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SEPARATOR PLATE

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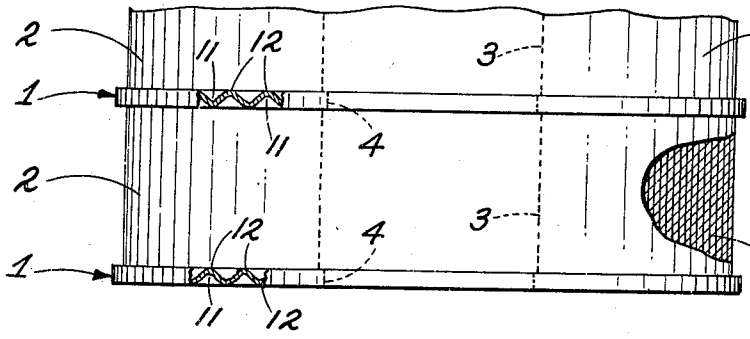

Fig. 1

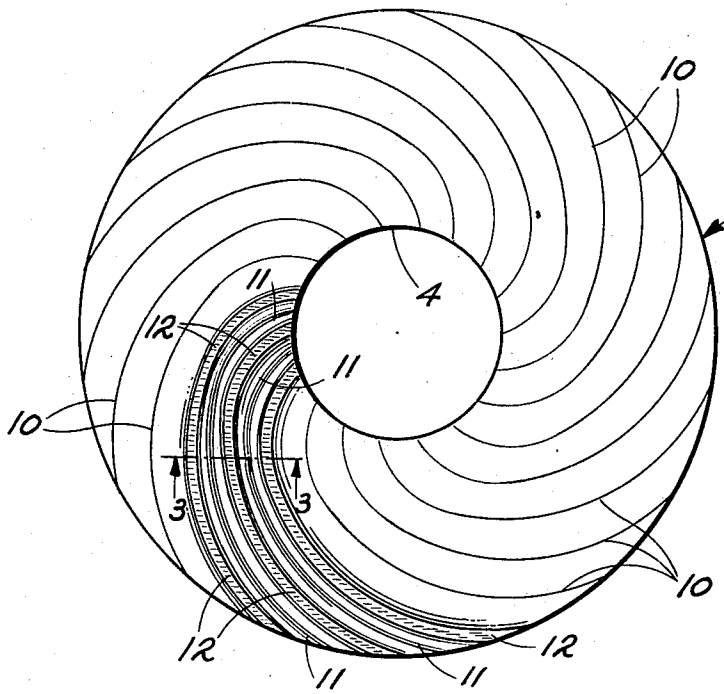

Fig. 2

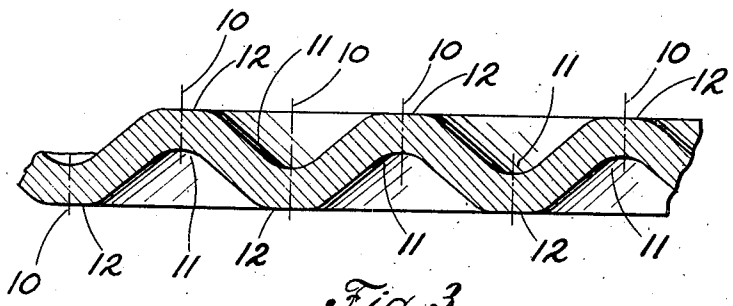

Fig. 3

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SEPARATOR PLATE

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This invention relates to the art of heating metal coils and is particularly concerned with a new plate for use in separating and supporting such coils during heating.

Many different types of separators for use with coils while being heated have been proposed and several have been used. All such separators with which we are familiar have been fabricated by welding narrow, metal bars on edge to one or more ring-like plates, that is, plates having axial openings for the flow of hot gases therethrouugh. Usually the bars curve outwardly and extend from near the inner periphery to or beyond the other periphery of the plate or plates.

These prior fabricated separators possess certain inherent disadvantages. They are expensive to make because of the cost of the material and the cost of fabricating; they are subjected to differential expansion and contraction which creates forces tending to break the welds; when the bars are between the plates the hot gases do not transfer their heat directly to the coils; and where the plates are between the bars, expansion of the coils may exert forces on the bars tending to break the welds.

The present invention aims to avoid all these and other disadvantages of prior separators and attains this aim by providing a cast metal separator of new form and characteristics.

This invention will be better understood by those skilled in the art from the following specification and the accompanying drawings in which:

Fig. 1 is a fragmentary side elevational view partly in section showing separators embodying the present invention assembled with metal coils for use while heating the latter;

Fig. 2 is a plan view of one of the separators of Fig. 1; and

Fig. 3 is a fragmentary sectional view taken on line 3—3 of Fig. 2.

In Fig. 1, two of the corrugated separators or plates 1 of this invention are shown assembled with two coils of strip metal 2, as they might be assembled in a furnace for heating. Each coil 2 has a central opening 3 through which heated gases may flow.

The corrugated plate 1 is provided with a central opening defined by an inner periphery 4, the diameter of this opening being slightly less, preferably, than the diameter of opening 3 through the coils and the outer periphery of the plate being slightly greater than that of the coil so that all the turns of the coils will be supported by the plate.

The plate 1 is a metal casting and consists of suitable heat and oxidation resisting metal, for example, stainless steel. This plate is corrugated, the corrugations curving outwardly from the inner periphery on an involute curve of such a nature that the center lines of adjacent corrugations are substantially parallel for their full length. This formation of the corrugations provides valleys between adjacent corrugations which are of approximately the same width from the inner periphery

of the plate to the outer periphery and hence afford passages of substantially uniform cross-sectional area for gases to travel from the central opening in the plate along the adjacent edge of the coil engaging plate. The gases flow through these valleys with minimum changes in velocity such as are traceable to cooling of the gases. As a result, the rate of heat transfer is substantially uniform.

By reason of the corrugations and their curvature the plate may expand and contract without the cracking which occurs in the prior fabricated separators.

In Fig. 3 the center lines of the corrugations are indicated at 10 and the valleys are indicated at 11. The crests of the corrugations have flat surfaces 12 to provide relatively wide support for the edge of a coil 2 resting thereon. All the crests 12 on one side of the plate lie in substantially the same plane and all the crests on the other side of the plate lie in substantially another plane with the two planes being substantially parallel to one another.

The plate illustrated in the drawings was five feet in diameter and had a central opening twenty inches in diameter. The inner ends of the center lines of the corrugations intersected the inner periphery 4 of the plate at 20° intervals. The involute curves for the corrugations were described as follows: A tape was fixed at one of these 20° points and was wrapped about 160° around the inner periphery 4 of the plate. A scribe was fixed to the free end of the tape and described the involute curve as the tape was unwound while being kept taut. The center lines of the other corrugations were described in a similar manner by moving the fixed end of the tape to each of the 20° points. The center lines of the corrugations so described were approximately 3.49 inches apart and the flat surfaces of the crests were about ⅞ inches wide. The plate 1 was about 1½ inches thick measured from the plane of the crests on one side to the plane of the crests on the other side thereof.

It will be understood that the foregoing dimensions have been given merely for the purpose of illustration and to enable those skilled in the art to practice the invention. It will also be understood that the thickness and diameter of the plate, as well as the diameter of its central opening, may be varied as desired and that, similarly, the width of the crests of the corrugations, the spacing between the corrugations and the precise curvature of the center line of the corrugations may be changed to suit conditions or as may be desired.

Having thus described this invention in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains to make and use the same, and having set forth the best mode contemplated of carrying out this invention, we state that the subject-matter which we regard as being our invention is particularly pointed out and distinctly claimed in what is claimed, it being understood that equivalents or modifications of, or substitutions for, parts of the above specifically described embodiment of the invention may be made without departing from the scope of the invention as set forth in what is claimed.

What is claimed is:

1. A separator for use with metal coils to be heated, comprising, a cast metal annular plate having an upper and a lower metal surface with a substantially constant thickness of solid metal therebetween along a radial section of said annular plate, said surfaces being substantially parallel and being formed so as to produce corrugations described by an involute curve extending from the inner periphery of the annulus to its outer periphery with the center line of each corrugation being substantially equally distanced for its length from the center line of corrugations on each side thereof.

2. A separator for use with metal coils to be heated, comprising, a cast metal annular plate having an upper and a lower metal surface with a substantially constant thickness of solid metal therebetween along a radial section of said annular plate, said surfaces being substantially parallel and being formed so as to produce corrugations described by an involute curve extending from the inner periphery of the annulus to its outer periphery with the center line of each corrugation being substantially equally distanced for its length from the center line of corrugations on each side thereof, each of said corrugations having flattened crests with the crest on either side of the plate lying in a plane and with the two planes being substantially parallel.

References Cited in the file of this patent

UNITED STATES PATENTS

1,938,306	Webb	Dec. 5, 1933
2,489,012	Dailey, Jr.	Nov. 22, 1949
2,671,656	Winder	Mar. 9, 1954