

Description

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Device for feeding glass melt over a spout lip during the manufacture of float glass.

5 The invention concerns a device for feeding glass melt over a spout lip during the manufacture of float glass, said melt being fed from a glass melting tank via an adjustable feeder channel to the spout lip and, guided over its surface, reaching the tin surface of a float bath.

10 During the manufacture of float glass, according to the float procedure, it is usual that the glass is melted in a glass melting tank, that it is refined to render it bubble-free in a refining member, and that it is homogenised and conditioned in a feeder channel between the
15 glass melting tank and the float bath (to set the viscosity necessary for the shaping). At the end of the feeder channel, the conditioned glass melt flows over a spout lip onto the liquid tin in the float bath. In the float bath, forming of the glass melt into a glass strip takes place.

20 The separation of the lower edge of the spout lip from the surface of the tin and the surface properties of the spout lip are decisive for the forming process in the float bath and therefore for the quality of the floated glass.

If the surface of the spout lip coming into contact
25 with the glass melt has cracks, holes or corrosion profiles, this leads to surface faults in the floated glass (due to cross distortion).

If the separation of the lower edge of the spout lip from the surface of the tin in the float bath is too large
30 due to progressive corrosion of the spout lip, the conditions for infeed of the glass melt into the float bath, such as the ratio of back flow: front flow, become altered. The result is that wet back bubbles then appear.

In the known devices, the spout lip is made of a fireproof ceramic material. Usually, the material that is used for the spout lip is slip cast, and sintered fused silica. This material is entirely sufficient for the
5 manufacture of soda-lime glass and provides a service life for the spout lip of 2 to 3 years.

During the manufacture of high-melting point corrosive glasses, such as borosilicate glasses (low alkali and alkali-free) and aluminosilicate glasses, the service life
10 of a spout lip made of this material is no more than 6 months. Attempts have therefore already been made, through use of other materials for the spout lip, to increase its service life. It has previously been proposed, for instance, to use fused cast Al_2O_3 as the material for the
15 spout lip or fusion cast material with 85% to 97% by weight of ZrO_2 and to use such spout lips in the manufacture of borosilicate glasses, and in particular, low-alkali borosilicate glasses. In this manner, it has been possible to increase the service life of the spout lip to about 1
20 year (JP 06-345467 A).

The disadvantage of the previously known materials for a spout lip is the limited service life due to corrosion caused by the glass melt, with the known results on glass quality (distortion, etc.). Furthermore, any corrosion of a
25 ceramic material is associated with bubble formation and the release of corrosion products, which also impair the glass quality.

The materials set out for a spout lip in JP 06-345467 A have a relatively good corrosion-resistance, although
30 they are sensitive to changes in temperature. Temperature changes bring about flaking from the surface and even, in extreme cases, to cracks and the known quality faults of

float glass. In addition, these materials are extremely expensive.

It is the aim of the invention to provide a device of the aforementioned type in which the spout lip has heat resistance up to 1400°C, a raised corrosion-resistance compared with various glass melts, and no undesirable interactions with the glass melt, is insensitive to temperature changes and gives off no corrosion products into the glass melt.

This aim is fulfilled according to the invention in that at least the surface of the spout lip coming into contact with the glass melt is covered with a non-noble refractory metal layer.

By means of the metal layer made of non-noble refractory metal, excellent corrosion-resistance is achieved for the surface coming into contact with the glass melt and thus the disadvantages of known materials for spout lips are avoided. According to a particularly simple embodiment, it may be provided that the metal layer is made of molybdenum sheet or tungsten sheet.

This metal layer may be applied to the spout lip made of slip cast and sintered fused silica ceramic. It has proved entirely sufficient for the metal layer to be applied to a spout lip made of slip cast and sintered fused silica ceramic. This substrate for the metal layer is not only inexpensive, but is also insensitive to temperature changes. The attachment sites for the metal layer may also be so placed that they do not come into contact with the glass melt.

The metal layer must also be so designed that the underside of the metal layer not coming into contact with the glass melt is provided with a gas-tight oxidation layer.

Protection of the upper side of the metal layer against oxidation is given by the glass melt flowing over it. The gas-tight oxidation protection layer applied to the underside of the metal layer which does not come into
5 contact with the glass melt brings not only protection against oxidation, but also against tin in the form of vapour arising in the float bath and, in particular, in the region of the lower edge of the spout lip.

The metal layer made of molybdenum sheet or tungsten
10 sheet possesses excellent corrosion-resistance with respect to borosilicate and aluminosilicate glasses, so that spout lips provided with such a metal layer are suited to such glass melts, in particular for the manufacture of float glass.

15 The invention will now be described in greater detail with the aid of an example illustrated in the drawings, in which:

Fig. 1 shows a float system for manufacture float glass in the transition region from the glass melting tank
20 to the float bath, having a pouring lip, and

Fig. 2 shows the transition region with the spout lip in detail.

As the principle illustration in Fig. 1 shows, the glass is melted in a glass melting tank 10 and then fed to
25 a feeder channel 11 in which the level of the refined glass melt 12 may be adjusted with a glass quantity adjusting device 14 (front tweel) assigned to the spout lip 20 at the end of the feeder channel 11.

In larger float systems, a blocking device 13 (back
30 tweel) is assigned to the feeder channel 11, with which blocking device the feeding of the glass melt 12 to the spout lip 20 may be completely interrupted.

As Fig. 2 shows more clearly, the glass melt 12.1 guided over the upper side of the spout lip 20 is adjusted in the vertical dimension by adjustment of the glass quantity adjusting device 14 (front tweeel). The upper side
5 of the spout lip 20 is covered with a metal layer 22 formed of molybdenum sheet or tungsten sheet and attached by means of molybdenum or tungsten pins into the side lips laterally bordering the spout lip 20. The attachment sites may be so placed that they do not come into contact with the glass
10 melt 12.1 flowing over the coated spout lip 20.

The glass melt 12.1 reaches the float bath, which is indicated with the start wall 15 and the floor elements 17 and accepts liquid tin 18. The inflowing glass melt 12.1 forms a glass strip 12.2 over the liquid tin 18, which
15 strip is pulled out of the float bath over drawing-off rollers.

Of decisive importance in this process is that the lower edge of the spout lip 20 takes the correct separation from the surface of the liquid tin 18 in the float bath.
20 The spout lip 20 may be arranged on the start wall 15 of the float bath and have a nozzle 21 via which gaseous nitrogen may be fed at a temperature of between 800° C and 1200° C to the transition between the spout lip 20 and the float bath.

25 The transition region between the spout lip 20 and the float bath is covered towards the feeder channel 11 with a front cover 19. The liquid tin 18 forms a liquid substrate for the floated glass strip 12.2 in the float bath made from the start wall 15 and the floor elements 17, said
30 glass strip being separated by a tile 16 from the start wall 15 of the float bath.

The spout lip 20 comprises slip cast and sintered fused silica ceramic. The base material is therefore

economical and, with the metal layer, possesses corrosion resistance that significantly increases the service life of the assembled spout lip. The underside of the metal layer is provided with a gas-tight oxidation layer, which
5 protects the metal layer not only against oxidation, but also against tin vapour generated in the float bath.

With the assembled spout lip, even when used in float systems for borosilicate glass and aluminosilicate glass, a service life of 2 to 3 years is achieved for the spout lip.

Claims

1. Device for feeding glass melt over a spout lip during the manufacture of float glass, said melt being fed
5 from a glass melting tank via an adjustable feeder channel to the spout lip and guided over its surface onto the tin surface of the float bath, characterised in that at least the surface of the spout lip (20) coming into contact with the glass melt (12.1) is covered with a non-noble
10 refractory metal layer (22).

2. Device according to Claim 1, characterised in that the underside of the metal layer (22) not coming into contact with the glass melt (12.1) is provided with a gas-tight oxidation layer.

15 3. Device according to Claim 1 or 2, characterised in that the metal layer (22) is made of molybdenum sheet or tungsten sheet.

4. Device according to one of the claims 1 to 3, characterised in that the metal layer (22) is applied to a
20 spout lip (20) made of slip cast and sintered fused silica ceramic.

5. Device according to Claim 3 or 4, characterised in that the molybdenum sheet or tungsten sheet has a thickness of between 4 mm and 8 mm and is attached with pins made of
25 molybdenum or tungsten into the side lips laterally adjoining the spout lip (20).

6. Device according to one of the claims 1 to 5, characterised in that it is used in the manufacture of borosilicate glass.

30 7. Device according to one of the claims 1 to 5, characterised in that it is used for the manufacture of aluminosilicate glass.