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(54) **A launder system for supplying molten metal and a launder nozzle.**

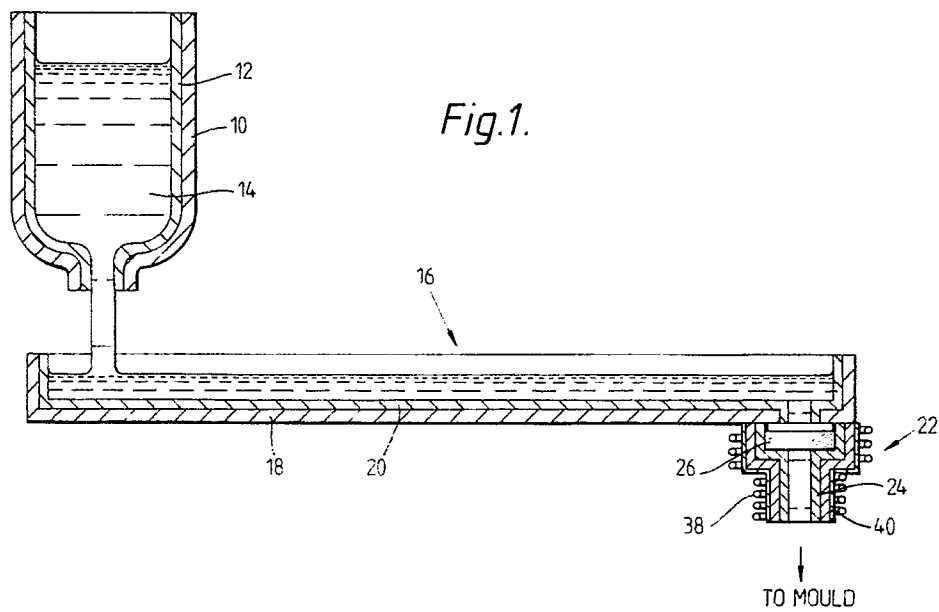
(57) A launder system (16) for supplying molten metal (14) from a crucible (10) to a casting mould or a secondary process comprises a nozzle (22) which has a filter (26) positioned within the nozzle (22) to filter the molten metal as it flows through the nozzle (22).

The nozzle (22) and filter (26) assembly is removably locatable on the launder system (16), and is

used once and is replaced by a new nozzle and filter assembly.

This allows efficient cleaning of the molten metal without an increase of probability of blockage due to the filter. The scrapping rate of the launder system is reduced, and hence the launder may be used many times.

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The present invention relates to launder systems for supplying molten metal from a source of molten metal to a casting mould or a secondary process, and is particularly concerned with the launder nozzle.

It is current practice to melt a metal in a crucible and to supply the molten metal from the crucible to one or more casting moulds or to a secondary process. The molten metal is supplied along launders which have one or more channels to interconnect the crucible and the casting moulds or secondary process.

It is known to incorporate devices to remove or reduce the amount of inclusions present in the molten metal passing along the launder, so as to clean the molten metal and thereby improve the integrity of finished cast articles.

One way of achieving this is to provide one or more dams or weirs in the launder to trap the inclusions. However, some inclusions can still be carried through to the casting mould or secondary process.

Another way of achieving this is to provide a fixed filter in the launder. This is more efficient at cleaning the molten metal than the dams. However, the provision of the filter in the launder increases the possibility of blockages occurring which can result in the scrapping and remaking of the launder.

In some launders a ceramic lining is cemented into the launder, and is normally replaced after each casting operation.

In some crucibles a ceramic lining is provided, and it is usual practice with such crucibles to have a wash out melt which cleans the surface of the ceramic lining and removes any loose debris. Thus it can be seen that presently used launders are used only once and are wasteful of their ceramic linings.

The present invention seeks to provide a launder system in which the launder may be used more than once to gain benefit from their ceramic linings and to incorporate a filter.

Accordingly the present invention provides a launder system for supplying molten metal from a source of molten metal to a casting mould or a secondary process comprising a nozzle arranged, in operation, to supply the molten metal from the launder to the casting mould or the secondary process, and a filter arranged within the nozzle to filter the molten metal as it flows through the nozzle, the nozzle and filter assembly being removably attached to the launder.

A changing means may be arranged to remove a first used nozzle and filter assembly from the launder and to install a second unused nozzle and filter assembly into the launder.

Preferably the filter is a reticulated foam filter.

The launder and nozzle having mating faces, the mating faces may have sealing means to prevent the leakage of molten metal.

The sealing means may comprise interengaging grooves and lands on the mating faces.

The sealing means may comprise a refractory wadding on either of the mating surfaces.

The launder may have a ceramic lined channel.

The filter may be integral with the nozzle.

Heating means may be provided to heat the nozzle and filter assembly. Preferably the heating means comprises at least one electrical induction coil. Preferably an electrically conducting ring is located within the electrical induction coil, and is arranged around the nozzle.

The present invention also provides a launder nozzle comprising a filter arranged such that in use it filters molten metal as it flows through the nozzle.

Preferably the filter is a reticulated foam filter.

The filter may be integral with the nozzle.

The present invention will be more fully described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a longitudinal cross-sectional view through a crucible for molten metal and a launder system according to the present invention.

Figure 2 is an enlarged cross-sectional view through a portion of the launder system shown in Figure 1, and

Figure 3 is an enlarged cross-sectional view of an alternative embodiment of the portion of the launder system shown in Figure 1.

In Figure 1 is shown a crucible 10 which contains molten metal 14. The crucible 10 has a lining 12 of ceramic material. The crucible 10 is arranged to supply the molten metal 14 to one or more casting moulds or a secondary process via a launder system 16. The secondary process may be an atomisation process for coating articles or depositing the atomised particles on a former to create an article or to create metallic powder.

The launder system 16 comprises one or more channel members 18 which have linings 20 of ceramic material. The launder system 16 also comprises one or more nozzles 22 which supply the molten metal from the launder channel members 18 to the casting moulds or secondary process.

Each nozzle 22 has a ceramic lining 24 and is provided with a filter 26 which is positioned within the nozzle 22. The filter 26 is arranged to filter the molten metal as it flows through the nozzle 22 from the launder channel members 18 to the casting mould or secondary process.

The nozzle 22 and filter 26 assembly is removably attachable to the launder channel member 18 by suitable means, so that after the nozzle and filter assembly has been used once it is then replaced by a new nozzle and filter assembly.

The provision of the removable nozzle and filter assembly allows efficient cleaning of the molten metal without the disadvantage of an increased possibility of blockage. This reduces the scrapping rate and hence allows the launder assembly to be used many times to gain maximum benefit from the ceramic lining.

An electrical induction heating coil 38 is located coaxially around the nozzle 22 and filter 26 assembly, to directly heat the molten metal as it flows through the nozzle 22 and filter 26 assembly to reduce the possibility of the metal solidifying in the nozzle 22 or filter 26. It may be desirable to use several induction heating coils positioned coaxially around the nozzle and filter assembly, especially induction coils of different diameters to correspond with portions of the nozzle 22 having different outer diameters. An electrically conducting ring 40, a susceptor, is located coaxially within the induction heating coil 38, and coaxially around the nozzle 22 and filter 26 assembly. The electrically conducting ring 40 is heated by the electrical induction coil 38, and then the electrically conducting ring 40 radiates heat to heat the nozzle 22 and filter 26 assembly. The induction coil used together with the susceptor may be used to preheat the nozzle and filter assembly, before molten metal flows therethrough, whereas the induction coil alone cannot preheat the nozzle and filter assembly. The electrically conducting ring 40 in this example is a graphite ring. The electrically conducting ring 40 contacts the nozzle 22 in Figure 1, however the ring 40 may be spaced from the nozzle 22. Although an electrical induction heating coil has been shown in the figure, a radiant heater, for example an electrical resistance heater, may be used to heat the nozzle and filter assembly. Radiant heaters may also be used to preheat the nozzle and filter assembly before molten metal flows therethrough, to prevent or reduce the possibility of the molten metal solidifying in the nozzle and filter assembly.

The nozzle 22 is manufactured using appropriate ceramic moulding technology, for example isostatic pressing or injection moulding followed by sintering, although other suitable methods may be used, for example shell moulding, and the filter 26 is a reticulated foam filter although other suitable filters may be used.

A mechanism to allow quick changing of the nozzle and filter assemblies may be provided to remove a used nozzle and filter assembly and to install a new unused nozzle and filter assembly.

The quick change mechanism, for example, may comprise an arm which has first and second ends. The arm is pivotally mounted at its first end about a vertical axis, and the second end is arranged to releasably hold the nozzle and filter

assembly. The arm is simply rotated about its pivotal axis between a first position and a second position. In the first position a new unused nozzle and filter assembly is located in the second end of the arm, the arm is then rotated to the second position to position the new nozzle and filter assembly underneath the launder for use. The arm is then rotated back to the first position, to allow the used nozzle and filter assembly to be removed and, to allow a further new nozzle and filter assembly to be used.

The quick change mechanism could equally well comprise a number of arms pivotally mounted at their first ends about the same vertical axis, each of the arms has a second end to releasably hold a nozzle and filter assembly.

The quick change mechanism could alternately comprise a reciprocatory arm.

A portion of the launder channel member 18 and the nozzle 22 is shown in figure 2, the mating face of the launder channel member 18 has lands 32 and grooves 34 which interengage with grooves 28 and lands 30 respectively on the mating face of the nozzle 22 to form a seal.

The upper end of the nozzle 22 fits into a recess 19 on the underside of the launder 18. The nozzle 22 is pushed into the recess 19 to be located with respect to the launder 18, and is pulled out of the recess 19 for removal. In use the nozzle 22 is held stationary by the clamping action between the launder 18 and the arm of the changing mechanism.

An alternative seal is shown in figure 3, in which a refractory wadding 36 is positioned between the mating surfaces of the launder channel member 18 and the nozzle 22.

Alternative positions for the filter 26 are also shown in Figures 2 and 3, and the nozzle 22 in Figure 3 is wholly ceramic and has a smooth conical shape to reduce the possibility of cracking by thermal shocks.

Although the filter is a separate element from the nozzle as shown in the Figures, it may alternatively be formed integrally with the nozzle.

Claims

1. A launder system (16) for supplying molten metal from a source of molten metal (10) to a casting mould or a secondary process comprising a nozzle (22) arranged, in operation, to supply the molten metal from the launder (16) to the casting mould or the secondary process, characterised in that a filter (26) is arranged within the nozzle (22) to filter molten metal as it flows through the nozzle (22), the nozzle (22) and filter (26) assembly being removably attached to the launder (16).

2. A launder system as claimed in claim 1 in which heating means (38) are provided to heat the nozzle (22) and filter (26) assembly.
3. A launder system as claimed in claim 2 in which the heating means (38) comprises at least one electrical induction heating coil.
4. A launder system as claimed in claim 3 in which an electrically conducting ring (40) is located within the electrical induction coil (38), and is arranged around the nozzle (22).
5. A launder system as claimed in claim 2 in which the heating means (38) comprises at least one electrical resistance heater.
6. A launder system as claimed in any of claims 1 to 5 in which a changing means is arranged to remove a first used nozzle (22) and filter (26) assembly from the launder (16) and to install a second unused nozzle (22) and filter (26) assembly into the launder (16).
7. A launder system as claimed in claim 6 in which the changing means comprises an arm which has a first end and a second end, the arm is pivotally mounted at its first end about an axis, the second end is arranged to releasably hold a nozzle (22) and filter (26) assembly, the arm is rotated to remove a first used nozzle (22) and filter (26) assembly from the launder (16) or is rotated to install a second unused nozzle (22) and filter (26) assembly into the launder (16).
8. A launder system as claimed in claim 6 in which the changing means comprises a plurality of arms, each arm has a first end and a second end, the arms are pivotally mounted at their first ends about a common axis, the second ends are arranged to releasably hold a nozzle (22) and filter (26) assembly, the arms are rotated such that one of the arms removes a first used nozzle (22) and filter (26) assembly from the launder (16) and another one of the arms installs a second unused nozzle (22) and filter (26) assembly into the launder (16).
9. A launder system as claimed in any of claims 1 to 8 in which the filter (26) is a reticulated foam filter.
10. A launder system as claimed in any of claims 1 to 9 in which the launder (16) and nozzle (22) have mating faces, the mating faces having sealing means (28,30,32,34) to prevent the leakage of molten metal.
11. A launder system as claimed in claim 10 in which the sealing means comprises interengaging grooves (28,34) and lands (30,32) on the mating faces.
12. A launder system as claimed in claim 10 in which the sealing means comprises a refractory wadding (36) on either of the mating surfaces.
13. A launder system as claimed in any of claims 1 to 12 in which the launder (16) has a ceramic lined (20) channel (18).
14. A launder system as claimed in any of claims 1 to 13 in which the filter (26) is integral with the nozzle (22).
15. A launder nozzle (22) comprising a filter (26) arranged such that in use it filters molten metal as it flows through the nozzle (22).
16. A launder nozzle (22) as claimed in claim 15 in which the filter (26) is a reticulated foam filter.
17. A launder nozzle (22) as claimed in claim 15 in which the filter (26) is integral with the nozzle (22).

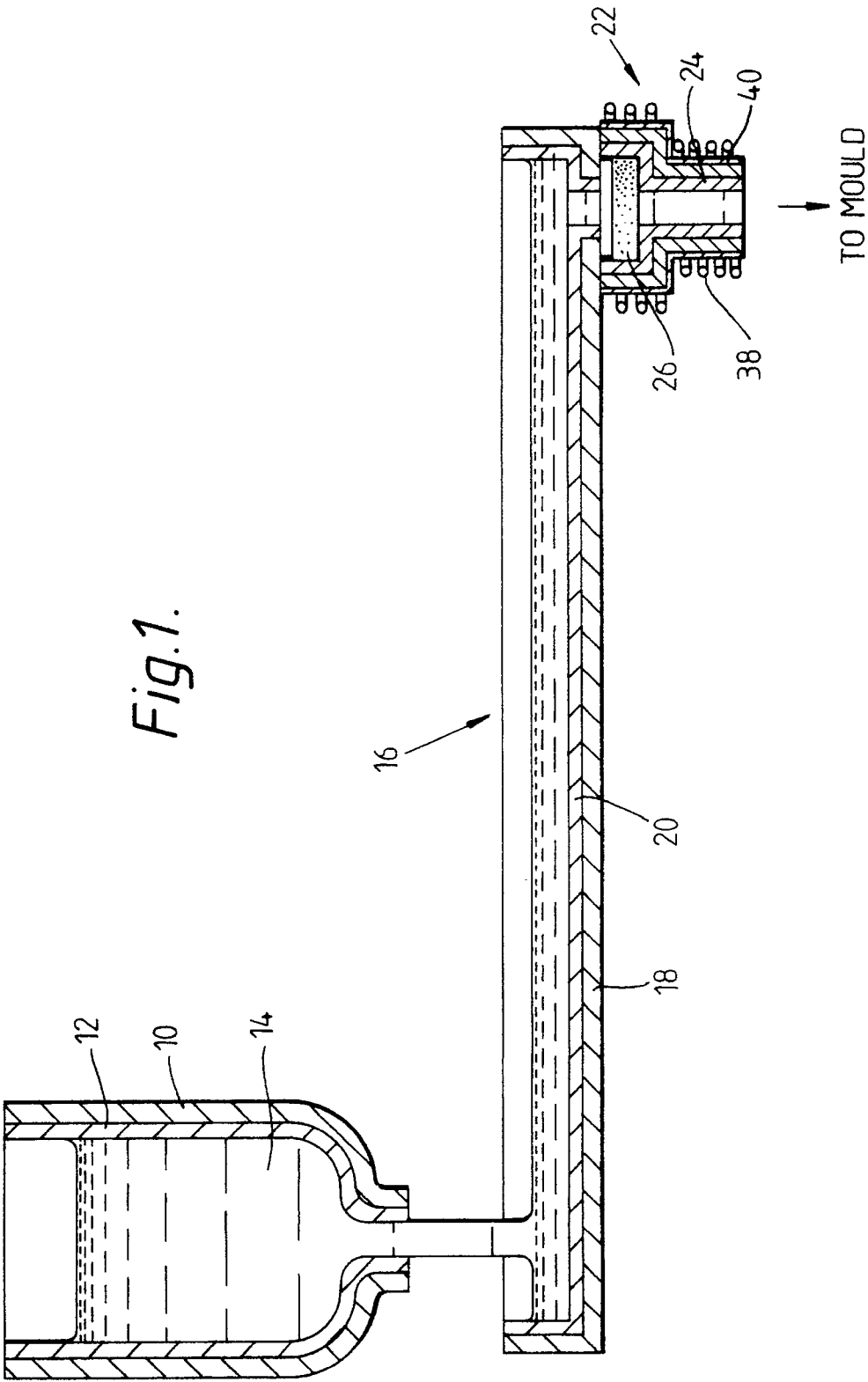


Fig.2.

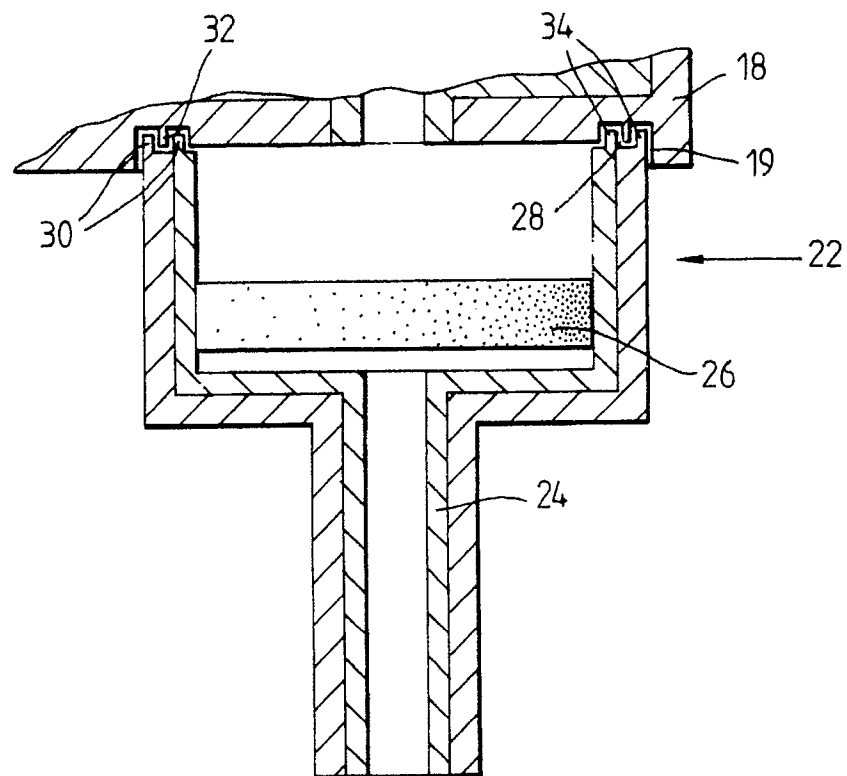
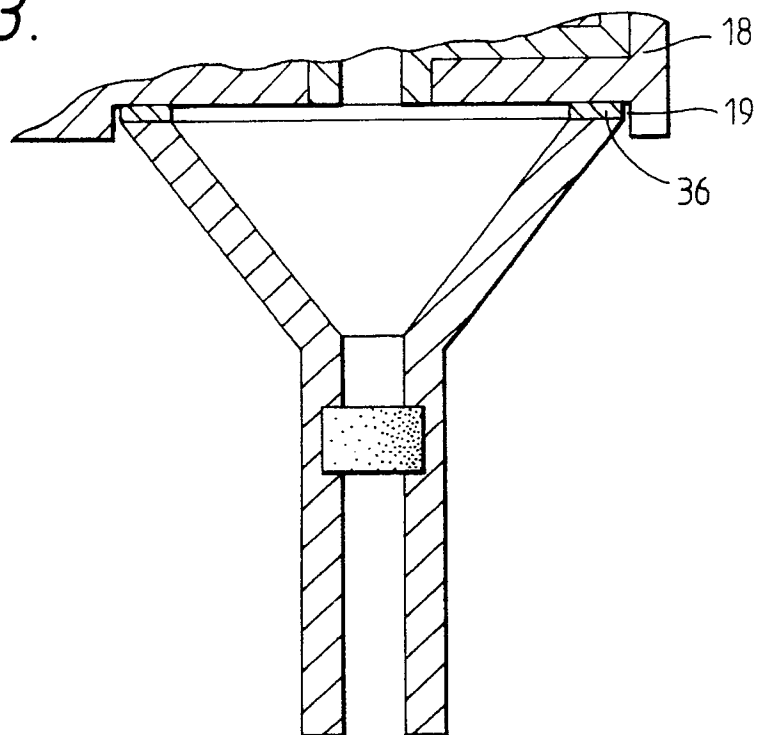


Fig.3.





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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 91301900.6
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	<u>DE - C - 865 942</u> (JUNGHANS) * Claim 4; page 2, lines 52-59; fig. 2 *	1, 2, 13	B 22 D 35/00 B 22 D 1/00 B 22 D 41/50
A	<u>DE - A1 - 3 048 220</u> (STOPINC AG) * Fig. 1; claim 6 *	1, 3, 5	
A	<u>EP - A1 - 0 317 500</u> (SCHWEIZERISCHE ALUMINIUM AG) * Fig. 3; claims 2,3; column 5, lines 3-9 *	1, 9, 16	
A	<u>AT - B - 19 213 E</u> (PONT-A-MOUSSON) * Fig. 1; claims 1,3 *	1, 3, 4, 5, 13	
A	<u>EP - A1 - 0 234 572</u> (ASEA AB)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 22 D 1/00 B 22 D 11/00 B 22 D 13/00 B 22 D 35/00 B 22 D 41/00 B 22 C 9/00 F 27 D 3/00 F 27 D 11/00 F 27 B 9/00 C 21 C 1/00
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
VIENNA		04-07-1991	RIEDER
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 I : document cited for other reasons & : member of the same patent family, corresponding document	