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Figure 1

PRIOR ART

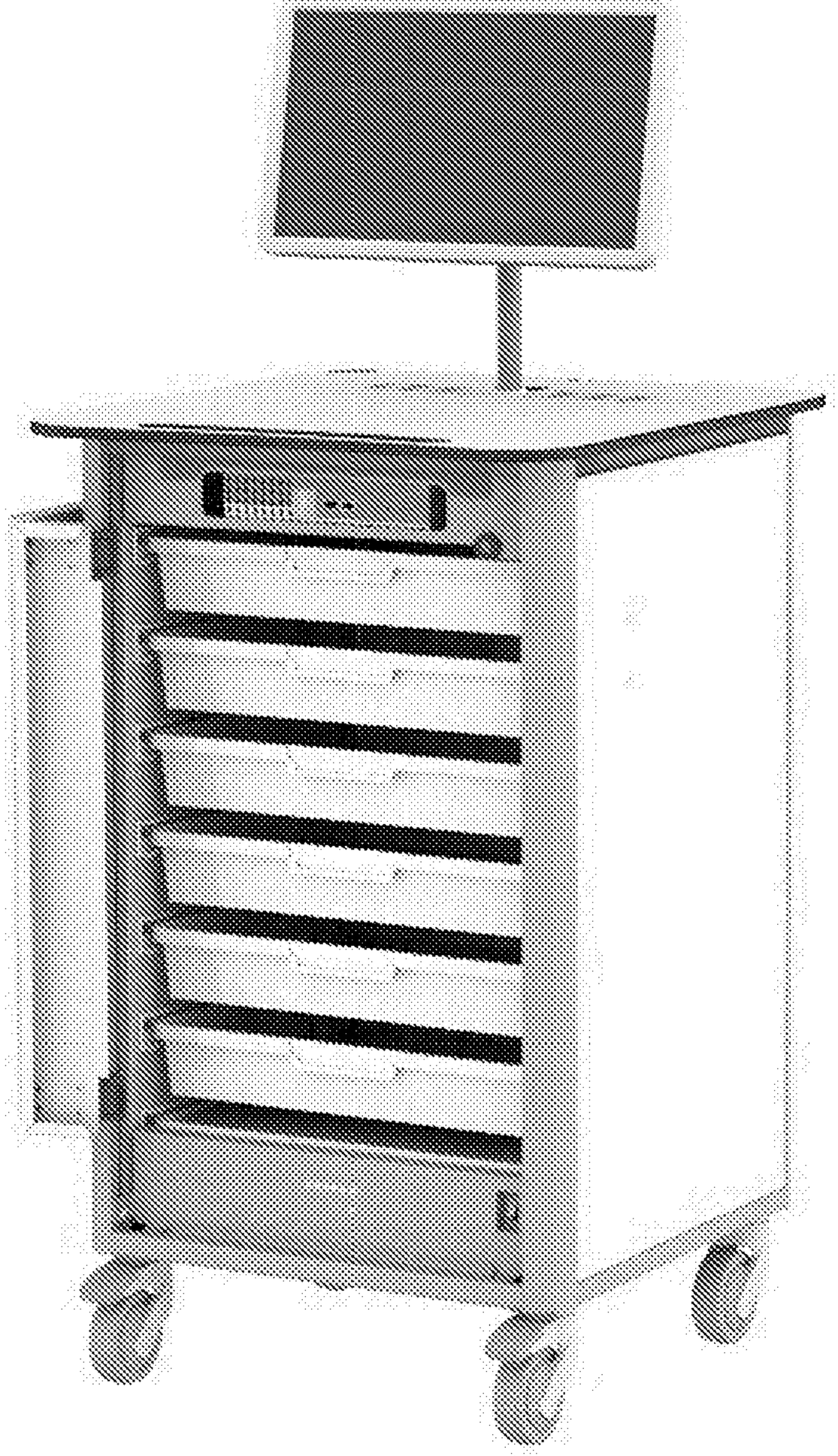

Figure 2

PRIOR ART

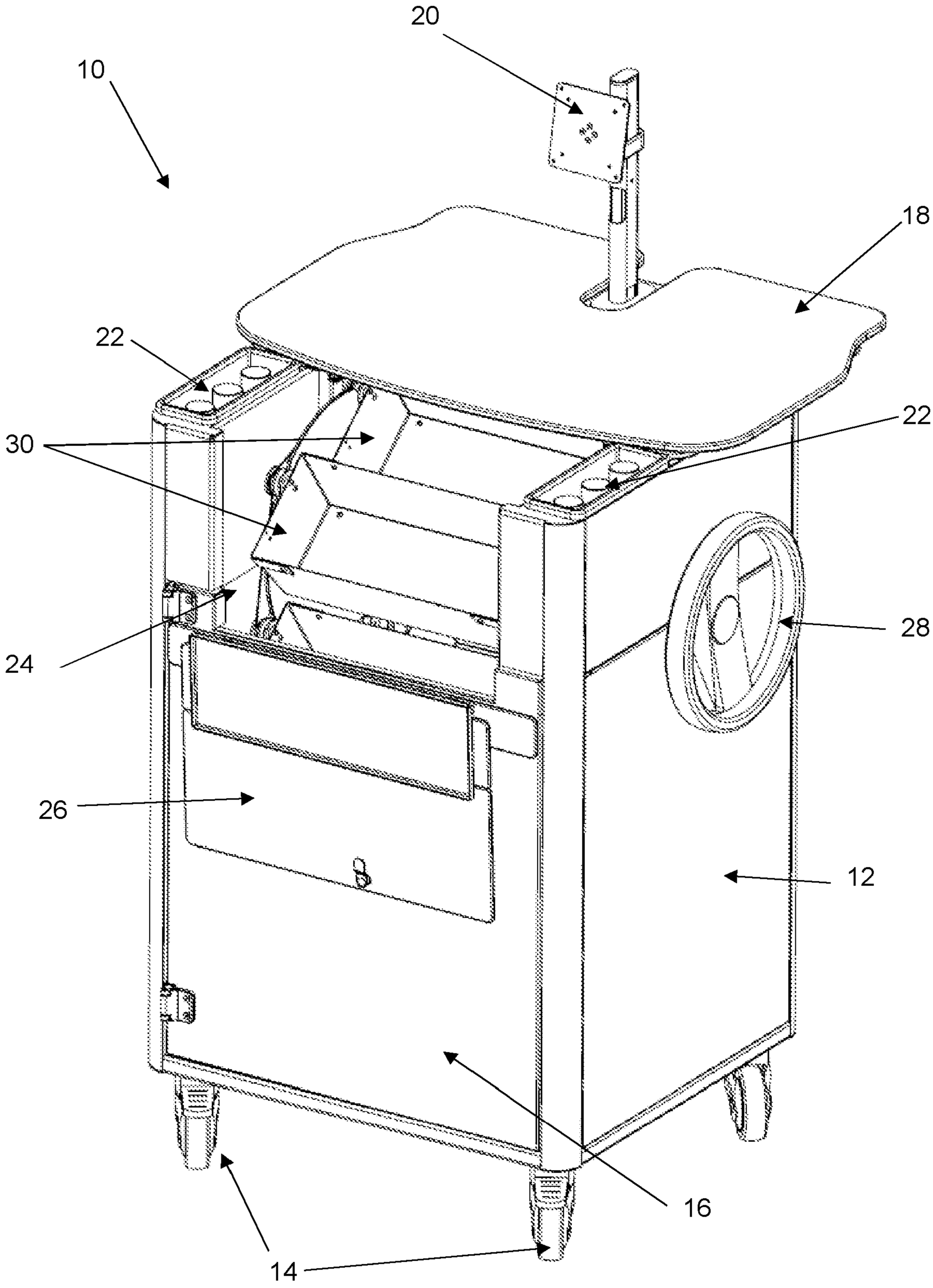

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Figure 3

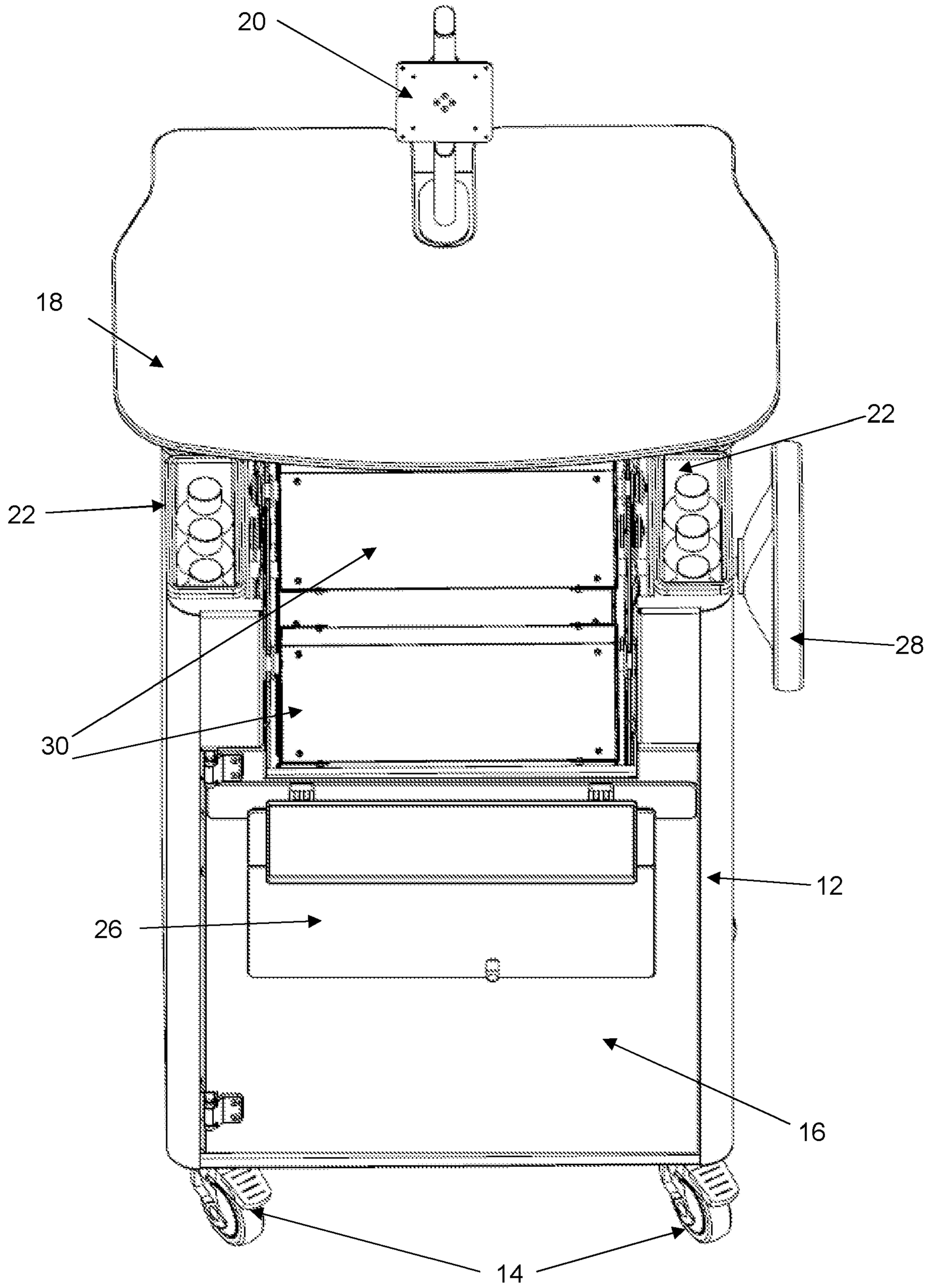

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Figure 4

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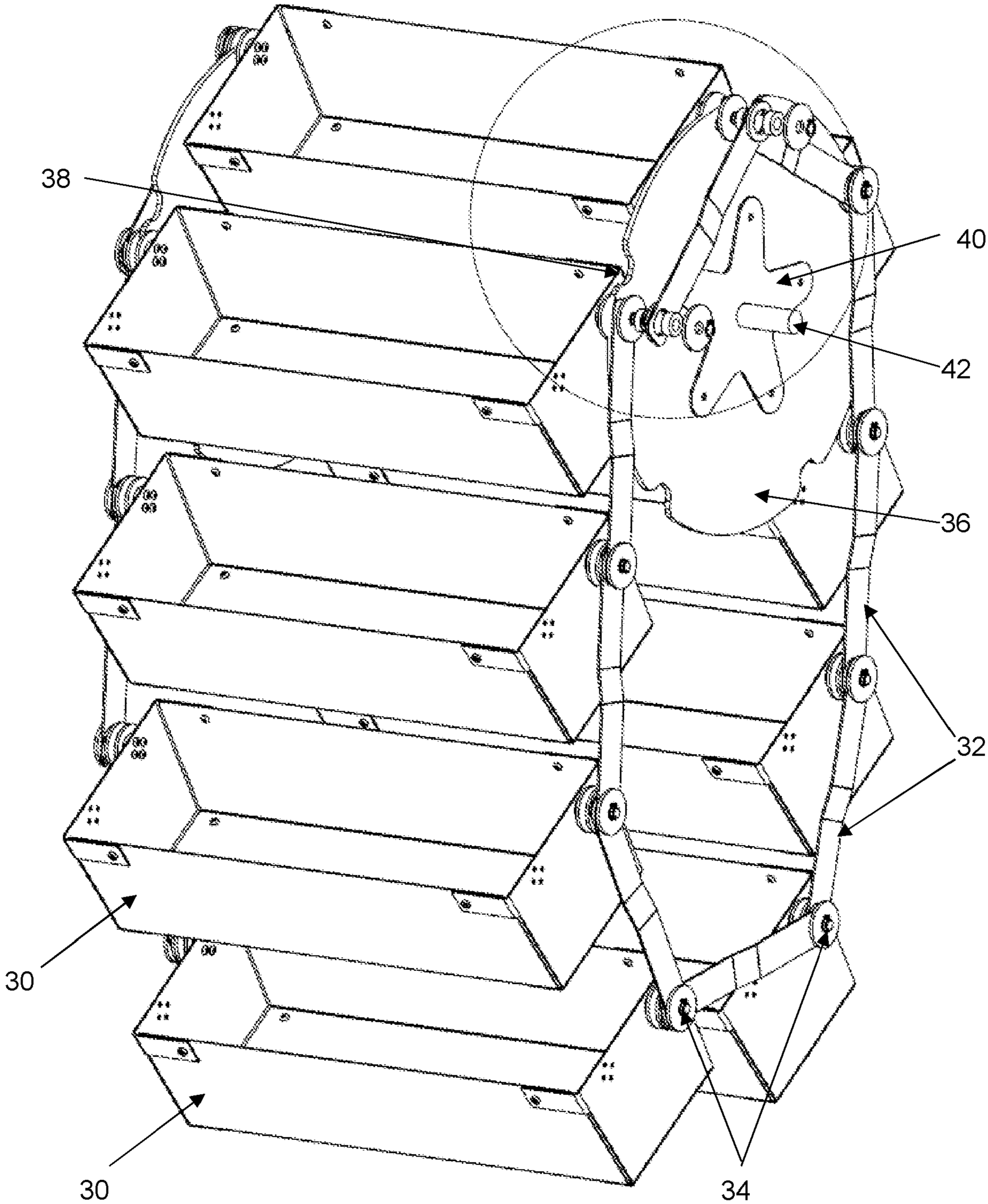

Figure 5

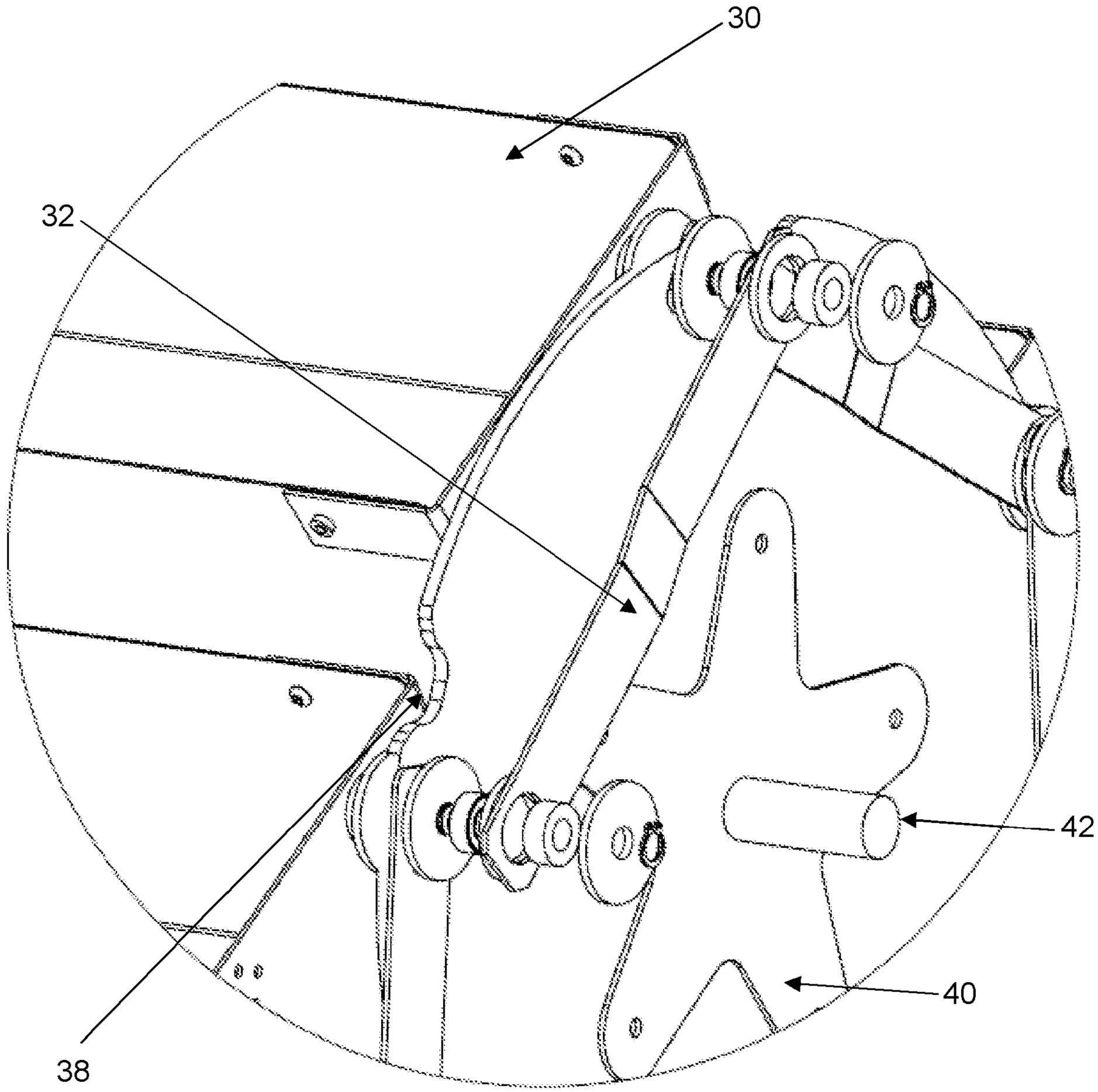

Figure 6

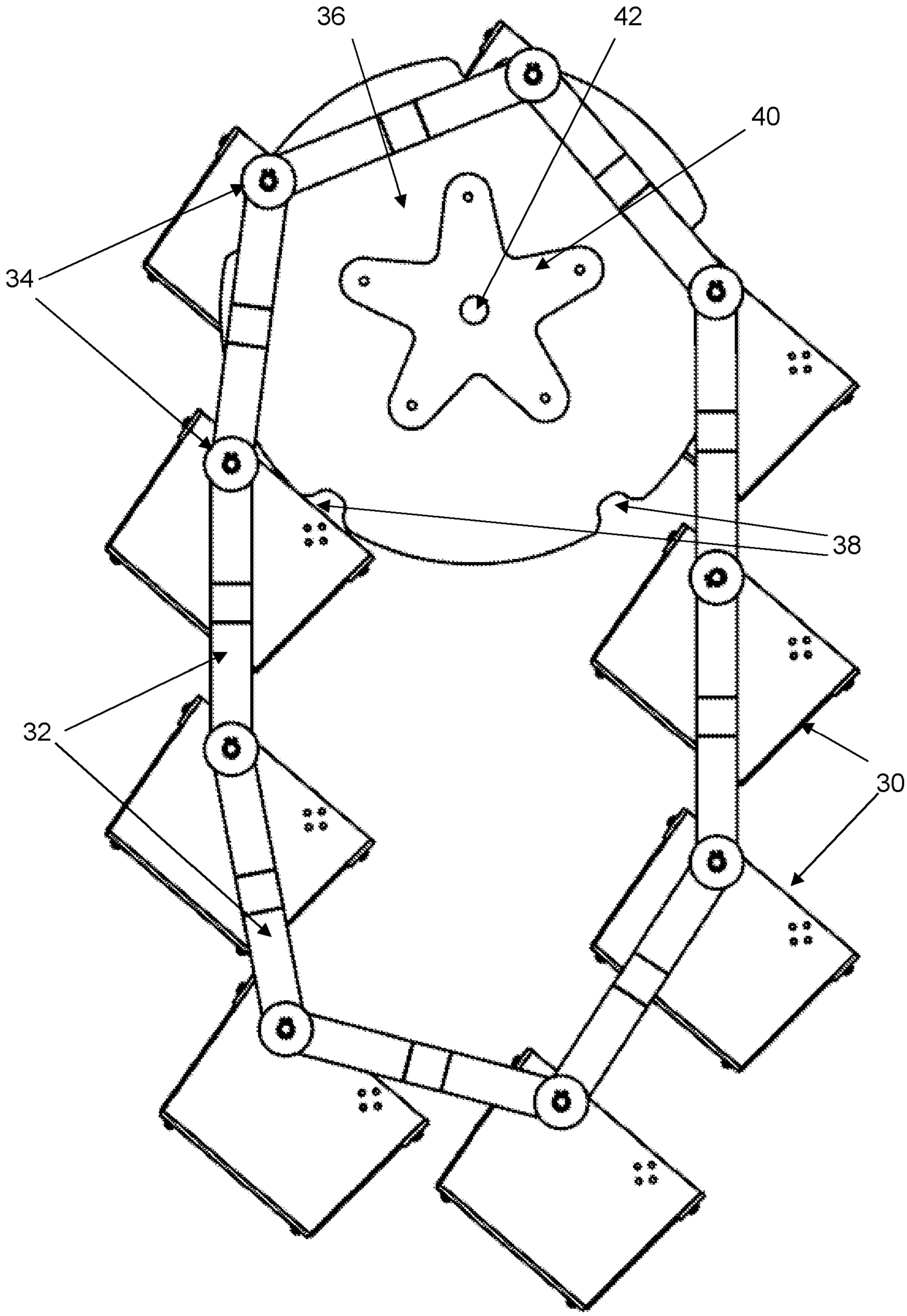

Figure 7

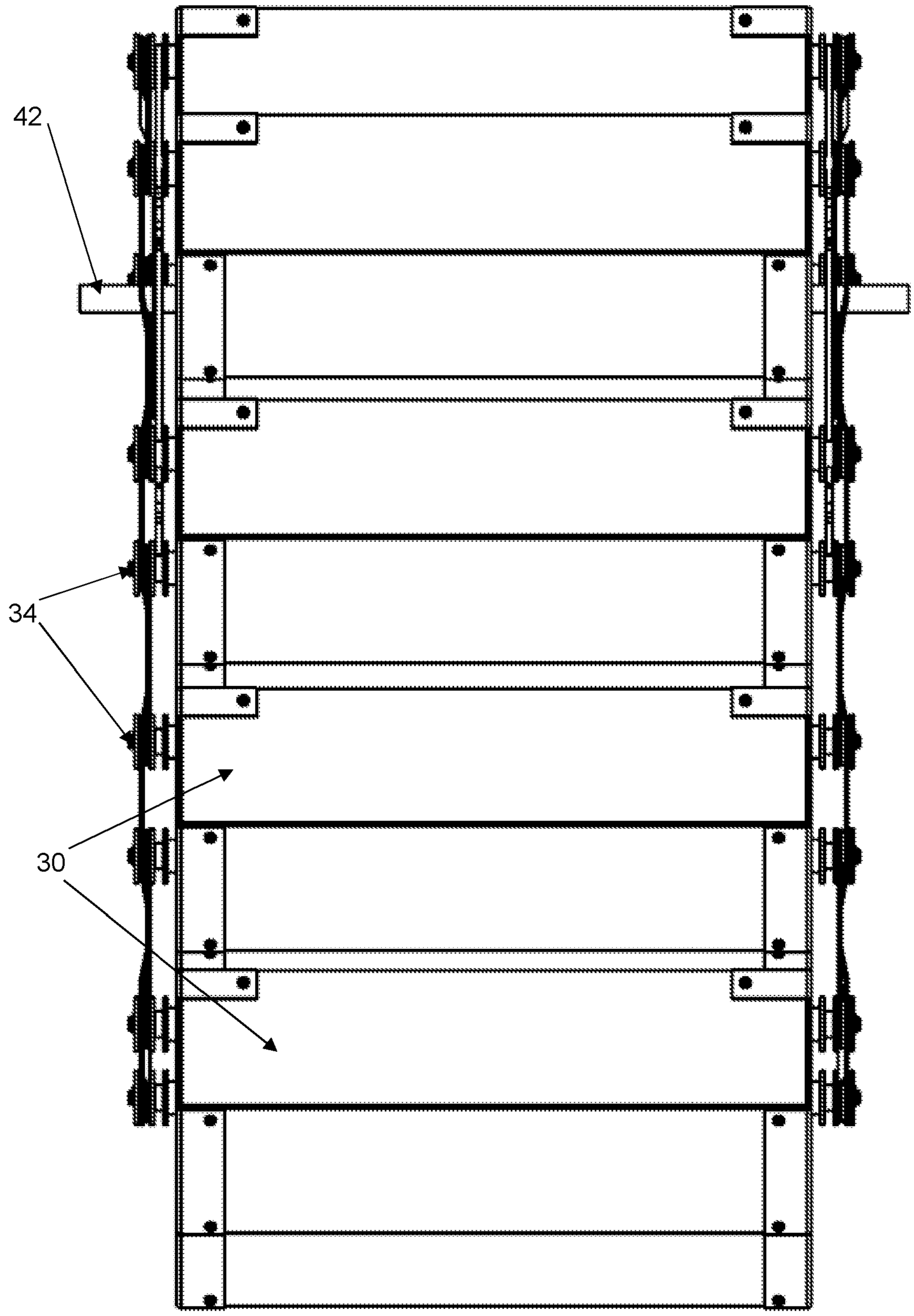

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Figure 8

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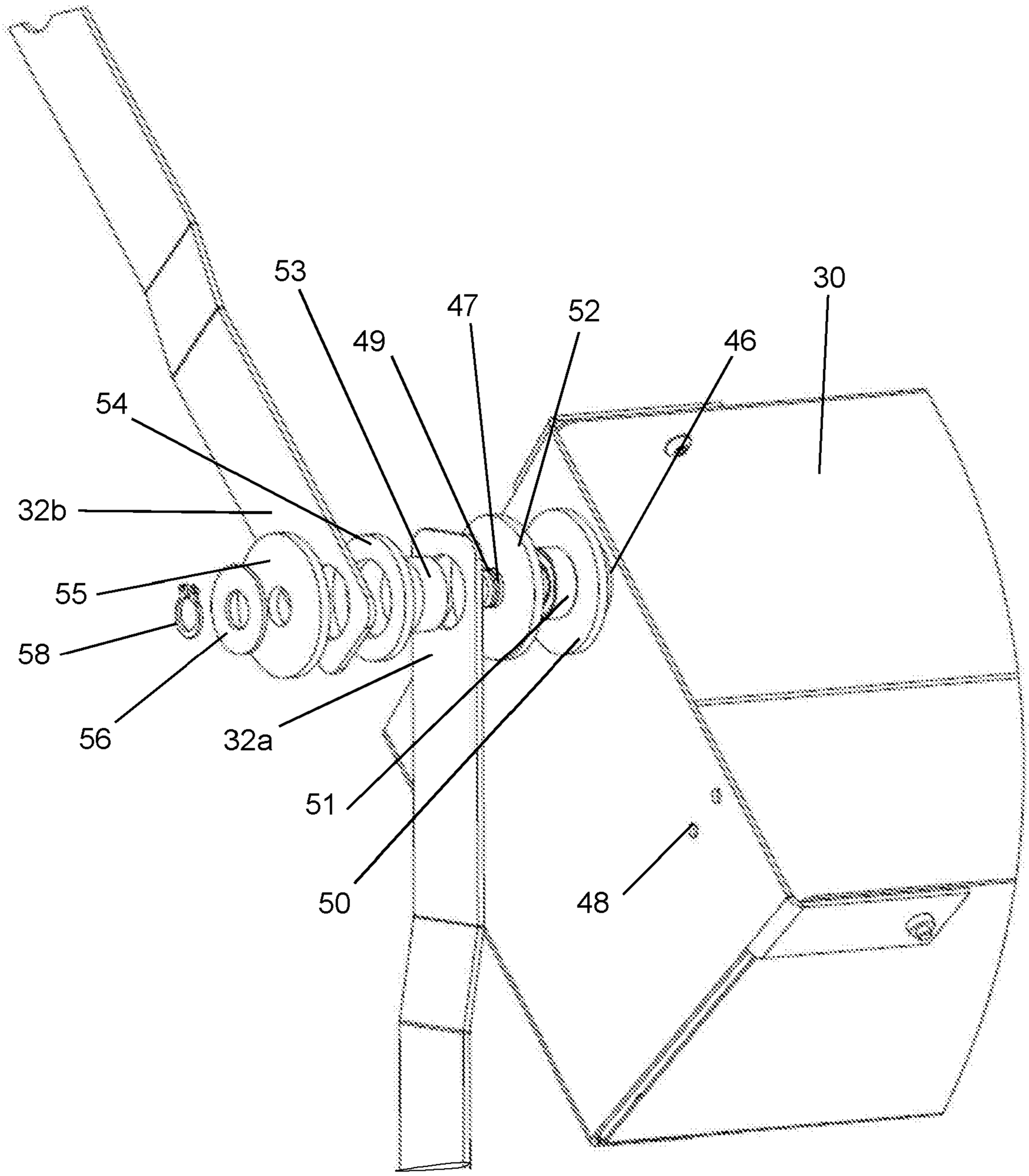

Figure 9

A MEDICAL DISPENSING CART

This invention relates to a medical dispensing cart, and more particularly to a medical dispensing cart which provides easier access to the contents of the cart by the user.

Background of the Invention

It is common practice in hospitals and related healthcare facilities for medical staff to make bedside visits to patients to dispense medicines. When doing the rounds, the medical staff member (e.g. nurse) will typically carry the medicines in a mobile dispensing cart or trolley, examples of which are shown in Figures 1 and 2. As shown in Figures 1 and 2, a typical dispensing cart will comprise a chassis mounted on castor wheels and a rack of draws which can be used for holding medicines and other medical supplies. The cart will usually have an upper support surface that can be used variously as a desk-top upon which paperwork can be completed, or upon which medical instruments or a computer keyboard and mouse can be carried, and/or may have be provided with a number of receptacles or containers for temporary storage of medical supplies prior to dispensing. Many medical carts are provided with an on-board computer carrying patient records and dispensing lists, and may therefore be provided with a computer screen.

Examples of medical carts can be found in WO2015/120002 (Enovate Medical LLC) and US2014/0172158 (MV Circuit Design, Inc.).

A common feature of many existing medical carts is that they have an array of vertically stacked drawers. It has been found that repeatedly bending down to gain access to the lower drawers in a vertically stacked array of drawers can result in medical staff developing back problems. Indeed, this has proved to be a significant problem in many hospitals. Thus, at present, there remains a need for a more ergonomically effective medical cart which avoids the need for repeated bending down to reach lower drawers in a vertical stack.

The Invention

The present invention provides an improved medical cart which makes use of a paternoster or vertical carousel arrangement of containers whereby interlinked containers are arranged to be moveable around a substantially vertical loop such

that a desired container can be moved to a top of the loop to allow access to the interior of the container.

Accordingly, in a first aspect, the invention provides a medical cart comprising:

a main housing provided with one or more ground engaging rolling elements to facilitate movement of the cart;

a window at or near the top of the main housing;

a flexible conveying element in the form of a continuous loop;

a plurality of containers pivotably mounted on the flexible conveying element at spaced locations around the loop such that each container is pivotable about a transverse pivot axis; wherein each container is either open or openable at an upper face thereof; and wherein the containers are tilted when accessible through the window; and

a drive mechanism engaged with the flexible conveying element for moving the containers around a substantially vertical loop so as to bring successive containers into and out of register with the window to give access to the container and any contents therein;

whereby, by virtue of each container being pivotable about a transverse pivot axis, the upper faces of the containers remain upwardly facing as the containers move around the substantially vertical loop.

By operating the drive mechanism, the flexible conveying element and attached containers are moved along a vertically looped path so that successive containers mounted on the flexible conveying element can be brought into register with the window and their contents accessed. As the window is provided at or near the top of the main housing, the containers can be accessed from the top of the cart thereby avoiding the need for the user to bend down to reach the contents of the cart.

The containers are either open or openable at an upper face thereof. In other words, the containers have a number of walls that define the bottom and sides of the container and an upper face through which the interior of the container can be accessed. The upper face may be open and may be free from any closures (i.e. the container is open-topped), or the upper face may be fitted with a door or cover (e.g. a hinged or slidable door or cover) or a simple lid which can be opened or removed to give access to the interior of the container. In one preferred embodiment, the containers are open-topped.

Because each container is pivotable about a transverse pivot axis, the upper faces (e.g. the open tops) of the containers remain upwardly facing as the containers move around the substantially vertical loop, and therefore lids, doors or covers are not needed to prevent the contents of the container from falling out.

The window may be provided with a lockable door or a lockable cover which prevents unauthorised access to the interior of the cart and the containers inside the cart when the cart is not in use.

The one or more ground engaging rolling elements typically comprise wheels or castors or combinations thereof that allow the cart to be rolled along an underlying surface (e.g. the ground or a floor). At least one ground engaging rolling element (e.g. wheel or castor) is provided and more usually there are at least two. For example, the cart may be provided with a set of four castors.

The cart may also comprise one or more openings, other than the window, to allow access to the interior of the cart. These openings are typically provided with a door (for example, a lockable door).

The cart comprises a plurality of containers pivotably mounted on the flexible conveying element at spaced locations around the continuous loop such that each container is pivotable about a transverse pivot axis that passes through the container. Typically, there are at least three containers, and more usually there may be five, six, seven, eight or nine such containers.

It is preferred that the cart is provided with a pair of flexible conveying elements, the containers being mounted between the flexible conveying elements. Thus, in this embodiment, each container has a pivot mounting at each end.

The flexible conveying element(s) may be flexible due to the inherent properties of the material from which the flexible conveying element(s) is/are made (e.g. a cable or a rope). Alternatively, the flexible conveying element(s) may be flexible as a result of being formed from a plurality of linking members (e.g. chain members). In one embodiment, the flexible conveying element is flexible in a single plane only.

Each flexible conveying element may, for example, be a single continuous linking member such as a continuous belt or cable, or it may be a chain comprising a plurality of chain members pivotably linked together to form a continuous loop.

In one embodiment, the flexible conveying element may take the form of a continuous roller chain comprising chain links of conventional design. The chain links may be formed from a metal material such as steel or from a suitable tough and durable plastics material.

In a preferred embodiment, the flexible conveying element, in the form of a chain, comprises a plurality of chain members pivotably linked together to form a continuous loop, wherein the chain members are elongate strips. The elongate strips have two ends with an aperture at each end in which a pivot pin can be located to secure one chain member to an adjacent chain member. At each pivot joint between two adjacent chain members, the chain can also be pivotably connected to a container as well as a further chain member. The pivot pin may therefore extend through an aperture in a wall of the container so that the container is pivotable about the pivot pin. Alternatively, the pivot pin can be fixedly and non-rotatably mounted on or in the container wall, provided of course that the container can still pivot within the pivot joint. Although a container may be attached to the flexible conveying element at each pivot joint, in alternative embodiments, one or more pivot joints may be present between each pair of pivot joints to which containers are attached. In one embodiment, the pivot pin comprises an integrally formed boss and spigot construct, the boss being secured (e.g. by means of screws) to the container wall, and the spigot serving as a pin upon which the chain elements and any intervening washers are mounted.

The elongate strips may be bent or kinked so that the strips can be connected together in a repeating arrangement to form a continuous circuit of linking elements. The elongate strips are therefore connectable in a repeating pattern, wherein each repeated element contains one (and only one) elongate strip, to form a substantially planar chain. In other words, connection of the elongate strips to one another does not result in a helical formation.

In one embodiment, the elongate strips comprise two end portions and an adjoining portion located between the two end portions. The adjoining portion is angled with respect the to two end portions so that the two end portions are not co-planar. Each of the two end portions and the adjoining portion are typically flat.

The planes of the two end portions, even though not co-planar, may be parallel. They may, for example, be offset by a distance corresponding to the sum of

thickness of the end portions and a washer located between the connected ends of two adjacent chain elements. The elongate strips may be substantially symmetric with respect to a rotation of 180º about axes (e.g. two axes) which pass through the adjoining portion in the plane of the adjoining portion.

The elongate strips may be formed from a rigid plastics material (for example, polyacetal or nylon) or a lightweight metal (for example, aluminium).

The containers are pivotably attached to the chain members (e.g. elongate strips) so that each container has a single transverse axis about which it can pivot. The points of attachment to chain members (e.g. the pivot pins) are on the upper part of the walls of the containers, and typically close to the upper edges of the side walls of the containers, so that the containers hang from the pivot attachments.

The pivot axes may be located on a plane of symmetry extending down through the container, in which case the containers will have an upright orientation. In this configuration, the centre of gravity of the container is vertically aligned with the pivot axis. However, more preferably, the pivot axis is offset relative to the plane of symmetry extending down through the container such that the container is normally in a tilted orientation, i.e. the centre of gravity of the container is not vertically aligned with the pivot axis. In particular, the pivot axis is offset so that the container is tilted towards a side of the medical cart from which a user would normally access the container contents.

In the present invention the containers are tilted at an angle with respect to the ground when at the window so that it is easier for the user to see inside the containers. The containers may be tilted at an angle of 20° to 60°, typically 30° to 60°, more typically 35° to 45°, for example 40°. References to angles of tilt are given with respect to the ground or other surface upon which the medical cart stands.

The position of the axis required to provide a desired tilt angle will depend on the shape of the container. However, generally, the pivoting axis runs through the container in an upper and non-centric position. The terms upper and non-centric refer to the position when the container is viewed in a direction along or parallel to the axis of rotation. Upper refers to an area of the container above the midpoint when viewed in a direction along or parallel the axis of rotation. Non-centric refers

to an area of the container to the left or to the right of the midpoint when viewed in a direction along or parallel with the axis of rotation.

In one embodiment, the containers are connected to the flexible conveying elements such that the containers are tilted at a constant angle. The angle of tilt therefore does not depend on the position of the container in the loop. For example, the containers may be connected to the chain members such that the centre of gravity of the container is not vertically aligned with the pivoting axis of the container.

In another embodiment, the cart may comprise a guide for rotating/tilting the containers as the approach the window. Therefore, when a container is not accessible through the window, the container is not tilted. In order to achieve this, the containers may be connected to the chain members such that the centre of gravity of the container is vertically aligned with the pivoting axis of the container. When the container is moved to be accessible through the window, the container may be tilted.

For example, the interior of the cart may have one or more guide protrusions that engage with tracks or channels in the side of the container as the container approaches the window. The tracks or channels are shaped to tilt the container as the guide protrusions travel through the tracks or channels.

The drive mechanism may comprise an axle which is mounted in the cart at or near the top of the loop of containers. The axle may have a drive wheel (or a pair of drive wheels where there are two flexible conveying elements) at each end that engage with the flexible conveying element(s) (e.g. chain(s)). Therefore, as the drive wheel and axle rotate, the flexible conveying element and attached containers move around a substantially vertical loop.

The drive wheel may be a sprocket with one or more protrusions (e.g. teeth) or recesses that engage complementary formations on the flexible conveying element. For example, where the drive wheel is a sprocket, the teeth of the sprocket may engage holes or grooves in the flexible conveying element.

In another embodiment, the drive wheel takes the form of a circular disc having a plurality of notches around its circumference which engage with complementary

formations on the flexible conveying element (e.g. the chain members). The notches are typically equally spaced around the circumference of the drive wheel.

The flexible conveying element may comprise formations which engage with the drive wheel. The formations are typically located at the point of pivotal connection with the containers. For example, the formations that engage the drive wheel or sprocket may comprise the pivot pins that connect adjacent chain members together. The pivot pins may have mounted thereon an annular spacer element and a pair of washers or like disc-shaped elements either side of the spacer element, the annular spacer element and disc-shaped elements together forming circumferential channels of a size suitable for receiving an edge of the drive wheel so that a notch on the drive wheel can engage the spacer element mounted on the pivot pin.

The notches in the drive wheel may therefore engage with these formations, and in particular with the circumferential channels in the formations, to rotate the flexible conveying element and the plurality of containers around the substantially vertical loop.

The drive mechanism may be powered manually or by a motor. In the case where the drive mechanism is powered manually, one or both ends of the axle may protrude through an opening to the main housing so that it can be accessed by the user. The axle may also be provided with a handle to assist rotating the axle. Alternatively, the drive axle can be provided with a further drive belt which is connectable to a motor.

The cart may also optionally comprise a mount for a computer. The term computer refers not only to desktop computers, in which case the mount may be used to hold a monitor for a computer, but also portable computers, such as laptops and other portable computers. The term therefore also encompasses smaller portable computers such as notebooks and tablets. Various mounts for computers are known and the structure of the mounts do not form part of the present invention.

The cart may also comprise an upper support surface. The upper support surface can be used as a desk to complete paperwork or support electronic equipment, such as laptop computers, computer keyboards and computer mice.

The cart is preferably dimensioned so that it can be moved by a single person. For example, the cart typically has a size no greater than 2m x 1m x 1m. The cart may also be lightweight to make the cart easier to transport. Accordingly, the cart may have a weight of no greater than 60 kg, typically no greater than 40 kg, for example no greater than 20 kg, when empty (i.e. the contents are not loaded into the cart).

Further aspects and embodiments of the invention will be apparent from the specific description below and the drawings.

Brief Description of the Drawings

Figure 1 shows a known type of (prior art) dispensing cart which comprises a chassis mounted on castor wheels and a rack of draws which can be used for holding medicines and other medical supplies

Figure 2 shows another known type of (prior art) dispensing cart which is configured to additionally hold a computer.

Figure 3 is a perspective view of a cart according to one embodiment of the invention.

Figure 4 is front view of the cart shown in Figure 1.

Figure 5 is a perspective view of the internal mechanism of the cart of Figure 1.

Figure 6 shows an exploded view of the pivot joints in the internal mechanism.

Figure 7 is a side-view of the internal mechanism shown in Figure 3.

Figure 8 is a front-view of the internal mechanism shown in Figure 3.

Figure 9 is an enlarged exploded view showing a pivot joint.

Detailed Description of the Invention

The invention will now be described in more detail, but not limited, by reference to the specific embodiment illustrated in the drawings.

Referring now to the drawings, Figures 3 and 4 show a cart (10) according to one embodiment of the invention. The cart is formed of a housing (12) having a plurality of (for example, four) wheels or castors (14). The housing also has a door (16) to provide access to the interior of the cart. At the top of the cart there is an upper

support surface (18) and a mount for a computer monitor, laptop or tablet (20). The upper support surface can be used as a desktop upon which paperwork can be completed. Alternative the upper support surface can be used to carry medical instruments or when a computer monitor is attached to mount (20), a computer keyboard and/or mouse. Mounts for computer monitors, laptops and tablets are known and the mounts do not form part of the present invention.

The cart also has a window or an opening (24) at the top of the cart which allows access to a plurality of containers (30) disposed inside the cart. The window or opening (24) can be covered by a lockable cover (26) to secure the contents of the cart when not in use.

The cart contains a plurality of containers (30) which are connected together in a vertical carousel or paternoster arrangement to allow each of the containers (30) to be accessed through window (24).

The containers (30) take the form of hollow boxes with one open face which allows access to the content of the containers.

The cart has a rotating handle (28) on its outside which is linked to the arrangement of containers and allows rotation of the paternoster arrangement so that the user can select which of the containers (30) is accessible through window (24).

Figures 5 to 8 show the containers and internal paternoster arrangement inside the cart.

The containers (30) are linked by a plurality of chain elements (32). Each chain element (32) is pivotably connected at each of its two ends to a container (30) and each side of the containers (30) are pivotably connected to two chain elements (32) at one side to form a continuous loop of containers connected by two chains formed by the chain elements.

The containers (30) and chain elements (32) are connected via pivoting connectors (34). A pivoting connection is shown in greater detail in Figures 6 and 9.

The interior of the cart also contains two rotating discs (36) with a plurality of (for example, four) notches (38) equally spaced around their circumferences. The rotating disc is situated between the containers (30) and the chain elements (32)

and notches (38) on the rotating discs (36) engage with the pivoting connectors (34) on the containers as the disc (36) rotates. The distance between the notches (38) corresponds to the length of the chain elements (32) so that as the rotating disc (36) rotates successive notches (38) can continuously engage with successive pivoting connectors (34).

A plate (40) is mounted on each of the rotating discs (36) and a drive axle (42) which pass through a hole in the plates (40) and the side walls of the cart casing and serves as an axis of rotation of the rotating discs. One end of the drive axle is also connected or connectable to the rotating handle (28) such that rotation of the handle causes rotation of the rotating disc (36) and hence movement of the containers.

Each container has a pair of pivot pins mounted on the walls of the container at opposite sides of the container. The pivot pins are aligned with each other to provide a pivoting axis for the container.

A series of spacers and washers are mounted on the pivot pins to provide a profile that allows for engagement of the spacer with the notches on the rotating disc. The arrangement of the spacers and washers is shown in more detail in Figure 9.

The pivot pin comprises an integrally formed (e.g. by machining) boss (46) and spigot (47), the spigot (47) extending outwardly from the boss. The boss (46) is fastened to the container wall by means of two small screws that pass through a pair of holes in the container wall. The container shown in Figure 9 has two pairs of holes, one pair of which (48) is unused. The outer end of the spigot (47) has a circlip groove (49).

On the pivot pin are mounted (from the side wall of the container to the outer end of the shaft), a first washer (50), a first spacer or bearing (51), a second washer (52), a first chain element (32a), a second bearing (53), a third washer (54), a second chain element (32b), a fourth washer (55), a fifth washer (56) and a circlip (58). The first, second, third and fourth washers and the first and second bearings are formed from nylon whereas the fifth washer and the circlip are formed from a metal such as steel. The circlip (57) is retained in the circlip groove (49) in the end of the spigot (47) and serves to hold the assembly together.

The chain elements can be formed from flat-strips of a lightweight plastics material (e.g. polyacetal or nylon) or a lightweight metallic material (e.g. aluminium). Each chain element comprises a pair of straight sections linked by an angled middle section. The two straight sections lie in parallel planes and the parallel plans are offset from one another by a distance corresponding generally to the sum of the thickness of the chain element and the thickness of the third washer (54). The geometry of the chain elements means that they can be connected together to form a continuous chain of substantially planar form. In other words, connection of the chain elements in a repeated pattern does not form a helical structure.

As the containers are only connected at a single pivoting point on each side, the containers are able to free-swing. The pivoting connectors (34) are located in a "non-central" location of the containers, such that the free-swinging containers are angled with respect to the ground (i.e. the base of the container is not parallel with the ground). Typically, the connectors are arranged so that the containers are tilted at an angle of 35° to 45° (for example, 40°). The precise location of the connectors in order to achieve a desired tilt angle will depend on the shape of the container.

The cart may also have additional, fixed, non-rotating storage compartments (22) which are not connected to the containers (30) or rotating paternoster arrangement.

The medications, medical supplies or other equipment can be placed into or removed from the containers through the window (24). The rotating handle (28) can be used to rotate the array of containers so that each container can be filled through the window (24). The door (26) can also be opened to provide access to a greater number of containers for filling of emptying the containers.

Equivalents

It will readily be apparent that numerous modifications and alterations may be made to the specific embodiments of the invention described above without departing from the principles underlying the invention. All such modifications and alterations are intended to be embraced by this application.

CLAIMS

1. A medical cart comprising:

a main housing provided with one or more ground engaging rolling elements to facilitate movement of the cart;

a window at or near the top of the main housing;

a flexible conveying element in the form of a continuous loop;

a plurality of containers pivotably mounted on the flexible conveying element at spaced locations around the loop such that each container is pivotable about a transverse pivot axis; wherein each container is either open or openable at an upper face thereof; and wherein the containers are tilted when accessible through the window; and

a drive mechanism engaged with the flexible conveying element for moving the containers around a substantially vertical loop so as to bring successive containers into and out of register with the window to give access to the container and any contents therein;

whereby, by virtue of each container being pivotable about a transverse pivot axis, the upper faces of the containers remain upwardly facing as the containers move around the substantially vertical loop.

2. A medical cart according to claim 1 wherein the containers are open topped.

3. A medical cart according to claim 1 or 2 wherein the window is provided with a lockable door or lockable cover.

4. A medical cart according to any one of claims 1 to 3 wherein the cart is provided with a pair of flexible conveying elements, the containers being mounted between the flexible conveying elements.

5. A medical cart according to any one of claims 1 to 4 wherein the flexible conveying element is a chain comprising a plurality of chain members pivotably linked together to form a continuous loop.

6. A medical cart according to claim 5 wherein the chain members are elongate strips.

7. A medical cart according to claim 6 wherein the elongate strips are bent or kinked so that the strips can be connected together in a repeating arrangement to form a continuous circuit of linking elements.

8. A medical cart according to claim 7 wherein the elongate strips comprise two end portions and an adjoining portion located between the two end portions, wherein the adjoining portion is angled with respect the to two end portions so that the two end portions are not co-planar.

9. A medical cart according to any one of claims 6 to 8 wherein the containers are pivotably attached to the chain members so that each container has a single transverse axis about which it can pivot.

10. A medical cart according to claim 9 wherein the transverse axis about which the container can pivot axis is offset relative to a plane of symmetry extending down through the container.

11. A medical cart according to any one of claims 1 to 10 wherein the containers are tilted at an angle of 20° to 60°, typically 30° to 60°, more typically 35° to 45°, for example 40°, when accessible through the window.

12. A medical cart according to claim 11 wherein the containers are connected to the flexible conveying elements such that the containers are tilted at a constant angle.

13. A medical cart according to any one of claims 1 to 12 wherein the drive mechanism comprises an axle which is mounted in the cart at or near the top of the loop of containers.

14. A medical cart according to claim 13 wherein the axle has a drive wheel at each end that engage with the flexible conveying element.

15. A medical cart according to claim 14 wherein the drive wheel takes the form of a circular disc having a plurality of notches around its circumference which engage with complementary formations on the flexible conveying element.