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F. T. COPE

ANNEALING APPARATUS

Filed Feb. 23, 1925

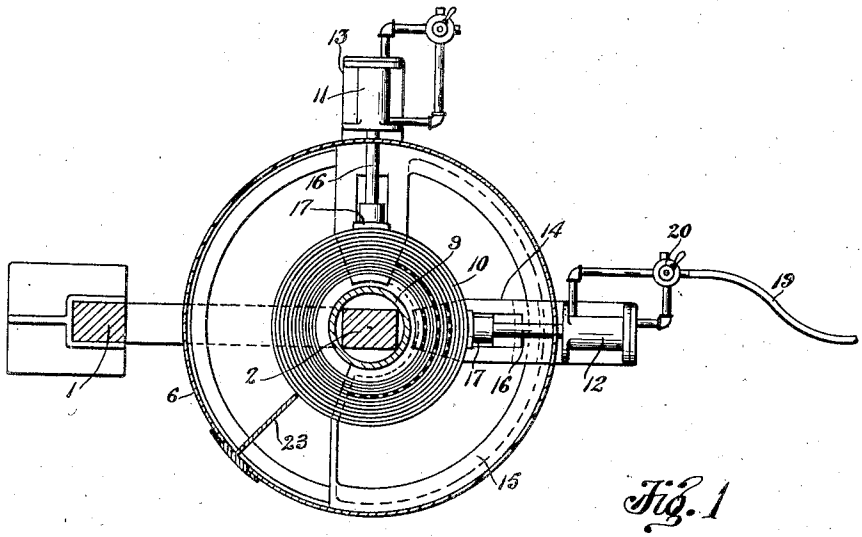


Fig. 1

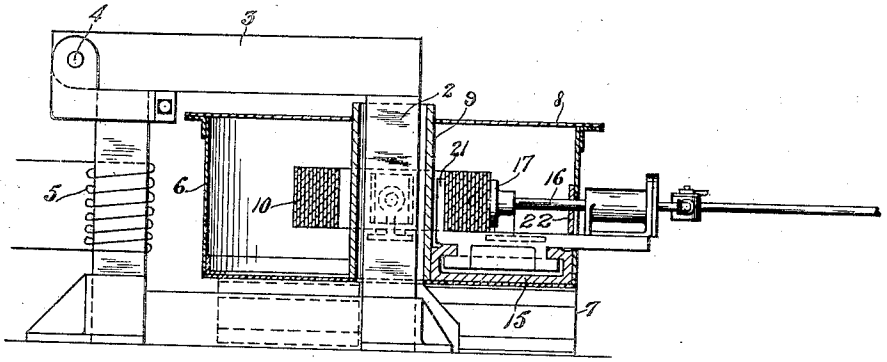


Fig. 2

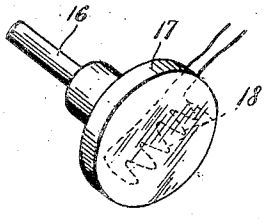


Fig. 3

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UNITED STATES PATENT OFFICE.

FRANK T. COPE, OF SALEM, OHIO, ASSIGNOR TO THE ELECTRIC FURNACE COMPANY, OF SALEM, OHIO, A CORPORATION OF OHIO.

ANNEALING APPARATUS.

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in. .tion relates to apparatus for annealing narrow strips or bands of metal, wire and the like. Products of this character are usually coiled upon reels or drums as they emerge from the rolls or forming apparatus.

In annealing material of this character it is customary to load a large number of the coils on a steel pan which is drawn into the furnace by means of a cable or chain haul apparatus, which passes through the back of the furnace. To discharge the annealed material from the furnace, the cable mechanism is reversed and the pan is withdrawn through the same door through which it entered the furnace. Due to the excessive wear upon these steel pans the upkeep upon the same is considerable. It is also found that coils of brass or copper are usually seriously oxidized and frequently warped by the weight of other coils resting upon the same. The coils nearest the outside of the pan receive more heat than those in the center, frequently resulting in burned stock near the outside of the pan and underannealed stock at the center of the pan.

The object of the above improvement is to provide an apparatus which will eliminate the above objections and which will evenly and uniformly anneal the coils of metal strips or wire without oxidizing.

The above and other objects may be attained by providing a transformer having only a primary coil, a portion of the core being movable to permit a coil of metal strip or wire to be placed upon the core, whereby the coil of material will act as the secondary coil of the transformer and will be heated by the current passing through the same.

Means may be provided for clamping all of the turns of the coil of material together and if desired, a closed container may be provided around the transformer core to receive the coil of material to be annealed and the container may be kept under a reducing or non-oxidizing atmosphere by the introduction of a suitable reducing or inert gas.

An apparatus embodying the invention is illustrated in the accompanying drawing, in which,

Figure 1, is a plan sectional view through the improved annealing apparatus;

Fig. 2, a vertical sectional view of the same, and

Fig. 3, a detailed perspective view of one of the clamping heads.

Similar numerals refer to similar parts throughout the drawing.

The apparatus includes a transformer having a core provided with the stationary U-shaped portion having the spaced upright arms 1 and 2 and the movable arm 3 hinged to the upper end of the arm 1 as at 4 and arranged to normally contact with the upper end of the arm 2.

The primary coil 5 is wound around the stationary arm 1 of the core, any desired number of turns being provided. A tank or container 6 surrounds the stationary arm 2 of the core and is supported in substantially the position shown in Fig. 2, upon the base 7, a removable cover 8 being provided upon the top of said container.

A sleeve 9, of alundum or similar non-conducting material, surrounds the coil 2 of the transformer and is spaced therefrom to permit an air blast to be directed up between said core and the sleeve in the event it is necessary to cool the transformer core.

The coil of metal strip or wire to be annealed is adapted to be placed within the tank or container 6, surrounding the sleeve 9, as indicated at 10. The lid 8 is then placed upon the receptacle and the hinged arm 3 of the core is lowered into contact with the arm 2, as shown in Fig. 1, and the current passed through the primary coil 5, the coil of material 10 acting as the secondary coil of the transformer and being heated to the proper temperature for annealing.

For the purpose of preventing oxidizing of the material under treatment, or to remove any scale which may be present upon the material, a reducing or non-oxidizing atmosphere may be maintained within the tank by admitting a reducing or inert gas to the same.

In order that the coil of material under treatment may constitute only a single turn of the secondary winding, it is desirable to clamp the several convolutions of the coil together, preferably at points adjacent to the inner and outer ends of the coil of material, in order that no portion of the material remains unannealed. In order to accomplish

this clamping action, two clamping devices are preferably provided, one of which is stationary and the other movable through an arc of substantially 180 degrees, whereby, regardless of the relative positions of the inner and outer ends of the coil, the material may be clamped at these points.

For the purpose of illustration, I have shown a pair of fluid cylinders 11 and 12, the cylinder 11 being preferably mounted upon a stationary bracket 13 and the cylinder 12 being carried upon a bracket 14, arranged to be slidably rotated upon the casing 15 located in the bottom of the tank 6, and covering substantially 180 degrees.

Each of the cylinders is provided with a plunger 16, having a clamping head 17 of heat resisting alloy adapted to engage the coil of material, and preferably provided with an electrical heating element 18 for keeping the head at proper temperature to overcome any chilling effect of the head when placed against the coil of material. This electrical heating element may be discontinued after the apparatus has been working for some time and the heads have come up substantially to the temperature of the coil.

A fluid pipe 19 communicates with each end of each cylinder, a four way valve 20 controlling the flow of fluid to the cylinder whereby the clamping head may be extended or retracted as desired. A flange 21 is mounted rigidly upon the inner end of each cylinder bracket and arranged to engage the inner surface of the coil of material which is clamped between said flanges and the clamping heads 17.

The cylinder 11 and its clamping mechanism may be insulated from the rest of the apparatus in any well known manner, in order that current may not flow from one cylinder to the other. The tank 6 is of course slotted to permit the rotation of the cylinder 12. The slot in the tank is closed at all times by means of the plate 22 carried by the supporting bracket for the cylinder 12.

It will be obvious that in an apparatus of this kind it is necessary that no metal excepting that under treatment form a complete circle or ring about the transformer core, in order to prevent heavy induced currents from being set up in such metal. For this reason the casting 15 is not continuous about the core 2 and the steel tank 6 has an insulating joint 23 which interrupts the continuity of the electrical current at the top, sides and bottom of the tank.

I claim:

1. An annealing apparatus including a core having a U-shaped portion, a primary winding upon one arm of the U-shaped portion, the other arm thereof being arranged to receive, in inductive relation thereto, a coil of material to be annealed, and means for clamping the coil of material transversely.

2. An annealing apparatus including a core having a U-shaped portion, a primary winding upon one arm of the U-shaped portion the other arm thereof being arranged to receive, in inductive relation thereto, a coil of material to be annealed, and means for clamping the coil of material transversely at each end of the coil.

3. An annealing apparatus including a core having a U-shaped portion, a primary winding upon one arm of the U-shaped portion, the other arm thereof being arranged to receive, in inductive relation thereto, a coil of material to be annealed, a stationary clamping head for clamping the coil of material transversely at one end of the coil and a movable clamping head for clamping the coil of material transversely at the other end thereof.

In testimony that I claim the above, I have hereunto subscribed my name.

FRANK T. COPE.