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(54) **Apparatus for extracting and inverting the housing cover of a hydraulic lift mechanism of a tractor.**

(57) A service tool to be fitted to a tractor to extract and support the cover 2 of the housing 2A of a hydraulic lift mechanism. The tool includes a hoist 9 by which the cover 2 is lifted from the housing. The hoist 9 is supported on a pivotal structure comprising rigid links 4, 10 and the structure is swung bodily together with the hoist 9 and the cover 2 after it has been raised and secured to the hoist 9 in a clockwise direction, as viewed in Figure 2, to withdraw the cover 2 from a position beneath the cab 3 of the tractor. The pivotal movement of the links 4 and 10 is limited by a stop-pin 17 slidable in a slotted arm 14 also forming part of the structure. The hoist 9 together with the cover 2 is then swung about a pivot 7 to invert the cover, the arm 14 holding the inverted cover 2 displaced laterally from the housing 2A.

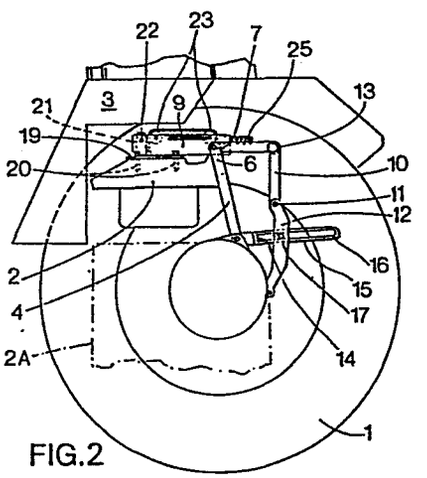

FIG.2

EP 0 134 652 A2

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APPARATUS FOR EXTRACTING AND INVERTING THE HOUSING COVER OF A HYDRAULIC LIFT MECHANISM OF A TRACTOR

The invention relates to apparatus for extracting the cover from the housing of a hydraulic lift mechanism of a tractor and then for inverting the cover. The hydraulic lift-mechanism may be, for example, the conventional three-point lift mechanism of an agricultural tractor.

The housing cover of the hydraulic lift mechanism of a tractor is often heavy and is tightly and sealingly fitted into an opening in the top of the housing. Therefore a considerable upward force is usually required to extract and to raise the cover. Furthermore the housing and the cover are often positioned beneath the cab of a tractor with little clearance between the cover and the cab. Therefore in many makes of tractor it is necessary first to remove or to dismantle parts of the cab before the cover can be removed and inverted. It is usually necessary to support the cover in an inverted position in order to gain access to control linkages and other parts of the lift mechanism which are commonly located in the cover.

An object of the invention is to provide apparatus whereby the cover of the lift mechanism can be raised and then withdrawn from beneath the cab and inverted without necessarily removing or dismantling parts of the cab or with only minimal dismantling thereof or with only limited movement of the cab or both.

According to the invention, apparatus for extracting the cover from the housing of a hydraulic lift mechanism of a tractor and then for inverting the cover and supporting it in an inverted position in which the cover is spaced from the housing comprises a pivotable structure arranged to be removably mounted on the tractor adjacent said housing; hoist means supported by the pivotable structure and operable to lift the cover from the housing and to raise the cover to an upper part of the structure; means for securing the cover in its raised position to the

structure ; means for swinging the structure together with the cover from an initial position in which the cover is supported upright above the housing to a second position in which the cover is withdrawn from a position immediately above the housing and the cover is then swung to a final position in which the cover is supported inverted and spaced laterally from said initial position.

The structure may comprise a plurality of rigid links arranged to be removably and pivotally attached to the tractor or a part of the lift mechanism thereof and supporting a fixed part of the hoist means.

The hoist means may be a hoist comprising a body and a lifting element arranged to be lowered to engage the cover and then to be raised to lift the cover from the housing and to raise the cover to a position in which it can be secured to the body of the hoist. The hoist may be manually-operable to raise and to lower the lifting element or it may be of a power-operable kind.

The structure conveniently includes stay means operable to limit the swinging of the structure into said second position, whereby the cover is supported in said final position. The stay means may comprise a pivotally-mounted arm with which a stop pin on another part of the structure or on a part of the lift mechanism of the tractor or on the tractor itself is engageable when the structure has been swung to said second position. The arm may for example have a longitudinal slot therein in which said stop pin is slidable freely to and from an end of the slot which is engaged by the stop pin when the structure has been swung into said second position. The stop pin may be carried by a control beam of a three-point linkage of the lift mechanism of the tractor.

By way of example, the apparatus for the extraction of the cover from the housing of the hydraulic lift mechanism of a tractor and for inverting the cover is now described with reference to the accompanying drawings, in which:-

Figures 1-4 are side views of the apparatus fitted to a tractor and showing successive positions of the apparatus;

Figure 5 is an end view of the apparatus in the direction of arrow V in Figure 1, and

Figure 6 is a plan view of the apparatus in the direction of arrow VI in Figure 1.

Referring to Figure 1 the apparatus is shown mounted on a tractor adjacent the hydraulic lift housing cover which is to be removed, inverted and supported in an inverted position. The housing of the hydraulic lift mechanism which is fitted with the cover is indicated at 2A. The tractor is of the type having a cab of which part projects above the housing 2A and the cover 2. In Figure 1, a rear wheel of the tractor is shown at 1. The housing 2A of the hydraulic lift mechanism is positioned between the rear wheels 1 and is fitted with the cover 2. Part of the cab of the tractor is indicated at 3. When it is necessary to carry out work on the hydraulic lift mechanism, the cover 2 must be removed and then be supported in an inverted position to enable the underneath and interior of the cover 2 to be exposed so that work can be performed on controls and other parts of the lift mechanism which are usually contained in the cover.

The apparatus provided by this invention enables this to be done and thus the apparatus constitutes a service tool. Referring to Figures 1, 5 and 6, the service tool comprises a pivotable structure comprising a pair of laterally-spaced links 4 which are each connected at one end thereof for pivoting about a common axis 5 to fixed lugs on the tractor. The upper end 6 (as shown

in Figure 5) of each of the links 4 is pivotally connected about a common axis 7 to a bridge 8 which carries a hoist 9. The bridge 8 is also connected for pivoting about the common axis 7 to a pair of cranked links 10 which are pivotally connected at their other ends at 11 to one end of the control beam 12 of the top link of a three-point linkage of the tractor or to some other part of the tractor spaced from the axis 5. Transverse handles 13 are attached to the links 4, 10 parallel with the common pivotal axis 7. Thus on pulling or pushing the handles 13, the pairs of links 4 and 10 are swung about their respective axes 5 and 11. Another pivotally-mounted stay arm 14 is pivotally attached at one end thereof to swing about the axis 5. The arm 14 has a slot 15 therein in which a stop pin 17 on the beam 12 of the three-point linkage is captive and is slidable along the slot 15 to a limiting end 16 thereof.

The hoist 9 has a lifting chain or cable 18 carrying at its lower end a lifting plate 19 which is to be bolted to the top of the cover 2, as indicated at 20 in Figure 1. The lifting plate 19 has an upstanding lug 21 having a hole therein by which the lug 21 when raised is secured to a fixed part of the hoist 9 by a pin 22 engaged in the hole. The hoist may be of any kind having a lifting chain or cable 18. For example it may be of the kind having pulleys 23 around which the cable 18 is passed, the pulleys 23 being moved by means of a pair of lead screws 24 and 25. The lead screws 24 and 25 have oppositely-handed screw-threads, whereby double travel of the pulleys 23 is effected per revolution of the outer lead screw 25. The lead screw 25 is turned by means of a key, not shown.

The service tool is used as follows:

The links 4 and 10 and the stay arm 14 are connected to the pivots 5 and 11 as shown in Figure 1 and the stop pin 17 on the beam 12 is located within the slot 15 in the arm 14. With the links 4 and 10 and the arm 14 in the position shown in Figure 1, the hoist 9

will be supported in a substantially horizontal position above the cover 2. The chain or cable 18 is lowered to the position shown in Figure 1 and the lifting plate 19 is bolted to the cover 2 at point 20. The hoist 9 is then operated by turning the lead-screw 25 to raise the plate 19 and thus to extract the cover 2 from the housing of the hydraulic lift mechanism. The cover 2 is sealingly engaged with the housing and so a prising lever 26 (shown in Figures 3 and 4 for another purpose) having a blade-like end 27 may be used to break the seal. The lever 26 is later used as a detachable handle for inverting the cover 2 and is shown in that mode in Figures 3 and 4. When the cover 2 has been raised fully into the position shown in Figure 2 the cover 2 is secured to the body of the hoist 9 by engaging the pin 22 in the hole in the lug 21. The whole service tool is then swung from the position shown in Figure 2 by the operator pulling on the handles 13 and thereby moving the links 4 and 10 in the clockwise direction to a second position shown in Figure 3. The movement of the service tool from the position shown in Figure 2 into the position shown in Figure 3 causes the cover 2 to be withdrawn rearwardly of the tractor from beneath the cab 3 and then to be tipped into the position shown in Figure 3, without necessarily first removing or dismantling the cab 3, as has usually been necessary hitherto. In this position of the tool, the pin 17 will have moved along the slot 15 in the arm 14, as shown in Figure 3, to engage the end 16 of the slot 15, thereby holding the links 4 and 10 from pivoting any further in the clockwise direction.

When the service tool has reached the position shown in Figure 3, the lever 26 is secured to the hoist 9 by inserting the lever 26 in a socket 28 in a fixed part of the hoist 9, as indicated in Figure 3. By means of the lever 26, the hoist 9 together with the cover 2 is swung about the pivot 7 into the final position shown in Figure 4 in which the cover 2 is supported in an inverted position in which it is spaced laterally from the position shown in Figure 1. This enables work to be performed on the cover

and also supports the cover to enable work to be performed on the exposed lift mechanism parts within the housing.

After service work has been performed on the lift mechanism or the cover 2, the cover 2 and the service tool are returned in the reverse direction from the position in Figure 4, through the position in Figure 3, to the position shown in Figure 2. Finally, the lifting plate 19 is detached from the body 9 of the hoist and the cover 2 is lowered into position on the housing 2A. Then the lifting plate 19 is detached from the cover 2 and the whole service tool is removed from the tractor.

Arms 4 and 10 of different lengths and shapes and having different mounting positions may be used to enable the service tool to be used on different makes of tractor.

CLAIMS

1. Apparatus for extracting the cover (2) from the housing (2A) of a hydraulic lift mechanism of a tractor and then for inverting the cover (2) and supporting it in an inverted position in which the cover (2) is spaced from the housing (2A) characterised in that the apparatus comprises a pivotable structure (4, 8, 10) arranged to be removably mounted on the tractor adjacent said housing (2A); hoist means (9, 18, 19) supported by the pivotable structure (4, 8, 10) and operable to lift the cover (2) from the housing (2A) and to raise the cover (2) to an upper part of the structure (4, 8, 10); means (21) for securing the cover (2) in its raised position to the structure (4, 8, 10); means for swinging the structure (4, 8, 10) together with the cover (2) from an initial position in which the cover (2) is supported upright above the housing to a second position in which the cover (2) is withdrawn from a position immediately above the housing (2A) and the cover (2) is then swung to a final position in which the cover (2) is supported inverted and spaced laterally from said initial position.

2. Apparatus as claimed in Claim 1 in which the structure (4, 8, 10) comprises a plurality of rigid links (4, 10) arranged to be removably and pivotally attached to the tractor (5) or a part (12) of the lift mechanism thereof and supporting a fixed part (9) of the hoist means (9, 18, 19).

3. Apparatus as claimed in Claim 2 in which the hoist means (9, 18, 19) comprises a body (9) and a lifting element (18,19) arranged to be lowered to engage the cover (2) and then to be raised to lift the cover (2) from the housing (2A) and to raise the cover (2) to a position in which it can be secured to the body (9) of the hoist.

4. Apparatus as claimed in Claim 3 in which the hoist (9,18,19) is manually-operable.

5. Apparatus as claimed in Claim 3 in which the hoist (9,18,19) is of a power-operable kind.

6. Apparatus as claimed in any preceding claim in which the structure (4, 8, 10) includes stay means (14) operable to limit the swinging of the structure (4, 8, 10) into said second position, whereby the cover (2) is supported in said final position.

7. Apparatus as claimed in Claim 6 in which the stay means (14) comprises a pivotally-mounted arm (14) with which a stop pin (17) on another part of the structure or on a part of the lift mechanism of the tractor or on the tractor itself is engageable when the structure has been swung to said second position.

8. Apparatus as claimed in Claim 7 in which the arm (14) has a longitudinal slot (15) therein in which said stop pin (17) is slidable freely to and from an end of the slot (15) which is engaged by the stop pin (17) when the structure has been swung into said second position.

9. Apparatus as claimed in Claim 8 in which the stop pin (17) is carried by a control beam (12) of a three-point linkage of the lift mechanism of the tractor.

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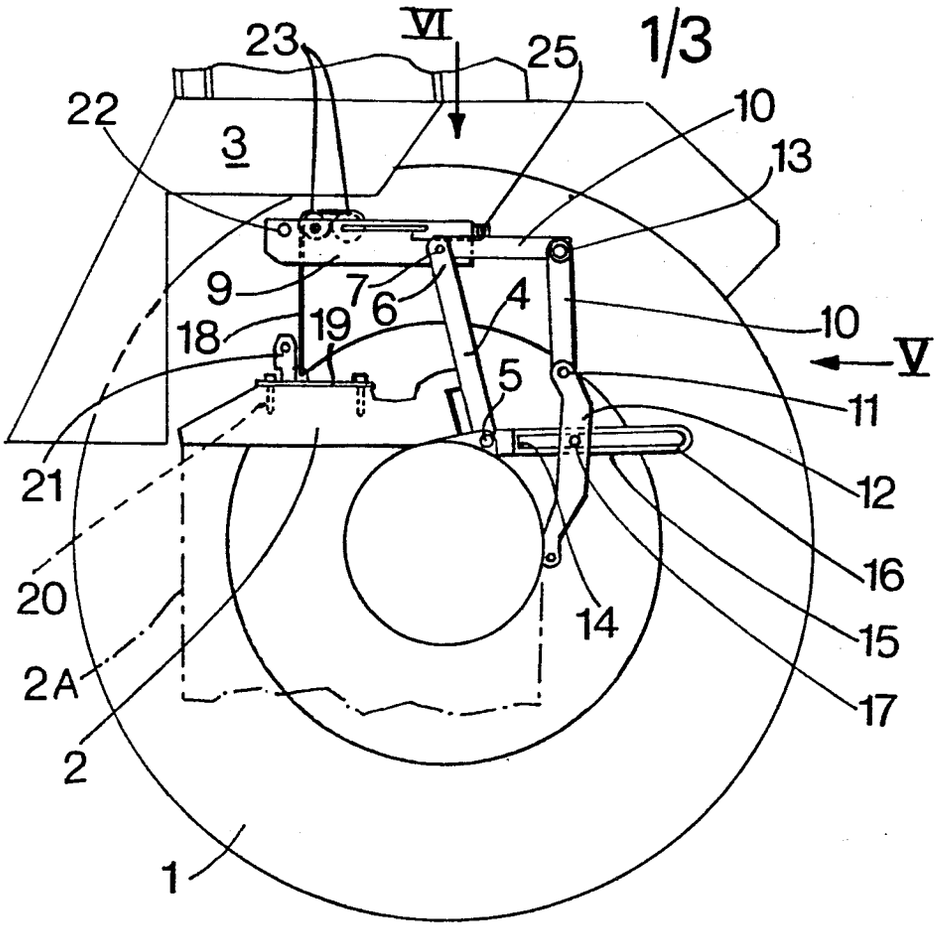

FIG.1

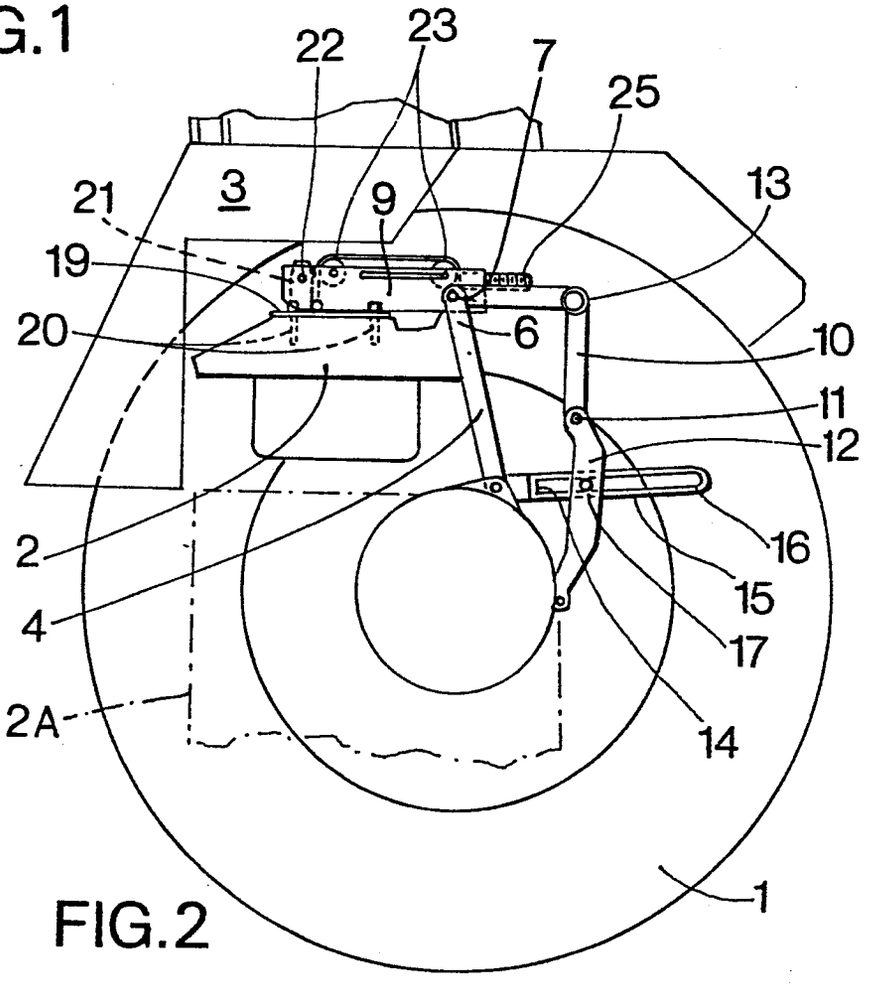

FIG.2

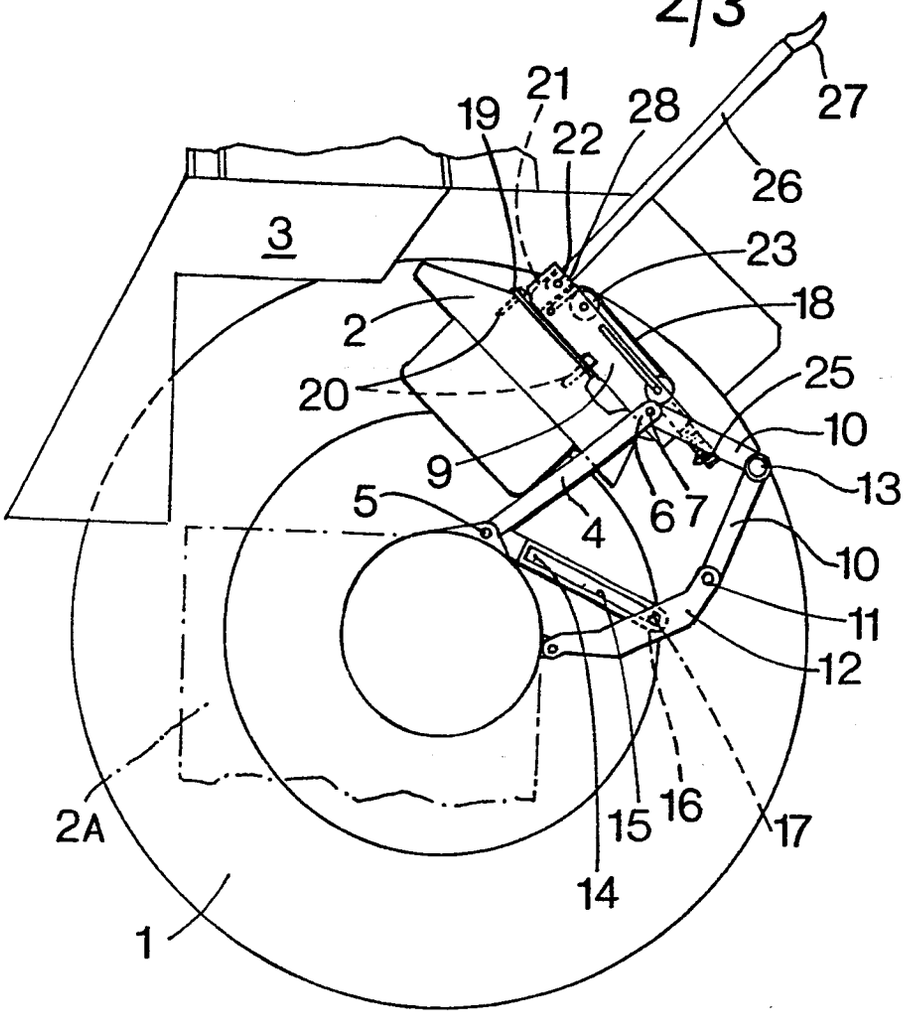
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FIG.3

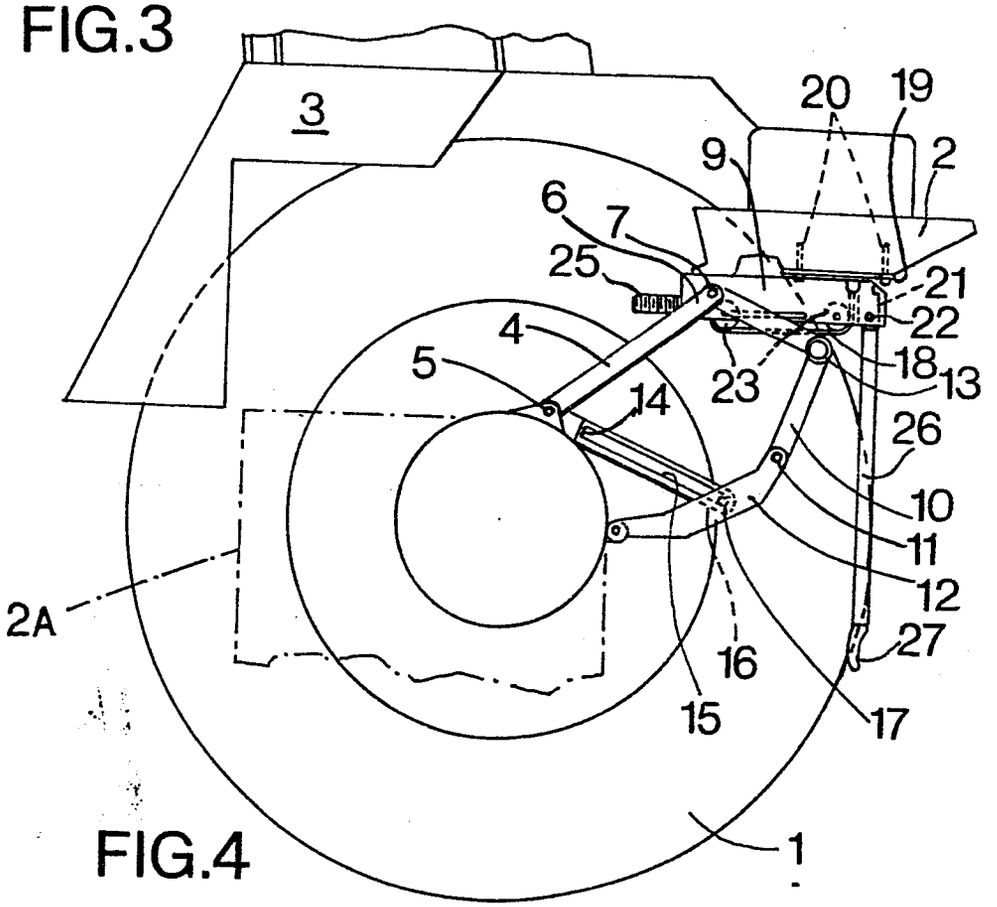
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FIG.4

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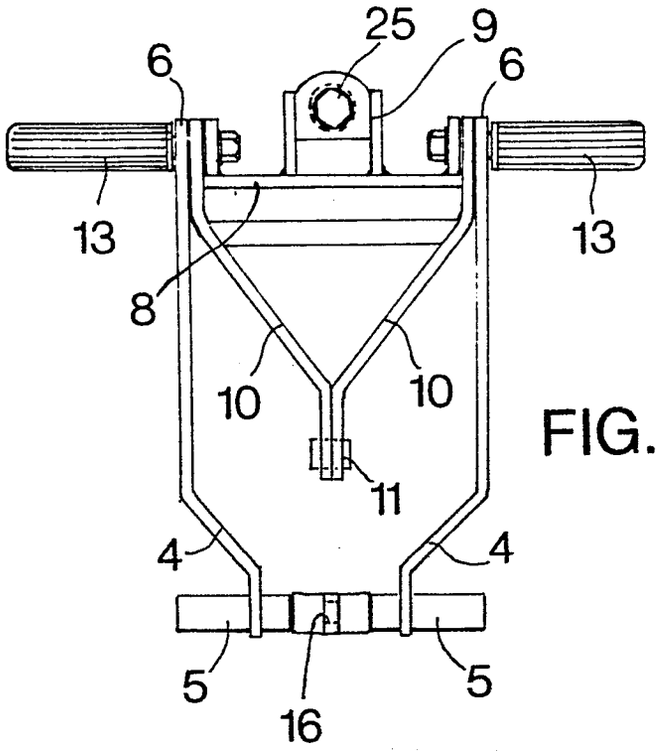

FIG.5

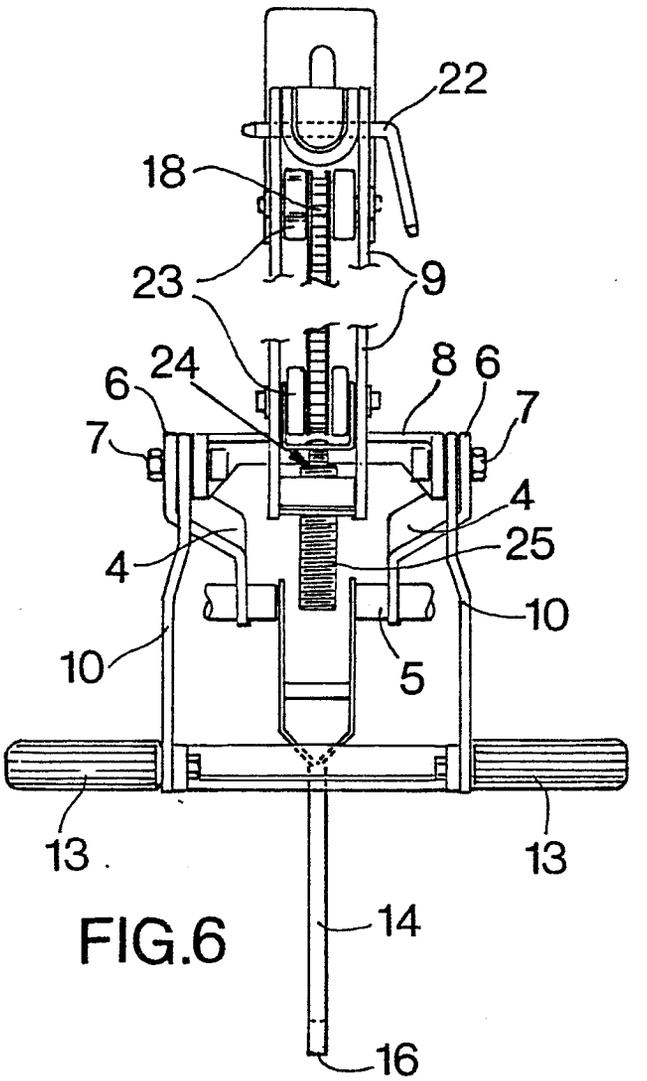

FIG.6