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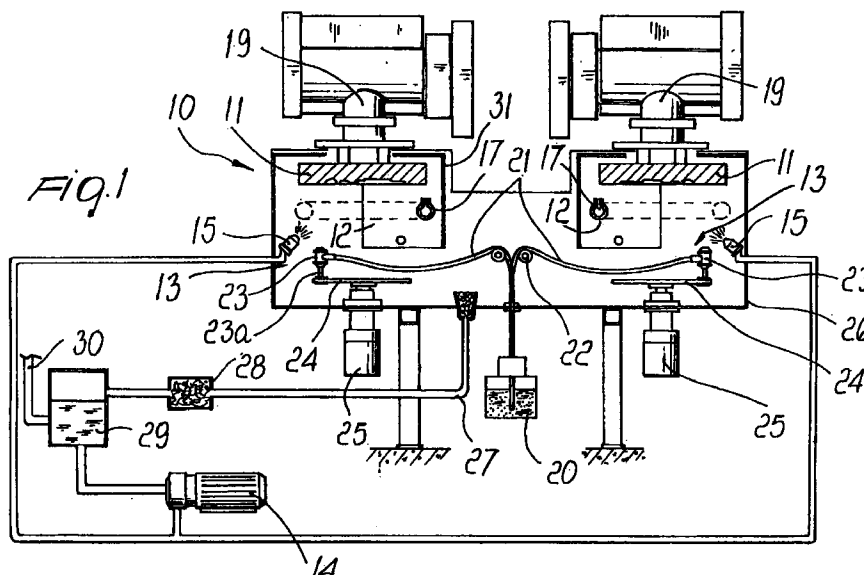
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(54) **Apparatus for preparing permanent molds in casting units**

(57) An apparatus for preparing permanent molds
(11) in casting units, characterized in that it comprises:

-- means (12) for flushing the permanent molds (11)
by means of distribution of water in high-pressure
jets; and

-- means (13) for coating the permanent molds (11)
with a layer of release agent by means of a pressu-
rized distribution of a nebulized mix of the release
agent and of a liquid.



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Description

[0001] The present invention relates to an apparatus for preparing permanent molds in low-pressure and gravity die-casting units.

[0002] After each casting of molten metal into a permanent mold, it is necessary to restore the initial conditions of the permanent mold by cooling and cleaning and by spraying its surface with release agents.

[0003] Cooling is indispensable, since the permanent mold, which is usually made of a copper alloy, has heated by receiving the molten metal inside it.

[0004] The cooling must be as uniform as possible, because if there are colder spots in the permanent mold, when the molten metal is poured into it its inflow slows in those spots and cooling occurs earlier than in the remaining regions, leading to a finished product which has an unacceptable surface finish.

[0005] Graphitization of the permanent mold instead consists in depositing thereon a film of graphite which acts as a release agent, i.e., prevents the product obtained by casting molten metal from sticking to it.

[0006] Cooling and graphitization are currently performed by immersion.

[0007] The permanent molds are in fact immersed in a tank containing a mix of water and graphite for a certain time, which must be sufficient to ensure its cooling and the adhesion of a layer of graphite on the surface of the permanent mold.

[0008] In this way, cooling and graphitization are in fact performed simultaneously and the cooling time coincides with the graphitization time.

[0009] For some applications, it is preferable to perform cooling and graphitization fully independently of one another.

[0010] In these cases, therefore, graphitization is performed manually at each cycle by an operator who, by using spray guns, distributes the graphite as uniformly as possible over the entire surface of the permanent molds.

[0011] This manual operation does not ensure uniform deposition and causes considerable inconvenience to the operator.

[0012] In any case, graphitization is necessary at each cycle and the destruction of the graphite is ensured simply by introducing the molten metal in the permanent molds.

[0013] After each casting cycle, oxides, impurities and slag deposit on the permanent molds owing to the destruction of the layer of graphite, causing a deterioration of the surface quality of the products obtained with the molten metal and causing uneven cooling and a consequent higher likelihood of cracks.

[0014] Accordingly, after a preset number of casting cycles it is necessary to perform mechanical cleaning by peening in order to remove the surface slag from the permanent molds.

[0015] Each permanent mold must therefore be

removed to be placed in a peening machine, in which metal pellets are propelled against it, separating the slag attached to it.

[0016] Besides this, peening must often be combined with cleaning by means of brushes, depending on the type and shape of the item to be obtained.

[0017] Indeed, the higher the number of sharp-edged regions in the permanent molds, the higher the likelihood of slag forming thereon and therefore of the item to be produced being rounded in those regions, thus losing its characteristics.

[0018] If the permanent molds are made of an aluminum alloy, graphitization is not used; other types of release materials are used instead.

[0019] The aim of the present invention is to provide an apparatus for preparing permanent molds in casting units solving the drawbacks noted above in conventional types.

[0020] Within the scope of this aim, an important object of the present invention is to provide an apparatus capable of cleaning the permanent molds and of coating them with a layer of release agent in a fully automatic manner at each casting cycle.

[0021] A further object is to provide an apparatus which can include means for cooling the permanent molds in a fully automatic manner before cleaning them.

[0022] A further object of the present invention is to provide an apparatus for preparing permanent molds for casting which cools and coats them with a layer of release agent with two fully mutually independent operations.

[0023] A further important object of the present invention is to provide an apparatus for preparing permanent molds for casting units which is repeated at each cycle in order to achieve the maximum cleanliness of the permanent molds and avoid peening them.

[0024] A further object of the present invention is to provide an apparatus for preparing permanent molds which can be used for all kinds of currently available low-pressure and gravity die-casting units.

[0025] This aim, these objects and others which will become apparent hereinafter are achieved by an apparatus for preparing permanent molds in casting units characterized in that it comprises:

-- means for flushing the permanent molds by means of distribution of water in high-pressure jets; and

-- means for coating the permanent molds with a layer of release agent by means of a pressurized distribution of a nebulized mix of said release agent and of a liquid.

[0026] Further characteristics and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional view, taken along a longitudinal plane, of a part of an apparatus according to the present invention;

Figure 2 is a perspective view of a detail of the apparatus of Figure 1;

Figure 3 is a perspective view of a further detail of the apparatus of Figure 1;

Figure 4 is a perspective view of a still further detail of the apparatus of Figure 1;

Figure 5 is a schematic top view of a detail of the apparatus according to the invention.

[0027] With reference to the above figures, an apparatus according to the invention comprises, in this embodiment: means 10 for cooling the permanent molds 11 by means of a distribution of low-pressure nebulized water; means 12 for flushing the permanent molds 11 by distributing water in high-pressure jets; and, in this case, means 13 for graphitizing (coating) the permanent molds 11 by means of a pressurized distribution of a nebulized mix of graphite and liquid.

[0028] In this embodiment, the permanent molds 11 are made of a copper alloy.

[0029] In the case being considered, the cooling means 10 comprise a low-pressure pump 14 (conveniently operating at a pressure on the order of a few bars) which is connected to sprinkler nozzles 15.

[0030] The flushing means 12 are constituted in this case, for each portion of the permanent molds 11, by a high-pressure pump 16 which is connected to a movable manifold 17 which is provided with spray nozzles 18.

[0031] The manifold 17 can move at right angles to its extension, so as to affect the entire surface of each portion of the permanent molds 11 arranged in front of it by means of a respective movement unit 19 by means of a rotation from an active position, in which the permanent mold 11 is in a vertical configuration, to a flushing position, in which it is horizontal so that the surface to be flushed faces downward.

[0032] The high-pressure pump 16 is advantageously constituted by a double-acting piston pump with a pressure conveniently between 80 and 120 bar and delivers which converge into a single duct, particularly the manifold 17.

[0033] The graphitization means 13 instead comprise a compressed-air unit, not shown in the figures for the sake of simplicity, which is combined with a device 20 for feeding a liquid-graphite mix from which the vertical portion of a flexible hose 21 draws; its horizontal portion, after a guiding element 22, ends with a nozzle 23 which is installed on a universal joint 23a which is in turn mounted on a disk 24 motorized by means of a gearmotor 25.

[0034] For each portion of the permanent molds 11 there is provided a nozzle 23 which is installed on a universal joint 23a and is connected to a disk 24 and a gearmotor 25 and is connected by means of the flexible hose 21 to the feeder device 20.

[0035] Advantageously, the sprinkler nozzles 15, the manifolds 17, the nozzles 23 are contained in a single enclosed tank 26 which is provided, on its bottom, with a discharge duct 27 with a filter 28 and a settling tank 29.

[0036] From the settling tank 29, a pipe 30 returns the water collected therein to the high-pressure pump 16 and to the low-pressure pump 14.

[0037] Movable protections 31 affect the region of the paths along which the portions of the permanent molds 11 move from the active position to the flushing position.

[0038] The movable protections 31 can rotate with respect to a horizontal axis and are actuated by a fluid-driven jack 32 between a position which does not interfere with said path and a position adapted to complete the enclosure of the tank 26.

[0039] All the process variables, such as flow-rates, times, pressures, speed of the jets and repeatability, are controlled and actuated by means of an electronic apparatus which is shown schematically in the figures and is designated by the reference numeral 33; said apparatus is connected to control means constituted, for example, by television cameras 34.

[0040] In practice, it has been observed that the present invention amply achieves the aim and all the intended objects.

[0041] In particular, the apparatus described with the present invention can be used in all currently existing casting units, both for low-pressure die-casting and for gravity die-casting.

[0042] In particular, if the permanent molds are made of an aluminum alloy or of other materials, different types of release agent are used.

[0043] A further important advantage is achieved with the present invention in that an apparatus for preparing permanent molds in casting units has been provided which is capable of cooling and flushing the permanent molds and of coating them with a layer of release agent in a fully automatic manner at each casting cycle.

[0044] A further important advantage obtained with the present invention is that an apparatus for preparing permanent molds has been provided which is used at each casting cycle to achieve maximum cleanliness of the permanent molds and thus avoid peening.

[0045] The present invention is susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept.

[0046] All the details may also be replaced with other technically equivalent elements.

[0047] The materials employed, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to requirements.

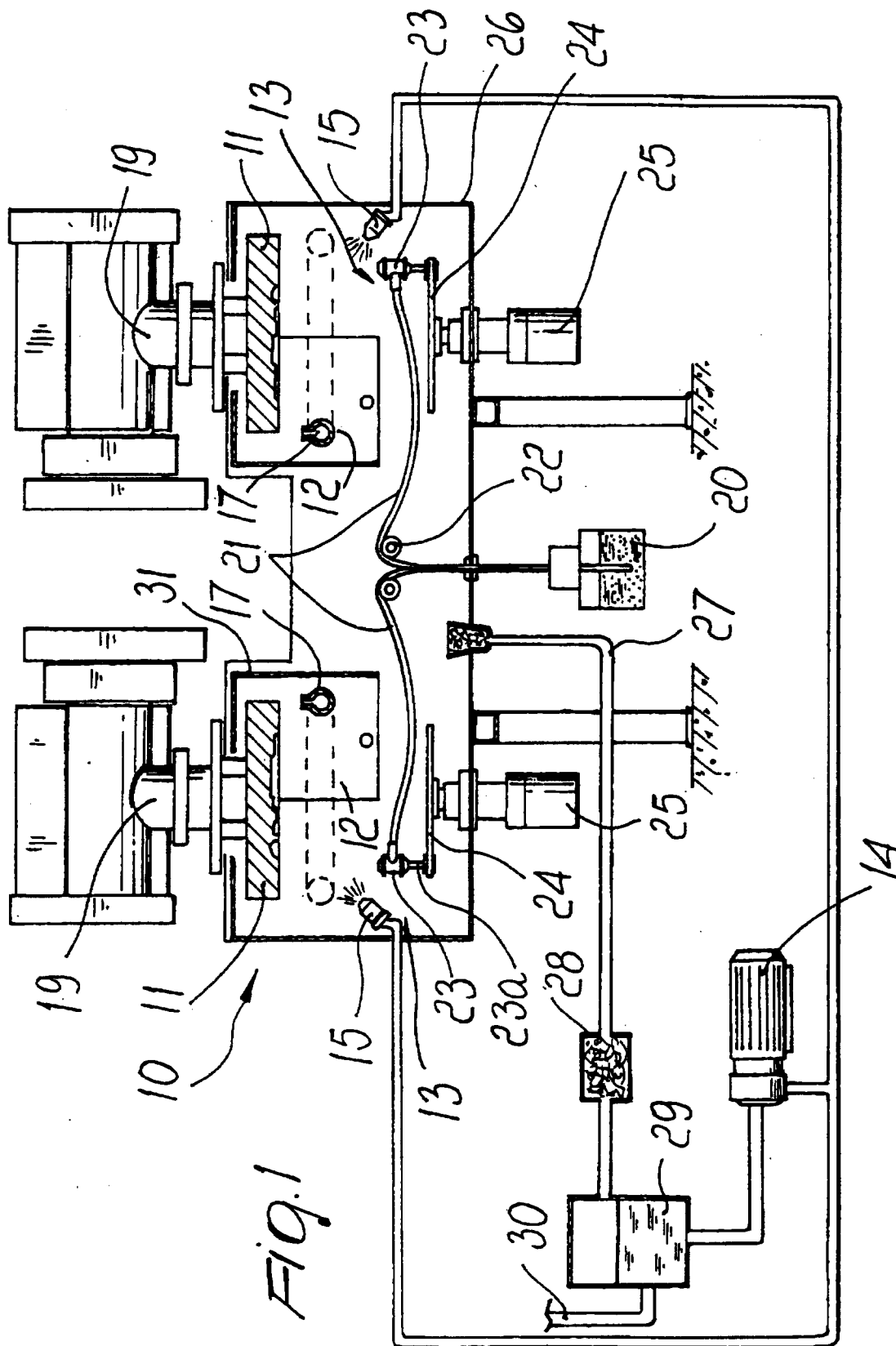
[0048] The disclosures in Italian Patent Application No. PD98A000011 from which this application claims priority are incorporated herein by reference.

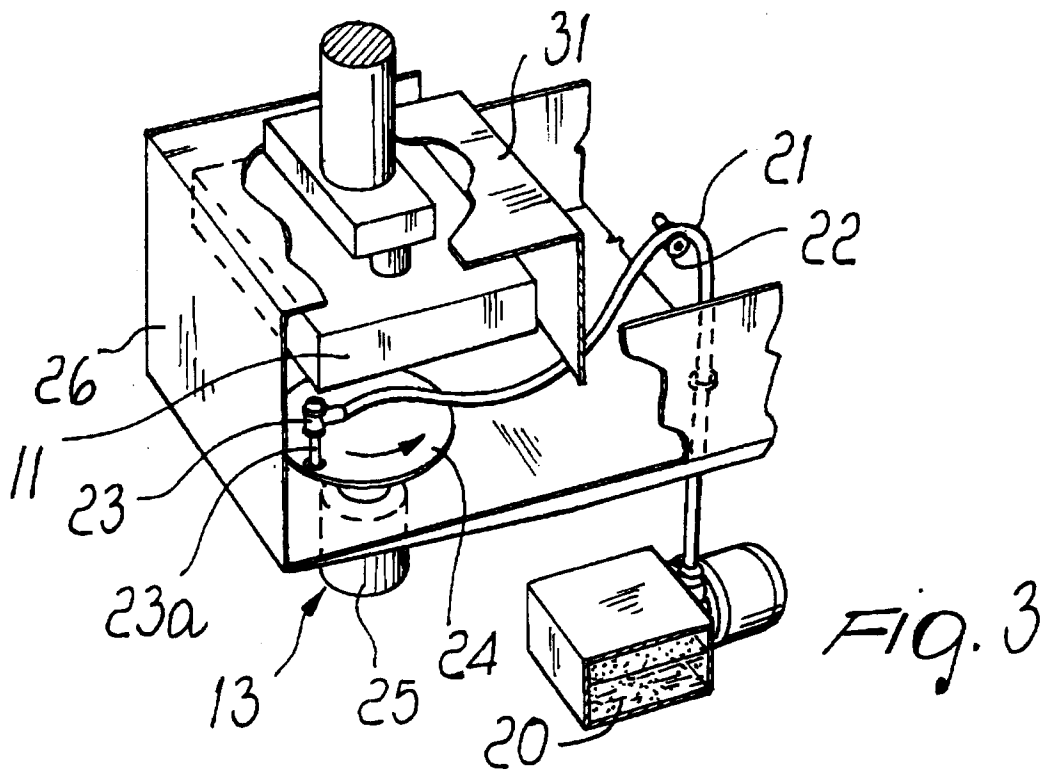
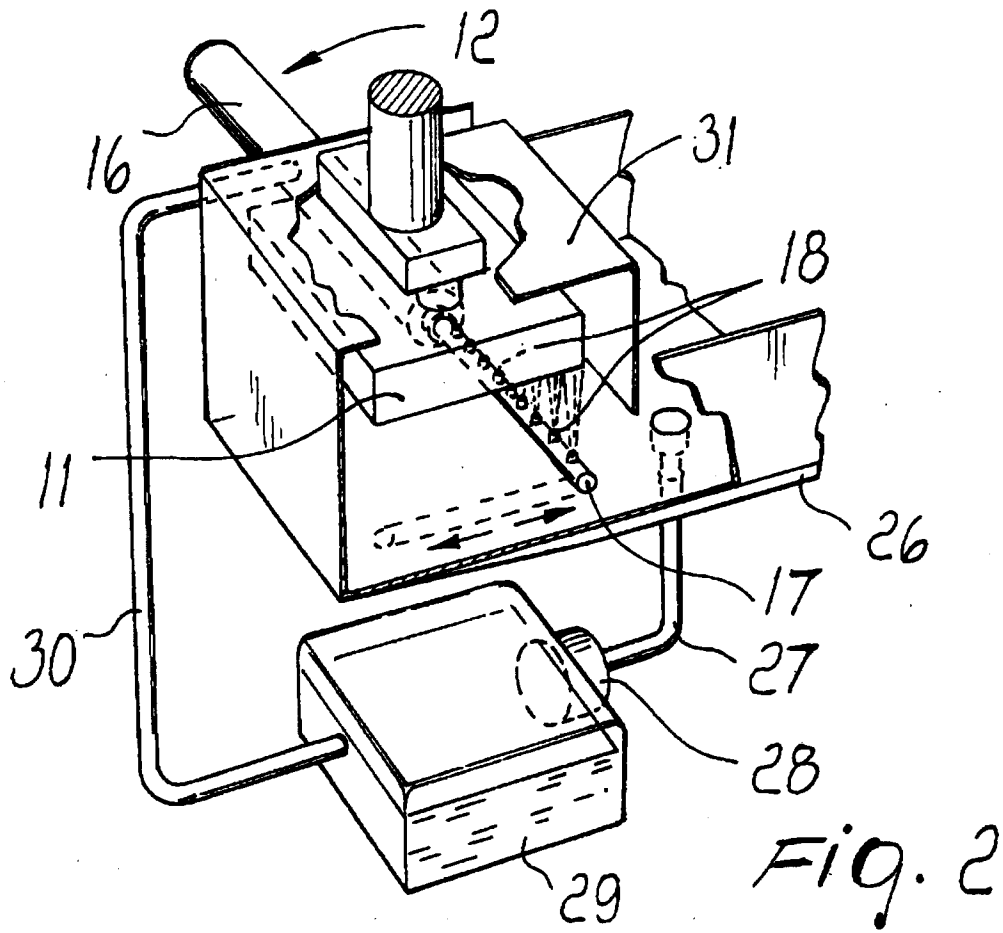
[0049] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of

increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An apparatus for preparing permanent molds in casting units, characterized in that it comprises:
 - means for flushing the permanent molds by means of distribution of water in high-pressure jets; and
 - means for coating the permanent molds with a layer of release agent by means of a pressurized distribution of a nebulized mix of said release agent and of a liquid.
2. The apparatus according to claim 1, characterized in that it comprises means for cooling the permanent molds by distributing low-pressure nebulized water.
3. The apparatus according to claim 1, characterized in that said flushing means comprise at least one high-pressure pump which is connected to a movable manifold provided with spray nozzles.
4. The apparatus according to claim 3, characterized in that said at least one high-pressure pump is a double-acting piston pump in which deliveries lead into a single duct.
5. The apparatus according to claim 1, characterized in that said means for coating the permanent molds with a layer of release agent comprise a compressed-air unit combined with a feeder unit for feeding said mix of release agent and of a liquid.
6. The apparatus according to claim 5, characterized in that said means for coating the permanent molds with a layer of release agent comprise a hose which is immersed in said feeder unit and is connected, at its opposite end, to a nozzle which is mounted on a disk motorized by means of a gearmotor.
7. The apparatus according to claim 6, characterized in that said nozzle is installed on a universal joint which is mounted on said motorized disk.
8. The apparatus according to claim 2, characterized in that said means for cooling the permanent molds comprise at least one low-pressure pump which is connected to sprinkler nozzles.
9. The apparatus according to claim 1, characterized in that said release agent is graphite.
10. The apparatus according to claim 1, characterized in that it comprises an electronic apparatus for controlling the process variables.
11. The apparatus according to claim 2, characterized in that said flushing means, said means for coating the permanent molds with a layer of release agent and said means for cooling are integrated in a single tank.





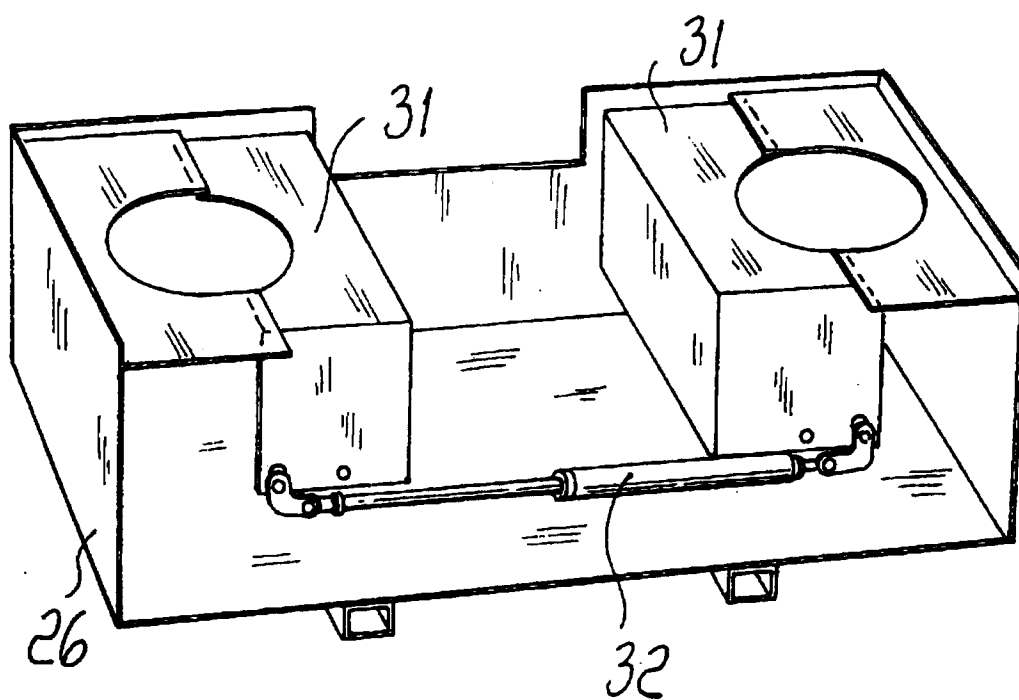


Fig. 4

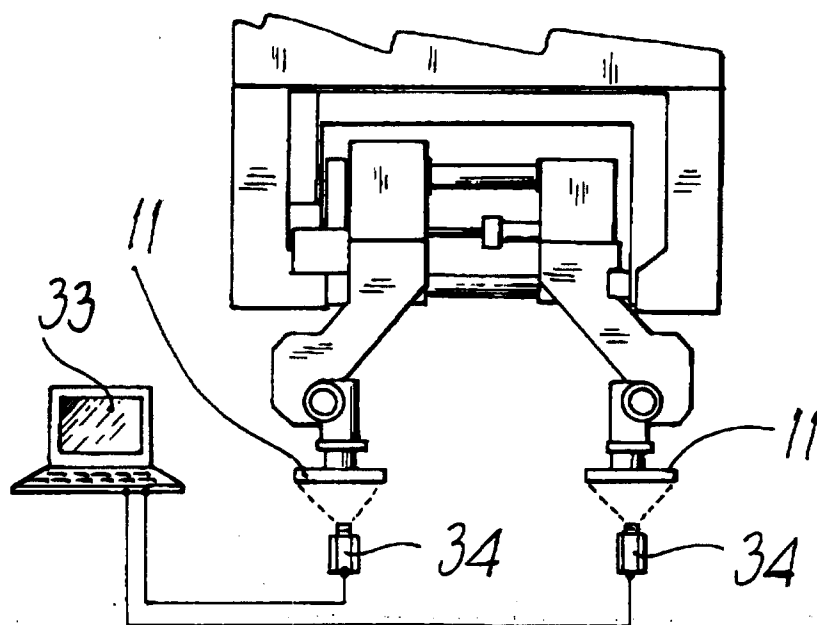


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 1069

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	US 3 482 652 A (STONE FRANZ T) 9 December 1969 * figure 1 * * column 1, line 26 - line 39 * * column 3, line 35 - column 4, line 25 * ---	1, 2, 11	B22C23/02
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 572 (M-1696), 2 November 1994 & JP 06 210398 A (UNISIA JECS CORP), 2 August 1994 * abstract *	1	
A	EP 0 811 447 A (IMR SRL) 10 December 1997 * column 3, line 32 - line 38 * * claim 1 * * figures *	1	
A	GB 2 007 557 A (MANNESMANN AG) 23 May 1979 * figure 1 * * claim 1 *	1	
A	FR 2 252 875 A (KESTREL SA) 27 June 1975 * claim 1 * * figure 1 * -----	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B22C B22D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 1 April 1999	Examiner Riba Vilanova, M
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			

EPO FORM 1503 03 82 (P04C01)

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

EP 99 10 1069

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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