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CORE TYPE MUFFLE FURNACE FOR HEAT TREATING SMALL WORK PIECES

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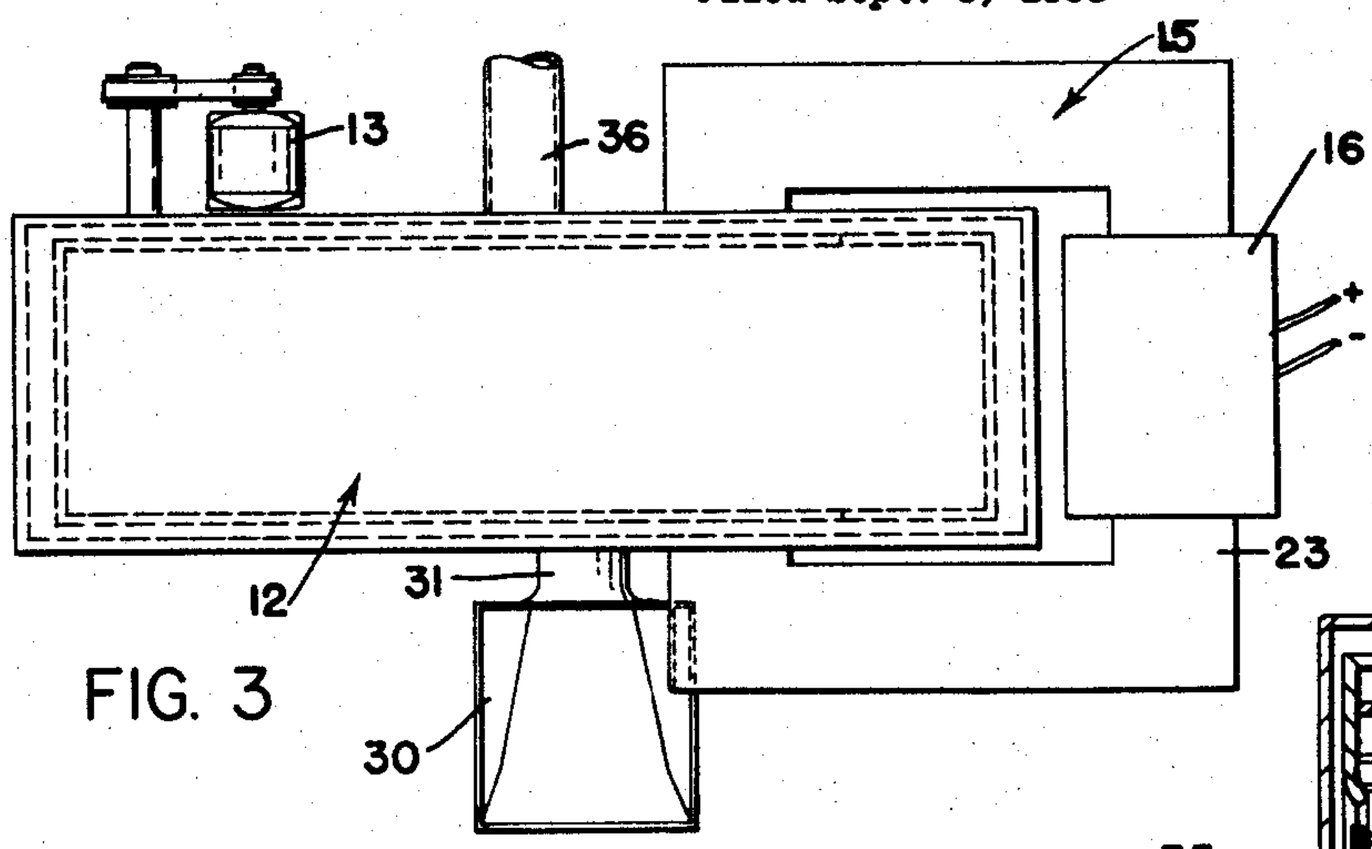

FIG. 3

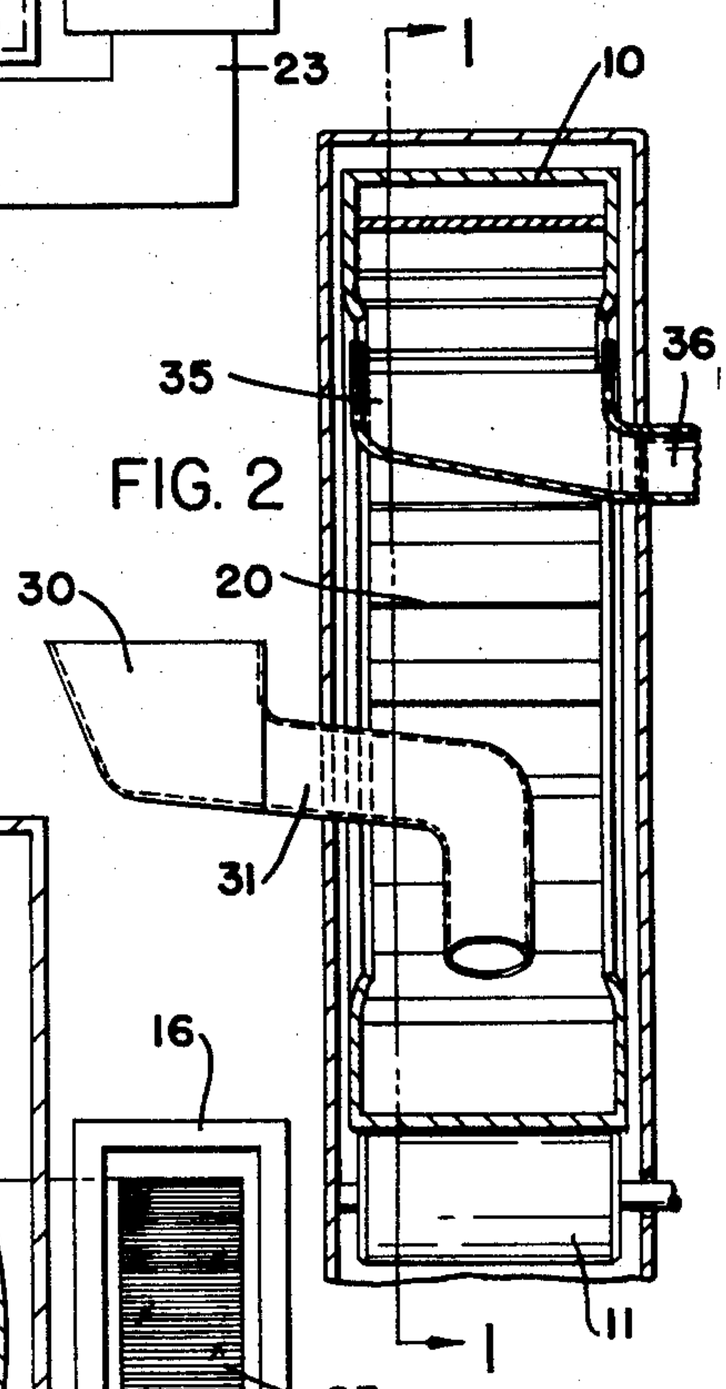

FIG. 2

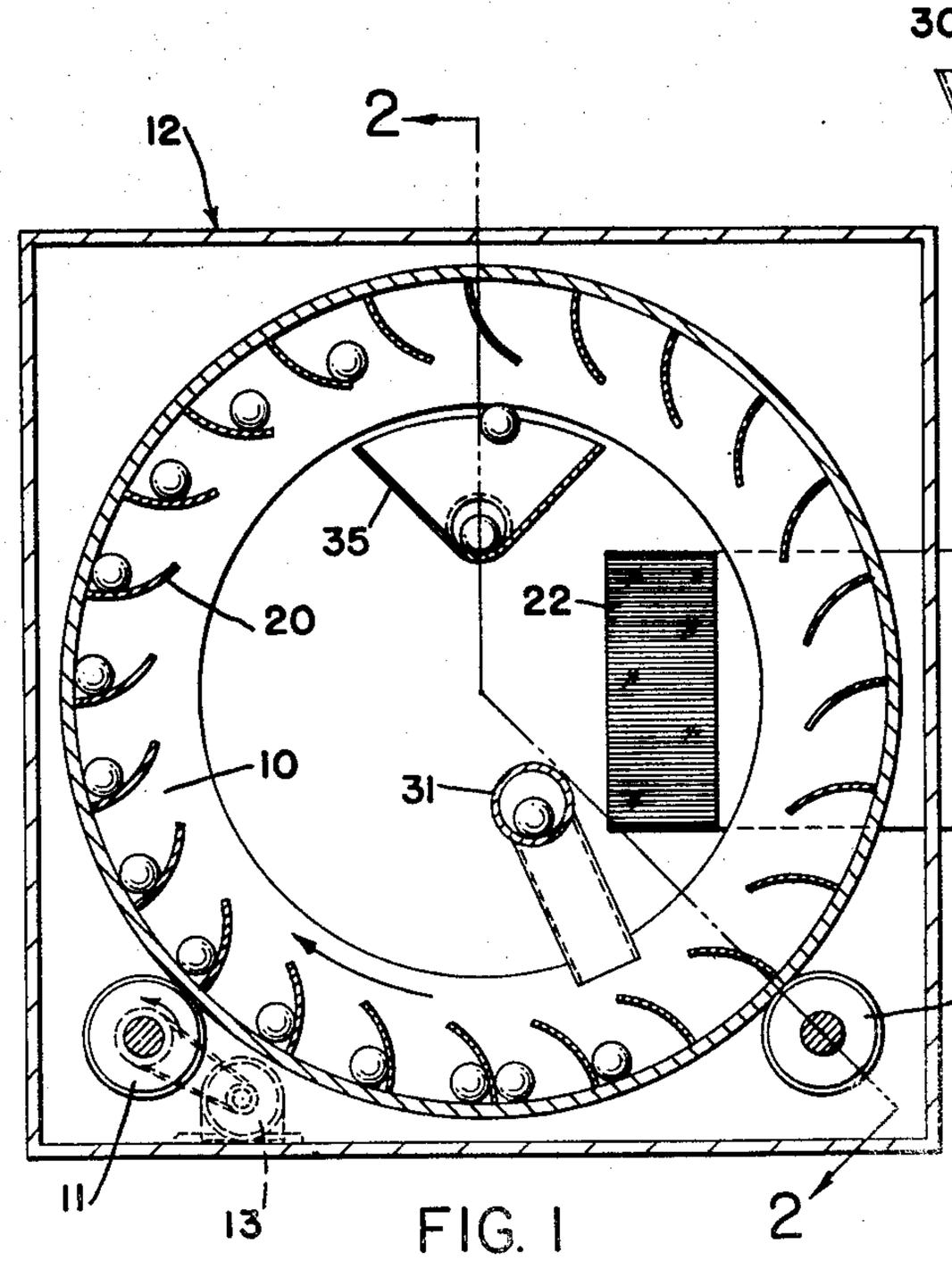

FIG. 1

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CORE TYPE MUFFLE FURNACE FOR HEAT TREATING SMALL WORK PIECES

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This invention pertains to the art of muffle furnaces and more particularly to a muffle furnace of the type which is heated by induced electrical currents.

The invention is particularly applicable to a muffle furnace employed for the purpose of heating small work pieces to elevated temperatures and will be described with particular reference thereto although it will be appreciated that the invention has broader applications.

It is known to provide muffle furnaces wherein the hearth is in the form of a ring-shaped flat disc disposed in a horizontal plane with an iron core linking this disc with a primary winding energized from a low frequency electrical power source. Currents are induced to flow in the disc which heat the disc to elevated temperatures. Work pieces are positioned on the hearth and are heated by induction or radiation or both. When the work-pieces have achieved the desired temperature, they are removed and allowed to cool.

The rate of heating is normally not very rapid and if high production is to be obtained, the hearth must be of a relatively large diameter and take a large amount of floor space.

Furthermore, with the hearth in a horizontal position, the work pieces must be individually placed and removed or complicated apparatus must be provided for the purpose of loading and unloading the hearth.

The present invention contemplates a core-type muffle furnace of the general type described which overcomes the above-referred to difficulties and others, and provides for automatic loading and unloading as well as using a minimum of floor space.

In accordance with the present invention, the hearth is in the form of a ring rotating about a horizontal axis and has provision for receiving work pieces on the inside thereof at a point close to or adjacent the lowest point in the arc of rotation and for discharging the work pieces close to or adjacent to the highest point in the arc of rotation. An iron core links a primary winding with this ring so as to induce electric currents therein and to heat the ring to elevated temperatures.

The principal object of the invention is a provision of a new and improved core type muffle furnace which takes up a minimum of floor space, which is simple in construction, positive in operation, and electrically efficient.

Another object of the invention is the provision of a new and improved core type muffle furnace which permits of automatic loading and unloading of the work pieces.

Another object of the invention is the provision of a new and improved core type muffle furnace comprised of a ring rotatable about a horizontal axis and having a channel-shaped cross-section with cleats or means in the channel for progressing the parts from one location to another.

The invention may take physical form in certain parts or arrangements of parts, a preferred embodiment of which will be described in detail in this application and

illustrated in the accompanying drawings which are a part hereof and wherein:

Figure 1 shows somewhat schematically a core type muffle furnace embodying the present invention;

Figure 2 is a cross-sectional view of Figure 1, taken in approximately the line 2—2 thereof; and

Figure 3 is a top elevational view of Figure 1.

Referring now to the drawings when the showing is only for the purposes of illustrating a preferred embodiment of the invention and not for the purposes of limiting same, the figures show a hearth **10** in the shape of a ring mounted for rotation about a horizontal axis on a pair of rollers **11** rotatably journalled in a housing **12** and driven by a motor **13**. A core **15** couples the hearth **10** with a primary coil **16**.

The hearth **10**, as indicated, generally in the shape of a ring channel-shaped in cross-section with the open side of the channel facing the center or axis of rotation. Disposed in the channel and transversely thereof are a plurality of cleats **20** the purpose of which will appear hereinafter.

The housing **12** may be of any desired construction, but is preferably made of a heat insulating material so that the heat generated in the hearth **10** by electric currents flowing therein will not be dissipated by radiation. The housing **12** may take any desired construction, and may be made of any desired heat insulating material.

The core **15**, as shown in Figure 3, is generally rectangular and has one leg **22** extending through the hearth **10** and another leg **23** on which the winding **16** is supported. Electric currents flowing in the winding **16** create a magnetic field which is linked with the hearth **10** by means of the core **15**. This magnetic flux induces electric currents to flow in the hearth **10** which currents rapidly heat the hearth **10** to an elevated temperature. For this purpose, it is preferred that the hearth **10** be made of a Nichrome or stainless steel which will not corrode or rust at the elevated temperatures and which has a substantial electrical resistivity.

A hopper **30** disposed externally of the housing **12** has a chute **31** extending through the wall of the housing **12** and terminating inside of the channel of the hearth **10** and adjacent to the inner edges of the cleats **20**. Work pieces are placed in the hopper **30** and then feed into the inside of the channel between the cleats **20**. It will be noted that the end of the chute **31** is generally adjacent to the lowermost point in the arc of rotation of the hearth **10**. A discharge hopper **35** is positioned interiorly of the housing **12** adjacent to the high point in the arc of rotation and has a chute **36** extending to the exterior of the housing **12**. Work pieces placed in the hopper **30** flow to the inside of the channel as it rotates in a clockwise direction as viewed in Figure 1. These work pieces are heated both by conduction and by radiation from the heated hearth **10**. They are carried upwardly by the cleats **20** to a point over the discharge hopper **35** where they fall thereinto and can pass to the exterior of the housing through a chute **36**. If desired, quenching means can be associated with the discharge hopper **35** or the discharge chute **36** can end in a quenching bath.

In the embodiment of the invention shown, the coil **16** has been placed outside of the housing **12**. The need for artificial cooling of the coil **16** is thus avoided. In some cases it may be necessary to water-cool the leg **22**, however, if the temperature of operation is unduly high.

The speed of rotation of the ring **10** will depend upon the rate of heating of the work pieces and the desired temperature to which it is desired to heat them. Thus, it is desired to operate the hearth **10** at the maximum temperature and then to control the temperature to which the work pieces are heated by varying the rate of rotation of the hearth **10**. Obviously the temperature can be con-

trolled by rotating the hearth at a fixed rate of speed and varying the temperature to which the hearth itself is heated.

With the arrangement shown, a core type muffle furnace has been provided which takes up a minimum of floor space and which provides substantially automatic loading and automatic unloading with a minimum of maintenance and labor.

It is believed that the invention has been described with sufficient clarity to enable one skilled in the art to construct apparatus embodying the invention, and obviously modifications and alterations differing in appearance from the embodiment described in this specification will occur to others upon reading and understanding this specification, and it is my intention to include all such modifications and alterations insofar as they come within the scope of the appended claims.

Having thus described my invention, I claim:

1. A core type muffle furnace comprised of an annular ring having means to receive a plurality of work pieces to be heated; means for supporting the ring for rotation on a horizontal axis; means adjacent the lowermost point in the arc of rotation for feeding work pieces to said ring; means adjacent the highest point in the arc of rotation for receiving heated work pieces from said ring; means on said ring for retaining the workpieces thereon between said feeding means and said receiving means; and means for inducing electrical current to flow in said ring for the purpose of heating same.

2. A muffle furnace comprised of an annular ring channel shaped in cross-section with the opening of the channel facing the center of the ring; a plurality of cleats extending transversely across said channel; means supporting said ring for rotation on a horizontal axis; a supply chute terminating above said channel adjacent the lowermost point in the arc of rotation; a discharge chute facing the inside of said channel adjacent the highest point in the arc of rotation for receiving heated work pieces; and means for heating said ring to an elevated temperature comprised of a magnetic core having a leg extending through said ring and another leg having an electrically energized coil thereon.

3. A core type muffle furnace comprised of a ring, channel-shaped in cross section with the channel opening to the inside of said ring; means mounting said ring for rotation on a horizontal axis; a plurality of cleats extending transversely in said channel; a magnetic core linked through said ring; an electrical winding on said core for providing a magnetic field to heat said ring; means for feeding work pieces into the inside of said channel adjacent the lowermost point in the arc of rotation; and means for receiving heated work pieces adjacent the uppermost point in the arc of rotation.

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