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(54) Abstract Title
CRANE VEHICLE WITH A COUNTERWEIGHT ADAPTOR PLATE

(57) A crane vehicle has an upper vehicle portion 2 disposed upon a lower vehicle portion 1 so as to be rotatable, at least one hoist 5 which can be secured to the upper vehicle portion 2 and a frame member 6 onto which counterweight elements 8-12 can be loaded, where the width 14 of said frame member corresponds substantially to the vehicle width 15. The counterweights are connected to one another in an interlocking manner. An adaptor plate 13 is arranged on the frame member 6 on top for the counterweights 8-12 and on which additional counterweights of crane vehicles of other tonnage classes may be stacked. A second hoist 7 may be positioned on top or between the additional counterweights.

Fig.1

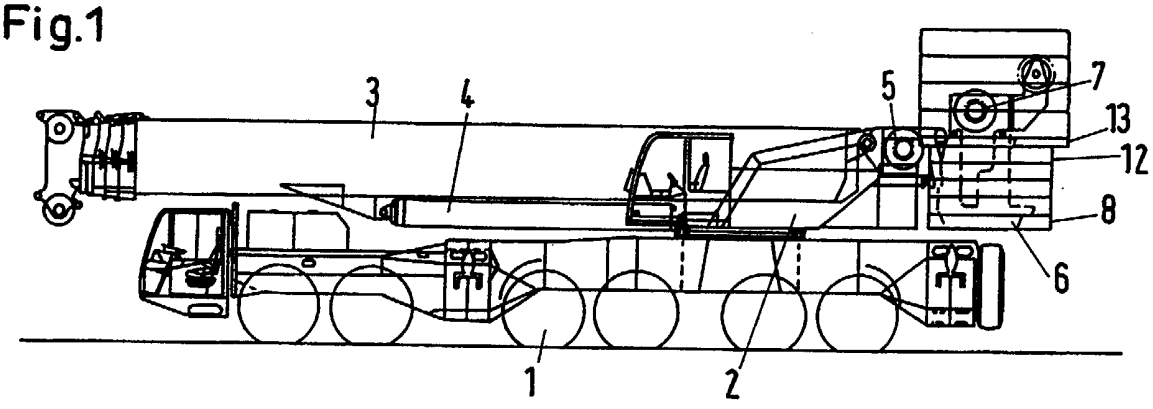

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Fig.1

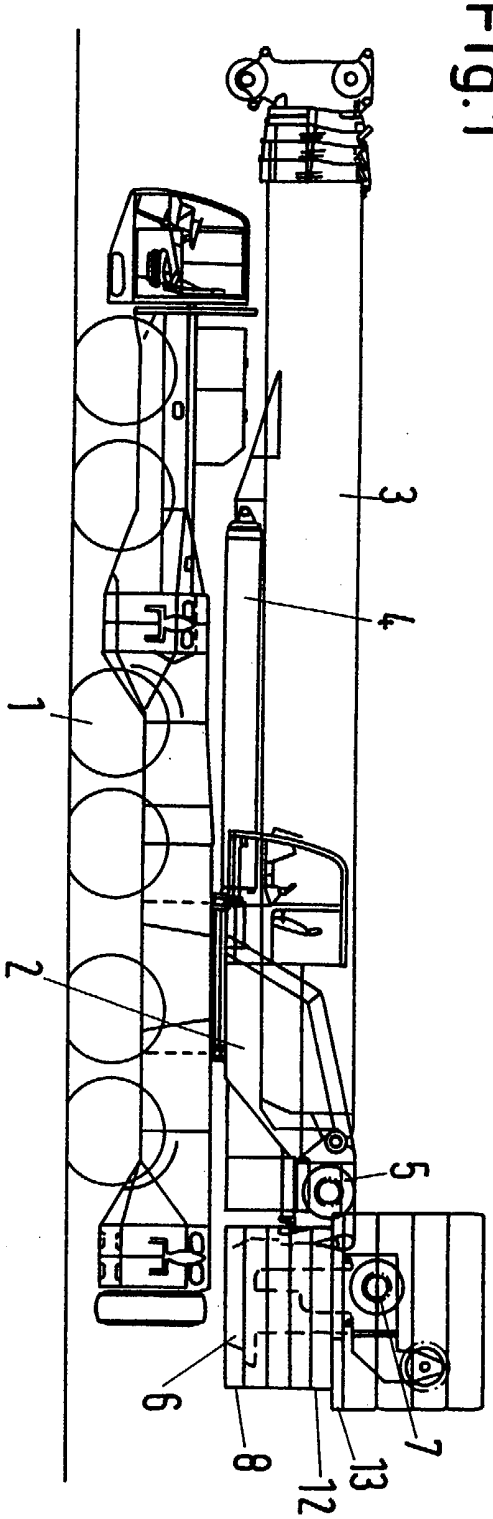


Fig.2

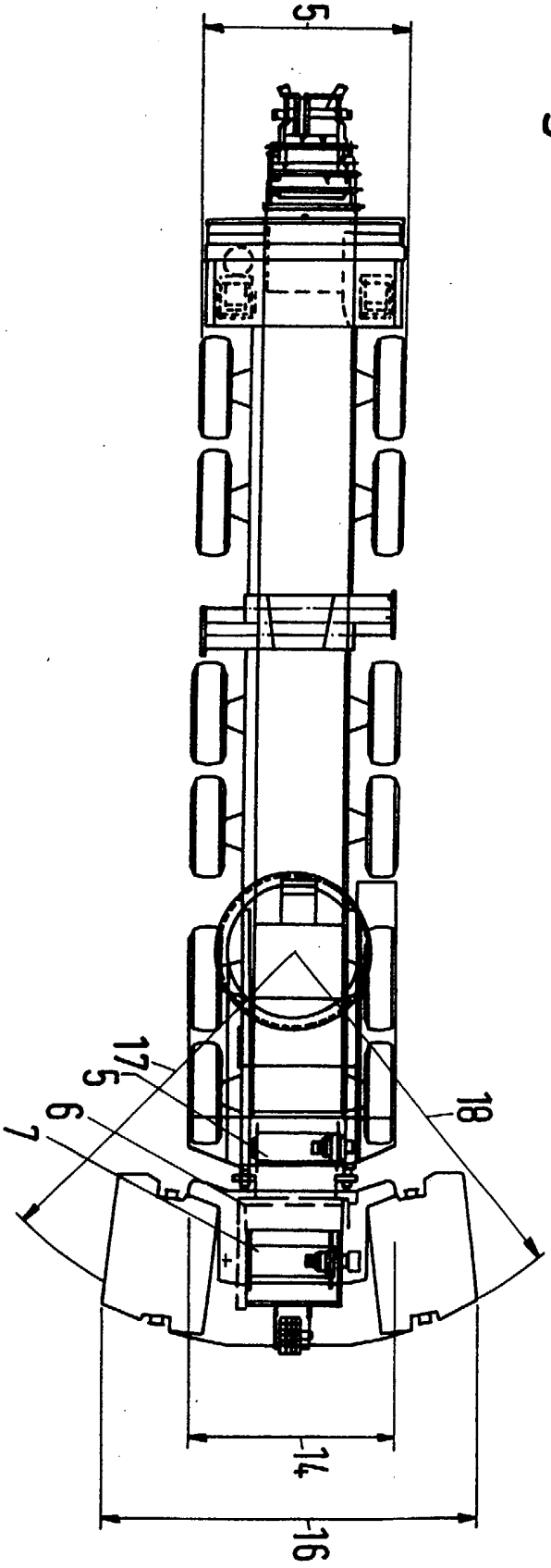


Fig.3

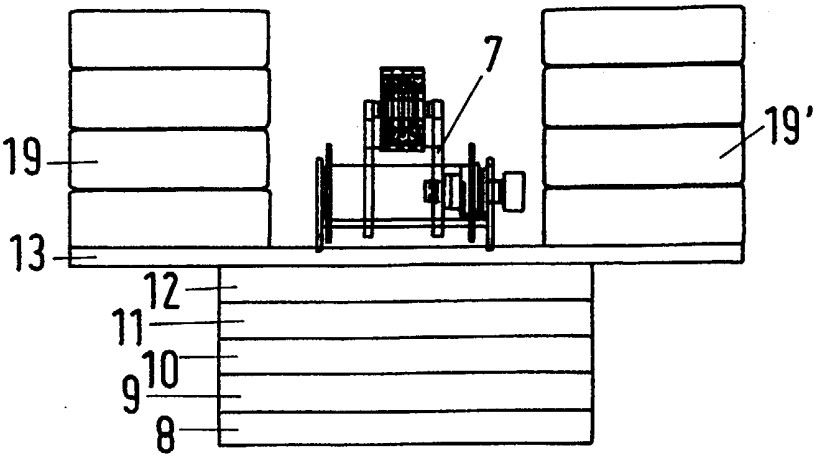
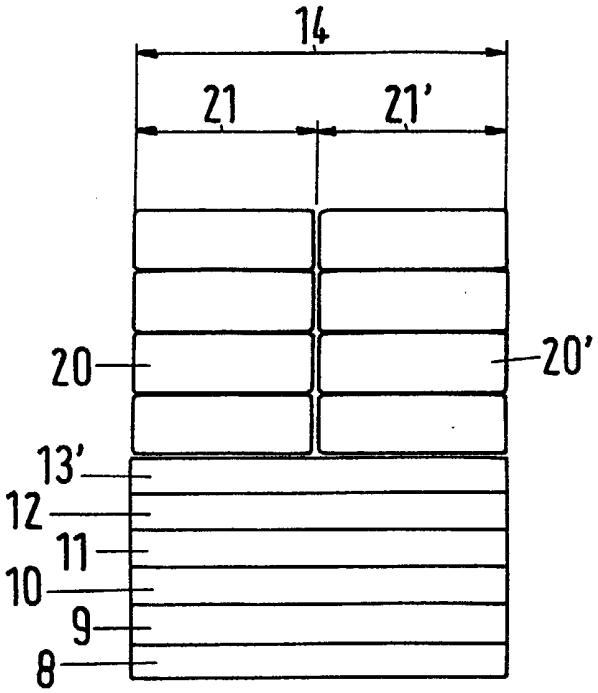


Fig.6



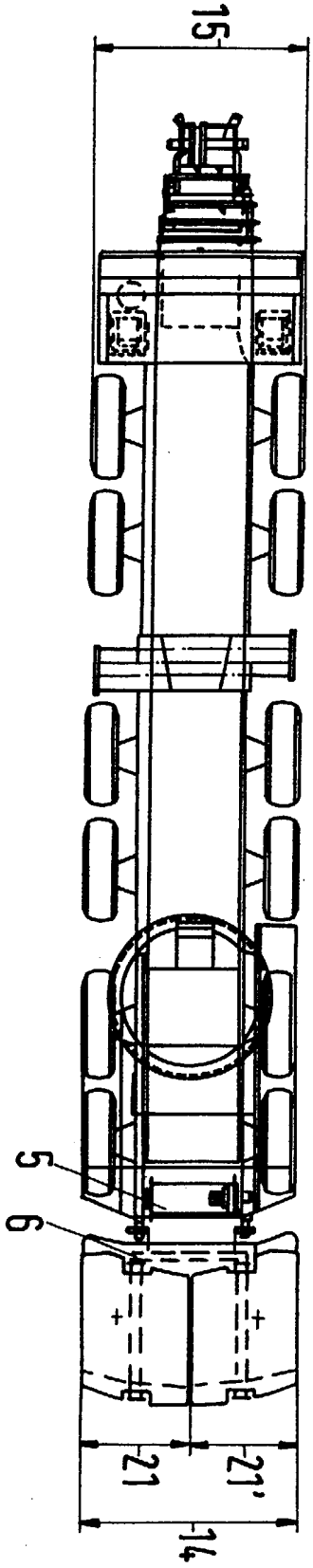


Fig.5

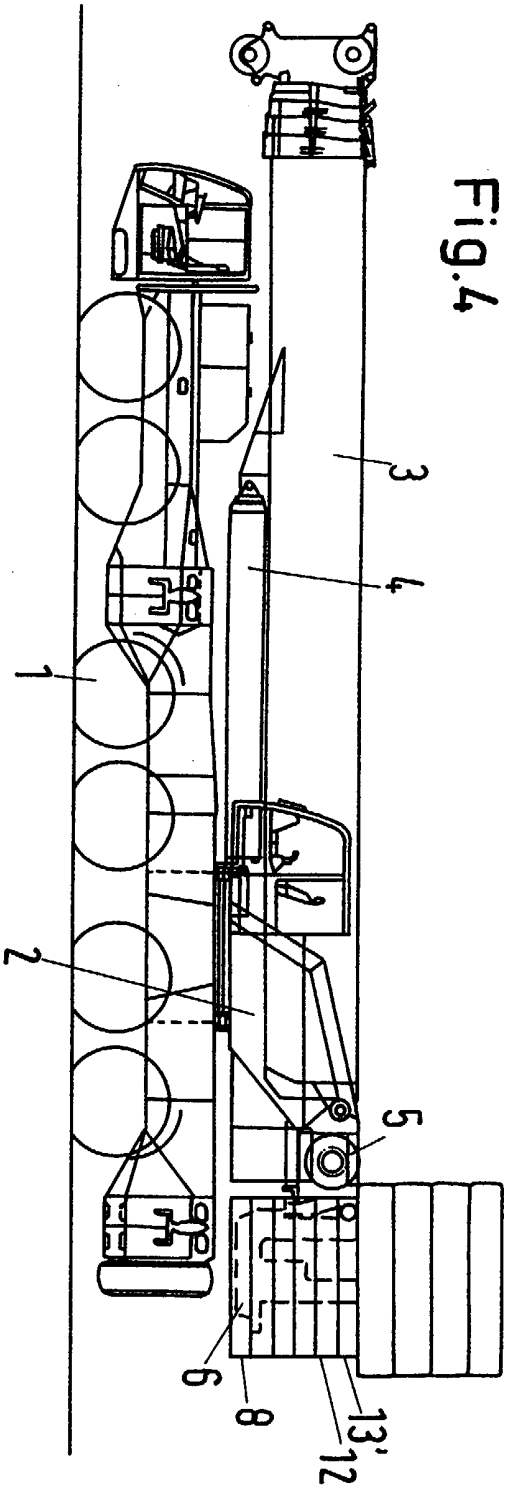


Fig.4

Fig.7

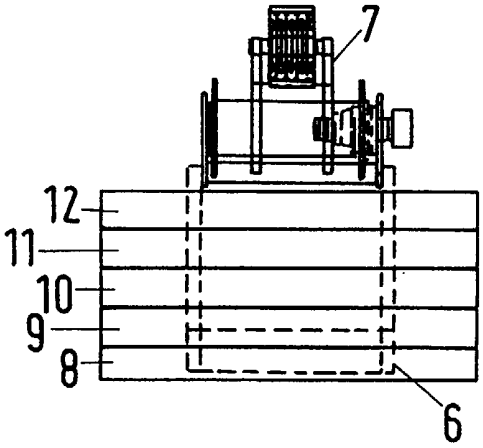


Fig.8

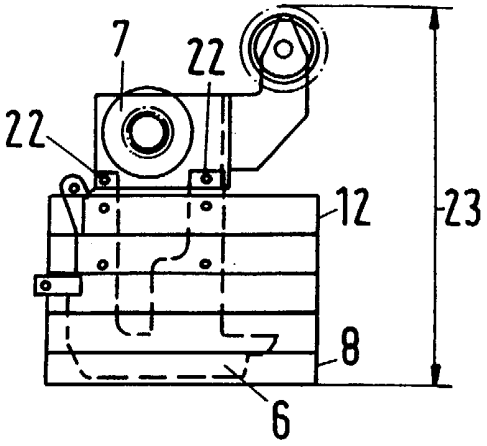


Fig.9

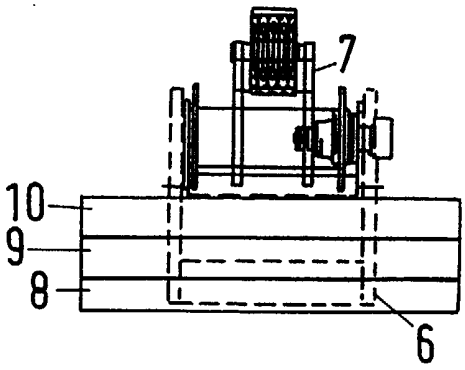
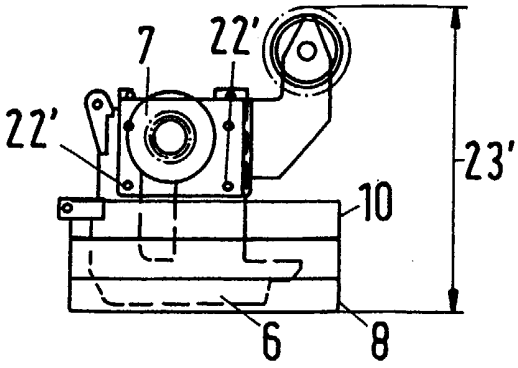


Fig.10



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CRANE VEHICLE

The invention relates to a crane vehicle having a lower vehicle portion and an upper vehicle portion disposed upon the lower vehicle portion so as to be rotatable.

In crane vehicles having higher loads, in contrast to smaller crane vehicles, the individual counterbalance elements are not attached below the first hoist or stacked to the right and left of the first hoist, but rather instead are on a frame member attached to the end of the upper vehicle portion, preferably behind the first hoist as shown, for example, in DE 39 12 868 C1; DE 198 01 837 A1; Demag AC 650, company prospectus for Mannesmann Dematic AG, order no. AC650 C4-201 120 12.

What is disadvantageous about the known counterweight concept is the low variability of the width and the swivelling radius of the counterweight elements. An additional disadvantage is that in an arrangement with a second hoist, the latter is not included in the counterweight concept. Moreover frequently the manoeuvrability of the crane vehicle is limited by the unfavourable width and the large swivelling radius of the counterweight.

An object of the invention is to provide a crane vehicle of this type, in which the counterweight has high variability in respect of the width and the swivelling radius of the counterweight elements, and which allows account to be taken of the possible inclusion of a second hoist. In addition, the manoeuvrability of the crane vehicle is intended to be optimal and the outlay for attaching very high counterweights to be low.

The invention provides a crane vehicle having a lower vehicle portion, an upper vehicle portion disposed upon the lower vehicle portion so as to be rotatable, at least one hoist which can be fastened to the upper vehicle portion, a frame member on which counterweight elements can be disposed and the width of which substantially corresponds to the vehicle width, and an adaptor plate which can be arranged on the frame member in addition to counterweight elements specific for the vehicle type and on which can be stacked counterweight elements of crane vehicles of different tonnage classes, the counterweight elements being connected to one another in an interlocking manner or stacked in an interlocking manner.

According to the invention, an adaptor plate can be arranged on the frame member, on which plate counterweight elements of crane vehicles of other tonnage classes can be stacked.

The counterweights of crane vehicles are generally provided with bulges and recesses which are complementary to one another, or with other shaped elements complementary to one another, so that they can be stacked upon one another in an interlocking manner. Thus the shaped element of a counterweight engages either in the complementarily shaped element of the counterweight lying below it or of a supporting plate serving as a base. The shaped element can be, for example, cams on one side of a counterweight element which engage in corresponding bores or recesses on the side of the immediately adjacent counterweight element. On account of the differing dimensions of the individual types of counterweight elements and their respective shaped elements, up till now only counterweight elements of the identical type have been able to be stacked upon one another in a regular, i.e. interlocking, manner.

The adaptor plate allows use also of counterweight elements of other tonnage classes, i.e. elements other than those provided for the particular vehicle, since the adaptor plate can be equipped on its lower side with shaped elements which fit one type of counterweight and on its upper side with shaped elements which fit another type of counterweight. Preferably the adaptor plate with its shaped elements is so configured that more than one type of counterweight can alternatively be stacked upon it. In particular provision can be made for standard counterweight elements, (i.e. counterweight plates which are typical for the vehicle) of the respective crane vehicle also to be stacked thereupon. This increases the application possibilities.

This concept has the advantage that, in order to increase the counterweight, the crane operator can optionally stack on the adaptor plate identical or different counterweight elements. This has the advantage for him that he can make use of counterweight elements which are already present. On the other hand, the concept offers the advantage that, despite an already considerable counterweight, the manoeuvrability of the vehicle crane is optimal, since the width of the frame member corresponds to the vehicle width. The crane vehicle can therefore be moved with vehicle-typical counterweights of corresponding dimensions already stacked on it, even through narrow passages on a construction site to its place of use. If the adaptor plate is so designed as to its outer dimensions that it does not protrude beyond the width of the vehicle, the same movement capability is guaranteed with an adaptor plate already attached and even also with counterweight elements which are foreign to the vehicle and correspondingly dimensioned. Naturally provision can also be made for the counterweight to be significantly increased by attaching an adaptor plate only after the use site has been reached.

According to a further feature, the adaptor plate can advantageously also be so dimensioned that it protrudes beyond the frame member and the swivelling radius of the frame member with the counterweight elements typical for the vehicle is lower than the swivelling radius of the adaptor plate. The adaptor plate can also be arranged for configuration of the counterweight elements in two spaced stacks, in order to secure a second hoist to the frame member in the gap between the two stacks.

In order not to impair the variability when a second hoist is arranged on the crane, according to a further feature, the second hoist can be bolted at different height settings. This has the advantage that, without an adaptor plate, an increased number of counterweight elements can be stacked on the frame member, without encroaching on the space required for the second hoist. Even if the counterweight has to be even further increased, this will be made possible through the arrangement of a protruding adaptor plate.

The counterweight elements to be stacked on the adaptor plate can be configured in a particular manner, specifically in such a way that when they are pushed together horizontally they complement one another in pairs. It is particularly expedient if the counterweight elements to be stacked on the adaptor plate can be joined to form two stacks, the respective width of each stack corresponding substantially or exactly to half the vehicle width. This means that when the two stacks are pushed together, a total width identical to the vehicle width is produced. This has the advantage that when a second hoist is not present, the manoeuvrability of the vehicle crane is not impaired despite a high counterweight.

The invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 shows a crane vehicle configured according to the invention in longitudinal view,

Fig. 2 is a plan view of the crane vehicle of Fig. 1,

Fig. 3 is a rear view of the counterweights of the crane vehicle of Fig. 1,

Fig. 4 shows a second embodiment variant in longitudinal view,

Fig. 5 is a plan view of the crane vehicle of Fig. 4,

Fig. 6 is a rear view of the counterweights of the crane vehicle of Fig. 4,

Fig. 7 shows a frame member with counterweight plates and hoist in rear view,

Fig. 8 is a side view of the frame member of Fig. 7,

Fig. 9 shows a modification of the embodiment of Fig. 6, and,

Fig. 10 is a side view of the modification of Fig. 9.

Figs. 1 to 3 show a crane vehicle in longitudinal view, plan view and rear view, respectively. The embodiment shown has a six- axle telescoping crane with a lower vehicle portion 1 and an upper vehicle portion 2, disposed upon the lower vehicle portion 1 so as to be rotatable and to which a main boom 3 having a plurality of telescoping sections is secured. To the underside of the main boom 3 is hinged at least one tilting cylinder 4, the other end of which is connected to the upper vehicle portion 2. At the rear end of the upper vehicle portion 2 is disposed a first hoist 5, to the steel structure of which is releasably bolted a frame member 6. On the frame member 6, which also serves to accommodate a second hoist 7, can be stacked counterweights shown here in the form of five counterweight plates 8-12 typical for the vehicle. On the uppermost counterweight plate 12 an adaptor plate 13 is disposed which

protrudes beyond the frame member 6. This is clear from the differing width and the swivelling radius. Whilst the width 14 of the frame member 6 corresponds to the width 15 of the crane vehicle, the width 16 of the adaptor plate 13 is recognisably larger. Thus the swivelling radius is also altered. The reference numeral 17 at the bottom of Fig. 2 indicates the swivelling radius of the frame member 6, whilst the reference numeral 18 at the top indicates the swivelling radius of the adaptor plate 13. The adaptor plate 13 is therefore not a simple rectangular plate but a structural part which is adapted in its outer shape to the contour of the counterweight plate, and which only increases the swivelling radius comparatively little. In terms of construction, the adaptor plate has the capability of storing and securing different types of counterweights. The centre of gravity of the stacked counterweights is practically not altered, or is altered only insignificantly.

It is easiest to appreciate this stack variant from Fig. 3, which omits the lower vehicle portion. Fig. 3 shows the highest possible vertical setting of the second hoist 7. Details of the vertical setting will be discussed further with respect to Figs. 7 to 10. This vertical position makes it possible to arrange five counterweight plates 8-12 on the frame member 6 (not shown here). It is usual to arrange the lowest counterweight plate 8 directly on the frame member 6 itself and to stack the others above it. If one starts from a weight of 10 t per counterweight plate, altogether 50 t is stacked on the frame member 6. If one then adds the intrinsic weight of the frame member amounting to 2 t, that makes altogether 52 t. This means that without the adaptor plate 13 only 50 t counterweight can be stacked as a result of the vertical position of the second hoist 7. This counterweight is indeed disposed in such a compact manner that the vehicle width is not enlarged by it. In the interests of completeness, reference should also be made here to the fact that when the crane vehicle is travelling on a road, the lowest counterweight plate 8

weighing 10 t is placed on the platform of the lower vehicle portion 1, in order to be able thus to distribute the axle load more favourably. Only the remaining 40 t counterweight plates 9–12 have to be transported separately by means of low loaders.

The adaptor plate 13 is preferably so designed in respect of thickness that it also weighs 10 t and thus corresponds to the weight of a standard counterweight plate 8-12. The adaptor plate 13 allows optional stacking of counterweight elements 19, 19' of a crane vehicle of identical or different tonnage. This has the advantage that the crane operator can make use of already available counterweight elements. If one assumes that each individual element 19, 19' weighs 10 t then 2 x 10 t are stacked on the plate 13 per layer. Since in this embodiment, in each case four elements are stacked, this means 4 x 2 x 10 t = 80 t. If one adds all the counterweight elements together this gives a total weight of 52 t plus 10 t plus 80 t, i.e. = 142 t.

In Figs. 4 to 6 another embodiment is shown also in longitudinal view, plan view and rear view, like reference numerals being used for like parts. These figures show a possible way of achieving optimal counterweight width when the second hoist 7 is omitted. Here the width of the adaptor plate 13' is selected to be identical to the vehicle width 15. The counterweight elements 20, 20' are, like those 19, 19' illustrated in Fig. 3, so designed that they complement one another in pairs, the width 21, 21' of the individual counterweight element 20, 20' corresponding to half the width 14 of the frame member 6 or half the width 15 of the vehicle. If one notionally removes from Fig. 3 the second hoist 7 and forms the counterweight elements 19, 19' in the above-mentioned manner, then by pushing the two stacks together one obtains the arrangement represented in Fig. 6. This means that, despite a drastically increased counterweight, the manoeuvrability of the vehicle is not

impaired since the width of the counterweight corresponds to the vehicle width.

Figs. 7 to 10 illustrate two variants of the frame member 6 with the second hoist 7 secured at different heights and a corresponding number of standard counterweight plates 8–12 or 8–10, in each case in a rear view and a side view. Fig. 8 shows the hoist 7 secured in the uppermost of three possible height settings. The bolting sites used for this purpose are designated 22 and the overall height 23. In Fig. 10 the bolting sites 22' are lower which results in a significantly lower overall height 23' for the structural unit. Figs. 7 to 10 also clarify the shape of the fork-like frame member 6, which is represented in a broken line. The counterweight plates 8-12 have recesses, which are not shown in detail, for the struts of frame member 6, so that they can be stacked one upon the other on frame member 6. Between the two height settings shown, a middle setting is also possible, such that the height of the hoist 7 can be matched to specific pre-set sizes of the necessary counterweight and its stack height. Naturally further different height settings could be provided. It is also obvious that an adaptor plate 13, 13' although not provided in Figs. 7 to 10 could also be placed on different heights of the standard counterweight plates 8-12. This produces an additional variability in respect of the stacking of the counterweights. Advantageously, the lowermost counterweight plate 8 is bolted from below to the frame member 6, i.e. hangs below the frame member 6, such that said plate forms a base plate on which the additional counterweight plates 9-12 can be laid.

Application No: GB 0128790.3 **Examiner:** James Hull
Claims searched: All **Date of search:** 17 May 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B8B (BGA, BGB, BGG, BGX)

Int Cl (Ed.7): B66C 23/72

Other: ONLINE DATABASES: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	US 4196816 A	(DVORSKY). Heavy duty crane with auxiliary counterweight frame.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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