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(72) Inventor: **Cummings, Paul**
Souldern, Bicester
Oxfordshire OX6 9LA (GB)

(74) Representative: **Stanley, Michael Gordon**
Michael Stanley & Co.,
P.O. Box 270
Banbury,
Oxfordshire OX15 5YY (GB)

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(71) Applicant: **Blue Sky Access Ltd**
Shiplake,
Henley on Thames,
Oxfordshire RG9 3LP (GB)

(54) **Material handling apparatus**

(57) A material handling apparatus(30) for use with a fork lift and which has a base (31) with two fork receptors (33) for receiving the forks (13) of the fork lift (10), with material support means being mounted on a pair of spaced apart slideways (39,41) secured on the base (31)

and extending substantially longitudinally of the fork receptors (33), the support means (35) being mounted on the slideways (39,41) via a mounting head (42) slidably and rotatably mounted on one slideway (39) and a further slideway (43) also slidably and rotatably mounted relative the second slideways (41).

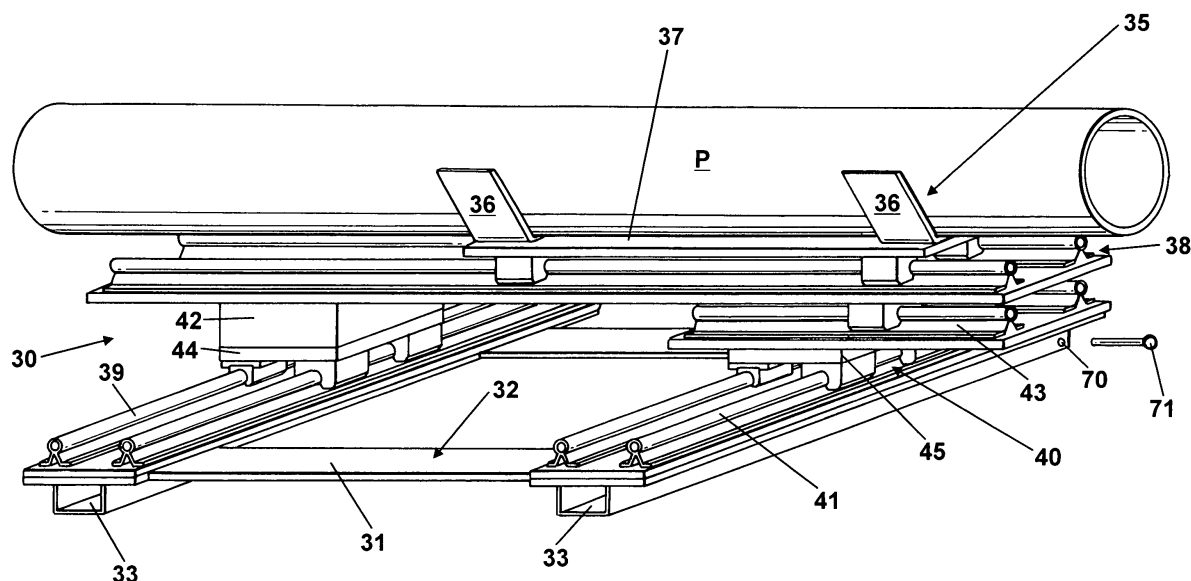


Fig. 2

Description

Field

[0001] This invention relates to material handling apparatus and in particular to apparatus to be in combination with a fork lift.

Background of the Invention

[0002] Building construction sites for large buildings frequently employ construction equipment for lifting large and heavy components into position during the construction of a building. For example, lengths of standard 8 inch (200mm) diameter steel pipe are typically 6 meters in length and may weigh in the order of 150-300 kgs depending on the pipe diameter. During construction of commercial building, the overhead pipework is typically fixed into position using a pair of spaced apart aerial lifts working in synchronisation with the pipe being finally lifted and manoeuvred into position manually.

[0003] A typical aerial lift is a mobile scissor lift available which has a work platform which may be lifted into the air by a hydraulically operable scissor mechanism. These lifts are located as close to the erection site as is possible for the safe lifting and manoeuvring of heavy loads and are stabilised by means of stabilisers located at the corners of the self drive body. In some circumstances due to ground works, or the state of the ground it may not be possible to position the scissor lift platform at an appropriate working distance from the work location and the scissor lift may be destabilised if material loads are supported at excess distances beyond the lift platform.

[0004] The present invention is concerned with auxiliary material handling equipment for use with fork lift apparatus, especially when fitted to long reach vehicles such as telehandlers, for lifting and locating materials into position during building construction.

Statements of Invention

[0005] According to the present invention there is provided a material handling apparatus having a base with two substantially parallel fork receptors for receiving the forks of a fork lift with material support means being mounted on displacement means secured to the base for movement of the support means, characterised in that the displacement means comprise a pair of spaced apart substantially parallel slideways secured on the base and extending substantially longitudinally of (that is substantially parallel to) the fork receptors, the support means being mounted on the two longitudinal slideways via a mounting head slidably and rotatably mounted relative to one of said slideways and a further slideway also slidably and rotatably mounted relative the second of said slideway.

[0006] The fork receptors are preferably a pair of elongate

gate hollow section struts fixed to a lower surface on the base.

[0007] The material support means may include an elongate transverse slideway fixed to the mounting head and slidably mounted on the further slide. The bias angle between the longitudinal axis of the transverse slideway and the axis of the first and second slideways is variable within a desired arc.

[0008] A pair of material supports is slidably mounted on the transverse slideway for movement relative thereto. The supports may be mounted in spaced relationship in a carriage which is slidably mounted on the slider.

[0009] Actuator means, preferably hydraulically operated, may operable to move the mounting head and the further slide relative to the first and second slide respectively. Further actuator means may be operable to move the carriage relative to the transverse slider.

[0010] The material supports may each include a jack for adjustment of the height of the respective support above the base. The or each jack may be operated by any suitable means, for example the ram may be displaced by mechanical means such as a pawl and ratchet mechanism, or screw threaded drive means, and is preferably a hydraulic jack.

[0011] The two jacks may be interconnected so that they are raised or lowered in unison.

[0012] The material handling apparatus is used in combination with a fork lift, the forks of which are inserted into the fork receptors on the base.

[0013] The apparatus includes a hydraulic control means to which the hydraulic actuators and hydraulic jacks are connected, preferably independently.

[0014] The fork lift is preferably a mobile self drive lift having forks on a boom which is raised by a powered hydraulic system, wherein said hydraulic control means are connected into the powered hydraulic system of the fork lift.

Description of the Drawings

[0015] The invention will be described by way of example and with reference to the accompanying drawings in which:-

- FIG. 1 is a schematic view of a fork lift vehicle having apparatus according to the present invention mounted on the vehicle forks,
- Fig. 2 is an isometric view of a material handling apparatus according to the present invention, with some details omitted for the sake of clarity,
- Fig. 3 is an exploded isometric view of the apparatus shown in Fig. 1,
- Fig. 4 is a plan view of the one of the slideways showing the actuator,
- Fig. 5 is a side view of the slideway of Fig. 5, and
- Fig. 6 is an end view of the apparatus including actuators and controls.

Detailed Description of the Invention

[0016] With reference to Figs 1 of the drawings, there is shown a vehicle 10 in the form of a self drive mobile lift of any suitable type for use on a building site. A suitable type of vehicle is a telehandler available from different sources including JCB. The vehicle 10 has a drivable vehicle body 11 having wheels 12 and an extendable boom 14 with a pair of lifting forks 13 located on the end of the boom. Stabilisers 15 are provided for steadying the vehicle on the ground. The lifting forks 13 in use, can be raised or lowered relative to the ground as is well known. The forks 13 are shown in a raised condition and are raised or lowered by any suitable means, preferably typically operated by a powered hydraulic system provided on the lift. The vehicle hydraulic system is provided with a hydraulic coupling 16 located at the end of the boom 14 whereby hydraulic power may be taken from the powered system of the lift and used to operate pipe handling apparatus 30 of the present invention.

[0017] With reference to Figures 2 & 3, the material handling apparatus 30 has a base 31 in the form of an open substantially square frame with a planar upper surface 32. The underside of the base 31 is provided with a pair of elongate substantially parallel hollow members 33. The hollow members 33 have a rectangular cross-section and are secured to the underside of the base 31, preferably in alignment with two opposed sides of the base 31. The hollow members 33 provide two substantially parallel fork receptors for receiving the forks 13 of the vehicle lift 10. The fork receptors 33 are provided with retention means 70 at the end adjacent the boom 14 for securing the material handling apparatus 30 to the forks 13 on the boom and prevent slippage. In this case the retention means are aligned holes through the fork receptors which accept a pin 71 (see 2). Similar holes may be provided in lugs formed on the receptors 33 or base 31.

[0018] The base 31 provides a support for a material support means 35, in this example a pair of V shaped pipe holders 36 which are mounted in spaced relationship on a carriage 37. The material support means 35 is mounted to the base 31 through a displacement means 40 secured to the base 31 for movement of the support means 35 in two axial directions relative to the fork receptors 33.

[0019] In an alternative arrangement shown in Fig. 1 only, the pipe holders 36 may be each fixed to the upper end of the ram of a hydraulic jack 49. The two hydraulic jacks 49 are then in turn mounted on the carriage 37A.

[0020] The carriage 37 is slidably mounted on a transverse slideway 38 for movement in the transverse axial direction (that is substantially transverse to the fork receptors 32,33). The transverse slideway 38 is mounted on a pair of substantially parallel longitudinal slideways 39,41 for movement in the longitudinal axial direction (that is longitudinal with respect to the fork receptors 33). The transverse slideway 38 is mounted on one of said slideways 39 via a mounting head 42 and is mounted to

the second of said slideways 41 via a further slideway 43.

[0021] The mounting head 42 is rotatably mounted on a support plate 44 via bearings 45 and the further slideway 43 is similarly mounted on a further support plate 46 via bearings 47. The two support plates 44,46 are slidably mounted on the two longitudinal slideways 39,41 respectively.

[0022] The support plates 44,46 and carriage 37 are all moved along their respective slideways 39,41,38 by respective actuator means 51 which are similar to each other and therefore only one slideway 39 and its respective actuator means 51 will be described in detail.

[0023] With reference now to Figs 5 and 6 there is shown a slideway 39 with the actuator means 51 operable to move the support plate 44 along the slideway. The slideway 39 comprises two parallel slides 52 which co-operate with four sliders 53 secured to the underside of the support plate 44 allowing the support plate to move freely along the slideway 39. A screw-threaded bracket 54 is mounted on the underside of the support plate 44 centrally between the one pair of sliders 53A.

[0024] An actuator 55 is mounted between the slides 52 and has a rotatable screw strut 56 which extends substantially parallel with the slides 52 and is supported at its far end by a bearing bracket 57. The actuator 55 preferably comprises a hydraulic motor 58 which is connected rotatably fast with the screw strut 56 via a suitable connector 59. The screw strut 56 is threadedly connected to the screw threaded bracket 54 on the plate 44 so that rotation of the screw thread in one direction or the other moves the mounting plate along the slideway in one direction or the other. Limit switches 61 may be provided at each end of the slideway 39 for control of the actuator 55.

[0025] Similar actuator means 51 are provided on the second longitudinal slideway 41 for movement of the support plate 45, and on the transverse slideway 38 for movement of the carriage 37.

[0026] As is shown in Fig 6, the hydraulic actuators 58 and the hydraulic jacks 49 are connected to a valve block 62 operated via an electric control 63 for operation of the hydraulic valves and movement of the material support means 35. The electrical control 63 for the control of the actuators 58 is connected by electrical cable 64 to a radio receiver 65 which receives commands from a remote control hand set 66 for operation of the valves. The electrical control 63 and receiver are interconnected so that the receiver 65 commands the operation of the valve block 62 in accordance with command signals received from the hand set. The electrical control 63 is connectable via a standard plug 67 to the electrical power system of the lift 10.

[0027] The hydraulic cylinders 69 of the two jacks 49 are hydraulically interconnected via a balance valve 68 so that they are raised or lowered in unison this prevents tipping of the elongate load, in this case pipe P.

[0028] The hydraulic control valve block 62 is connected by flexible hydraulic hose H to the connection 16 on

the boom 14 for take-off of hydraulic power from the lift hydraulic system.

[0029] Heavy pipe P may be placed the holders 36 and in use lifted proximate the required location on the boom 14

[0030] The pipe length may then be manoeuvred into its final position using the jacks 49 and actuators 55. The pivotal movement around the bearing 45 allows for forks 13 to be skewed relative to the pipe run allowing for slight offsets and other mis-alignments during the manoeuvring of the pipe P.

[0031] The different actuators 55 can be individually or jointly operated from the hand set 66. An emergency stop switch 71 is provided on the apparatus adjacent the electrical control 63. The control system may be arranged so that the material handling apparatus is operable only when the boom 14 is in a static condition relative to the lift vehicle.

[0032] If desired the pipe P may be secured to the pipe holders 36 by suitable means, for example a known device for retaining pipes on pipe holders 36 is described in WO 2005/077711.

[0033] In use, the material handling apparatus 30 is utilised for lifting and manoeuvring over small height and distance ranges relative to the base 31, for example, a height range Z of 150mm and horizontal ranges X & Y of about 600mm.

Claims

1. A material handling apparatus(30) for use with a fork lift and comprising a base (31) with two substantially parallel fork receptors (33) for receiving the forks (13) of a fork lift (10), with material support means (35) being mounted on displacement means (40) secured to the base (31) for movement of the support means (35), **characterised in that** the displacement means comprise a pair of spaced apart substantially parallel slideways (39,41) secured on the base (31) and extending substantially longitudinally of-the fork receptors (33), the support means (35) being mounted on the two longitudinal slideways (39,41) via a mounting head (42) slidably and rotatably mounted relative to one of said slideways (39) and a further slideway (43) also slidably and rotatably mounted relative the second of said slideways (41).
2. Apparatus as claimed in Claim 1 wherein the fork receptors (33) comprise a pair of hollow section elongate members fixed to a lower surface on the base (31).
3. Apparatus as claimed in Claim 1 or Claim 2 wherein the fork receptors (33) include retention means (70,71) for securing in use the base (31) to said forks (13).
4. Apparatus as claimed in any one of Claims 1 to 3, wherein the material support means are mounted on an elongate transverse slideway (38) fixed to said mounting head (42) and is slidably mounted on said further slideway (43).
5. Apparatus as claimed in Claim 4, wherein the material support means (35) comprises a pair of material supports (36) mounted in spaced relationship on a carriage (37) slidably mounted on the transverse slideway (38) for movement relative thereto.
6. Apparatus as claimed in any one of Claims 1 to 5, wherein actuator means (51) are provided to move the mounting head (42) and the further slideway (43) relative to the first and second slideways (39,41) respectively.
7. Apparatus as claimed in Claim 5 or Claim 6 when dependant on Claim 5, wherein actuator means (51) are provided to move the carriage (37) relative to the transverse slider (38).
8. Apparatus as claimed in any one of Claims 1 to 10, wherein the material support means (35) includes at least one jack (49) for adjustment of the height of the support means (35) above the base (31).
9. Apparatus as claimed in Claim 8, wherein the the material support means (35) comprises two material supports (36) each mounted on a hydraulic jack (49), the two hydraulic jacks (49) and being interconnected by a balance valve (68) so that they are raised or lowered in unison.
10. Apparatus as claimed in any one of Claims 6 to 9, wherein the actuators (55) and/or jack(s) (49) are hydraulically operated and the apparatus further includes a hydraulic control means (62,63) to which the hydraulic actuators (55) and hydraulic jacks (49) are connected.
11. A fork lift (10) including apparatus as claimed in any one of Claims 1 to 10, wherein the fork lift (10) is a mobile self drive lift having forks (13) raised by a powered hydraulic system, wherein said hydraulic control means (62,63) are connected by hose H to a connector (16) to the powered hydraulic system of the fork lift.

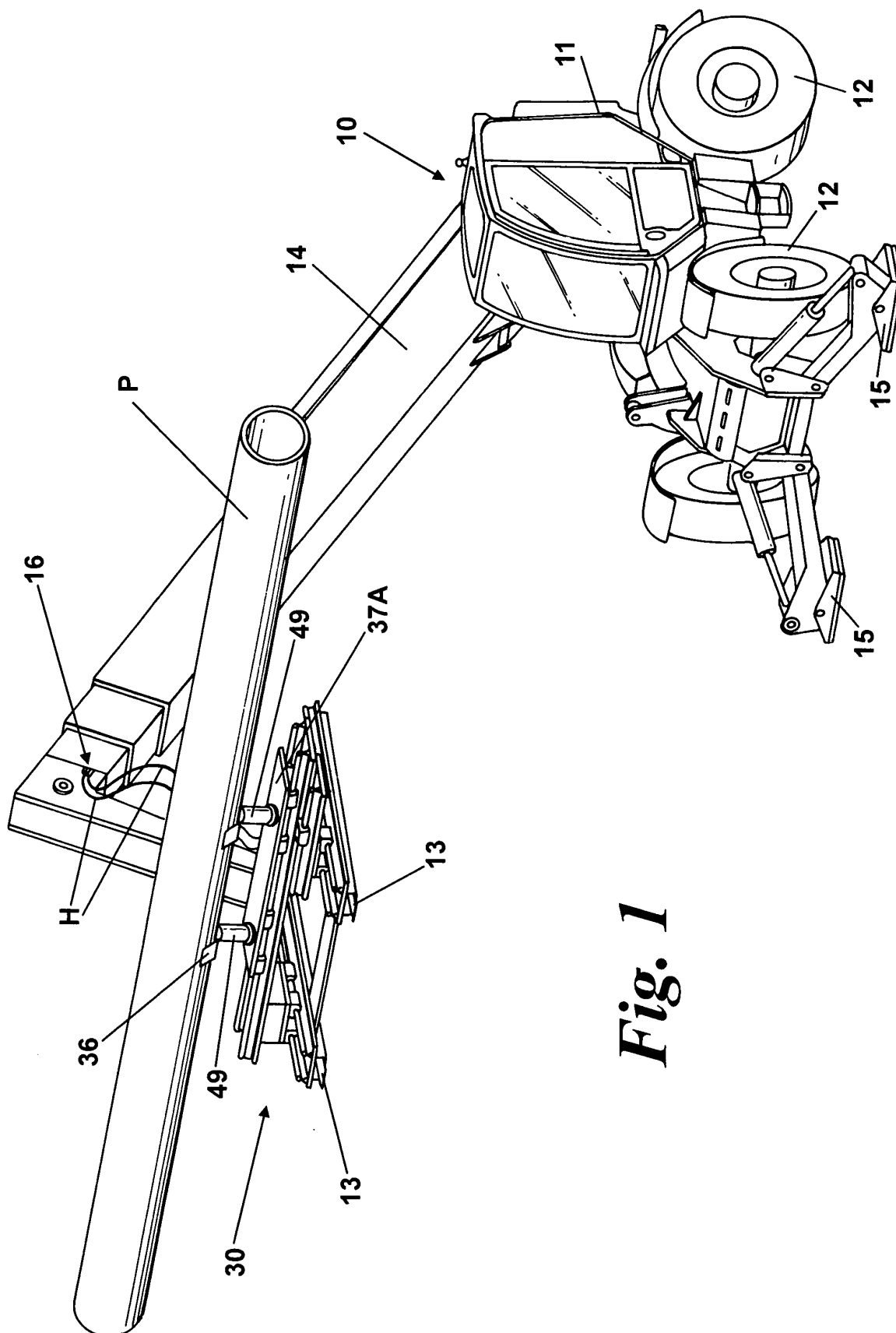


Fig. 1

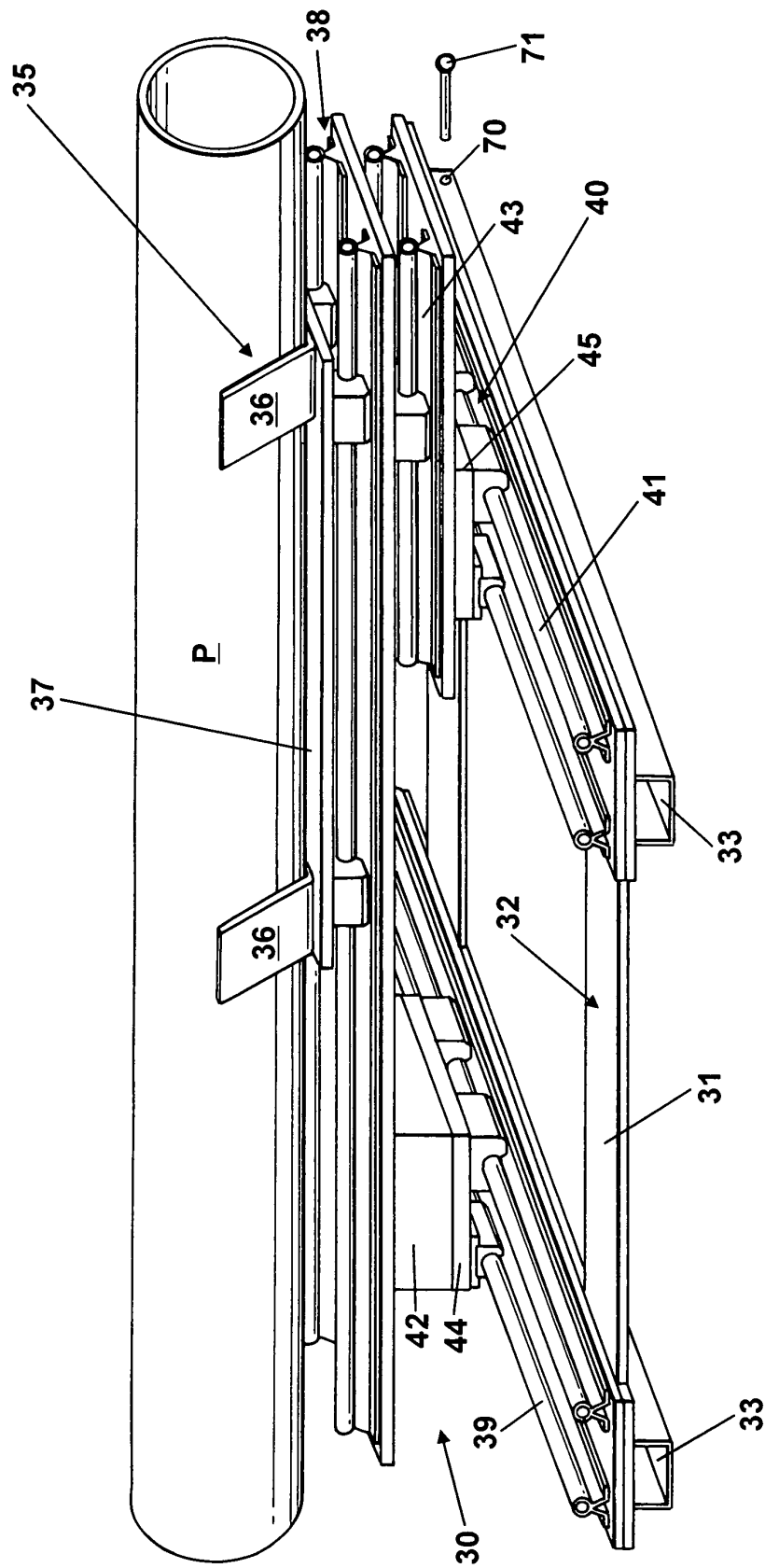
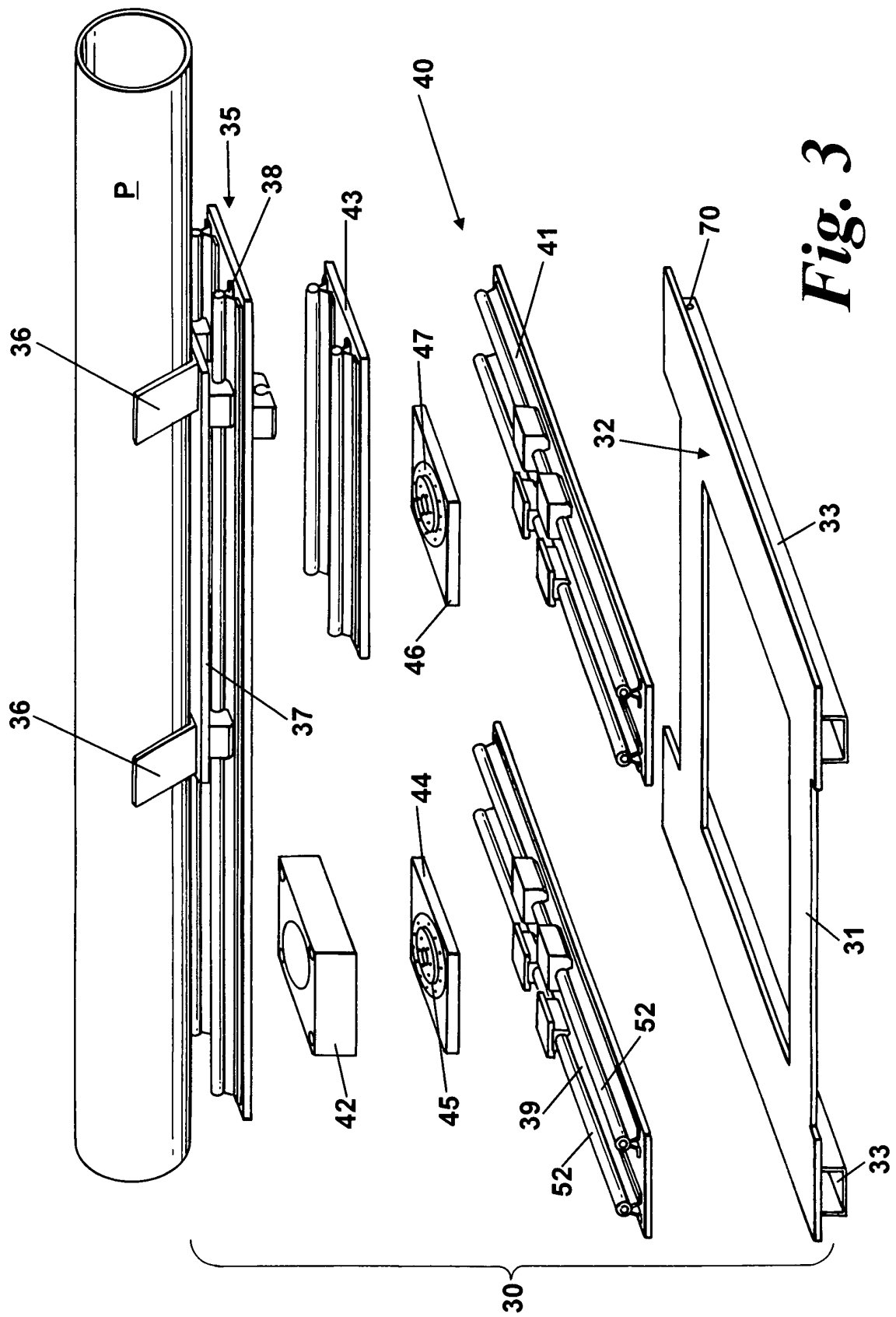


Fig. 2



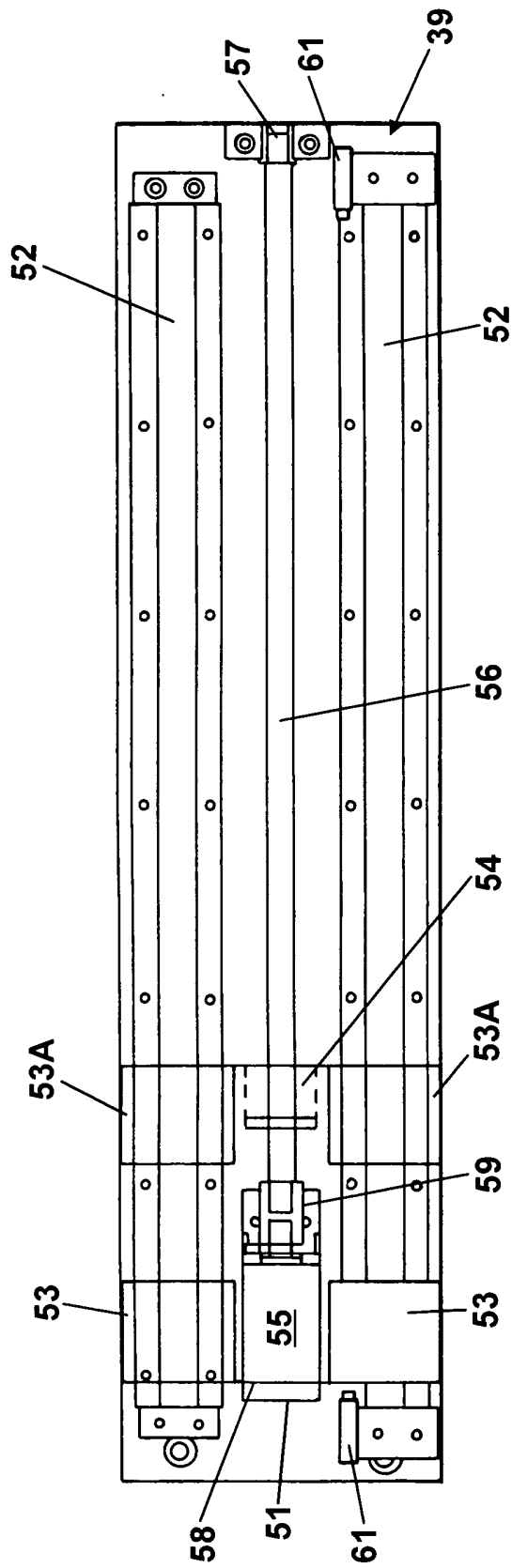


Fig. 4

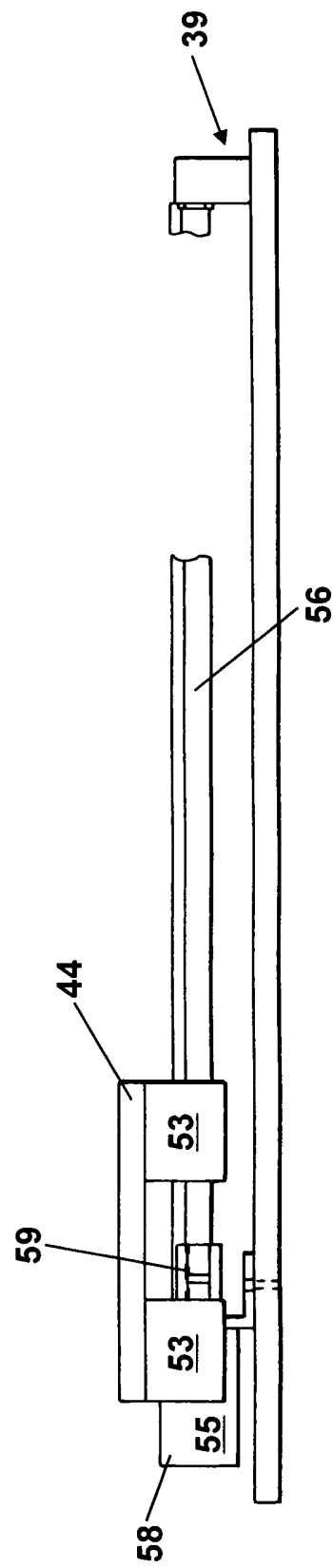


Fig. 5

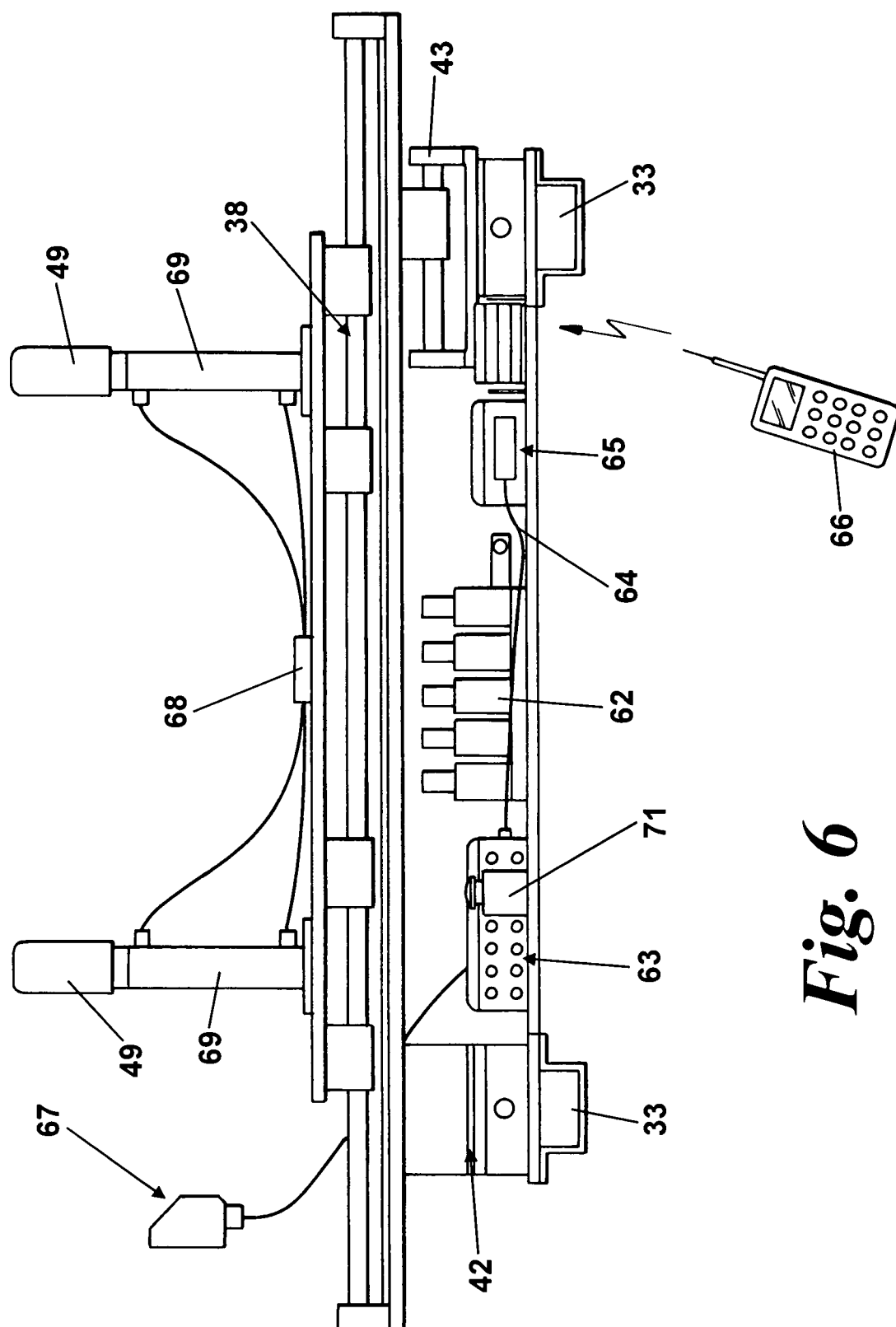


Fig. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 25 2877

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 November 2007	Examiner Ferrien, Yann
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 25 2877

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12-11-2007

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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