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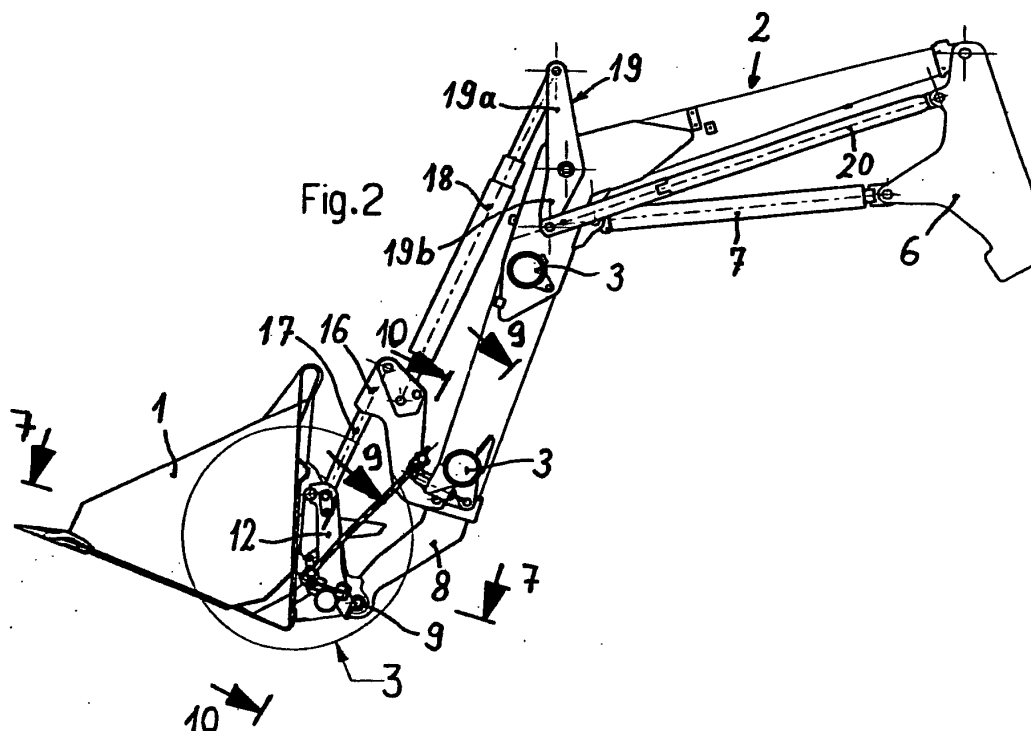
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(54) **Front loader**

(57) The specification describes a front loader for fitting onto a supporting vehicle, with a quick-change frame for interchangeable tools which is coupled to the free end region and can be swivelled by tipping cylinders, at least one locking pin being mounted on the frame, which pin can be moved at a given unlocking signal from a locked position fixing the tool to the quick-change frame to an unlocked position releasing the tool, by a hydraulic auxiliary force against the force of a re-

silient element.

In order to have a simpler, more favourably priced construction while retaining the advantages of known front loaders, the locking pin (23) can be moved into the unlocked position by an actuating mechanism which becomes active only in response to the unlocking signal, and which responds to the increase in the distance between the locking pin (23) and the front loader (2) which takes place when the tipping cylinders (18) are drawn out.



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Description

[0001] The invention relates to a front loader with a quick-change frame for interchangeable tools which is coupled to the free end region and can be swivelled by tipping cylinders, at least one locking pin being mounted on the frame, which pin can be moved at a given unlocking signal from a locked position fixing the tool to the quick-change frame to an unlocked position releasing the tool, by a hydraulic auxiliary force against the force of a resilient element.

[0002] Front loaders of this type are pieces of equipment with which tractors are fitted to carry out certain jobs which arise particularly in agriculture and community facilities. The work substantially consists of transporting many different materials, for which suitably adapted tools are required such as manure forks, earth scoops, compost scoops and pallet forks. A tool of this type is held on a carrier articulated to the front of the loader and can be raised or lowered by drawing tipping cylinders engaging the carrier in or out. To enable the front loader to be refitted with an appropriate new tool as simply and quickly as possible when the job is changed, the carrier in known front loaders has a horizontally extending, round crossbar at the top. The tool is picked up by swinging the loader up, with the crossbar engaging from below in downwardly directed receiving apertures in upper holding devices on the tool and lifting the tool. As the lifting process continues - if necessary aided by drawing in the tipping cylinders - the bottom of the tool also swings towards the carrier; holes in the carrier are aligned with holes in holding devices on the tool. Locking pins which slide into these holes secure the tool in the position assumed.

[0003] A front loader is known from a Stoll company pamphlet P1260a of 10-11/97 under the name of HY-DRO-LOCK where the locking pins for removing and fitting a tool are no longer handled manually as before but are slid into the unlocking or locking position by a double acting hydraulic cylinder. The cylinder is activated by an unlocking signal to the associated control valve, which may be transmitted by the operator of the vehicle from the driver's cab. Thus the tractor operator no longer has to leave and climb back onto the vehicle several times when changing the tool. Equipping the front loader with such a cylinder is however very costly.

[0004] The problem of the invention is to make a front loader of the above type simpler and more favourably priced while retaining the advantages of the known front loaders.

[0005] The problem is solved, in that the locking pin can be moved into the unlocked position by an actuating mechanism which becomes active only in response to the unlocking signal, and which responds to the increase in the distance between the locking pin and the front loader which takes place when the tipping cylinders are drawn out. In this way a separate hydraulic cylinder used for unlocking and locking the tool can be dispensed

with, and with it its whole supply of pressure oil including a control valve. Compared with this, only a few easily produced parts, some of them standard parts, are required to form a front loader according to the invention. The rod assembly made with them enables the force provided by the outwardly-travelling tipping cylinders to be used for unlocking the locking pins.

[0006] To enable the force to be transmitted from the tipping cylinders to the locking pins only when a change of tool is intended, the actuating mechanism is switched into an inactive state in the absence of an unlocking signal and into an active state when an unlocking signal is sent.

[0007] An advantageous embodiment of the invention is seen in the features that the actuating mechanism has a bar and an arresting lever which is flexibly coupled thereto and mounted on the front loader, and which in the absence of an unlocking signal can be swivelled freely and adjusted according to the distance between the locking pin and the loader, and that on transmission of an unlocking signal when the tipping cylinders are drawn out an arresting pin may be slid into the path of movement of the arresting lever.

[0008] For easy production of an unlocking signal according to the invention the arresting pin may be controlled by a lifting magnet mounted on the front loader. There are no problems in supplying it with electricity as it is located on the loader.

[0009] A simple arrangement for diverting the force of the tipping cylinders is provided by the feature that the actuating mechanism contains an actuating lever mounted for swivelling movement on the quick-change frame, which lever is coupled to the free end of the bar and has a cam plate which acts on an entrainment member on the locking pin.

[0010] In well-trying and tested manner the path of the actuating mechanism is transferred to the locking pins, in that the cam plate has a cam section which causes the locking pin to be moved into the unlocking position.

[0011] Further advantageous measures, some of them known *per se*, are contained in the other claims. The invention will be further explained below with reference to the accompanying drawings, in which:

Fig. 1 shows a front loader with a fitted earth scoop, seen from above,

Fig. 2 is a view of the front loader in section along the line 2-2 in Fig. 1, with the tipping cylinder drawn in,

Fig. 3 is the detail 3 on the front loader in Fig. 2, on a larger scale,

Fig. 4 is a view of the loader in section along the line 4-4 in Fig. 3,

Fig. 5 is a view of the joint region of the loader with

the quick-change frame, with the tipping cylinder drawn in,

- Fig. 6 is a view of the loader in section along the line 6-6 in Fig. 5,
- Fig. 7 is a view of the loader in section along the line 7-7 in Fig. 2,
- Fig. 8 is a view of the loader in section along the line 8-8 in Fig. 7,
- Fig. 9 is a view of the loader in section along the line 9-9 in Fig. 2,
- Fig. 10 is a view of the loader in section along the line 10-10 in Fig. 2,
- Fig. 11 is a view of the loader in section along the line 11-11 in Fig. 10, with the lifting magnet not operated,
- Fig. 12 is a view of the loader in section as in Fig. 11 but with the lifting magnet operated,
- Fig. 13 is a view of the loader in section as in Fig. 2, with the tipping cylinder drawn out,
- Fig. 14 is a view of the loader in section along the line 14-14 in Fig. 13,
- Fig. 15 is a view of the loader in section along the line 15-15 in Fig. 13,
- Fig. 16 is a view of the loader as in Fig. 5, with the tipping cylinder drawn out, and
- Fig. 17 is a view of the loader in section along the line 17-17 in Fig. 16.

[0012] Referring to Figs 1 and 2, these show a front loader fitted on a farming tractor (not shown), the front loader 2 carrying a loading scoop as the tool 1 being lowered onto the ground.

[0013] The front loader 2 comprises two laterally spaced members 4, 5 which are linked by cross members 3 to form a rigid framework, each fixed to the tractor by a coupling tower 6 and each enabled to swivel in a vertical plane by a hydraulically operable lifting cylinder 7. The end region of the members 4, 5 comprises bearing arms 8, at the free ends of which a quick-change frame 10 for the tools 1 is mounted for swivelling movement by means of hinge pins 9.

[0014] As shown also in Figs 3 to 5, the quick-change frame 10 has two upwardly extending side members 11, 12, which are non-detachably joined by a bar 13 and an angle plate 14 in the upper region and by an angle 15 in the lower region. Together with coupling rods 17 and

with swivel arms 16 mounted for swivelling movement on the members 4, 5, the side members 11, 12 form two four-bar mechanisms which can be swivelled by means of two hydraulically operable tipping cylinders 18.

[0015] In Fig. 2 the tipping cylinders 18 are shown in the drawn-in condition, in which the quick-change frame 10 assumes its most vertical position and the tool 1 a raised position. Each cylinder 18 is supported on an arm 19a of a two-arm lever 19ab mounted laterally on the respective member 4, 5; together with a rod 20 acting on its other arm 19b and the coupling tower 6 the lever forms a parallelogram of rods in which the quick-change frame 10 is included. In this way the relative position of the frame 10 and thus of the tool 1 fitted on it is maintained when the front loader 2 pivots about its mounting point on the coupling tower 6.

[0016] To fix the tool 1 to the quick-change frame 10, the tool 1 has two downwardly directed catch hooks 21 in the upper region of its rear wall, the hooks engaging over the bar 13 as far as possible away from each other. In the position assumed by the frame 10 the rear wall abuts an angle plate 15 under its own weight, and two links 22 arranged in the lower region of the rear wall and projecting therefrom at right angles engage respectively between two walls 11a, 11b, 12a, 12b of the side members 11, 12. Two locking pins 23, 24 engaging through aligned holes in the walls 11a, 11b, 12a, 12b and in the links 22 secure the tool 1 in this correct position, so that the catch hooks 21 cannot come off the bar 13 as a result of vertical impacts. The two locking pins 23, 24 are coupled together by connecting links 25 and a bar 26. The bar 26 is mounted displaceably in the walls 11a, 12a of the side members 11, 12 and is subject to the force of a biased return spring 27, which is arranged on the bar 26 between a transverse pin 28 and the wall 12a and keeps both locking pins 23, 24 pushed into their locking position.

[0017] As shown also in Figs 5 and 6 the locking pin 24 is bent into a U shape in its outer end region. The resultant free limb 24a is subject to the force of a spring 30 on an abutment surface 31, the spring surrounding the locking pin 24 and being supported on the connecting link 25 and a transverse pin 29 in the locking pin 24. The abutment surface is on top of the wall 12c which, together with a further wall 12d, mount the associated bearing arm 8 between them. The length of the limb 24a is such that when the tool 1 is fully unlocked the end of the limb is just moved out of the region of the wall 12c, so that in the corresponding position of the tool 1 the locking pin 24 can be swivelled in front of the wall 12c by the force of the leg spring 30 as shown in Fig. 17. To enable the pin 24 to swivel relative to the quick-change frame 10 the relevant connecting link 25 is rotatable on the locking pin 24 but immobilised in a longitudinal direction by means of transverse pins arranged on both sides.

[0018] To move the locking pins 23, 24 out of the locked position illustrated into the unlocked position, a

process covered by Figs 12 to 17, an actuating mechanism shown in Figs 7 to 11 is provided. In accordance with the invention the function of the actuating mechanism is to utilise a swivelling movement of the quick-change frame 10, leading to an enlargement of the distance between the locking pins 23, 24 mounted on the frame and the front loader 2, in order to slide the pins 23, 24 into the unlocked position.

[0019] For control of the locking pin 24 the actuating mechanism comprises an actuating lever 33 mounted for swivelling movement on the side member 11, with an integral two-part cam plate 34, a drawbar connected to the lever 33 by a universal joint 35, an arresting lever 37 mounted for swivelling movement on the cross member 3 and connected to the drawbar 36 by a universal joint 38, and a lifting magnet 39 also arranged on the cross member 3.

[0020] Referring now to Figs 7 and 8, the actuating lever 33 is mounted for swivelling movement about a pin 40 in a plane extending radially of the unlocking pin 23. The cam plate 34 is of U-shaped cross-section with its limbs engaging over and under the locking pin 23. The cam plate 34 lies against a transverse pin 41 projecting from the locking pin 23 at both sides, so that swivelling of the actuating lever 33 anticlockwise in Fig. 7 causes the locking pin 23 to move towards the unlocked position. A first, very curved region 34a of the cam plate 34 is used for movement into the unlocked position, while an adjoining, slightly curved region 34b does not cause any further movement and merely secures the locking pin 23 in the unlocked position.

[0021] The universal joint 35 shown in Fig. 7 between the actuating lever 33 and the drawbar 36 comprises two hinge pins extending towards each other in a T shape, one of which is mounted rotatably in a bush 42 welded to the actuating lever 33. The other pin carries a forked member 43 fixed to the drawbar 36. The arrangement and shape of the drawbar are chosen so that a force component strong enough for the purpose is transmitted from the drawbar 36 to the actuating lever 33, if necessary in all operating positions.

[0022] The universal joint 38 shown in Fig. 9 between the drawbar 36 and the arresting lever 37 similarly comprises two hinge pins extending towards each other in a T shape, one of which carries a forked member 44 joined rotatably to the drawbar 36. The other pin is mounted rotatably in a bush 45 welded to the arresting lever 37.

[0023] The mounting of the arresting lever 37 on the cross member 3 of the front loader 2 can be seen from Figs 10 and 11. A housing 46 is provided there on the cross member 3 and a hinge pin 47 is arranged on its front plate 46a. The plate-shaped arresting lever 37 is mounted for swivelling movement on the hinge pin 47, spaced from the front sheet 46a by distance pieces 48. The lifting magnet 39, operable from the driver's cab of the farming tractor, with its armature 49 extending parallel with the hinge pin 47, is arranged inside the housing

46 at the rear of the front plate 46a. The armature 49 is joined to an arresting pin 50 which is mounted displaceably in a bush 51 against the force of a spring 52. The bush 51 and arresting pin 50 extend into the immediate vicinity of the arresting lever 37, so that the pin 50 is placed in the swivelling plane of the lever 37 when the lifting magnet 39 is operated.

[0024] In the fitted condition described the tool 1 can be swivelled at will by drawing the tipping cylinders 18 in and out, within the limits imposed by the design, without this having any effective influence on the actuating mechanism. Instead, owing to the change in the distance of the locking pin 23 swivelling with the quick-change frame 10 from the arresting lever 37 on the front loader 2, and owing to the force of the return spring 27 counteracting any displacement of the locking pins 23, 24, the swivelling movement of the frame 10 when the tipping cylinders 18 are operated merely causes the arresting lever 37 to be swivelled without resistance.

[0025] If the tool 1 is to be exchanged for a different one it first has to be unlocked. For this purpose the front loader is lowered onto the ground with the tipping cylinders 18 drawn in, as shown in Fig. 2. The driver of the vehicle then sends an unlocking signal by operating the lifting magnet 39, the armature 49 of which slides the arresting pin 50 into the path of the arresting lever 37 as shown in Fig. 12. If the tipping cylinders 18 are now drawn out as in Fig. 13, thereby increasing the distance between the locking pins 23, 24 and the arresting lever 37, the lever 37 swivels until it abuts the arresting pin 50, which prevents any further swivelling movement. If the tipping cylinders 18 are drawn further out, the further increasing space between the forementioned members of the actuating mechanism is no longer taken up by the arresting lever 37 but by the actuating lever 33. The lever 33 swivels into the position shown in Figs 14 and 15, pushing the locking pin 23 and, via the bar 26, also the locking pin 24 into the unlocked position against the force of the return spring 27. As the limb 24a of the pin 24 is no longer above the wall 12c at the end of this process, the pin 24 is swivelled into the position shown in Figs 16 and 17 by the force of the leg spring 30. On further drawing out of the tipping cylinders 18 the tool 1 swivels about the bar 13 at the top and is released from the quick-change frame 10 at the bottom. By lowering the front loader 2 the bar 13 can be moved downwardly out of the catch hooks 21, so that the tool 1 is removed from the frame 10. If no other tool is to be fitted the tipping cylinders 18 may be drawn in to protect their piston rods, thereby moving the swivelled locking pin 24 back as far as the wall 12a, where it is held securely in the catch 53.

[0026] If on the other hand the removed tool 1 is to be replaced by another one, the bar 13 of the quick-change frame 10 is inserted from below in the catch hooks 21 of the tool 1 to be fitted, while the tipping cylinders 18 are still drawn out. The cylinders 18 are then drawn in. The tool 1 swivels around the bar 13 in the process and

lies against the quick-change frame 10. As the cylinders 18 are drawn further in the tool 1 swivels into the Fig. 5 position. During this operation the adjacent bearing arm 8 swivels the limb 24a of the locking pin 24 out of the catch 53 on the wall 12c until the pin 24 finally snaps back into its locking position through the force of the return spring 27 and locks the tool 1.

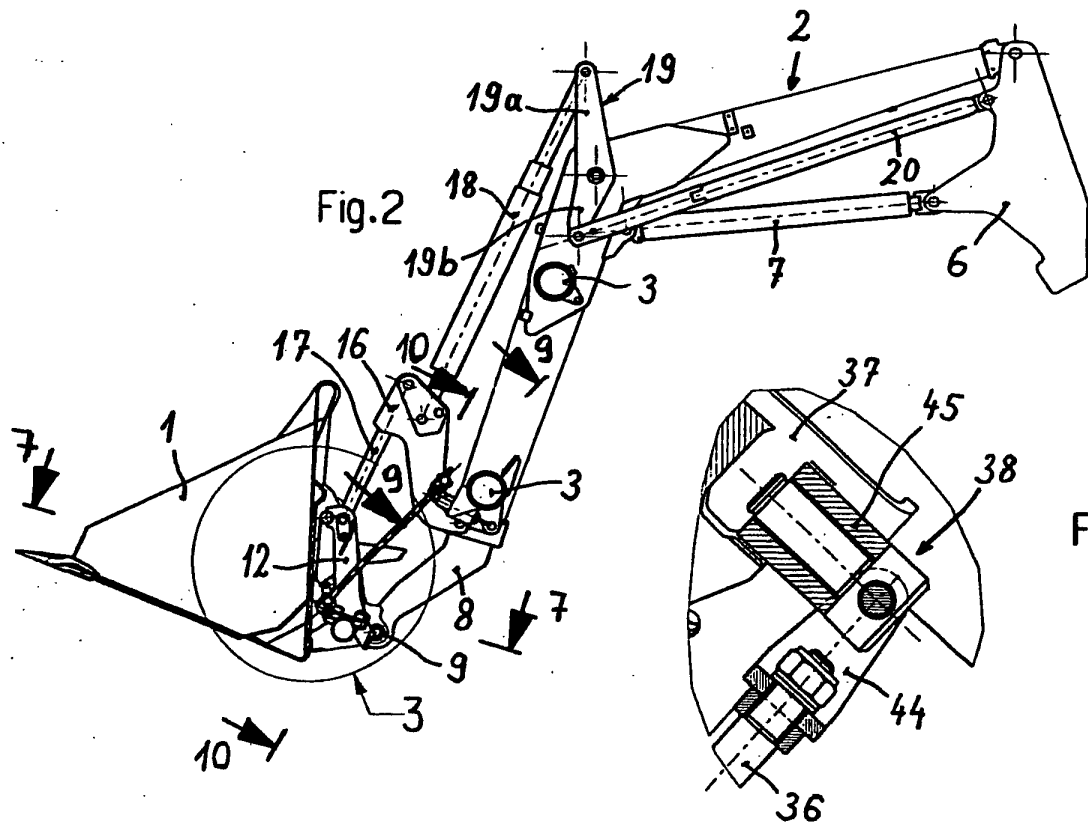
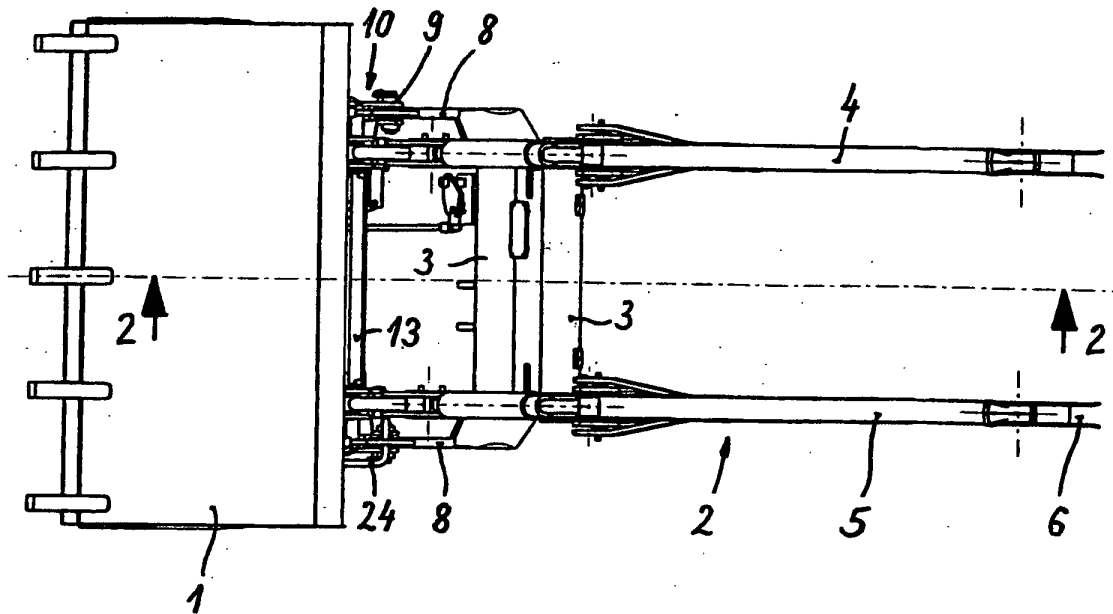
Claims

1. A front loader with a quick-change frame (10) for interchangeable tools (1) said frame being coupled to the free end region of the loader and being pivotable by tipping cylinders (18), at least one locking pin (23) being mounted on the frame, which pin (23) can be moved in response to an unlocking signal from a locked position fixing the tool to the quick-change frame to an unlocked position releasing the tool, by a hydraulic auxiliary force against the force of a resilient element, **characterised in that** the locking pin (23) is movable into the unlocked position by an actuating mechanism which becomes active only in response to the unlocking signal, and which responds to an increase in distance between the locking pin (23) and the front loader (2) which takes place when the tipping cylinders (18) are drawn out.
2. A front loader according to claim 1, **characterised in that** the actuating mechanism is switched into an inactive state in the absence of an unlocking signal and into an active state when an unlocking signal is sent.
3. A front loader rocker according to claim 2, **characterised in that** the actuating mechanism comprises a link member (36) and an arresting lever (37) which is flexibly coupled thereto by a universal joint (38) and mounted on the front loader (2), and wherein in the absence of an unlocking signal the arresting lever (37) can be swivelled freely and adjusted according to the distance between the locking pin (23) and the loader (2), and wherein the transmission of an unlocking signal when the tipping cylinders (18) are drawn out permits an arresting pin (50) to slide into the path of movement of the arresting lever (37).
4. A front loader according to claim 2 or 3, **characterised in that** the arresting pin (50) is controlled by a lifting magnet (39) mounted on the front loader (2).
5. A front loader according to any of claims 2 to 4, **characterised in that** the actuating mechanism contains an actuating lever (33) mounted for swivelling movement on the quick-change frame (10), which lever (33) is coupled to the free end of the

drawbar (36) by a universal joint (35) and has a cam plate (34) interacting with an entrainment member (41) on the locking pin (23).

6. A front loader according to claim 5, **characterised in that** the cam plate (34) has a cam section which causes the locking pin (23) to be moved into the unlocking position.
7. A front loader according to any of claims 1 to 6, **characterised in that** two locking pins (23, 24) are mounted on the quick-change frame (10) and fixed together by connecting links (25) and a bar (26) arranged longitudinally on the frame (10).
8. A front loader according to any of claims 1 to 7, **characterised in that** one locking pin (24) is U-shaped and has a free limb (24a), which in the unlocking position is swivelled in front of an abutment surface (catch 53) by the force of a leg spring (30) and projects into the path of movement of a bearing arm (8) of the loader (2), in such a way that when the tipping cylinders (18) are drawn in the limb (24a) of the locking pin (24) is swivelled back from the abutment surface (53) by the bearing arm (8).

Fig.1



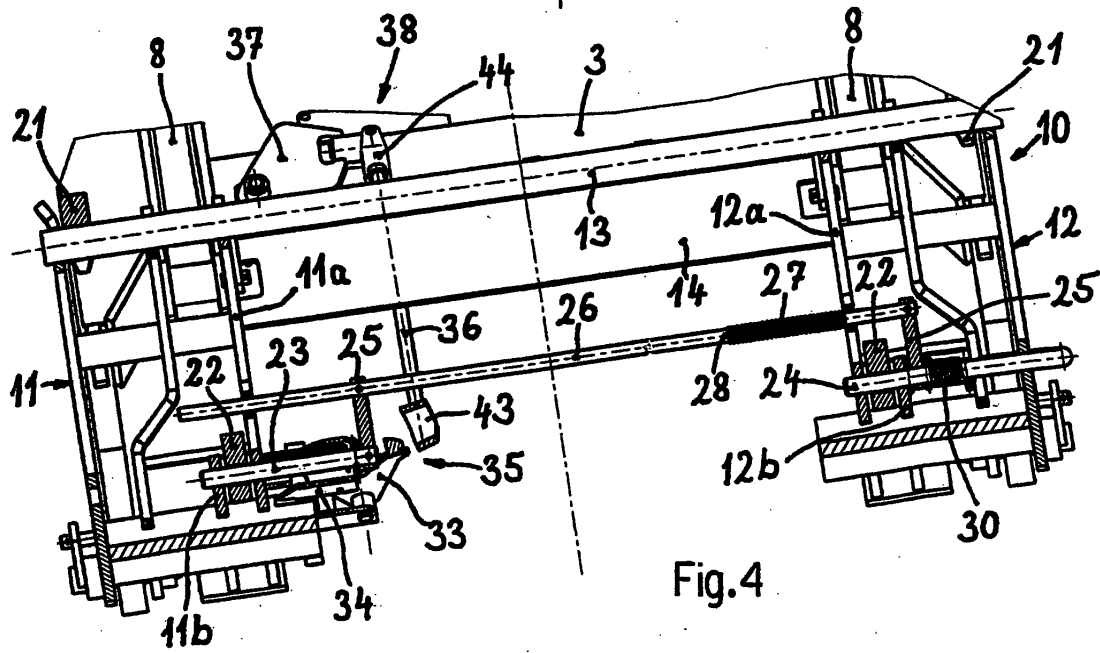
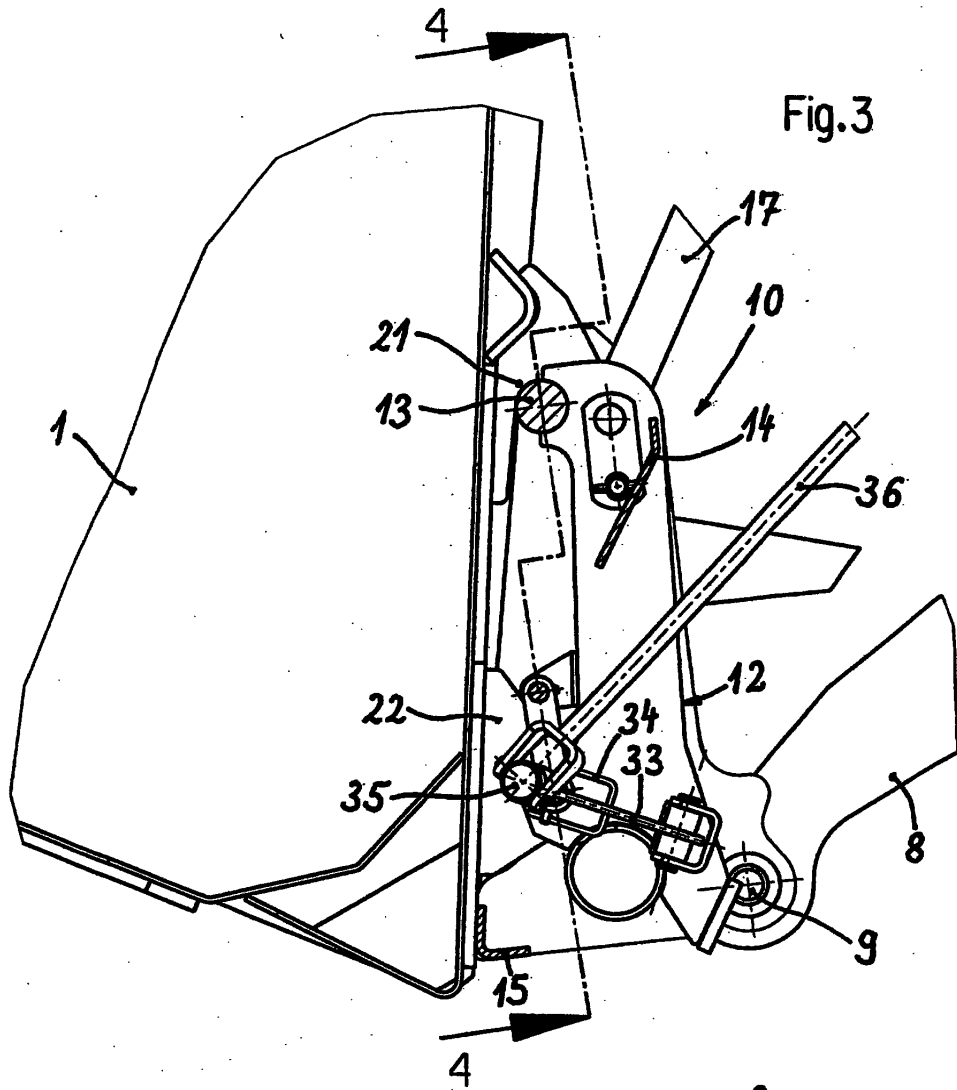


Fig.5

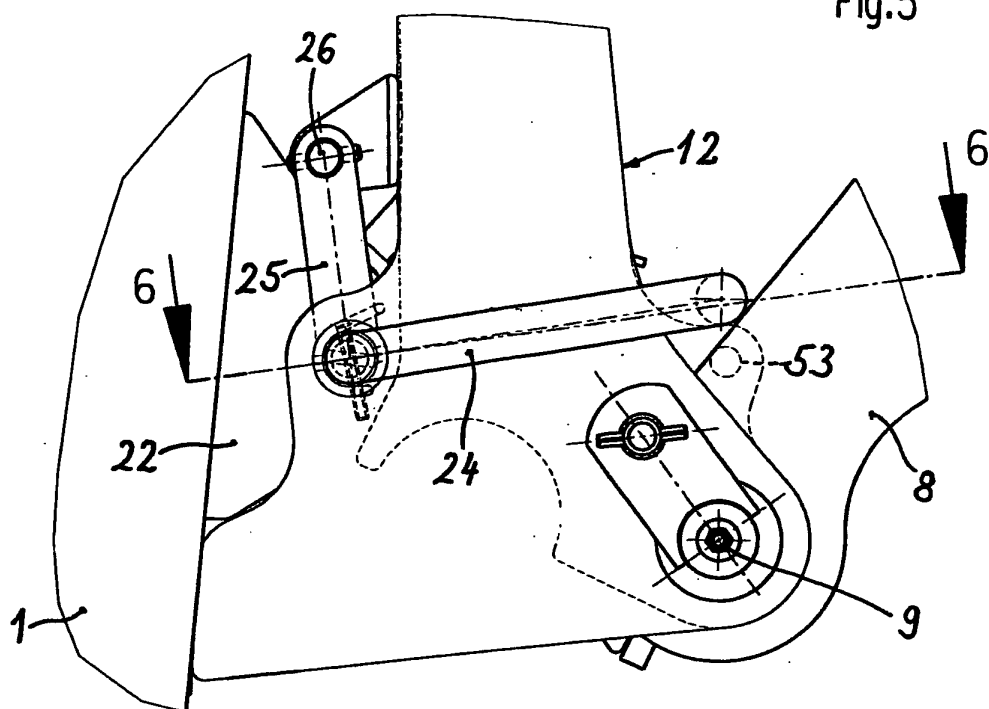


Fig.6

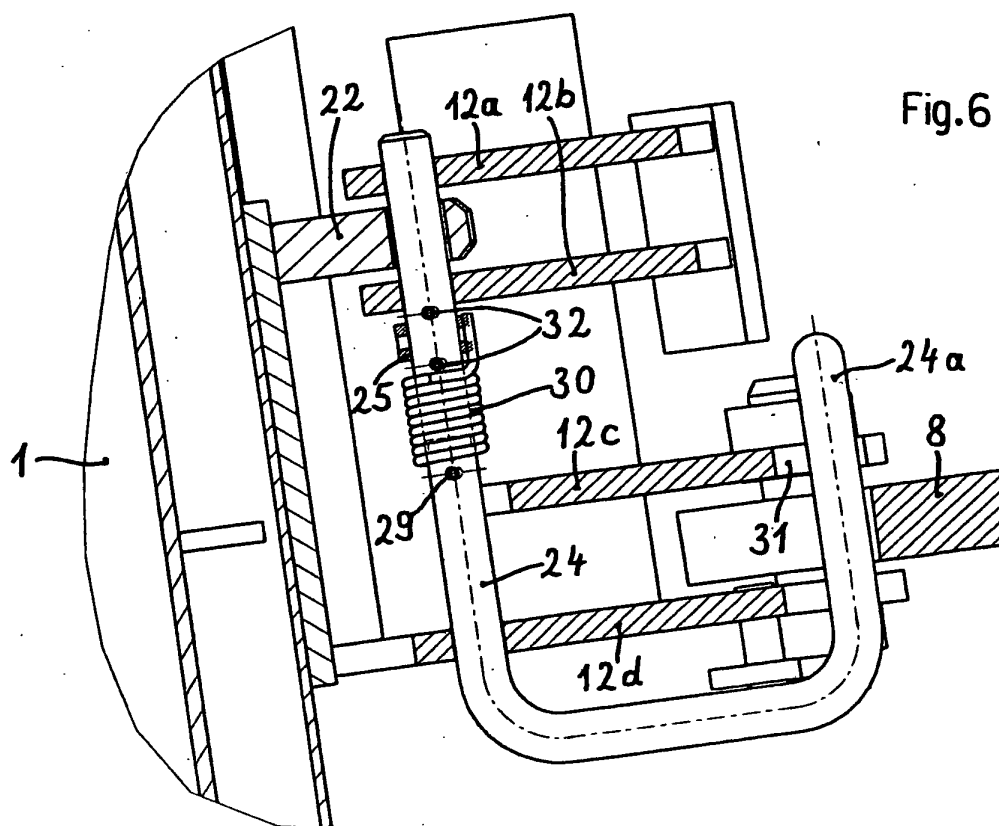


Fig.7

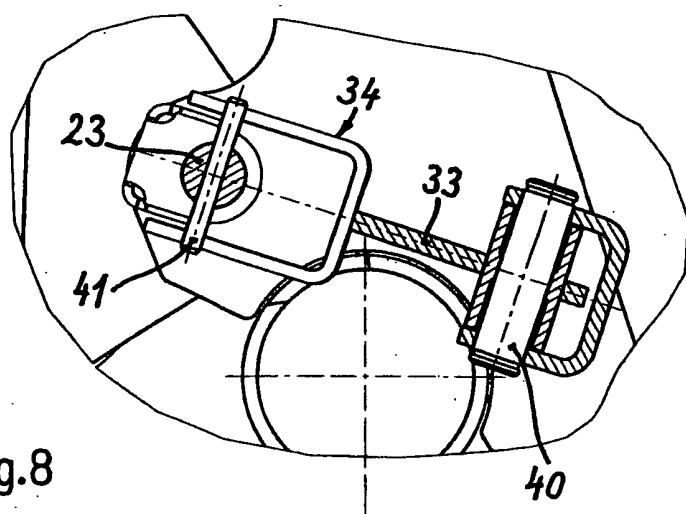
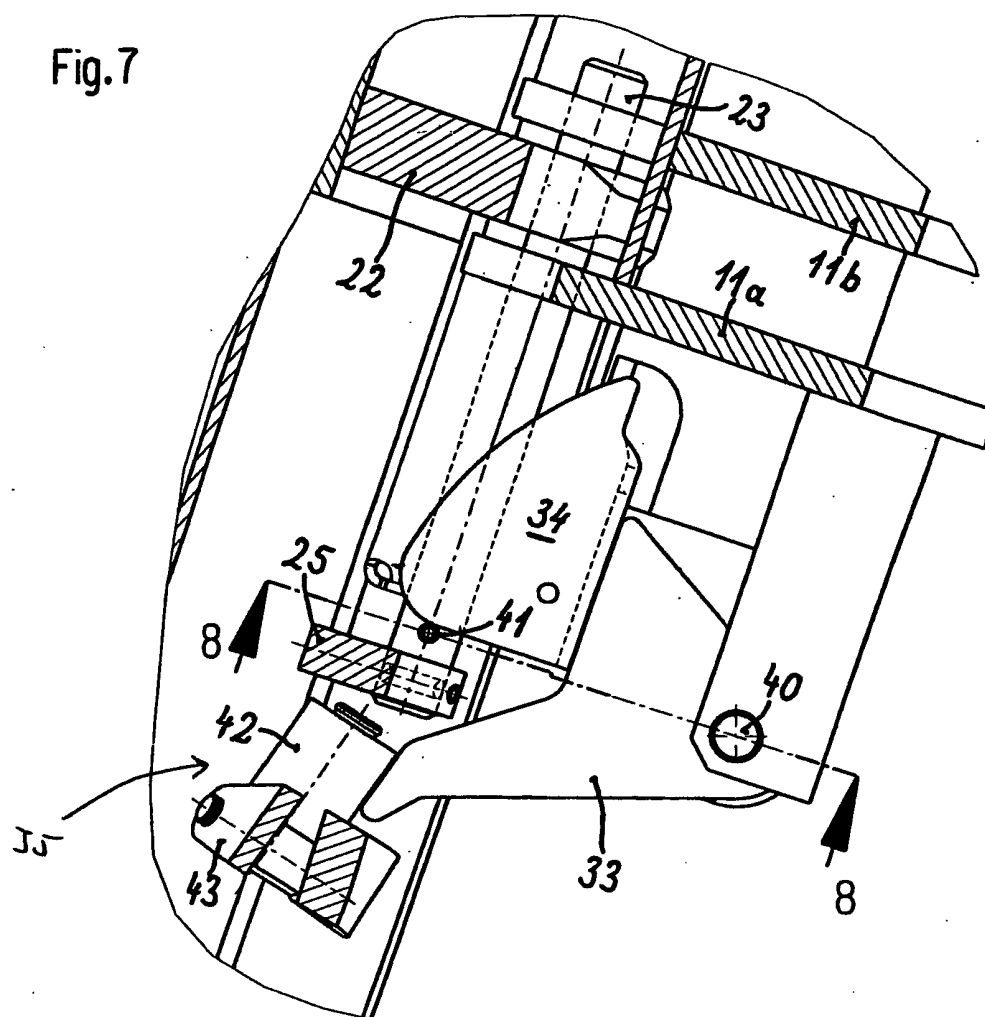


Fig.8

Fig.10

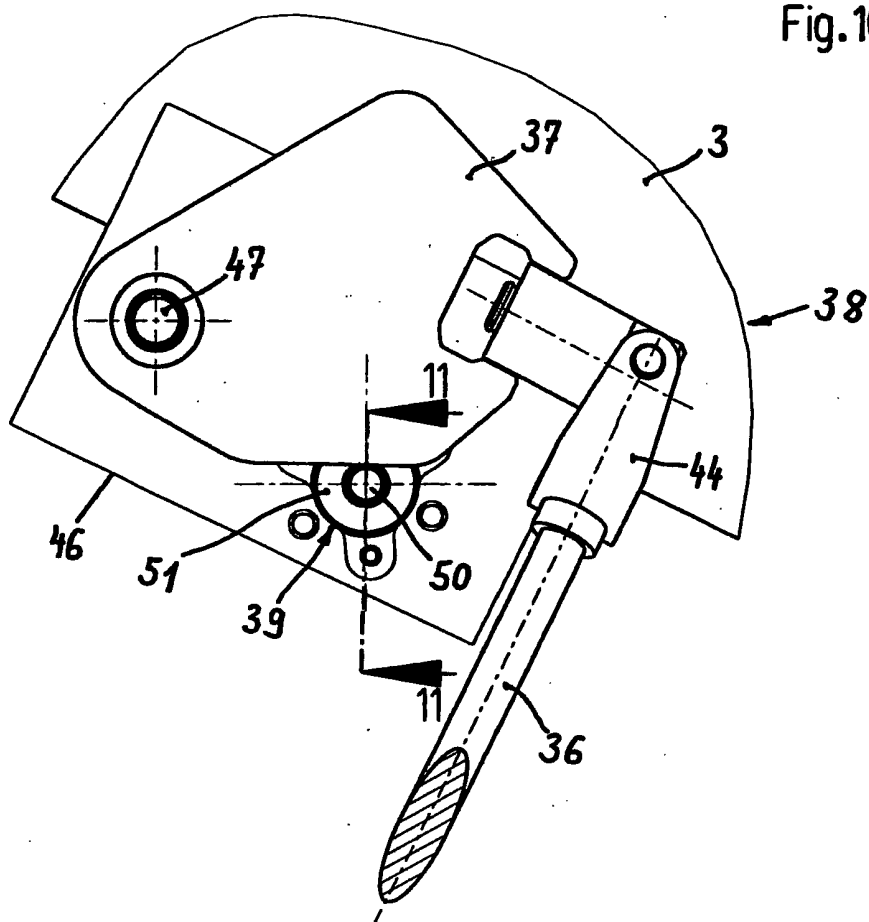


Fig.11

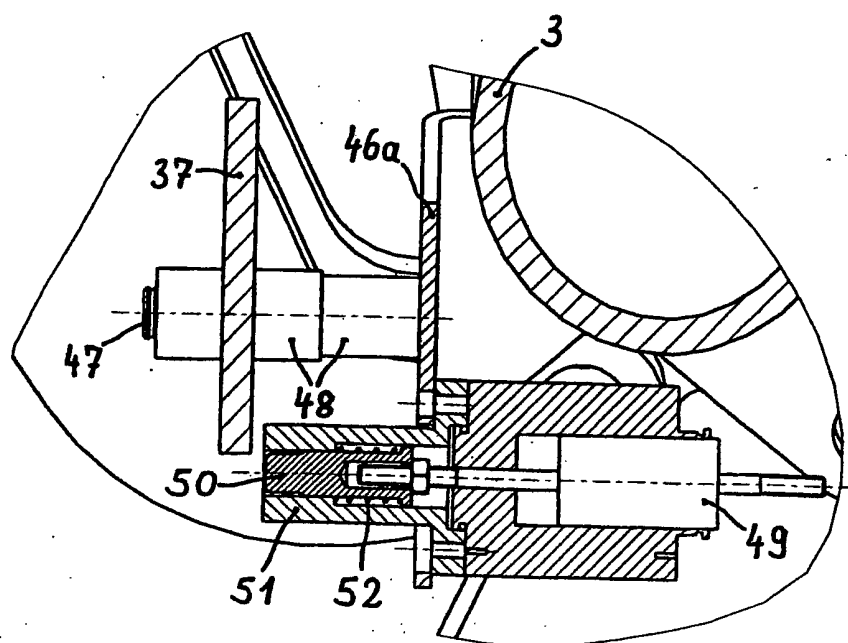


Fig.12

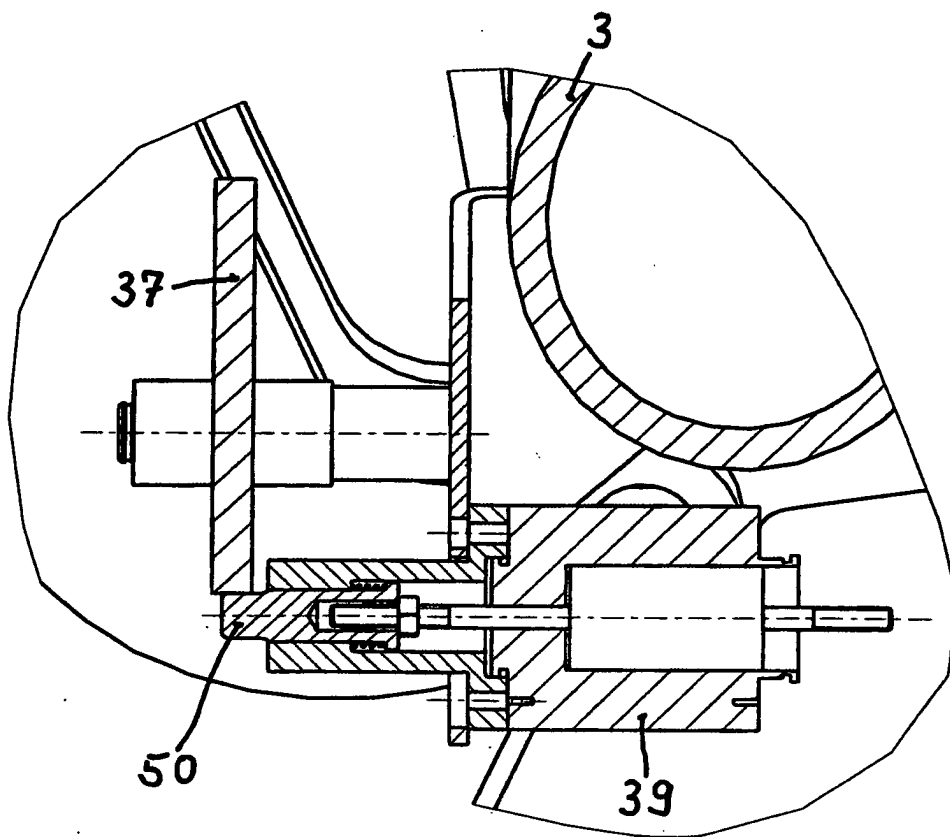


Fig.13

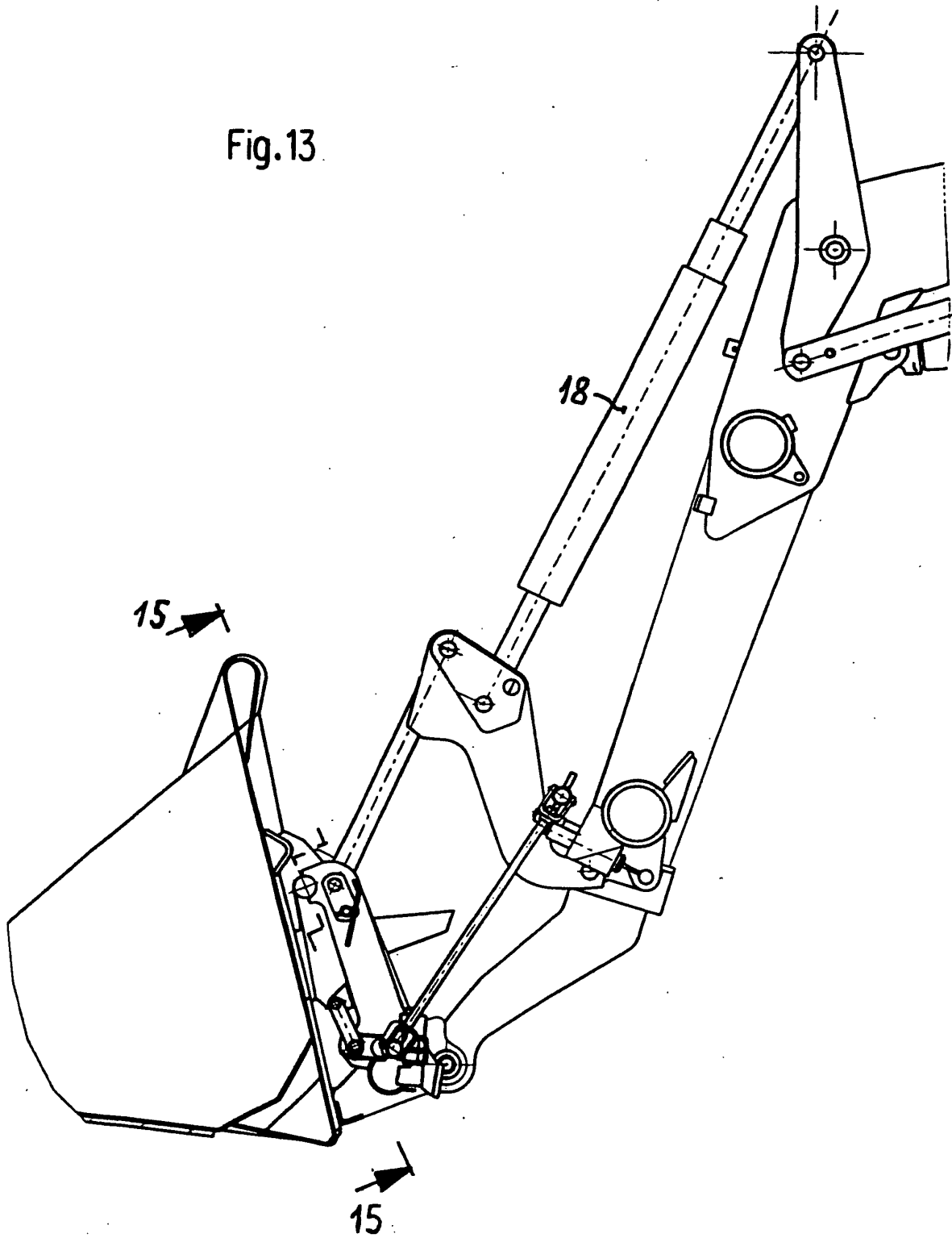


Fig.14

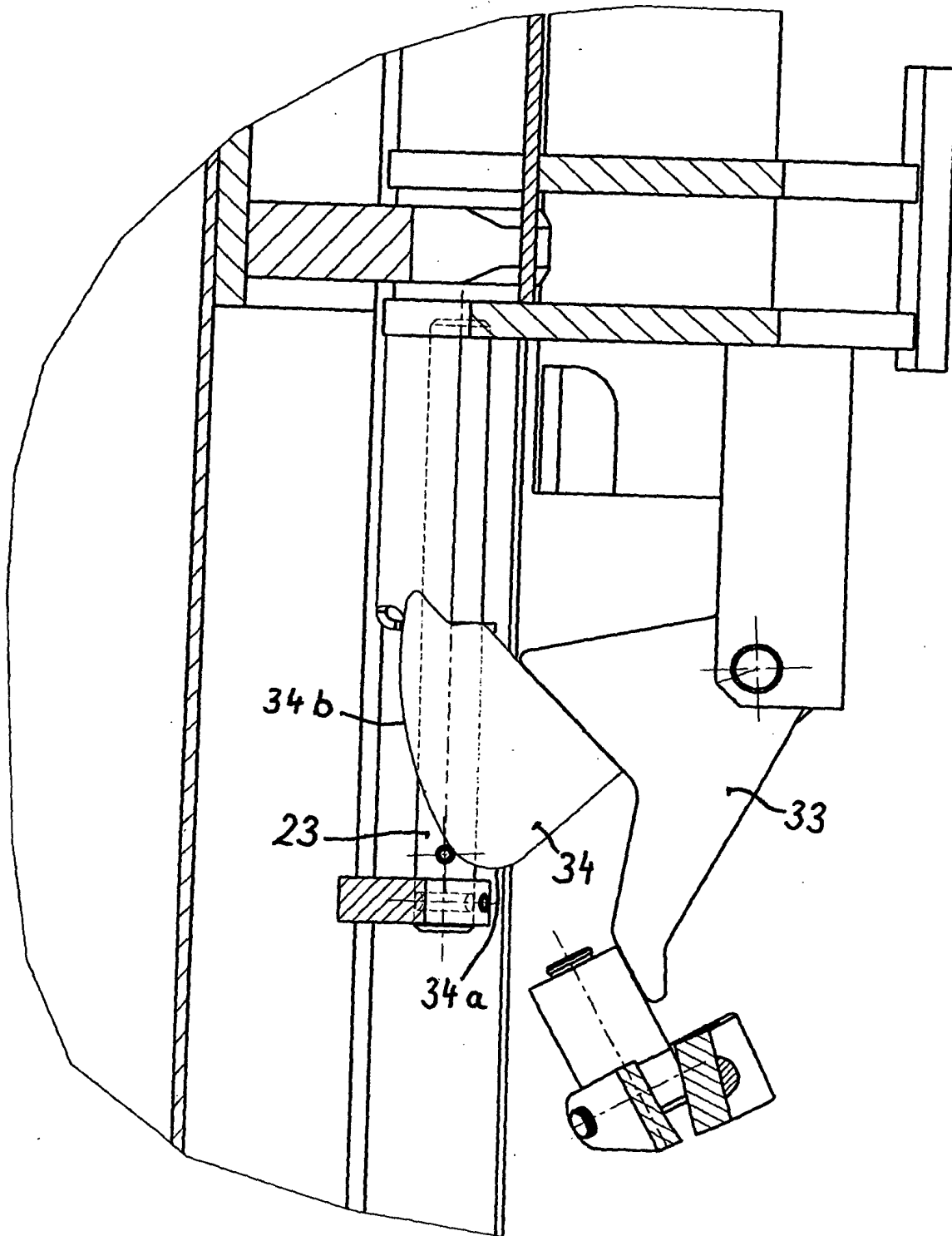


Fig.15

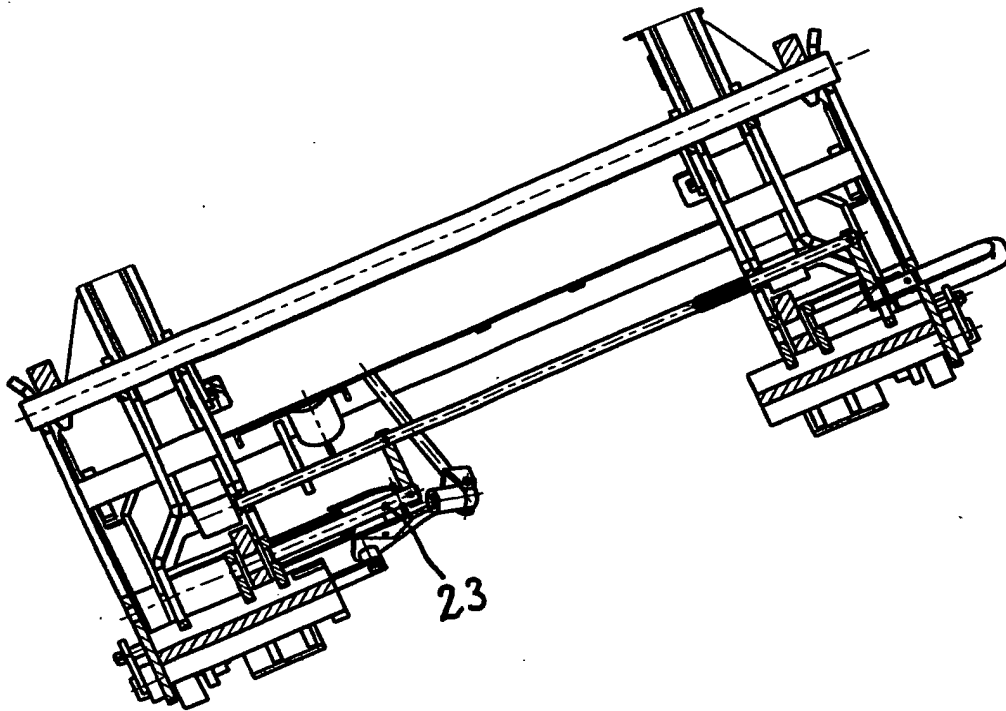


Fig.16

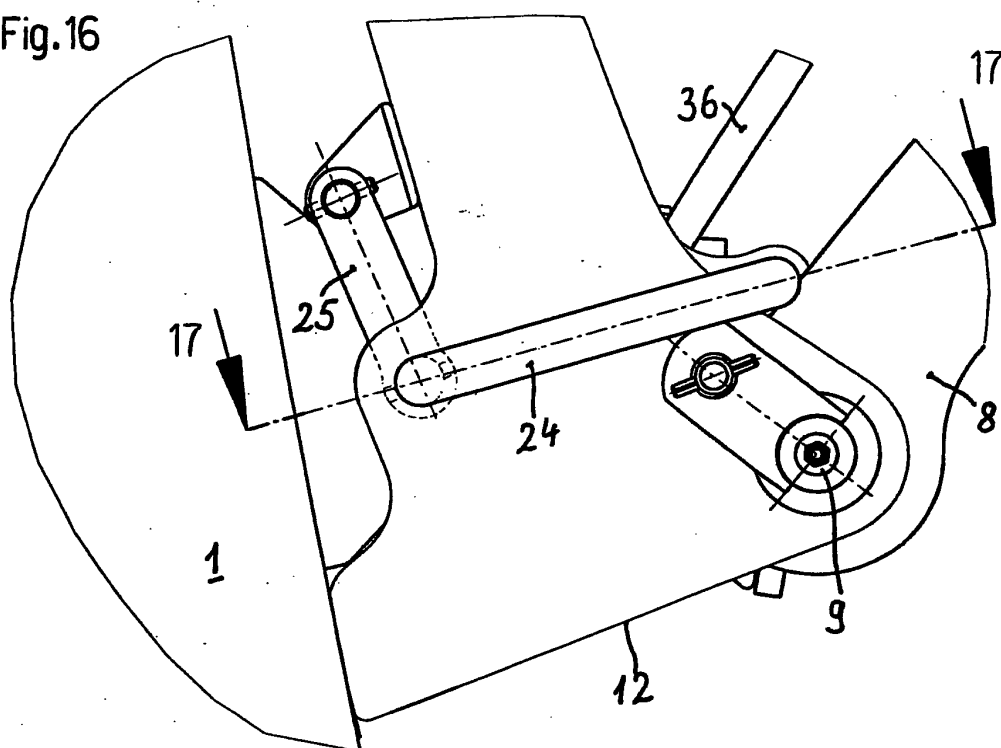
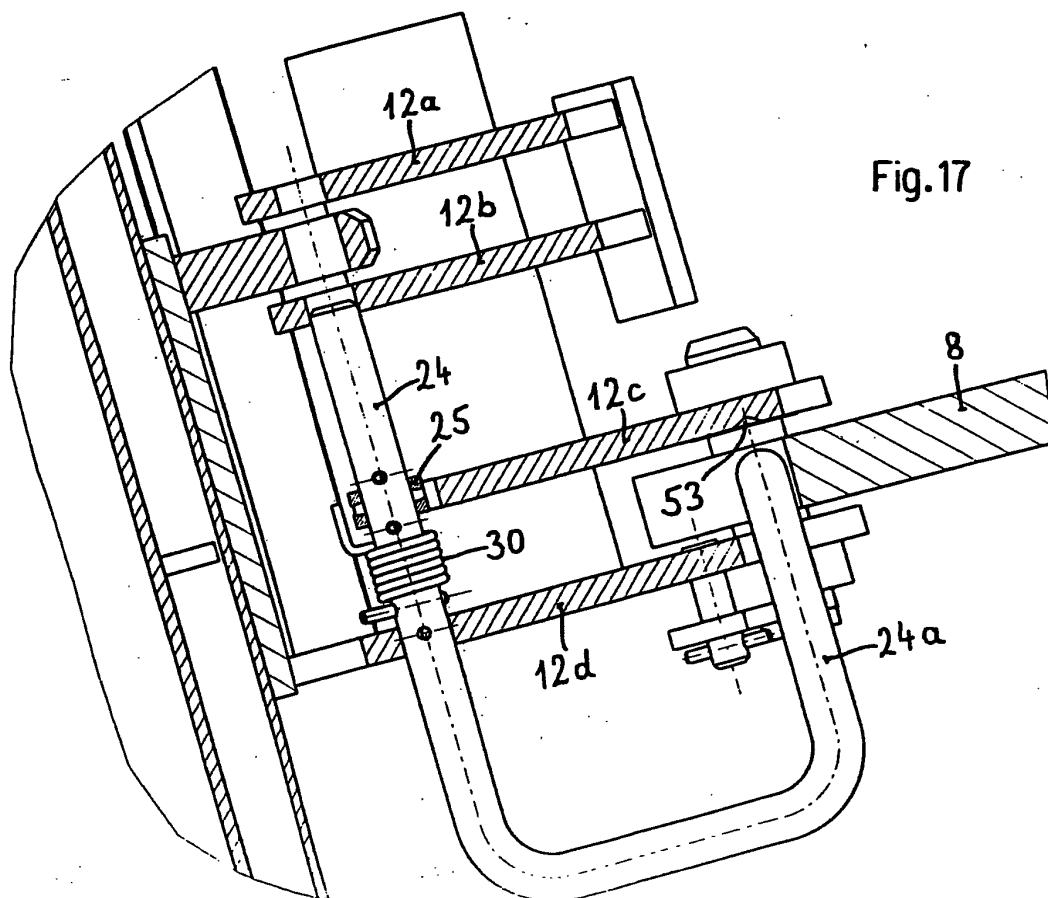


Fig.17





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Place of search THE HAGUE		Date of completion of the search 13 January 2003	Examiner Guthmuller, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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