SHAFT AND BEARING COOLING MEANS

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2 Claims. (Cl. 230—209)

While not limited thereto, our invention is pec-

3 Clark Product Inc.

arily well suited for cooling the fan shaft and
bearing of an annealing furnace such as used in
the annealing of coils of steel strip.

One object of the invention is to provide means
for air cooling a shaft having a portion subject
5 to intense furnace heat.

Another object is to provide means for air
cooling a bearing for a shaft operating in an in-
tensely hot environment.

A further object is to construct and arrange the
several parts herein shown and described so
that they individually and collectively perform
the functions set forth.

For a more complete understanding of the in-
vention, reference should be made to the fol-

10 lowing disclosure, the accompanying draw-

ings, and the appended claims.

In the drawings:

Figure 1 is a view in vertical longitudinal sec-

15 tion of an annealing furnace embodying the in-
vention.

Figure 2 is an enlarged longitudinal section
illuminating the structural details of the chief
component parts of the herein claimed inven-

20 tion.

Figure 3 is a horizontal section on line III—III
of Figure 2.

Figure 4 is a detail view of a sleeve shown in
Figure 2.

Referring in detail to the embodiment of the in-
vention illustrated, reference numeral 10 rep-

25 resents a suitable base including supporting
beams or rails 12, a plate 14, and a pedestal 16.
The base includes a ring 18 and locating pins 20
which are adapted to engage lugs 22 to position
the removable furnace cover 24. The cover

30 comprises an outer shell 26 and an inner shell 28
with a filling or insulating 30 between them.

The furnace illustrated is of a type suited for
the annealing of coils 32 of steel strip which
are stacked in a pile with separators 34 between them
to facilitate circulation of a gaseous atmosphere.

Cool annealing furnaces of the type shown em-

35 ploy a heating means for raising the stack of
steel coils from room temperature of about 70° F.
to an annealing temperature of about 1450°
F. In the furnace shown, the heating means
includes coils of radiating heating tubes 36 sup-

40ported by hangers 38 depending from the furnace
50 top 40. The specific heating means is not claimed
herein, and thus need not be further described
except to mention that it is desirable to pro-

45 vide a fan 42 to circulate a suitable deoxidizing
50 gas in contact with the coils of steel strip stacked
in the furnace.

A particular feature of the present invention
relates to the means for cooling the shaft 44 and
the bearing 46 adjacent the heating means. The

55 other bearing 48 remote from the heating means
need not be equipped with the special cooling
structure, since the effectiveness of the cooling
means to now be described in connection with
the bearing 46 will suffice to maintain satisfac-

60 tory operating conditions.

The bearings 46 and 48 are bolted to an up-
right plate 50 which is secured to the top frame
structure 52 of the furnace in any suitable man-
ner.

Since the bearing 46 nearest the heating means
is the one principally affected by heat transfer
along the fan shaft, we provide special means for
cooling the shaft in the vicinity of this bear-

65 ing, and also provide a special type of sleeve 54
such as best shown in Figures 2 and 3, to retard
the transfer of heat from the shaft to the adja-
cent parts of the bearing.

The sleeve 54 is formed of a metal having a low
rate of heat conductivity, such as stainless
steel. The interior of the sleeve is bored as
shown in Figure 4, to provide spaced bearing
portions 56 and 58 of limited area contacting the
fan shaft 44. These bearing portions are sepa-

70 rated by an annular chambered portion 59 which
provides for an insulating blanket of air sur-
rrounding the shaft between the bearing portions,
thus serving to inhibit heat transfer. The ex-
terior of the sleeve 54 is formed with an annular
depression 62 so as to restrict the contact with
the antifriction bearing raceway bushing 64 to
two spaced annular areas 66 and 68 and thus
negative the tendency to conduct heat from one
another. The roller bearing 60 includes the an-

75 trifriction rollers 70, race rings 72 and retainer
member 74 and oil seals 75 of usual or known
conventional form.

A plurality of grooves 76 extend longitudinally
on the exterior of the sleeve from the top there-

80 of to a point beyond the lower end of the bush-
ing 64. At the top of the sleeve, a series of an-
nular grooves are cut so as to form the cooling
fins 78. A casing 80 surrounds and encloses the
upper end of the sleeve, and nozzles 82 are con-

85 nected to pipes 84 leading to a supply of com-
pressed air. Cooling air ejected from the nozzles
is impinged on the fins 78 and a slight pressure
is maintained within the casing 80. Thus a plu-

90 rality of streams of cooling air flow longitudinally.
3 along the exterior of the sleeve and exhaust to atmosphere beyond the lower end of the bearing bushing 84, as suggested by the arrows in Figure 2. At the top of the furnace is a stuffing box 88 surrounding the portion of the fan shaft below the bearing 46, a gland 90 and means 92 to compress a packing material in working condition about the sleeve 84 which revolves with the shaft which is driven through pulleys 92, 94 and belt 96, from a motor 98, as shown.

Deoxidizing gas is introduced into the furnace from an inlet pipe 100 connected to the stuffing box 88, and the gas circulates through the space between the sleeve and the stuffing box and enters the top of the furnace through the clearance space 102 between the shaft 44 and the wall of the shaft opening in the furnace top.

While we have disclosed specific details of a preferred construction which an actual reduction to practice has demonstrated to be highly desirable, it is not to be construed that we are limited thereto, since various modifications may be made by those skilled in the art without departure from the invention as defined in the appended claims.

We claim:
1. In a furnace having a fan therein supported on a shaft a portion of which is subjected to intense furnace heat, a bearing for said shaft and means for cooling it and an adjacent portion of the shaft comprising a sleeve secured to the shaft having respective annular portions firmly contacting the shaft and separated by an inner chambered portion clearing the shaft, an antifriction bearing-race-bushing surrounding a portion of said sleeve and firmly contacting it at spaced portions and clearing it therebetween, the sleeve having a plurality of longitudinal grooves formed on its exterior and extending beyond the ends of said bushing, a casing surrounding one end of said sleeve forming an air chamber, and means effective to deliver cooling air under pressure to said chamber and force it through the grooves in said sleeve.

2. In an annealing furnace having a heating means, a fan for circulating a gaseous medium heated thereby, a shaft to which the fan is secured having one bearing remote from the heating means and another bearing adjacent there-