(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 625 903 A2

(12) # EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.02.2006 Bulletin 2006/07

(51) Int Cl.:
B22C 9/08 (2006.01)

(21) Application number: 05385201.8

(22) Date of filing: 17.06.2005

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

(30) Priority: 17.06.2004 ES 200401560

(71) Applicant: Casa Maristas Azterlan
48200 Durango, Vizcaya (ES)

(72) Inventors:
- Suàrez Creo, Ramòn
Vigo (Pontevedra) (ES)
- Sertucha Pèrez, Jon
Mungia (Bizkaia) (ES)

(54) **Riser funnel**

(57) The riser or feeder is a metal storehouse that is attached to pieces with the aim of compensating for the metal contraction phenomenon and of avoiding internal soundness defects known as cavities or porosities, which result in the rejection of pieces in the casting process.

This invention aims at obtaining better feeding head efficiency than is achieved at present, whether coated or not, the cost of which will be less and which will not need any coating.

The riser is made up of a single element, which is moulded at the same time as the rest of the piece mould. It consists of an upper chamber, vertical or quasi-vertical, a bottom chamber, which is wider, and at least one conduit that stems from the bottom chamber, through which the metal flows from the feeder to the piece.

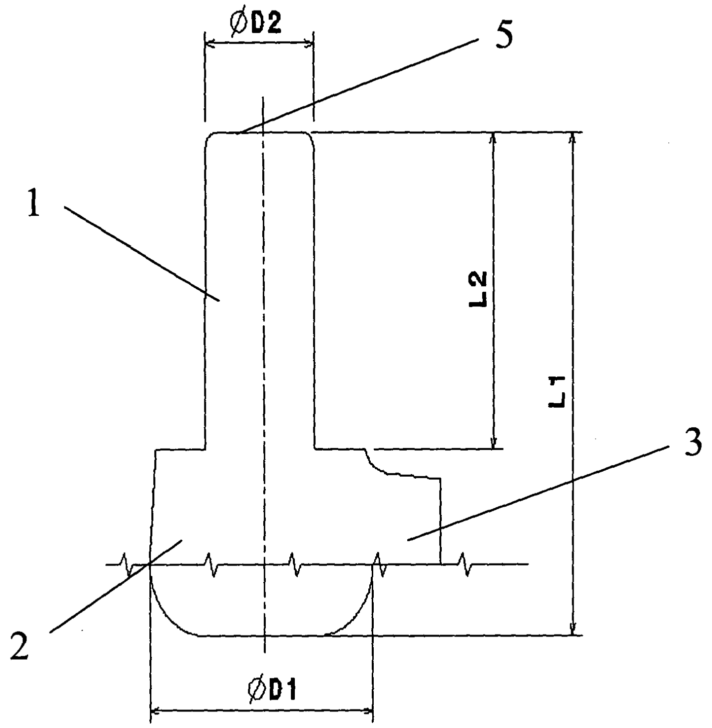


FIGURE 2

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF INVENTION

[0001] The riser or feeder is a metal storehouse that is attached to pieces with the aim of compensating for the metal contraction phenomenon and of avoiding internal soundness defects known as cavities or porosities, which result in the rejection of pieces in the casting process.

[0002] The total riser feeding mass is to be found above the feeding neck of same and can be split into operative and non-operative mass. The operative mass is that which compensates for the contraction phenomenon of the metal in the casted part, that is to say, it is that which flows from the riser head to the piece. Non-operative mass, on the contrary, is that which solidifies in the riser and does not flow to the piece. The sum of the operative and non-operative mass represents the total mass that is to be found above the riser neck of same. The efficiency of a feeding head is defined as the ratio between its operative mass and the total mass that is to be found above the feeding throat of same. That is to say, the efficiency is defined as the ratio between the operative mass and the sum of the operative and non-operative mass.

[0003] In order for the riser to work properly it must fulfil a series of characteristics, among which the following deserve special mention:

- The active, operative feeding head mass must be at least the same as the corresponding contraction for which it has to compensate.
- The feeder must have its operative mass subject to greater heat energy than the area of the piece that must be compensated, in such a way that the liquid metal flows from the feeder to the casted part.
- The metal flows from the feeder to the piece by means of the metallostatic pressure.

[0004] As has been stated above, the non-operative mass does not flow to the piece. Nevertheless, it must be borne in mind that said non-operative mass, in spite of not flowing to the piece, fulfils a thermal function, in the sense that it prevents the operative mass from solidifying before flowing to the piece. Therefore, the optimising of riser efficiency has always been a preferred goal when it comes to designing new feeders. This is so, given that reduced efficiency implies greater non-operative mass for the same amount of operative mass, and, therefore, a greater total mass. Consequently, given that the mass that does not flow from the feeding head to the piece is greater in a reduced efficiency feeding head, this gives rise to higher material costs, energy costs and even labour costs.

[0005] With the aim in mind of optimising feeding head efficiency, at present the design of the feeder is giving priority to the fact that the riser has a bigger module (the module is defined as its volume divided by its cooling surface area) than the module of the piece that it is feeding. Figure 1 shows a classic feeding head.

[0006] Furthermore, with the aim in mind of optimising efficiency, a large number of feeders coated with heat insulation and/or an exothermic layer have been designed, in such a way that the non-operative mass needed in a particular feeding head can be reduced, thus increasing efficiency. This happens because the feeder coating also carries out the heat function fulfilled by the non-operative mass whenever the coating is exothermic, or optimises the non-operative mass heat function whenever a heat insulation coating is used.

[0007] At present, feeder efficiency without a coating lies between 15% and 20%, while efficiency with heat insulation and/or an exothermic layer can rise by 20%-25%, and even more in some instances.

[0008] Document EP0804980 indicates a feeder made up of a mixture of insulation components and/or exothermic layers and usual additives joined by means of a binding agent.

[0009] Document EP-A-313 907 indicates another feeder made up of a mixture of insulation components and/or exothermic layers and usual additives joined by means of a binding agent.

[0010] A problem associated with coated feeding heads is their manufacturing cost, given that this is still relatively high, in spite of the fact their use can be justified by the resultant increase in efficiency. This is due to the fact that said feeders must be fitted with an sleeve, which will also be heat insulating and/or exothermic, and therefore, cannot be manufactured directly on a sand mould. This gives rise to a cost increase for two different reasons. The first of these is the use of heat insulating and/or exothermic material for the making of the sleeve. The second reason is the adding of a further operation to the process, given that the sleeve must be placed in the sand mould.

[0011] Another problem with exothermic feeders is that, due to their geometry, sometimes the top part of the feeder sleeve (4) does not break and does not enable the atmospheric pressure to exercise pressure on the metal in order for this to flow. In this way, sometimes a vacuum is formed and the metal does not flow from the feeding head to the piece, thus denying it the opportunity of fulfilling its function.

SUMMARY OF THE INVENTION

[0012] This invention aims at obtaining better feeding head efficiency than is achieved at present, whether coated or not, the cost of which will be less and which will not need any coating.

[0013] The riser is made up of a single element, which is moulded at the same time as the rest of the piece mould. It consists of an upper chamber, vertical or quasi-vertical, a bottom chamber, which is wider, and at least one conduit that stems from the bottom chamber, through which the metal flows from the feeder to the piece. This conduit is known as the feeding neck.

[0014] This feeder is a complete novelty when compared with current models, whether coated or not, given that this is designed in a completely different way. At present, feeders are designed so that their module (the module is defined as its volume divided by its cooling surface area) is greater than the module of the piece they are feeding. The funnel feeder, which is the object of the invention, is not, however, designed in this way, and its module can, and in general, will be smaller than the module of the piece that they are feeding.

[0015] The funnel feeder head acts during the course of the first phase of contraction, the so-called liquid contraction phase. This gives rise to the primary cavity. It is a short period in comparison to the solidification phase, during which the feeding head must work under load. After this first phase has been covered, the conduit that stems from the lower chamber, through which the metal flows to the piece, solidifies and stops the metal flow from the feeding head to the piece.

[0016] Funnel feeder efficiency is based on the fact that the temperature of the metal is much lower in the upper chamber area and, thus, of a greater density. On increasing the density, the top chamber conduit metal is heavier than the bottom chamber metal and exercises greater metallostatic pressure, which improves the metal flow and better feeds the piece. The following must be added to this effect: the upper surface of top chamber (5) breaks when it loses metal and the atmospheric pressure also exercises its action, boosting the effect of the metallostatic pressure.

[0017] Another advantage of the funnel feeder is that it is obtained directly during the moulding operation, without the need for any other element apart from the mould.

[0018] On the other hand, it is worthwhile pointing out that the funnel feeder can have one or more feeding necks and feed several pieces from the base, leaving part of the funnel completely free from necks.

[0019] Although in comparison to the classic feeder, the mass that is achieved by using the funnel feeder is quite variable, depending on the values taken by its basic parameters, one can be quite sure that, on the basis of the different practical cases analysed, this mass reduction lies somewhere between 30% and 60%.

[0020] On the other hand, the normal efficiency of classic feeding heads varies between 15% and 25%, as has been pointed out above. As far as funnel feeders are concerned, efficiency values rise to between 30% and 80%, depending on the particular case.

BRIEF DESCRIPTION OF THE FIGURES

[0021]

Figure 1 shows the classic feeding head, designed in accordance with classic theory principles. Figure 2 shows the funnel feeder. Figure 3 shows a part with the volume that the feeder is going to feed (i.e. the lined section). Figure 4 provides an example of a classic feeder feeding a piece. Figure 5 shows a funnel feeder feeding the same piece as the one represented in Figure 4.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0022] Figure 4 shows a nodular casting part. Said part needs a feeder in the top area, which is an area that it is supposed will be the last to solidify. Said area is represented as the lined section in Figure 3. In order to dimension the classic feeder that is to be used, the piece module area to be fed is calculated first. The module of the area to be fed is calculated by dividing the volume of said area by its cooling area. In the example we are dealing with, the volume will be that of the lined section in Figure 3, and the cooling surface area will be the total surface area that limits said volume, except for the area marked as non-cooling. After the module of the area of the part to be fed has been calculated, the module of the feeder that will feed said area is also calculated. The traditional theory used in the dimensioning of the feeding heads indicates that the module of the feeding head must be greater than the area of the piece that it is to feed. To this end, the calculation of the feeding head module is arrived at by multiplying the piece area module by a coefficient (greater than 1). Said coefficient can be determined on the basis of different existing materials' tables, or simply from experience. For the case in hand, the module of the piece to be fed is 0.71cm. The feeder module that is to be applied is set at 0.94cm. After the module of the feeder to be used has been determined, the choice of the geometry of same is arrived at by using tables that relate the module and the geometry. In this way, the geometry of the classic feeding head chosen can be seen in Figure 4.

[0023] The funnel feeder that would be used in this case can be seen in Figure 5. Said funnel feeder has a mass of 73% of the mass of the classic feeding head in Figure 4, which means that the feeding head mass is reduced by 27%. On the other hand, the efficiency of the classic feeding head, which can be seen in Figure 4, is to the order of 19%. The efficiency of the furnace feeding head that is shown in Figure 5 is some 57% higher.

[0024] The following tables shows 10 different examples of particular instances of funnel feeders, as well as comparing them with classic risers that are currently in use. (Measurements in accordance with Figure 2)

Ref.	D_1 (mm)	L_1 (mm)	L_2 (mm)	D_2 (mm)	Mass reduction	Classic feeding head efficiency	Furnace feeding head efficiency
1	130	227.5	136.5	52	50%	15%	73%
2	130	227.5	91	39	37%	20%	47%
3	130	195	117	52	51%	15%	73%
4	130	195	78	39	37%	25%	58%
5	110	192.5	115.5	44	50%	15%	78%
6	110	192.5	77	33	37%	15%	35%
7	85	127.5	76.5	34	51%	15%	73%
8	85	127.5	51	25.5	37%	20%	47%
9	60	105	63	24	51%	15%	79%
10	60	105	42	18	37%	25%	63%

[0025] In the table above, one can see how the efficiency increase of a funnel feeder as compared with that of a classic riser can be anywhere from 15% to 79%, and its mass reduction up to 51%.

Claims

1. Feeder comprising a top chamber (1), vertical or quasi-vertical, a bottom chamber (2), somewhat wider, and a conduit (3) that stems from the bottom chamber.

2. Feeder of Claim 1 in which the upper chamber section (1) is made up of between 5% and 50% of the lower chamber section (2), and the height of said upper chamber is made up of between 25% and 75% of the total height of the feeder.

3. Feeder of Claims 1 and 2 in which the upper chamber section (1) is made up of between 9% and 25% of the lower chamber section (2), and the height of said upper chamber is made up of between 30% and 60% of the total height of the feeder.

4. Feeder of Claim 1 in which the upper chamber (1) is cylindrical and its diameter is made up of between 25% and 70% of the diameter of the lower chamber (2), which is also cylindrical, and the height of said upper chamber is made up of between 25% and 75% of the total height of the feeder.

5. Feeder of Claims 1 and 4 in which the upper chamber (1) is cylindrical and its diameter is made up of between 30% and 50% of the diameter of the lower chamber (2), which is also cylindrical, and the height of said upper chamber is made up of between 30% and 60% of the total height of the feeder.

6. Feeder of Claims 4 and 5 in which the total height of the feeding head is between 100% and 250% of the diameter of the lower chamber (2).

7. Feeder of Claims 4 and 5 in which the total height of the feeder is between 125% and 200% of the diameter of the lower chamber (2).

8. Feeder of Claims 1, 2, 3, 4, 5, 6 and 7 for use in graphite casting.

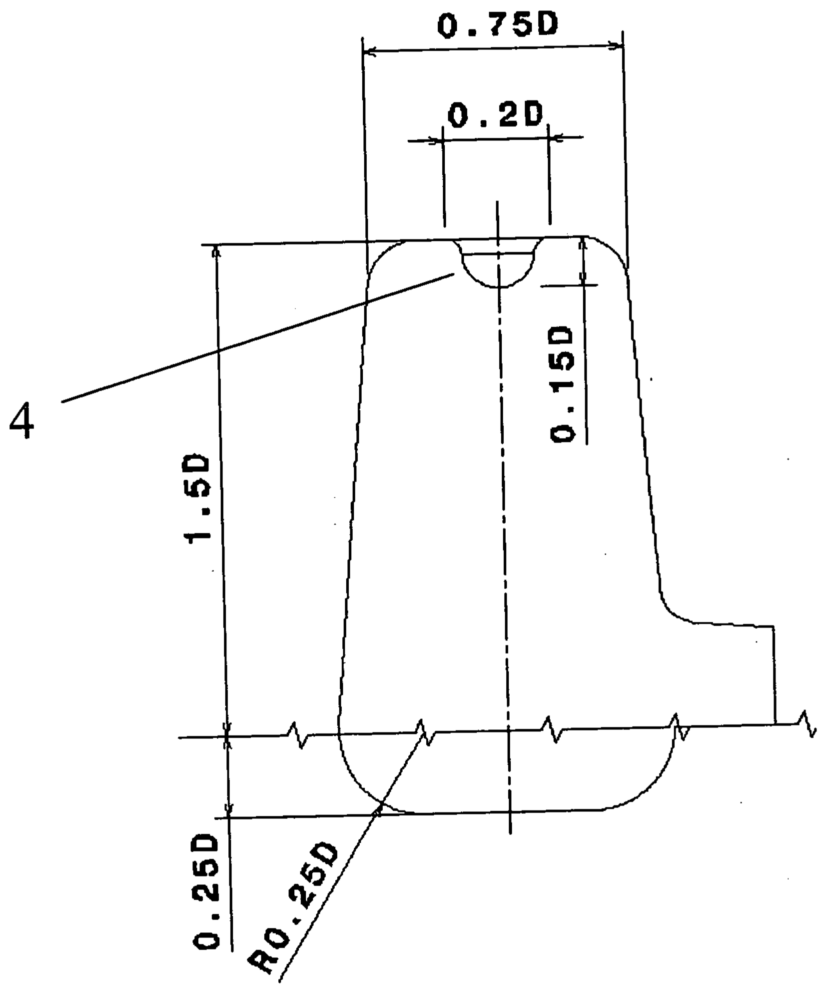


FIGURE 1

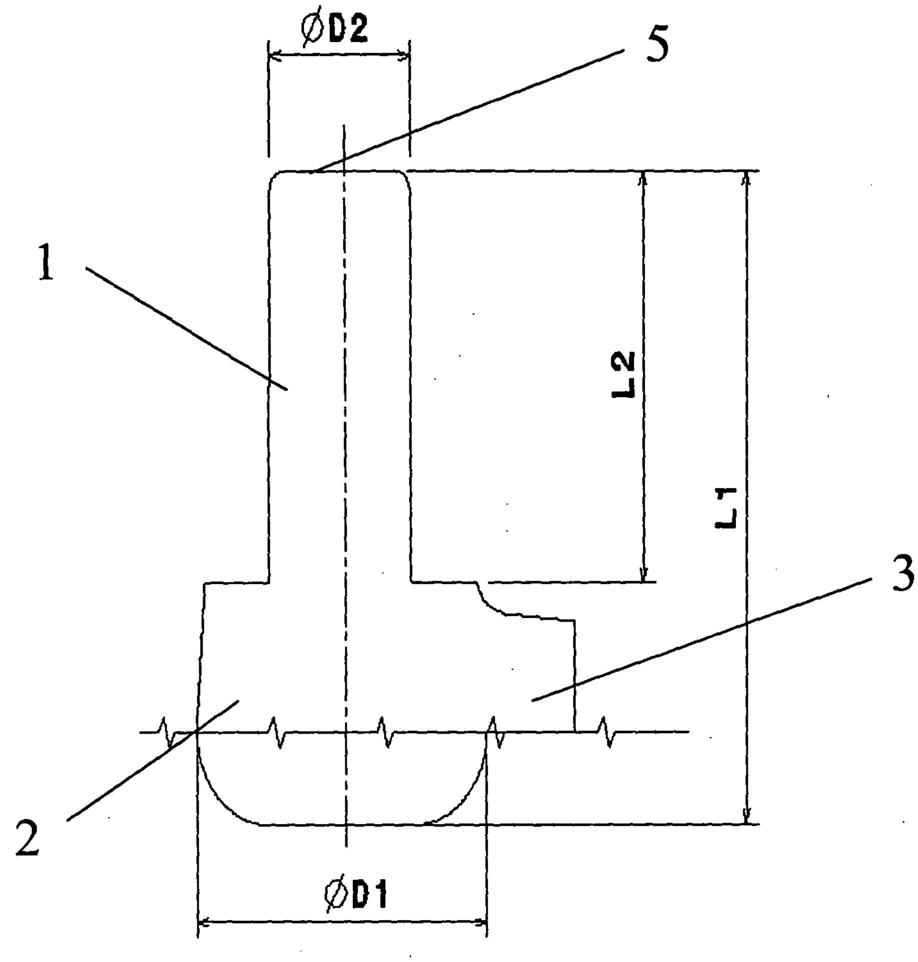
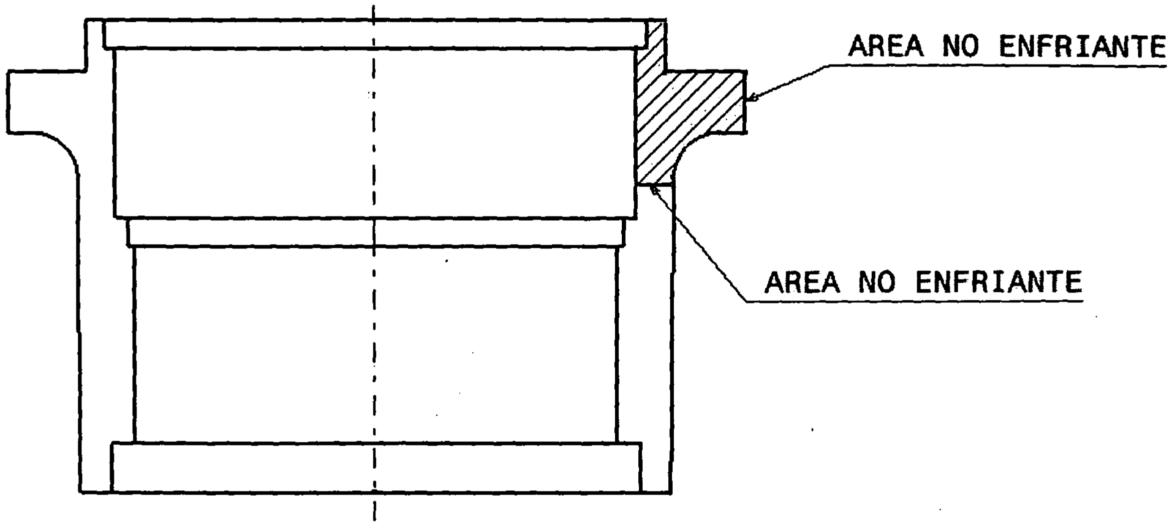


FIGURE 2



AREA NO-ENFRIANTE = NON-COOLING AREA

FIGURE 3

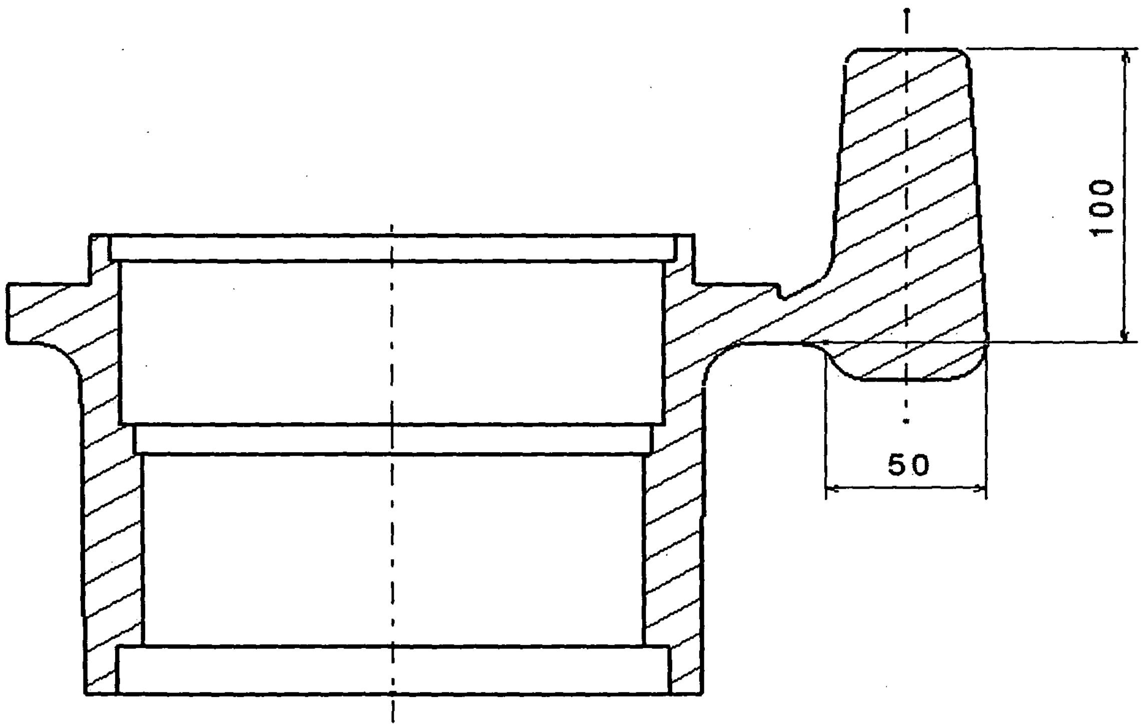


FIGURE 4

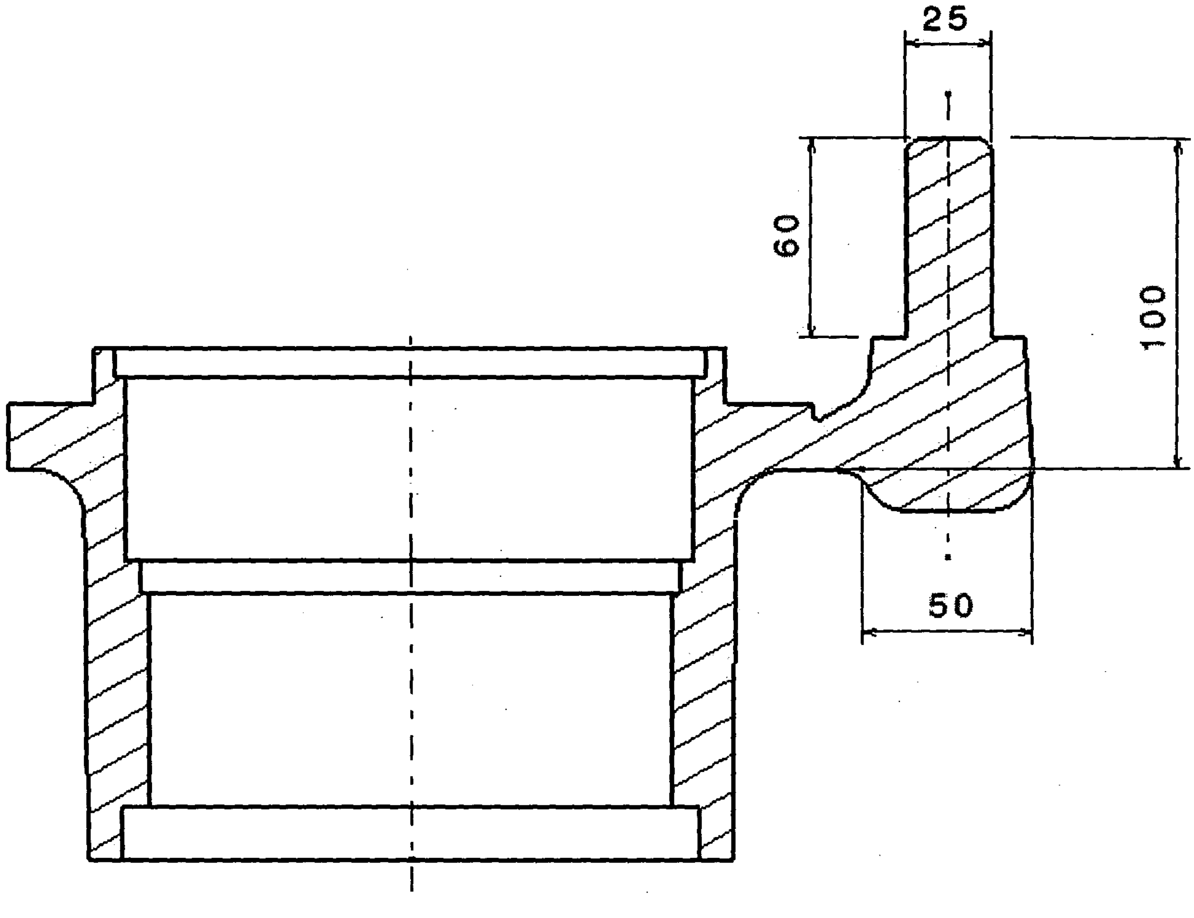


FIGURE 5