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HEATER FOR EXTRUSION PRESS CONTAINER

Filed June 13, 1968

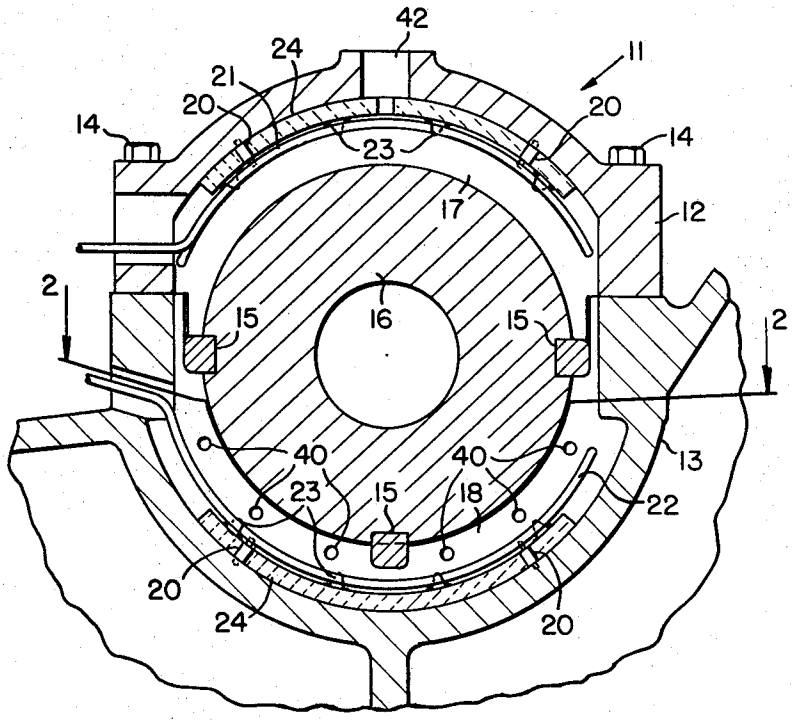


FIG. 1

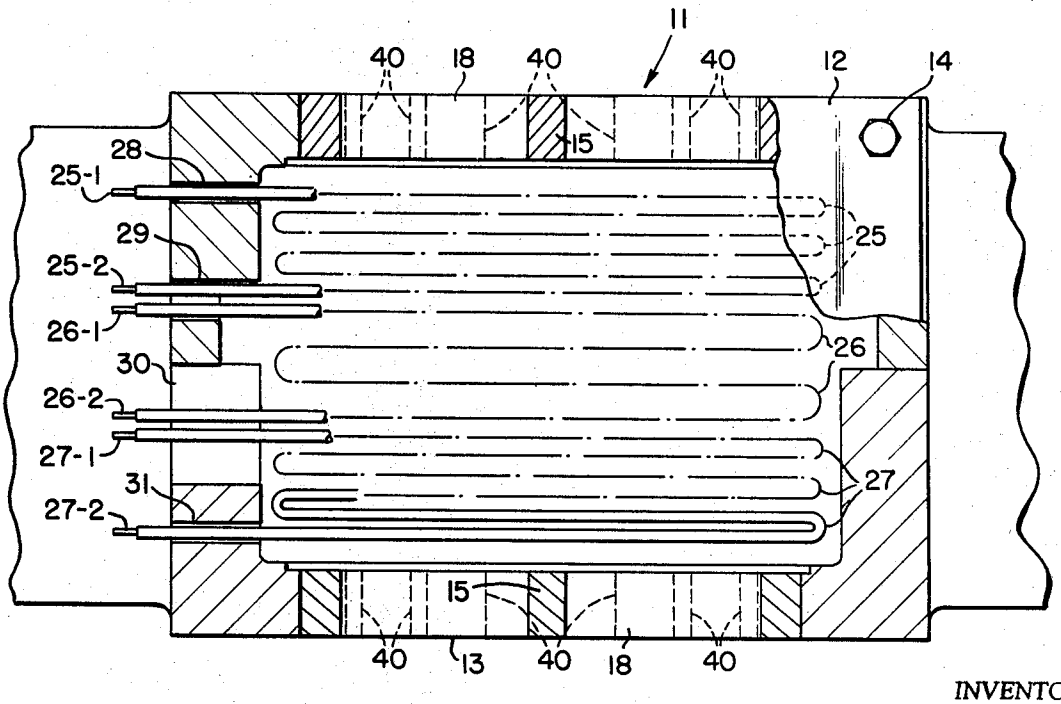


FIG. 2

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HEATER FOR EXTRUSION PRESS CONTAINER

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U.S. Cl. 219—422 2 Claims

ABSTRACT OF THE DISCLOSURE

Two arcuate heater coils are mounted, respectively, in the opposed, upper and lower sections of a container housing. Each coil comprises three heater elements; and each element comprises a plurality of convolutions extending generally transversely of the housing axis. The longitudinally center or middle element of each coil has fewer convolutions, and its convolutions are spaced further apart than are the convolutions of the two outer elements of each coil, so that when the coils are energized, less heat is developed at the center of the housing than at its ends. At each end the housing has a plurality of holes therein for venting the housing interior so heat from inside the housing may flow over opposite ends of the container to maintain its temperature uniform.

This invention relates to extrusion presses, and more particularly to an improved electric heater for the billet container of a metal extrusion press. Even more particularly, this invention relates to an improvement over the heater disclosed in my U.S. application Ser. No. 491,118, filed Sept. 29, 1965, now Pat. No. 3,385,953, granted May 28, 1968.

Electric radiant heating of extrusion press containers has usually been accomplished by applying three-phase power to one or more heater coils or conductors, which are mounted in the container housing to surround the container. For best results, it is essential that the heater distribute its heat uniformly to the container.

Prior such heaters, however, have tended to concentrate the greatest quantity of heat at the longitudinal center of the container housing, with consequent nonuniform heating of the container, and hence the billet passing therethrough. This also causes excessive strain on the heater element and connections located centrally of the housing, and thus tends to shorten the life of the heater. Moreover this construction makes it difficult to control the container temperature accurately by known temperature-responsive instruments.

An object of this invention is to provide an improved container heater, which is more efficient, and which will have a substantially longer operating life, than prior such heaters. To this end a major object of this invention is to provide an improved container heater which distributes heat much more uniformly than prior such heaters.

Another object of this invention is to provide an improved container heater which is designed to heat the container housing uniformly, thereby simplifying the instrumentation needed to control the operation of the heater.

Still another object of the invention is to provide an improved container housing in which it is substantially easier to maintain uniform heater temperatures throughout the entire length of the housing as compared to prior such housings.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawing.

In the drawing:

FIG. 1 is a fragmentary vertical section through a billet container and housing equipped with a heater made in accordance with one embodiment of this invention; and

FIG. 2 is a slightly enlarged, fragmentary sectional view of this housing taken along the line 2—2 in FIG. 1 looking in the direction of the arrows, with the billet container removed to illustrate the lower section of the housing and portions of the heater mounted therein, and with a minor portion of the upper section of the housing shown in full merely for purposes of illustration.

Referring now to the drawing by numerals of reference, **11** designates a container housing comprising upper and lower sections **12** and **13**, respectively, which are removably secured to one another by bolts **14**. Housing sections **12** and **13** have integral bearing portions at both ends, denoted at **17** and **18**, respectively. Removably secured between the sections **12** and **13**, and seated on and supported by the bearing portions **17** and **18**, is the billet container **16**. Keys **15**, which engage in aligned slots in the container and in the bearing portions **18**, serve to hold the container against rotation in the housing.

Intermediate their bearing portions **17** and **18** sections **12** and **13** accommodate arcuate-shaped upper and lower heater coils **21** and **22**, respectively. These coils **21** and **22** are mounted in their respective sections **12** and **13** on metal clips **23**, which are secured to arcuate insulating blocks **24** that are fastened, in turn, to the respective housing sections by studs **20**.

Lower coil **22** comprises a plurality (three in the embodiment illustrated) of electric heater elements **25**, **26** and **27** (FIG. 2), each of which extends transversely of the container, and in addition to being curved coaxially with the container, is wound back and forth several times in opposite directions intermediate its ends to form a plurality of legs (six in the embodiment illustrated for the outer elements **25** and **27**, and four for inner or middle element **26**). In one side thereof, the left side as illustrated, the lower housing section **13** has therethrough a plurality of spaced ports or openings **28**, **29**, **30** and **31**. Opposite ends **25–1** and **25–2** of element **25** project out of openings **28** and **29**, respectively; opposite ends **26–1** and **26–2** of element **26** project out of openings **29** and **30**, respectively; and opposite ends **27–1** and **27–2** of element **27** project out of openings **30** and **31**, respectively. These ends **25–1**, **25–2**, **26–1**, **26–2**, **27–1** and **27–2** are removably connected by conventional means (not illustrated) to a nearby circuit box, where they are wired to a known control circuit.

Coil **21** also comprises three serpentine heater elements, and in plane view constitutes substantially a mirror image of the coil **22** illustrated in FIG. 2. Coil **21**, like coil **22**, is adapted to be connected to a known control device or circuit, which may be of the type disclosed in my said copending application, so that these coils are automatically energized periodically to maintain the container **16** at a substantially constant temperature. Since it forms no part of the instant invention the above-referred to control device has not been described in detail herein.

The coils **21** and **22** of the present application differ from the structure of my prior patent, among other things, in that the spacing of adjacent convolutions of each coil is varied along the length of each coil, and is increased toward the longitudinal center of each coil. In the embodiment illustrated, the legs of the center element **26** in the lower housing section **13** are fewer in number, and are spaced further from one another, than are the legs of the outer elements **25** and **27**. The same is true, of course, of the middle or center element in the upper housing section **12**. This variation in the spacing

of the legs of the upper and lower coils **21** and **22** produces less heating at the center of housing **11**, and consequently produces a more uniform distribution of heat to container **16**.

This uniform distribution of heat in the container housing **11** is further enhanced by providing the bearing portions **18** at opposite ends of the lower housing section **13** with a plurality of spaced, parallel holes **40**, which vent the space between the container **16** and the housing **11**. This permits heat to flow over opposite ends of the container to even out its temperature.

In use heater coils **21** and **22** are operated to elevate and maintain the temperature of the container **16** above a predetermined level during operation of the press, so that the billet will be extrudable through the die (not shown) which is mounted in usual manner to the rear of the housing **11**, when the ram of the press (not shown) forces the billet out of the container through the die in conventional fashion. The container temperature may be detected by a thermocouple mounted in a heat sink **42** in upper section **12**. By spacing the legs of the central elements of coils **21** and **22** further apart than the outer elements, and by use of the vents or openings **40** in the lower section **13**, it has been found that the temperature of the container **16** can be maintained substantially uniform throughout its length, so that the single thermocouple in heat sink **42** is all that is necessary to monitor the container temperature accurately. Moreover, the uniform heating achieved not only permits the use of simpler and more reliable control means for the heater, but also contributes to a substantially longer heater life.

While this invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. In an extrusion press having a billet container, and a housing surrounding said container, said housing having therein a pair of internal, axially spaced, arcuate bearing portions engaging said container adjacent opposite ends thereof to support said container in said housing in radially spaced, coaxial relation thereto, billet heating apparatus, comprising

arcuate electric heater coils mounted in said housing to overlie diametrially opposite sides, respectively, of said container, and adapted to be connected to a power source at the exterior of said housing for energization thereby,

each of said coils comprising a plurality of spaced legs extending transverse to the axis of said container and wound back and forth in serpentine fashion,

one coil at each side of said housing being positioned centrally between at least two other coils at the same side of said housing and having its legs spaced further apart than the legs of said two other coils, and

at least a portion of each of said bearing portions having therethrough a plurality of spaced holes extending parallel to the axis of said housing and communicating at their inner ends with the space between said container and said housing, and at their outer ends with the exterior of said housing, thereby to vent said space between said container and said housing.

2. An extrusion press as defined in claim **1**, wherein said one coil has fewer legs than said other coils.

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VOLODYMYR Y. MAYEWSKY, Primary Examiner

U.S. Cl. X.R.

13—22; 72—272; 219—478