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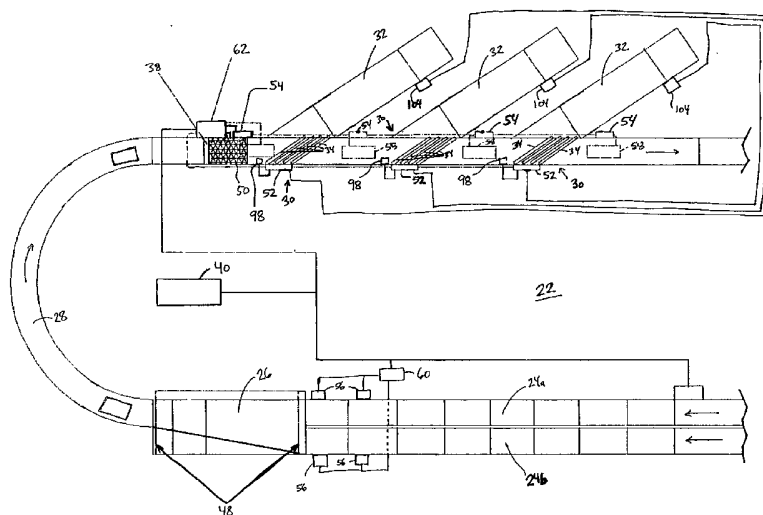
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GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent  
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,  
NE, SN, TD, TG).

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted  
a patent (Rule 4.17(ii)) for the following designations AE,  
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,  
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES,  
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MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent

[Continued on next page]

(54) Title: TIERED CONTROL ARCHITECTURE FOR MATERIAL HANDLING



(57) Abstract: A control architecture for material handling includes multiple tiers of controllers, such as three. The lowest-level controllers interact directly with sensors and actuators used in the material handling system, such as photo-eyes and motors used with conveyors. The lowest-level controllers receive higher level commands from one or more mid-level controllers. The mid-level controllers, in turn, receive still higher level commands and information from at least one upper level controller. Each mid and low level controller is designed to include sufficient intelligence to deal with many of the signals and messages it receives without having to forward those signals or messages to the next higher level controller and await instructions from that higher level controller. The system thus distributes intelligence amongst the controllers. The system is well-adapted for application to conveyor control systems.



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(AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU,  
MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI,  
CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 02/06229

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 G05B19/418 B65G47/84

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G05B B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.   |
|------------|--|---|
| Y<br><br>A | US 5 967 289 A (KELSEY RICHARD W)<br>19 October 1999 (1999-10-19)<br>figures 1,5,9,11,12<br>column 2, line 61 -column 6, line 23                 | 1-12, 14,<br>21, 27, 37<br><br>13,<br>15-20,<br>22-26,<br>28-36,<br>38-44 |
| Y<br><br>A | WO 00 31597 A (MAITZ GERHARD ;M & R<br>AUTOMATISIERUNG VON INDU (AT))<br>2 June 2000 (2000-06-02)<br>figure 1<br>page 3, line 21 -page 5, line 8 | 1-12, 14,<br>21, 27, 37<br><br>13,<br>15-20,<br>22-26,<br>28-36,<br>38-44 |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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- \*O\* document referring to an oral disclosure, use, exhibition or other means
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- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* & \* document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 02/06229

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |  |                       |
|--|--|-----------------------|
| Category °   | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
| Y  | WO 01 36307 A (UNITED PARCEL SERVICE INC)<br>25 May 2001 (2001-05-25)<br>page 11, paragraph 1<br>----                                | 12                    |
| A  | US 6 041 909 A (SHEARER JR JAMES T)<br>28 March 2000 (2000-03-28)<br>figures 1-9<br>column 4, line 25 -column 9, line 57<br>----     | 1-44                  |
| A  | US 5 971 132 A (BONNET HENRI)<br>26 October 1999 (1999-10-26)<br>figures 1,2,6A-9<br>column 4, line 25 -column 9, line 58<br>----    | 1-44                  |
| A  | US 6 157 866 A (SHEDD DANNY C ET AL)<br>5 December 2000 (2000-12-05)<br>figures 1,4<br>column 5, line 25 -column 8, line 40<br>----- | 1                     |

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP 02/05119

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
**see FURTHER INFORMATION sheet PCT/ISA/210**
  
2.  Claims Nos.: -  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
**see FURTHER INFORMATION sheet PCT/ISA/210**
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

**see additional sheet**

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
**1-14, 19, 41, 49 (all completely); and 15-17, 20-24, 27-38, 42-46, 50-54, 57-60 (all in part)**

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 02/06229

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date   |
|--|------------------|-------------------------|--|
| US 5967289                             | A                | 19-10-1999              | NONE   |
| WO 0031597                             | A                | 02-06-2000              | WO 0031597 A2 02-06-2000<br>AU 1253000 A 13-06-2000<br>EP 1137972 A2 04-10-2001<br>US 2001037362 A1 01-11-2001   |
| WO 0136307                             | A                | 25-05-2001              | US 6264042 B1 24-07-2001<br>WO 0136307 A2 25-05-2001   |
| US 6041909                             | A                | 28-03-2000              | US 5927465 A 27-07-1999<br>AT 203736 T 15-08-2001<br>AU 719095 B2 04-05-2000<br>AU 5047498 A 05-05-1998<br>BR 9712500 A 19-10-1999<br>WO 9815481 A1 16-04-1998<br>DE 59704207 D1 06-09-2001<br>DK 934217 T3 08-10-2001<br>EP 0934217 A1 11-08-1999<br>JP 2001503361 T 13-03-2001 |
| US 5971132                             | A                | 26-10-1999              | AT 215508 T 15-04-2002<br>DE 69804641 D1 08-05-2002<br>DE 69804641 T2 14-11-2002<br>DK 1012084 T3 29-07-2002<br>EP 1012084 A1 28-06-2000<br>ES 2174443 T3 01-11-2002<br>JP 3142585 B2 07-03-2001<br>JP 2000512254 T 19-09-2000<br>WO 9857875 A1 23-12-1998                       |
| US 6157866                             | A                | 05-12-2000              | NONE   |