Dec. 3, 1957 H. KÜLLMAR 2,815,135

DEVICE FOR CHARGING FURNACES

Filed Aug. 4, 1953 2 Sheets-Sheet 1

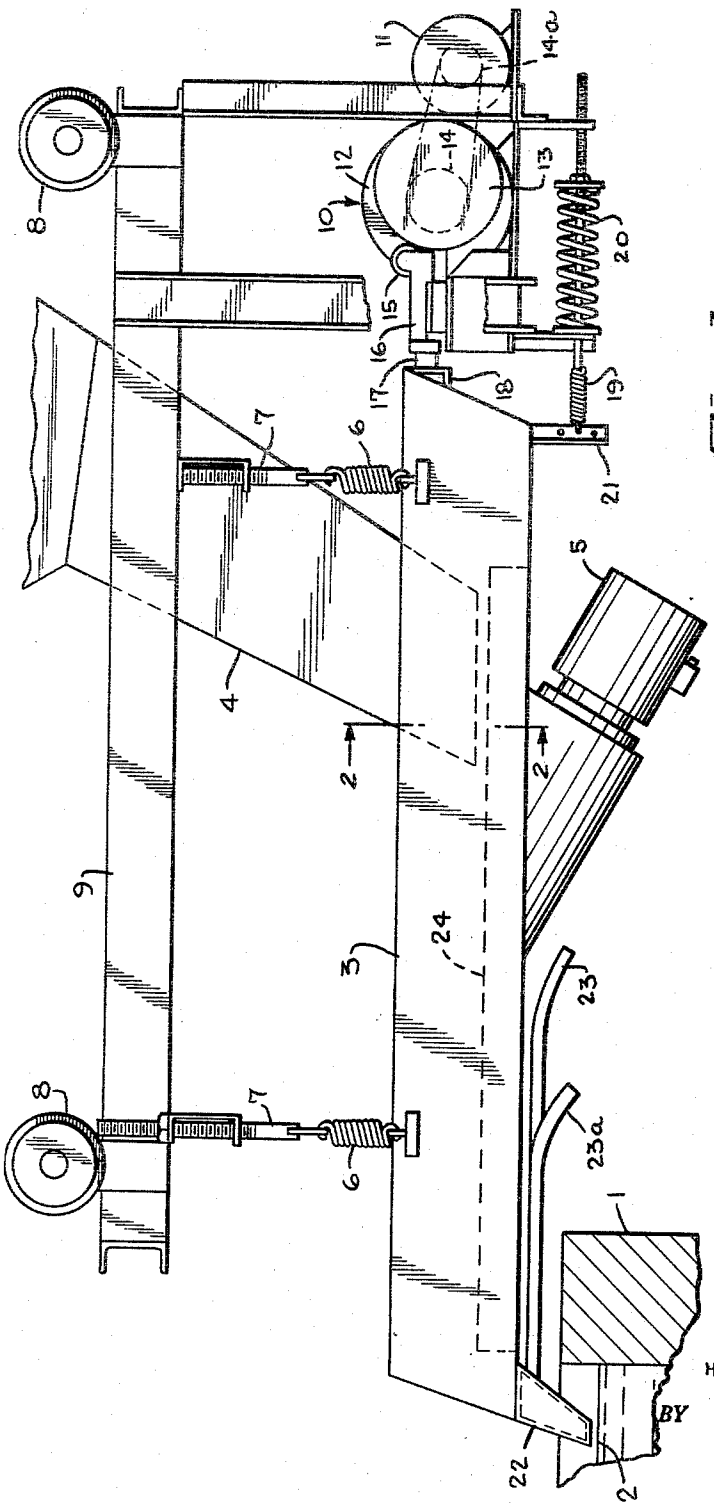


Fig 1

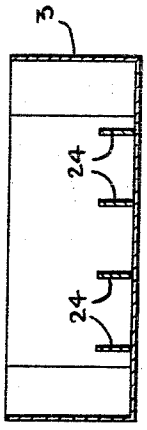


Fig 2

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DEVICE FOR CHARGING FURNACES

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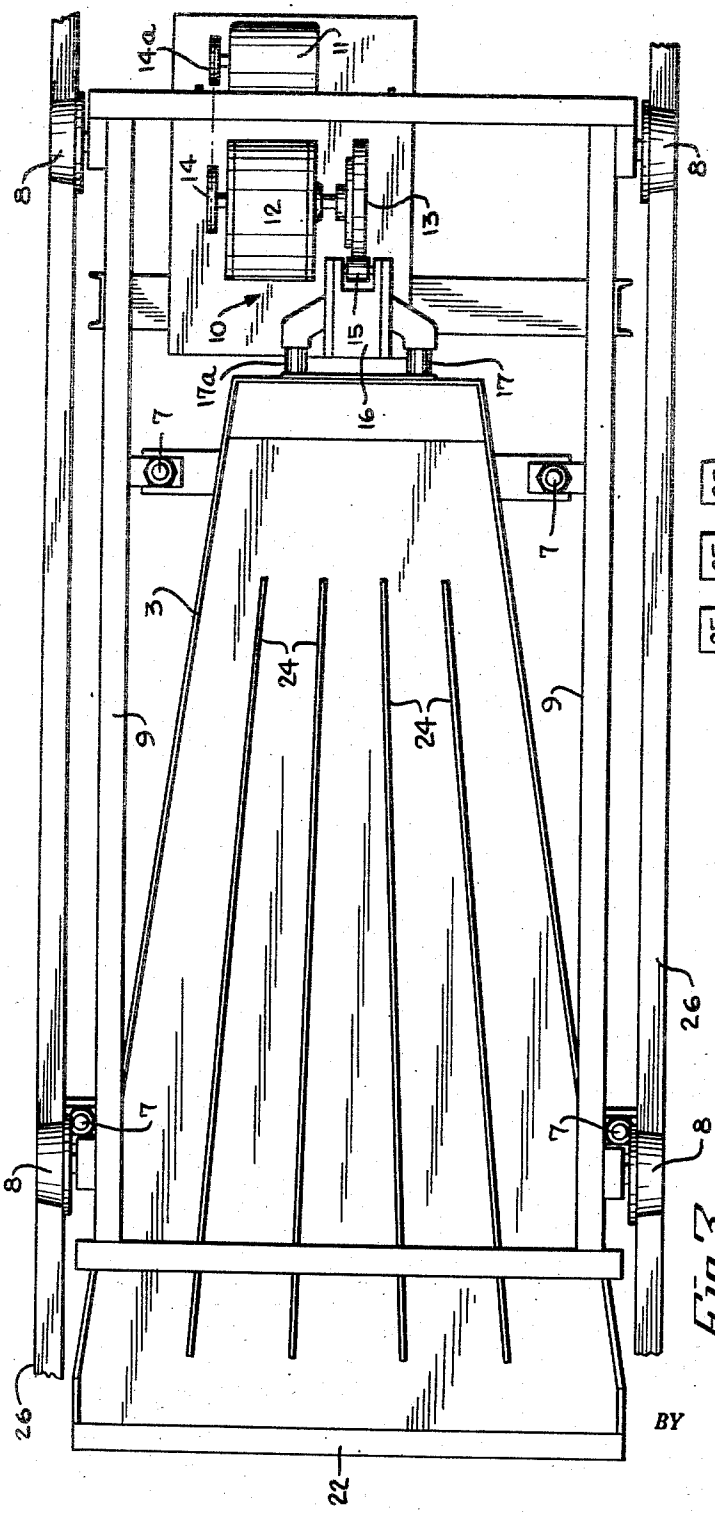


Fig 3

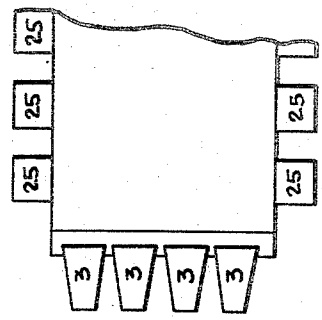


Fig 5

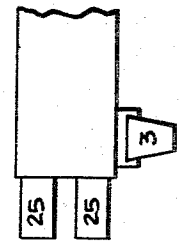


Fig 4

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2,815,135

DEVICE FOR CHARGING FURNACES

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Claims priority, application Germany August 8, 1952

2 Claims. (Cl. 214—18)

The invention relates to a device for charging melting furnaces and particularly glass melting furnaces.

In the early periods of the glass producing art the glass forming mixtures were manually charged into the melting furnaces.

This mode of charging was replaced by traveling ladles and similar devices; the ladles were afterwards in many cases substituted by motor-driven screw conveyors which press the raw material mixtures charged from a bunker into the glass melting furnace.

The charging of these furnaces was also performed by so-called "pushers" which push the mixtures to be melted into the melting furnace and spread the same on the surface of the molten bath.

It is also customary to use troughs which are actuated by vibrators for the transport of the glass forming material mixtures into the furnaces. These vibrators are often operated by separate driving means, such as rollers and the like; the feed is controlled by adjustable levers, slides or gears.

The above referred-to charging devices serve the exclusive purpose to feed the raw materials onto the surface of the molten bath.

In essential contradistinction thereto it is the main object of the invention not only to feed the glass forming material mixtures onto the molten charge but to distribute the same uniformly upon its entire surface in such a manner that a layer of equal thickness results, which in the following will be denoted as a "carpet layer" or a "carpet."

With this important object in view one or a plurality of charging troughs of a large width are used for the feed of the raw material mixtures into the melting furnace; these troughs are oscillated by customary vibrators, for instance, the generally known "Hertz" vibrators, adapted to apply to the charging troughs a frequency of about 20 to 100 vibrations.

The novelty of the invention consists therein that the high-frequency created vibrational feeding movement of the troughs is combined with a second vibration of a lower frequency but of a larger amplitude.

Whereas the materials to be charged onto the molten bath are fed by the high frequency oscillator in one direction, the low frequency oscillator having a large amplitude causes the charged mixture to be distributed all over the surface of the molten bath whereby a uniform carpet layer is produced.

The feeding efficiency of the charging device may be controlled in the customary manner by the use of a rheostat resistor. By a control of the frequency and oscillation width of the low frequency oscillator the thickness of the carpet layer may be controlled in a simple manner.

In order to further secure a uniform thickness of the carpet over the entire bath surface the charging trough may be provided with distributor or guiding ribs which have a sufficient height to guide the charge as individual sections.

A known automatic height regulator or a time relay may be used which enables the maintenance of an equal height of the molten bath.

The invention is in its particular application to a glass melting furnace illustrated by way of example in the attached drawings.

In the drawings,

Fig. 1 is a side view of a part of a glass melting furnace and of the raw mixture feeding device;

Fig. 2 is a cross-sectional view of the feeding trough on line 2—2 of Fig. 1;

Fig. 3 is a plan view of the feeding trough shown in Fig. 1;

Fig. 4 is a schematic top view of a glass melting furnace provided with front burners; and

Fig. 5 is a schematic top view of a glass melting furnace provided with a multitude of charging devices.

As apparent from Fig. 1, numeral **1** denotes the lateral wall of a glass melting furnace and numeral **2** denotes the level of the molten charge.

The glass forming material mixture is transported into the melting furnace **1** by means of the trough **3**. This trough is continuously supplied with a mixture of the raw materials from the charging end of the bunker **4**. The trough **3** is in a known manner operatively coupled with a high-frequency vibrator **5**, whereby a uniform flow is produced of the raw materials in the trough **3**.

The trough **3** is by means of the spiral springs **6** and the spindles **7**, which are adapted to be lifted and lowered, suspended from the frame **9**. The rollers **8** are connected by frame **9**; accordingly the trough **3** including its accessories may be moved along the rails **26**. Upon interruption of the melting procedure and lifting of the trough **3** by the spindles **7** the charging device may be moved backwards and again returned into its charging position, as shown.

A second oscillator or vibrator is provided for the charging trough **3**, which is denoted by numeral **10**.

This second vibrator or oscillator comprises motor **11**, Fig. 3, which over the driving mechanism **12** actuates the eccentric disc **13**. The eccentricity of the disc **13** controls the oscillation amplitude; the disc **13** may be exchanged and replaced by a disc of a different eccentricity.

Preferably discs are used which have an oscillation amplitude between 20 to 50 millimeters.

The number of the oscillations per time unit may be varied by a change of the gears or changes of the transmission discs **14**, **14a**. It is preferred to use 12–18 oscillations per minute.

The transmission of the oscillations to the trough **3** is achieved by the eccentric disc **13** over roller **15**, whereby a forward movement is imparted to the slide **16**. This slide is provided with rubber buffers **17**, **17a**, Fig. 3, which act upon the push-angle **18**, Fig. 1, fastened to the trough **3**. The rubber buffers **17**, **17a** serve the purpose to prevent transmission of the high frequency oscillations of trough **3** onto the other parts of the device.

Since the motor **11** only creates an advance movement, additional means have to be provided to cause the trough to swing in another direction. This purpose is served by the pull springs **19**, **20**, which are connected with the ledge **21**.

Water cooled pusher **22** is fastened to the operative end portion of the trough **3**, the cooling water is supplied to the pushers **22** by the conduit **23** and discharged through conduit **23a**.

As apparent from Figs. 2 and 3, the trough **3** is provided with laterally widening vertical distributing ribs **24a**, which produce a uniform distribution of the charged material mixture all over the width of the trough.

Fig. 4 shows schematically a simple application of the instant charging device to a furnace provided with front burners 25 and a lateral single trough 3.

Fig. 5 is a schematic view of a large cross-heated furnace provided with four front charging troughs 3.

By the combinative action exerted upon the trough 3 by the two vibrators an excellent distribution and equalizing action is exerted upon the charge which accordingly is continuously and uniformly distributed over the entire surface 2 of the bath contained in the furnace 1.

The distributing action is further improved by the distributing ribs 24a; the width of the trough 3 being enlarged in the transport direction of the material mixture.

Since certain changes may be made in the above device and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is accordingly desired that in construing the breadth of the appended claims they shall not be limited to the specific exemplifications of the invention described herein.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. In a device for charging a glass melting furnace including a reservoir for a molten bath and a bunker for charging the raw materials, in combination, an elongated vibratory feeding trough extending with one end to a point below said bunker and extending with the other end to a point above the molten bath in said furnace, a

low frequency vibrator in driving connection with said trough and operable to oscillate said trough parallel to its direction of elongation, and a high frequency vibrator in driving connection with said trough and operable to superpose onto said trough a second oscillation at an angle to the direction of said first oscillation and of a smaller amplitude than the same.

2. In a device for charging melting furnaces and particularly glass melting furnaces, in combination, a charging bunker, a vibratory feeding trough to receive the charged glass forming materials from said bunker and to deliver the same continuously onto the surface of the molten bath in said melting furnace, a first high frequency operated vibrator operatively connected with said trough to impart to the same an oscillatory feed movement, a second low frequency vibrator operatively and fully independently from said first high-frequency operated vibrator connected with said trough to impart to the same a second additional oscillatory feed movement of which the amplitude is larger than the amplitude of the high frequency operated vibrator.

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