April 21, 1970 J. W. CANNON 3,508,024

DUAL INDUCTANCE INDUCTION HEATER

Filed June 17, 1968

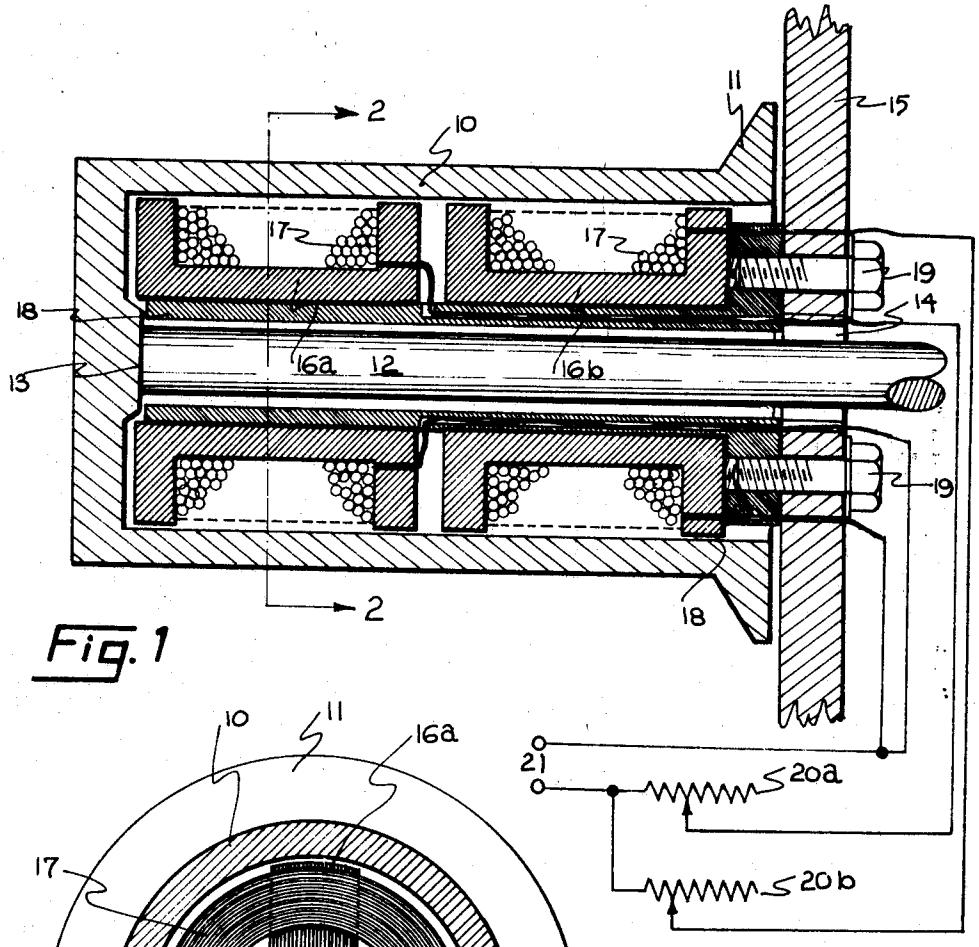

Fig. 1

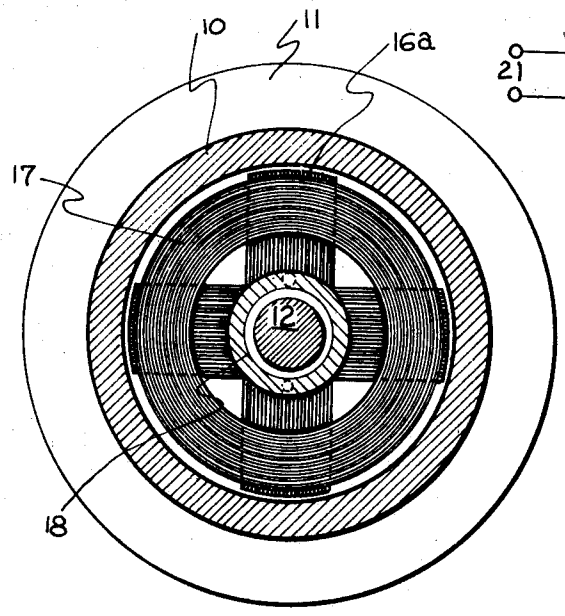

Fig. 2

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DUAL INDUCTANCE INDUCTION HEATER

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ABSTRACT OF THE DISCLOSURE

A rotatable induction type heater roll in the form of a hollow, metallic cylinder having internal windings upon independently supported stationary magnetic cores within the cylinder coacting with it to induce heating currents in its wall, each of the windings being energized with alternating current and controlled independently of the other to compensate for heat losses at the ends of the cylinder and to provide for a predetermined heat distribution over the lateral surface of the cylinder.

BACKGROUND OF THE INVENTION

Electric heaters of the roll type are useful in many industrial applications such as the heating of synthetic fibers in the processing of threads and the like. Careful attention is necessary to accurate regulation of heating of these fibers; consequently, it has been found that induction type heaters lend themselves to such use. Normally the induction type roll heater includes a metallic, hollow cylinder which rotates around a magnetic core arrangement within the cylinder, the core having windings excited by alternating current and the resulting magnetic flux inducing heating currents in the cylinder.

Heat losses at the ends of the cylinder, however, present a problem, and to compensate for these losses internal sleeves, rings, and the like are introduced to provide additional heat at the ends of the cylinder as illustrated, for example, in copending application Ser. No. 731,952 filed May 24, 1968, now abandoned. These supplemental heating components are economical; however, where extreme accuracy is required in heat regulation other means may have to be resorted to.

SUMMARY OF THE INVENTION

The present invention provides a means for providing very accurate heat distribution in an induction type electric heater roll by making use of two or more independent magnetic flux sources within a heater roll, each source being controlled independently as to the amount of flux provided to the heater roll. By spacing these independent, variable flux sources within the heater roll a diversity of heating patterns may be obtained upon the lateral surface of the roll.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 shows a sectional view of a roll type heater having two independent magnetic flux sources.

FIGURE 2 is a cross-sectional view of FIGURE 1 along the line 2—2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGURES 1 and 2 a cylinder **10** composed of steel or other conductive metal having a flange **11** represents the form of a conventional induction heater roll. The roll **10** is supported by a shaft **12** attached to the inner end of the cylinder at **13**, the shaft **12** being supported in a bearing **14** carried by a support **15** and being rotated by some means such as an electric motor (not shown). Supported within the cylinder **10** are cores **16***a* and **16***b* having similar windings **17**, the cores being supported by a member **18** cleared by the shaft **12** and the member **18** being bolted to the support **15** via bolts **19**. Leads from the windings **17** of the cores **16***a* and **16***b*, respectively, are brought out to rheostats **20***a* and **20***b*, and the common lead of the windings, together with the common lead of the rheostats **20***a* and **20***b*, is connected to an alternating current source **21**.

The cores **16***a* and **16***b* are identical and may be of multi-pole construction (four poles being shown); however, the number of poles is not important. Clearance between the inner surface of the cylinder and the ends of the pole pieces of the cores **16***a* and **16***b*, however, should be at a minimum consistent with the expansion of these members under heated conditions. The cores, however, may be spaced along the axis of the cylinder either symmetrically, as shown in FIGURE 1, or concentrated near the ends of the roll to permit compensation for heat losses. In other words, the flux sources provided by these plural cores (and their windings) may be spaced within the cylinder **10** to accommodate the heating requirements. However, since each of the flux sources (core and winding) has a limited range of variation of flux via their respective control rheostats **20***a* and **20***b*, the spacing of these flux sources along the length of the cylinder must be such that their axial separation along the cylinder's length is no more than will permit the desired heat pattern to be obtained at the overall lateral surface of the cylinder. Otherwise a cool area might be obtained near, or at the center of, the length of the cylinder, in the event these flux sources were concentrated too near the ends of the cylinder, or cool areas at the ends of the cylinder, were these flux sources concentrated too near the center of the length of the cylinder.

While the invention has been explained and described with the aid of particular embodiments thereof, it will be understood that the invention is not limited thereby and that many modifications retaining and utilizing the spirit thereof without departing essentially therefrom will occur to those skilled in the art in applying the invention to specific operating environments and conditions. It is therefore contemplated by the appended claim to cover all such modifications as fall within the scope and spirit of the invention.

What is claimed is:

1. A single phase induction heater for a rotating metallic cylinder comprising a plurality of H-shaped, independent magnetic cores axially arranged therewithin with the poles of said cores adjacent the internal lateral surface of said cylinder, a single winding upon each said core, a common source of alternating current connected to each said winding for generating magnetic flux in the core thereof, and a separate rheostat in series with each said winding for controlling the flux of said winding independently of that of any other winding.

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