concentration values, such inclusions, however, can adversely influence the corrosion behaviour of the otherwise high-purity magnesium, for example.

In accordance with EP 1 335 032 A1, there is a process in which an impure magnesium melt is evaporated in an evaporation vessel from high-purity graphite, wherein this steam then precipitates as liquid melt in a condensation crucible likewise consisting of graphite. Both crucibles are surrounded by a bell made of graphite, which prevents the magnesium steam from coming into contact with the cold wall of the vacuum retort surrounding the bell and condensing there. In order to bring both the evaporation crucible and the condensation crucible to the temperatures necessary for the process and simultaneously to keep the retort cold, two heating elements are present in the gap between the retort wall and the graphite bell. In particular due to the mounting of the heating elements within the vacuum region and the protection of the actual evaporation zone and condensation zone by the graphite bell, an increased structural outlay is created and in addition the inner volume has to be evacuated through leaks of the graphite bell, whereby magnesium steam can also pass externally at these points to the heating elements and the cold retort wall.

In contrast to most processes according to the prior art, the high-purity magnesium condenses in the liquid state in the process according to the techniques disclosed herein, wherein a high-purity magnesium melt free from non-metal inclusions results, which forms a compact block following solidification, which is suitable for example in the sense of a semifinished product as starting material for shaping processes, without the material containing relatively large quantities of non-metal inclusions, which on the one hand can negatively influence the mechanical properties and on the other hand can negatively influence the corrosion behaviour.

In particular compared with the process cited further above in accordance with EP 1 335 032 A1, the process has the advantage that the retort can be heated externally, wherein the magnesium steam can come into contact with the inner wall of the retort without difficulty, since this wall is at such a high temperature that solid magnesium crystals cannot be deposited thereon. Likewise, the retort wall may also consist of a material that is soluble to a low extent in the magnesium melt, whereby the magnesium

melt is contaminated. A condition of this, however, is that it is preferable the retort consists of a material that releases no volatile impurities into the magnesium steam.

Due to the possibility of arranging the heating system outside the retort and also allowing the contact with the hot inner wall of the retort, which only slightly contaminates the magnesium melt, a process is created that is particularly simple and cost-effective in terms of structure compared with the prior art.

The process according to the invention will be explained hereinafter on the basis of three apparatus examples.

Fig. 1 shows a diagram of an exemplary apparatus for producing high-purity magnesium.

Fig. 2 shows a cross section through an exemplary apparatus for producing high-purity magnesium.

Fig. 3 shows a cross section through a further exemplary apparatus for producing high-purity magnesium.

In figure 1 the elements of the first apparatus example are illustrated purposefully in geometrically simple form in order to emphasize the fact that the central inventive concept is based less on the specific form of these parts, but more on the functionality of these parts in conjunction with the temperature distribution within the retort. The starting material 2 in the form of a magnesium-containing metal melt is present together with the upper region 32 of a condensation vessel 3, preferably made of a high-purity graphite, in the upper region 11 of a retort 1 produced for example from stainless steel and having an arbitrary cross section, wherein a cylindrical cross section is most favourable in practice. The upper region 11 of the retort is brought by a heating element 5 surrounding it, for example in the form of a resistance furnace, to a temperature above the boiling point of the magnesium, within the limits of the level lines 8 and 81, and is then held constant, such that steam rises

connected to the inert gas source 79 via the flow and/or pressure regulator 78 by opening the valve 77 until the pressure has risen again into the setpoint range. In both cases the barrier unit 6 is closed immediately once the setpoint pressure range has been reached in order to prevent excess infiltration of magnesium steam into the supply chamber 31.

As soon as the distillation process in accordance with the apparatus example of image 1 is finished and the retort 1 is cooled with its contents to room temperature, the retort can be opened, for example by a sawn cut along the dashed level line 83, whereupon the high-purity magnesium 21 present in the lower region 33 of the condensation vessel 3 can be removed from the crucible following removal of the cover 4, for example by turning the entire apparatus on its head. New starting material 2 can be introduced through the opening into the evaporation region 111 of the retort in a similar manner. Then, the retort 1 has to be joined together again to the supply chamber 13 in a vacuum-tight manner, for example by means of a welding or soldering process.

The heating elements 5 and 51 used in this example according to figure 1 are resistance heating elements controlled to constant temperatures, which are located at points of the retort relevant for the distillation process, that is to say for example in the region of the upper region of the retort contacted by the melt of the starting material in order to adjust the temperature of the evaporation process, and in the lower region 33 of the condensation vessel 3 and the immediate environment of the barrier unit 6 in order to check whether the temperature in these regions is above the melting point of magnesium. Instead of the resistance heating elements 5 and 51, two induction coils or a single induction coil wound in accordance with the temperature distribution can of course also be provided, which heat the retort and/or the materials present therein.

Figure 2 shows an example of an apparatus that is particularly suitable for rational operation under industrial conditions, wherein like numbers denote parts having the same function as in figure 1. Here, the retort 1 is welded together as central symmetrical tubular body to an upper region 11 of larger diameter and to a lower region 12 of smaller diameter consisting of a superalloy, wherein the lower region 12 extends in a tubular extension 15 into the upper region 11 of the retort. The melt of the

starting material 2 is thus present in an annular crucible, of which the side walls are formed by the wall region 111 of the upper region 11 of the retort 1 and the tubular extension 15, such that the melt does not come into contact with the outer wall of the condensation vessel.

In this example of the apparatus, the tubular extension 15 and the lower region 12 of the retort have, internally, an inner wall with continuous conicity, such that the condensation vessel 3 in the form of a crucible consisting of high-purity graphite, which has a corresponding conicity of the outer lateral surface, does not provide a gap for the infiltration of condensing magnesium melt. In contrast to the apparatus example according to figure 1, where the condensation vessel 3 has a cylindrical inner bore, since the solidified pure magnesium block can generally be easily removed as a result of the large shrinkage, the condensation vessel 3 in the present apparatus example also has a conical inner face, such that the high-purity magnesium block 21 can be removed even more easily following solidification.

The opening 31 in the condensation vessel 3 is covered by a roof-shaped graphite cover 41 with radial bores leading upwardly at an incline for the entry of the magnesium steam according to arrow 92. The cover 41 can also be formed in a manner more complex than that in the figure, for example by also placing lateral screens in front of the radial bores, such that no splashes of the fiercely boiling melt of the starting material 2 can be flung directly into the condensation vessel 3.

The barrier unit is configured here in the form of a conical metal stopper 64, which seals with respect to the conical seat 113 of the intermediate wall 112. This sealing process is also assisted by the fact that liquid magnesium condenses in the seal gap between the metal stopper 64 and the seat 113 and prevents the passage of magnesium steam. The push rod 61, by means of which the barrier unit can be closed in the direction of the arrow 92, is actuated externally through a vacuum feedthrough 63 with ring seal 631, wherein this can be performed manually or automatically via a control pulse. Instead of the ring seal 631, the push rod 61 could also be introduced through the flange 14 into the supply chamber 13

sits tightly above the barrier unit 64 in a protuberance of the lower region of the wall of the supply chamber 13 and makes it possible to check whether this barrier unit is above the temperature of the melting point of magnesium, since only then is the correct function of this barrier unit ensured. At the end of a furnace cycle, that is to say prior to the cooling of the facility, the barrier unit 64 should be lifted from the seat face 113 so that it is not soldered thereto.

In the first example of an apparatus, a variant of the heating system with two independent heating elements is presented, but in the present second example the upper retort region is heated by means of a heating element 5, wherein the lower region 12 surrounded by the thermal insulation is also heated indirectly by the upper region, wherein the heat introduced by the condensation of the magnesium steam also contributes. In the sense of the process, apparatuses having a plurality of furnaces arranged in succession in the vertical direction are also possible, such that the upper and the lower part of the retort and additionally also the region of the barrier unit 6 can be controlled separately in each case to their specific temperature by means of a dedicated heating element.

Figure 3 shows a third example of an apparatus, which is largely similar to the apparatus shown in figure 2. In contrast to this apparatus shown there, however, the condensation vessel 3 in the present example has a cylindrical outer face, whereby an annular gap is produced between this outer face and the inner lateral surface of the lower region 12 of the retort 1. By removing a selectively water-cooled flange 15, the crucible can be removed downwardly from the retort. In order to prevent magnesium steam from infiltrating into this gap and condensing into liquid in its lower region or into solid below the crucible base 34, this flange 15 has a feed line 761 with a flow regulation element 781, through which gas originating from an inert gas source can be introduced into the space beneath the base 34 of the condensation vessel 3. The quantity of the fed inert gas is such here that its speed in the gap outside the condensation vessel 3 is so high that it exceeds the diffusion rate of the magnesium steam potentially ready for migration in the opposite direction. As a result of this addition of inert gas, the pressure rise within the retort is indeed accelerated, whereby the intervals within which the barrier unit 64 has to be