Aug. 13, 1963 C. J. RUBRECHT ET AL 3,100,634

COIL SUPPORT FOR ANNEALING FURNACE

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Fig.1.

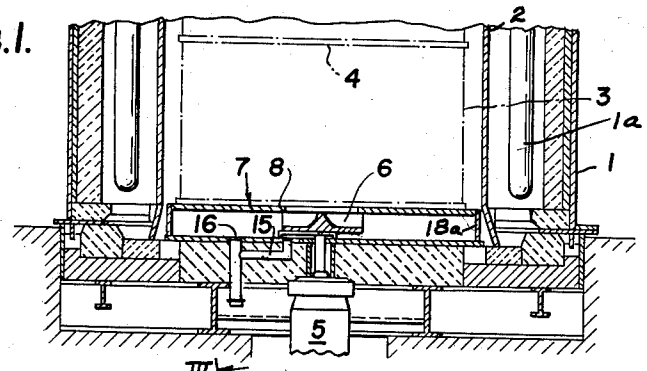
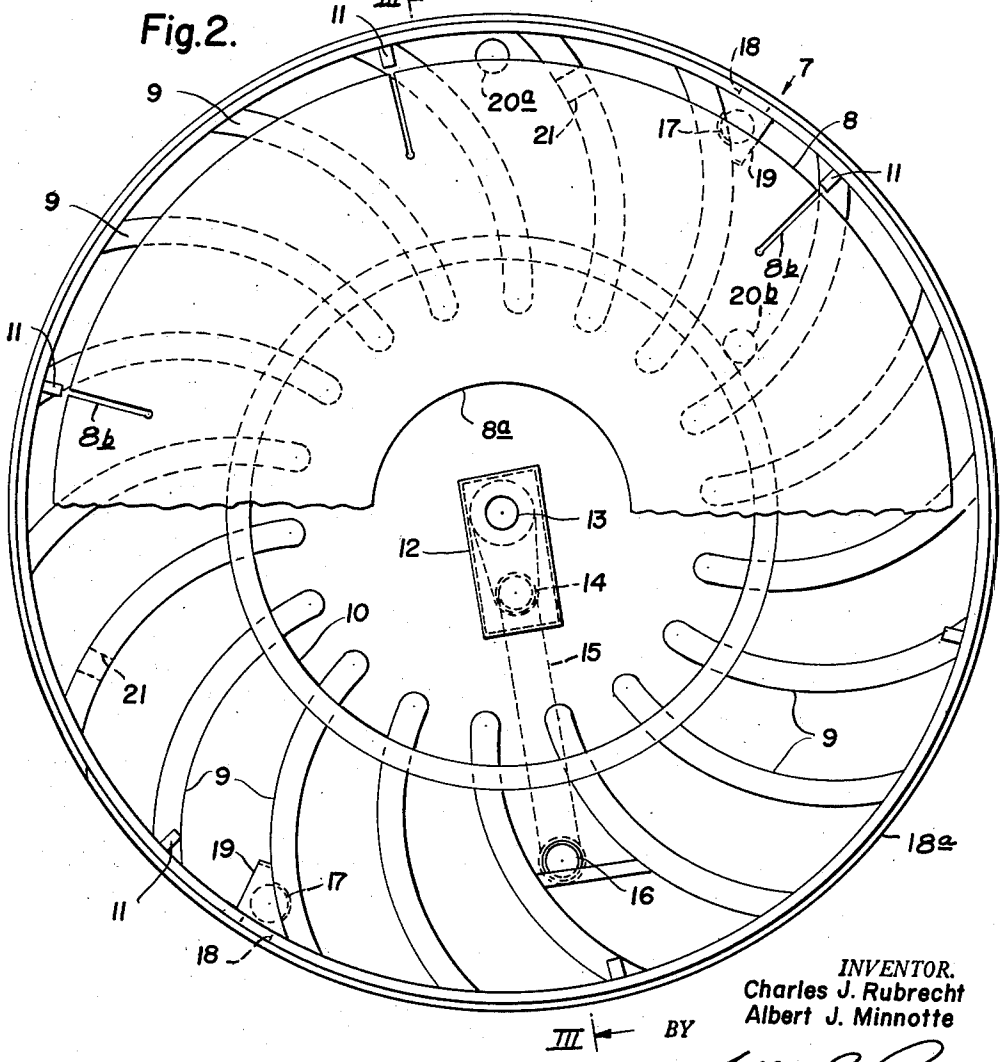


Fig.2.



INVENTOR.
Charles J. Rubrecht
Albert J. Minnotte

BY

William J. Ruano

their ATTORNEY

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Fig.3.

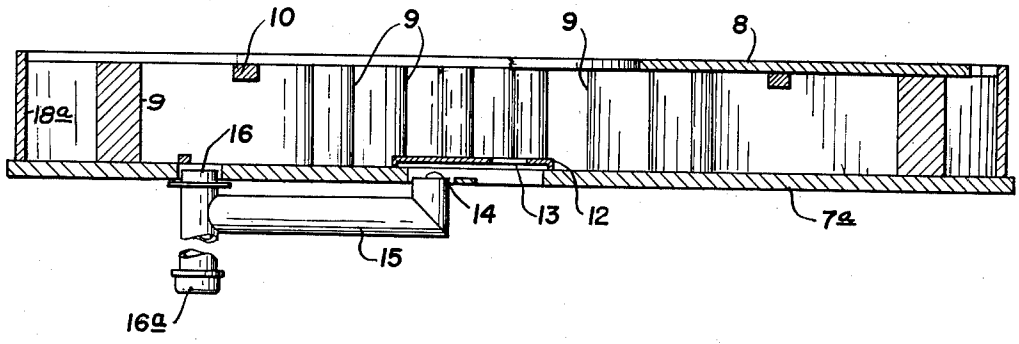


Fig.4.

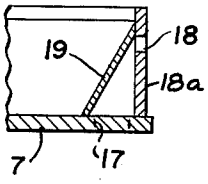


Fig.5.

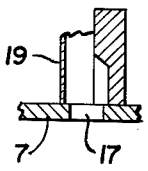


Fig.6.

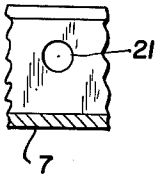
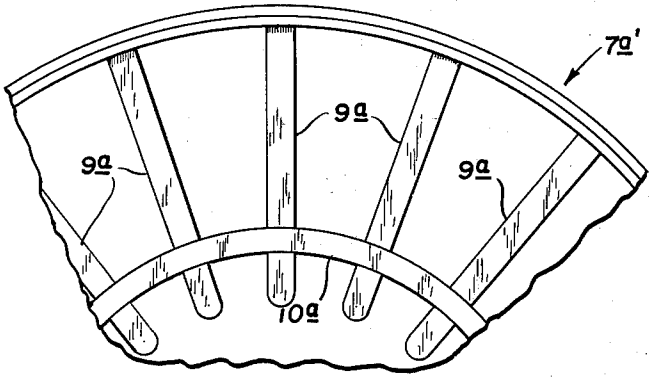


Fig.7.



INVENTOR.
Charles J. Rubrecht
Albert J. Minnotte

BY William J. Ruano

their ATTORNEY

United States Patent Office 3,100,634 Patented Aug. 13, 1963

3,100,634

COIL SUPPORT FOR ANNEALING FURNACE

Charles J. Rubrecht, Allison Park, and Albert J. Minnotte, Pittsburgh, Pa., assignors to Metaline Corporation, Bridgeville, Pa.

Filed Sept. 23, 1960, Ser. No. 58,002
2 Claims. (Cl. 263—47)

This invention relates to a coil support for annealing furnaces and, more particularly, to a charge support and diffusing structure useful for the purpose of supporting a stack of coils of strip steel while being annealed in a rectangular or bell-type furnace, such furnace being well known and commonly used in the steel industry.

An outstanding disadvantage arising from the use of conventional base structures and diffusers in coil annealing furnaces has been that due to the very heavy loads imposed by the stack of coils and the high temperatures encountered, there is a great tendency for the base or coil supports to collapse or, at least, to become warped or distorted, thus throwing other parts out of alignment or proper relationship.

We have found that this difficulty may be traced to the lack of a properly constructed base or coil support and diffuser assembly.

An object of our invention, therefore, is to provide a novel coil support and diffuser assembly for supporting coils in an annealing furnace in a manner so as to obviate the above named shortcomings and disadvantages of coil supports heretofore used.

A more specific object of our invention is to provide a novel coil support and diffuser for annealing furnaces, which support is mechanically constructed in a manner so as to provide amazingly higher strength and reinforcement than prior supports, while being no heavier, and which will withstand loads far in excess of loads withstood by prior structures, also which will have no tendency to distort, warp or collapse as a result of heavy loading or abnormally high temperatures or thermal shock stresses.

Other objects and advantages will become more apparent from a study of the following description taken with the accompanying drawings wherein:

FIG. 1 is a fragmentary portion, shown in vertical cross-section, of the lower part of a bell type of coil annealing furnace, which furnace is well known in the art;

FIG. 2 is an enlarged, top or plan view of the base or charge support and diffuser, shown in FIG. 1 and embodying the present invention, showing a portion of the cover plate broken away for the purposes of clarity of illustration;

FIG. 3 is a vertical, cross-sectional view taken along line III—III of FIG. 2;

FIG. 4 is a fragmentary, vertical cross-sectional view taken through baffle plate **19** of FIG. 2;

FIG. 5 is a view similar to FIG. 4 showing a portion of the baffle plate spaced from that illustrated in FIG. 4;

FIG. 6 is a fragmentary, cross-sectional view showing a portion of the rib **9** which has a lifting hole **21**; and

FIG. 7 is a fragmentary, top or plan view of a modified form of the base or coil support and diffuser showing straight radial ribs instead of curved ones.

Referring more particularly to FIG. 1 of the drawing, numeral **1** denotes a heating hood or furnace bell having a closed top portion (not shown) and an opened bottom portion, and numeral **2** denotes a bell type muffle which encloses a stack of coils **3** of strip steel, supported on end, and which coils are separated by separators or spacers **4** for the purpose of providing gas passages therebetween, as well known in the art. Internally fired radiant tubes **1***a* heat the gas.

Numeral **5** denotes a motor which drives an air circulating fan **6**, the blades of which are adapted to force air radially outwardly so as to draw air downwardly from the central space or circular opening within the coils **3**, then through the coil support and diffuser assembly, denoted generally by numeral **7**, and upwardly in the space surrounding the coils.

The present invention relates to the specific construction of the coil support or base and diffusing assembly **7** which is shown more clearly in FIG. 2. The base **7** comprises a bottom metal plate **7***a* of circular configuration upon which is mounted and supported, in end relationship, a plurality of ribs **9** of thick steel, which ribs are of involute form, extending along curves which are generally radial and having inner ends which point generally to the center of bottom plate **7***a*. The peripheries of the bottom ends of ribs **9** are welded to the bottom plate **7***a* to form an integral structure therewith. Spaced from the radially inward ends of ribs **9** there are provided, on the top surfaces or ends of the ribs **9**, notches or grooves disposed in a circular path and in which is supported an inner metal ring **10**, which extends only throughout the height of the top portion of ribs **9**, as shown more clearly in FIG. 3. Ribs **9**, for example, may have a thickness of about 2 inches and a height of about 6 inches, or any other height, whereas the inner ring **10** has a thickness of about 1 inch but a height of only about 1 inch. Inner ring **10** may be welded to the top, notched out portions of ribs **9** so as to form an integral structure therewith. Welds are also preferably provided between the radially outward ends of ribs **9** and the outer ring **18***a*, such welds being made along the top of the end portions of ribs **9** which join the outer ring, also the weld may be made along the vertically extending joints between ribs **9** and the outer ring **18***a*. Instead of welding as described above welds may be made only between the central portions of the ribs and bottom plate **7***a* to allow free expansion of both ends of the ribs.

The cover plate **8** is of somewhat smaller diameter than the outer ring **18***a* to provide an air space therebetween for the flow of air drawn into the spaces between the ribs **9**, as shown more clearly in FIG. 2. A circular opening **8***a* is made in the central part of the cover plate **8**. A plurality of metal bars of short length **11** are welded on the top outer ends of certain of the ribs **9**, as shown in FIG. 1, to serve as supporting ledges, the top surfaces of which are substantially in the same plane as the top of outer ring **18***a*. Radially extending grooves or slots **8***b* are formed or burned into the cover plate **8**, as shown, along spaced peripheral portions.

In operation, as the fan blades **6** are rotated so as to suck air downwardly from the center of the stack of coils **3** to be annealed, the air will flow into an opening **13** formed in cover plate **12** and will flow through the inlet opening **14** of a pipe **15** which leads radially outwardly to a vertical pipe **16** to conduct air or heated gas to the space between the ribs **9**. The bottom of pipe **16** is closed by a cap **16***a*. Air which is thrown out by centrifugal force by blade **6** will move radially outwardly and will be deflected upwardly by baffles **19**, as shown in FIGS. 4 and 5, and will flow through the space between the outer periphery of top plate **8***a* and the outer ring **18***a*. Atmosphere outlet openings **17** are provided in the bottom plate **7**. Openings **21** are provided in certain of the ribs for facilitating lifting of the base assembly. Openings **20***a* and **20***b* are for the purpose of inserting thermocouples or other instruments. The remaining parts of the base are substantially the same as described above in connection with FIGS. 1–6.

Top plate 8, in some instances, may be omitted from the structure shown in FIGS. 1–7.

By omitting both the top plate 8 and the bottom plate 7*a*, the structure described in FIGS. 1–7 may also be used either as a base or as separators to take the place of separators 4, shown in FIG. 1, in which case, of course, the diameter of the outer ring will be made smaller as well as that of the inner ring.

Both the curved ribs of FIG. 2 and the straight ribs of FIG. 7 also provide greater uniformity of distribution and circulation of heated air.

Thus it will be seen that we have provided an efficient base and diffuser that solves the problem of distortion, warping and collapsing that has plagued the art.

FIG. 7 shows a modification 7*a'* of the support having straight radial ribs 9*a*, instead of curved ones, the inner end portions of which are joined together by inner ring 10*a* in the manner as described above for ribs 9 and ring 10. The remaining parts of the base are substantially the same as in FIGS. 1–6.

Therefore, we have provided a highly reliable, efficient and an amazingly strong support or base and diffuser for supporting a stack of coils to be annealed in a bell-type or rectangular furnace, which base and diffuser assembly is reinforced in such manner as to avoid any possibilty of warping or distortion or collapsing of the generally radially extending ribs separating the top and bottom plates of the base, despite abnormally high and enormous loads provided by the annealing coils, or high temperatures encountered, or stresses resulting from loading or non-uniformity of temperatures.

While we have illustrated and described several embodiments of our invention, it will be understood that these are by way of illustration only, and that various changes and modifications may be made within the contemplation of our invention and within the scope of the following claims.

We claim:

1. A support and diffuser for supporting coils to be annealed in a bell-type furnace, comprising a base plate having a central opening adapted to accommodate a fan portion, a plurality of substantially radially extending, spaced metal ribs supported on and welded to said base plate, the inner end portions of said ribs having transversely extending slots formed only in the upper surface portions of said ribs, said slots defining a circular path, a metal ring supported in said slots and integrally welded to the top end portions of said ribs so as to tie the ribs together, the top surface of said ring being flush with the top surfaces of said ribs, an outer ring engaging the outer ends of said ribs, and a top plate of smaller diameter than said outer ring and directly supported on said ribs and said inner ring to form a platform for supporting the coils to be annealed, said top plate having a central opening, whereby an air space is provided between the perimeter of said top plate and the inner surface of said outer ring to allow air flowing between said ribs to communicate with the space exterior of the outer periphery of said coils.

2. A support and diffuser as recited in claim 1 wherein radially extending, peripherally spaced slots are formed only in the outer peripheral portion of said top plate.

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