

[54] **INDUCTION FURNACE**
[75] Inventor: **Ignaz Mosser**, Braunau, Austria
[73] Assignee: **Veveinigte Metallwerke
Ranshofen-Berndorf AG**, Vienna,
Austria

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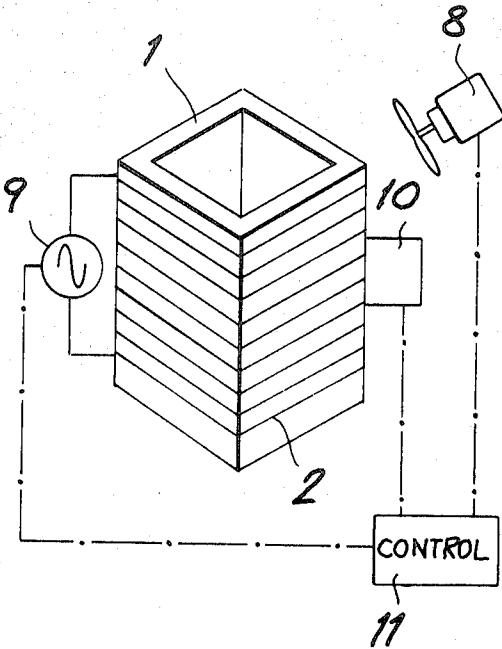
Primary Examiner—Roy N. Envall, Jr.
Attorney, Agent, or Firm—Karl F. Ross; Herbert
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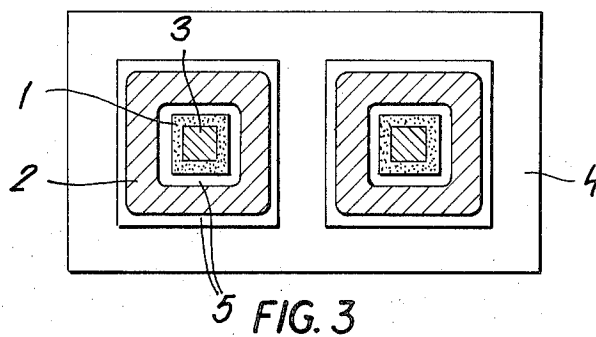
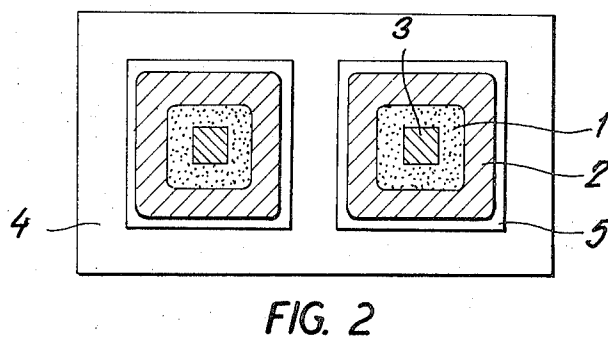
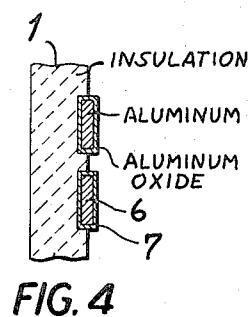
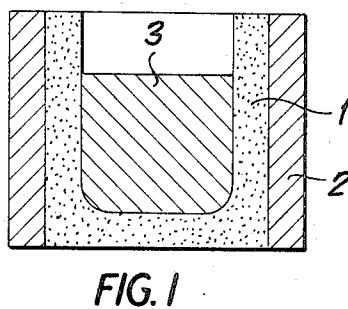
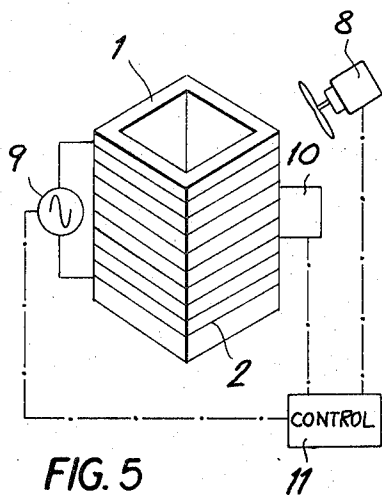
[30] **Foreign Application Priority Data**
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[58] Field of Search 13/26, 27, 28, 29, 30;
219/10.49, 10.79; 336/223

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[57] **ABSTRACT**
An induction furnace has a coil formed of an anodized aluminum conductor whose current density is controlled according to the heat resistance of the furnace lining and of its anodized coating. The furnace lining may be formed directly on this coil, and the coil is air cooled.

5 Claims, 5 Drawing Figures





INDUCTION FURNACE

FIELD OF THE INVENTION

The present invention relates to an induction furnace.

BACKGROUND OF THE INVENTION

An induction furnace usually comprises a vessel adapted to receive a charge of metal or the like to be heated for smelting or a similar operation. A coil formed of a hollow copper conductor surrounds this vessel and is connected to an alternating-current source. Energization of the coil creates a magnetic field in the vessel which generates eddy currents in the charge in order to heat it.

Since the most heat-resistant Class H insulators lose most of their effectiveness above about 180°C it is necessary to hold the temperature of the induction coil down. Similarly since water is usually passed through the hollow conductor as a coolant it is important that the temperature of the coil be maintained below 100°C, the boiling point of water, in order to prevent vaporization of the water and lime buildup in the conductor. To this end the coils are often also air-cooled in order to ensure that they do not overheat. This cooling robs a good deal of the heat from the crucible so that induction furnaces are excessively inefficient mainly due to losses resulting from cooling the coil.

Another problem with induction furnaces of the water-cooled type is that should the coil become perforated somehow and the water come into contact with the melt, a violent explosion can take place.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide an improved induction furnace.

Another object is the provision of an induction furnace which is of inexpensive and simple construction, but which operates at a higher level of efficiency than the prior-art devices.

SUMMARY OF THE INVENTION

These objects are attained in an induction furnace whose coil is made of an aluminum conductor provided with an anodized heat-resistant insulating coating. This coil can be allowed to heat up to above 400°C without insulation breakdown or loss of conductivity so that it need merely be air cooled. Since the temperature differential between the coil and the melt is several hundred degrees smaller than in most prior-art furnaces, the amount of energy lost to the coolant is greatly reduced.

In addition an aluminum conductor is substantially less expensive than a copper one, even though it will need to be somewhat heavier than a copper conductor of similar electrical capacity. The elimination of a water cooling system also reduces the expense of the furnace substantially.

According to another feature of the present invention the coil is used as a base either for the crucible lining or the crucible support. In either case the material is tamped or rammed in place right on the coil either on the inside or the outside, leaving each turn exposed on at least one side for air cooling.

DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages

will become apparent from the following, reference being made to the accompanying drawing in which:

FIG. 1 is a vertical section through a crucible induction furnace according to the present invention;

FIGS. 2 and 3 are top views of two types of air-cooled core-type or channel-type induction furnaces;

FIG. 4 is a sectional view in enlarged scale showing a detail of the furnace of FIG. 1; and

FIG. 5 is a perspective view of a coil according to the present invention.

SPECIFIC DESCRIPTION

As shown in FIG. 1 a crucible lining 1 containing a charge 3 is surrounded by a coil 2 formed, as shown in FIG. 4 of a solid aluminum band 6 of rectangular section provided with an anodized aluminum-oxide coating 7. The lining 1 is rammed in place on the coil 2.

As shown in FIG. 2 the lining 1 can be rammed on the inside of the coil 2 in which case the cooling air is passed through the space 5 between the outer periphery of the coil 2 and the iron core 4.

FIG. 3 shows how the lining can be tamped against an independent cylinder so that the coil 2 may be free-standing between the core 4 and the crucible 1. In this case the lining 1 which forms the crucible may be formed on a support made of, for example, wood which is consumed when the furnace is heated up to simply leave the heat-resistant furnace lining.

The furnace may be provided as shown in FIG. 5 with a thermostat 10 which is connected through a control circuit 11 to the blower 8 and to the source 9 in order to reduce the current density in the coil 2 when the temperature of this coil 2 and the lining 1 rises above a predetermined limit. The type of the lining and of the insulation coating 7 would determine just what the critical temperature is. This control would limit joule heat in both the conductor 6 and in the melt 3 as necessary.

I claim:

1. An induction furnace comprising a vessel adapted to receive a charge of metal to be melted and a helical coil surrounding said vessel, said coil being formed of an elongated aluminum conductor provided with a heat-resistant anodized insulating coating; an alternating-current source connected to said coil; and means for forcing a current of air over said coil for cooling same.

2. The furnace defined in claim 1, further comprising an oven lining formed directly on said coil.

3. The furnace defined in claim 2 wherein said lining is formed directly on the inside of said coil.

4. The furnace defined in claim 2 wherein said lining is formed directly on the outside of said coil.

5. An induction furnace comprising a vessel adapted to receive a charge of metal to be melted and a coil surrounding said vessel, said coil being formed of an elongated aluminum conductor provided with a heat-resistant anodized insulating coating; an alternating-current source connected to said coil; means for forcing a current of air over said coil for cooling same; a temperature sensor responsive to the temperature of said coil and connected to said source and to said means for forcing air over said coil for maintaining said coil below a predetermined temperature by controlling power output from said source and the output of said air-forming means.

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