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K. FOLGERÖ ETAL

3,200,185

ELECTROMAGNETIC STIRRER

Filed March 19, 1963

Fig. 1

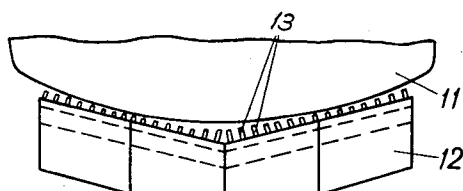


Fig. 2

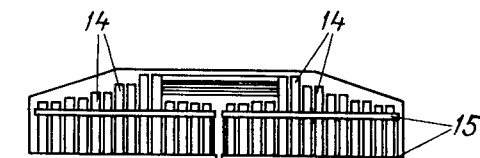


Fig. 3

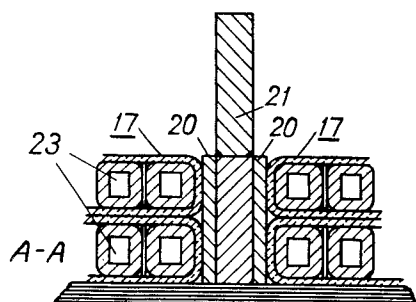
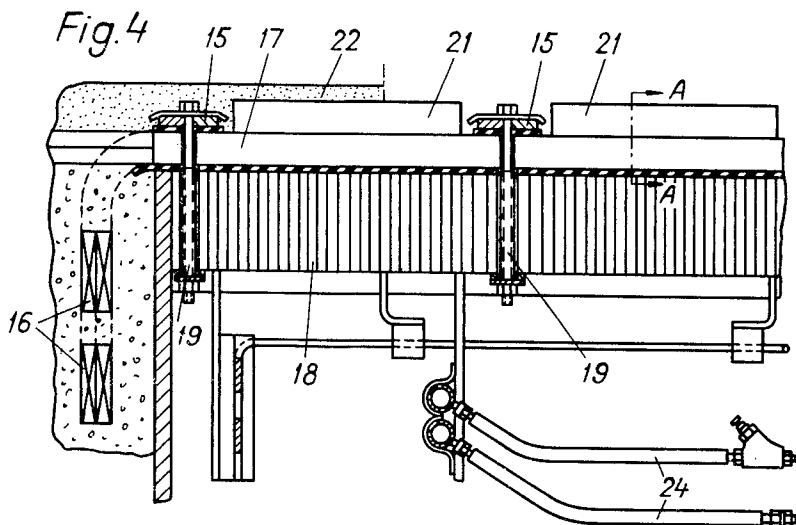


Fig. 4



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ELECTROMAGNETIC STIRRER

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3,130/62

3 Claims. (Cl. 13—26)

The present invention refers to an electromagnetic stirrer for metallurgical containers, such as furnaces consisting of stirrer winding, iron core and teeth of magnetic material extending from said core.

Stirrers of this type are previously known, for example through the U.S. Patent 2,960,556. In this is shown a stirrer winding with straight core legs and with teeth brought out towards the furnace bottom, which teeth are embedded in a ceramic protective layer protecting the stirrer winding from falling charge. Perpendicular to the teeth are fixed covers over the stirrer coil of non-magnetic material.

The present invention relates to an improvement of this construction and is characterised in that the teeth extending towards an air gap at the furnace bottom or side at least partly are situated between the coils of the winding and are provided with a centre part extending to the air gap. Such a construction achieves, inter alia, the advantage in relation to earlier known constructions that the erection is easier at the same time as the manufacture is cheaper. With a proposed embodiment the winding is made coil-wound and the teeth are made in three parts, two insulating side bars, which in height do not extend essentially outside the coils and an uninsulated centre portion, extending from the space between two coils to the air gap. A similar construction means small losses and at the same time small dimensions.

These and other embodiments and details of the invention are more clearly illustrated in accompanying figures, of which FIGURE 1 shows a furnace bottom with applied electromagnetic stirrer. FIGURE 2 shows a stirrer winding with the cover removed. FIGURE 4 shows partly in section a stirrer winding and FIGURE 3 shows a section along line A—A in FIGURE 4.

In FIGURE 1 is shown schematically a furnace bottom 11 for a furnace in which an existing charge may be stirred by means of a multi-phase low frequency electromagnetic stirrer 12, in principle made according to the U.S. Patents 2,513,082 and 2,960,556. The teeth of magnetic material and including parts 20 and 21 are brought forward to a narrow air gap between the stirrer 12 and the furnace bottom or side. The stirrer is made with straight core legs, which means a simplification of the final form and an easier erection. The stirrer according to FIGURE 1 is made without cover, but such a cover suitably of ceramic material may of course from a protection point of view be proposed (see also FIGURE 4).

In FIGURE 2 is shown the stirrer in FIGURE 1 seen from the furnace bottom. The coil-wound stirrer windings 14 are fastened by band-formed coil cover 15 of magnetic material, which cover extends substantially perpendicular to the coils. The teeth extending towards a charge air gap close to the furnace bottom 11 or side lie partly between the coils.

In FIGURES 3 and 4 is shown a detailed embodiment of an electromagnetic, coil-wound, multi-phase and low frequency stirrer for steel charge. Between the coil ends 16, which are bent down and possibly cast into concrete or the like or non-conducting and non-magnetic com-

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pound, the winding 17 extends in a plane along the stirrer. Under the winding a straight laminated iron core 18 is placed and perpendicular to the windings 17 are placed band-formed slot caps 15, suitably of magnetic material. These caps are held fast by insulated fastening bolts 19 between the windings 17 and through slots engaged in the iron core 18, along the whole length of the core, whereby the bolts existing in the slot are not subjected to damaging magnetic field.

Between the coils 17 and between slot cap plane and iron core are inserted outer parts 20 of the teeth, insulated (for example enamelled) and made in magnetic material. Between these is inserted an uninsulated centre portion 21 of teeth, whole or spliced, of magnetic material. The width of this part is considerably greater than for each of the parts 20 and is chosen so that magnetic saturation will not occur in this. It extends to the air gap at the furnace bottom. Above the stirrer is placed a ceramic cover or layer 22, partly embedding the parts 21 of the teeth and intended to protect the stirrer against falling charge. The insulation of the side bars 20 may of course also occur by means of winding, loose insulating layers, etc. The coil ends 16 are cast suitably into non-magnetic compound, such as concrete or cement (see Industriell Teknik, profylax, No. 5/1963). In the different conduits in the coils are included cooling medium channels 23 and the cooling medium, for example water, which circulates through the different conduits in normal manner, for example via the tube conduits 24.

The two side bars 20 should suitably extend along the whole or the greater part of the stirrer, while the centre portion 21 with the prominent tooth parts are divided into parts, lying between the different slot caps 15 and their fastening bolts 19 respectively. Between the two outer bars 20 a space thus arises for these fastening bolts 19 close to the slot cap 15.

The invention may also be applied for coil-winding and for other than straight core legs. It may be varied in many ways within the scope of the following claims.

We claim:

1. Electromagnetic stirrer for metallurgical containers, comprising a stirrer winding comprising coils for electric current having spaces between them, and an iron core on the side of the coils remote from the container, teeth of magnetic material having parts extending from points within said spaces between said coils substantially below a plane through those parts of the coils positioned nearest the container to points outside such spaces and substantially closer to the container than such plane, and spaced from said container to provide an air gap.

2. Electromagnetic stirrer in accordance with claim 1, in which said teeth each comprises a central portion extending along the whole length of the teeth and of less width than the spaces, and two insulated side bars extending within the spaces on each side of the central portion and positioned adjacent the coil sides.

3. Electromagnetic stirrer in accordance with claim 1, in which the teeth and the coils extend sideways in one direction along the container bottom; strip formed caps of magnetic material extending perpendicular to such direction, and bolts clamping said caps to said coils and parts of the teeth.

References Cited by the Examiner

UNITED STATES PATENTS

2,513,082	6/50	Dreyfus	13—26
2,960,556	11/60	Fredricksson	13—26

RICHARD M. WOOD, *Primary Examiner.*