(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 354 364 A2**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.08.2011 Bulletin 2011/32

(51) Int Cl.:
E04D 15/02 *(2006.01)* ***E04D 15/04*** *(2006.01)*
B66C 1/24 *(2006.01)*

(21) Application number: **11000776.2**

(22) Date of filing: **01.02.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **05.02.2010 BE 201000064**

(71) Applicant: **Vanrobaeys, Bart**
8908 Vlamertinge (BE)

(72) Inventor: **Vanrobaeys, Bart**
8908 Vlamertinge (BE)

(74) Representative: **Ryckeboer, Leo L.H.**
Leuzestraat 35
8510 Bellegem (BE)

(54) Apparatus and method for the handling of plates

(57) The invention concerns an apparatus (1) and a method for the handling of plates or sheets (2) on a surface (3). The apparatus includes a moveable loading platform (6) for the plates, which platform is moveable by driving means (8) for the plates. The platform is carried by a vertical suspension beam (5). Upon the suspension beam (5) a first carrying arm (16) is mounted perpendicularly to the beam. The said arm (16) is surrounded by an element (26) and has a fixed connection to the loading platform (6). First control means (22) allow the required rotation at an angle A of the element (26) with the loading platform (6) around the first carrying arm. The suspension beam has a second carrying arm (17) mounted crosswise to this beam (5). Its free top end (19) can be connected to a hook (20) of a hoist cable (4) as part of a hoisting device.

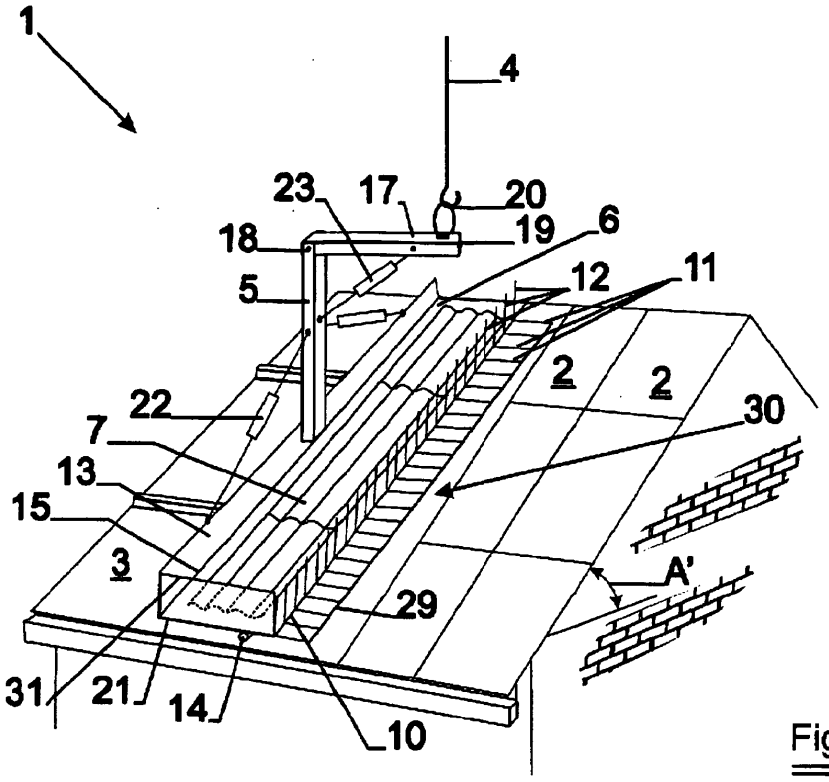

Fig. 1

EP 2 354 364 A2

Description

[0001] The invention concerns an apparatus for handling plates or sheets, e.g. for the delivery to or the removal from a surface, particularly on a sloping roof and a method or process for the use of that apparatus.

[0002] Machines are currently available for the removal of roof tiles or other tiles, such as roof courses from a sloping roof. These machines are normally moved along the roof surface moving from the roof ridge down to the gutter or vice versa. These concepts are already well known from US-patents 6257094, 5218766 and 7013758. However many roofs are presently covered with a series of relatively large plates or sheets, for example corrugated sheets (made for example from asbestos cement), insulation sheets, sandwich panels or flat sheets (for example relatively thin sheet steel). The application and removal of these sheets is mainly carried out manually. Generally speaking this is a very elaborate task that requires heavy manual labour, during which it is seldom possible to provide adequate protection for the prevention of labour accidents.

[0003] The invention seeks to remove this heavy and unsafe working practise, by providing an apparatus which could be ergonomically operated from a distance by an operator, reducing the required amount of manual labour to a minimum. In order to achieve the maximum loading capacity for the apparatus, its own weight should be as light as possible.

[0004] The apparatus according to the invention for the handling of sheets or plates on a horizontal or sloping surface comprises a moveable loading platform with long and short ridges, which platform for the plates that require handling is moveable by driving means. This platform is carried by a substantially vertical suspension beam. According to an important feature of the invention the suspension beam is equipped at its bottom with a first carrying arm that is mounted perpendicularly to the suspension beam. According to the invention this carrying arm is surrounded by an element, preferably a shaft or tube, which has a fixed connection to the loading platform. By using a first set of control means or devices, this element and the platform can be rotated at angle A around this first carrying arm. When the suspension beam is in a vertical position, the apparatus allows to adjust the inclination of the platform, for example by an angle A' equal to the slope of a surface or more specifically the angle of inclination of a roof.

[0005] Moreover, according to another important feature, the aforementioned suspension beam is equipped with a second carrying arm near its top which is mounted crosswise to this beam. It is possible to link this second carrying arm with its free top end to a hook of a hoist cable of a hoisting device, for example a crane. This allows the apparatus to be transported along the surface by this hoisting device, for example along a roof to another location. The first and second carrying arms are preferably in the same plane and are located one above the other most of the time. The first carrying arm is placed crosswise of the linear direction of the loading platform and runs preferably substantially across the centre of gravity of this platform.

[0006] According to the invention the apparatus comprises preferably also a gripping element to handle the plates, in particular close to the loading platform. When the apparatus is used for example for the removal of plates located on a horizontal or sloping surface, this preferred embodiment comprises a gripper near its long ridge, that is most remote from the aforementioned suspension beam, which gripper can be tilted or pivoted back and forth around a tilting beam in a position along this ridge from a substantially horizontal up to an upright position and vice versa.

[0007] The loading platform of the apparatus for the handling of plates carries preferably driving rolls, for example at its bottom, in particular in order to shove or slide the gripper underneath the plates that need to be removed. This sliding will be done in a direction substantially parallel to the gutter. This direction is thus perpendicular to the moving direction of the apparatuses known in the art.

[0008] Moreover, it could be very beneficial for the invention that the second carrying arm in the apparatus is provided with hinges around the top end of the said suspension beam and that a second set of control means is mounted for the adjustment of enclosed angle B between the suspension beam and the second carrying arm. The purpose of this will be explained further on.

[0009] Finally, the invention comprises a method for the use of the aforementioned apparatus for the handling, and in particular the removal from a surface and disposal of plates, by 2 means of a moveable loading platform and the moving or transport of the removed plates to the deposition area where they are slid off the platform.

SHORT DESCRIPTION OF THE DRAWINGS

[0010] The invention will be further explained with reference to the attached drawings which illustrate an embodiment of the apparatus in accordance with the invention. Further details and advantages will be clarified. Naturally the invention is not limited to this embodiment.

Figure 1 shows schematically a perspective view of the apparatus on a sloping surface in accordance with the invention.

Figure 2 represents a perspective view of this apparatus, showing the bottom of the loading platform.

Figures 3, 4 and 5 are schematic vertical sectional views of the apparatus in three consecutive operational positions.

Figure 6 provides a schematic and frontal view of the apparatus on a sloping surface.

Figure 7 illustrates a deposition situation of the removed sheets on a disposal area.

DETAILED DESCRIPTION

[0011] The position of an embodiment of the apparatus 1 in accordance with the invention on a sloping or inclined roof surface 3 has been illustrated in figure 1. There is a roof cladding provided on this roof, comprising for example a number of corrugated plates 2 which have to be handled, for example removed, by using the apparatus. These plates or sheets must be transferred to the loading platform 6 of the apparatus. To achieve this, the loading platform is supported by a first carrying arm 16, arranged at the bottom of a suspension beam 5, said beam 5 being placed in a vertical position with this arm placed perpendicular to this beam. This is shown in detail in figures 2 and 6. The carrying arm 16 is surrounded by a tube 26 which has a fixed connection to the platform 6. The arm 16 could also be tubular in order to achieve a weight reduction in accordance with the invention. This benefits a construction which consists of relatively light materials with great strength and achieves a relatively light weighing apparatus. This construction allows the rotation of the loading platform 6 with the use of a first set of control means 22, for example hydraulic compression cylinders, around the carrying arm 16 at angle A' which is equal to the inclination angle of the surface 3 and at the same time equal to the complementary angle A (figure 6) with the beam 5. These cylinders (22) then suitably connect to, for example, suspension beam 5 on the one side and to the upright back wall 13 of the platform 6 on the other side.

[0012] Preferably, the second carrying arm 17 is hinged around the top end 18 of the suspension beam 5. This second arm 17 runs again crosswise of the suspension beam. Both arms 16 and 17 lie preferably in the same plane. In the free end 19 of that second carrying arm 17, the hook 20 of the hoist cable 4 of-the lifting device will link apparatus 1 to said lifting device, for example a crane (not represented in the figures) to lift and suitably deliver, remove or relocate said apparatus along the roof. The hinges of the second carrying arm 17 allow the adjustment of the enclosed angle B between beam 5 and second arm 17. This can be achieved by using the second control means 23. These second control means 23 can comprise a hydraulic cylinder which is attached to the suspension beam 5 at one end and to the second carrying arm 17 at the other end. The operation itself will be further explained with reference of figures 3 through 5.

[0013] The loading platform 6 will often have an elongated rectangular shape. Its longitudinal direction runs generally crosswise of the longitudinal axis of the carrying arms 16 and 17. The first carrying arm 16 runs preferably substantially across the centre of gravity of the loading platform 6. More specifically: this first arm 16 should preferably extend just underneath the loading platform when this platform is in a horizontal position. It is possible to apply longer or shorter loading platforms 6, for example of 6, 8, 10 or more meters, as desired by the needs or circumstances. These platforms 6 which each have a tube 26 can then be slid over the first carrying arm 16.

[0014] In accordance with an important embodiment, the apparatus 1 comprises a gripping element 30 near the front ridge 10 of the loading platform 6 for the plates 2 requiring handling. This element 30 can be tilted or rotated around a tilting beam 24 from a substantially horizontal position up to an upright position along ridge 10. The gripper can carry e.g. a number of fork arms 11. Substantially perpendicular to these fork arms, for example near the rotational beam 24 of the gripper 30, suitable abutments 12 could be mounted in front of a longitudinal edge of the removed or stacked plates 7. The top ends of the fork arms 11 will preferably be interconnected by a solid slat 29 to prevent any hampering during the scooping or shovelling operation. The motion of gripper 30 can be controlled by the third control means 25 which are for example mounted underneath platform 6; see figure 2.

[0015] Another important feature of the invention is related to the mounting of a series of preferably driven rolls 14 underneath the loading platform 6, as shown in more detail in figures 2 and 6. This is particularly useful for sliding the gripping element 30 underneath plates or sheets 2 that are to be handled. The separate driving of preferably each of the rolls 14 is controlled by remote control means. This results in a quickly manoeuvrable and controllable apparatus 1 to be moved in any direction along a solid surface, especially along a surface 3 or along a series of purlins 27 (made of wood, steel or concrete) but also on the ground or on a floor.

[0016] Finally, it will be convenient to mount the driving means 8 (figure 4) with for example the usual hydraulic components (pump, valves etc.) for the various control means (22, 23 and 25 among others) and their control receivers on the suspension beam 5. These receivers will then receive the appropriate signals from the operator who operates the means 9 for the remote control. The activation, execution and control of the operation is thus at a safe distance from the whole moving process of the apparatus 1 and the movement of one or more of its parts, such as for example the platform 6, rolls 14, second carrying arm 17, gripper 30 and crosswise oriented elements 31.

[0017] With reference to the figures 3 through 5 the operation of the removal of plates 2 from a sloping roof 3 is now explained as an example of a number of steps in the handling process. Figure 3 shows the first step, the shovelling of a series of plates 2. The gripper 30/11 is slid e.g. at a slight angle underneath plates 2. To achieve this, it could be very handy to adjust angle B at an angle over 90° by using the remote control device 9 for the second control means 23 for the hinged second carrying arm 17 at the top end 18 of the beam 5. Subsequently the rolls 14 can be driven to ride platform 6 along surface 3 and by doing this to realize a suitable sliding motion (parallel to the gutter) underneath the plates 2.

[0018] Once the plate or plates 2 are scooped, the gripper 30/11 is turned or pivoted upwards at an angle of preferably at least 90°, as shown in figure 4. This causes

the scooped plates 7 to slide against the abutments 12 and to turn and fall upside down on platform 6. In the meantime angle B for arm 17 can be brought back to approximately 90° by using control means 23. It is also advisable to first place the inclined platform 6 (at angle A') with the newly scooped sheets 7 in a horizontal position by using first control means 22, before turning the loaded gripper 30/11 upwards.

[0019] When the loading platform 6 has been fully loaded after a sufficient number of scooping or shovelling and loading cycles, the loaded platform is then moved away as shown in figure 5. The crane lifts the apparatus 1 by means of hoist cable 4. The first control means 22 move the sloping platform 6 back into a horizontal position by adjusting angle A at 90° and the crane transports the loaded horizontal platform 6 to a disposal area 39 for the removed plates 7. This area 39 could for example comprise a container. For delivering the load, a suitable angle A is then again applied ensuring that plates can slide down from platform 6 above the container.

[0020] As indicated in figure 6, it is recommended that in some instances suitable braking elements 28 are mounted underneath the platform 6 to prevent unwanted sliding downwards of the platform across the sloping surface 3. When the apparatus 1 is moved e.g. along purlins 27, parallel to the gutter, the braking elements 28 could comprise guiding wheels which are extendible upwards and downwards. These wheels 28 can then roll up against the higher (in the upstream direction) lateral face 32 of a purlin 27.

[0021] In order to prevent the undesirable sliding away of the handled sheets 7 themselves on a sloping platform 6, removable crosswise oriented end elements 31 (figures 1 and 3) are mounted near the short platform ridges 21. These removable elements 31 should preferably be able to be removed by switching off or by moving temporarily away. The moving away of each such end element 31 could for example be carried out by a driving mechanism 43 connected to it and activated by remote control means. This driving mechanism could for example comprise a compact hydraulic motor 43.

[0022] An additional positive aspect of the invention is the possibility to use suitable coupling means 33 near the short ridges 21 of platform 6 as indicated in figures 6 and 7. These means could include for example suitable recesses or notches 33 beneath platform 6. Indeed when the apparatus 1, loaded with removed plates 7, is transported with the hoist cable 4 away up to the deposition or disposal area 39 and apparatus 1 is lowered above this area 39 (e.g. comprising a waste container), then the short ridge 21 should be secured to enable the orderly deposition of removed sheets 7 at the disposal area 39, preferably after the platform 6 has been positioned in the inclined position for delivery of the plates 7. This securing is preferably achieved by a temporary link or coupling between the recesses 3 3 involved (at the relevant ridge 21) and a suitably mounted support aid 34 to ensure that sheets do not fall beside the intended disposal area 39.

[0023] The invention therefore also includes a method for using apparatus 1, whereby the plates 2 are shovelled or scooped up by gripper 11 near the long ridge 10 of the moveable loading platform 6 and are then deposited on that platform. Subsequently, the loaded platform 6 is then moved or transported to the deposition area 39 where the removed plates 7 are slid off the platform. In this method the loading platform 6 is s inclined up to angle A for the scooping and depositing of the scooped plates 7 on platform 6. The loaded platform 6 is again placed at an angle above the disposal area 39 at an angle to ensure plates 7 to slide off above this disposal area.

[0024] I As shown in figure 7, it is possible to use a suitably mounted crossbar 34 as a support aid above the unloading area or container 39. The recesses 33 facing downwards near the lowest short ridge 21 of the platform 6 can then be lowered over crossbar 34 and temporarily coupled to it, in order to position and support the apparatus 1. After this temporary coupling the applicable cross end element 31 on the lowest short platform ridge 21 can be moved away as explained above to ensure that plates 7 slide down correctly from platform 6 to the designated area 39. The emptied platform 6 is then unhooked from crossbar 34 at the location of recesses 33 and is suitably lifted with the crane for the next handling cycle. Crossbar 34 can for example be mounted on a solid (moveable) tripod or in a framework 3 5 at the end 36 of crane-jib 37 of a (moveable) hoisting device 38 near the disposal area 39.

[0025] It could also be convenient to mount a service board walk 40 along the upright back wall 13 of platform 6 to for example supervise the scoop operation: see figure 3. Finally, it could also be useful to mount spray nozzles 41 and/or 42 on the gripper 30/11 1 to apply for example a spray or mist of a treatment agent, such as a moisturizer, binding agent or disinfectant against harmful dust particles blowing up from the plates 2 or 7 during handling. This is preferably done before the removed plates 7 are transported and deposited. This is for example useful when the plates 2 contain asbestos.

[0026] A container 44 for the treating agent is then e.g. mounted on suspension beam 5 with a pump 45; see figures 3 and 4. This pump could supply separate hydraulic hoses (not indicated in the figures); leading along beam 5 underneath platform 6 to spray nozzles 41 and/or 42 on for example the fork arms 11 of gripper 30. Spray nozzles 41 are intended for treatment of the undersides of plates 2, for example during scooping (figure 3) or plates 7 after scooping and turning upside down onto platform 6. Nozzles 42 are for spraying the upper side of plates 2 from a distance (figures 4 and 5) before scooping, for example when the fork arms 11 are in their vertical position. The spray nozzles 41 are preferably mounted at 50 cm intervals. This also applies to the mutual distance between spray nozzles 42. It is often sufficient to mount only nozzles 42 for the treatment of only the top surface of plates 2 to be handled or removed.

[0027] The platform including its load can weigh up to

three tonnes. The inclination of the surface 3 (roof) should be less than 45°; preferably not more than 36°. Instead of a beam shaped suspension beam 5, it is also possible to use a rectangular framework, parallel to upright back wall 13 of platform 6. As an alternative to the second control means 23 shown in figures 3 through 5 it is also possible to maintain angle B at 90° and to construct the second carrying arm 17 in a telescopic arrangement and extensible. In the situation shown in figure 3, the arm will then be somewhat retracted and adjusted to a shorter length between end 18 and crane hook 20. In figures 4 and 5 the arm 17 will be in the extended position. However, this alternative is technically less desirable.

[0028] The protection of this patent application is not limited to the herein described embodiment. It also applies to the constructional and functional variations of the apparatus 1 or of any part thereof obvious to the person skilled in the art.

Claims

1. Apparatus (1) for the handling of plates or sheets (2) on a surface (3), comprising a moveable loading platform (6) for the plates, which platform is moveable by driving means (8)

- which platform contains long (10) and short platform ridges (21) and
- which platform is carried by a substantially vertical suspension beam (5),
- wherein the loading platform is equipped near its bottom with a first carrying arm (16) for the platform and which arm (16) is mounted perpendicularly to the suspension beam (5)
- wherein the aforementioned arm (16) is surrounded by an element (26) which has a fixed connection to the loading platform (6),
- wherein first control means (22) allow the desired rotation at an angle A of the element (26) with the loading platform (6) around this first carrying arm and
- wherein the suspension beam is equipped with a second carrying arm (17) near its top (18), which is mounted crosswise to this beam,
- wherein this second carrying arm (17) can be linked with its free top end (19) to a hook (20) of the hoist cable (4) of a hoisting device,
- wherein the first and second carrying arms (16, 17) are in the same plane and
- wherein the first carrying arm (16) is placed crosswise of the longitudinal direction of the loading platform (6) and runs substantially across the centre of gravity of this platform.

2. Apparatus in accordance with claim 1 whereby the loading platform (6) comprises a gripping member (30) for the plates (2) to be handled.

3. Apparatus in accordance with claim 2 whereby the aforementioned gripper (30), located near the long ridge (10) of the loading platform (6) that is most remote from the beam (5), can be tilted or pivoted backwards and forwards around a tilting beam (24) at this ridge (10) from a substantially horizontal up to an upright position.

4. Apparatus in accordance with claim 3 whereby the gripper (30) carries a number of fork arms (11) and abutments (12) for a handled or shovelled plate or sheet (7) at approximately a perpendicular angle to those fork arms (11), and mounted near their tilting beam (24).

5. Apparatus in accordance with claim 1 or 2 whereby loading platform (6) carries driving rolls (14) underneath, in particular in order to be able to shove the gripper (30) underneath the plates (2) which require handling.

6. Apparatus in accordance with claim 1 whereby the aforementioned first control means (22) comprise hydraulic cylinders which suitably connect to the suspension beam (5) on one side and on the upright back wall (13) of the platform (6) on the other side.

7. Apparatus in accordance with claim 1 whereby the second carrying arm (17) is hinged around the top end (18) of the suspension beam (5) whereby the second control means (23) are mounted to adjust the enclosed angle B between said beam (5) and the second carrying arm.

8. Apparatus in accordance with claim 7 whereby the aforementioned second control means (23) comprise hydraulic cylinders which are suitably connected to the suspension beam (5) on one side and on the second carrying arm (17) on the other side.

9. Apparatus in accordance with claim 3 whereby the tilting of the rotation and tilting of gripper (30) is controlled by third control means (25), which have been mounted beneath the loading platform (6).

10. Apparatus in accordance with claim 1 whereby suitable breaking elements (28) have been mounted underneath the loading platform (6) to prevent downwards sliding from this platform.

11. Apparatus in accordance with claim 1 whereby the driving means (8) for its movement and for the movement of multiple parts (6, 14, 17, 30, 31) of the apparatus and for various control means (22, 23, 25) are mounted on the suspension beam (5).

12. Apparatus in accordance with claim 1 or 11 whereby the driving means (8) are activated and controlled

by remote control devices (9) for driving the moving process of the apparatus and for movement of its parts.

13. Apparatus in accordance with claim 1 whereby removable crosswise oriented end elements (31) are mounted near the short platform ridges or edges (21).

14. Apparatus in accordance with claim 1 whereby suitable coupling means, such as for example recesses (33) are provided for a temporary link or coupling at the relevant ridge (21) involved with suitably mounted support aids (34) near the area of deposition (39) for the handled sheets (7).

15. Apparatus in accordance with claim 14 whereby these support aids (34) include a crossbar which is carried by a solid stand or hoisting device (38).

16. Apparatus in accordance with a previous claim whereby spray nozzles (41 and/or 42) are mounted onto the gripper (30) to apply a treatment agent on sheets (2 or 7) which have or have not yet been removed.

17. A method for using the apparatus according to a previous claim whereby the plates (2) are shovelled near a long ridge (10) of a moveable loading platform (6) by a gripping element (11) and are then deposited on that platform and whereby the so loaded platform (6) is moved to an area of deposition or unloading (39) where the removed plates (7) are slid off that platform.

18. Method in accordance with claim 17 whereby the loading platform (6) is tilted or rotated from a horizontal position at angle A for the purpose of scooping or shovelling the plates and whereby, after depositing the shovelled plates (7) onto the platform (6), this loaded platform is rotated again near the handling area (39) at an angle before the sheets (7) are finally slid off at this deposition area.

19. Method in accordance with claim 18 whereby the coupling means (33) near the lowest short platform ridge (21) are temporarily coupled to suitable support aids (34) near the deposition area (39).

20. Method in accordance with claim 18 or 19 whereby, in view of sliding off the plates (7), a crosswise oriented end element (31) is removed or switched off near the lowest platform ridge (21) before the sheets (7) are slid off and whereby after the sheets (7) have been removed, the loading platform (6) is again disconnected from the supporting aids (34) at the level of the aforementioned coupling means (33).

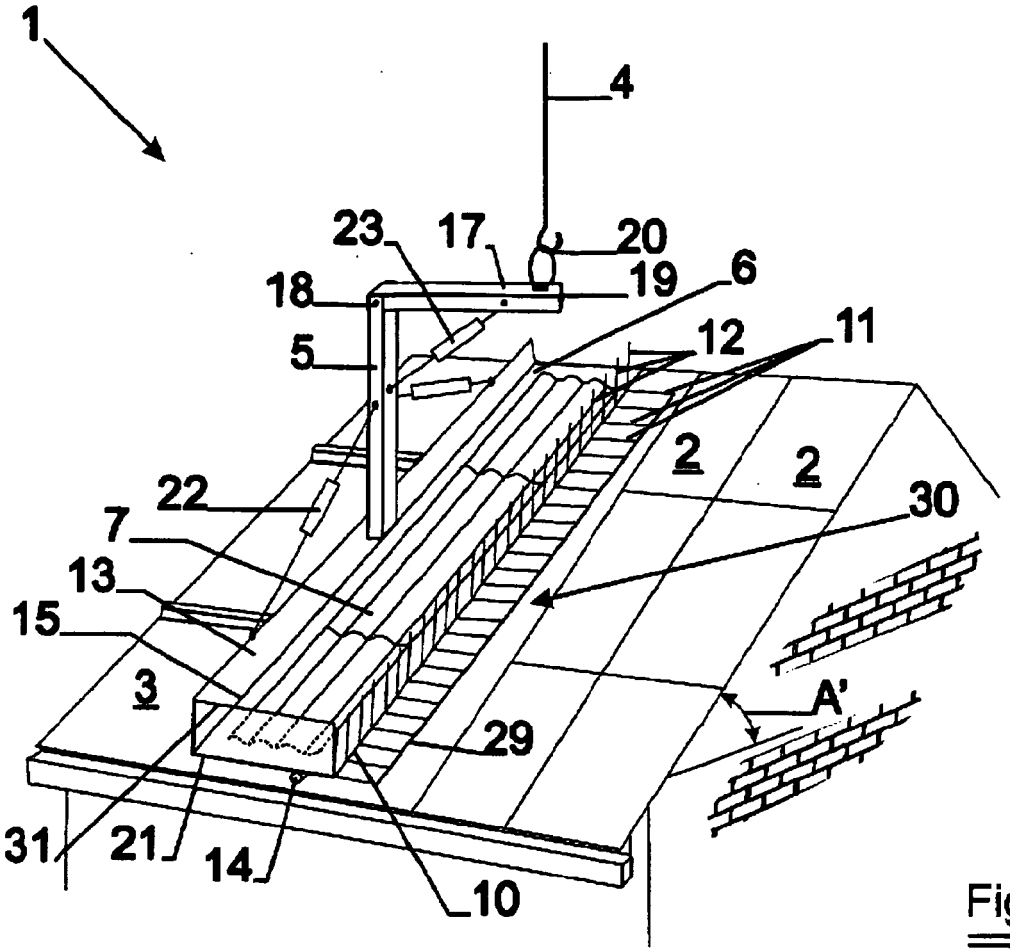
1
4
23
17
20
18
19
6
5
12
11
2
2
22
30
7
13
15
3
A'
29
31
21
14
10

Fig. 1

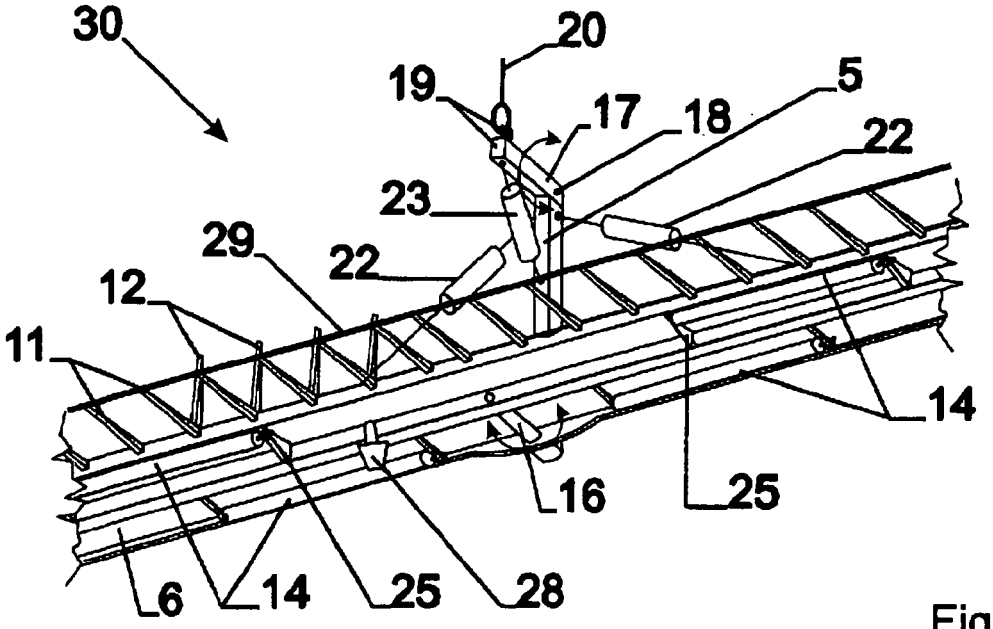
30
20
19
17
18
5
22
23
29
22
12
11
14
16
25
6
14
25
28

Fig. 2

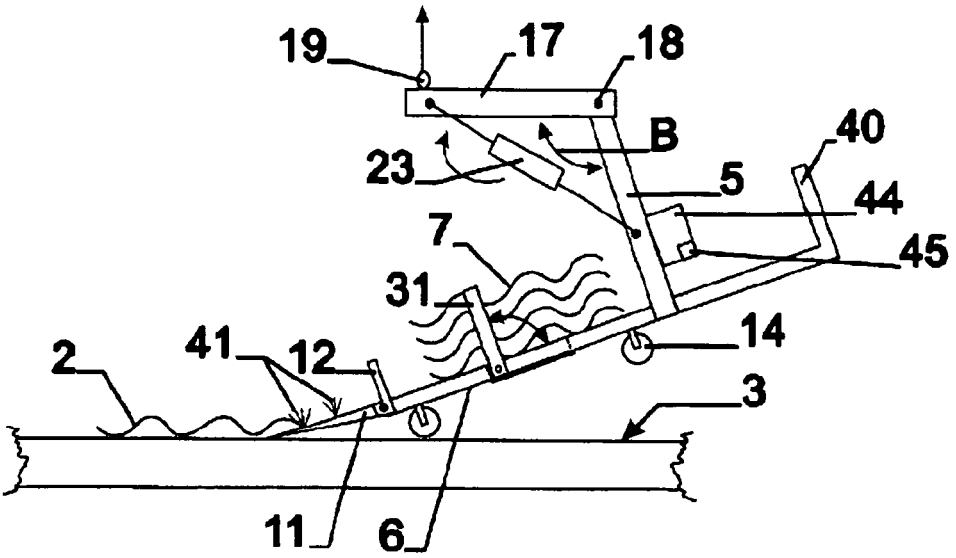
19
17
18
B
40
23
5
44
7
45
31
14
41
12
2
3
11
6

Fig. 3

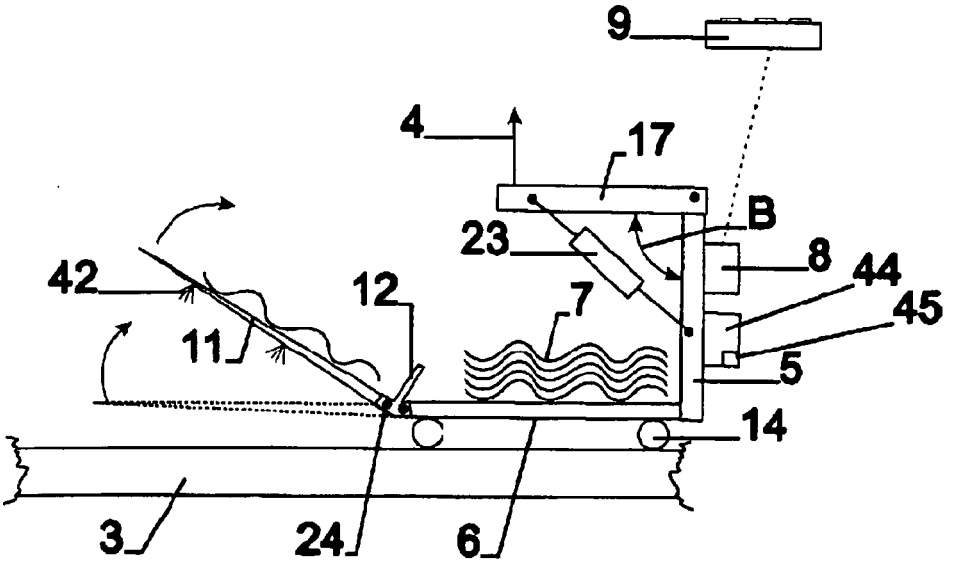
9
4
17
B
23
8
44
42
12
7
45
11
5
14
3
24
6

Fig. 4

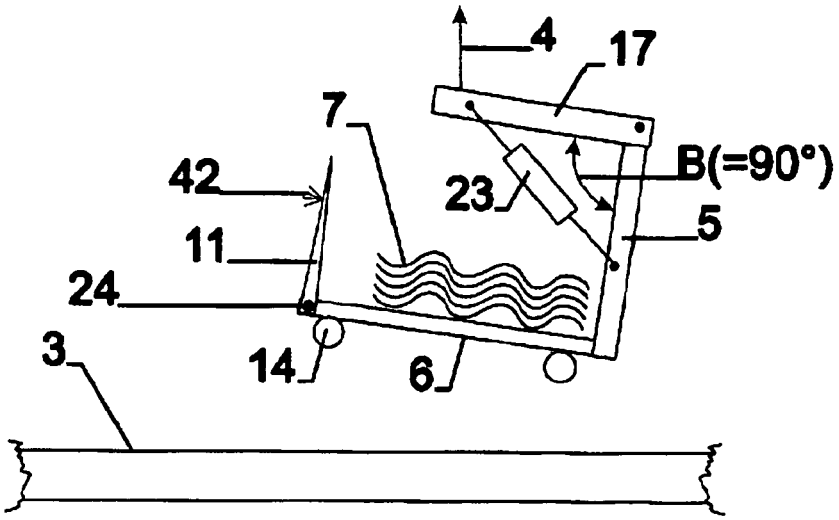
4
17
7
42
23
B(=90°)
11
5
24
14
6
3

Fig. 5

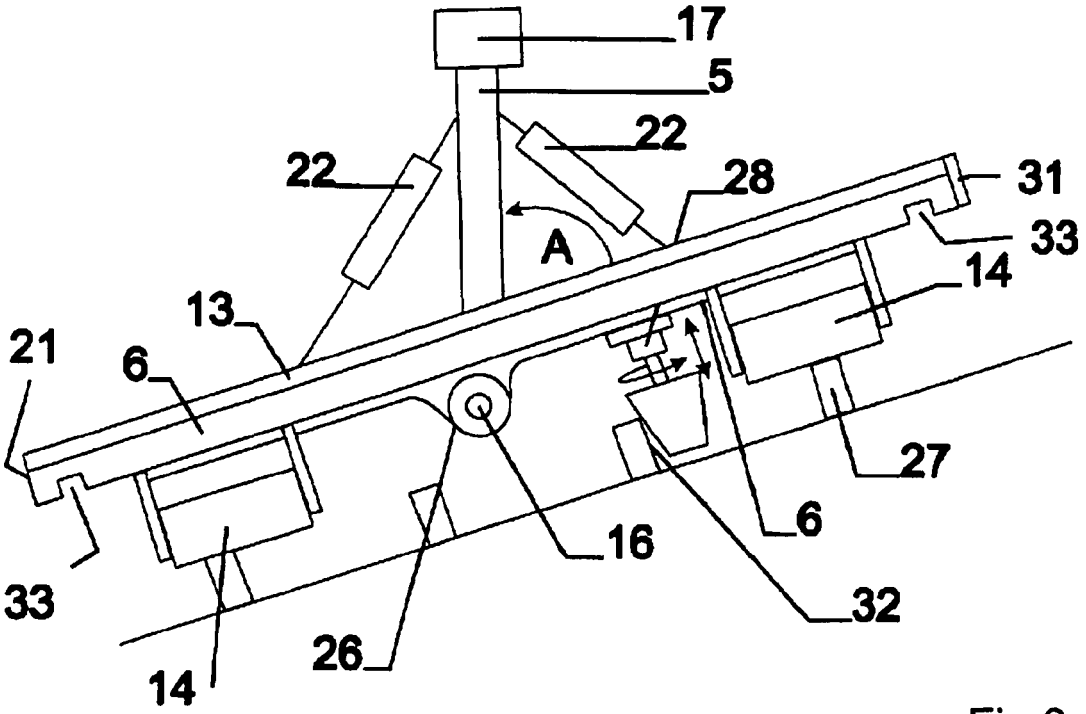
17
5
22
22
28
31
33
A
14
13
21
6
27
6
16
32
33
26
14

Fig.6

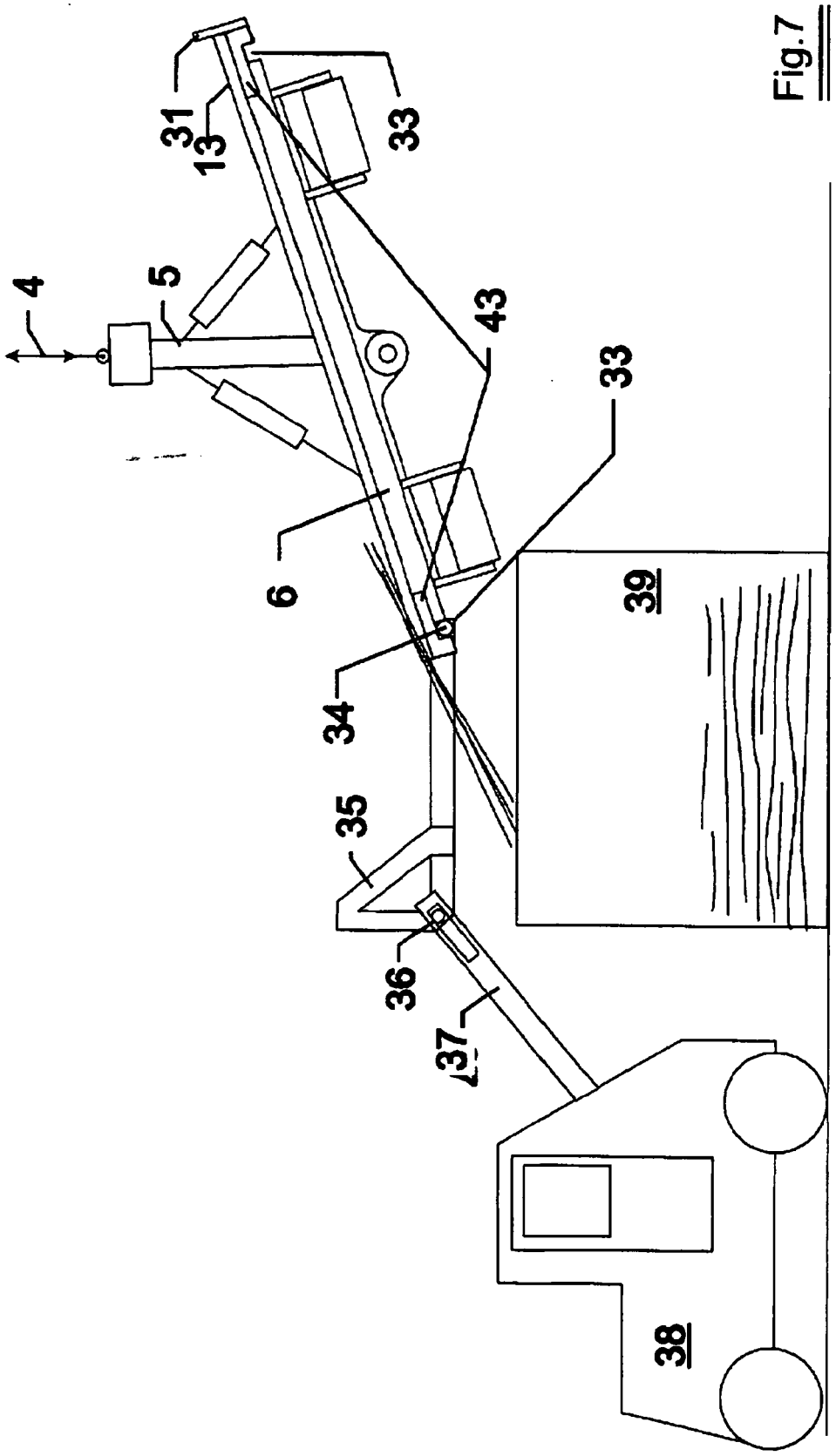

Fig.7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6257094 B **[0002]**
- US 5218766 A **[0002]**
- US 7013758 B **[0002]**