United States Patent [19]

Cremer et al.

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[54] **APPARATUS FOR COOLING HOT MATERIAL IN BULK**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **34/187,** 213/32 R

[51] **Int. Cl.** **F26b 11/08**

[58] **Field of Search** 34/167, 168, 184, 34/186, 187; 263/32, 28, 7

[56] **References Cited**

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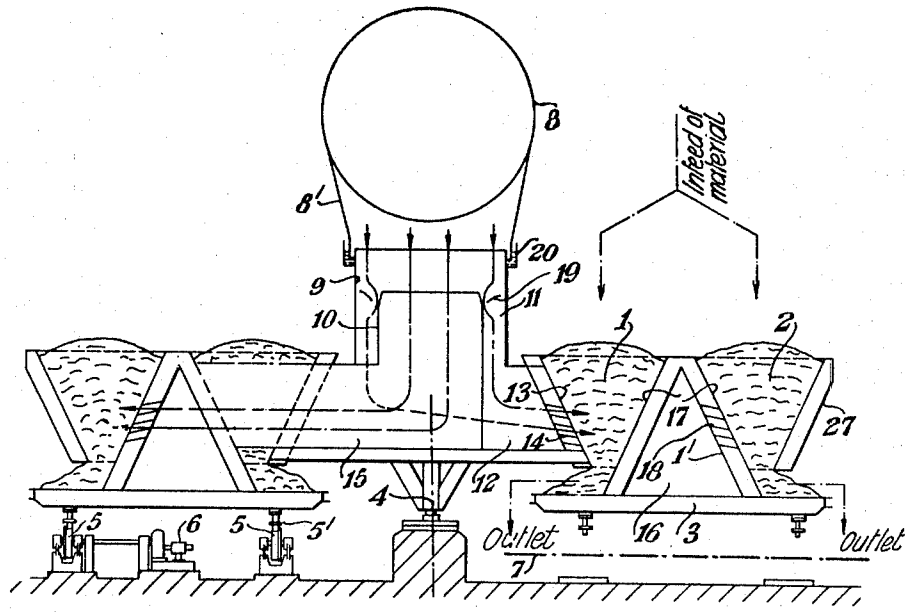
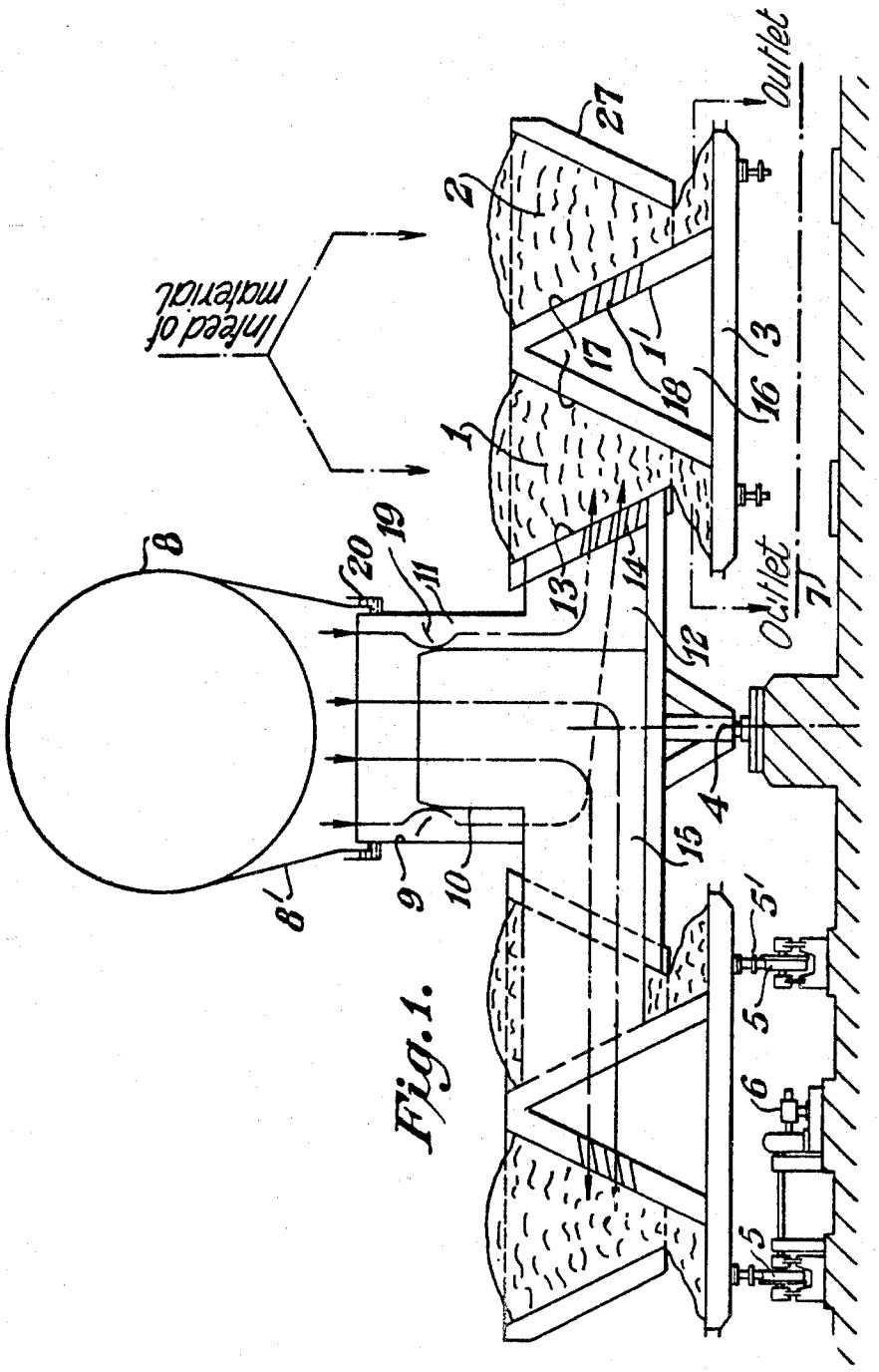
[57] **ABSTRACT**

Apparatus for the cooling of iron ore sinter or other hot material in bulk comprising a frame structure mounted to revolve about a vertical axis, at least two concentrically arranged annular troughs supported on said frame structure, each of which troughs is of downwardly tapering cross-section, said troughs being of open formation at the top and bottom, means for introduction of material to be cooled into the open top of each trough as it revolves, a platform on said structure and positioned to receive material as it discharges therefrom, stripping means by which material is discharged from the platform and means for introduction of cooling medium through a side wall of each trough.

9 Claims, 3 Drawing Figures




Infeed of material
Outlet
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27
2
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17
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1'
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16
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Fig. 1.

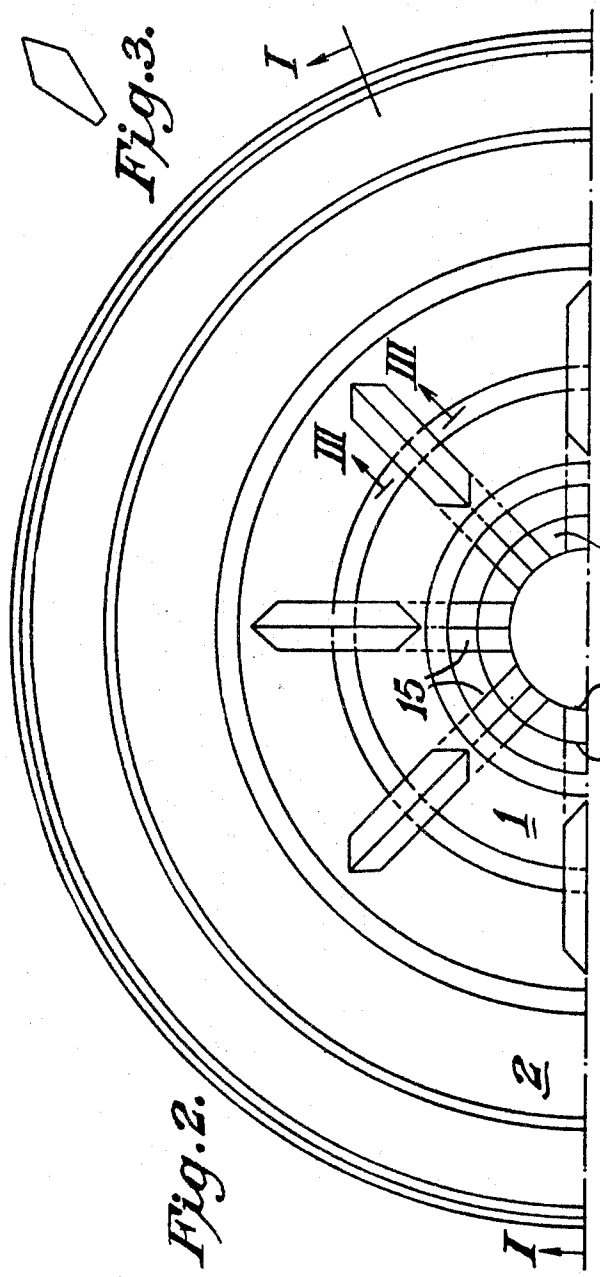

Fig. 2.

Fig. 3.

APPARATUS FOR COOLING HOT MATERIAL IN BULK

The invention relates to apparatus for cooling of hot material in bulk and in particular iron ore sinter with reference to which it is hereinafter described in detail. Continuously revolving or circulating sinter coolers are known in which the hot sinter from a sinter belt is deposited on an endless slat type conveyor moving on a circular track, or on a tub railway (i.e. a number of buckets on wheels) or the like, where it is cooled by air drawn or blown through the material. Sinter coolers of this type are on the whole fairly satisfactory but their performance is limited to the extent of the floor area available.

This invention is concerned with providing apparatus for cooling of hot bulk material, in particular iron ore sinter, capable of handling a relatively large quantity of sinter to be cooled for a given floor area. This if of particular importance where the overall diameter of the cooling installation of a sinter plant must be kept to a minimum because only a limited space is available.

According to the present invention apparatus for cooling hot material in bulk comprises two or more concentrically arranged annular troughs supported to revolve about a vertical axis, each of which troughs are of downwardly tapering cross-section and open at the top and bottom to permit of continuous throughput of material and so arranged as to discharge onto a platform from which the material is continuously removed by stripping means and in which one side wall of each trough is provided with louvres or the like to admit cooling air.

One embodiment of the cooling device according to the invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a section on the line I—I of FIG. 2;

FIG. 2 is a section on the upper edge of the cooler and

FIG. 3 is a section on the line III—III of FIG. 2

The cooling apparatus of this invention comprises two concentrically arranged, annular, open top troughs indicated generally at 1 and 2 having a downwardly tapering cross-section in the shape of an inverted cone. The two troughs are built up on an annular base plate or table 3, the side walls of the troughs being formed by an inverted V-structure 1', an outer wall part 27 and an inside wall part 13, the space contained between walls 17 providing a chamber for cooling air or gas. It will be seen that the wall plates 17 are rigid with the base plate and that the inside wall plate 13 and the outer wall plate 27 are secured to the wall plate 17 in any conventional manner such as by means of upper bracket arms 38,38' and lower bracket arms 40,40' arranged at circumferentially spaced intervals as disclosed in U.S. Pat. No. 2,822,078 to William A. Haven, granted Feb. 4, 1958.

Base plate 3, which revolves about a central axis 4 is provided with rails 5' which run on circumferentially spaced sets of wheels 5, at least one of these wheel sets being driven by a drive motor 6.

Material to be cooled is continuously fed into each of the two troughs by suitable means diagrammatically shown in FIG. 1. Cooled material from the open bottom of each trough falls on to the overhang of baseplate 3 from which it is removed by means of conventional fixed stripper blades 31, whence it is carried away by

conventional endless conveyor belts indicated at 36, or other conveying means.

The air required for cooling the material is admitted through a duct 8 and thence through a central shaft 9. A water seal 20 is provided to seal an off-take duct 8' to the shaft 9 which rotates with the cooling device. Enclosed within the walls 13 of the trough 1 is an annular space 12 into which part of the cooling air flows via an annular passage 11 formed between the shaft 9 and a central pipe 10. From the annular space 12 the air enters the inner trough 1 through apertures in the side wall 13 formed by bars 14 arranged in the form of a louvre. On entering the trough 1 the air flows upwardly in a direction opposite to the movement of the material, finally leaving the material at its surface. The other portion of the cooling air passes down through the pipe 10 and thence along radial branch pipes 15 leading off the pipe 10. The pipes 15 extend through the trough 1 into the annular space 16, the air passing through openings in the inside wall 17 of trough 2. The side wall 17 of trough 2 is also equipped for this purpose with bars 18 forming a louvre. The distribution of the cooling air entering the troughs 1, 2 is controlled by hingedly mounted baffles or throttles 19 in the passage 11.

To prevent the material dropping downward in the inside trough 1 from being unduly obstructed by the branch pipes 15, these pipes accordingly are given a flow-dynamic cross-section, such as that shown in FIG. 3.

Obviously, the admission of cooling air to the troughs can also be effected by means different from the arrangement described above, e.g. the entire flow of air can pass from chamber 12 into the annular space 16 and thence by louvres in the walls 17 into each of troughs 1 and 2, the openings in the side wall 17 taking the place of the louvres in the side wall 13.

What is claimed is:

1. Apparatus for the cooling of iron ore sinter or other hot material in bulk comprising a frame work including a platform, support means for mounting said frame work to revolve about a vertical axis, at least two concentrically arranged annular troughs supported on said platform, each of which troughs is of downwardly tapering cross-section, said troughs being of open formation at the top and bottom, means for introduction of material to be cooled into the open top of each trough as it revolves, said platform underlying said troughs and positioned to receive material discharging from said troughs, stripping means for discharging material from the platform, and cooling means for introduction of cooling medium through a side wall of each trough.

2. Apparatus as claimed in claim 1 wherein the platform includes an annular base plate and said support means includes spaced sets of rollers.

3. Apparatus as claimed in claim 1 and comprising two troughs separated by an inverted V-formation partition wall.

4. Apparatus as claimed in claim 3 wherein said cooling means include a central duct connected to a source of supply of cooling medium in which a hollow shaft connects at its upper end with the duct and at its lower end opens into a central chamber enclosed within said position wall, and connections between said chamber and said troughs for supply of cooling medium thereto.

5. Apparatus as claimed in claim 4 wherein said cooling means also include a pipe within said shaft, said

pipe extending into the central chamber to form an annular passage bounded by the side wall of the inner trough in which side wall are provided openings for admission of cooling medium, said pipe having radial branch pipes extending through the inner trough and connecting with the outer trough.

6. Apparatus as claimed in claim **5** in which the branch pipes open into an annular chamber provided between the troughs, this chamber communicating with the outer trough by slots in the side wall of the trough.

7. Apparatus as claimed in claim **6** wherein said cooling means further include means for controlling the relative distribution of cooling medium to the troughs.

8. Apparatus as claimed in claim **4** in which the central chamber is provided with branch pipes connecting with an annular chamber provided between the troughs, and openings provided in the inner walls of each trough for flow of cooling medium from said annular chamber into the troughs.

9. Apparatus as claimed in claim **8** and including means for controlling the relative distribution of cooling medium to the troughs.

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