



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
12.01.2000 Bulletin 2000/02

(51) Int Cl.7: **B66C 13/06, B66C 13/46**

(43) Date of publication A2:
13.05.1998 Bulletin 1998/20

(21) Application number: **97308303.3**

(22) Date of filing: **20.10.1997**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**
Designated Extension States:
AL LT LV RO SI

- **Kouno, Susumu, Mitsubishi Heavy Ind., Ltd.
Hiroshima-shi, Hiroshima (JP)**
- **Hoshina, Hiromitsu, Mitsubishi Heavy Ind., Ltd.
Hiroshima-shi, Hiroshima (JP)**

(30) Priority: **08.11.1996 JP 29604896**

(71) Applicant: **Mitsubishi Heavy Industries, Ltd.
Tokyo 100-0005 (JP)**

(74) Representative:
**Cross, Rupert Edward Blount et al
BOULT WADE TENNANT,
27 Furnival Street
London EC4A 1PQ (GB)**

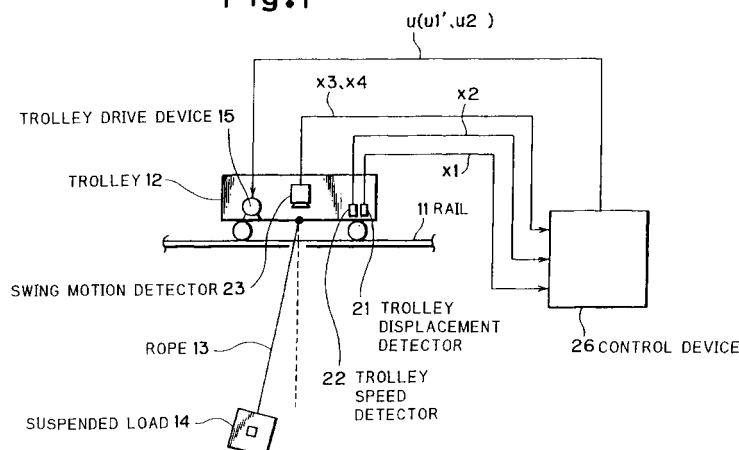
(72) Inventors:
• **Toyohara, Takashi, Mitsubishi Heavy Ind., Ltd.
Hiroshima-shi, Hiroshima (JP)**

(54) **Suspended load steadying control device**

(57) A trolley 12 travels along rails 11 while suspending a load 14 by a rope 13. The trolley 12 has a trolley displacement detector 21 for detecting a trolley position x_1 , a trolley speed detector 22 for detecting a trolley speed x_2 , and a swing motion detector 23 for detecting a swing displacement x_3 and a swing speed x_4 of the suspended load 14. A control device 26 produces a speed command u based on the detected values x_1 , x_2 , x_3 and x_4 . In response to the speed command u , a

trolley drive device 15 is driven to run the trolley 12. When the trolley is to be moved to the target position by the control of the control device 26, control for steadying the suspended load while the trolley 12 is following a set speed is performed in the first half of control. As the trolley 12 approaches the target position, control for positioning the trolley and steadying the suspended load is performed. Thus, the swing of the suspended load is lessened not only at the target position, but also during the travel of the trolley.

Fig.1





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 8303

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|--|--|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| A | EP 0 668 237 A (SIEMENS AG) 23 August 1995 (1995-08-23) * claims 1-4; figures 1-5 * | 1,2 | B66C13/06 B66C13/46 |
| A | US 5 550 733 A (YUN JI-SEOP ET AL) 27 August 1996 (1996-08-27) * claims 1,2; figure 5 * | 1,2 | |
| A | EP 0 611 211 A (CAILLARD) 17 August 1994 (1994-08-17) * claims 1,2,11-13,15; figures 10,11 * | 1,2 | |
| A | FR 2 704 847 A (BERTIN & CIE) 10 November 1994 (1994-11-10) * claims 1,3,9; figures 1-4 * | 1,2 | |
| A | DE 35 13 007 A (HITACHI LTD) 19 December 1985 (1985-12-19) * figures 3,18 * | 1,2 | |
| | | | TECHNICAL FIELDS SEARCHED (Int.Cl.6) |
| | | | B66C |
| The present search report has been drawn up for all claims | | | |
| Place of search BERLIN | | Date of completion of the search 18 November 1999 | Examiner Thomas, C |
| CATEGORY OF CITED DOCUMENTS | | 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 | |
| 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 | | | |

EPO FORM 1503 03.82 (P04C01)

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

EP 97 30 8303

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-11-1999

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| EP 0668237 A | 23-08-1995 | DE 4405683 A | 24-08-1995 |
| | | DE 59506816 D | 21-10-1999 |
| US 5550733 A | 27-08-1996 | KR 9703508 B | 18-03-1997 |
| | | SE 9401560 A | 26-09-1995 |
| EP 0611211 A | 17-08-1994 | FR 2701467 A | 19-08-1994 |
| FR 2704847 A | 10-11-1994 | NONE | |
| DE 3513007 A | 19-12-1985 | JP 60218290 A | 31-10-1985 |
| | | JP 60218291 A | 31-10-1985 |
| | | JP 60236991 A | 25-11-1985 |

EPO FORM P0459

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