

## Attachment Method

### Field of the Invention

5           The present invention relates to attachment method, in particular to attachment methods suitable for attaching a piece of plant machinery to a mount. The present invention further relates to mounts suitable for attaching a piece of plant machinery thereto. The present invention still further relates to associated kits and transporters.

### 10           Background to the Invention

          Pieces of transportable plant machinery, for example diggers and the like must be securely mounted to a transporter during transportation. However, arranging machinery on a transporter and then securing it using straps and tie-bars brings a number of problems -  
15           problems in safely carrying the straps or tie bars, and problems in ensuring their correct use.

          Examples in the art which show typical mounts or mounting arrangements, or the like, are shown in each of US5215425 and WO03/072423. More specifically, US5215425 shows a tractor towing apparatus. WO03/072423 shows a tractor unit/trailer combination for suspended  
20           transport of equipment. GB2416337 shows securing the wheels of a vehicle to a transportation apparatus. US2008/0008571 discloses a wheel lift lock.

          It is an aim example embodiments of the present invention to address at least one problem associated with the prior art, whether identified herein, or otherwise.

25

### Summary of the Invention

          According to the present invention there is provided an apparatus and method as set forth in the appended claims. Other features of the invention will be apparent from the  
30           dependent claims, and the description which follows.

### Brief Introduction to the Drawings

          For a better understanding of the invention, and to show how embodiments of the same  
35           may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

          Figure 1 shows a schematic side perspective view of a trailer including a mount according to an example embodiment of the present invention;

Figure 2 shows side perspective view of a trailer including a mount according to an example embodiment of the present invention;

5            Figures 3 and 4 shows an end view of the trailer of Figure 2 in use with a piece of plant machinery;

Figure 5 shows a side perspective view of a trailer including a mount according to a further example embodiment of the present invention;

10

Figure 6 shows a side perspective view of the trailer of Figure 5 in use with a piece of plant machinery;

Figure 7 shows an end perspective view of a trailer including a mount according to a still further embodiment of the present invention;

15

Figure 8 shows an end view of a trailer including mounts according to a still further example embodiment ~~s-of~~ not in accordance with the present invention; and

20            Figure 9 shows a side perspective view of the trailer of Figure 8 in use with a piece of plant machinery.

#### Description of Example Embodiments

25            Referring now to Figures 1 and 2 there is shown a trailer 1 comprising a mount 100 suitable for use in attaching a piece of plant machinery thereto. The mount 100 is useful in an attachment method for attaching a piece of plant machinery to the mount. Figures 3 and 4 show the mount in use with a piece of plant machinery in the form of a mini-excavator 2.

30            To use the mount 100 a piece of plant machinery 2 comprising a body 30 and a moveable portion arrangeable relative to the body 30 is moved so that the body 30 is brought into a mounting location. The moveable portion is then arranged in cooperative engagement with the mount to attach the piece of plant machinery to the mount 100. Cooperative engagement, in the example embodiments described below involves butting up to, or lying in  
35            close adjacent proximity thereto. As will be described below, the piece of plant machinery 2 may comprise various movable portions, for example driving portions, a scraping blade or an arm. Moving a movable portion of the piece of plant machinery 2 into engagement with the mount 100 may conveniently provide a strong reliable attachment, without the need for additional moveable or removable mounting components.

A first embodiment of mount 100 useful in attaching the piece of plant machinery 2 to a trailer 1 involves the mount 100 cooperating with drive portions 20 of the piece of plant machinery 2, and will now be described in more detail. The piece of plant machinery 2, in this case the mini-excavator is driven under its own power onto the trailer 1, for example using a ramp or platform (not shown). The piece of plant machinery 2 moves on drive portions 20 comprising an arrangement of tracks. The drive portions 20 comprise tracks that contact the surface 3 on which the piece of plant machinery 2 rests, and by which the piece of plant machinery 2 may be moved. The body 30 of the piece of plant machinery 2 is driven into a mounting location relative to the mount 100, bringing the drive portions 20 into position relative to the mount 100, here alongside the mount 100. Movement of the body 30 is then stopped.

The mount 100 comprises a cowling 110 to receive the moveable portion. The cowling 110 is arranged above the surface 3 on which the body of the piece of plant machinery 2 rests. The cowling 110 is arranged to receive at least a part of the drive portion 20 of the piece of plant machinery 2 when the piece of plant machinery 2 is attached to the mount 100.

In the embodiment of Figures 1 to 4, the moveable portion comprises the drive portions 20, and arranging the moveable portion in cooperative engagement with the mount 100 comprises moving the drive portions 20 into a position in which at least a part of thereof is under the cowling 110. As shown in Figure 3, the drive portions 20 are relatively closer to one another, enabling the piece of plant machinery 2 to move to the mounting location. The drive portions 20 are thereafter expandable away from one another into the mount 100 to cooperatively engage the mount as shown in Figure 4. Typically, some mini-excavators are provided with expandably separable drive portions 20 to enable them to be manoeuvred through small gaps when moving, but still provide a stable platform when digging.

As can be seen in Figures 1 to 4, the cowling 110 is provided as a pair of opposed cowlings 110, each to receive a moveable portion and each comprising a first portion 111, second portion 112 and third portion 113. Arranging the moveable portion in cooperative engagement with the mount 100 comprises arranging a front part of the drive portion 20 alongside the first portion 111 of the cowling 110. Arranging the moveable portion in cooperative engagement with the mount 100 comprises arranging a rear part of the drive portion 20 alongside the second portion 112 of the cowling. Arranging the moveable portion in cooperative engagement with the mount 100 comprises arranging an upper part of the drive portion 20 alongside the third portion 113 of the cowling 110.

The mount 100 comprises a static component with no moving parts. This simplifies construction thereof, and enables the mount 100 to be securely fixed to the trailer 1 without fear of lost components.

5            Figures 1 to 4 further show guide rails 120, useful in aligning the drive portions 20 parallel to the mount 100 and also in positioning the drive portions on the surface 3 on which the piece of plant machinery 2 rests so as to be moveable between the cowlings 110. To move the piece of plant machinery 2 from the trailer 1, the drive portions are moved toward one another, causing them to slide across the surface 3 on which the piece of plant machinery  
10            2 rests. The guide rails 120 serve to centralise the piece of plant machinery 2, meaning that even if there is a tendency for one of the drive portions 20 to initially remain underneath one of the cowlings 110 as the drive portions 20 approach one another, one of the guide rails 120 arrests movement of the corresponding drive portion once 20 out from underneath its cowling 110, causing the other drive portion 20 to move out from its cowling 110 and toward its guide  
15            rail 120.

In another embodiment, as shown in Figures 5 and 6, the moveable portion comprises an arm 40 of the piece of plant machinery 2. Typically, the arm 40 comprises a hydraulically actuated arm, suitable for in use carrying a tool such as a bucket or breaker at the end thereof:  
20            The arm comprises a tool coupling 60 arranged toward the end of the arm 40, and arranging the moveable portion comprises positioning the tool coupling 60 to be coupled to the mount 100. The tool coupling 60 suitably comprises a quick release coupling arrangeable to releasably connect to a bar 140 provided on the mount 100.

25            In another embodiment, as shown in Figure 7, the moveable portion comprises a scraping blade (not shown) of the piece of plant machinery 2. Arranging the moveable portion comprises lowering the scraping blade into cooperative engagement with the mount 100, the mount comprising a stop 130 against which the lowered scraping blade can rest. The stop extends 130 from the surface 3 on which the piece of plant machinery rests. Moving the body  
30            of the piece of plant machinery relative to the mount 100 to bring the piece of plant machinery to a mounting location comprises moving the body such that the scraping blade passes over the mount 100. This body movement relative to the mount 100 takes place in a first direction, and the stop 130 is arranged when in cooperative engagement with the scraping blade to resist movement of the scraping blade in a second direction that is parallel to, but opposite in  
35            sense to the first direction. As can be seen in Figure 7, the stop 130 extends in a direction perpendicular to the direction of the drive portions 2, i.e. the stop 130 extends in a direction which is typically parallel to a scraping edge of the scraping blade. In another embodiment which is not shown, the stop 130 is arranged when in cooperative engagement with the

scraping blade to resist movement of the scraping blade in first and second directions, for example by comprising a slot into which the lower parts of the scraping blade may locate.

In other embodiments (not shown), not according to the invention, a further attachment method for attaching a piece of plant machinery to mount using a drive portion of the piece of plant machinery is provided. For example, the expandable drive portions described above are not available on all mini- excavators or other pieces of plant machinery. However, the use of cowlings to engage drive portions is still useful. For example, a drive portion in contact with the surface on which the piece of plant machinery rests and comprising an arrangement by which the piece of plant machinery may be moved can be brought at least partially under the mount as the plant machinery moves across the surface on the drive portion, so that part of the drive portion comes into cooperative engagement with the mount to attach the piece of plant machinery thereto. The mount may provide a moveable gate portion or the like, which is arranged to allow the movement of the piece of plant machinery into the mount, and then moveable to a locking position in which the piece of plant machinery is prevented from moving back out of the mount. If the mount is provided as cowlings as described above in relation to Figures 1 to 4, the movable gate portion may be provided as the second portion 112 of the cowling. Alternatively, a stop such as described in relation to the embodiment of Figure 7, or moveable ramp portion associated with the cowling may be used to prevent the piece of plant machinery from moving back out from under said mount once the piece of plant machinery is arranged in the mounting location.

Figures 8 and 9 show an embodiment, not according to the invention, which combines features of the embodiments of Figures 1 to 7 and the embodiments described in the previous paragraph. That is, the trailer 1' comprises a mount 100 to cooperate with the arm 40 of a piece of plant machinery 2. The trailer 1' also comprises guide rails 120', useful in aligning the drive portions 20 and in positioning the drive portions on the surface 3 on which the piece of plant machinery 2 rests so as to be moveable between the cowlings 110'. The guide rails 120' are arranged to have an introducing portion 121 that presents a wider opening to the drive portions 20 to facilitate alignment of the drive portions 20 on the trailer 1', but which spread relative to one another in the direction of loading of the trailer 1' to then bring the drive portions 20 into place relative to the cowlings 110' with further movement in the loading direction. The piece of plant machinery 2 shown in Figure 9 comprises a scraping blade 21. A stop 130 against which the lowered scraping blade can rest is provided as part of the mount 100 on the trailer 1'. The stop extends 130 from the surface 3 on which the piece of plant machinery 2 rests. Moving the body of the piece of plant machinery relative to the mount 100 to bring the piece of plant machinery to a mounting location comprises moving the body in a loading direction of the trailer, described above as a first direction, such that the scraping blade is positioned in cooperative engagement with the stop 130 to resist movement of the scraping blade in the loading

direction. This distributes load which would otherwise be imparted onto the cowlings 110' by the piece of plant machinery 2, for example during deceleration of the trailer 1'.

5 Even though the expandable drive portions 20 described above are available on the piece of plant machinery 2, the cowlings 110' are arranged with only first and third portions, such that the drive portions of a fixed separation can be moved under the cowlings by moving into place on loading of the trailer 1'. The mount provides a moveable gate portion that allows movement of the piece of plant machinery onto the trailer 1' and into the mount. In this embodiment  
10 (which is not in accordance with the invention) the piece of plant machinery 2 is prevented from moving back out of the mount as the movable gate portion provides, when closed, a second portion 112' of the cowlings.

The mounts and related methods and equipment described herein provide a simple and effective way of securing a piece of plant equipment. Although the plant equipment described  
15 in relation to the example embodiments is a mini-excavator, it will be apparent that other pieces of plant equipment useful in industrial processes, such as excavators, bulldozers, backhoe loaders and the like can also benefit from operation with the mount.

**CLAIMS:**

1. A mount (100) for attaching a piece of plant machinery (2) thereto,  
5 the piece of plant machinery comprising a body (30) and a moveable portion (20) arrangeable relative to the body,  
the mount arranged such that with the body of the piece of plant machinery moved to a mounting location, movement of the moveable portion brings the moveable portion into cooperative engagement with the mount to attach the piece of plant machinery thereto,  
10 characterized in that the mount comprises a cowling (110) to receive the moveable portion;  
the cowling is arranged above a surface on which the body of the piece of plant machinery rests to receive at least a part of the moveable portion there-under when the moveable portion is arranged in cooperative engagement with the mount;  
the at least a part of the moveable portion is at least a part of a drive portion of the piece  
15 of moveable plant machinery; and  
the mount is a static component with no moving parts.

2. The mount of claim 1, wherein the drive portion comprises an arrangement of  
20 wheels or tracks of the piece of plant machinery.

3. The mount of any preceding claim, wherein the cowling comprises one or more of: (i) a first portion, and the arranging the moveable portion in cooperative engagement with the mount comprises arranging a front part of the drive portion alongside the first portion of the  
25 cowling; (ii) a second portion, and the arranging the moveable portion in cooperative engagement with the mount comprises arranging a rear part of the drive portion alongside the second portion; and (iii) a third portion, and the arranging the moveable portion in cooperative engagement with the mount comprises arranging an upper part of the drive portion alongside the third portion.

30  
~~4. The mount of claim 3, wherein the cowling comprises at least one portion that is arrangeable to move to a loading position in which movement of the body relative to the mount to bring the piece of plant machinery to a mounting location is uninhibited, and arrangeable to move to a loaded position to cooperate with the piece of plant machinery to contribute to  
35 attaching the piece of plant machinery to the mount.~~

5.4. The mount of any preceding claim, comprising two cowlings, each to receive a moveable drive portion.

6-5. The mount of claim 54, comprising a first cowling arranged to receive a drive portion on a first side of the piece of plant machinery and a second cowling arranged to receive a drive portion on a second side of the piece of plant machinery.

5           76. The mount of any preceding claim, comprising a guide means to in use bring a drive portion of the piece of plant machinery into alignment with the mount.

10           78. The mount of claim 76, wherein the guide means comprises an introducing portion presenting a wider opening to the drive portion to facilitate alignment of the drive portions, and spreading guide rails to bring the drive portions into place relative to the mount.

98. A transporter (1) comprising the mount (100) of any one of Claims 1 to 87.

15           940. An attachment method for attaching a piece of plant machinery (2) to a mount (100), the piece of plant machinery comprising a body (30) and a moveable portion (20) arrangeable relative to the body,  
                  the attachment method comprising:  
                  moving the body relative to the mount to bring the piece of plant machinery to a mounting location, and arranging the moveable portion in cooperative engagement with the  
20           mount to attach the piece of plant machinery thereto,  
                  wherein the mount comprises a cowling (110) to receive the moveable portion;  
                  the cowling is arranged above a surface on which the body of the piece of plant machinery rests to receive at least a part of the moveable portion there-under when the moveable portion is arranged in cooperative engagement with the mount;  
25           the at least a part of the moveable portion is at least a part of a drive portion of the piece of moveable plant machinery; and  
                  the mount is a static component with no moving parts.