view of the assembled implement carrier when assembled in a crab steer scaffold configuration.

Figure 6B is a variation of Figure 6A in which the front and rear wheels have been interchanged.

Figure 7 is a side elevational view of the assembled implement carrier in a full trailing, four wheel rear caster mode.

Figure 8 is a side elevational view of the assembled carrier in a semi-trailer mode shown with a mouldboard plough share supported thereon.

Figure 9 is a side elevational view of the assembled implement carrier in a semi-trailer tandem wheel mode.

Figure 10 is a side elevational view of the implement carrier in a semi-trailer single wheel mode with a harrow bar and a grader blade supported thereon.

Figure 11A is a side elevational view of the assembled implement carrier shown in a front pusher mode with a dozer blade or snow plough supported thereon where two tow tongues between it and the pusher vehicle form a rigid steerable attachment.

Figure 12 is an electric walkie version wherein the operator is pedestrian but the other functions (ground and implement drive) are electric powered. The implement example shown is an earth auger and with a light implement such as this the casters can

be placed at the front.

Figure 13 is a side elevational view of the assembled implement carrier in a four wheel electric rider mode supporting and powering a barrel mixer thereon. The larger wheels here are in front supporting the presumably heavier load.

5 Figure 14 is a side elevational view of the assembled implement carrier in a riding mode shown with a rotary mower supported and powered thereon at front. Battery packs can be atop forks for quick change and the narrow "gullwing" caster assembly at rear facilitates sharp turns and offers handy footrests.

10 Figure 15 is a side elevational view of the assembled implement carrier in an other electrically driven trike mode. The seat and operator's control column face rearward in this bi-directional mode, that is, opposite to the direction the forks face. It is configured for an implement that requires tractive force as well as auxiliary electric power so is provided with the tow tongue to accept assistance from another vehicle.

15 Figure 16A is a side elevational view of the assembled implement carrier in an electrically powered 4 wheel forward travel mode somewhat similar to the conventional common rider type forklift. Legs and casters are in the rear and a platform across supports batteries and other counterweight.

20 Figure 16B is a side elevational view of the assembled implement carrier in an electrically powered rearward travel mode. It is a similar configuration to Figure 16A except that the bidirectional seat and control column face the rearward operational direction. A hitch ball fastened to carriage makes it into a light duty electric tractor.

Figures 17A, 17B, and 17C are considered the heavy duty configurations as they use four powered wheel modules to double weight capacity and mechanical power output as well as some stability, flotation etc. increase.

25 Figure 17A is a side elevational view of the assembled implement carrier in a

tandem power wheel configuration known as the skid steer mode. The optional caster wheels add stability.

Figure 17B is a side elevational view of the assembled implement carrier in a 6 wheel forward travel mode with 4 main wheels electrically powered in front.

5 Figure 17C is a side elevational view of the assembled implement carrier similar to Figure 17B but in a rearward travelling mode. With suitable ballast on the forks and a hitch provision, it is a conventional tractor. With a cargo bed on the forks and perhaps flotation tires on the tandem wheels, it is a utility all terrain vehicle.

10 Figure 18 is a side elevational view of the assembled implement carrier with legs and wheels removed configured as a forklift attachment to be mounted on a 3 point hitch or loader frame of a supporting vehicle.

Figure 19 is a side elevational view of the lift carriage and lift forks shown separated from the frame of the implement carrier. This further reduction configures it as a forks attachment only to the three point hitch or loader frame of a supporting vehicle.

15 Figure 20 is a perspective view of the lift forks shown with tree spade attachments supported thereon.

Figure 21A is a view of a quick attach main wheel belonging to the kit for assembly into an implement carrier including a quick attach in-the hub insert motor and gearcase (power take off) combined module that power the main (power) wheels, the on
20 board implements, possibly any of the adjustable height carriage lift mechanisms such as the drawn two way manual electric winch example, and other compatible alien equipment etc. A caster wheel is also shown.

Figure 21B is a second detail drawing of the carriage, a removable end bearing, two types of implement mount clevises and the winch mast assembly.

25 Figure 22 is a schematic illustration of further accessories belonging to the kit

for assembly into the implement carrier including a bi-directional seat and drive controller, a pulley, a wheel clamp adapter, a clevis adapter, a booster bar, a T-bar, a sway bar, a two piece tow tongue and a hitch ball.

In the drawings like characters of reference indicate corresponding parts in
5 the different figures.

DETAILED DESCRIPTION

Referring to the accompanying figures there is illustrated a kit of parts generally indicated by reference numeral 10. The kit 10 is particularly suited for assembly into a multiple configuration implement carrier for carrying a plurality of different
10 implements thereon in different configurations of the parts. In each configuration, the carrier is arranged to support an implement thereon of the type which may be carried on a frame for rolling movement across the ground or which can be supported on a three point hitch as examples. Various configurations of the kit are shown in the attached drawings and the following description, however in each instance the kit of parts includes a core
15 configuration which is generally in common with the other configurations.

In each instance there is provided a base 12 to support the assembly for rolling movement across that ground. The base generally comprises two tubes 14 which are mounted parallel and spaced apart from one another to be oriented to lie generally horizontally spaced above the ground. A cross bar 16 is connected between the two tubes
20 14 at a mid-length therealong so as to be perpendicular to the tubes and form a generally H-shaped structure therewith.

The tubes 14 include opposed open ends 18 which are each arranged to receive a respective wheel mount 20 therein. The wheel mounts 20 are available in a variety of configurations, but in each instance a portion of the wheel mount is telescopically
25 received within the open end of the tube 14 to support the assembly for rolling movement

in a forward direction 22 in a longitudinal direction of the tubes in most instances.

In addition to the base 12, the frame includes two uprights 24, each comprising a vertically extending rigid frame member mounted on a respective one of the tubes 14 centrally thereon to extend upwardly and perpendicularly in relation thereto. Each
5 upright 24 comprises a generally U-shaped channel having a base flange and two side flanges projecting from opposing sides thereof parallel and spaced from one another so as to define an open side along the length of the channels. The channels are oriented so that the two uprights 24 are parallel and spaced apart from one another with the open sides thereof confronting and facing one another.

10 A lift carriage 26 is slidably mounted along the uprights 24 to span between the open sides of the uprights for sliding movement therealong in a vertical direction. The carriage 26 comprises two horizontal rails 28 which are mounted vertically spaced apart from one another. Each rail 28 includes an end 30 adapted for sliding movement along the interior of the respective one of the U-shaped channels forming the uprights 24 by action of
15 a wheel, roller or slider of material having a low co-efficient of friction. A vertical post 32 is connected between two rails 28 at a laterally centered position therealong between the two uprights 24. The post 32 comprises upper and lower sections which are telescopic relative to one another to adjust the length thereof and accordingly adjust the vertical spacing between the two rails 28. A suitable locking pin is received through cooperating apertures
20 in the upper and lower sections of the post 32 for selectively locking the post at a designated length or height thereof.

A plurality of implement mounts 34 are provided on the carriage 26 upon which various implements can be supported. In the preferred embodiments, the implement mounts each comprise a clevis or tang supported for sliding movement along the
25 respective rail. Each implement mount 34 includes a tube 36 supported about the

respective one of the rails 28 upon which it is mounted for lateral sliding movement therealong in the horizontal direction of the rail. Two or more implement mounts 34 are supported on each of the two rails 28 in which the two mounts 34 are both slidable along the rail so as to be adjustable in horizontal spacing relative to one another. When adjusting
5 the height of the post 32 between the two rails 28, the vertical spacing between the implement mounts 34 on the two different rails 28 can accordingly be adjusted in vertical spacing or height relative to one another as well. When the implement mounts each comprise a clevis, two vertically spaced apart vertical plates 38 project upwardly and forwardly from the respective tube 36 so as to project forwardly and outwardly beyond a
10 plane spanning the two uprights 24. Due to the adjustability of the relative horizontal and vertical spacing between the implement mounts 34, the implement mounts can be readily set at a suitable spacing for supporting a conventional three-point hitch mounted implement thereon by matching the relative spacing between the mounts on various commercially available three-point hitch connections.

15 An auxiliary support 40 is provided on the frame which extends vertically, spaced and parallel from the uprights so as to be essentially centered in a lateral direction between the two uprights while being positioned rearwardly from the plane spanning between the uprights in a direction which is opposite the forwardly projecting implement mounts 34. The auxiliary support comprises a rigid frame member joined centrally on the
20 crossbar 16 of the base 12 of the frame by a support leg 42 spanning horizontally in the longitudinal direction between the bottom end of the support 40 and center of the crossbar. The auxiliary support 40 is further supported by an additional crossbar 44 joined between the uprights across a rear side thereof opposite the forwardly projecting implement mounts 34. The crossbar 44 extends horizontally between the uprights, so as to be generally
25 perpendicular thereto at a location corresponding approximately to a mid-height or vertical

center of the uprights. The auxiliary support 40 extends vertically upward beyond the crossbar 44 adjacent to the rear side thereof so that the crossbar 44 is joined between the uprights and the auxiliary support 40 due to the auxiliary support 40 being spaced rearwardly from the plane of the uprights only by the thickness of the crossbar. A vertical sleeve 46 is attached to the rear of the crossbar at a central location thereon for slidably receiving the auxiliary support 40 therethrough. Height of the auxiliary support 40 can thus be adjusted by sliding adjustment through the sleeve 46. A similar sliding and locking pin connection through cooperating apertures can be provided between the bottom of the auxiliary support 40 and the support leg 42. Accordingly the auxiliary support 40 can be interchanged with supports of varying height or varying configuration as may be desired. In the preferred embodiment, the support 40 has a height which is near the height of the uprights.

Position of the lift carriage 26 along the uprights can be controlled by a lift actuator 48 which in the illustrated embodiment comprises a combination manual-electric winch mounted to the top end of the auxiliary support 40. A cable extends from the winch for connection to the lift carriage 26 so that actuation of the winch effectively raises or lowers the lift carriage in a lifting or lowering movement along the uprights. A pulley attachment 50 may be provided for attachment of a pulley to anyone of various frame members of the kit to vary the orientation of the cable pulling on the lift carriage if desired. Accordingly the lift actuator is operable in a first orientation where force of the lift actuator causes the lift carriage to be raised in relation to the uprights, or alternatively in a second orientation, force of the lift actuator 48 may cause the lift carriage 26 to be lowered in a downward direction relative to the uprights. The second orientation is particularly suited when a ground engaging implement is supported on the lift carriage and it is desired to engage the implement downwardly into the ground with greater force.

The kit further includes a mounting sleeve 52 which is adjustably supported on the vertical auxiliary support 40. The mounting sleeve 52 is supported by a vertical support sleeve 54 which is mounted for vertical sliding movement along the support 40. A locking pin and cooperating aperture again act to selectively restrict sliding movement of the support sleeve relative to the auxiliary support 40 in a preferred orientation. The mounting sleeve 52 is fixed to one side of the vertical support sleeve 54 to project horizontally in relation to the auxiliary support 40. The open end of the mounting sleeve 52 is suitably arranged for receiving the stem of a hitch member, operator's seat, or various other accessories so that these accessories are supported to be vertically adjustable along the auxiliary support 40.

The wheel mounts 20 include first mounts for mounting caster wheels 56 onto the base of the frame, and second mounts for mounting fixed orientation wheels 58 on the base. The wheel mounts 20 for the castor wheels 56 generally include a stem 60 which is receivable into the open end of the base tube. From the horizontal stem 60, a vertical member extends upwardly from one end thereof and a horizontal member projects horizontally from the top end of the vertical member opposite the stem 60 for locating the caster wheel 56 below the free end of the horizontal member for rotation about a vertical axis pivot which permits the rolling direction of the castor wheel to be variable about a vertical axis.

The wheel mounts 20 for mounting the fixed orientation wheels 58 on the frame generally comprise an upright mounting plate 60 supporting a flange at right angles thereto along one edge. An opposing edge of the mounting plate 60 is inclined upwardly and outwardly opposite the right angle flange. Suitable fasteners, for example L-shaped bolts permit fastening of the mounting plate and corresponding right angle flange in a clamping configuration onto any of the elongate frame members forming the base of the

frame. The fixed orientation wheel 58 is supported on the upwardly extending and outwardly inclined portion of the mounting plate 60 so that when the mounting plate is clamped onto one of the frame members of the base which are generally square in cross section, the axle supporting the corresponding wheel thereon extends outwardly at a generally downward incline from the mounting plate and the wheels rotatable thereon are accordingly inclined upwardly and outwardly away from each other when the mounting plates are supported on opposing outer sides of the base 12 of the frame 12. Auxiliary frame members 62 are provided for telescoping insertion into the open ends of the tubes 14 of the base to support any of the wheel mounts 20 farther from the base in the longitudinal direction if desired. When supporting the fixed orientation wheels 58 thereon, the auxiliary frame members 62 permit the wheels to be telescoped in the longitudinal direction of the tubes and in the rolling direction of the wheels in either forward to rearward directions of the frame depending on whether the auxiliary member and wheels supported thereon are mounted in the front open ends or the rear open ends of the tubes 14 of the base.

The arrangement of the wheels permits the caster wheels 56 to be readily interchanged with the fixed orientation wheels 58 having a fixed rolling direction once mounted, due to the stem 60 and the auxiliary frame members 62 being interchangeable with one another within the tubes 14 in telescoping mounting configuration.

Variation of the configuration of the wheels is desired when supporting different implements thereon so that the wheel configuration is suited to the particular implement being supported. The wheels are thus arranged to be supported in a first configuration in which a first one of the plurality of implements is supported on the frame and in a second configuration, different from the first configuration, in which a second one of the plurality of implements is supported on the frame. The configuration of the wheels

permits the wheels to be supported for different lateral spacings between the wheels in a direction which is perpendicular to the longitudinal direction of rolling movement of the wheels as well as permitting the wheels to be adjustable in different orientations of the longitudinal direction of rolling movement and furthermore being adjustable for different longitudinal spacing in the direction of rolling movement. In some embodiments the frame may be fully supported on the wheels so that the implement supported on either the lift carriage or the uprights of the frame is fully supported by the wheels for rolling movement on the ground. Alternatively a hitch may be inserted through the mounting sleeve 52 in which case at least part of the frame and the implements supported thereon are instead carried by the hitch of the towing vehicle. In this instance, the wheels are configured for optimal placement behind a towing vehicle. The wheel mounts 20 further permit the wheels to be completely removed from the base of the frame by simply removing locking pins or bolts through cooperating apertures in the telescoping members of the stem 60, auxiliary member 62 and the tubes 14.

Many embodiments of the assembly make use of a pair of lift forks 64 arranged to be supported on the lift carriage. Each lift fork 64 comprises a mounting member 66 arranged to be supported in an upright orientation on the carriage, and a lift member 68 mounted perpendicularly thereto. The lift member is arranged to extend horizontally from one end of the mounting member 66 when the mounting member is vertically supported on the carriage. The mounting member 66 is selectively supported on the carriage by a pin connection 70 at both top and bottom ends of the mounting member 66 so as to be suitably spaced with one another for alignment with the respective vertically spaced rails of the lift carriage. More particularly each pin connection of the lift forks is arranged for being receive within cooperating apertures in the clevis mount of a respective one of the implement mounts 34 on the lift carriage. The pin connections permit the lift

forks 64 to be mounted in two different orientations. In a first configuration as shown in Figure 6 for example, the mounting member is mounted so that the lift member 68 projects horizontally outward from the top end of the mounting member so that two lift forks 64 together form an elevated lifting platform which can be raised well above the height of the uprights. Alternatively in a second mounting configuration, the lift members 68 are oriented to project from the bottom ends of the mounting members 66 respectively so that in a preferred palette lifting confirmation as shown in Figures 1 through 4 for example, the members 68 can be positioned close to the ground when the lift carriage is in its lowermost position.

The lift forks 64 include a plurality of mounting apertures 72 therein at spaced positions along each of the lift members 68. Fasteners are provided for securing implements directly to the lift forks by fastening through the mounting apertures 72 on the horizontal lift members 68 of the lift forks.

As shown in the accompanying Figures, the components noted above can be assembled in various configurations in which various different implement configurations can be supported thereon. Other components of the kit 10 for assembly into a multi configuration implement carrier are shown in Figures 21 and 22. In particular a seat 74 is provided which permits a single operator to be seated thereon. The seat 74 is typically supported on a horizontal leg member 76 which is arranged to be telescopically received within the mounting sleeve 52 and secured thereto by a suitable pin and cooperating aperture connection. A seat post 78 is mounted at the opposing end of the leg member 76 in a sliding crosspiece to allow horizontal and vertical adjustment of seat and insert other accessories e.g. a tow tongue thereto. The seat post 78 comprises telescoping sections to permit the seat 74 to be vertically adjusted in relation to the leg member 76. The seat assembly may further include an auxiliary mounting sleeve 80 which is supported at the

bottom end of the seat post 78 to extend horizontally in the longitudinal direction of the leg member and of the base of the frame when supported thereon. The mounting sleeve 80 permits the hitch member or other members to be telescopically received therein similarly to the manner in which they are to be mounted within the mounting sleeve 52 on the
5 upright support 40 of the frame.

The kit 10 also includes a plurality of motors with detachable gearcases (electric power take off) modules 82, each comprising an electric motor for quick coupling attachment to either the fixed orientation wheels 58, or the lift actuator 48. The motors for driving rotation of the wheels and for driving lifting and lowering motion of the lift carriage
10 along the uprights are thus interchangeable with one another. The motor/gearcase modules 82 may further be used for providing any power requirements to implements supported on the frame, for example for driving rotation of an auger.

A plurality of battery modules 84 are also provided for being carried on the frame to provide power to the motor modules 82. The battery modules may be carried on
15 lower portions of the frame directly on the wheel mounts, or on support bases spanning the frame. In some embodiments however the substantial battery weight can be massed or distributed to advantage for traction, downforce on implements, balance and stability etc. or rest on a quick exchange base on the forks.

An operator's control column module 86 is provided for permitting an operator
20 to control the individual motor modules 82 whether applied to one of the wheels to drive rotation of the wheels or whether applied to the lift actuator 48 for driving lifting movement of the lift carriage relative to the upright. The operator's control column module 86 can be selectively mounted onto any of the frame members of the kit by suitable fasteners. In some embodiments the operator's control column module 86 is mounted onto the seat post
25 of the seat 74 or the seat boom 76, whereas in other instances, it may be mounted directly

to the upright auxiliary support 40 of the frame.

One embodiment of a hitch member 88 is illustrated in Figure 2 in which the tongue comprises two overlapping members arranged to extend in a generally common longitudinal direction in which a first one of the members is telescopically received within the mounting sleeve 52 on the frame while a hitch connector is mounted at the opposing
5 end of the hitch member 88. The configuration of the seat 74 to include an auxiliary mounting sleeve 80 or a sliding crosspiece permits the hitch member 88 to be received therein for example so that a combination of the hitch member, a seat and an operator's control column module may all be together supported within the mounting sleeve 52 on the
10 auxiliary support 40 of the frame.

A plurality of first auxiliary clevis adapters 89 is provided for clamping onto any of the frame members wherever desired using suitable U-bolts which secure the clevis adapter 89 wherever the user prefers. The clevis adapter 89 similarly comprises two parallel plates or tangs with cooperating apertures at opposing ends thereof for receiving a
15 pin connector of an implement therethrough.

A plurality of second clevis adapters 90 are provided, each in the form of a stem arranged to be telescopically received in the open ends of the tubes 14 of the base in place of the wheel mounts 20 in which a pair of parallel and spaced apart plates are mounted to project outwardly from the opposing end of the stem. Cooperating apertures in
20 the free ends of the plates of the second clevis adapter 90 permit connection of a suitable implement pin connection therethrough.

Among the various components, there is also provided a plurality of wheel adapters in the kit 10 in which the wheel adapters 92 comprise a tube of square cross section arranged for telescoping connection with one of the frame members and having a
25 pair of mounting flanges projecting therefrom at right angles for securing the wheel mounts

thereto by mounting apertures in the flanges of the wheel adapter 92.

The components of the kit 10 further include a plurality of sway bars 94 comprising an elongate bar with inclined flanges at opposing ends thereof with mounting apertures therein. A booster bar 96 is provided in the form of an elongate frame member
5 with mounting apertures at spaced positions therealong for telescoping or bolting connection to any one of various frame members of the kit 10. The booster bar 96 may be used as auxiliary frame members 62 in the base for supporting the wheel mounts thereon. A plurality of T-bars 98 are also provided in the form of two frame members attached in a T-shaped configuration relative to one another in which one or both of the members
10 forming the T-bar 98 are arranged to be mounted in telescoping configuration with other frame members of the kit 10.

In addition to the hitch member 88, two hitch ball assemblies 99 may be provided in the kit 10 in the form of a mounting plate having two flanges at right angles for bolted connection to one of the components of the frame or to an attached vehicle. The ball
15 of the hitch ball 99 is supported on one of the flanges.

In general, all of the frame members of the kit 10 generally comprise one of a plurality of first frame members of a plurality of second frame members. Each of the frame members comprises an elongate rigid member of generally square cross section in which the first elongate frame members have an outer dimension substantially equal to the inner
20 dimension of the second frame members so that the first frame members are arranged for telescopically being received within any one of the second frame members. Cooperating apertures are also provided in all of the frame members for fixing the orientation and position of the frame members relative to one another at any one of various selected positions using suitable pin connections or mating fasteners including bolts and the like.
25 This arrangement of frame members readily permits the components of the kit 10 to be

assembled into multiple configurations, each supporting a different implement thereon. In addition to the different orientations of the frame members, the frame can also be driven for rolling movement along the ground in different manners. Power can be provided directly to the wheels through motor modules 82 or alternatively the frame can be towed using the
5 hitch member 88. Two frame members 88 can also be used for attachment in a rigid (non pivoting) manner to vehicle providing the motive force. When a plurality of motor modules 82 are provided on respective wheels at opposing lateral sides of the frame, the operator's control column module can be arranged so that in addition to driving rolling movement of the frame in the longitudinal direction of rolling movement of the wheels, the direction and
10 speed of rotation of the wheels can be varied relative to one another to steer the frame in a manner similar to a skid steer i.e. in a "zero turn radius" configuration.

Turning now more particularly to particular configurations of the kit 10, figures 1 through 4 illustrate a configuration in which the lift forks are supported on the lift carriage to project forwardly from the plane of the uprights. In this embodiment the wheel mounts
15 are arranged to also telescopically extend forwardly for locating fixed wheels directly below the free ends of the lift forks while caster wheels are supported to project rearwardly from the base opposite the lift carriage. The lift actuator in this instance comprises a winch arranged to lift the lift carriage along the uprights when actuated. The particular lift actuator shown in the embodiments is a combination of an electric winch with an additional
20 removable manual crank and worm gear drive whose mount bracket allows selective engagement as desired.

Turning now to Figure 5, a similar configuration is illustrated in which the caster wheels and the wheels of fixed orientation are interchanged in relation to the previous embodiment so that the caster wheels are located at the front end of extension
25 members below the free ends of the lift members respectively instead of rearward from the

frame as in the previous embodiment, and wheels of fixed orientation are clamped directly to the longitudinally extending tubes 14 of the base frame so as to be located near the rear of the frame instead of at the forward end of the extension members as in the previous embodiment.

5 Figure 6A illustrates a further configuration of the kit 10 in which the lift forks are mounted in an inverted configuration relative to the previous embodiments so that the lift members extend from the top end thereof to form a raised platform or scaffold structure where the lift members can be raised well above the height of the uprights. When operated as a scaffold, it may be desirable for the wheels to be varied in orientation to have a rolling
10 direction which is perpendicular to the longitudinal direction of the tubes 14 of the base frame. This can be arranged by clamping the wheels of fixed orientation along the crossbar of the base frame for orientation in a lateral rolling direction. The caster wheels can be mounted on extension members at the forward ends thereof so as to be located below the free ends of the lift forks. The variable orientation of the caster wheels permits their rolling
15 direction to be also oriented in the lateral direction for lateral rolling movement of the assembly alongside a wall for example.

Figure 6B is a simple variation of 6A wherein the wheels of fixed orientation are transposed with the casters.

The previous embodiments represent some of the configurations possible in
20 the Mode 1 or pedestrian operator pushed mode.

The following Figures 7 to 11 inclusive are embodiments wherein a separate motorized vehicle e.g. automobile provides the motive power. The manual worm gear winch drive is disengaged and the electric winch can be powered by the vehicle battery with a remote control within reach of operator.

25 Turning now to Figure 7 a further embodiment is illustrated in which the

wheels are similarly arranged to the configuration of Figures 1 through 4 by locating wheels of fixed orientation forwardly of the uprights on extension members with caster wheels rearward of both tubes 14 of the base. In this instance a hitch member 88 can be mounted in the mounting sleeve 54 on the upright 40 to project rearwardly from the plane of the
5 uprights opposite the lift forks of the lift carriage.

Turning to Figure 8, a further configuration is illustrated in which the caster wheels are removed from the rear ends of both tubes 14 of the base with only wheels of fixed orientation being mounted on extension members telescopically received in the front ends of the respective tubes of the base. The hitch member 88 is again mounted in the
10 mounting sleeve 52 on the auxiliary support 40 to project rearward from the plane of the uprights opposite the lift carriage and the wheels of fixed orientation. When supported on a towing vehicle, part of the frame is carried on the wheels at the front ends of the telescoping members of the base while a rearward portion of the assembly is supported on the hitch member. In the embodiment of Figure 8, a moldboard plowshare (for example) is
15 mounted to the lift forks directly by a suitable angle bracket adapter having mounting apertures therein for securement to both the moldboard plowshare and the mounting apertures in the lift members of the lift forks. In this instance, the lift actuator may be oriented to urge the plowshare downward into the ground and additional ballast may be added onto lift members if desired. Many other tool bits of this class (draft type surface or
20 subsoiler) can be arrayed singly or in multiples in this manner.

Turning now to Figure 9, a further configuration is illustrated in which tandem wheels of fixed orientation are mounted spaced longitudinally along both laterally opposed sides of the frame so that a first wheel of fixed orientation is mounted on each of the tubes 14 of the base and a second wheel of fixed orientation is mounted on an extension
25 member telescoping forward from the tubes in the same direction as the lift forks projecting

from the lift carriage. A hitch member 88 is again received in the horizontal mounting sleeve 52 on the vertical auxiliary support 40 for connection to a towing vehicle. The lift carriage can be fully lowered so that the lift members of the lift forks are close to the ground, only slightly above the wheel axles to form a suitable deck for towing cargo thereon in a semi-trailer tandem wheel mode of operation. With the booster bar bridging the space between the tandem wheel supports and heavily loaded forks resting atop it, this configuration cancels the cantilevered fork load (bending moment) on both the forks and the legs.

In the configuration of Figure 10, only two wheels of fixed orientation are supported on the two tubes 14 of the base respectively for rolling movement in the longitudinal direction. The hitch member 88 is supported in the mounting sleeve 52 on the vertical support 40 to project rearwardly from the plane of the uprights, opposite the lift forks on the lift carriage. A novel implement is shown mounted on the lift forks using fasteners extending through the mounting apertures therein. A scraper blade 110 is provided for spanning laterally between the two lift forks. A right angle bracket is mounted to the rear face of the scraper blade for locating fastener apertures therein to secure the scraper blade in a generally upright orientation spanning laterally between the two lift forks to depend from the lift forks. The flange mounts a plurality of harrow tines 112 at spaced positions therealong to be oriented to project rearwardly from the rear face of the scraper blade 110 so as to be oriented generally perpendicularly thereto. Accordingly when the scraper blade is mounted in an upright orientation, the harrow tines project forwardly in a generally horizontal orientation in the forward direction of the lift forks when the scraper blade faces rearwardly in the direction of the hitch member towards the towing vehicle. Alternatively, the scraper blade could be mounted in a generally horizontal configuration to the underside of the lift forks in which instance the harrow tines extend generally downward

in an upright orientation. Positioning of the lift carriage along the uprights positions the height and degree of engagement of the tines or the scraper blade with the ground. As illustrated, two implements of similar configuration are shown mounted on the lift forks in the two different orientations so that in one instance the scraper blade is horizontal and the tines are vertical whereas in the other instance the scraper blade is vertical and the tines are generally horizontal. Thus the implement carrier can support the operation of other dual purpose implements built in the same fashion as this example where two different tool bars are fixed at a right angle to a heavy steel angle "backbone"

In a further configuration, Figure 11A two hitch members 88 are telescopically received within the open ends of respective ones of the tubes 14 of the base frame at the rear end thereof to project rearwardly opposite the forwardly projecting lift forks of the lift carriage. When desired for use as a pusher dozer or snow plow, the scraper blade 110 noted above can be mounted to the lift forks to face forwardly at a desired angle about the vertical axis while caster wheels are mounted by wheel mounts 20 to the open front ends of both tubes 14 of the base with the scraper blade being located farther forward towards the free ends of the lift forks to be located ahead of the caster wheels. Two hitch ball accessories 99 on their support brackets are attached to the front bumper of the pusher vehicle to receive the hitch tubes 88 attachment.

A related variant of this direct steering rigid attachment, (Figure 11B) is pulled behind the motor vehicle instead. The implement is oriented facing rearward or in the same direction as puller vehicle.

The caster brackets 20 of caster wheels 56 are turned upside down so as to more closely match the height of implement carrier to the respective vehicle bumpers.

The grader blade implement example shown can be tilted through an angle (for slope grading, trenching, etc.) by inserting shims or spacers under one of the lift

members.

The following figures 12 through 17C illustrate some of the possible electric self propelled configurations. The power wheels for ground drive have the old type angle drive gearmotors rather than the proposed power take off insert modules inside the hubs.

- 5 The electric two way winches have the factory equipped 12 volt motors and their manual worm drives are shown raised out of engagement.

All are controlled by an operator's control column that has a separate variable speed and reverse control for each side for "zero turn radius" steering and most rider configurations are bidirectional.

- 10 At least one and up to four wheels of fixed orientation are driven by electric motors. Two types are shown; a conventional angle drive "gearmotor" type attached to a mounting wing and electric power take off modules consisting of an electric motor with or without an attached speed reduction gearcase which insert into the recesses of the wheel hubs.

- 15 (These wheel modules are shown inclined outwards to lessen obstruction to other neighboring components).

The drawings do not show the control and power cables and the motor controller (the pulse width modulator voltage controller) that is common to larger D.C. motors.

- 20 The implements shown are only typical examples; any 3 point hitch or one modified to fit below or above the forks can be served.

The batteries can be distributed anywhere on the frame to gain advantage in weight distribution, traction, balance, stability, etc. When massed atop forks they can be quickly changed in a pallet exchange manoeuvre.

- 25 Steering can be effected by individual differential control of speed and torque

of powered wheel motors by the operator's control column. Other forms of steering such as manual mechanical systems can be incorporated into the swivelling casters.

Two options for electric motor attachment are shown, one a conventional "gearmotor" attached to the angled mounting flange of the wheel module, the other by
5 insertion of a PTO module (electric motor and speed reduction gearcase) into a recess in the wheel hub. Other drives such as chain and sprocket are possible.

Figure 12 is a pedestrian configuration suitable for light implements. The powered wheels are driven by gearmotors such as the earth auger shown which itself is driven by the electric PTO module. The auger in this instance is fastened to the free ends
10 of the lift forks which also carry a plurality of battery modules 84 thereon. In this example, wheels of fixed orientation are preferably mounted directly onto both of the tubes 14 of the base frame in approximate alignment with the uprights in the longitudinal direction, while extension members are used to mount additional mounts 20 spaced forwardly from the frame of the uprights. A walk behind frame is illustrated in which the wheels at the forward
15 ends of the telescoping members comprise only caster wheels and the operator's control column module is mounted directly onto the vertical support 40 to control a motor module on the wheels of fixed orientation which are clamped directly onto the tubes 14 of the base frame.

In the configuration of Figure 13, a barrel mixer for e.g. concrete with a three-
20 point hitch attachment is secured to the clevis mounts arranged at a three-point hitch spacing on the lift carriage. The lift forks are also mounted on the lift carriage on the same or a second set of mount clevises to support a plurality of the battery pack modules 84 for driving rotation of the concrete mixture. The batteries may also be used to drive rotation of motor modules mounted on respective ones of the wheels of the base. With the large mass
25 of a concrete mixer projected forwardly from the plane of the uprights, larger wheels of

fixed orientation are preferably located on extension members projecting telescopically from the front ends of the tubes 14 of the base frame so that the wheels are located approximately beneath the concrete mixer. Caster wheels can be inserted into the rear ends of the two tubes 14 of the base frame directly below a seat assembly including the leg member or seat boom 76, the seat post 78 and the seat 74 supported thereon with the operator's control column module 86 for controlling the motors of the wheels and of the mixer.

As shown in the configuration of Figure 14, the implement may comprise a lawn mower deck which is fastened below the lift forks to be suspended above the ground by the lift carriage at an inner end while additional caster wheels are supported at a free outer end of the deck of the mower. Battery modules to drive the mower, ground drive and lift actuator may be carried on a platform or container on forks for quick exchange at the charging station as electric energy demands in this case are high. Additional batteries for ground drive and lift actuator can be placed in the rear for counterbalance. Wheels of fixed orientation driven by motor modules can be clamped directly onto the two tubes 14 in this instance to allow additional clearance as the mower deck example is too wide to straddle while the seat is positioned rearwardly from the plane of the uprights, opposite the mower deck, by a suitable leg member 76 received in the mounting sleeve 52 on the frame. An additional caster wheel, or a pair in a "gullwing" assembly using a T bar 98, is/are installed in a mount sleeve below the seat post. An additional T bar 98 mounted forward of the seat post offers a footrest.

Turning now to the configuration of Figure 15, essentially the rearward travelling variant of tricycle wheel gear mode similar to Fig. 14, the lift forks are again used to support an implement suitable for pulling in the rearward direction directly thereon of the type comprising a scraper blade 110 as described above. Batteries for driving rolling

movement of the wheels are also preferably carried on the deck formed by the lift forks of the lift carriage for weight and traction advantage. In this example, wheels of fixed orientation driven by motor modules can be located alternatively on forwardly telescoping extension members projecting from the two tubes 14 of the base respectively (if the
5 implement is narrower than frame) while support for rolling movement at the rear end of the assembly is provided by caster wheels received within the auxiliary mounting sleeve 80 mounted at the bottom of the seat post 78 supported on the leg member projecting rearward from the mounting sleeve 52 on the vertical support 40 of the frame. The seat and operator's control column module are again mounted on the seat post as in previous
10 embodiments, but are instead oriented to face the rearward direction of travel from the plane of the uprights opposite the forwardly projecting lift forks contrary to previous embodiments. This adds the advantage of better visibility and in some circumstances such as spraying, allows operator to face away from dust or noxious spray etc. In this direction a towing assist tongue can be added to the assembly. (Spray tank can be supported on a
15 platform atop the legs for stability).

Turning now to Figure 16A a configuration similar to a conventional rider forklift is illustrated in which the forwardly projecting lift forks are counter balanced by telescoping extension members projecting rearward from the two tubes 14 of the base frame to locate caster wheels at the rear ends thereof spaced rearwardly from the plane of
20 the uprights. Wheels of fixed orientation are preferably clamped directly to the tubes 14 of the base frame at laterally opposed sides and driven by motor modules which receive power from a battery module supported on the caster wheels at the rear of the assembly again for counter balancing the forwardly projecting lift forks. The seat assembly including the seat boom seat post and seat with control module can again be supported to project
25 rearwardly from the mounting sleeve 52 on the upright vertical support 40 of the frame. An

additional platform can straddle the rear legs to support more counterweight i.e. batteries, passengers, toolboxes etc.

The configuration of 16B is a reversal of the operator's control station to the rearward direction of travel. The forks are replaced with a hitchball on a bracket to turn it
5 into the lighter duty electric tractor configuration with an elevating hitch.

The Figures 17A, 17B, and 17C being 4 wheel drive have increased weight capacity, tractive force, stability, and sustained electrical power output so are more suitable for heavy duty performance.

Figure 17A illustrates an electric rider skid steer forklift. The casters are
10 mounted in the rear below seat boom in a gullwing configuration to add further stability. Batteries can be as before massed atop forks for an underslung implement or distributed in rear as shown. A walking or standing operator configuration (not shown) is also possible.

In Fig. 17B a six wheel forward rider configuration is shown also for forklifting or operating heavier implements but unlike the previous tricycle gear the two rear caster
15 wheels are installed on the legs in the rear to form a rear deck or platform support for added stability and cargo capacity. The typical implement shown comprises a dump bucket straddled by and pivotally supported on the lift forks of the lift carriage. Although a rigid linear screw or hydraulic actuator might perform better, it is shown with pulley assemblies provided at appropriate locations on the lift carriage and on the fixed frame of
20 the assembly so that the lift actuator causes the bucket to be dumped by action of the cable being pulled across the pulley and lifting the bucket relative to the lift carriage as the lift carriage is displaced along the uprights or as the lift actuator causes displacement of the cable connected to the bucket about the pulleys. In this instance, a set of four wheels of fixed orientation with respective motor modules are preferably mounted onto the base to
25 be located clamped directly onto both tubes 14 of the base and onto forwardly projecting

telescoping extensions extending from both tubes 14 of the base frame. A suitable deck formed of two other extension members extending rearward from the tubes 14 may again be provided for supporting the battery modules or cargo/passengers thereon.

The embodiment of Figure 17C is the heavier duty electric tractor which is
5 derived from the previous 17B by turning the seat post with attached operator's control to face the rearward direction of travel. The power enhancement can be both electrical (more batteries) and mechanical power because the embodiment of Figure 17C has double the sustained mechanical tractive force with four motors. The hitch ball may be attached onto the accessory booster bar which assembly may be installed either further forward along
10 forks for an elevating hitch feature or straddling atop the forward facing legs to leave forks free for a battery pack. The former embodiment may also find occasional use in the forward direction (as in Fig. 17B) as a trailer dolly around a parking lot.

The configuration of Figure 18 is a forklift attachment only for a carrier vehicle other than the implement carrier. The clevis adapters 90 received respectively in the rear
15 ends of the tubes 14 of the base are clamped onto the uprights respectively for connection to either the tractor 3 point hitch top link or the anti-sway bars 94 pivotally coupled thereto so that the assembled frame is arranged for mounting directly onto a three point hitch (example shown) or the front end loader frame of a conventional tractor or perhaps the front or rear bumper of a truck or other carrying vehicle (with suitable brackets). In this
20 instance the assembled frame can be fully supported on the chassis of the carrying vehicle or caster wheels may be provided in the opposing front ends of the two tubes 14 for partially supporting the assembled frame for rolling movement along the ground. When supported entirely on the vehicle chassis, operation of the lift actuator to displace the lift carriage along the uprights also causes the lift carriage to be lifted and lowered in relation
25 to the chassis of the vehicle.

As shown in Figure 19, the lift carriage including the lift forks connected thereto can be detached from the uprights and connected directly to the three point hitch of a tractor. Similarly the three-point hitch arrangement or adjustability of the implement mounts on the lift carriage permit any number of mounted implements to be supported thereon. This forks attachment can also be adapted to other carrier vehicle apparatus such as the loader frame of a tractor or the snow plow lift frame of a pickup truck.

As shown in Figure 20, implements may also be mounted on the lift forks by use of fork sleeves 120 which are arranged for close sliding engagement along the length of the lift members of each fork. Cooperating apertures are provided in the fork sleeves and in the lift members of the forks for selectively retaining the sleeves at a desired set position.

In the illustrated example, the implements supported directly on the fork sleeve comprise tree spades in which an auxiliary mounting sleeve 122 is fixedly mounted onto the fork sleeves 120 so that the two mounting sleeves 122 project downwardly and inwardly towards one another when the fork sleeves are slidably supported along the length of the lift members of the forks. Elongate stems 124 are mounted for sliding movement in the direction of the mounting sleeves 122 with spade attachments 126 being mounted at the lower free ends of the stems 124. The spade attachments are thus arranged to project downwardly and inwardly towards one another for engaging beneath opposing sides of a tree to be spaded.

Referring now again to the kit in a general summary the “assembly kit” approach to mechanical equipment described herein refers mostly in this case but is not limited to small consumer machinery of landscaping and construction and “short line” farm equipment of the drawn or on board mounted attachment type. It can be scaled to sizes to correspond to 3 point hitch implements of from Category 0 small to any larger size desired.

The following terms used herein are understood as follows:

A dependent implement is defined here as a machine that performs a particular task but depends upon another machine for its motive and auxiliary power and so must conjoin with an independent accommodating machine for its operation in this case
5 the implement carrier invention noted.

By accommodation of a dependent implement is meant the attachment unto, receiving, retaining, transport, elevation, orientation, steering and control, provision of auxiliary power and such other support functions of the accommodated dependent implement in the performance of its intended task. This invention therefore is an extension
10 in assembly kit form of the implement carrier concept into a number of different forms of a “prime mover” independent machine dedicated to the total support of other dependent implements and so a new classification of “dedicated implement carrier” is proposed. (The terms “tool carrier” “equipment carrier” and “attachment carrier” have less specific or distracting implications).

15 A “module” is defined here as “a self contained assembly of mechanical/electrical components that functions as a single unit and performs as part of a larger unit.” In this sense the main wheel module comprises the main wheel, hub, spindle, bearings, and the universal clamp on mounting bracket, the complete self contained assembly unit. The electric powered version or the “power wheel module” adds either of
20 the described electric motor options; the gearmotor or the hub inserted electric power take off (motor, gearcase, and shaft drive adapter if required).

In its simplest form, the present invention may comprise a homebuilt manually propelled walkie (or pedestrian powered) forklift for outdoor use. Although indoor versions of such a “manual pallet stacker” are commonplace in industry, as are various
25 other single purpose lifting and load transport devices, a dedicated design for both these

functions (lift and transport) over improved outdoor terrain is somewhat rare; a seeming anomaly in the marketplace and conversion of any existing indoor example of pallet stacker was deemed impractical. In the course of this protracted design and construction of a suitable outdoor prototype, the original manual push outdoor forklift idea evolved into a substantially broadened new concept far beyond the original single mode single purpose material handling apparatus for the yard. It is now a unique forklift based generic multi mode multi function "universal" implement carrier in assembly kit form. The lifting forks from its origins as a pallet stacker are simply another dependent implement or task attachment but now double as mounting brackets for other implements as well.

The modular assemblies of the kit described herein, and other component details and accessories some of possible inventive merit, are listed following in this small equipment example. As the "core embodiment" of the invention in basic manual "walkie" or pedestrian powered mode is comprised of the same main components as the familiar manual pallet stacker of the warehouse industry (except as a quick assembly kit), only specialized and unique features will be detailed further herein.

The chassis, a rigid frame of at least one mast guide (two in drawings) with cross members forms the vertical track.

An adjustable transverse mounting frame for the forks called the "carriage" travels vertically inside this guide track raised or lowered by a lift mechanism.

Upon its top and bottom rails is a unique feature, four or more universal implement mount clevises (or tangs) that move about with laterally and rotationally adjustable motion. These "Quickclevises" or "Quicktang" receive in releasable attachment the 3 point hitch stud pins of any implement (the lift forks are considered an implement as well) or the compatible mount brackets of others.

The clevises or tangs are mounted on either sliding sleeves or U bolts for the sliding and rotatable connection to the top and bottom carriage rails.

A set of pallet forks defines various novel features. They attach onto the rail clevises in the same manner as other 3 point hitch implements i.e. 3 point hitch stud pins
5 attached to their vertical segments. Also there are holes in the horizontal tines for bolt connection of other implements attachable from above or below allowing them to double as implement mounting brackets.

Behind this assembly of frames is a vertical mast onto which are attached a lift mechanism, the middle cross bar of chassis, the sliding socket for the tow tongue
10 accessory, and other accessory components.

A lift mechanism (winch, hydraulic cylinder, linear screw or lever jack etc.) may be either manually powered or electric but note that the lifting device selected in drawings is a unique winch combination; it embodies a manually cranked worm gear quick
15 releasable attachment atop a standard electric winch with a d.c. electric motor that may be one of the PTO (power take off) modules of the assembly kit).

Another feature is a system of modular components for a power supply for mobility and attachment of auxiliary power. The battery electric one of self propelled Mode 3 described herein consists of battery power packs, a clamp on the operator's control
20 column module and electric motors and speed reduction gearcases (as well as the standard requirement of connecting cables and electronic motor controllers.

The combination of an electric motor and a speed reduction gearcase is defined here as a PTO module. These PTO power modules power all electric driven implements through a universal compatible attachment system and when inserted into the hub of main (traction) wheels form in turn the self contained power wheel module.

25 Other features include:

-The novel adaptations; conversions/reductions of existing 3 point or drawn implements i.e. the plowshare attachment.

-Conversions /reductions of machines such as the earth auger conversion from a manual gas engine powered version.

5 -Special implements designed specifically for the implement carrier such as the tree spade and "garrow" or grader/harrow combo.

Any number of existing 3 point hitch implements may be installed directly onto the quick attachment system of the carriage and are compatible with its other accessories.

10 Other implements can be adapted to fit directly onto forks (above or below) or carriage eliminating conventional 3 point hitch mounting frames.

The implements and their one universal implement carrier cover from :

1. homeowner yard chores such as lawn mower, snow blower, rototiller, and snow plow;
- 15 2. agricultural use such as plow, harrow, cultivator or other tool bar;
3. commercial landscaping use such as stump grinder, tree moving spade;
4. light construction such as pipe/cable laying plow, chain or other type trencher, earth auger, mobile barrel mixer (concrete etc.), grader, scaffold;
- 20 5. light industrial such as the pallet forks, mobile work platform/scaffold, tool/equipment carrier, mobile boom crane, auto lift, and shop waste dump bins themselves; and
6. many other items that can be rendered mobile by human or motorized vehicle tractive force and powered electrically.

25 Numerous other accessories for the kit include simple additions such as the hand cranked worm gear for the electric winch, the tow tongue, sulky seat, booster bar,

stabilizer bars, over/undershot pulley, hitch ball bracket, wheel clamp adapters and possibly a hand crank drive for some implements such as the barrel mixer and earth auger.

Another class of accessories are the chassis transition adapters of the implement carrier itself such as the crab steer Tees, the angle brackets for connecting
5 some implements to the forks, the clevis adapters, and the wheel mount adapters (clamp to insert tube mount).

A further class of adapters may be required to provide matching interfaces between motor or PTO modules and other implements.

Various advantages of the kit according to the present invention include:

10 1. Redundance, complexity, and cost are reduced with a single "common denominator" prime mover chassis in a multimode multifunction machine. Implements can now be reduced to their simplest essence often the tool bit(s) alone as other functions are now provided by the carrier machine.

2. Similarly, the various interchangeable adjustable quick attachable
15 component modules easy convenient reconfiguring into different carrier versions each with its own particular advantage. The assembly kit invention can be a forklift, cart, scaffold, lift table, mobile jack or auto lift, trailer moving dolly, mobile crane as well as the versatile implement carrier.

3. In a dedicated multimode design, the most advantageous
20 configuration can be selected for each implement in terms of performance, traction, balance, convenience, visibility for operator, etc. For instance the best location for a mower, snow blower or dozer is obviously up front. However a front pusher plow wouldn't work well nor would an operator want to face the noxious spray from a front mounted sprayer boom. Pushed trailers don't co-operate well but pusher mode for a trailer dolly is
25 helpful. The significant weight of the batteries can be distributed anywhere for

counterbalance, stability, and traction purposes and if massed onto a forks platform offers quick drive in-drive out exchange at the charging stand. This text and drawings show only a sampling of the possible configurations and functions of the implement carrier.

4. The established advantages of battery electric drives are well known
5 but of particular benefit in a multi-configuration machine as they offer a greater flexibility in design for optimizing an electrically mobilized chassis described in the following Mode 3 class of configurations. This is due mainly to the separation, relocation and recombination options available in having components and assembled drive units for mobility and implement operation connected only by flexible power cables, control wires, etc. Motors,
10 gearcases, differentials, and power take off shaft drives need no more be in fixed mechanical arrangement. For example, power driven traction wheels can now be self contained motor and wheel modular units attachable onto chassis at various locations and direct drive electric motors eliminate much power transmission mechanism. Steering and bidirectional operation (as distinguished from a simple reversing gear) are simplified and
15 performance enhanced with wider and individual independent control over motor speed and torque.

5. It may also, in its electric propulsion modes, offer a further advance in the green shift to a more ecologically benign and sustainable energy form (renewable electric) thus contributing to the reduction in the output of pollution emissions and
20 greenhouse gases and dependence on fossil energy sources by internal combustion engine dependent lifestyles. Small equipment engines such as consumer lawn and garden tractors etc. have insignificant pollution control equipment to date.

6. It is a simple down to earth low technology machine some parts amenable even to homebuilding; many components can be improvised from salvage
25 machinery and common steel stock and off the shelf hardware items.

A quick attachment feature is incorporated into the kit. As the versatility here is in the quick attachment, release, adjustment and interchangement of component modules, a number of strategies both common and innovative to this aim are listed:

5 The prototype's main frame members are built mainly of two related sizes of seamless square steel tubing (e.g. ASTM 1030 DOM), a nominal outside dimension insert tube which slides inside nominal similar but inside dimension sleeve tube. These provide the sliding, rotational and adjustment flexibility.

Some quick uniform standardized systems of attachment between different systems and components thereof, have been specially designed (Items 1, 2, 3, 4, 5, and 6
10 below) or adopted from existing common hardware (Item 7):

1. A simple length of right angle steel stock (angle iron) that can clamp onto any square tube by two or more L or U shaped bolts tentatively dubbed a "Quickclamp". The "Quick" attachment features are defined in the drawings. A variation on this could be a flat strap or plate rather than the angle steel with U bolts for clamping. The main power
15 wheel modules for instance attach by this unique "Quickclamp", a device for quick easy attachment anywhere on any square tubing of chassis frame or legs etc.

2. For most fork mounted implements and even the battery packs one can also just drive into them to engage them.

3. A number of universal clevis members of metal straps (or tangs) atop a
20 form of sliding, rotating detachable support bracket (which could be a sliding sleeve tube section or either the L or U bolt version of the "Quickclamp" (Item 1 above). They install on the top and bottom carriage rails and are dubbed "Quickclevis" forming an universal implement attachment interface accepting the standard 3 point hitch stud pins as well as other devices albeit in a rigid fashion. However, a conventional swing bar type 3 point hitch

apparatus can be fitted and used as a rear mount or front mount hitch in the bidirectional electric modes.

4. Holes through chassis framing matching ones through the mating components for quick attachment and adjustment with "Quikpins" bent pins and retainers,
5 bolts etc.

5. A series of holes in the horizontal fork tines for releasable attachment and adjustment of simple implement reductions. They turn the forks themselves into implement mount brackets.

6. A specially designed common mount dubbed "Quicklatch" to
10 releasably interattach all the separate modules i.e. motors, gearcases, main (powered) wheels, power shaft adapters, the driven implement modules (and conforming alien ones) to each other in any required configuration or location for both mobility and auxiliary power.

7. A number of specially designed but very simple transition and conversion adapters. For example, a length of "sleeve tube" welded to a length of
15 "Quickclamp" forms a transition adapter to allow casters to clamp mount (rather than their insert tube mounting) onto any 2 inch square tube. And a similar adapter from the round keyed shafts of motors and gearcases to an industry standard six spline PTO (or any other) shaft forms an electric power take off or hub drive for an alternate use in other electric vehicles.

20 8. Standard hardware items such as bent Quikpins, hairpins, threaded bolts, U and L shaped bolts, 3 point hitch stud pins, trailer hitch ball and coupler, Lovejoy shaft couplings etc. Many are not shown on drawings to prevent clutter as are any other items deemed obvious and of standard requirement such as the electric power and control conductors, electronic motor controllers, and some reinforcing, bracing and articulating
25 members.

With regard to performance and use this coupling flexibility and multi configuration assembly allows this implement carrier invention to:

1. Accept various common power sources from the limited human force to motorized traction vehicle (in draft, push or carry on mounting) to on board self contained
5 power.
2. Allow common existing tools and implements to be mounted for different tasks especially those simple ones of the 3 point hitch configuration. The forks which are also adapted to this industry standard are then just another task implement.
3. Allow new simplified design implements to be directly attached either to its
10 carriage rails or its forks in either upright or upside down position either singly or in multiples as tandem or stacked arrays.
4. Allow alternate uses for its main component modules and systems thereof on alien independent apparatus such as table saws, air compressors, even vehicles etc. that have the compatible "Quicklatch" module attachment feature.
- 15 5. Allow the most advantageous configuration for each application of motive and auxiliary power to optimize balance, traction, maneuverability, convenience and performance efficiency.

In discussing the flexibility of the implement carrier assembly kit, the multiple operational configurations have been organized into modes, submodes, functions and
20 alternate uses. Modes refer to the source of motive power from human effort to separate existing traction vehicle to on board self contained (e.g. battery electric) but they extend also to modes where a stripped down frame or lesser component is carried on another prime mover support vehicle. Submodes are variations of different modes with the same power source.

In each of these different mode and submode configurations from manual, towed, pushed and self propelled, the separate components can be placed at any location and are additional flexibility options to the mode selection ones for further customizing the tool carrier chassis in terms of weight distribution, balance, traction, maneuverability, convenience, and task implement requirements.

MODE 1, manually propelled or U push "walkie" mode. This is the basic mode wherein human force alone is used for mobility and sometimes tool operation. (Figures 1 thru 6B inclusive are such configured. It can function as a light duty carrier chassis for many light implements such as forks, dump bins, shop crane, mobile lift table, scaffold, manual tree spade, earth auger, barrel mixer etc. be they manual crank, battery electric, or however powered. Several practical variations (submodes) are possible as the straddle legs, the main wheels and the casters can all be moved about to different locations forward and aft and even turned sideways for crab steer submode. This mode can do duty as a conventional pallet stacker/light forklift, a light implement carrier for e.g. a soil auger or barrel mixer, trailer dolly, scaffold, mobile crane, etc.

The T shaped accessory brackets under chassis of some of the above modes would allow a transverse orientation to the main wheels for sideways or crab travel mode useful in scaffolding or narrow isle etc. special applications (Figure 6).

A dump or implement tipping feature (Figure 17) is easily rigged up with the cable pulley accessory attached to the top center of carriage. A length of separate cable or rope anchored at chassis bottom, strung over this "overshot" pulley and attached to the end of any implement. The same pulley attached at bottom of chassis can be rigged in reverse to apply downward winch force on carriage for the "hitchhiker transport mode" behind a truck or for down pressure on some implements.

MODE 2 external traction vehicle powered mode. (draft or pusher).

A trailer hitch tongue accessory at rear of chassis allows attachment of any small powered vehicle with a trailer hitch ball front or rear. Figures 7 to 11B inclusive show some of the preferred submode examples.

Some practical submodes of Mode 2 can be configured as:

5 Mode 2 Submode 1 –the 4 wheel rear caster full trailer of Figure 7. An obvious corollary would be submode variants 2 and 3 wherein the towing tongue is oriented 90 degrees to either side and the wheels are turned about in a manner similar to Figures 6A and 6B for vehicle pushed/pulled crab travel.

10 Minus the rear casters it's in semi trailer submode and the forward legs (as in direction the forks face, not the direction towed) can be slid to optimum position with regard to mounted implement (Figure 8).

 The Tandem Axle Heavy Hauler (example in Figure 9) can be configured in a number of ways using a second pair of main wheels. The booster bar accessory spanning atop the legs can support the forks to form one rigid structure of the legs and forks and
15 eliminate the stresses of heavy cantilevered loads on both of these projecting component pairs.

 A legless semi trailer shown in Figure 10 further lessens obstruction to wide mounted implements straddled. The implement shown is a makeshift "grubber" or "box scraper" of two "garrows" in tandem. (The "garrow" itself is a combo of harrow bar and
20 grader blade bar attached together at right angles). One can have fun conjuring up and naming other "grooth bar" or "grake bar" combos of tooth bar and whatever other implement for the "Tultruk".

 Installing caster wheels (caster brackets can be upside down to increase chassis height) in front and two hitch tongues in their place in the rear as in Figure 11A
25 forms the pusher submode. Connection to two front mounted hitch balls on a highway

vehicle bumper for instance allows dozer or snow plowing work using the “garrow” blade facing forward. A similar puller mode with connection in the same fashion to the rear bumper forms the direct steering puller mode variant.

MODE 3 the self propelled mode (Figures 12 to 17C inclusive) uses an on-board power supply most commonly a battery electric system as described for mobility and auxiliary attachment drive.

The chassis can be configured similarly to many of the previously listed versions but a number of additional configurations becomes available.

From one to 4 of the main fixed wheels can be powered by electric motors in various forms of mechanical connection. The examples described are an early type gearmotor and an electric power take off module inserted in wheel hub recess (as described in Figure No. 21A).

The addition of a bidirectional (swiveling) operator’s seat and operator’s control column in the rear adds bidirectional flexibility to some of these rider versions. Casters can now be placed singly or in lateral pairs (gullwing) fashion or in tandem pairs below seat post for a more maneuverable “tricycle gear”.

Legs and casters can be installed in the rear of frame and additional legs and main power wheels can be added to front.

Steering is by individual independent control of power wheel(s) on each side for “zero turn radius” capability but pivoting mechanical systems can be devised.

Direction of operational travel in bidirectional modes is defined as always in that forward is still the direction forks do or would face. Rearward is the operational travel in the opposite direction. A wise operator would face in the proper direction in each case. Reverse, when used on occasion as in other vehicles is defined as the direction opposite to normal travel.

Figure 12 shows a pedestrian configuration similar to front caster style of Figure 5 but with conventional electric “gearmotors” attached to the wide mounting wings of the main wheels. The electric drive earth auger implement aboard is however driven by a new and different proposed design; a “pancake” or axial flux type of d.c. electric motor with the speed reduction gearcase attached that together compose the “universal PTO (power take off) module” that fits everywhere and powers all. It is shown in Figure 21A as a portion of the new design power wheel modular assembly as it inserts into hub recesses to power the main wheels as well. (The mounting wing or flange for wheel motor need not be as wide now but is still canted outward provide additional clearance to main frame or implement.

Figure 13 shows a forward rider configuration wherein implement and battery weight are placed over the larger main powered or traction wheels. Various bi-directional electric trike versions can be assembled.

Figure 14 shows a forward rider for mowing, snowblowing, dozing, etc. Casters can be inserted using a crab steer Tee adapter in “gullwing” fashion with a second tee bracket serving as a handy footrest.

A rearward travel submode, (Figure15) offering unlimited visibility suits pulling implements and is shown with an auxiliary towing tongue.

With the straddle legs and casters installed in the rear of chassis and a weight platform spanning the space across them for counterbalance supporting operator, riders, battery pack(s) etc. as in Figure 16A, a (bi-directional) version forward is configured similar to the common conventional motor powered counterbalanced forklift submode which offers near obstruction free cantilevered forks for all operations.

In Figure 16B, a simple reverse orientation of the seat post with its attached operator's control column can be called the conventional light electric tractor. (There is a heavy version).

The heavy duty electric versions are listed in Figures 17A, 17B, and 17C. which mostly by virtue of their four tandem main powered wheels offer more weight capacity, traction force, power, stability, flotation etc.

An interesting extension of the self propelled Mode 3 is the skidsteer mode (Figure 17A) shown as a rider version. The caster wheel(s) if used contribute extra stability. A second pair of power wheels are attached in tandem to front legs. Walking, or even standing operator reductions may be derived but are considered not practical nor safe.

In Figure 17B, the addition of rear legs, casters, and platform in a manner similar to that of Figure 16A extends this to somewhat related but heavier duty tandem wheel conventional forklift version. The implement example shown is a dump bucket wherein the pulley arrangement can provide dump action as the slack in tipping cable is taken up.

The heavier duty electric tractor version of Figure 17C is merely a simple 180 degree rotation of the seat post and attached operator's control column. The hitching attachment shown here is one of the hitch ball accessories attached to the booster bar accessory. This hitch bar duo when bolted atop the forks forms an elevating hitch connection but when attached below across the legs instead, it leaves the forks available for a large quick change battery pack for sustained hard work and improved traction.

MODE 4 tractor mounted forklift attachment (Figure 18) is simply the direct mounting of the stripped down forklift chassis (less legs and main wheels) onto the lift bars of a 3 point hitch equipped tractor (as shown) or its front end loader frame. Two way mounting clevis adapters that replace the rear casters engage the lift bars or loader frame

and bucket cylinders instead. Two anti sway bar accessories are a more laterally stable top link attachment for the 3 point hitch mount. The caster wheel “depth stop” is of course optional.

Some variants by extension are mounting of the forklift attachment onto the snow plow lift frame of a truck or even a direct rigid mount of the forklift chassis assembly onto the bumper (front or rear) of say a pickup truck or any motorized vehicle etc. with suitable custom built adapter brackets.

MODE 5 (just the) carriage and/or forks attachment mode (Figure 19) is the direct mounting of forks and carriage assembly alone on the 3 point hitch bars or front loader frame of tractor or the snow plow lift frame of a pickup etc. It functions merely as a forks attachment.

These are just representative examples of the many possible configurations available.

The kit for assembly into a tool carrier has many functions. Functions (F1 to F8) are tasks performed by the implement carrier using a dependent tool or implement. They can be powered by any of the previously listed modes.

(F1). Conventional forklift for lifting/transporting anything that can be engaged thereon.

(F2). Forks upside down for high lift; a mobile scaffold, or mobile shop or yard crane etc.

(F3). 3 point hitch implement carrier, carriage mount. The forks are replaced here by an existing industry standard 3 point hitch implement with auxiliary power if necessary direct from electric motor or electric PTO module.

(F4). Direct to forks mount above or below the forks can be used as mounting brackets. Adapting an implement design to the Tultruk forks mount is often a reduction or

simplification of most standard 3 point hitch implements. For instance the triangular mounting frame and boom of a 3 point hitch grader blade is not necessary; models of the “garrow” “grake” “grock rake” or any other direct mount dual purpose creations of the “groot bar” subset bolt directly under forks through the holes in the fork tines. Most of the flexible
5 battery packs attach above forks and changing one is therefore as easy and quick as picking up a pallet with a forklift. The PTO shafts and gearboxes etc. for the finishing mower and soil auger reductions are also unnecessary as the electric motor can drive directly at rated speed or thru the PTO module assembly.

(F5) Combined tandem mount below forks. Bolting a separate tooth bar and
10 grader blade in tandem on the long forks forms a makeshift grubber of a sort akin to the box scraper landscape device shown in Figure 10. Other practical tandem tool or tool bar possibilities may exist.

(F6) Combined over/under implement mount from both above and below fork or direct to carriage and direct to forks combined mount. The 4 wheel conventional rider of
15 Figure 12 shows also that two implements, an electric barrel mixer (driven by the engineered motor/gearcase combo power module) and a set of forks can be mounted at the same time for a combined forks and other implement mount. Forks are then free to support a battery pack module. (The battery packs, controller, and control column can be clamped anywhere on chassis though). The trailer hitch ball accessory that turns Tultruk
20 into a trailer dolly also mounts directly onto carriage.

(F7) Direct onto forks using adapter brackets. In the case of plow type subsoiler implements (example in Figure 8) the reduction/simplification is further extended to just the tool bit(s), a vertical mounting shank, and an adapter bracket to match mounting holes of fork and tool bit. A towed configuration of the “Tultruk” provides all other necessary
25 function from draft, elevation, depth control, orientation, transport etc.

(Function 8). Direct to carriage mount of custom bracket design implements.

The mounted and driven dependent implements shown in drawings are just representative examples of .the class of spinoff implements showing some drastic reductions in complexity some to merely a tool bit bolted to forks; the result of having a
5 single universal common denominator “prime mover” support chassis for all. A prime mover that puts the accommodation needs of said implements first and custom configures itself around these requirements.

The kit also has many alternate uses. This refers to the use of component modules, accessories etc. comprising the kit on other (alien) equipment taking advantage
10 of the universal attachment features.

The unique manual/electric winch option used here for the implement carrier is mounted on a length of 2 inch square tubing pedestal for a purpose; it can now be inserted into an automobile trailer hitch (or any other) 2 inch square tube receiver sleeve on trailers, cranes etc. .

15 The main wheels by virtue of their integral “Quickclamp” feature can install wherever a few inches of similar size square tubing presents itself for the purpose of clamping – wheelbarrow, wagon, small trailer frame, boxes, crates, platforms, whatever. In fact a four way trailer frame (spinoff implement) has been designed that will accommodate a flat deck, stake body, and small boat cargo beds as well as a camper unit. Its torsion
20 spring and arm suspension has square tube arms suitable for clamping on the “Quickclamp” wheel assemblies, a winch bracket, and a front hitch tongue caster bracket. With the complete battery electric modular kit on board, it becomes a power cart. Needless to say, the “trailer moving dolly” version of the implement carrier already makes a power cart of any small trailer. Clamping a power wheel module up on a mast and replacing

wheel with a rope reel turns it into a makeshift rope wind winch called a "cathead" or "windlass".

The electric motors alone or as PTO modules with their Quickattach gearcases can match speed, torque and power requirements for hydraulic pumps, table
5 saws, air compressors, drill presses, lathes, etc. for a common universal power supply in unserviced workshops and jobsites.

Due to the inherent qualities of the electric modular system previously cited, there is no reason that the modular power system especially the battery pack based one and the power wheel units with their in-wheel motors cannot be used wholly or in part
10 moved over to an electric car chassis for weekday commuting; then placed onto the implement carrier for weekend chores on Saturday. And Sundays; just attach some of these electric components to the ATV or boat outfit -- if all have common quick attachment systems such as these "Quickclamp" and "Quicklatch" type examples. So in some ways it may be possible to extend the modular assembly kit to other powered vehicles and
15 machines besides the implement carrier. The "assembly kit" much more than just the original implement carrier frame. As long as all mating components have the uniform standardized attachment interfaces.

Needless to say, connecting an A.C. inverter to such an ample battery pack module provides a large mobile 110/220 volt A.C. emergency or alternate power supply for
20 off grid or jobsite use.

The clevis adapter converts any sleeve tube to a clevis end.

The wheel clamp transition adapter converts the L bolt type Quickclamp to insert sleeve attachment system.

The transition wheel mount adapter shown in the accessories drawing Figure
25 22 can "Quickclamp" onto any square tube of relevant size such as a trailer hitch tongue or

cart etc. frame. The caster wheel can then similarly install therein (or elsewhere) in similar fashion.

The booster bar, with a clevis pin hole (or hitch ball) in the middle and 3 point hitch pins in the ends can do double duty as a 3 point hitch drawbar for small tractors. It normally is used for assembling a second or tandem axle for transporting heavy loads in the Tandem Heavy Hauler trailer mode (Figure 9) or as a support bridge spanning legs. A further detailed discussion of some drawings will now be discussed.

The invention has symmetry about the central longitudinal axis.

Components not specifically defined are deemed self evident.

Common hardware attachment devices such as bolts, pins, etc. are not shown to avoid clutter. Neither are some larger ones such as frame braces, swivel joints, power cables, electronic controllers, etc. if not material to novelty claims.

Figure 1, the title sheet, is a perspective view of the basic chassis showing the origins as a manual pallet stacker. The manual worm gear attachment option is not shown on the electric winch nor are the forks. The L bolts clamping the main wheels up front and other retainer pins etc. are left out as well.

Figures 2, 3, and 4 are rear, top, and right side isometric views of the invention in the same basic configuration, the manually powered pedestrian pusher with main wheels at front of straddle legs and caster wheels in the rear. Some chassis details and some of the claimed innovations are visible and are itemized on these two sheets.

Various parts additional to basic rigid frame include:

-The electric winch with the additional option—the manual worm drive attachment a useful add-on option for the manual (Mode 1) operation but also as a position holding restraint brake and for fine tuning depth control of some implements. This attachment is “quick attached” by means of a hinged or slotted bracket as it must be

moved out of engagement to use the electric mode on winch. It is shown as a commercial unit powered by a 12 volt electric motor not the electric PTO module of this assembly kit.

-A sliding top link attachment to a tractor 3 point hitch (Mode 4) and below that a sliding collar receiver tube for the tow tongue or the sulky seat boom are also shown
5 lower on the winch mast.

-At least two removable caster wheels. Their insert tube universal mount allows them to be inserted at many sleeve tube locations on the implement carrier frame or on the wheel adapters.

-At least two removable slideable legs. They consist of a suitable leg length
10 of "insert tube" to insert and slide about inside receiver tubes in base frame with a section of sleeve tube at one end to allow attachment of a "Quickclamp" main wheel and insert mount type casters in several assembly ways.

-At least two main wheel assemblies. There are two main requirements for these:

15 1. These self contained main wheel modules must be driven at times by an electric motor that is quick attached as an integral part of the wheel assembly to form a self contained power wheel module. Two design options are shown; the simple solution: a right angle drive gearmotor mounted directly on a wing or flange and the preferred proposed design; the electric power take off module inserted inside the hub recess.

20 2. These complete main wheel modules powered or not must quick attach at many locations on the implement carrier's several chassis configurations so a form of universal (clamp type) mount has been devised. As the basic frame and legs of this chassis example are essentially square steel tube, a length of steel angle with at least two L or U shaped bolts can clamp anywhere unto them so that is the quick clamping option

chosen. The steel angle also incorporates a "mounting wing" or flange inclined slightly to increase clearance for an attached motor drive option installed thereon.

-The main wheels in their preferred embodiment as mentioned above would have an inner recess to accommodate the engineered power unit of the future; the electric
5 PTO module consisting of a d.c. pancake type (or axial flux) motor, and a pancake shaped quick attach planetary gearcase would fit at least partly inside recess. A shaft adapter would convert output to the common agricultural PTO type (one and three eighths inch diameter by six spline). Thus the main wheels would be considered driven implements for the electric PTOs just as the pallet forks are viewed as an implement for the implement
10 carrier.

Of the accessories list on Figure 22 perhaps only the wheel clamp adapter needs clarification. Clamped onto any piece of square tubing from trailer frame to cattle chute, it offers a sleeve tube receiver for the caster wheel, winch post, etc. Thus anything with a relevant size square tube section can be equipped with wheels, winch or other
15 components from the kit.

Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without department from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as
20 illustrative only and not in a limiting sense.

CLAIMS:

1. A kit of parts for assembling into a multiple-configuration implement carrier for supporting a plurality of different implements thereon, the kit of parts comprising:
a support frame comprising:

5 a base including two generally horizontal tubular members, each having respective open ends, and a crossbar supporting the tubular members parallel and spaced apart from one another; and

at least one upright extending generally vertically upward from the base and including at least one tool mount arranged to support at least some of the
10 plurality of implements thereon spaced above the base;

a plurality of first wheel mounts having respective first wheels of a first configuration and having respective stems arranged to be slidably received in the open ends of the tubular members of the base; and

a plurality of second wheel mounts having respective second wheels of a
15 second configuration different from the first configuration of the first wheels and having respective frame members arranged to be slidably received in the open ends of the tubular members of the base;

the stems of the first wheel mounts and the frame members of the second wheel mounts being interchangeable with one another in the open ends of the tubular
20 members of the support frame such that the first wheels and the second wheels are arranged to fully support the support frame in a self supporting manner for rolling movement along the ground in a first configuration of the wheels in which a first one of the implements is arranged to be supported on the frame and in a second configuration of the wheels, different from the first configuration, in which a second one of the implements is
25 arranged to be supported on the frame.

2. The kit according to Claim 1 wherein the first wheels and the second wheels are different in lateral spacing relative to one another in a direction transverse to a longitudinal direction of rolling movement of the wheels when supported on the support frame.

5 3. The kit according to Claim 1 or 2 wherein the first wheels and the second wheels are different in orientation of a longitudinal direction of rolling movement relative to one another.

10 4. The kit according to any one of Claims 1 through 3 wherein the first wheels and the second wheels are different in longitudinal spacing from said at least one upright relative to one another in a longitudinal direction of rolling movement of the wheels.

5. The kit according to any one of Claims 1 through 4 wherein one of the first wheels and the second wheels comprise caster wheels having a variable direction of rolling movement and the other one of the first wheels and the second wheels comprise fixed wheels having a fixed direction of rolling movement.

15 6. The kit according to any one of Claims 1 through 5 wherein there is provided a hitch connector on the frame which is arranged to at least partially support the frame on a hitch of a towing vehicle in a further configuration of the wheels.

20 7. The kit according to any one of Claims 1 through 6 wherein the second wheel mounts comprise telescoping members arranged to be supported for sliding adjustment in position relative to the frame in a longitudinal direction of rolling movement of the wheels.

25 8. The kit according to any one of Claims 1 through 7 wherein the frame includes vehicle mounts arranged to fully support the frame on a vehicle, the wheels being arranged to be slidably removed from the frame when the frame is supported on the vehicle.

9. The kit according to any one of Claims 1 through 8 in combination with first and second implements arranged for different functions, the first implement being supported on the frame in the first configuration of the wheels and the second implement being supported on the frame in the second configuration of the wheels.

5 10. The kit according to Claim 9 wherein the first and second implements are selected from a group comprising: a mouldboard ploughshare, a concrete mixer, a snowplough, a lawnmower, a harrow, a forklift, a grader, a dump bucket, and an auger.

10 11. The kit according to any one of Claims 1 through 10 wherein the frame is comprised of a plurality of first frame members comprising elongate members having an outer dimension of prescribed dimension and a plurality of second frame members comprising elongate members having an inner dimension substantially equal to the prescribed dimension, each of the plurality of first frame members being arranged for telescoping connection with each of the plurality of second frame members.

15 12. The kit according to any one of Claims 1 through 11 there is provided a lift carriage supported for lifting movement along said at least one upright, the lift carriage supporting said at least one tool mount thereon such that the lift carriage is arranged to support at least one of the implements thereon for lifting movement along said at least one upright.

20 13. The kit according to Claim 12 wherein the lift carriage comprises a pair of vertically spaced apart rails spanning generally horizontally and being arranged to support the implement thereon, a vertical space between the rails being arranged to be adjustable.

25 14. The kit according to Claim 12 or 13 wherein the frame includes vehicle mounts arranged to fully support the frame on a vehicle, the lift carriage being movable for lifting movement relative to the vehicle when the frame is supported on the vehicle.

15. The kit according to any one of Claims 12 through 14 wherein the lift carriage includes a 3-point hitch connection arranged to support a 3-point hitch-mounted implement thereon.

5 16. The kit according to any one of Claims 12 through 15 wherein the lift carriage includes a plurality of clevis mounts supported thereon, at least some of the clevis mounts being vertically and horizontally spaced from one another.

17. The kit according to Claim 16 wherein at least some of the clevis mounts are adjustable in height relative to one another.

10 18. The kit according to Claim 16 wherein at least some of the clevis mounts are supported on the lift carriage for relative sliding movement in a generally horizontal direction relative to one another.

15 19. The kit according to any one of Claims 12 through 18 wherein there is provided a winch operable between the frame and the lift carriage and a pulley attachment arranged to be supported on the frame such that the winch is operable in a first mode to apply a lifting force to the lift carriage and in a second mode to apply a downward force to the lift carriage.

20 20. The kit according to any one of Claims 12 through 19 wherein there is provided a pair of horizontal lift forks supported on the lift carriage parallel and spaced apart from one another, the lift forks being arranged to support one of the implements thereon.

25 21. The kit according to Claim 20 wherein each lift fork comprises a mounting member arranged to be supported in an upright orientation on the carriage and a lift member extending generally horizontally from one end of the mounting member, the mounting member being mountable on the lift carriage in a first configuration in which the lift member extends from a top end of the mounting member and a second configuration in

which the left member extends from a bottom end of the mounting member.

22. The kit according to either one of Claims 20 or 21 wherein the lift forks have mounting apertures at spaced positions therealong so as to be arranged to support one of the implements thereon using fasteners cooperating with the mounting apertures.

5 23. The kit according to any one of Claims 20 through 22 wherein the lift forks include sleeve members slidably supported thereon, the sleeve members being arranged to support one of the implements thereon.

24. The kit according to any one of Claims 12 through 23 wherein there is provided a hitch member supported on an opposite side of said at least one upright of the
10 frame in relation to the carriage.

25. The kit according to any one of Claims 12 through 24 wherein there is provided an electric motor arranged to be coupled to the lift carriage for lifting of the lift carriage relative to the frame in a first position and arranged to be coupled to one of the wheels for rolling of the frame relative to the ground, the electric motor being powered by
15 batteries arranged to be supported on the lift carriage when a ground engaging implement is supported on the lift carriage.

26. The kit according to any one of Claims 1 through 25 wherein there is provided a sleeve mounted on the frame to extend in a generally horizontal orientation and a hitch member arranged to be slidably received in the sleeve for selective separation from
20 the frame.

27. The kit according to any one of Claims 1 through 26 wherein there is provided a drive for driving rolling movement of the frame across the ground, a controller for operating the drive and a seat for supporting an operator thereon, the controller and the seat being arranged to be selectively supported on the frame.

25 28. The kit according to any one of Claims 1 through 27 wherein there is

provided at least one modular motor unit arranged to drive rotation of one of the wheels, the modular motor unit being mountable in a first position engaged for driving one of the wheels and in a second position engaged for driving a different one of the wheels.

29. The kit according to Claim 30 wherein there is provided a lift carriage
5 supported for lifting movement along said at least one upright and wherein the modular motor unit is mountable in a third position for driving the lifting movement of the lift carriage along said at least one upright.

30. The kit according to any one of Claims 1 through 29 wherein there is
provided a pair of modular motor units arranged to be interchangeably engaged with a
10 respective pair of the wheels for driving rotation of the respective pair of wheels, the modular motor units being operable to selectively drive the respective pair of the wheels at different rates of rotation such that the frame is operable in a skid steer mode relative to the ground.

31. The kit according to any one of Claims 1 through 30 wherein there is
15 provided a drive for driving rolling movement of the frame across the ground and a hitch ball arranged to be selectively supported on the frame.

32. The kit according to any one of Claims 1 through 31 wherein the frame
members of the second wheel mounts comprise extensibly adjustable leg members for
mounting in the open ends of the tubular members of the frame in a first configuration
20 wherein the leg members are extensible in a forward direction or in a second configuration wherein the leg members are extensible in a rearward direction.

33. The kit according to any one of Claims 1 through 32 wherein said at
least one tool mount comprises a vertically adjustable tool receiving member mountable on
the frame at a variable height.

FIG. 1

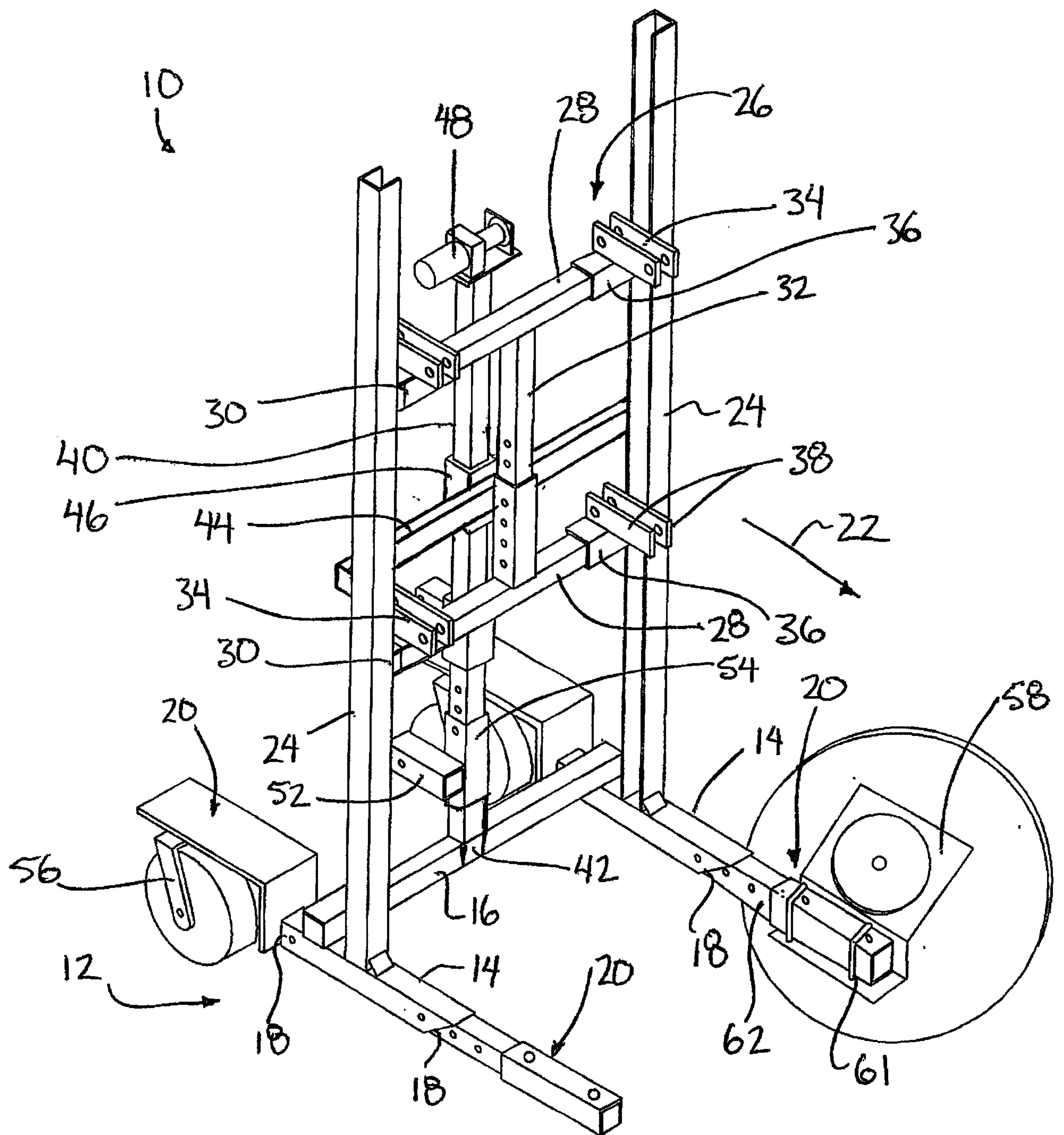


FIG. 2

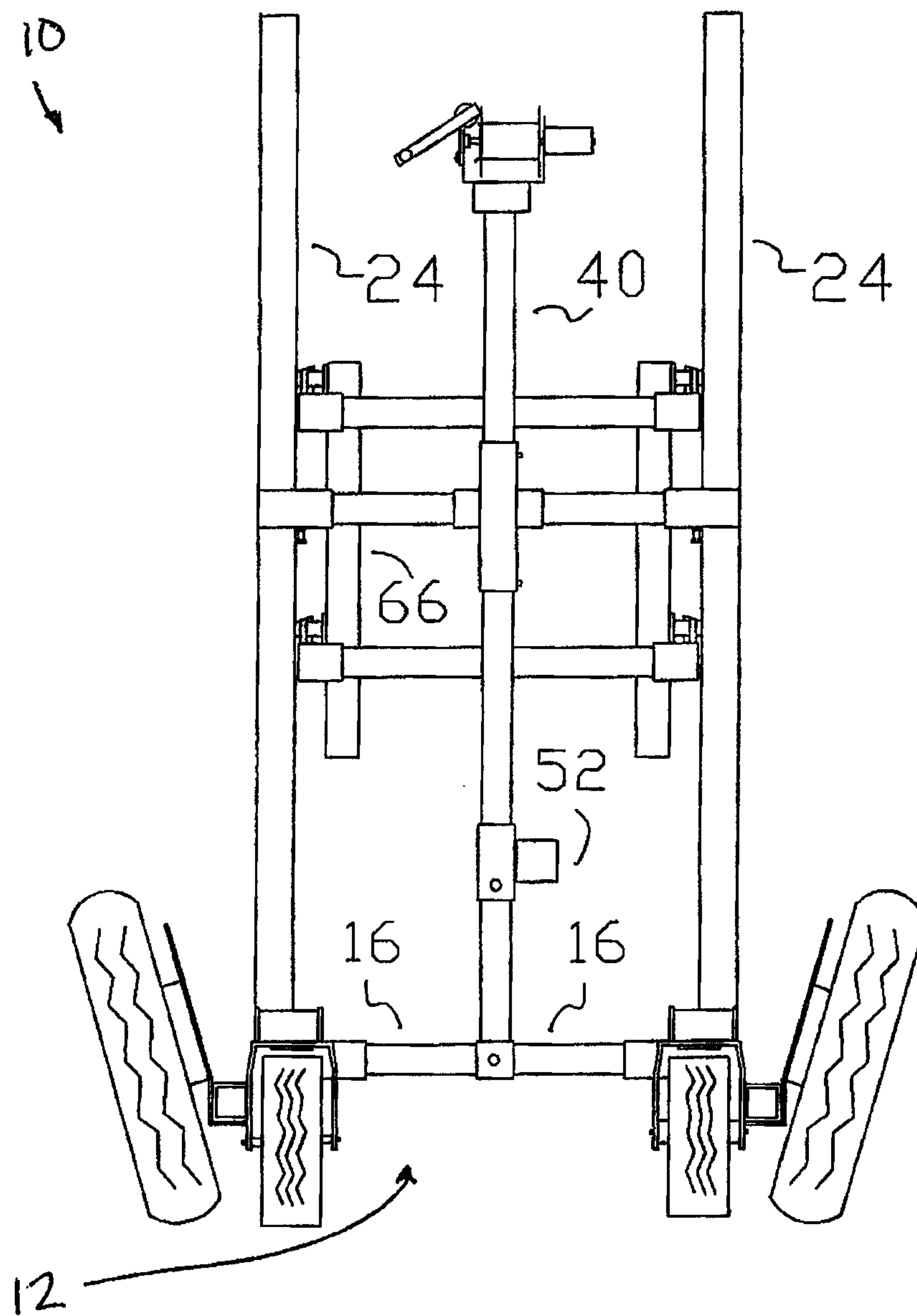
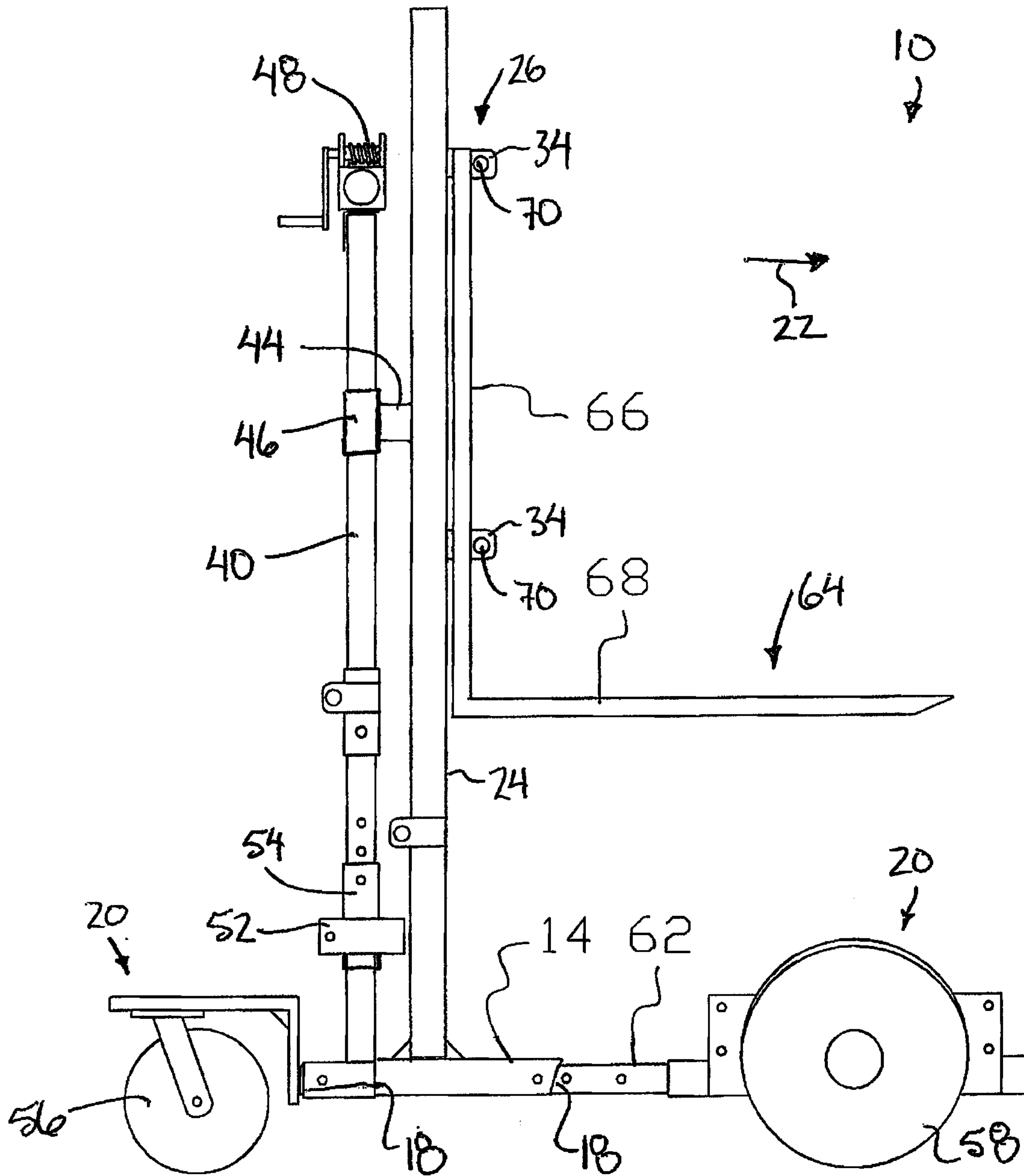


FIG. 4



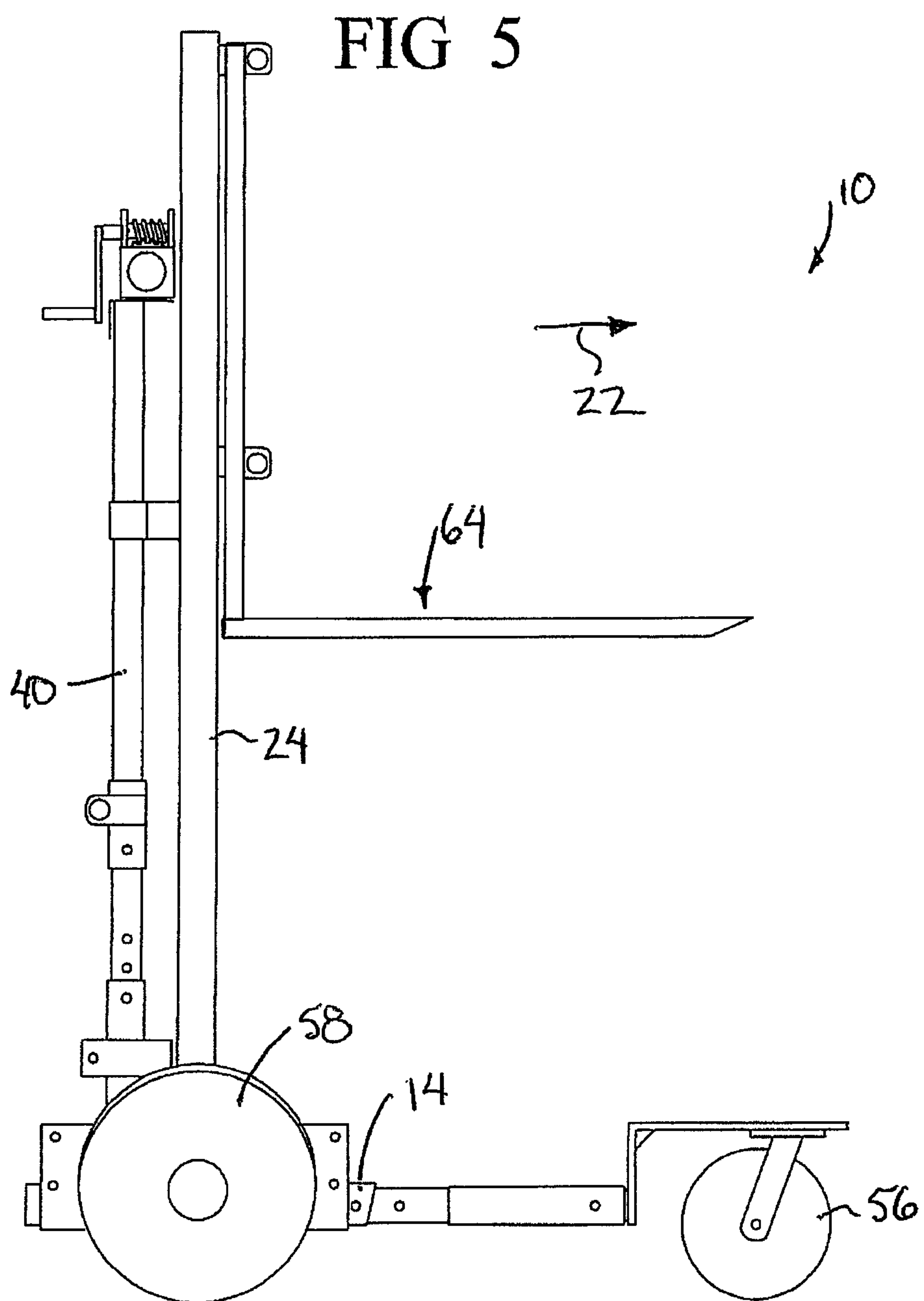


FIG. 6 A

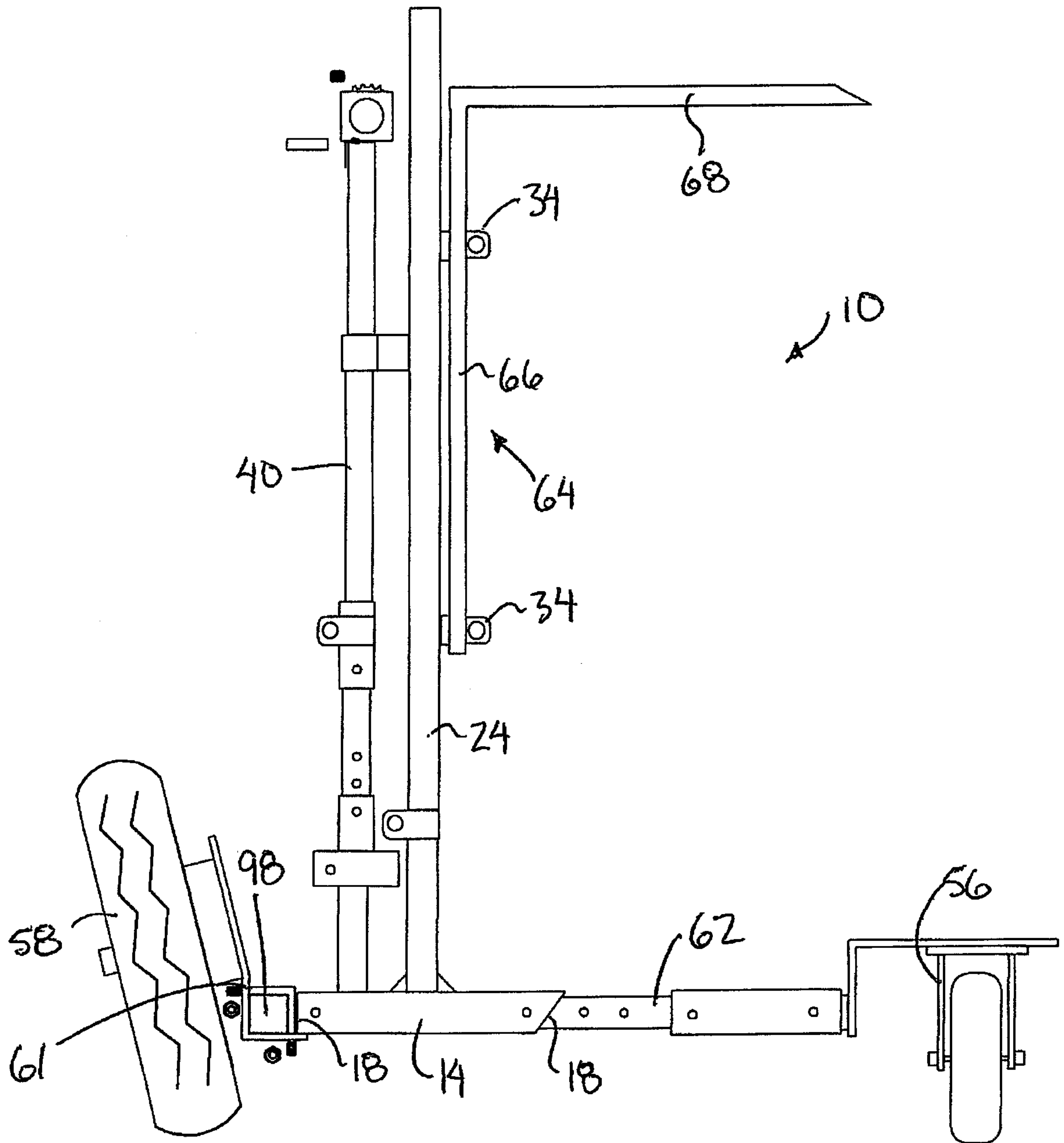


FIG. 6 B

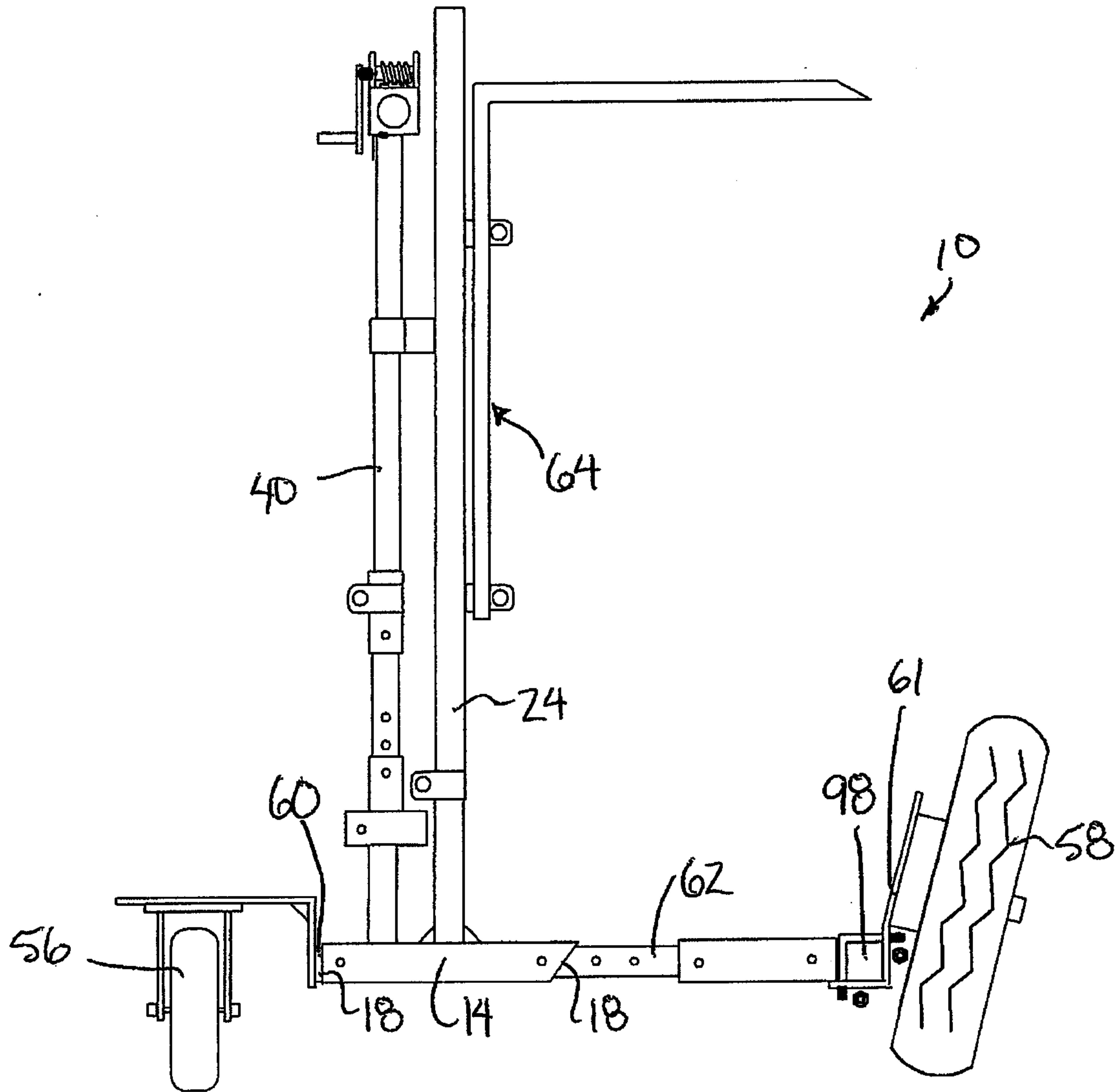


FIG. 7

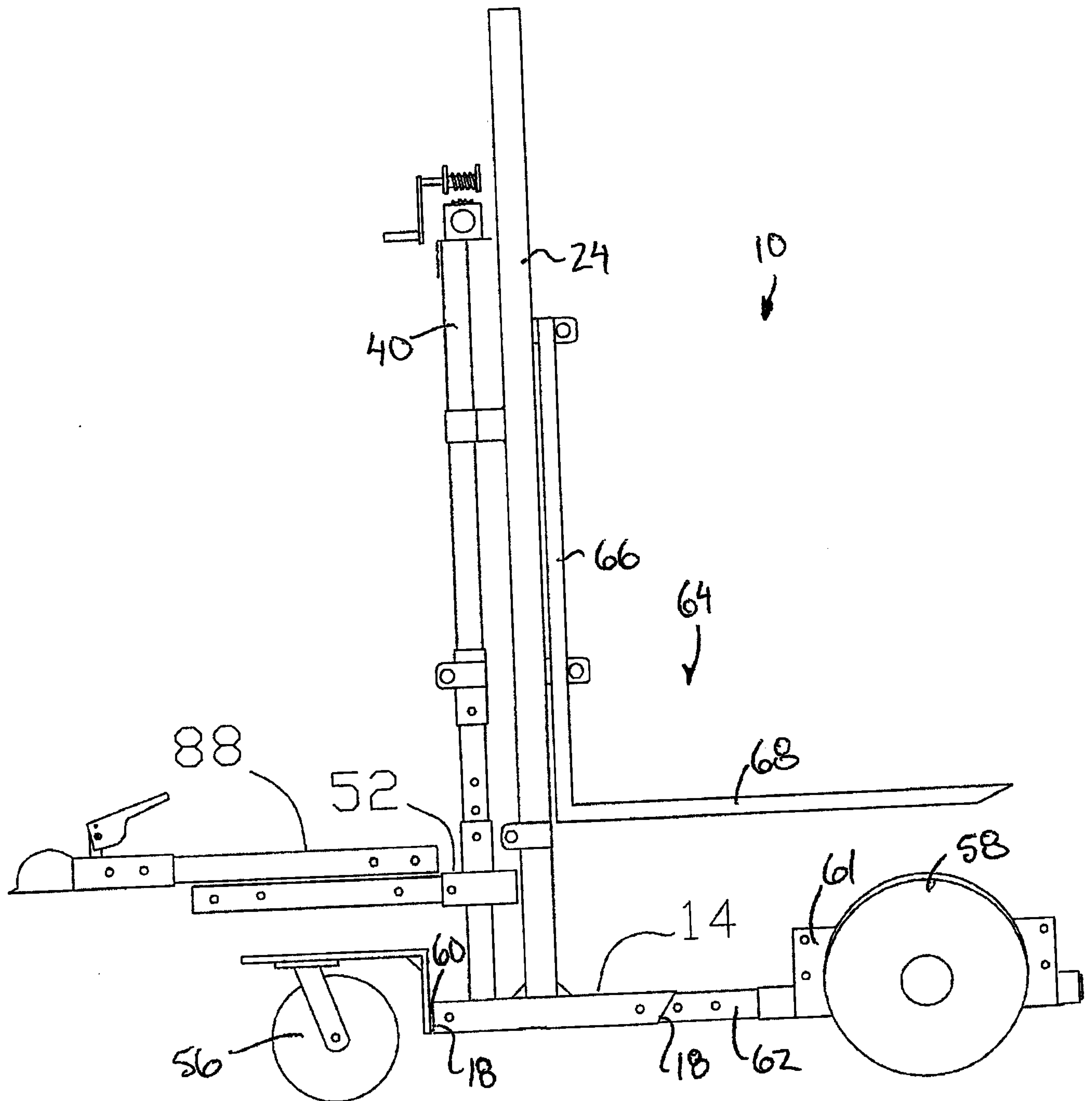


FIG. 8

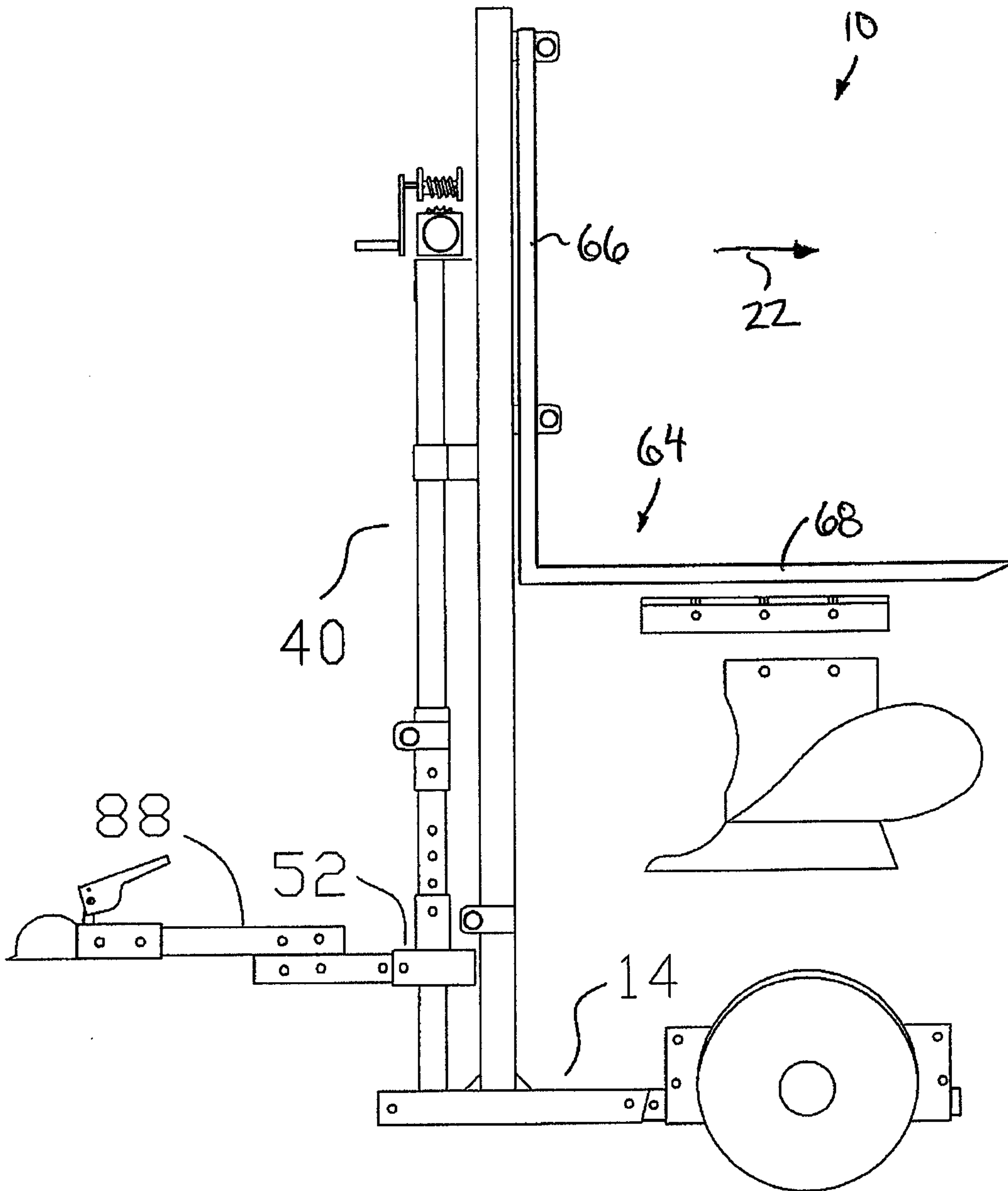


FIG. 9

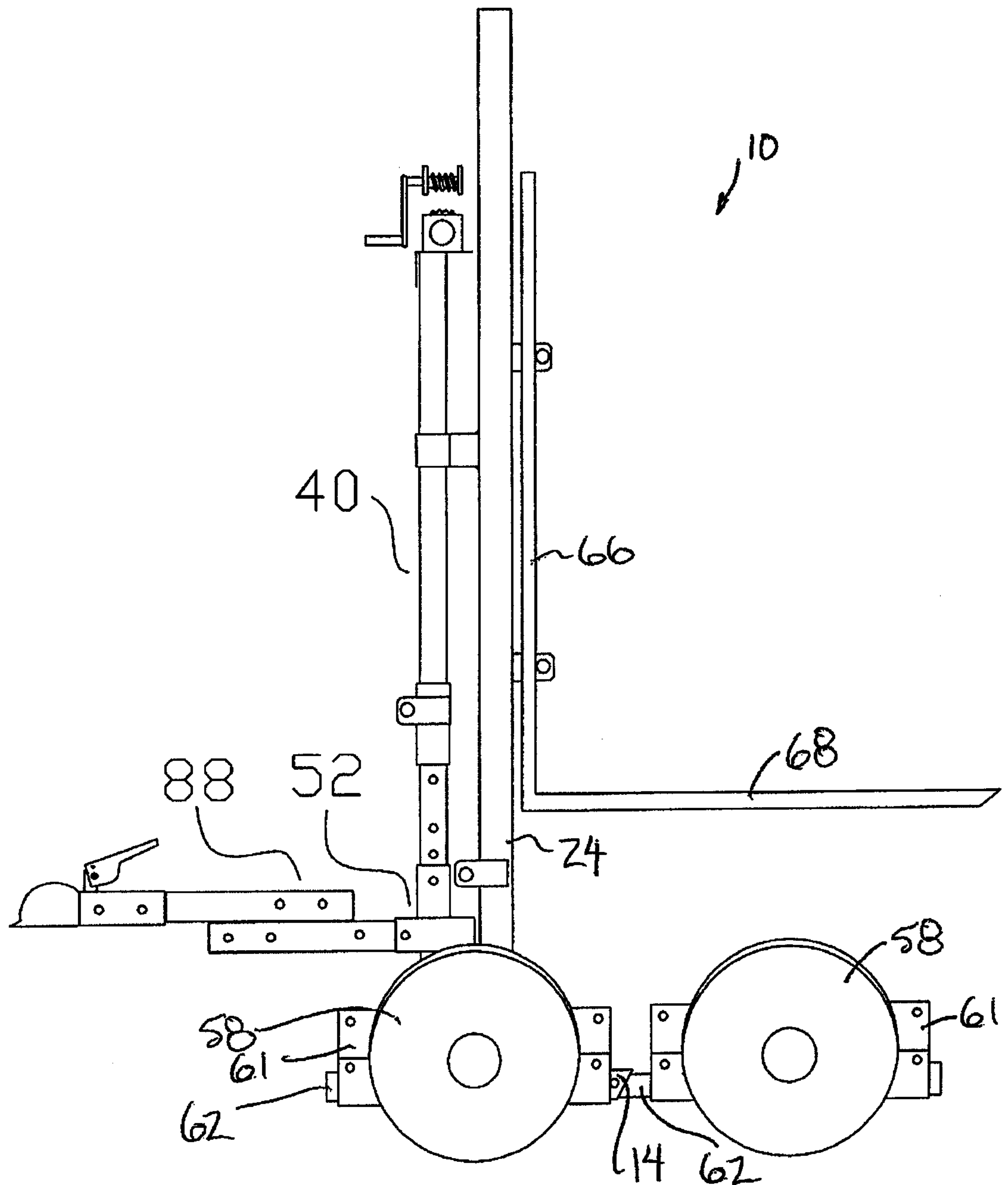


Fig. 10

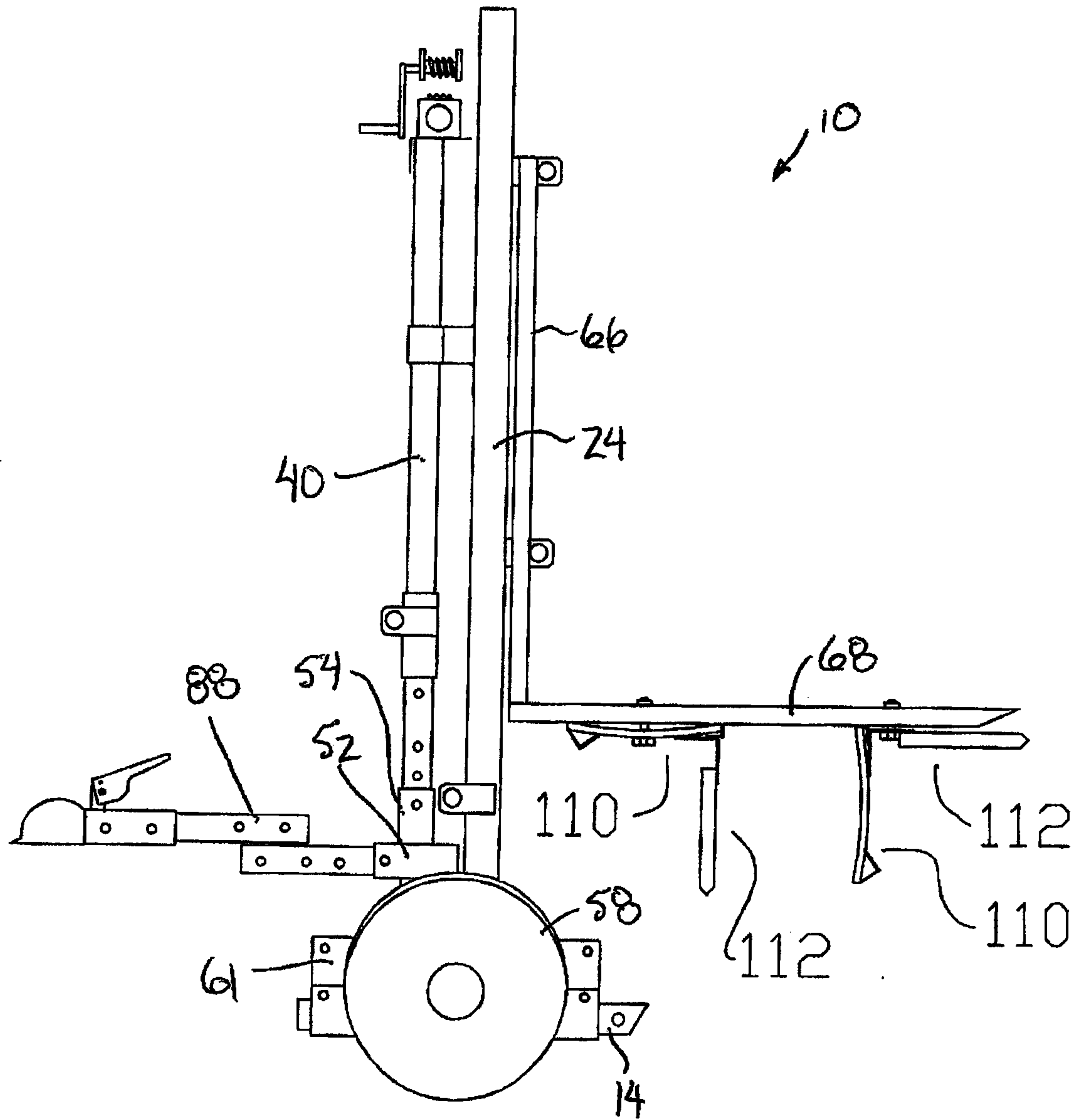


Fig. 11A

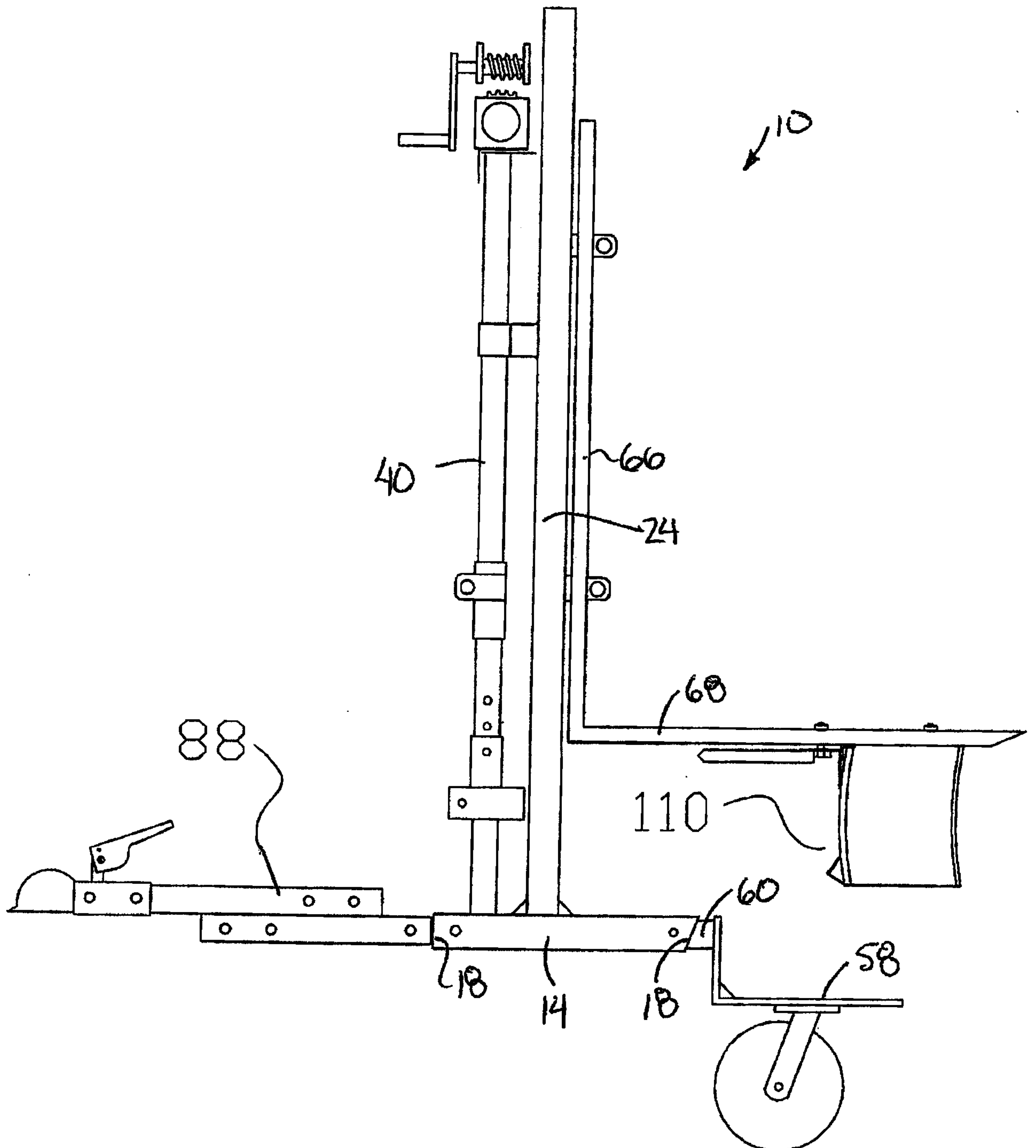


FIG. 1.

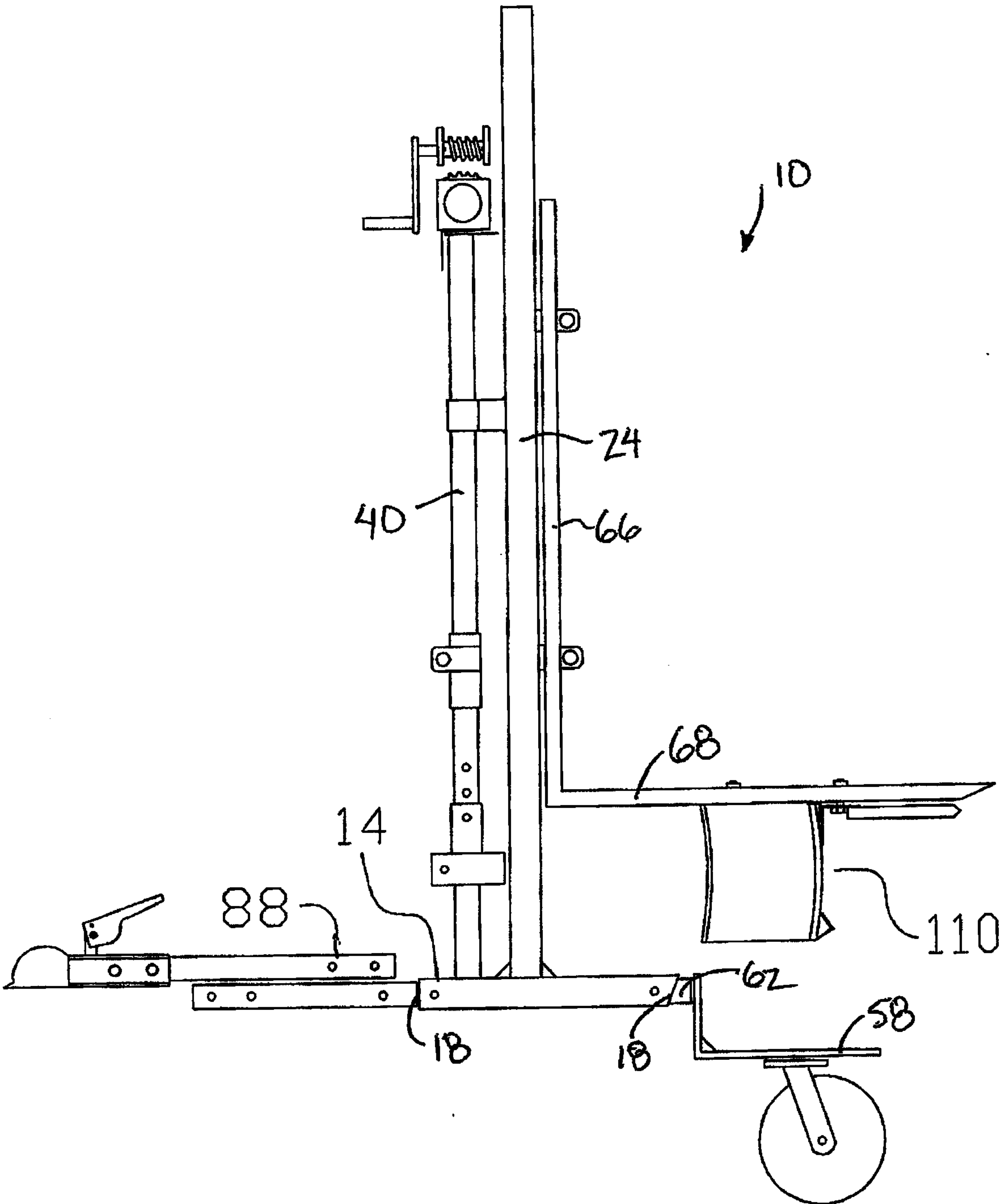


FIG. 12

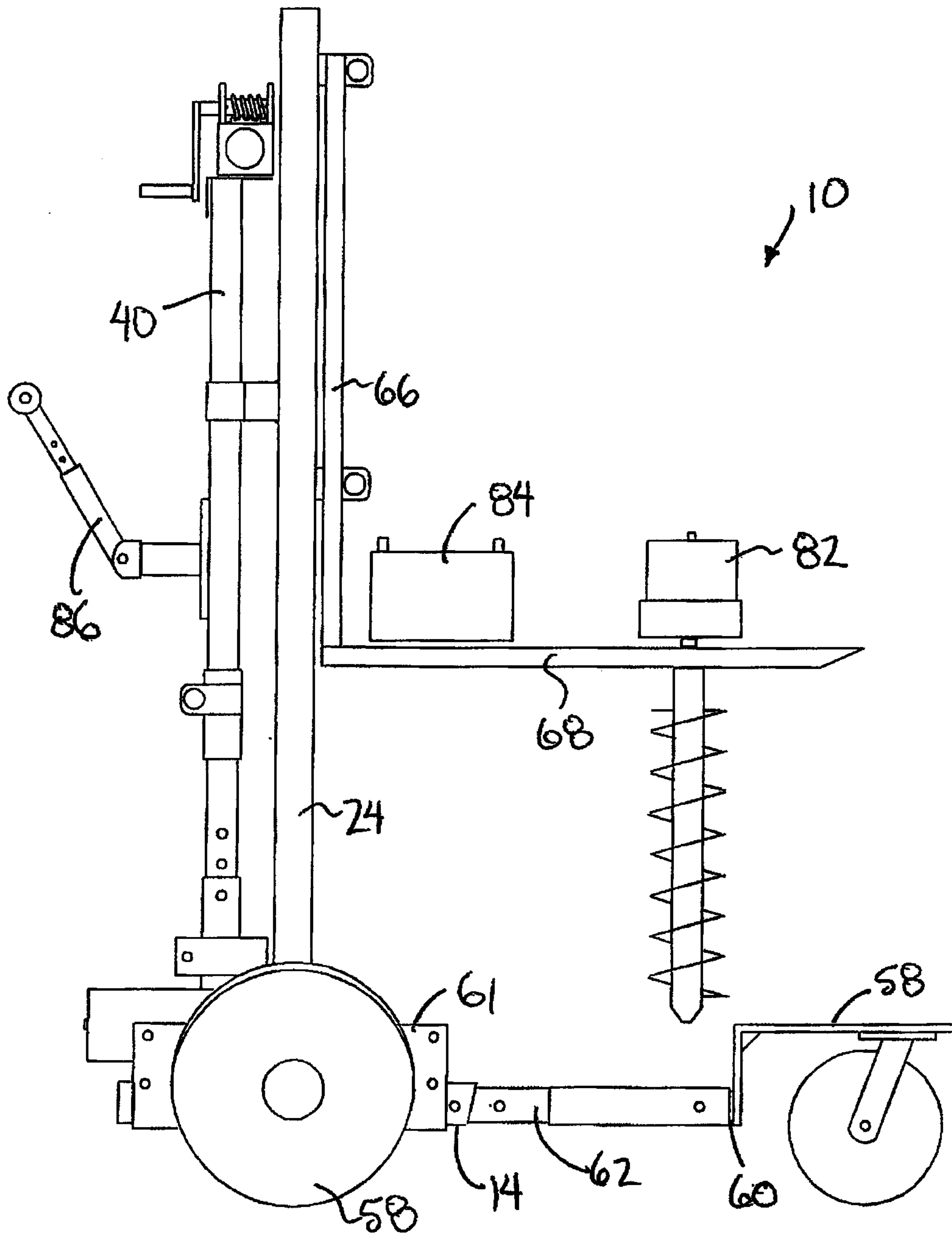


FIG. 13

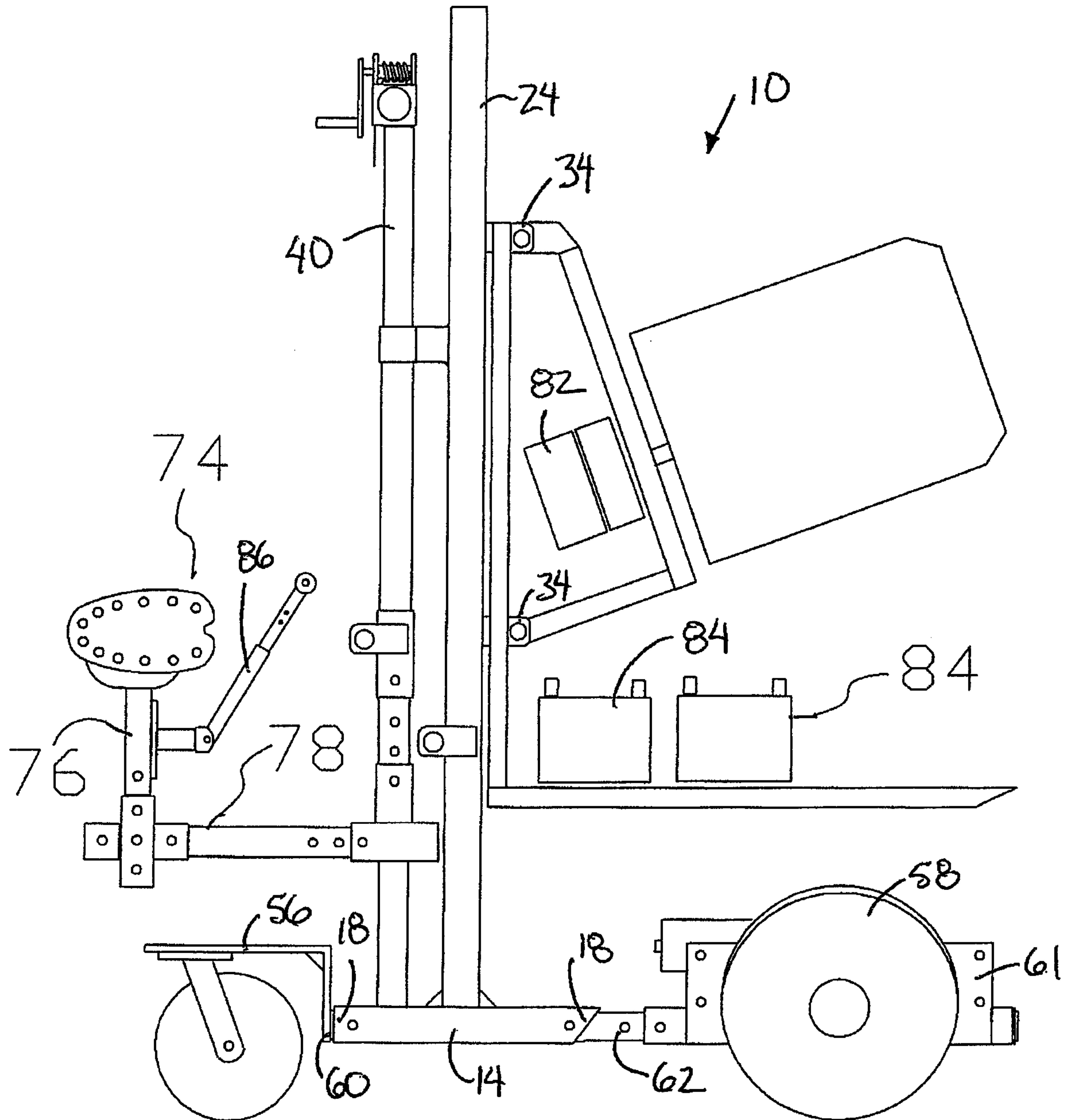


FIG. 14

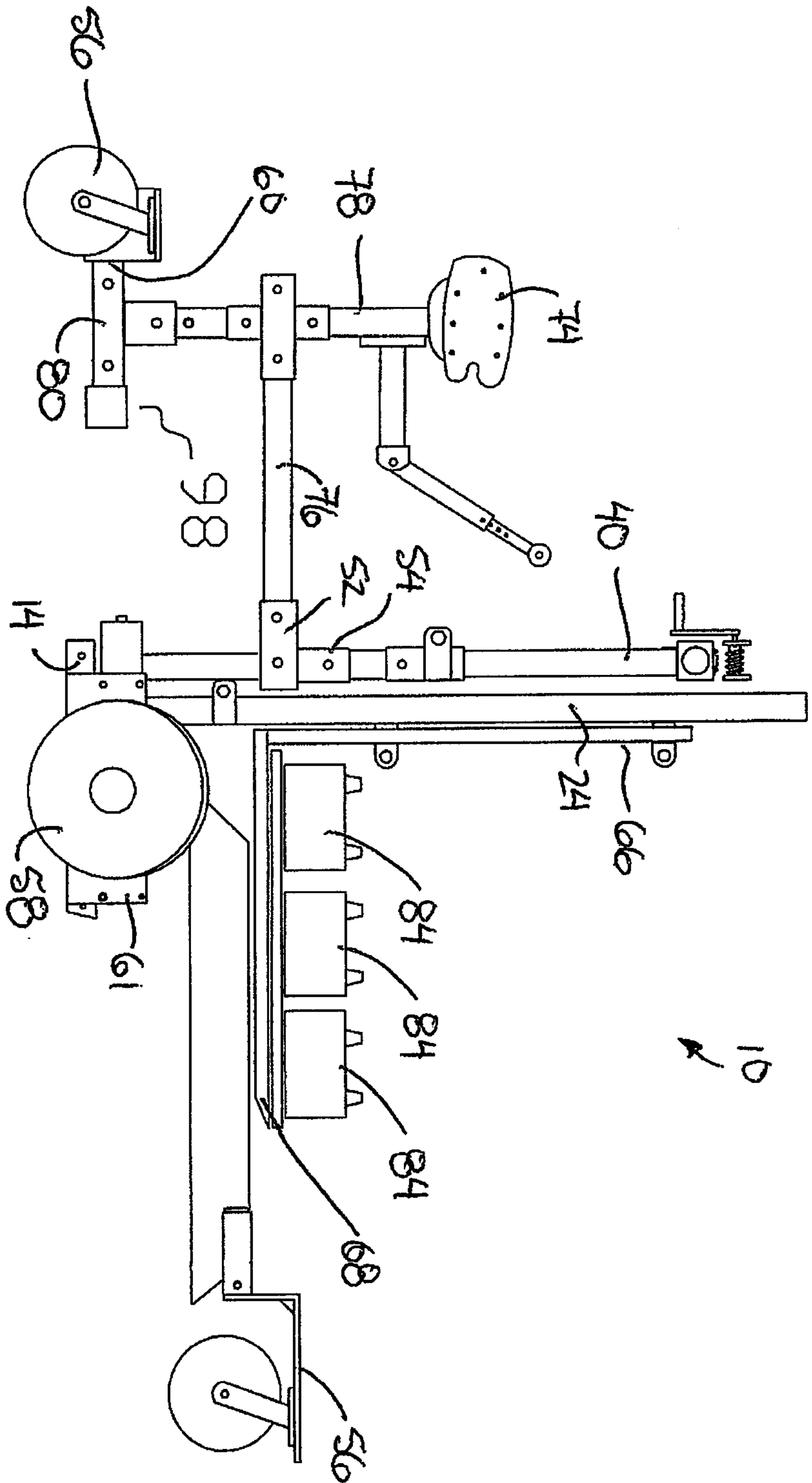


FIG. 15

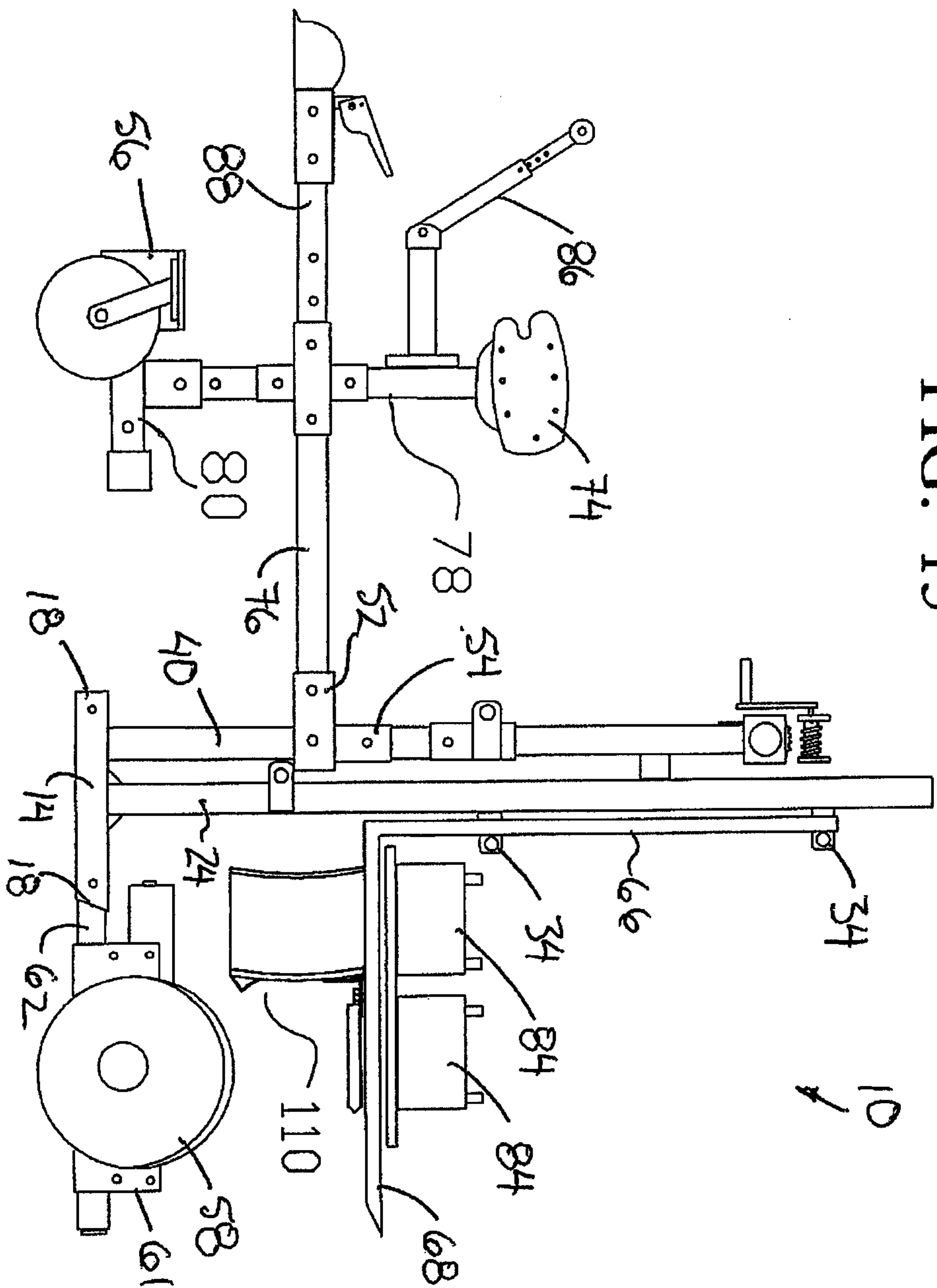


FIG. 16 A

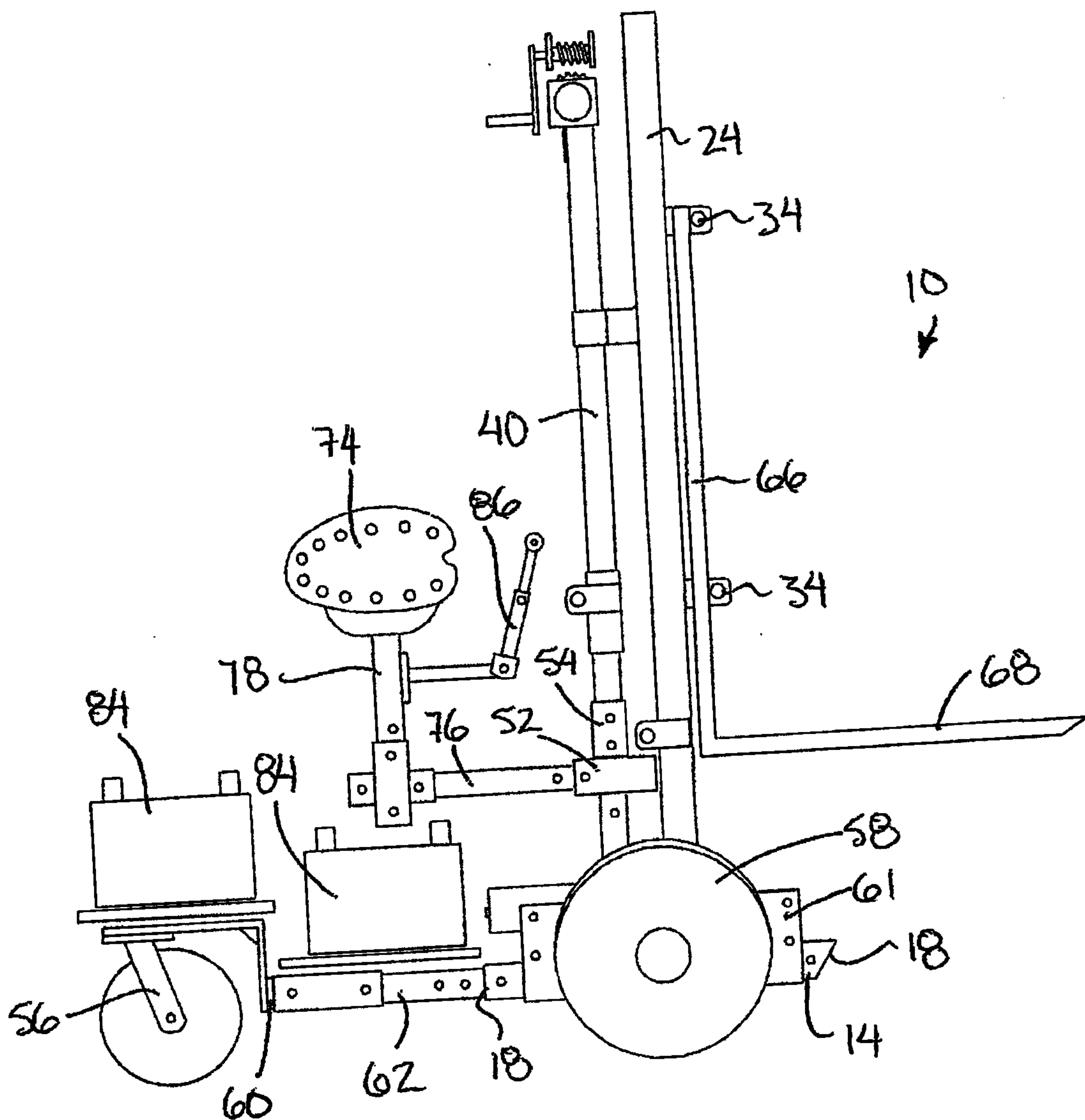


FIG. 17A

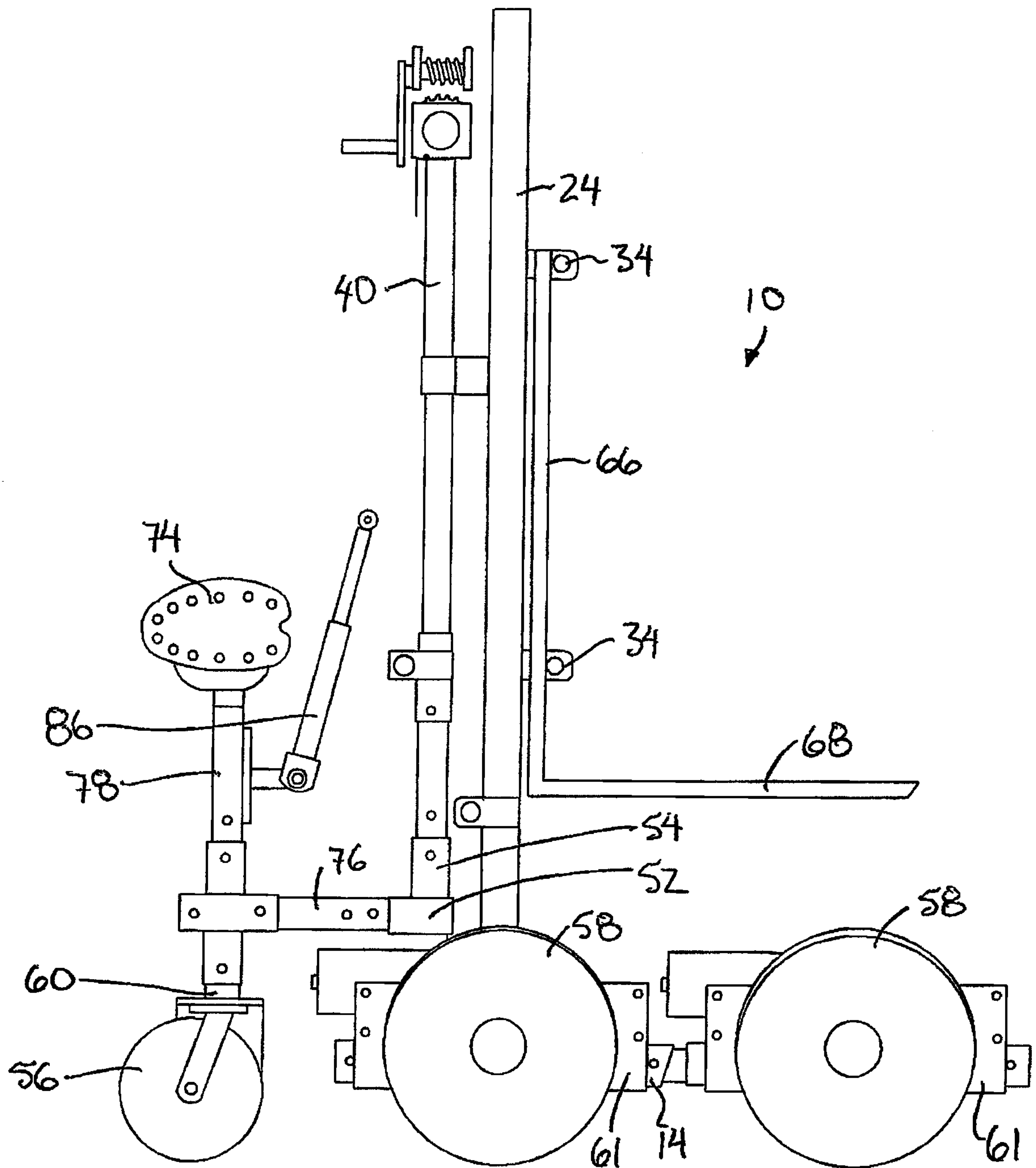


FIG. 17B

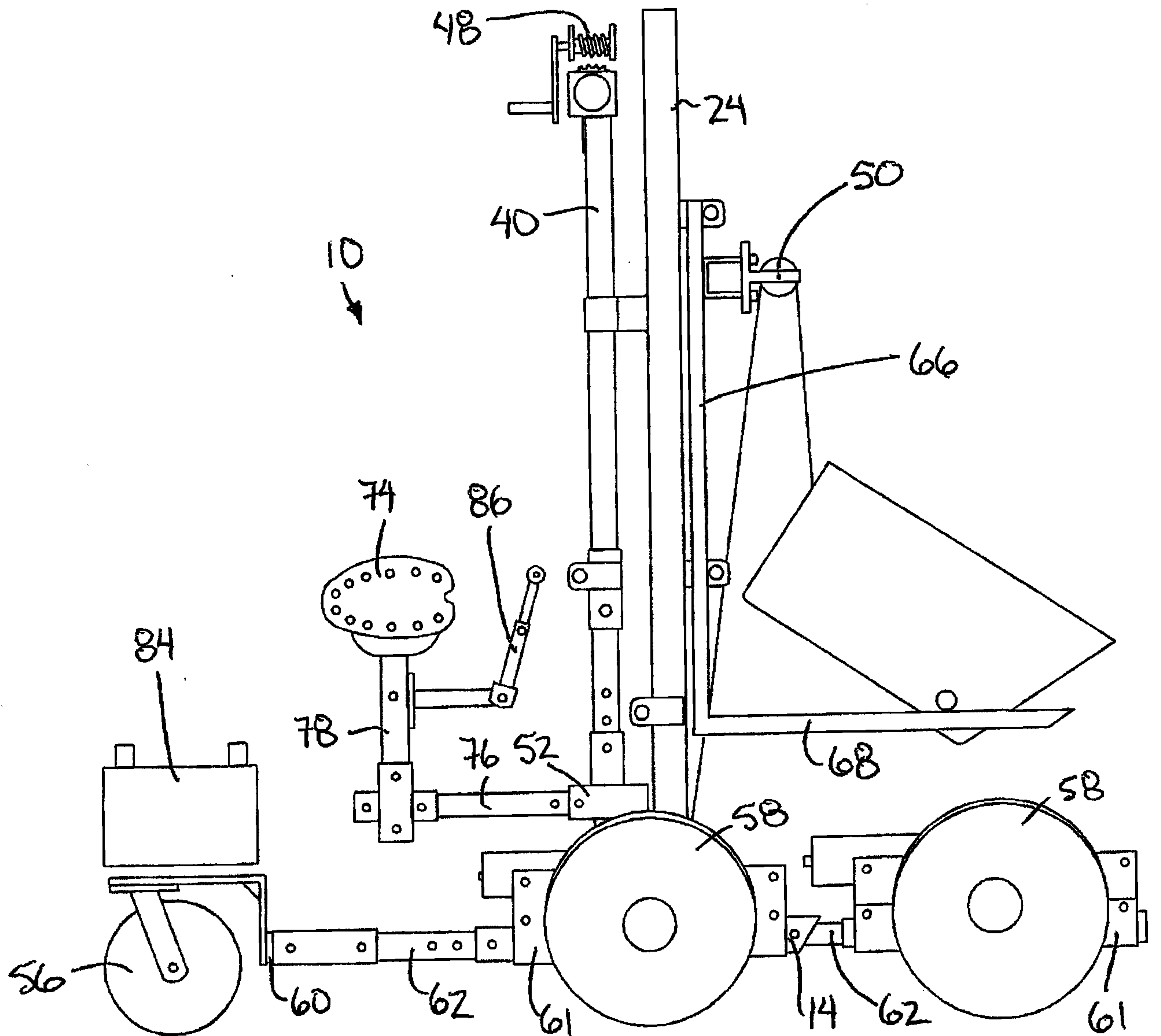


FIG. 17C

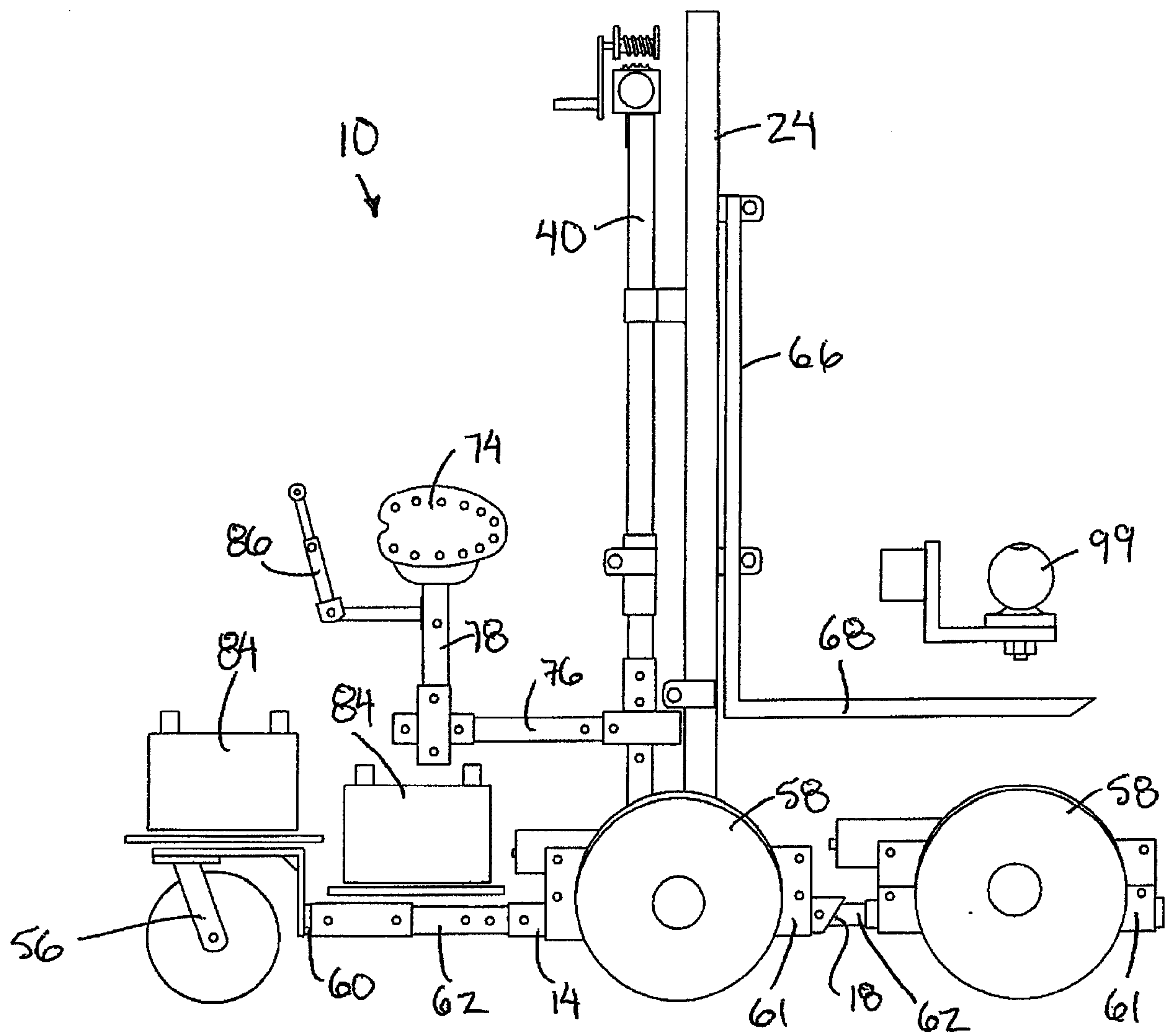


FIG. 18

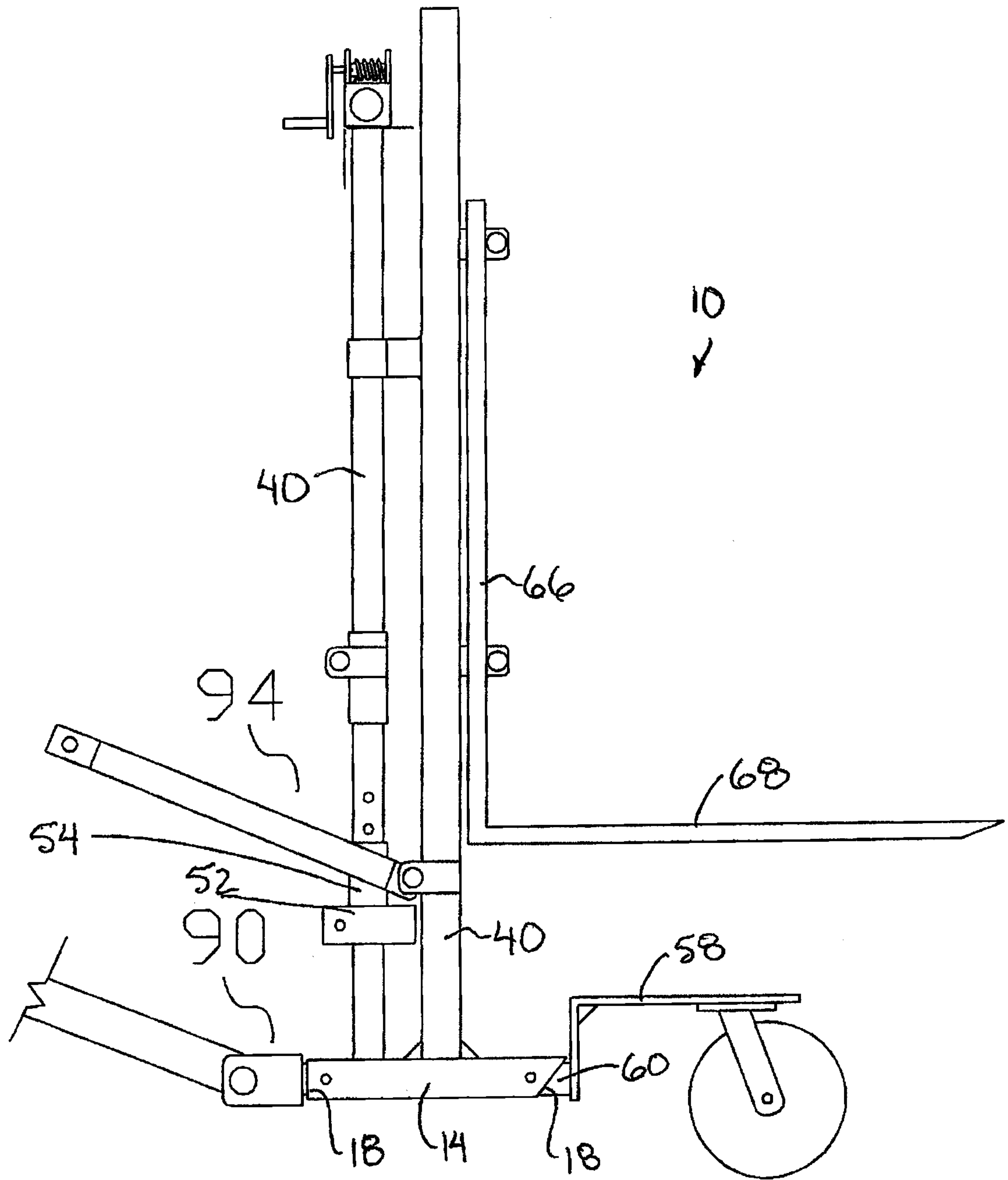


FIG. 19

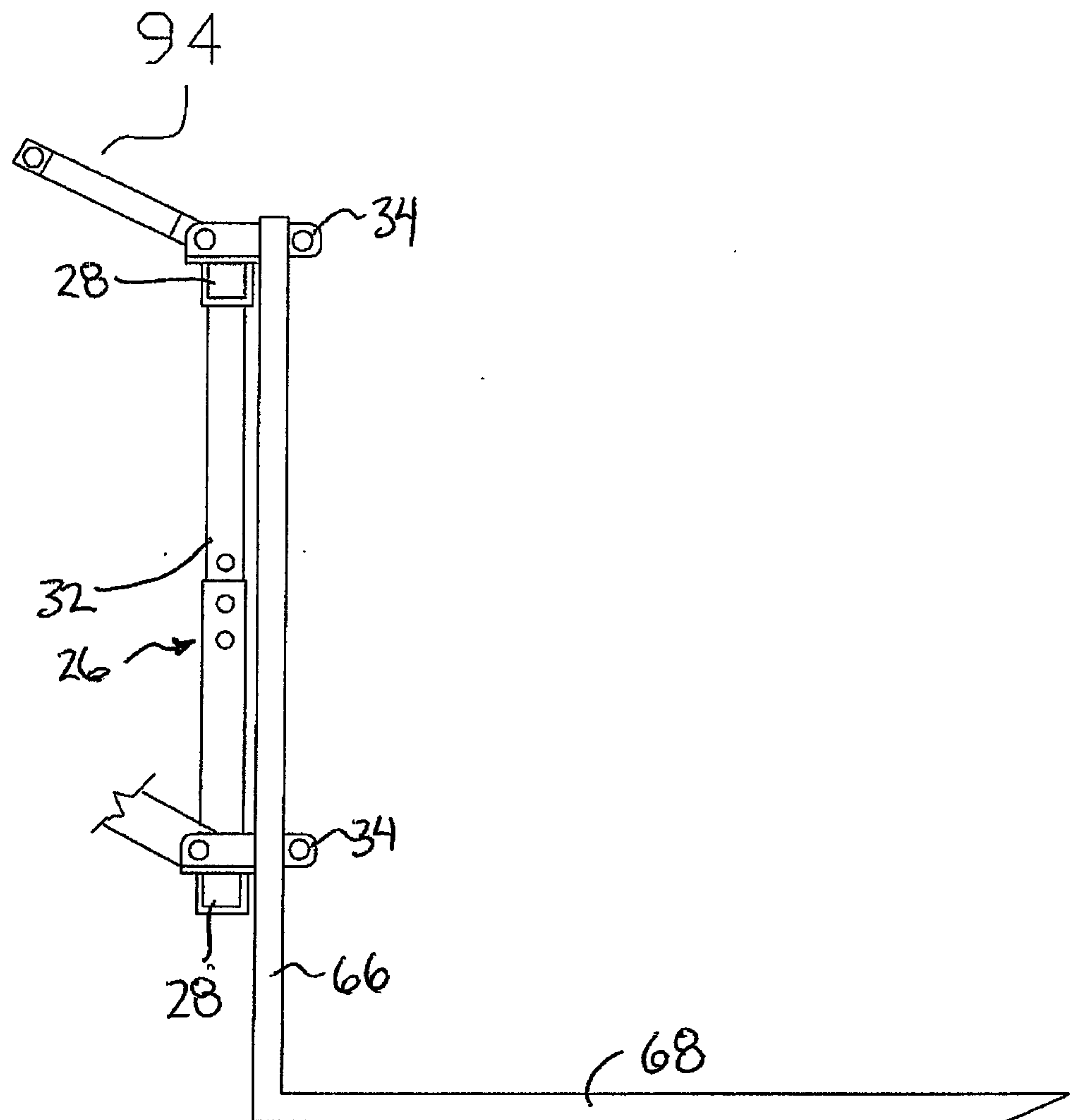
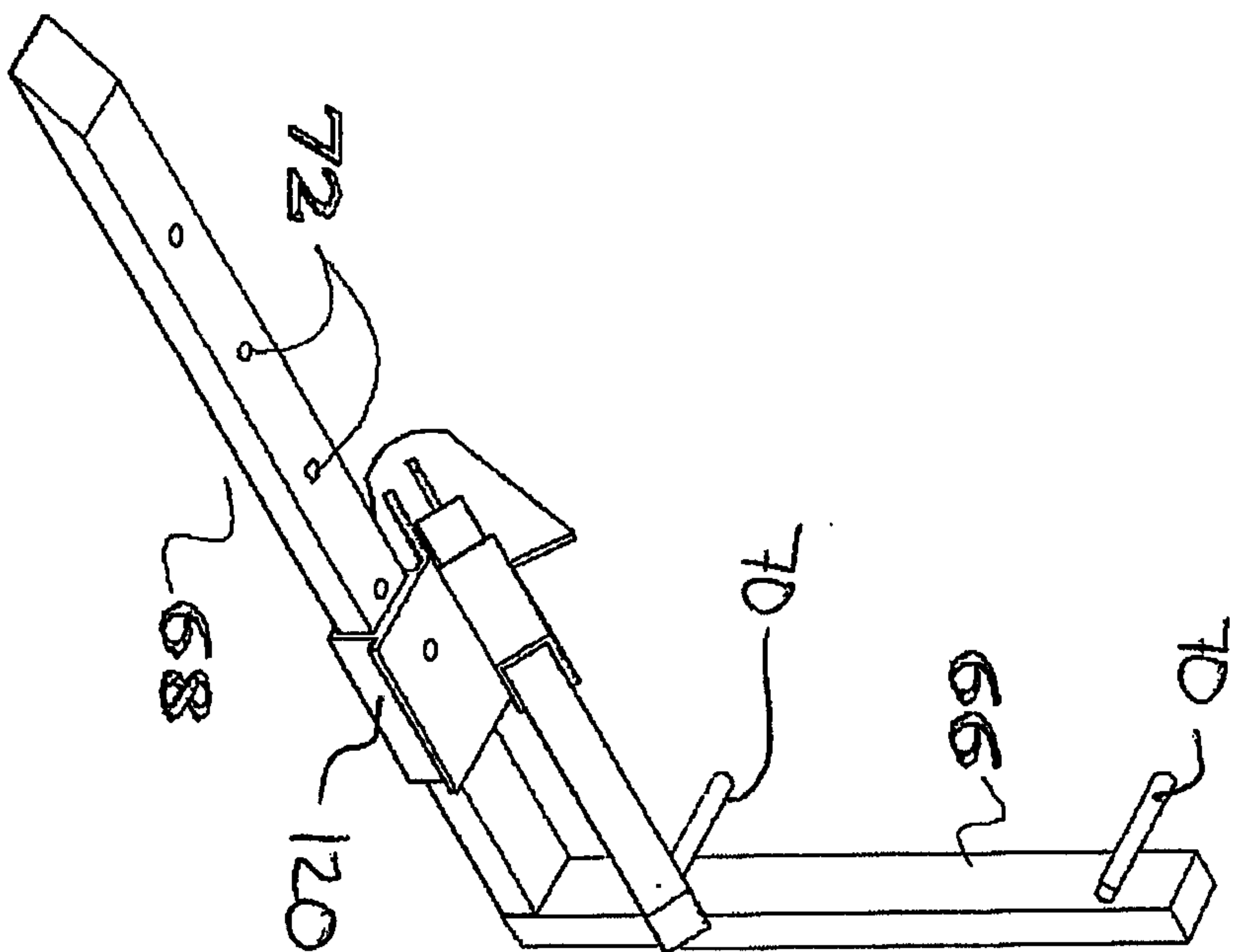
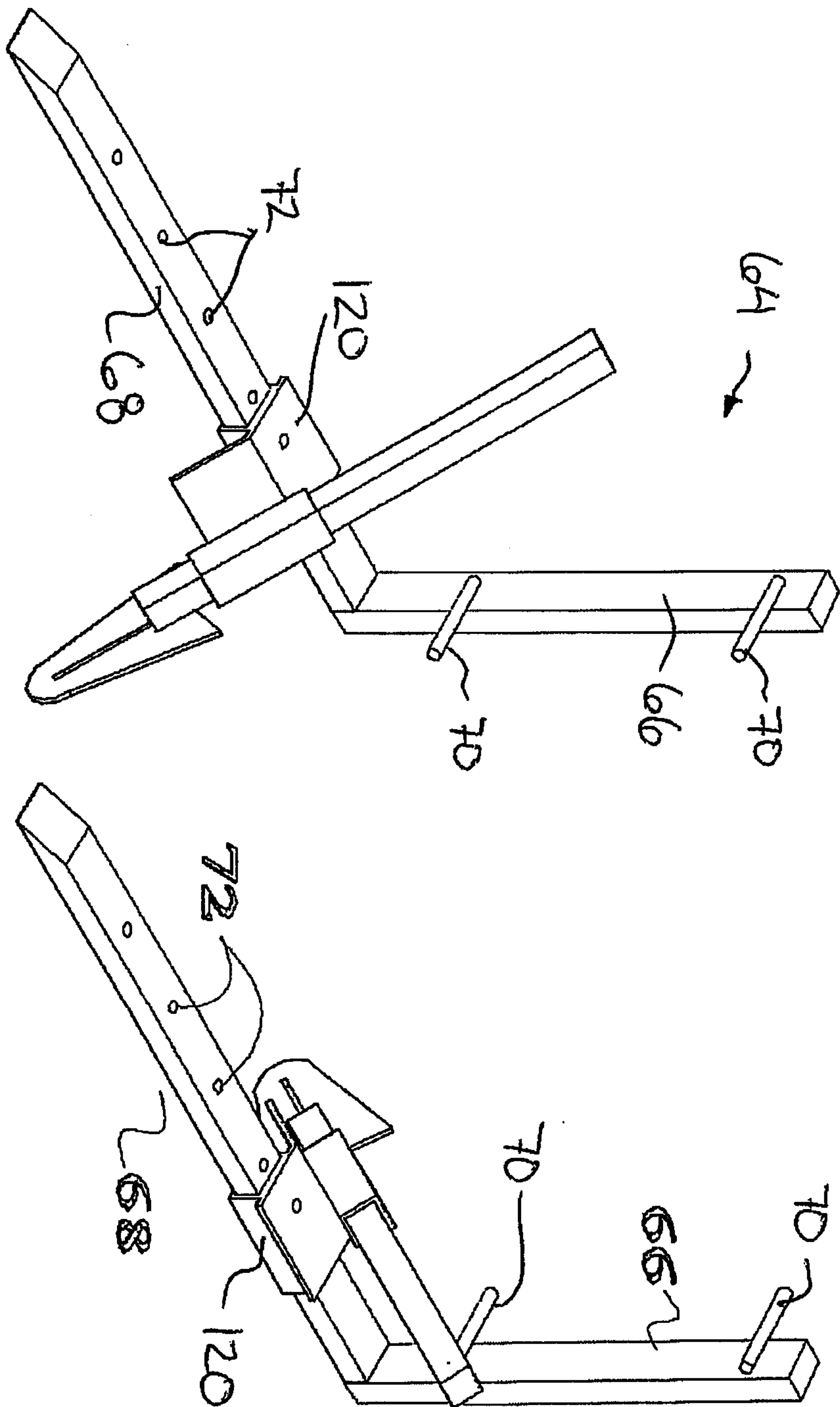


FIG. 20



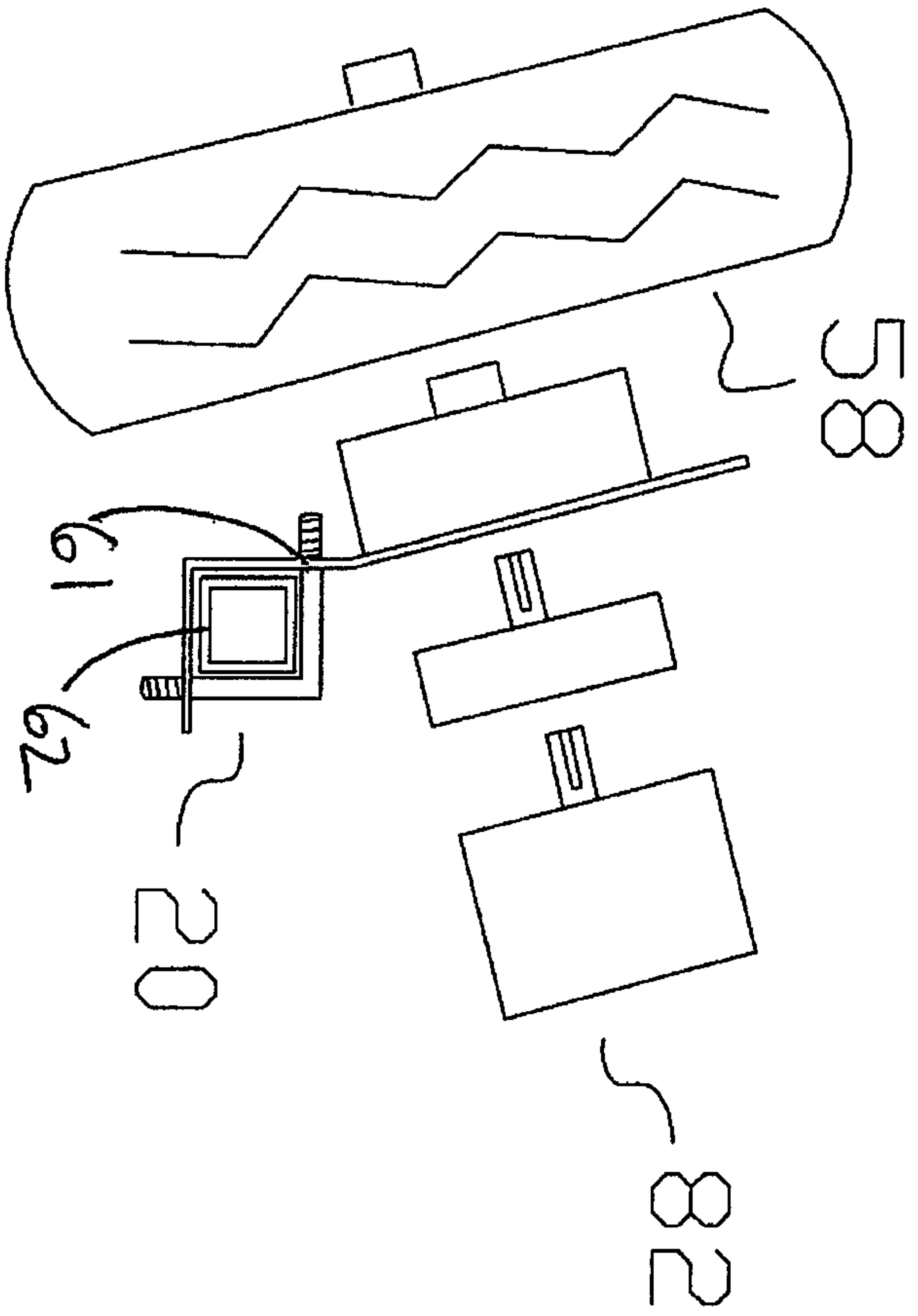


FIG. 21A

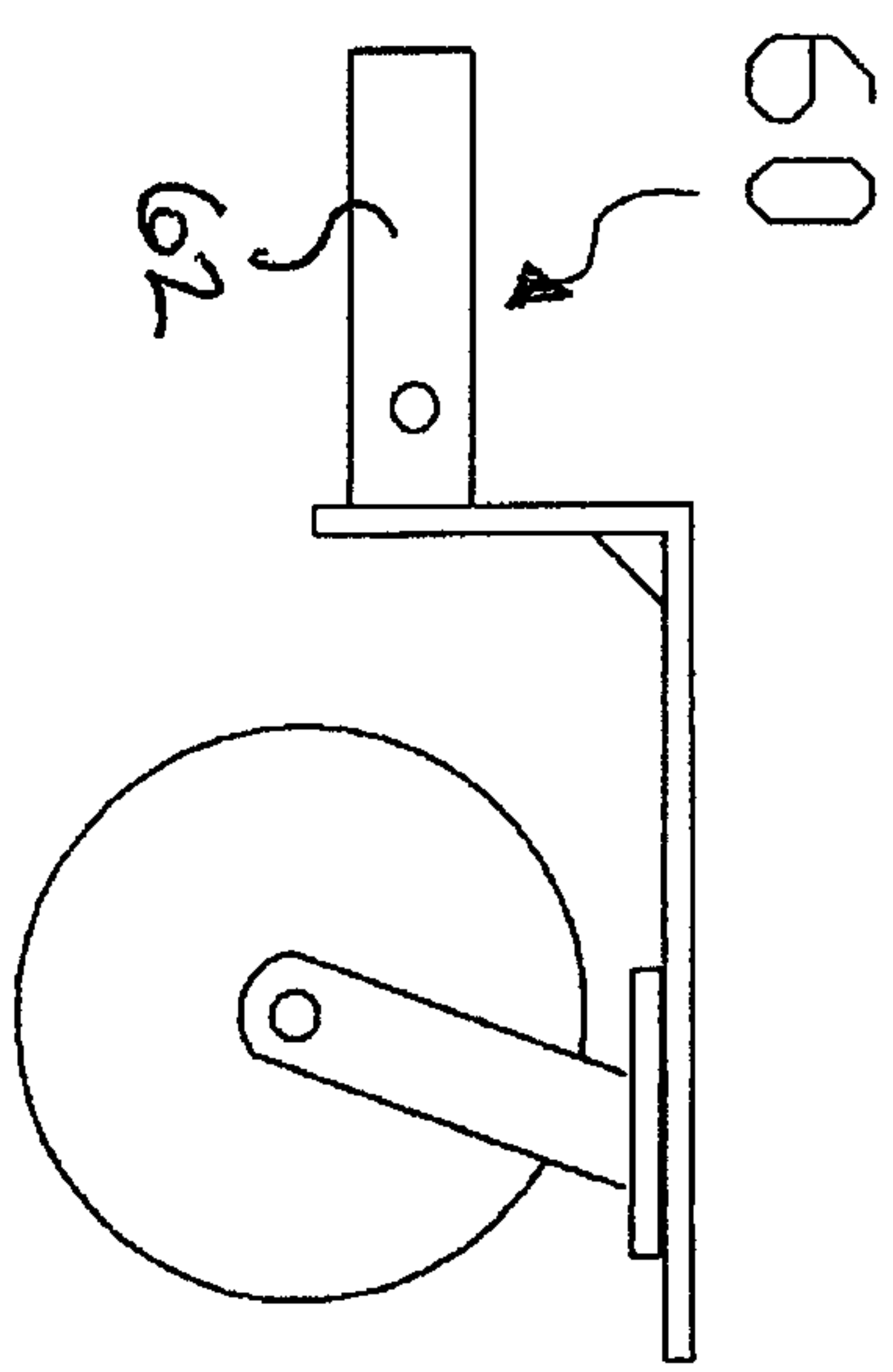


FIG. 21B

