VACUUM CHAMBER FOR COATING INSTALLATIONS AND METHOD FOR PRODUCING A VACUUM CHAMBER FOR COATING INSTALLATIONS

Description

The present invention relates to a vacuum chamber for coating installations ~~according to the preamble of claim 1~~ as well as a method for producing a vacuum chamber for coating installations ~~according to the preamble of claim 13~~.

The coating methods known as PVD or CVD designate for instance coating methods under vacuum conditions. In the case of PVD (physical vapor deposition), the coating process is based essentially on physical deposition of material on a work-piece to be coated. In the case of CVD (chemical vapor deposition), the coating method is based essentially on chemical reactions. Both methods have in common that they often take place under high vacuum conditions (HV, 10^{-3}mbar to 10^{-7}mbar) or under ultra high vacuum conditions (UHV, 10^{-7}mbar to 10^{-12}mbar). In the frame of the present invention, the state of a fluid under vacuum in a volume is to be designated with a pressure that is lower than 10^{-1}mbar.

As a general rule, to generate a vacuum a fluid is pumped out of a tightly sealed chamber. The chamber is typically made of an integrally formed chamber body, most often of high-quality steel. Thanks to such an integrally formed design of the vacuum chamber, possible leaks can be prevented and additionally a good vacuum can be created.

Using an integrally formed chamber body has however a disadvantage if modifications are to be made to the installation, since these can be effected on the integrally formed chamber body only with considerable efforts (separating, welding etc.).

In order to solve this problem, DE9404022 proposes a vacuum chamber that is not made integrally but in a modular fashion. In this case, the vacuum chamber is divided in several function levels (target, source and pump levels) formed through a flange composition. By providing a detachable connection of the flange-joint connected areas, modifications to the structure of the vacuum chamber are simplified and the costs for modifying the vacuum

EmbodimentsThe task of the present invention seekis thus to provide a vacuum chamber that can be adapted to changes and modifications in a flexible manner, but which at the same time has increased stability.

According to a first aspect of the present invention, there is provided a vacuum chamber for coating installations, the vacuum chamber having a bottom plate and a top plate, which are connected to each other by struts, wherein a plurality of openings are defined by the bottom plate, the top plate and the struts, wherein at least a portion of a front edge of the bottom plate and a portion of the front edge of the top plate form together with two struts a sealing area for an insert plate that can be inserted in one opening of the plurality of openings, said sealing area framing around the opening, and wherein the top plate and the bottom plate are construed in such a manner that the front edges of these respective plates are configured to be used as sealing up counterpart of the insert plate, when the insert plate is provided in the opening.

~~According to the invention, the task is solved by a vacuum chamber for coating installations with the characteristics according to claim 1 as well as by a method for producing a vacuum chamber for coating installations with the characteristics according to claim 13. Advantageous further embodiments are defined in the respective dependent claims.~~

~~According to the invention, a vacuum chamber for coating installations is provided, wherein the vacuum chamber has a bottom plate and a top plate, which are connected to each other by struts running substantially perpendicularly to the bottom plate and the top plate, wherein a plurality of openings are defined by the bottom plate, the top plate and the struts, wherein at least a portion of a front edge of the bottom plate and a portion of the front edge of the top plate form together with two struts a sealing area, running around one opening of the multiplicity of openings, for an insert plate that can be inserted into the opening.~~

Since the top plate and the bottom plate are of sufficient thickness, the front edges of these plates themselves can be used as sealing mating parts for the insert plates. Furthermore, using the front edges of the bottom plate and of the top plate as sealing surface affords the advantage that no additional panels need to be welded to the frame construction. Furthermore, integrating the front edges of the top plate and of the bottom plate as sealing

surface makes it possible for the flange plates resp. insert plates to be made markedly taller for the same height of the vacuum chamber.

Additionally, threaded holes that serve for example to fasten the inserted insert plates by means of screws can be provided directly in the top plate and in the bottom plate, which may results in lower production costs without any loss of precision whatsoever.

Because individual rods are used as struts for the frame that are, to begin with, separate from the bottom plate and the top plate and only connected tightly with the latter – for example by welding – when they are assembled, the production of the frame does not require a step of bending and the struts can be made in a thickness that mayguarantees increased stability.

According to a preferred embodiment, the bottom plate and/or the top plate have a thickness of at least 3 cm. This may results in an increased stability with respect to the load of the vacuum chamber generated because of the vacuum.

The bottom plate and/or the top plate is preferably made in the shape of a quadrangular panel. An octagonal or decagonal shape is particularly preferred.

According to another preferred embodiment, the bottom plate, the top plate and the struts form a prismatic body.

According to yet another preferred embodiment, the struts are made each with a polygonal section, in particular a pentagonal profile. By providing the struts with a pentagonal cross section, which can be achieved in particular by milling, the stability of the vacuum chamber can be further optimized in respect of the forces arising when the vacuum chamber is evacuated. Additionally, the struts made in a pentagonal profile have low spatial requirements in view of the vacuum chamber's volume.

The bottom plate and/or the top plate are preferably provided with centering holes at the positions where the respective struts can be fastened thereto, which makes the assembly of the frame easier.

It is furthermore preferable if the bottom plate and/or the top plate are provided with a tapered edge at the positions where the respective struts can be fastened thereto, for a subsequent welding seam.

Providing each of the struts with at least one threaded hole is particularly preferred. This allows the insert plates to be screwed onto the struts by means of screws from the outside, which may ensures a good sealing connection between the insert plates and the frame without any risk of possible leakages. This configuration further enables the insert plates to be arranged abutting next to one another, which results in a space saving of for example 4 to 5 cm by comparison with the systems known in the state of the art. This again has the consequence that for the same diameter of the vacuum chamber, more insert plates can be provided.

According to a further preferred embodiment, the insert plates can be affixed to the struts from the outside, they can in particular be screwed thereto by means of screws, which may creates a tight yet detachable connection. Additional sealing material, for example a rubber seal, can be used between the frame elements of the vacuum chamber and the insert elements.

It is furthermore preferred for the struts to be chamfered at their respective ends, which may considerably simplifysimplifies the application of the welding seam.

The insert plates of the vacuum chamber are preferably made of aluminum. This may results in lower production costs.

According to yet a further preferred embodiment, the vacuum chamber has a door for opening and closing the vacuum chamber.

According to a second aspect of the invention, there is provided a method for producing a vacuum chamber as defined in the first aspect for coating installations ~~is furthermore provided~~, comprising the following steps: putting together a frame which has a bottom plate, a top plate and struts, which connect the bottom plate and the top plate, ~~and~~ welding the bottom plate and the top plate to the struts, and attaching insert plates to the frame. AThanks to the inventive method, a vacuum chamber with a high stability and great flexibility as regards modifications can be achieved in an easy way.

In order to make the step of welding easier, the already assembled frame is held during welding in a supporting structure. Thanks to this, the frame may remains in a defined shape and warpage of the frame arising because of the welding may beis minimized.

After welding, the frame is preferably milled and subsequently sandblasted.

The invention will be explained hereinafter in detail by means of one embodiment and with the aid of drawings, which show:

Figure 1 a top view of a vacuum chamber according to one embodiment;

Figure 2 a side view of the vacuum chamber represented in figure 1;

Figure 3 a detailed view of a connection point of a strut with a section of the top plate.