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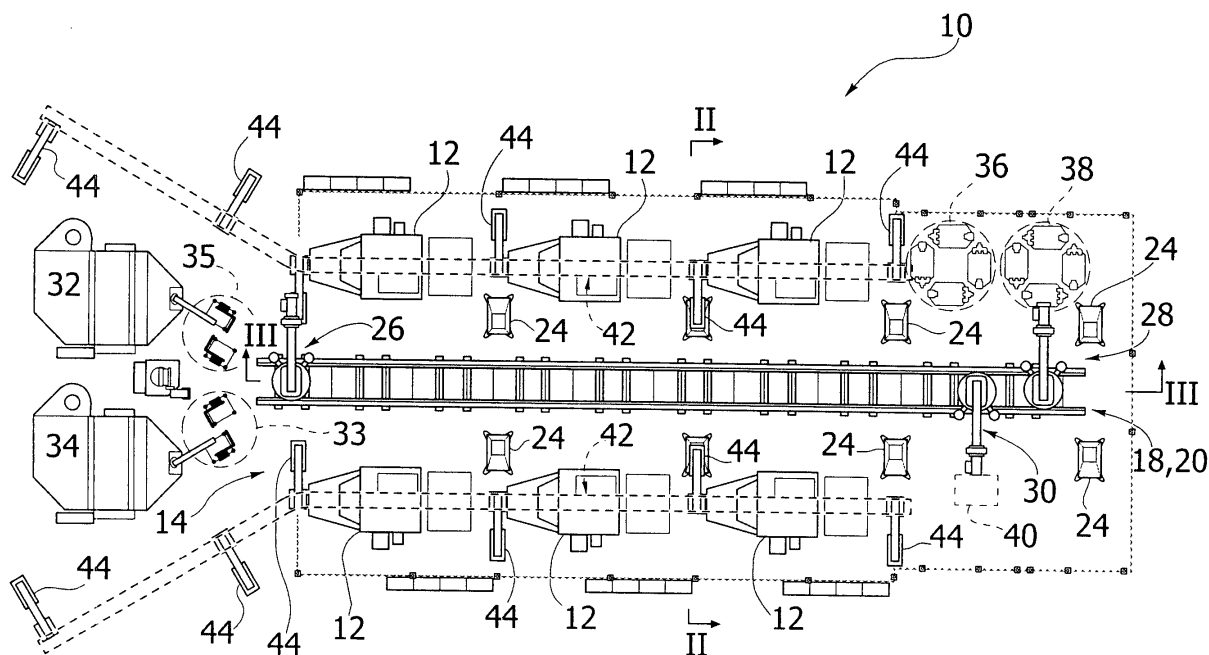
(54) **High productivity casting system**

(57) High-productivity casting system for the production of aluminium-alloy castings or the like, comprising:
- a plurality of casting machines (12); and
- a casting manipulator (26), a core-assembly manipulator (28), and a discharging manipulator (30), arranged for interlinking said plurality of casting machines (12).

The casting machines (12) are arranged along a first line (14) and a second line (16) that are parallel to one

another, and arranged between the first line (14) and the second line (16) are a first guide (18) and a second guide (20) set at a distance from one another in a vertical direction. Mobile along a first guide (18) are the casting manipulator (26) and the core-assembly manipulator (28) and mobile along a second guide (20) is the discharging manipulator (30). Each of said manipulators is set for interlinking the machines of the first line (14) and of the second line (16).

FIG. 1



Description

[0001] The present invention relates to a high-productivity casting system for the production of aluminium-alloy castings or the like.

[0002] Typically, a high-productivity automatic casting system comprises a casting manipulator, a core-assembly manipulator, and a discharging manipulator, arranged for interlinking a plurality of casting machines, usually constituted by machines for die-casting.

[0003] A typical lay-out of high-productivity casting systems envisages an in-line arrangement of the casting machines. An example of a casting system with in-line arrangement is illustrated in the document No. US 6725903, filed in the name of the present applicant. The casting manipulator, the core-assembly manipulator, and the discharging manipulator are mobile along respective guides parallel to the array of the machines.

[0004] A drawback of the in-line arrangement is represented in that, with an increase in the number of the casting machines, it is frequently necessary to provide more than one manipulator for execution of each operation (casting, core-assembly, and discharging).

[0005] In fact, the current trend is to reduce the times of solidification of the castings in die-casting machines. By reducing the time of solidification, the time of arrangement for the operating cycle of the manipulators is reduced. Considering that, with the increase in the number of the machines set in line, the length of the travel of the manipulators increases, with said in-line arrangement of the machines, situations are quite likely to arise in which just one manipulator for each operation is no longer sufficient. The fact of providing two manipulators for each operation renders the system more complex and costly.

[0006] There are also known high-productivity casting systems with carousel arrangement, in which the casting machines are carried by a rotary structure that turns about a vertical axis. The casting, core-assembly and discharging manipulators are situated in fixed positions. An example of a casting system with carousel structure is described in the document No. EP 0979698, filed in the name of the present applicant.

[0007] The systems with carousel structure are penalized by the high cost of the rotary structure carrying the casting machines. In addition, carousel systems cause considerable problems in the case where one or more casting machines must be stopped for operations of maintenance or replacement of the dies.

[0008] The object of the present invention is to provide a high-productivity casting system that will enable the problems of the known solutions to be overcome. A further object of the present invention is to provide a casting system with high flexibility and that will enable the use of standard components.

[0009] According to the present invention, said objects are achieved by a casting system having the characteristics forming the subject of the claims.

[0010] The present invention will now be described in

detail with reference to the annexed drawings, which are provided purely by way of non-limiting example and in which:

- 5 - Figure 1 is a plan view of an embodiment of a high-productivity casting system according to the present invention; and
- Figures 2 and 3 are schematic cross-sectional views according to the lines II-II and III-III of Figure 1, respectively.

[0011] With reference to the figures, the number 10 designates a high-productivity automated system for the production of aluminium-alloy castings. The system 10 comprises a plurality of die-casting machines 12 arranged in two parallel lines 14, 16 facing each other. The casting machines 12 can be of any known type used in the sector. Each line 14, 16 comprises a plurality of machines 12 aligned with one another in a longitudinal direction. The machines of the two lines 14, 16 are preferably arranged in a specular way with respect to a plane of vertical symmetry.

[0012] Preferably, as illustrated in Figure 1, the machine 12 of each line 14, 16 faces a corresponding machine 12 of the opposite line.

[0013] The system 10 comprises two horizontal guides 18, 20 extending in a rectilinear direction between the two lines 14, 16. The bottom guide 18 rests on the ground whilst the top guide 20 is carried by a portal-frame structure 22 that rests on the ground by means of a plurality of columns 24. Preferably, each guide 18, 20 is constituted by a horizontal and rectilinear rail. The top guide 20 is preferably superimposed on the bottom guide 18.

[0014] A casting manipulator 26 and a core-assembly manipulator 28 are mobile along the bottom guide 18, whilst a discharging manipulator 30 is mobile along the top guide 20. This arrangement could be reversed; i.e., the discharging manipulator could be mobile on the bottom guide and the casting and core-assembly manipulators on the top guide. Each manipulator 26, 28, 30 is able to interlink the casting machines 12 of both of the lines 14, 16. In the example of embodiment illustrated in the figures, the manipulators 26, 28, 30 are of an anthropomorphic type. The use of anthropomorphic manipulators is an advantageous characteristic of the present invention since said manipulators are standard devices available on the market at a relatively contained cost. Alternatively, other types of manipulators can be used, for example, cartesian manipulators with at least one rotating axis, or polar manipulators.

[0015] The casting manipulator 26 is pre-arranged for picking up a casting ladle filled with the liquid metal coming from a furnace 32 or 34 and for pouring the liquid metal into the casting mouth of the machines 12. The casting manipulator 26 picks up the casting ladles from two turntables 33, 35, in which the casting ladles are filled with the liquid metal coming from the furnaces 32, 34.

[0016] This particularly innovative solution enables the

casting ladle to be filled irrespective of the presence of the casting manipulator, which can consequently carry out, at the same time, other operations regarding its own working cycle.

[0017] Since the time necessary for filling the ladle is generally much longer than the time necessary for depositing the empty ladle and for picking up the full one from the casting manipulator, there follows a general reduction in the cycle time of the casting manipulator.

[0018] If it is considered, moreover, that the casting manipulator is usually the one, amongst the three manipulators (casting, core-assembly, discharging manipulators) with the longest cycle time, this solution results in a further increase in productivity of the entire casting system.

[0019] The core-assembly manipulator 28 is programmed for picking up the cores from a turntable 36 or 38 and for positioning the cores in the machines 12 when these are in the position of open dies. The discharging manipulator 30 is programmed for picking up the solidified castings from the machines 12 after opening of the dies and for depositing the finished castings in a discharging station 40. The operation of the casting, core-assembly and discharging manipulators is known to a person skilled in the sector and hence does not require any detailed description.

[0020] The arrangement of the casting machines 12 in two lines 14, 16 facing each other enables the travel of the manipulators 26, 28, 30 to be halved with respect to a system with the same number of machines arranged all in line. The smaller travel of the manipulators enables reduction in the time of the operating cycle of the manipulators, given that the time of transfer from and to the casting machines 12 is shorter. The shorter cycle time of the manipulators enables interlinking of a greater number of machines with a single manipulator for each operating step (casting, core-assembly, and discharging).

[0021] Preferably, the system 10 moreover comprises an overhead guide 42 for each line 14, 16. The overhead lines 42 extend over the respective line 14, 16 of machines 12 and serve to support respective lifting devices, which can be used for replacement of the dies of the casting machines 12. The overhead guides 42 are carried by respective columns 44.

said high-productivity casting system being **characterized in that** the casting machines (12) are arranged along a first line (14) and a second line (16) that are parallel to one another, in which arranged between the first line (14) and the second line (16) are a first guide (18) and a second guide (20) set at a distance from one another in a vertical direction, in which mobile along a first guide (18) are the casting manipulator (26) and the core-assembly manipulator (28) and mobile along a second guide (20) is the discharging manipulator (30), each of said manipulators being set for interlinking the machines of the first line (14) and of the second line (16).

2. The system according to Claim 1, **characterized in that** the casting machines (12) of the first line (14) and of the second line (16) face one another.
3. The system according to Claim 1, **characterized in that** said manipulators (26, 28, 30) are anthropomorphic manipulators.
4. The system according to Claim 1, **characterized in that** said manipulators (26, 28, 30) are cartesian manipulators with at least one rotating axis.
5. The system according to Claim 1, **characterized in that** said manipulators (26, 28, 30) are polar manipulators.
6. The system according to Claim 1, **characterized in that** each line of casting machines (14, 16) is equipped with a respective overhead guide (42) for a respective lifting device for the replacement of the dies.
7. The system according to Claim 1, **characterized in that** each of said guides (18, 20) is constituted by a horizontal rail.
8. The system according to Claim 1, **characterized in that** the casting manipulator (26) is pre-arranged for picking up a casting ladle from at least one turntable (33, 35), in which said ladle is filled with the liquid metal coming from at least one furnace (32, 34).

Claims

1. A high-productivity casting system for the production of aluminium-alloy castings or the like, comprising:
 - a plurality of casting machines (12); and
 - a casting manipulator (26), a core-assembly manipulator (28), and a discharging manipulator (30) arranged for interlinking said plurality of casting machines (12),

FIG. 1

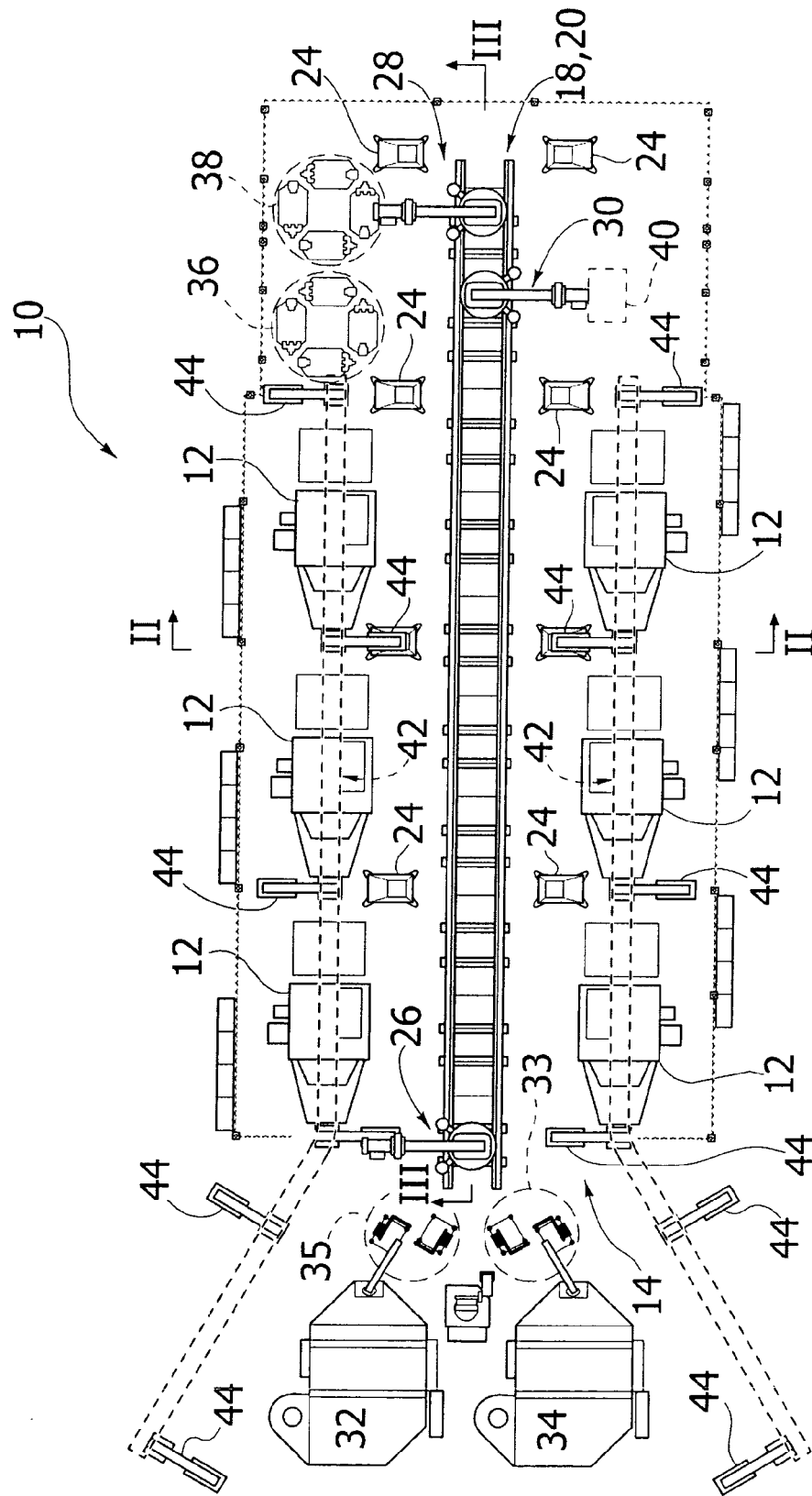


FIG. 2

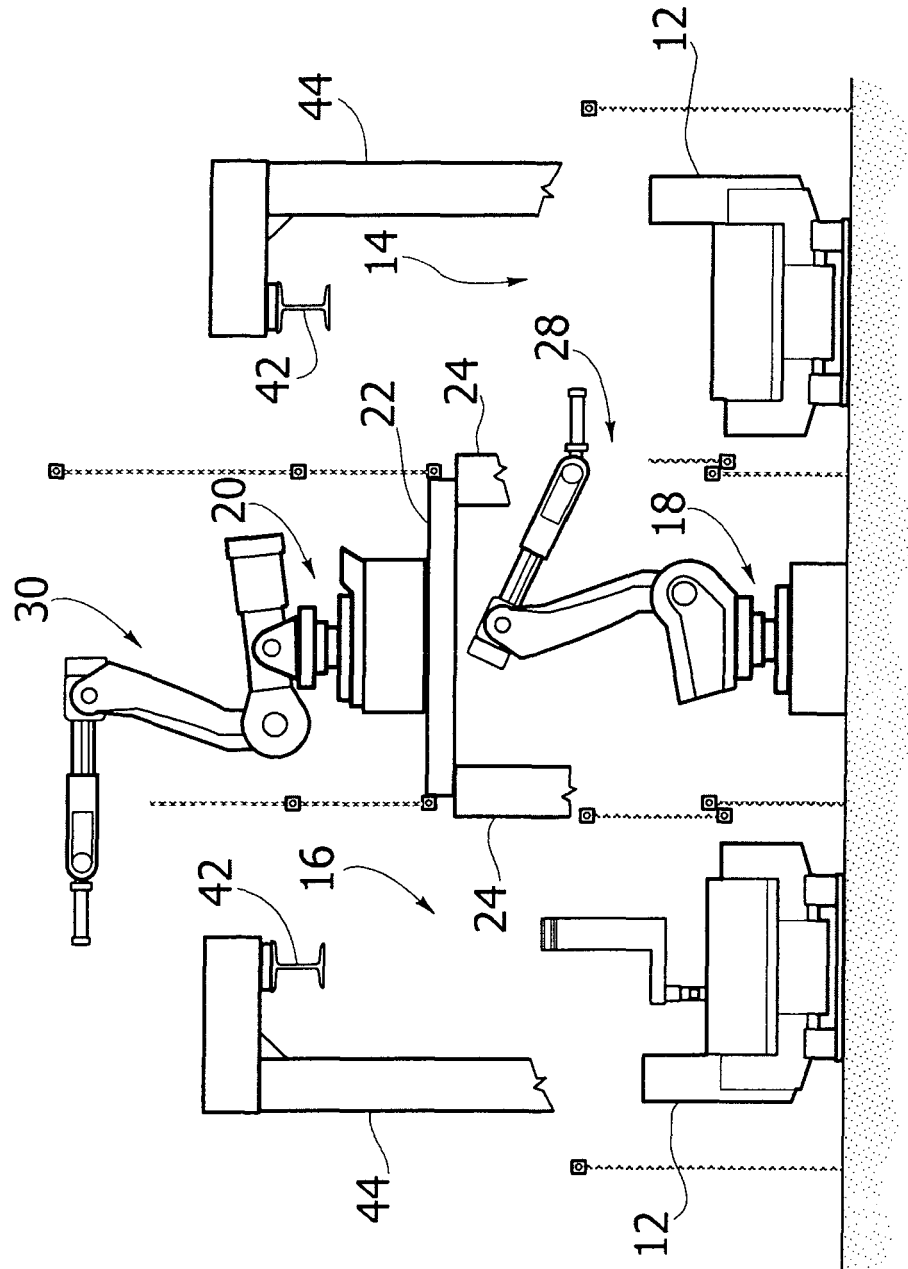
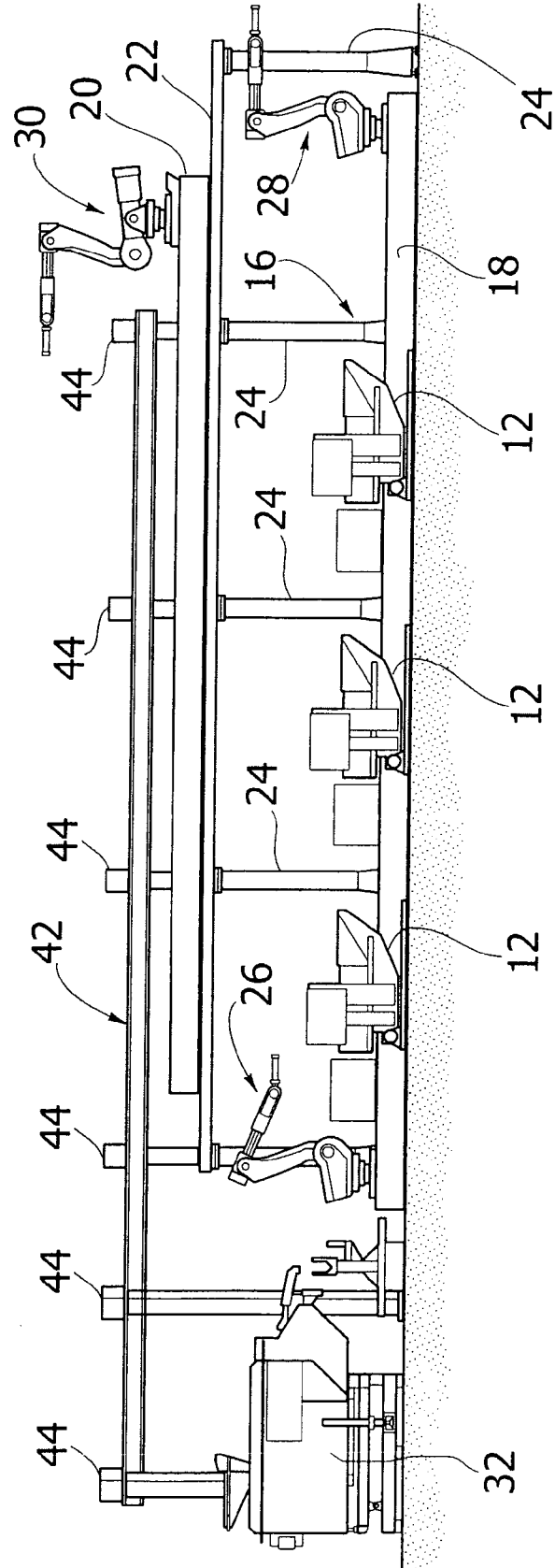


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5783

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	US 6 725 903 B2 (LAURINO ATTILIO [IT]) 27 April 2004 (2004-04-27) * the whole document * -----	1	INV. B22D47/00
			TECHNICAL FIELDS SEARCHED (IPC)
			B22D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 February 2008	Examiner Scheid, Michael
CATEGORY OF CITED DOCUMENTS 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 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			

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

EP 06 42 5783

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
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05-02-2008

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REFERENCES CITED IN THE DESCRIPTION

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- US 6725903 B [0003]
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