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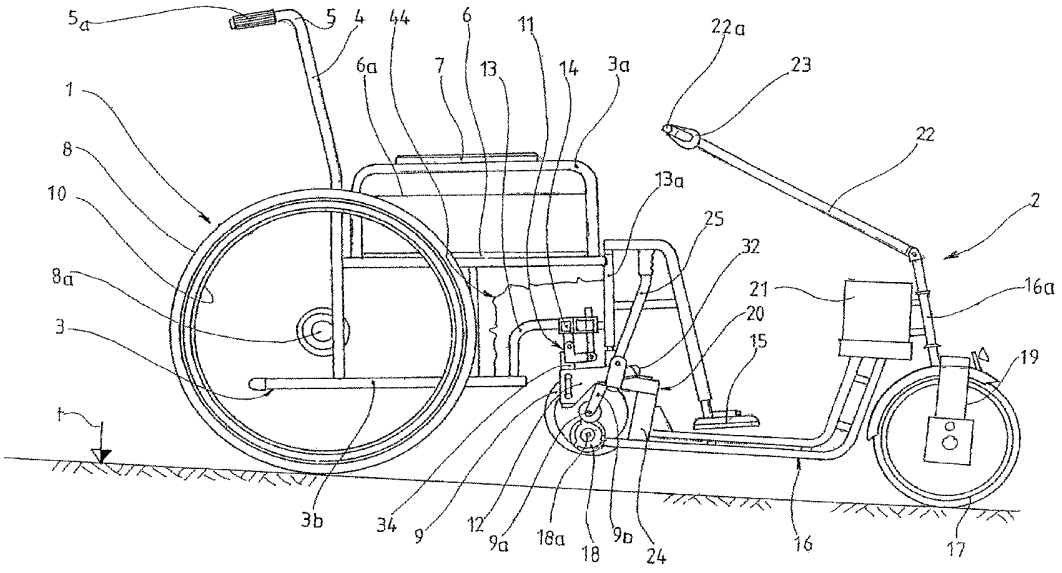
(54) **Title:** TRANSPORT DEVICE, ESPECIALLY FOR THE PHYSICALLY DISABLED AND/OR THE ILL



(57) **Abstract:** The transport device has a wheelchair (1) with front and rear wheels (8,9) and a towing vehicle (2) having front and rear wheels (17,18), as well as a connection structure serving for the releasable connection of these. The substance of the invention is that the connection structure is formed so that with the establishment of the connection between the towing vehicle (2) and the wheelchair (1) it results in the front wheel (9) or wheels of the wheelchair (1) and the rear wheel (18) or wheels of the towing vehicle (2) being raised from the ground level (t) and being kept in a raised position.

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Transport device, especially for the physically disabled and/or the ill

The invention relates to a transport device that can be primarily used advantageously by the physically disabled and/or the ill.

It is known that the wheelchair is a basically important device for the interior movement of the physically disabled and the ill, which has been known of for a long time and which the user is able to move by moving its wheels by hand. In general wheelchairs have two front smaller wheels and two rear large wheels which fall into the hands of the physically disabled or the ill, so while sitting in the chair they are able to move them comfortably. Although devices for interior movement are also known of that are operated by a battery power source, these are extremely costly, and so only a relatively small proportion of those affected can gain access to them.

For a large proportion of the physically disabled there is a demand to move outside, and for this purpose different types of transport devices have been developed also, generally operated by battery, in general, however, these are also so expensive that relatively few people are able to purchase them. The most modern of these solutions are based on the use of vehicle bodies that contain a steering unit, driving wheels and a battery as a source of power and are fitted with a floor that can be let down to ground level, the physically disabled and/or ill person then goes onto this fixes the position of the wheelchair in the vehicle body, closes the rear – only – door of the vehicle and has a complete vehicle which is very suitable for external movement. In this case the extremely high price of the vehicle places a limit onto the wider use of the vehicle.

A solution is also known according to which a wheelchair that is otherwise only for interior use is made suitable for external use by attaching to it, via a releasable connection, a towing vehicle that has its own power supply – battery – then following the completion of the

external use the towing vehicle is disconnected from the wheelchair and then this may be used as normal inside. In a known solution of such a four-wheeled, electric – battery – friction wheel transmission driven towing vehicle is used. The disadvantage of this solution is that the four-wheeled construction increased the mass of the structure, the length of the transport device when the two units are connected as well as the radius of the turning circle. The friction wheel drives either a front wheel or a rear wheel with direction change via extremely complex electrical controls. After this towing vehicle has been connected to the wheelchair it becomes an eight wheeled vehicle the manoeuvrability of which is unfavourable and a large amount of effort is required to turn it. Similarly the amount of effort required overcoming obstacles, e.g. getting up a kerb, is large, because at such a time first the front wheels of the towing vehicle and then its rear wheels have to be lifted up.

The task to be solved with the invention is the provision of a transport device created with the combination of a wheelchair and a towing vehicle that makes the movement of primarily physically disabled and/or ill persons possible which can be made with a favourable cost investment, the handling of which is simple, the assembly and disassembly of the components of which is easy to carry out, the steering of which requires small effort and the obstacle overcoming and gripping ability, driving characteristics and therefore manoeuvrability of which are significantly more favourable than that of similar known transport devices.

The invention is based on the recognition that if we use a three-wheeled – one large wheel at the front and two smaller wheels at the rear – towing vehicle and a connection structure between this and a wheelchair that, on the creation of an interlocked situation, raises the towing vehicle's rear and the wheelchair's front small wheels off the ground and in the interlocked state keeps the wheels in just this state, then a three-wheeled

vehicle is obtained the length and mass of which is minimal and driving characteristics of which are excellent.

On the basis of this recognition the set task has been solved in the sense of the invention with a transport device which has a wheelchair with front and rear wheels and a towing vehicle which also has front and rear wheels, a connection structure serving for the releasable connection of these and the essence of which transport device is that the connection structure is formed so that with the establishment of the connection between the towing vehicle and the wheelchair it results in the front wheels of the wheelchair and the rear wheels of the towing vehicle being raised from the ground and being kept in a raised position.

In the case of a favourable construction form of the transport device according to the invention it is characteristic that the connection structure has a receiving unit with a supporting plate connected to the wheelchair and a connection unit connected to the towing vehicle for the connection operation which has a base plate inserted under the supporting plate and positioned at an angle to it, which connection unit has an opening-closing lever fixed to a pin, rigidly at the bottom end, fixed in brackets that are fixed to the towing vehicle and at a distance from the pin there is a roller fixed, also rigidly, which is positioned so that it results in the fitting together of the supporting plate and the base plate via rolling caused by the movement of the closing-opening lever in its position carrying out the connection function fitting together the receiving unit and the connection unit through movement from the open terminal position towards the closed terminal position over the supporting plate and also in the raising of the rear wheels of the towing vehicle and the front wheels of the wheelchair at the same time from ground level.

According to another construction example in the closed terminal position the roller forced against the supporting plate with flexible pressing force; favourably the roller is made of deformable material,

and/or it is connected to compression spring(s) that exert a pressing force on its axle.

According to another invention criterion the roller is connected in an embedded way, so that it can rotate, to arms extending in the opposite direction to the closing-opening lever that are rigidly fixed to the pin; and the geometric axes of rotation of the pin and the roller are parallel to each other.

It is advantageous if in the area of one of the ends of the base plate there is a stop co-operating with the supporting plate and an upwards pointing pin in the area of the other end of the supporting plate that fits into a hole formed in the supporting plate in the closed position.

It may also be practical if in the fitted position of the receiving unit and the connection unit the supporting plate is horizontal, or nearly horizontal and if the base plate is in a position sloping down towards the wheelchair and forms an angle with the supporting plate; and also if the receiving unit is fitted to the frame structure of the wheelchair with the insertion of an adapter connected with a releasable connection, which is set up so that it makes it possible to adjust the height of the receiving unit. In this latter case it may be favourable if the adapter is fixed to a vertical supporting rod so that it can slide up and down it and be fixed with clamping bolts at the desired position; and the supporting rod is attached to the adapter in such a way that may be tilted in relation to the frame structure. In the following the invention is presented in detail on the basis of the attached drawings, which contain an advantageous construction form of the transport device and important structural solution details. On the drawings

figure 1 shows a construction form of the transport device in a state ready for use, it is shown in side view, the right-hand side of the

frame structure of the wheelchair is shown in part broken-out section, through which the connection structure used to connect the towing vehicle and the wheelchair can be easily seen;

figure 2 shows the transport device according to figure 1 separately in outline perspective view;

figure 3 shows the connection structure of the transport device according to figure 1 in its opened state, in larger scale side view;

figure 4 shows the connection structure according to figure 3 in its closed state;

figure 5 shows the parts of the connection structure according to figures 3 and 4 in even large scale perspective view.

The two main parts of the transport device shown in figure 1 – which we have illustrated with a broken-out section along the broken line 44 on the right-hand side of the frame structure of the wheelchair – are the wheelchair 1 and the towing vehicle, the latter of which is shown separately in figure 2.

The wheelchair 1, known in itself, has a frame structure 3, backrest 4 and pushing handles 5 that have grips 5a, furthermore, it also has a seat 6 and side panels 6a, above which on both sides the are armrests 7 fixed to the downwards U-shaped frame elements 3a of the frame structure 3. The

wheelchair 1 has two larger diameter rear wheels 8 with bearings and a wheel axle 8a and it has two front wheels 9 with a smaller diameter, the wheel axles 9a of which are supported with bearings in forks 9b. Apart from the usual rear wheels 8 the wheelchair 1 also contains driving rings 10 fixed to the wheel axles 8a. The wheelchair also has the usual footrest 15, which protrudes in front of the wheels 9. The parts of the wheelchair described above are known in themselves, new parts are, however, the adapter 11 fixed with a releasable connection to the middle of the cross-rod 14 connected to the upper ends of the upwards protruding bent side suspension rods 13 fixed to the front end of the lower longitudinal rods 3b, and the receiving unit 12 connected to it, which forms one of the main parts of the connection structure serving to create the releasable connection forming the wheelchair 1 and the towing vehicle 2 into a unified transport device, shown in figure 1 in its entirety with reference numbers. The receiving unit 12 is suspended on the adapter's 11 supporting rod 34 protruding downwards.

The towing vehicle 2 presented in the perspective drawing in figure 2 has a frame structure 16, which has a larger diameter front wheel 17 and two smaller diameter rear wheels 18, which are supported on bearings at the end of the supporting rod 18a fixed to and belonging to the frame structure 16. These small rear wheels are only for the independent movement of the towing vehicle and for supporting it while it is stand on the ground. There is a column 24 protruding upwards fixed to the middle of the supporting rod 18a, to the upper end of which the connection unit 20, which has an opening-closing lever 25 connected to its upper end, which forms the other main part of the mentioned connection structure, besides the receiving unit 12 belonging to the wheelchair 1. (We note here that in the following we will present the receiving unit 12 and the connection unit 20 and their method of operation in detail.) The towing vehicle 2 has a steering column fixed with a pivot to the upwards

protruding front column 16a of the frame structure 16, to the upper end of which there are handlebars 22a fixed together with the operating controls 23. Two batteries 21 and an electric motor 19 in an operation connection with these are fixed to the front part of the frame structure 16, which serve to drive the towing vehicle 2.

In figures 3-5 we illustrate at a greater scale the connection structure and its main structural parts. We remark that in figure 3 we have shown the open terminal state No. I of the connection structure, where the receiving unit 12 and the connection unit 20 are pushed completely together, in a state ready for closing, while in figure 4 we illustrate the closed terminal state No. II. It is especially in figure 5 that we can easily see in detail the two main parts of the connection structure that are to be pushed together according to the double ended arrow b to create the connection in the state just before connection, namely the receiving unit 12 belonging to the wheelchair 1 and the connection unit 20 belonging to the towing vehicle 2. According to this the receiving unit 12 suspended from the adapter 11, to be presented in detail later, has a casing 36 that fits over the supporting rod 34 and can slide up and down it, the casing 36 has a long slot 36a in one of its side walls in the same direction as the supporting rod 34, into which slot protrude fixing bolts 37, and by tightening these the casing 36 may be fixed, in a releasable way, to any chosen position within its sliding range on the supporting rod 34. The casing 36 has a trough 38 fixed, e.g. welded, rigidly to it protruding in a side direction, the long, rectangular supporting plate 39 of which in the base state of the wheelchair 1 – in other words in the rolling state not connected to the towing vehicle 2 – the roller 32 rests on this during connection – is horizontal, and the triangular side walls 38a, 38b with a height that goes down in the forward direction. Through the casing 36 and the trough 38 it can be seen easily in the broken-out section that there is a hole 40 in the area of the inner end of the supporting plate 39.

The connection unit 20 of the towing vehicle 2 visible on the right side of figure 5 has a cantilevered supporting body 28 fixed to the top of the column 24 (see also figures 1 and 2), to which there is a rectangular, sloped base plate 26 fixed, which slopes downwards in the direction of the receiving unit 12, according to the arrow c; the angle of the slope has been marked on figure 3 with the reference letter α. As can be seen on figures 3-5, the shape and size of the base plate 26 and the supporting plate 39 is the same. In the area of the front end of the base plate 26 there is an upwards pointing pin 33 in the place that is in the same line as the hole 40 in the base plate 39 of the receiving unit 12 when the receiving unit 12 and the connection unit 20 are pushed together. On the upper side of the supporting body 28, in the are of the upper end of the base plate 26 there is a stop 27. On the two sides of decreasing width of the supporting body 28 there are brackets 29a, 29b protruding upwards, into the upper end of which there is a cylindrical pin 30 built in supported with bearings, from which arms 31a, 31b protrude in the opposite direction to the already mentioned opening-closing lever 25 that can also be seen in figures 1 and 2 – these also are fixed rigidly to the pin 30 – to which arms 31a, 31b there is a roller 32 connected, supported by bearings, which is made of a flexibly deformable material. The axes X_1 and X_2 of rotation of the pin 30 and the roller 32 respectively are parallel to one another, and at right angles to the longitudinal axis y of the opening-closing lever 25.

The whole adapter 11 mentioned earlier can be seen in figure 1 in a smaller scale and in figure 3 in a larger scale, in more detail. Adapter 11 is suspended on the cross rod 14, the drop arm 41 can be tilted around the pin 45 in the direction of double arrow f, and cases 45, which can revolve around the pint 47 are fixed to the free end of the said drop arm 41, and the said cases are fitted to the guide pins 46 and they can slide up and down on them in a small range of motion. The receiving unit 12 is firmly

fixed to the supporting rod 34 going downwards, firmly fixed to the drop arm 41.

Connection between the wheelchair 1 and the towing vehicle 2 – which is possible either without sitting in the wheelchair 1 or in a way that the person who intends to use the transport device sits in the wheelchair 1, approaches the towing vehicle 2 and draws the two vehicle parts towards each other with the help of the handle bars 22a of the towing vehicle 2 – can be established by the person intending to use the transport vehicle to create a motor-driven transport vehicle that can also be used outdoor according to the following:

the connection unit 20 of the towing vehicle 2 is positioned opposite the receiving unit 12 of the wheelchair 1, exactly in one line with it – the height of the receiving unit 12 is adjusted with the help of the bolts 37 and its angle is adjusted (in approximately horizontal position) with the help of the nuts 46a, if necessary – so that these units are positioned with respect to each other as shown in figure 5, that is the front 39a edge of the horizontal supporting plate 39 is situated in space above the lower front edge 26a of the leaning base plate 26, at the same height as the higher upper edge 26b. If now the wheelchair 1 and the towing vehicle 2, accordingly the receiving unit 12 and the connection unit 20 are completely drawn together in the direction of double arrow b shown in figure 5, in the course of this operation the supporting plate 39 slides onto the base plate 26, and sliding along it, with its front edge 39a it is pushed up against the stop 27. This position is shown in figure 3, where it can be seen clearly that the front edge 26a of the base plate 26 is situated at m distance under the supporting plate 39, at α angle to it, and in connection with figure 5 axis of rotation X_1 is situated in space in the direction of the front wheel 17, at a distance from the geometrical axis of rotation X_3 of the wheels 18. The lower rods of the frame structure 16

slightly slope upwards and towards the front from the lower wheels 18 towards the larger front wheel 19.

Connection between the wheelchair 1 and the towing vehicle 2 is established so that opening-closing lever 25 is pulled until it stops from its position shown in figure 2, in the direction of arrow g shown in figure 3, as a result of which the roller 32 made of a flexibly deformable material rolls along the supporting plate 39 on a circular curved path with axis X_1, starting from its position on the left hand side shown in figure 3, while it pushes the supporting plate 39 downwards exerting pressure force on it downwards. By moving the supporting plate 39 downwards on the one part it lifts – pushes upwards – the front part of the wheelchair 1, while it is supporting itself with its larger back wheels 8 on the t ground level lifting up the smaller front wheels, on the other hand supported by the supporting plate 39 moving downwards it pushes the back end part and the smaller wheels 18 of the towing vehicle 2 upwards, and they are also lifted up from the t ground level, and by the time the roller 32 reaches its final position as shown in figure 4 rolling along the supporting plate 39 and getting over the dead point of its path of motion, the wheels are also above the t ground level with m distance, and the supporting plate 39 is completely and tightly touching the upper surface of the base plate 26, the pin 33 is sitting in the hole 40, and as the roller 32, which is flexibly deformed while it is moved, gets over the said dead point a safely locked – connected – self-locking position is reached as shown in figure 4. In this position – as the distance between the surfaces of the smaller front wheels 9 of the wheelchair 1 are larger than the distance between the external surfaces of the wheels 18 of the towing vehicle 2, the latter ones can be situated between the former ones, both wheels 9 and 18 are in a fixed position lifted up from the t ground level, and their axes are in one line or nearly one line.

It must be pointed out that the opening-closing lever 25 is kept in its final closing position (figure 4) by the stressing force of the flexibly deformed roller 32, the pin 33 basically provides safety against being pulled apart.

As a result of connecting the wheelchair 1 and the towing vehicle 2 as described above the user is provided with an outdoor motor-driven three-wheeled transport device – vehicle – which can be easily operated and steered.

It must be pointed out that the roller 32 can be made of a solid, hard material such as steel, making sure that flexible stressing force is exerted on its axis perpendicularly when it is in its final locking position as shown in figure 4. It can be ensured for example with the help of a compression spring –a pair of compression springs – (not shown) the ends of which are fixed to the pin 30 and to the axis of the roller 32, practically placed with the help of a spring guide beside the levers 31a, 31b, or with another suitable device.

It can be seen clearly that if the opening-closing lever 25 is moved – pushed – back again from its final position as shown in figure 4 to its final position shown in figure 3, the wheelchair 1 and the towing vehicle 2 are simply disconnected and they are separate units again.

Returning back to the adapter 11 described above, used to suspend the receiving unit 12 onto the wheelchair 1 it must be pointed out that it can be easily detached from the cross rod 14 (figures 1 and 3) together with the receiving unit 12, as a result of which the wheelchair 1 becomes foldable – in a way known in itself – and gains back its original function.

Apart from this adapter 11, due to its tilting ability described above (around pin 42 shown in figure 32) and adjustable height (with the help of slot 36 and fixing bolts 37) makes it possible to adjust the receiving unit 12 precisely, which is necessary because the bodyweight of the people using the wheelchair 1 may be different, and so the inflated rubber

wheels of the wheelchair 1 are deformed – flattened – differently, which obviously changes the height and angular position (as compared to the horizontal level) of the receiving unit 12. At the same time with the adjustable adapter 11 possible manufacturing inaccuracies can also be corrected.

The favourable effects of the invention are the following:

As a result of connecting the towing vehicle and the wheelchair with the connection structure according to the invention a three-wheeled outdoor motor-driven transport device is achieved with excellent driving characteristics, with special respect to its manoeuvrability and obstacle overcoming ability, which is ideally short and relatively light, and due to the latter characteristics there is no need for an estate car and there is no need for keeping a ramp in the boot. The towing vehicle and the wheelchair can be connected in a single motion – by pulling the closing-opening lever – exerting minimal physical force. The vehicle is easy to operate and steer.

Naturally the invention is not restricted to the construction of the transport device described above, as it can be realised in several ways within the scope of protection defined by the claims.

Claims

1./ A transport device, especially for the physically disabled and/or the ill, which has a wheelchair (1) with front and rear wheels (8,9) and a towing vehicle (2) which also has front and rear wheels (17,18), a connection structure serving for the releasable connection of these **characterised by** that the connection structure is formed so that with the establishment of the connection between the towing vehicle (2) and the wheelchair (1) it results in the front wheel (9) or wheels of the wheelchair (1) and the rear wheel (18) or wheels of the towing vehicle (2) being raised from the ground level (t) and being kept in a raised position.

2./ The transport device according to claim 1 **characterised by** that the connection structure (43) has a receiving unit (12) with a supporting plate (39) connected to the wheelchair (1) and a connection unit (20) connected to the towing vehicle (2) for the connection operation which has a base plate (26) inserted under the supporting plate (39) and positioned at an angle (α) to it, which connection unit (20) has an opening-closing lever (25) fixed to a pin (30), rigidly at the bottom end, fixed in brackets (29a, 29b) that are fixed to the towing vehicle (2) and at a distance from the pin (30) there is a roller fixed (32), also rigidly, which is positioned so that it results in the fitting together of the supporting plate (39) and the base plate (26) via rolling caused by the movement of the closing-opening lever (25) in its position carrying out the connection function fitting together the receiving unit (12) and the connection unit (20) through movement from the open terminal (I) position towards the closed terminal position (II) over the supporting plate (39) and also in the raising of the rear wheels (18) or wheel of the towing vehicle (2) and the front wheels (9) or wheel of the wheelchair (1) at the same time from ground level (t).

3./ The transport device according to claim 2 **characterised by** that in the closed terminal position (II) the roller (32) is forced against the supporting plate (39) with flexible pressing force.

4./ The transport device according to claim 3 **characterised by** that the roller (32) is made of deformable material, and/or it is connected to compression spring(s) that exert a pressing force on its axle.

5./ The transport device according to any of claims 2-4 **characterised by** that the roller (32) is connected in an embedded way, so that it can rotate, to arms (31a, 31b) extending in the opposite direction to the closing-opening lever (25), that are rigidly fixed to the pin (30); and the geometric axes of rotation (X_1, X_2) of the pin (30) and the roller (32) are parallel to each other.

6./ The transport device according to any of claims 2-5 **characterised by** that in the area of one of the ends of the base plate (26) there is a stop (27) co-operating with the supporting plate (39) and an upwards pointing pin (33) in the area of the other end of the base plate (26) that fits into a hole (40) formed in the supporting plate (39) in the closed position.

7./ The transport device according to any of claims 2-6 **characterised by** that in the fitted position of the receiving unit (12) and the connection unit (20) the supporting plate (39) is horizontal, or nearly horizontal and the base plate (26) is in a position sloping down towards the wheelchair (1) and forms an angle (α) with the supporting plate (39).

8./ The transport device according to any of claims 2-7 **characterised by** that the receiving unit (12) is fitted to the frame structure (3) of the

wheelchair (1) with the insertion of an adapter (11) connected with a releasable connection, which is set up so that it makes it possible to adjust the height of the receiving unit (12).

9./ The transport device according to claim 8 **characterised by** that the adapter (11) is fixed to a vertical supporting rod (34) so that it can slide up and down it and be fixed with clamping bolts (37) at the desired position; and the supporting rod (34) is attached to the adapter (11) in such a way that may be tilted in relation to the frame structure (3).

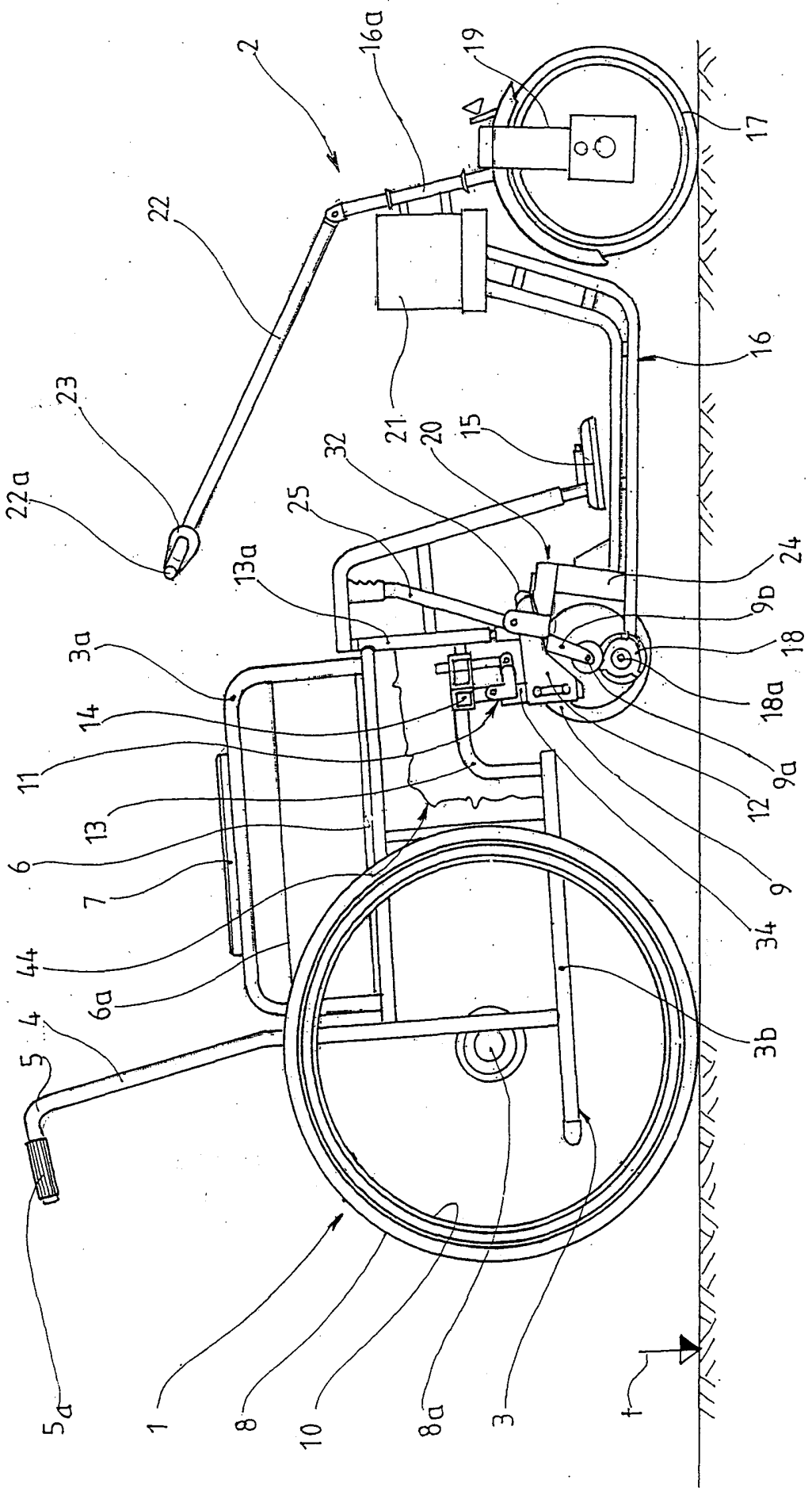
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Fig. 1

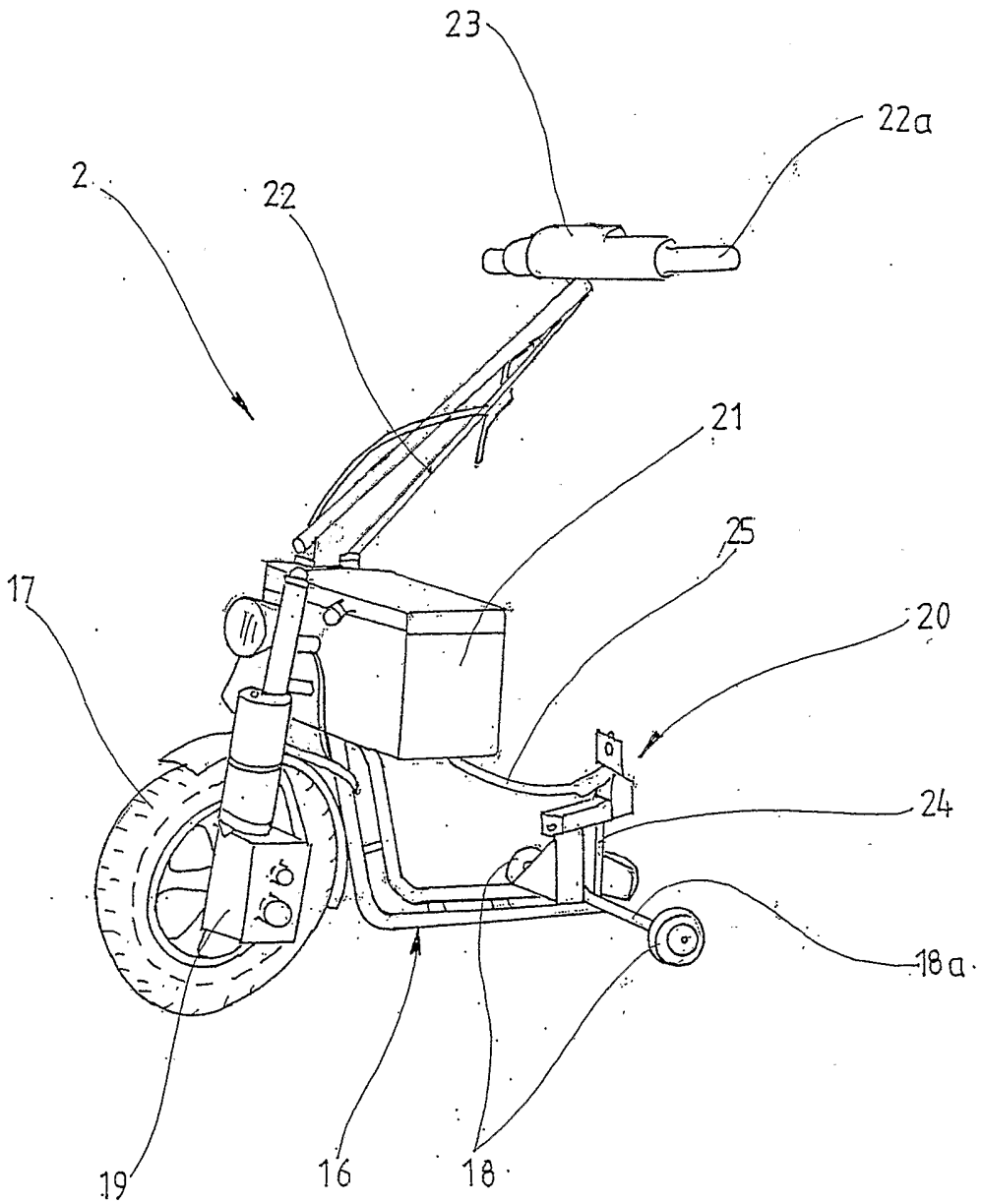

Fig. 2

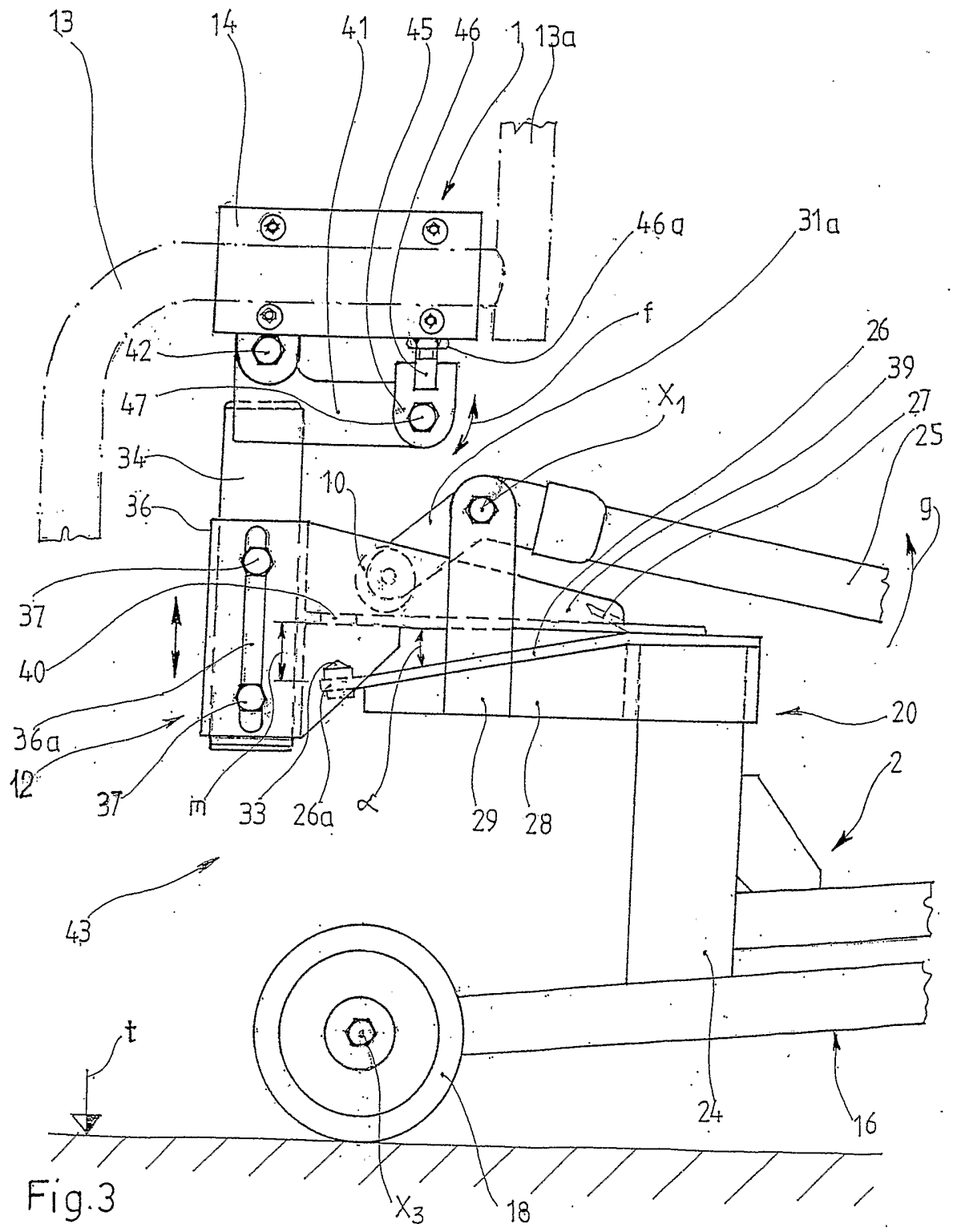
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Fig.3

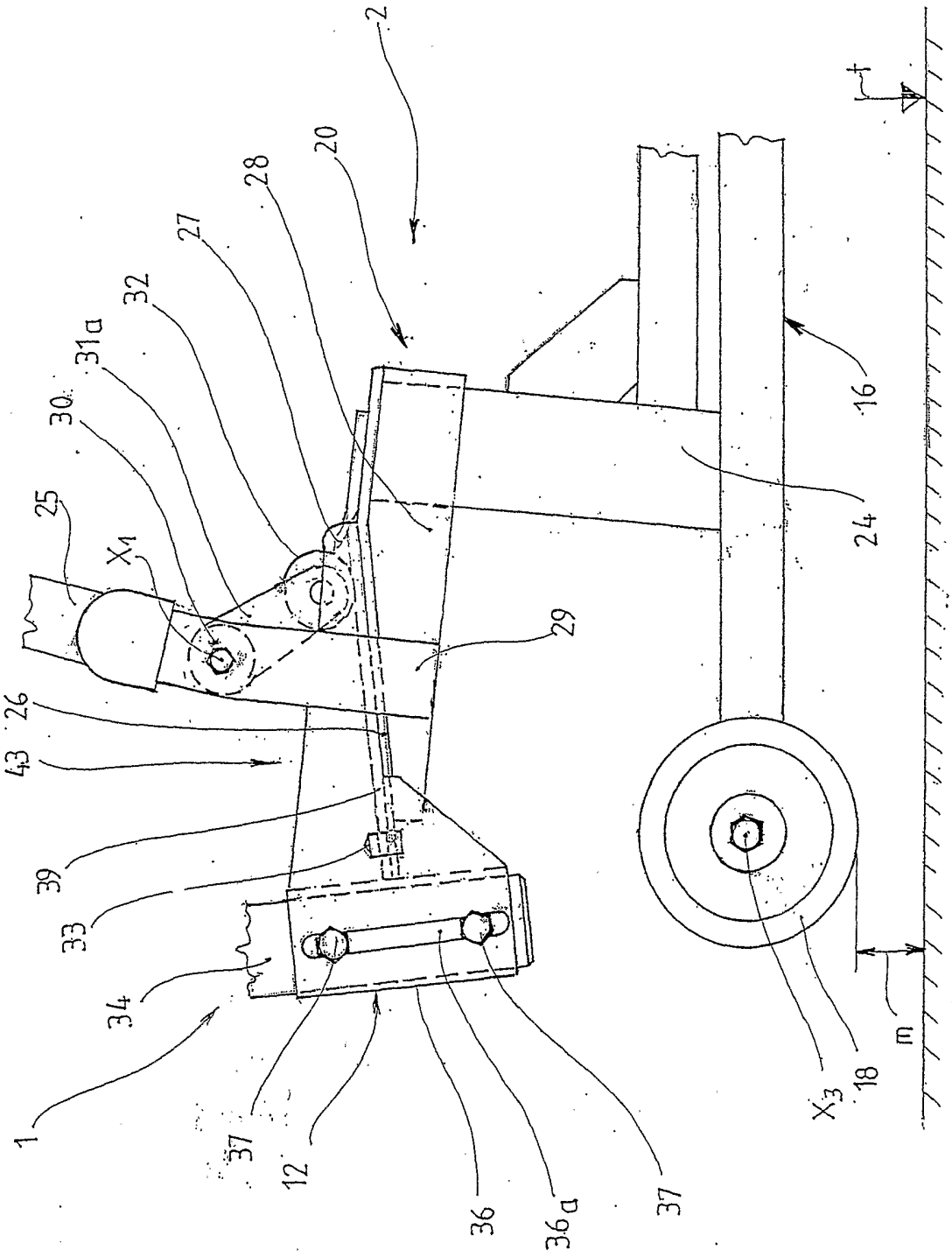
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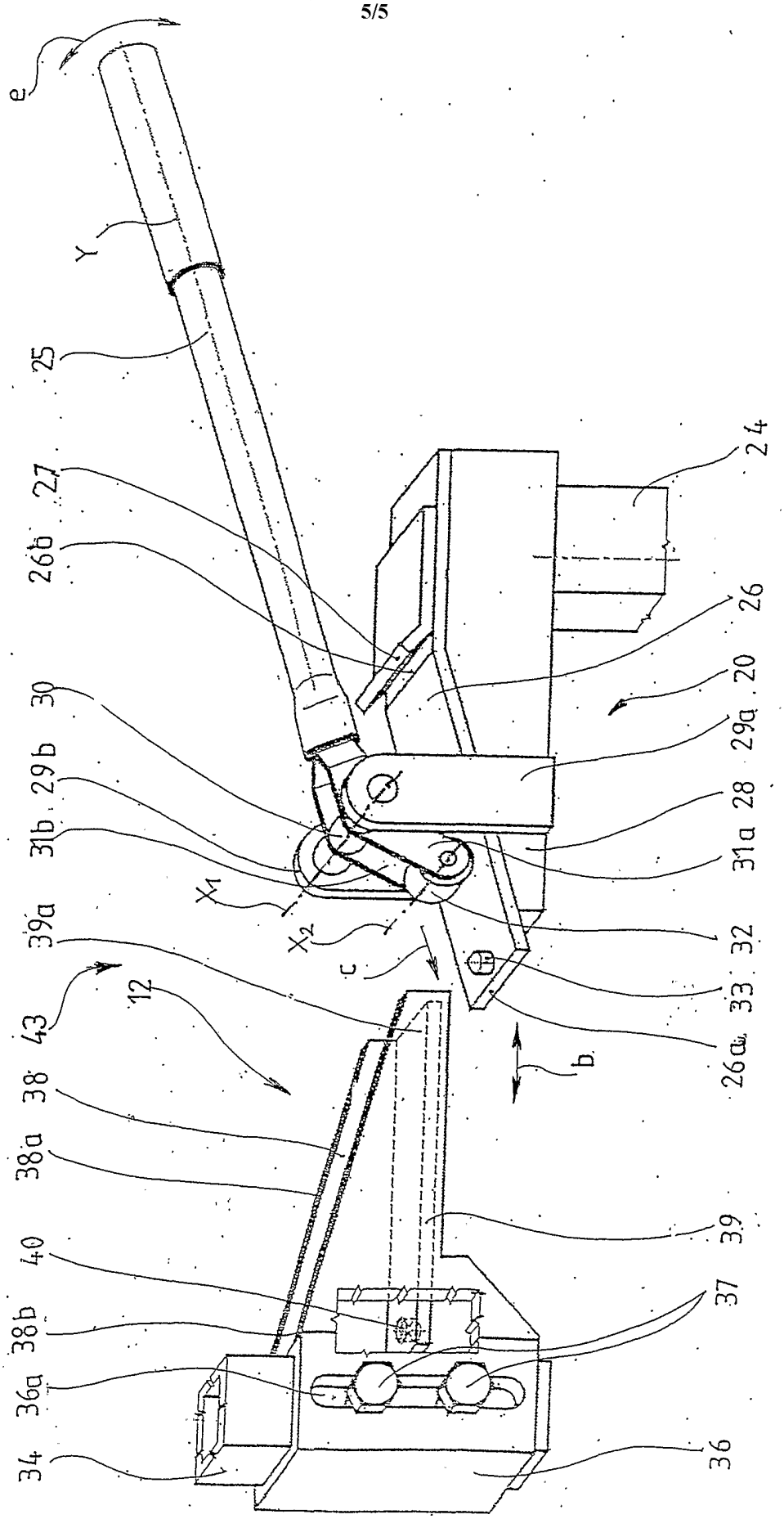
Fig.4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b
38
38a
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37
38b
36a
34
36

Fig.5

INTERNATIONAL SEARCH REPORT

International Application No
PCT/HU 02/00099

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61G5/02 A61G5/04

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61G

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

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

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 505 652 A (KERLOCH MICHEL) 19 November 1982 (1982-11-19) page 4, line 3 -page 6, line 5; figures	1
A		2-9

X	US 3 349 862 A (SHIREY JR THEODORE R) 31 October 1967 (1967-10-31) column 1, line 50 - line 65 column 3, line 67 -column 4, line 43; figures	1
A		2-9

X	DE 44 28 714 A (KUHLMANN ROLF) 15 February 1996 (1996-02-15) column 2, line 63 -column 3, line 63; figures 1-3	1
A		2-9

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

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 2003	24/02/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Fischer, E

1

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/HU 02/00099

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 050 695 A (KLEINWOLTERINK JR HENRY) 24 September 1991 (1991-09-24) column 2, line 40 -column 3, line 47; figures	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/HU 02/00099

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2505652 A	19-11-1982	FR 2505652 A1	19-11-1982
US 3349862 A	31-10-1967	NONE	
DE 4428714 A	15-02-1996	DE 4428714 A1	15-02-1996
US 5050695 A	24-09-1991	NONE	