United States Patent

[11] 3,586,302

[72] Inventor **Robert Lee Corbett, Jr.**
22732 Westlake Road, Rocky River, Ohio 44116

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[45] Patented **June 22, 1971**

[54] **LOAD SUPPORT DIFFUSER**
16 Claims, 13 Drawing Figs.

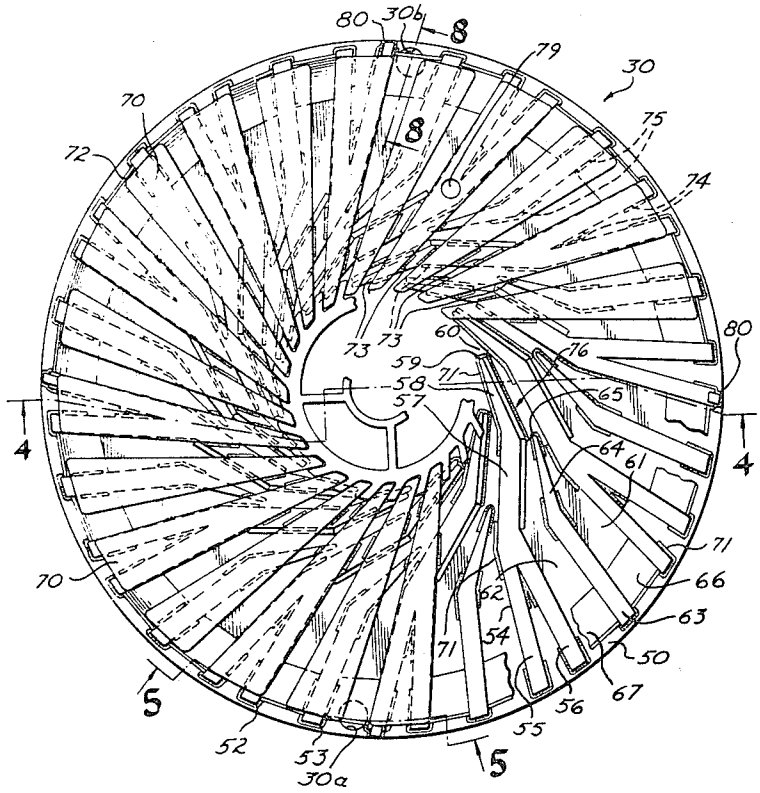
[52] **U.S. Cl.** **263/47,** 266/5
[51] **Int. Cl.** **F27d 5/00**
[50] **Field of Search** ..... 263/42, 43, 47 A, 47; 266/5 B, 3; 13/21—25

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Primary Examiner—J Spencer Overholser
Assistant Examiner—John S. Brown
Attorney—J. H. Slough

ABSTRACT: There is disclosed herein a unitized assembly adapted to support vertically stacked coils in an annealing furnace and diffuse a protective atmosphere gas within said furnace, the assembly comprising a flat base, means defining a central opening for receiving a blower or recirculating fan, structural members defining generally outwardly directed flow controlling passages, deflectors for diffusing the gas upwardly at the periphery of the support, and integral support bars carried by said structural members.



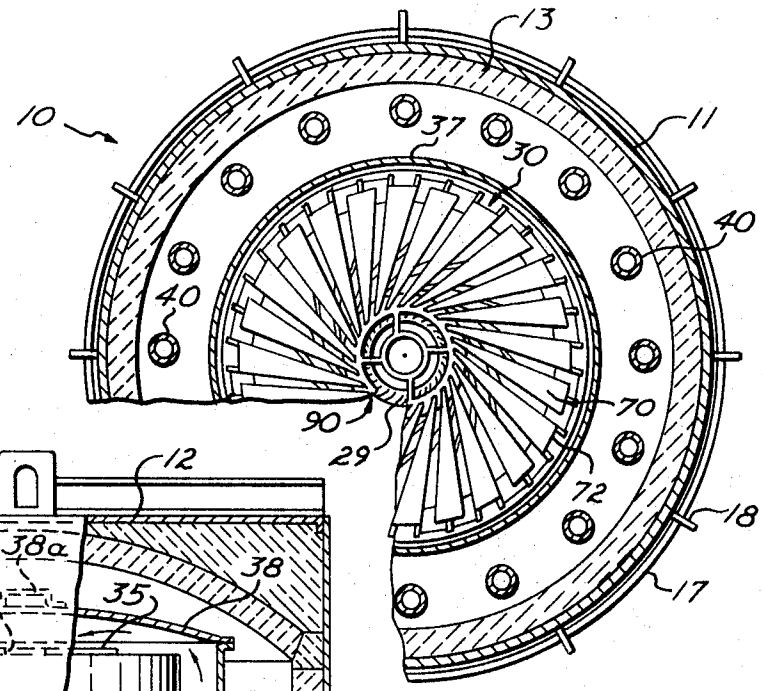


Fig. 2

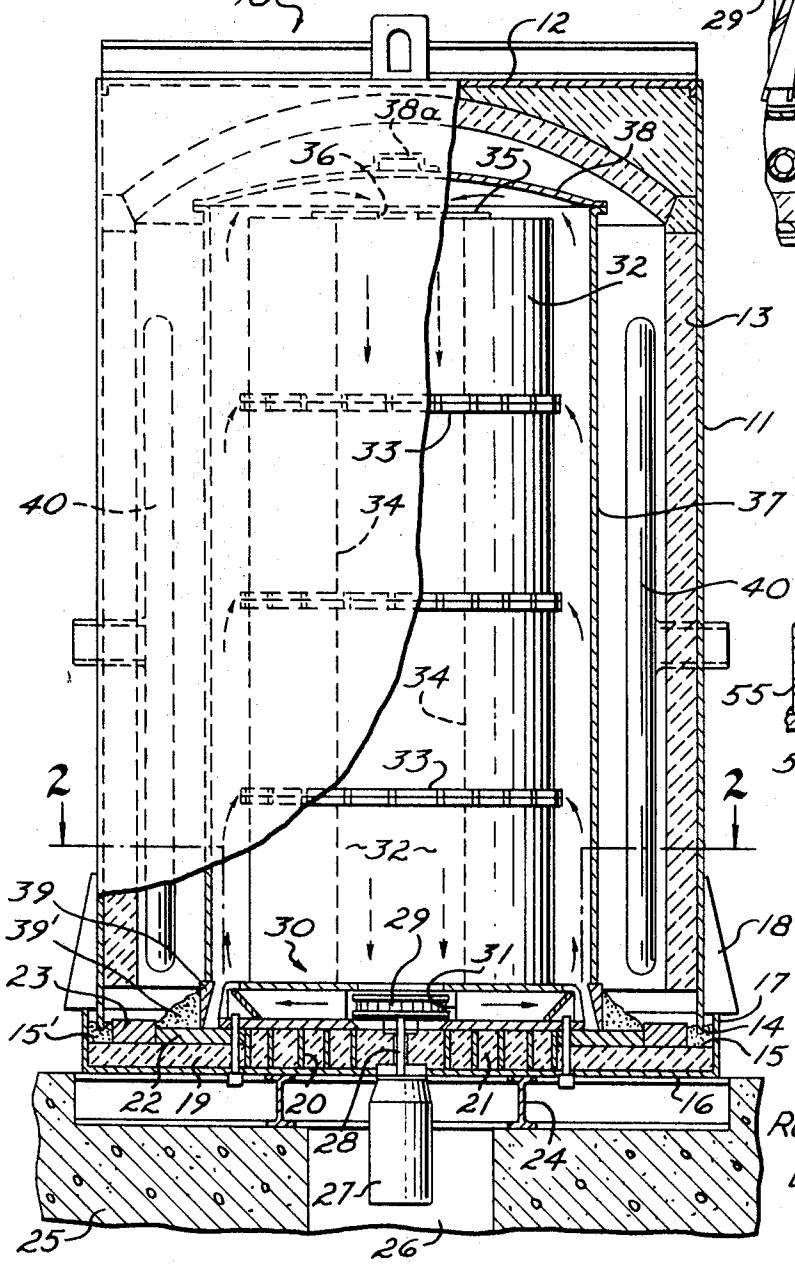


Fig. 1

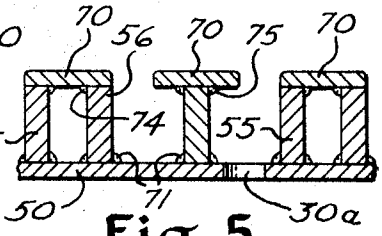


Fig. 5

INVENTOR
Robert Lee Corbett, Jr.
BY
J. H. SLOUGH
ATTORNEY

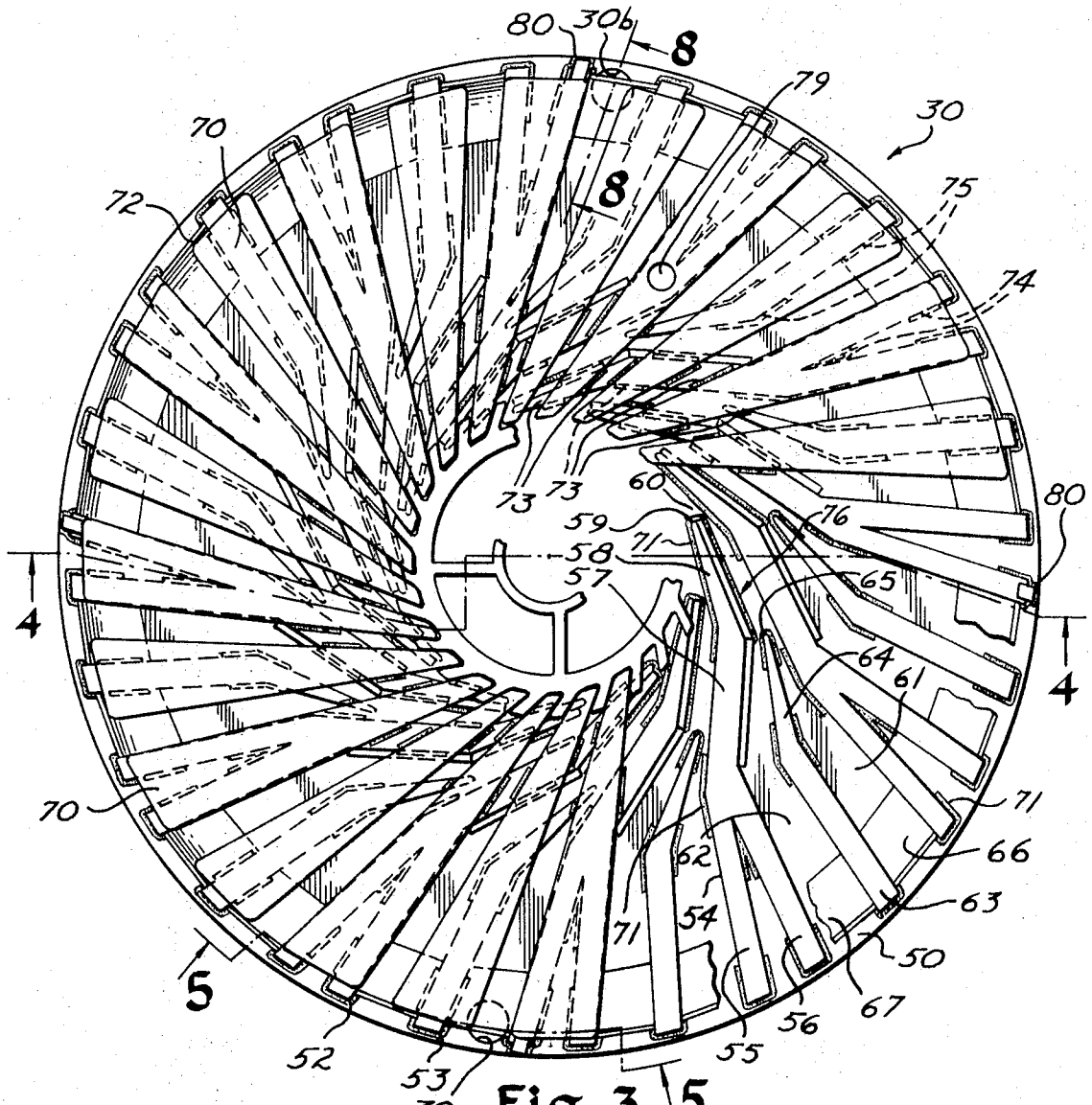


Fig. 3

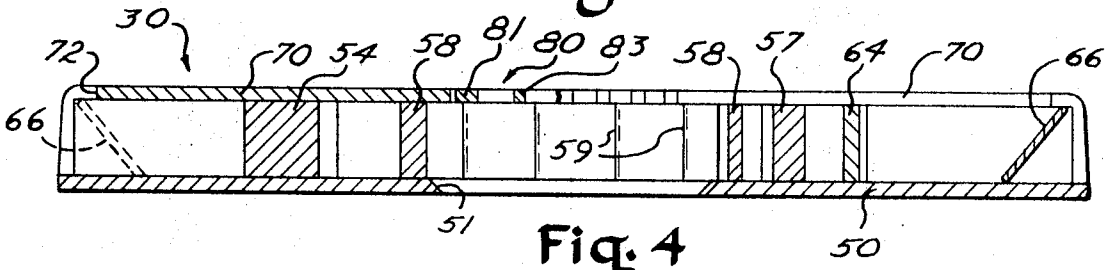


Fig. 4

INVENTOR
Robert Lee Corbett, Jr.
BY J. H. Slough
J. H. SLOUGH
ATTORNEY

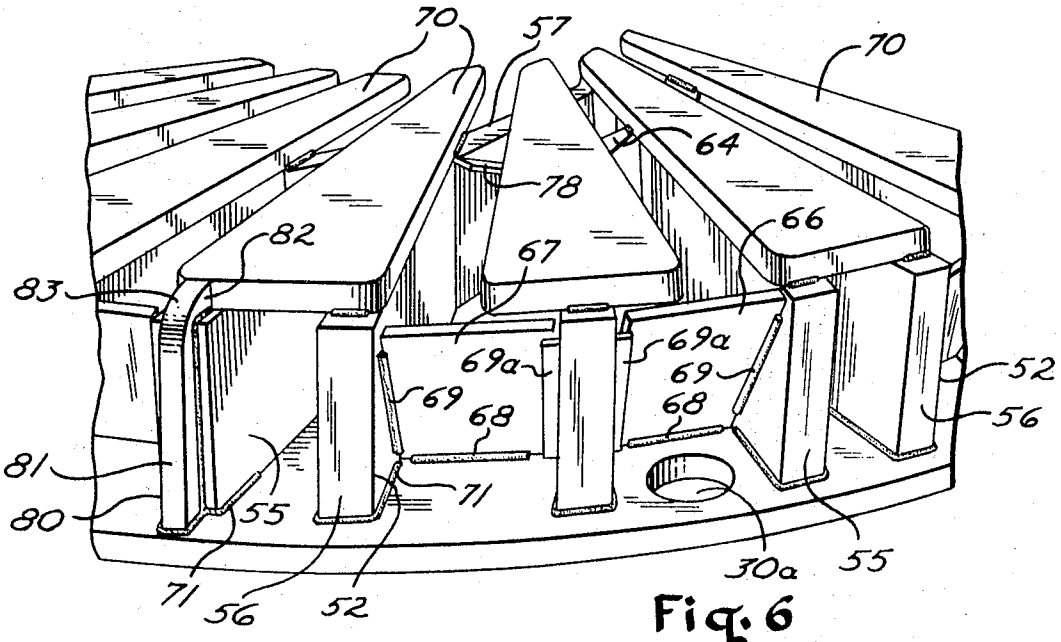


Fig. 6

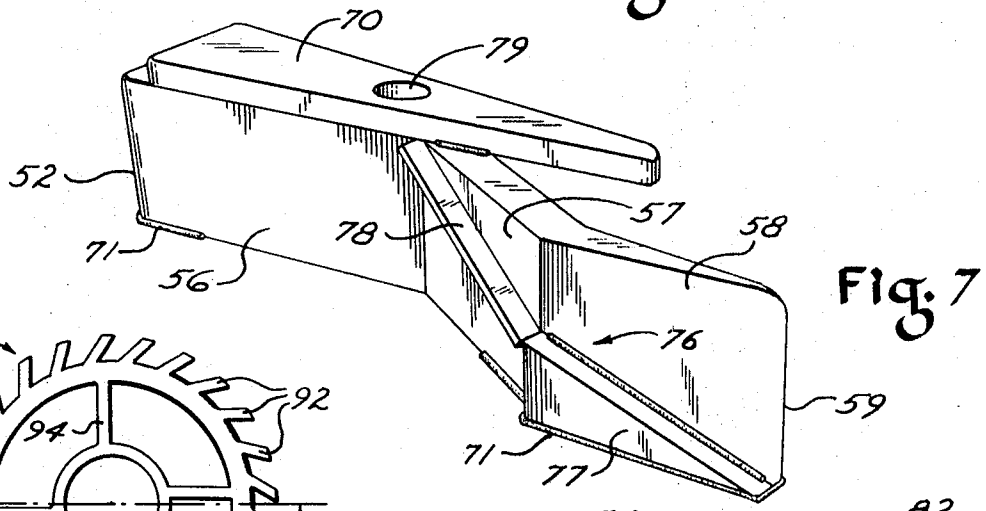


Fig. 7

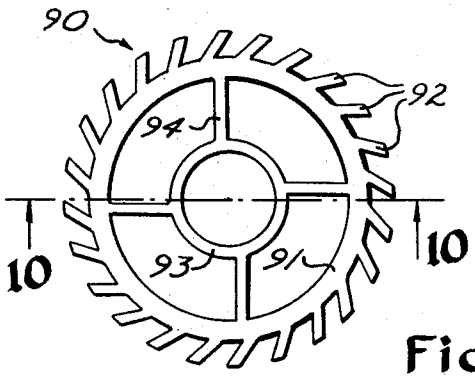


Fig. 9

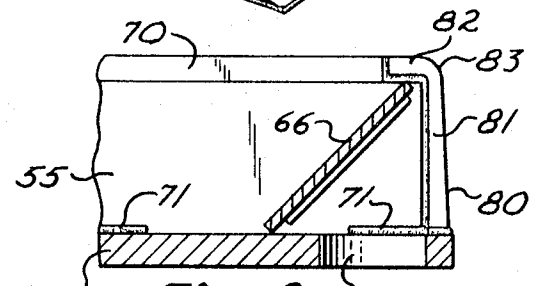


Fig. 8

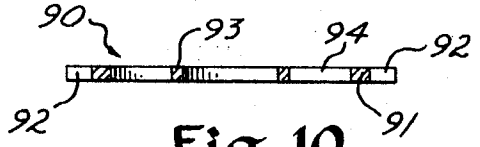


Fig. 10

INVENTOR
Robert Lee Corbett, Jr.
BY
J. H. SLOUGH
ATTORNEY

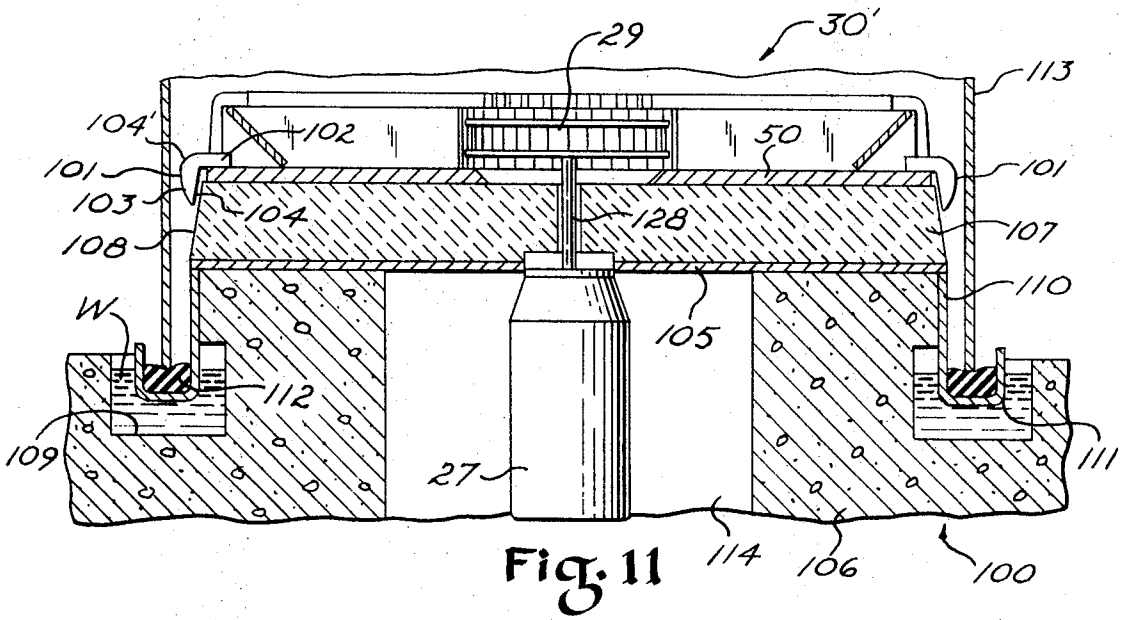


Fig. 11

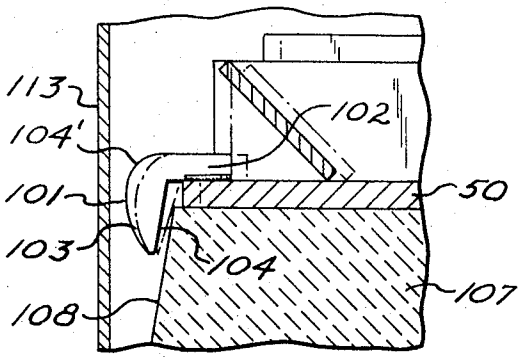


Fig. 12

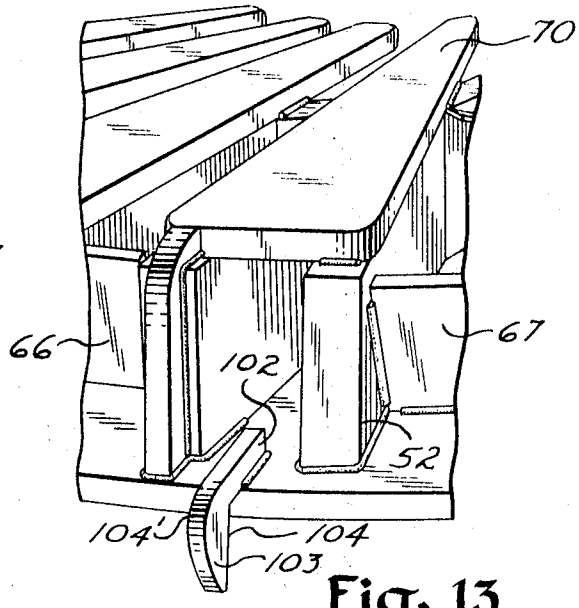


Fig. 13

INVENTOR
Robert Lee Corbett, Jr.
BY
J. H. SLOUGH
ATTORNEY

LOAD SUPPORT DIFFUSER

This invention relates to annealing furnaces for treating coils of metal in strip form and relates more particularly to an improved load support diffuser adapted to both support a charge of coils stacked endwise within a furnace and diffuse protective nonoxidizing atmosphere gas within the furnace.

In a known form of the type of furnace referred to, the coils of strip metal are stacked coaxially upon a suitable base structure and have a recirculating fan or blower disposed therebelow. Each coil has a coaxial central opening or eye, and the fan is adapted to circulate a heated, protective atmosphere gas upwardly around the outside of the coils and downwardly through the eyes of the coils. Coil separators or convector plates are preferably provided between adjacent coils, said separators providing passage means allowing the heated gas to circulate between the coils and across the edges of the coil wraps. The stacked coils are preferably enclosed within a gastight inner cover which is, in turn, disposed within a suitable furnace having radiant tube burners or other suitable heating means for heating the inner cover and the atmosphere gas confined within the inner cover.

It will be readily apparent that the load support is subjected to substantial pressures in use due to the fact that it supports the entire weight of all of the coils. It will also be apparent that the load support is subjected to a wide range of temperature changes which tend to cause said support to distort. A load support of the type herein disclosed is substantially hollow, passage means being provided therein for rapidly diffusing and recirculating the gas, whereby the problem of structural strength and distortion due to temperature changes are accentuated. Reinforcing structure must not interfere with the circulation of the gas and at the same time must be sufficient to afford a strong, durable structure not subject to distortion under pressure and temperature changes. Additionally, it is important that the load support have an upper, load-bearing surface having an area sufficient to prevent damage to the edges of the coil wraps. These and many other problems which arise in connection with the manufacture and use of load supports of the diffuser type have been solved in an improved manner by the invention disclosed herein.

An object of the present invention is to provide a load support diffuser for an annealing furnace, said load support diffuser having improved passage means therein for diffusing the heated atmosphere gas from below a stack of coils.

Another object of the invention is to provide a load support diffuser as set forth above which is so constructed as to resist distortion due to extreme temperature changes.

Still another object of the invention is to provide a load support diffuser having the above features and characteristics wherein the coil supporting surface area thereof is sufficient to support the coils without damage to the edges of the coil wraps, said support also affording adequate circulation of the atmosphere gas across the ends of the coil wraps.

Still another object is to provide a load support diffuser as set forth above having centering means for centering the inner cover with respect to the charge.

A still further object is to provide a load support of the above type wherein deflector means are provided at the outer ends of the passage means for deflecting the gas upwardly around the charge.

A still further object is to provide a load support as set forth above having means for lifting the gas flow as it passes through the passage means for diverting the flow of gas upwardly across the lower edges of the wraps of the lowermost coil.

Yet another object is to provide a load support diffuser of the type referred to having centering means adapted to maintain said diffuser concentric with a base member of the furnace.

Another object is to provide deformable centering means which will yield uniformly when said diffuser shrinks inwardly.

Another object of the invention is to provide a load support diffuser as set forth above which is of simple, sturdy construction, inexpensive to manufacture, and highly durable in use.

Other objects of the invention and the invention itself will be readily apparent to those skilled in the art to which it appertains upon consideration of the following description of the invention and the accompanying drawings, in which said drawings:

FIG. 1 is a view, partly in elevation and partly in section, of an annealing furnace containing a stack of strip steel coils disposed upon the load support of this invention;

FIG. 2 is a fragmentary transverse section taken generally along the line 2–2 of FIG. 1;

FIG. 3 is an enlarged top plan view of the load support of this invention;

FIG. 4 is a section taken along the line 4–4 of FIG. 3;

FIG. 5 is a section taken along the line 5–5 of FIG. 3;

FIG. 6 is a fragmentary perspective view of the load support of this invention;

FIG. 7 is a perspective view of a flow divider and support bar of the load support of this invention;

FIG. 8 is a section taken generally along the line 8–8 of FIG. 3;

FIG. 9 is a top plan view of a blower guard also shown in FIG. 3;

FIG. 10 is a section taken along the line 10–10 of FIG. 9;

FIG. 11 is a section view of a modified furnace base and load support diffuser of this invention;

FIG. 12 is an enlarged detail of the modification of FIG. 11; and

FIG. 13 is an enlarged fragmentary perspective of the modification of FIG. 11.

Referring now to the drawings in all of which like parts are designated by like reference numerals, FIG. 1 shows a hood or bell-type furnace 10 comprising a cylindrical body portion 11 having a top closure wall 12 and a suitable refractory lining indicated at 13. The cylindrical body portion 11 is preferably formed of heavy sheet metal and has a downwardly projecting, annular flange portion 14 which projects into a granular sealing trough 15 of a generally cup-shaped base 16. The base 16 has an upwardly projecting, annular flange 17 having a slightly larger diameter than the flange portion 14 whereby said flange portion is disposed generally within said annular flange. The body portion 11 is supported by radially projecting fins 18 the bottom edges of which seat upon the upper edge of the annular flange 17. The base 16 also includes a suitable refractory bottom lining 19 and a central support structure comprising concentric steel rings 20 having refractory material 21 disposed therebetween. An annular plate 22 surrounds the concentric rings 20, and a larger annulus 23 is disposed outwardly therefrom and forms the inner wall of the granular sealing trough 15. Said trough is filled with a suitable granular sealing material 15', such as sand, into which the flange portion 14 projects.

The base 16, as herein illustrated, is securely mounted upon I–beams 24 which are seated in a concrete floor 25 or other suitable supporting means. A central cavity 26 in the floor 25 affords space for mounting a motor 27 having a shaft 28 which projects upwardly through the central portion of the base 16, the upper end of said shaft carrying a centrifugal blower 29. The blower 29 is disposed within a central opening 31 of the load support diffuser of this invention, said load support diffuser being generally indicated at 30 and being hereinlater fully described in detail in connection with FIGS. 3—5. An atmosphere gas inlet 30*a* and an atmosphere gas outlet 30*b* project upwardly through the base 16 into said load support diffuser at the periphery thereof.

As herein illustrated, the diffuser 30 supports four coils 32 of strip sheet steel stacked vertically and coaxially within the body portion 11 and separated by coil separators or convector plates 33. Each coil 32 defines a central opening or eye 34, and the uppermost of said coils is provided with an end plate 35 which covers the eye of the upper coil and which may be provided with a flow-restricting central orifice 36.

A cylindrical inner cover 37 is disposed over the stacked coils 32, the upper end of said inner cover being closed by an upper end wall 38 having a bail 38*a* for lifting the cover by a crane or other suitable means. Said inner cover has a lower, annular base portion 39 which seats upon the annular plate 22 outwardly of the gas inlet 30*a* and gas outlet 30*b* and is sealed thereto by granular sealing means, such as sand, indicated at 39'. In the form shown, heating means for the furnace comprise elongated, gas fired radiant tube heaters 40 which are evenly circumferentially spaced around the outside of the inner cover 37 within the refractory lining 13.

Referring now to FIGS. 3—5, the diffuser 30 comprises a circular baseplate 50 having a central aperture 51 through which the shaft 28 of the motor 27 projects. The baseplate 50 seats upon the upper edges of the annular rings 20 with the outer circumferential edge portion thereof overlapping the annular plate 22. The centrifugal blower 29 is disposed above the baseplate 50 and circulates the protective atmosphere gas radially outwardly with respect to said baseplate.

The upper surface of the baseplate 50 carries a plurality of circumferentially spaced, alternately disposed flow dividers 52 and 53 adapted to define passages therebetween for directing the outward flow of the atmosphere gas. As herein illustrated, the flow dividers 52 and 53 are solid metal members which extend from points adjacent to the outer periphery of the baseplate 50 inwardly to points spaced radially outwardly from the axis of said baseplate.

Each flow divider 52 has a V-shaped portion 54 comprising arms 55 and 56 which diverge outwardly in the direction of the outer periphery of the baseplate 50. As shown in the plan view in FIG. 3, each V-shaped portion 54 is slanted or angled in a counterclockwise direction. An integral extension 57 which is angled an even greater amount in a counterclockwise direction projects generally inwardly from the inner end of the V-shaped portion 54; and an integral tapered portion 58 projects inwardly from the inner end of said extension at an angle which is generally parallel with said V-shaped portion. The inner ends of the tapered portions 58, indicated at 59, define the central opening 31 in which the centrifugal blower 29 is disposed, said tapered portions providing therebetween counterclockwise angled passages 60 which are substantially skewed with respect to a radius of the baseplate whereby they are adapted to receive the outflowing gas impelled by said blower which rotates in a clockwise direction.

It will be noted that the passages 60 become wider as they move radially outwardly and are divided into branch passages 61 and 62 by means of the flow dividers 53. Each flow divider 53 comprises a body portion 63 of substantially the same width or thickness as the arms 55 and 56 and disposed generally centrally between adjacent flow dividers 52. The inner end of each body portion 63 is provided with an angled tapered portion 64 having a tip end 65 which is disposed a substantial distance inwardly of the passage 60 and which divides the flow in a substantially equal manner into the branch passages 61 and 62.

Between the arms 55 and the body portions 63, there are provided angled deflector plates 66 which are disposed adjacent to the outer periphery of the baseplate 50 and angled upwardly and outwardly as best shown in FIGS. 3, 4 and 6. Similar deflector plates 67 are disposed between the arms 56 and said body portions 63. From the foregoing it will be readily seen that the outwardly flowing gas following the branch passages 61 is deflected upwardly by the deflector plates 66 and that in a similar manner, the gas flowing outwardly through the branch passages 62 is deflected upwardly by the deflector plates 67.

The deflector plates 66 and 67 are secured at their bottom edges to the baseplate 50 by welds 68 and along their side edges to the arms 55 and 56, respectively, by welds 69. The side edges opposite the welds 69 are supported by angled ledge members 69*a* which are welded to the body portions 63 of the flow dividers 53. Said ledge members and the deflector plates are not rigidly connected together but merely overlap thereby allowing for expansion and contraction of the associated parts.

It will be noted that the atmosphere gas inlet 30*a* is located beneath one of the deflector plates 66 whereby the circulating gas within the inner cover has a siphoning effect on the atmosphere gas at said inlet. Thus the action of the blower assists in introducing the atmosphere gas into the inner cover.

Each of the flow dividers 52 and 53 carries a flat bar 70 which tapers inwardly along its side edges terminating at its inner, smaller end radially inwardly a slight distance beyond the inner ends 59 of the flow dividers 52. The outer edges 72 of the bars 70 are disposed radially inwardly from the outer ends of said flow dividers and radially inwardly from the outwardly and upwardly disposed edges of the deflector plates 66 and 67 as best seen in FIG. 4 whereby the gas can flow upwardly beyond said outer edges 72 of those bars disposed upon the smaller flow dividers 53. The bars 70 carried by the flow dividers 52 are disposed substantially in alignment with the V-shaped portions 54, their larger ends being disposed generally over said V-shaped portions. The bars 70 carried by the smaller flow dividers 53 are disposed substantially in alignment with and centrally over the body portions 63.

As best shown in FIG. 3, each bar 70 is substantially angled or skewed with respect to a radius of the baseplate 50, all of said bars being skewed the same amount in the same circumferential direction. As herein shown, each bar 70 has its outer end displaced circumferentially approximately 43° in a clockwise direction from the point where the centerline of the bar at its inner end bisects a radius of the baseplate.

It will be readily noted that although the bars 70 are each carried mainly by one of the flow dividers, each said bar in fact overlaps and is connected to a portion of two other of said flow dividers. A bar carried primarily by a flow divider 52 also overlaps the tip end portion of a tapered portion 64 of a flow divider 53 and the tapered portion 58 of another flow divider 52. Each bar 70 carried primarily by a flow divider 53 also overlaps an extension 57 of a flow divider 52 and the tip end portion of a tapered portion 58 of still another flow divider 52. The bars 70 are preferably welded to the flow dividers at their overlapping edges, as indicated at 73; inside the V's formed by the arms 55 and 56 below said bars, as indicated at 74; and below said bars along the side of the body portions 63 and tapered portions 64 of the flow dividers 53, as indicated at 75. In a similar manner, said flow dividers are welded to the baseplate 50 as indicated by the reference numeral 71. It will be noted that where intersecting surfaces to be welded are of substantial length, the weld is not continuous throughout the length of said intersecting surfaces and unwelded spaces between portions of the weld are provided. This construction allows for separate expansion and contraction of the bars and the flow dividers due to temperature changes, without warping, twisting, or fracturing the load support 30.

Referring now to FIG. 7 of the drawings, each flow divider 52 is provided with means for lifting or diverting the flow of gas upwardly toward the bottom edges of the coil wraps as said gas flows outwardly through the passages 60 and into the branch passages 62. As herein illustrated, each said flow lifter comprises a ramp generally indicated at 76 comprising a ramp section 77 of triangular shape welded to the side of the tapered portion 58 and a ramp extension 78 welded to the side of the extension 57. Said ramp section and ramp extension project into the adjacent passage 60 and 62 on the outside of the angle between the extension 57 and the tapered portion 58 and provide a continuous upwardly angled flow-lifting surface extending from the baseplate 50 at the end 59 of the flow divider 52 outwardly and upwardly to the upper edge of said flow divider at the outer end of the extension 57. The flow lifters 76 divert the gas upwardly from the bottoms of the passages to cause the same to flow across the bottoms of the lowermost coil wraps and lift the stream whereby it is more readily diverted upwardly by the deflector plates 66 and 67 at the outer periphery of the load support 30. The solid, triangular form of the ramp section 77 affords additional bearing area and stability for the tapered portions 58 of the flow dividers 52.

FIG. 7 also illustrates the manner in which one of the flow dividers 52 and its associated bar 70 may be provided with a through opening 79 adapted to receive an upwardly projecting thermocouple or other heat sensing device for monitoring the temperature of the coils within the furnace.

Referring now particularly to FIGS. 3, 6, and 8, at least certain of the flow dividers carry centering lugs 80 for centering and locating the inner cover 37. Each said lug 80 has a vertical portion 81 which is disposed upright against the outer end of an arm 55 of a flow divider 52. The upper end of the vertical portion 81 has an inwardly directed lip 82 which projects inwardly over the end of the arm 55. The outer edge of each lip 82 is rounded as shown at 83 and the outer edge of each vertical portion 81 is tapered downwardly and radially outwardly, the combined effect of all of the lugs 80 being to engage and guide the lower end of the inner cover 37 into a concentric position with respect to the stack of coils 32.

Proper centering of the inner cover 37 promotes even heating of the charge by maintaining the inner cover a uniform distance from the coils 32. Said inner cover can be made with less tolerance thereby providing closer spacing with respect to the charge and consequent increased efficiency in the heating cycle when used with the aforesaid lugs 80.

A fan guard 90, shown in detail in FIGS. 9 and 10, is carried over the centrifugal blower 29 for protecting said blower from the load carried by the support 30. Said guard comprises an outer ring 91 having outwardly projecting teeth 92 so shaped and angled that they are adapted to project between the inner ends of the bars 70. A substantial number of the teeth 92 overlap the tapered portions 58 of the flow dividers 52 whereby said guard is supported at a plurality of points above the centrifugal blower 29. Said guard also has an inner protective ring 93 integrally connected with the outer ring 91 by means of braces 94.

The teeth 92 of the blower guard 90 are not secured to the tapered portions 58 but merely rest thereon, whereby said guard can be readily lifted out to facilitate removal, repair, and inspection of the blower. The teeth 92 stabilize and prevent distortion of the inner ends of the bars 70 and tapered portions 58 and generally lock those parts associated with the center of the load support into position. The radially disposed braces 94 prevent the inner wraps or coil tails from being drawn downwardly into the blower. It will also be noted that the teeth 92 and ring 91 block the upper part of the passages between the bars 70. This prevents the flow which is being forced radially outwardly by the blower from short-circuiting; that is, immediately reentering the blower adjacent to its upper end due to the substantial negative pressure present at the top of the blower. By blocking reverse flow at this point, better and more efficient circulation is achieved.

In the modification of FIGS. 11 to 13, inclusive, a load support 30' is disposed upon a modified furnace base generally indicated at 100. The load support 30' as herein illustrated is in all respects identical with the load support 30, the modification comprising a plurality of circumferentially evenly spaced centering vanes 101 secured adjacent to and projecting radially outwardly from the baseplate 50. Each centering vane comprises an angle shaped member made of steel having a horizontal leg 102 and a vertical, downwardly projecting leg 103. The horizontal leg 102 of each vane is welded or otherwise suitably secured to the upper surface of the baseplate 50 adjacent to its outer periphery whereby the vertical leg 103 projects outwardly of the periphery and downwardly below the level of said baseplate. Said vertical leg has an inner, downwardly and outwardly angled edge 104 and an outer edge 104' curved in a vertical plane throughout the length of said vertical leg.

The modified furnace base structure comprises a plate 105 disposed upon a suitable refractory foundation 106 and supporting a circular refractory slab 107. The slab 107 is preferably circular in plan view having an outwardly and downwardly sloping outer wall 108 disposed at the same angle as the inner edges 104. The foundation 106 has an annular recess or moat 109, and carries a ring 110 which projects downwardly into the moat. The lower end of the ring 110 has an outwardly turned, upwardly open trough 111 which is disposed within the moat 109. An annular resilient seat 112 of rubber or other resilient material is disposed within the trough 111 for receiving the lower edge of an inner cover 113. The moat 109 is provided with a coolant such as water W which cools the seal 112 during operation of the furnace.

The foundation 106 has a central cavity 114 for receiving the motor 27, the drive shaft 28 of said motor projecting upwardly through a suitable opening in the slab 107 to drive the centrifugal blower 29.

The centering vanes 101 serve to center the load support diffuser 30 and maintain it in a position substantially concentric with the blower 29. It has been observed that the annealing cycle of heating and cooling the furnace causes a shrinkage in the diffuser. Prior art structures with which the inventor is familiar utilize steel pegs or similar means carried by the base structure and disposed in suitable openings in the baseplate of the diffuser for maintaining it in its proper position. The aforementioned shrinkage in such prior art devices is thus limited in certain transverse directions while not limited in others, thereby causing the opening in which the blower is located to distort to an oval or egg-shape as shrinkage occurs. This nonuniform shrinkage causes the blower to contact the diffuser, and in some cases severe damage to the blower results.

The centering vanes 101 of the present invention control the shrinkage uniformly at the outer periphery of the diffuser whereby the concentricity of the diffuser with respect to the blower is not disturbed. A small space is preferably provided between the edges 104 of the vanes and the outer wall 108 whereby the diffuser is free to shrink uniformly in every transverse direction while remaining substantially concentric with the blower. However, it has been found that even where shrinkage is so extensive as to cause the edges 104 to abut the wall 108, the vertical legs 103 will bend outwardly in a uniform manner at the periphery of the diffuser whereby said diffuser can still shrink uniformly and without distortion. The curved edges 104' serve to further guide the inner cover 113 into a position concentric with the diffuser 30' and present rounded guiding surfaces for guiding the inner cover even though the vertical legs 103 may be bent outwardly as shown in broken lines in FIG. 12.

As shown in FIG. 3, the bars 70 are circumferentially spaced from each other whereby the atmosphere gas flowing through the passages 60 and the branch passages 61 and 62 also flows over the bottom edges of the coil wraps which contact the load support 30. The load support not only diffuses the gas outwardly and upwardly over the stack of coils, but also provides for convection heating of the lowermost of said coils. By decreasing the restrictions on the flow of gas at the outer edge of the support, the load on the blower is thereby reduced resulting in reduced power consumption. Thus a greater volume of flow wipes the outer wraps of the coils at a decrease in cost to the user.

The interconnection of each bar 70 with at least three flow dividers creates a structure of great strength which effectively resists warping and twisting when subjected to exterior pressures and substantial temperature changes. The bars 70, while affording access of the atmosphere gas to the coil wraps, also provide sufficient load bearing areas to prevent damage to the edges of said coil wraps. By preventing warpage, the upper surfaces of the bars remain level thereby maintaining a maximum area of contact with the coil wraps for efficient heating by conduction.

The improved flow characteristics and construction of the present load support also has other advantages. The spacing of the radial bars 70 combined with the flow lifters comprising the ramps 76 direct a flow of gas straight across the bottom edges of the coil wraps to be deflected upwardly by the deflectors 66 and 67 whereby the sand seal is not disturbed by the flowing gas. It has been observed by the inventor that the

highest temperatures in an annealing furnace occur at the upper end of the inner cover thereby normally heating the top coil first and to the highest temperature. The flow characteristics of the present invention improves the heating of the lower coils and minimizes the temperature differential between the top and bottom coils. In prior art devices of the same type, certain portions such as the inner tips of support vanes are commonly made of alloy steel to attain sufficient strength whereas the remainder of the device is made of mild steel. This prior art construction tends to distort when heated due to the different coefficients of expansion and contraction of the different metals. The present invention can be made of mild steel throughout without sacrificing strength and at the same time avoiding distortion during heating and cooling of the metal.

It will be further noted that the present construction affords proportional support for the coils, greater bearing area and reinforcement being provided adjacent to the outer periphery of the support where the coil wraps are larger and, therefore, substantially heavier.

The load support diffuser of the present invention as disclosed herein provides supporting area for approximately 70 percent of the transverse area of the bottom coil. The coil is heated in this area by conduction, that is, by the metal-to-metal contact between the lower edges of the coil wraps and the upper surfaces of the bars 70. The resistance of the present diffuser to distortion assures good metal-to-metal contact at the supporting surfaces which remain level thereby assuring efficient heating. The inventor has observed that even the slightest air gap serves to insulate the coil wraps against heat transfer, and it is an important feature of the invention that the support provides a distortion free bearing surface affording the best possible heat transfer.

It will be further understood that many changes in the details of the invention as herein described and illustrated may be made without, however, departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. A load support diffuser for supporting stacked coils in an annealing furnace comprising a baseplate having a vertical axis; said baseplate comprising a single piece of flat plate metal; a plurality of flow divider members carried on the upper surface of said baseplate, certain of said members having inner ends defining a central opening adapted to receive a blower; each said member comprising a plurality of substantially straight, relatively angled portions each of which is skewed with respect to a true radius of said diffuser in the same circumferential direction; flat support bars carried on the upper surfaces of said members whereby each said bar overlaps portions of more than one of said members; said members defining passages therebetween for directing flow of an atmosphere gas outwardly with respect to said load support for diffusing said gas within an annealing furnace said support bars having side edges tapering inwardly from the outer periphery of said diffuser; said support bars being circumferentially spaced from each other whereby portions of said passages are open at the top for directing the atmosphere gas across the end of a coil seated upon said support bars.

2. A load support diffuser as set forth in claim 1: outwardly and upwardly angled deflector plates disposed between and adjacent to the outer ends of said passages to deflect the gas upwardly at the outer periphery of said load support diffuser.

3. A load support diffuser as set forth in claim 1: each said bar-overlapping portions of at least three of said flow divider members.

4. A load support diffuser as set forth in claim 1: said certain flow divider members extending from said central opening substantially to the outer periphery of said baseplate; said certain members defining passages therebetween which substantially widen adjacent to said outer periphery; other flow divider members each comprising a plurality of substantially straight, relatively angled portions disposed within the widened portions of said passages and dividing said widened portions into branch passages.

5. A load support diffuser as set forth in claim 5: outwardly and upwardly angled flat deflector plates disposed at the outer ends of said branch passages to deflect the gas upwardly at the outer periphery of said diffuser.

6. A load support diffuser for supporting stacked coils in an annealing furnace comprising a baseplate having a vertical axis; a plurality of flow divider members carried on the upper surface of said baseplate, certain of said members having inner ends defining a central opening adapted to receive a blower; said members having portions skewed with respect to true radii of said diffuser; support bars carried on the upper surfaces of said members whereby each said bar overlaps portions of more than one of said members; said members defining passages therebetween for directing flow of an atmosphere gas outwardly with respect to said load support for diffusing said gas within an annealing furnace; said baseplate being circular in shape; a plurality of circumferentially evenly spaced centering lugs carried at the outer periphery of said baseplate said centering lugs projecting upwardly to substantially the level of the upper supporting surfaces of said bars; said centering lugs having upwardly converging outer surface portions adapted to guide a cylindrical cover downwardly into a substantially concentric position with respect to said diffuser.

7. A load support diffuser as set forth in claim 6: said 6: lugs being secured to outer end portions of selected flow divider members; each said lug being rounded inwardly toward the center of said diffuser at its upper end to guide the cover onto said outer surface portions.

8. A load support diffuser for supporting stacked coils in an annealing furnace comprising a baseplate having a vertical axis; a plurality of flow divider members carried on the upper surface of said baseplate, certain of said members having inner ends defining a central opening adapted to receive a blower; said members having portions skewed with respect to true radii of said diffuser; support bars carried on the upper surfaces of said members whereby each said bar overlaps portions of more than one of said members; said members defining passages therebetween for directing flow of an atmosphere gas outwardly with respect to said load support for diffusing said gas within an annealing furnace; said bars being circumferentially spaced whereby portions of said passages are open at the top for directing the atmosphere gas across the end of a coil seated upon said diffuser; flow-lifting ramps projecting laterally from one side of said certain flow divider members and extending from the inner ends of said certain members a substantial distance outwardly from the center of said diffuser and upwardly with respect to said baseplate whereby the radially outward flow of gas is diverted upwardly between said spaced bars and across the end of the coil.

9. A combined load support and diffuser for supporting an axially vertical stack of coils in an annealing furnace and diffusing protective atmosphere gas within said furnace, said load support comprising a baseplate; a plurality of flow divider members carried on the upper surface of said baseplate, said members being substantially skewed with respect to a radius of the baseplate in one circumferential direction; said members comprising circumferentially alternately disposed long and short dividers extending inwardly from adjacent to the outer edge of said baseplate; said long dividers having inner end portions defining a central opening adapted to receive a blower and being circumferentially spaced and providing passages therebetween which substantially widen adjacent to said outer edge for directing flow of an atmosphere gas outwardly with respect to said load support and diffusing said gas; said short dividers disposed within said widened portions of said passages and dividing said widened portions into branch passages; outwardly and upwardly angled deflector plates disposed at the outer ends of said branch passages to deflect the gas upwardly at said outer ends; support bars carried on the upper surfaces of said dividers, each said bar being substantially skewed with respect to a radius of the baseplate and overlapping and secured to the radially outwardly disposed portion of one divider and inwardly disposed portions of two circumferentially adjacent dividers; said bars tapering along

the side edges thereof toward their inner ends and being circumferentially spaced whereby portions of said passages are open at the top for directing the atmosphere gas across the end of a coil seated upon said load support.

10. A combined load support and diffuser as set forth in claim 9: each said long divider having a first portion disposed adjacent to the outer periphery of said baseplate, said first portion having outwardly diverging sidewalls and being skewed in said one circumferential direction, a second portion extending generally inwardly from said first portion and skewed in said one circumferential direction a greater degree than said first portion, and a third, inwardly tapered portion extending inwardly from said second portion and disposed generally parallel with said first portion; each said short divider comprising one portion disposed circumferentially between and generally parallel with the sides of two adjacent first portions of said long dividers, and another, inwardly tapered portion extending inwardly from said one portion between two adjacent second portions of said long dividers.

11. A combined load support and diffuser as set forth in claim 10: a blower guard member comprising a ring adapted to be disposed over said opening; said ring having outwardly projecting and circumferentially angled teeth disposed between inner end portions of said bars, at least some of said teeth overlapping tapered portions of said long dividers whereby said guard member is seated above said opening in the general plane of said bars.

12. A load support diffuser for supporting stacked coils in an annealing furnace comprising a baseplate having a central vertical axis; a plurality of flow divider members carried on the upper surface of said baseplate, certain of said members having inner ends defining an opening about said axis adapted to receive a blower; said members defining passages therebetween for directing a flow of gas from said opening outwardly to the periphery of said diffuser; support bars carried on the upper surfaces of said members, said bars being skewed with respect to true radii of said diffuser whereby each said bar overlaps portions of more than one of said members; said members being welded at the upper and lower edges thereof to said bars and said baseplate, respectively, at separated areas whereby substantial portions of said members are free to move with respect to said bars and baseplate to allow for separate expansion and contraction of the parts due to temperature changes.

13. A load support diffuser as set forth in claim 12: outwardly and upwardly angled deflector plates disposed between the outer end portions of adjacent flow divider members for deflecting the gas upwardly at the outer periphery of said diffuser; each said deflector plate having one side edge portion welded to one of said adjacent members; the opposite adjacent member having means loosely supporting the opposite side edge of said deflector plate.

14. A load support diffuser as set forth in claim 13: said last-mentioned means comprising ledge members projecting beneath said opposite side edges of said deflector members, said ledge members being secured to said opposite adjacent members at the same angle as said deflector plates.

15. A load support diffuser for supporting stacked coils in an annealing furnace comprising a baseplate having a vertical axis; said baseplate comprising a single piece of flat plate metal; a plurality of flow divider members carried on the upper surface of said baseplate, certain of said members having inner ends defining a central opening adapted to receive a blower; each said member comprising a plurality of substantially straight, relatively angled portions each of which is skewed with respect to a true radius of said diffuser in the same circumferential direction; flat support bars carried by said members whereby at least some of said bars overlap portions of more than one of said members; said members defining passages therebetween for directing flow of an atmosphere gas outwardly with respect to said load support for diffusing said gas within an annealing furnace; said support bars having side edges tapering inwardly from the outer periphery of said diffuser; said support bars being circumferentially spaced from each other whereby portions of said passages are open at the top for directing the atmosphere gas across the end of a coil seated upon said support bars.

16. A load support diffuser for supporting stacked coils in an annealing furnace comprising a baseplate having a vertical axis; said baseplate comprising flat plate metal; a plurality of flow divider members carried on the upper surface of said baseplate, certain of said members having inner ends defining a central opening adapted to receive a blower and outer ends u1iformly spaced outwardly therefrom; each said member comprising a plurality of substantially straight portions each of which is skewed with respect to a true radius of said diffuser; each said member comprising at least two of said portions positioned to form a V-shape construction with the apex thereof directed inwardly of the diffuser; a plurality of flat support bars disposed upon and secured to said members; at least some of said support bars extending in overlapping relationship with portions of more than one of said members; said members defining passages therebetween for directing flow of an atmosphere gas outwardly with respect to said load support for diffusing said gas within an annealing furnace; said support bars being circumferentially spaced from each other whereby portions of said passages are open at the top for directing the atmosphere gas across the end of a coil seated upon said support bars.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,586,302 Dated June 22, 1971

Inventor(s) Robert Lee Corbett, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 5 line 1, "5" should read -- 4 --. Claim 7, line 1, cancel "6;" second occurrence; same line 1, before "lugs" insert -- centering --.

Signed and sealed this 9th day of November 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents

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