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(54) Inductively heated apparatus

(57) The invention relates to an inductively heated apparatus more particularly for plastics extruders, with a casing (1) having an opening (1a) for passing through the substance to be heated, and with at least one laminated magnetic core (2) supporting an induction winding (7) for producing a magnetic field, as well as liquid cooling means (6, 8) mounted between the magnetic core and the induction winding. The core may be U-shaped or E-shaped (Fig. 2).

Fig.1

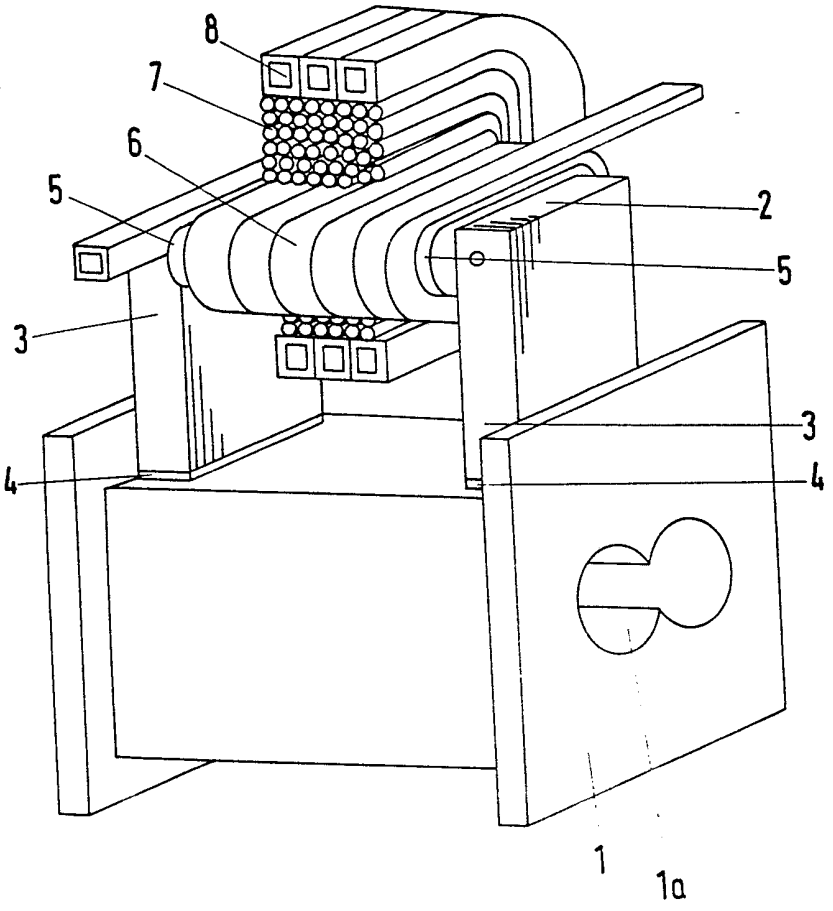

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Fig.1

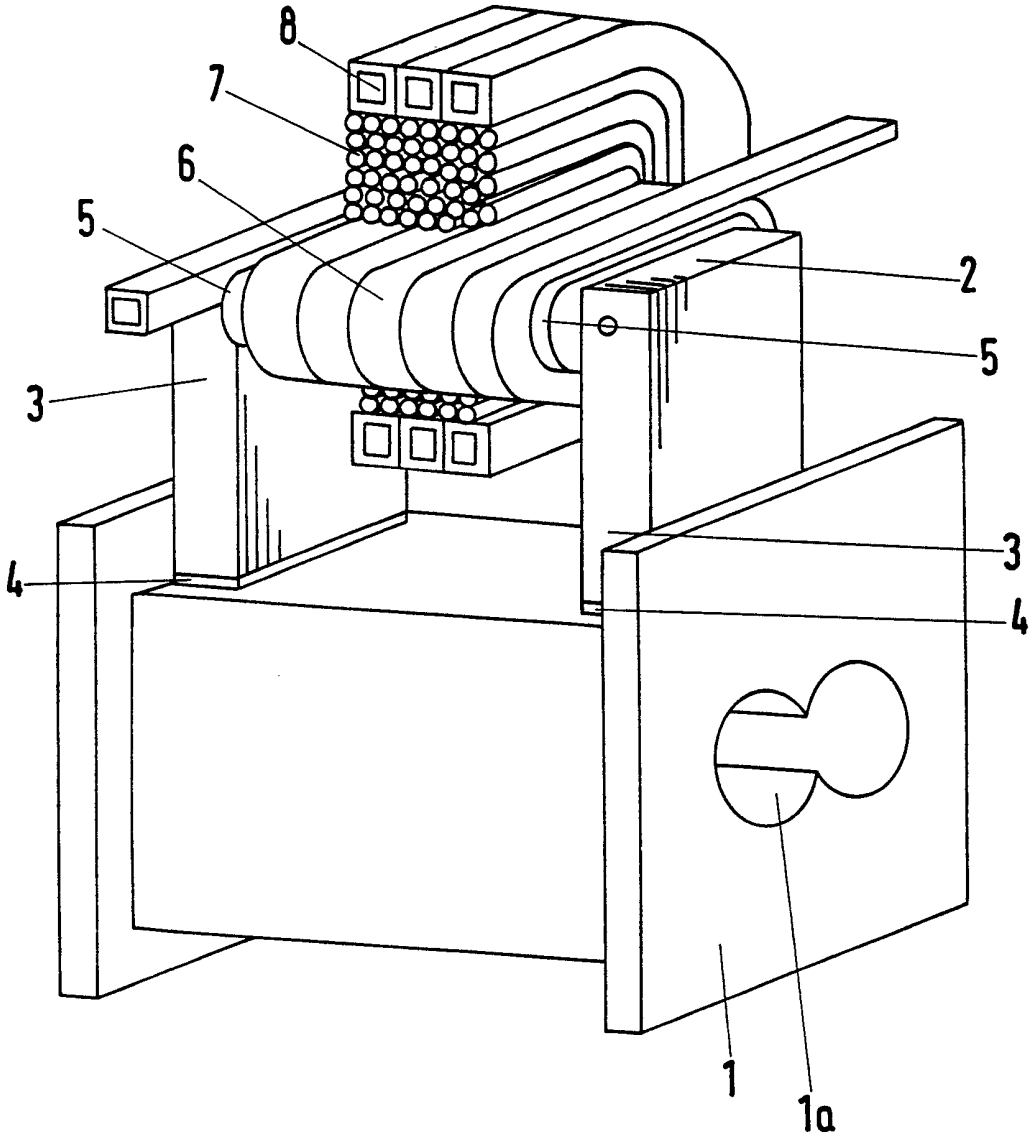
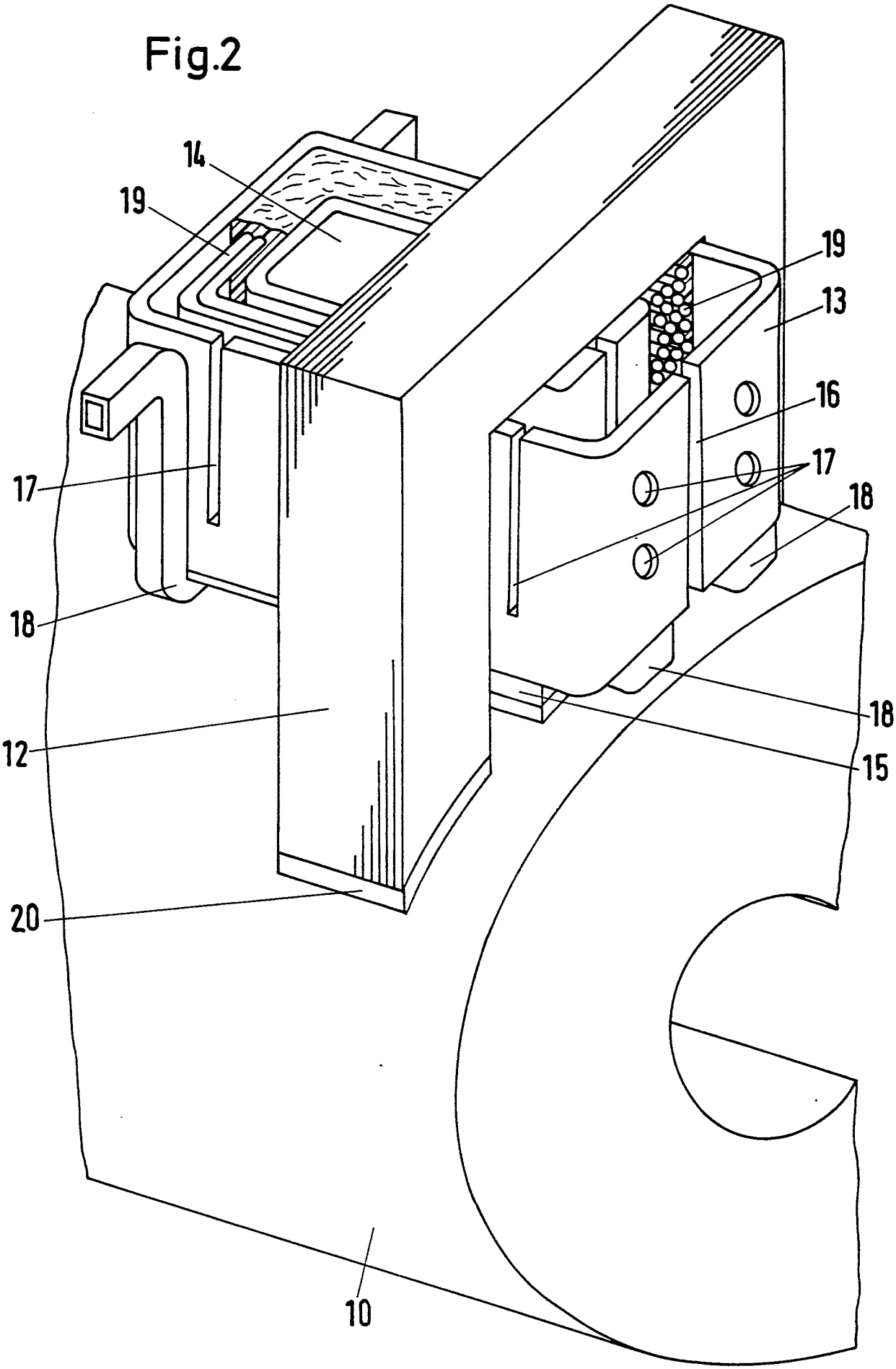


Fig.2



Inductively heated apparatus

The invention relates to inductively heated apparatuses, more particularly for plastics extruders, through which plastics particles are conveyed and heated, eg in order to work them in different ways into new mixtures.

Inductively heated apparatuses of this kind are known. They have a casing of steel so that the magnetic field can cause eddy currents therein which heat it up. The magnetic field is thereby produced by one or more laminated iron cores which support an induction winding. The flanges of the iron cores are magnetically coupled to the casing which is to be heated, ie they adjoin the casing. The casing forms the magnetic back-circuit. The magnetic cores are designed either as a U-core or as an E-core.

In order to protect the induction coils from too much heat, they are wound from a hollow electrical conductor which allows for a flow of cooling agent.

All these known apparatuses have the same disadvantage, that either they are only suitable for low casing temperatures - approximately 200°C, or they must be operated as a low voltage winding with an additional transformer.

Modern plastics require higher temperatures for processing or mixing, up to 500°C and more. The known induction windings, if they are made of copper as the ideal conductor, are then at risk because the heat flowing back from the casing over the magnetic core destroys such windings.

The invention is based on the problem of providing an apparatus of the kind mentioned at the beginning with which the high temperatures desired in the solid casing can be

achieved. More particularly the apparatus according to the invention is to provide a thermal insulation and cooling of the induction coil which builds up the magnetic field. Furthermore the apparatus according to the invention is to be easily and economically manufactured and should also have an improved degree of efficiency.

According to the invention this is achieved with an apparatus of the kind mentioned above wherein an apparatus made of a good heat-conductive material, supporting the winding and having a cooling medium flowing through, is mounted between the induction winding and magnetic core and serves as a heat barrier.

In this way the heat flowing back from the casing which is to be heated is drawn off through the cooling medium before reaching the induction winding.

Further expedient embodiments of the invention are apparent from the features of the sub-claims.

The invention will now be explained with reference to Figures 1 and 2 which illustrate two possible embodiments of the invention.

The apparatus illustrated in Figure 1 has an extruder casing 1 with passages 1a for the extruder screws. The extruder casing 1 supports a laminated iron or magnetic core 2 which is designed as a U-core wherein a heat-resistant intermediate layer 4 is mounted between the flanges 3 of the magnetic core 2 and the extruder casing 1 which is to be heated. A similarly heat-resistant covering 5 is mounted on the yoke of the magnetic core 2 connecting the two flanges 3. A layer of rectangular section tubing 6 is wound round the covering 5 so that a cooling medium can pass therethrough. An induction winding 7 which builds

up the magnetic field which is necessary to heat the casing 1 is mounted around the intermediate layer which is formed by the individual windings of the tube 6. A further layer of rectangular tubing 8 is mounted round the induction winding 7 whereby cooling medium can similarly flow through this tube. The two layers of tubes 6 and 8 preferably have the same number of windings and are wound in opposite directions so as not to cause any transformatory voltage - deriving from the induction winding 7.

To ensure that the assembly comprising the magnetic core 2, induction winding 7 and tubular windings 6,8 is held together satisfactorily, the assembly can be encased by a casing moulded from a heat-resistant substance so that only the end areas of the flanges 3 project out of this casing.

Figure 2 shows another kind of apparatus according to the invention.

A round extruder casing 10 supports a laminated core 12 which in this case is designed as an E-core. A pot-like support 13 of an induction coil 19 is made from a good heat conductive material and has an opening 14 which encloses the centre flange 15 of the core. The pot-like support 13 of the induction coil 19 is provided on one side with a full-length gap 16 so that it does not form a short circuit winding. To avoid high eddy currents through stray fields, it is provided with slits and apertures 17. Square tubing 18 for water cooling is in good heat conducting connection with the winding support. The induction winding 19 is sealed in the pot-like support. The laminated core 12 is held at a distance from the extruder casing 10 by heat-resistant supports 20. In Figure 2 only one part of the core is shown which fills up the opening 14.

Claims

1. Inductively heated apparatus, more particularly for plastics extruders with a casing which has an opening through which the substance to be heated will be passed, the apparatus comprising at least one laminated magnetic core supporting an induction winding and producing a magnetic field, as well as a liquid cooling system, characterised in that a liquid-cooled body made of a good heat conductive material and supporting the induction coil is mounted between the magnetic core and induction winding.

2. Inductively heated apparatus according to claim 1, characterised in that the body supporting the coil is in the form of a winding which conveys the cooling fluid.

3. Inductively heated apparatus according to Claim 2, characterized in that the winding is made from rectangular tubing.

4. Inductively heated apparatus according to any preceding claim characterised in that the induction winding is mounted between two tubular windings which convey the cooling liquid.

5. Inductively heated apparatus according to claim 1 characterised in that the body supporting the induction winding is designed as a pot which is connected to a tube conveying the cooling liquid.

6. Inductively heated apparatus according to claim 5 characterised in that the pot holding the induction winding is provided with slits and/or breaks in order to avoid an eddy current.

7. Inductively heated apparatus according to one of claims 1 to 6 characterised in that the magnetic core, induction winding and cooling device are provided with an insulating filling so that only the arm ends of the magnetic core project out.

8. Inductively heated apparatus accoridng to one of claims 1 to 6 characterised in that a poor heat conducting intermediate layer is mounted between the extruder casing and magnetic core and forms a space.

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