MEANS FOR INTERNALLY COOLING BRIQUETTING MACHINE ROLLS AND SEGMENTS

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References Cited
UNITED STATES PATENTS
2,226,186 12/1940 Derhoef ... 425/471

FOREIGN PATENTS OR APPLICATIONS
213,035 2/1955 Australia ... 425/237
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ABSTRACT
Roll-type briquetting machines employed for high temperature operations such as in the compaction and briquette making of heated, reduced iron ore are cooled by the use of a flexible internal cooling system employing water. The flexibility of the machine requires that mold segments be removable from the rolls. This system provides means for circulating water through the roll segments from a common source and maintaining uniform temperature on the surface of each segment on the rolls.

10 Claims, 6 Drawing Figures
3,907,486

MEANS FOR INTERNALLY COOLING BRIQUETTING MACHINE ROLLS AND SEGMENTS

This is a division of application Ser. No. 422,641, filed Dec. 7, 1973, now U.S. Pat. No. 3,873,259.

BACKGROUND OF THE INVENTION

This invention relates particularly to the cooling of roll-type briquetting machines. It will be discussed particularly in connection with briquetting machines of the type disclosed in Komarck U.S. Pat. Nos. 3,077,634, 3,143,769 and 3,269,611. These patents describe a roll-type briquetting machine in which two rolls in tandem are rotated tangentially and in opposite directions. The material to be made into briquettes is forced between the rolls into the area known as the nip of the rolls. On each side of the nip is a retaining wall known as a cheek plate. As the hot, reduced ore or other material to be briquetted is forced into the nip of the rolls, and as the pressures of compaction distribute the material throughout the mold pockets, surface heat is generated on the segments which must be dissipated in order to reduce the wear and erosion of the segment parts and the means used to force the material into the nip.

The buildup of heat in the nip of the rolls also stimulates and encourages the adherence of material to the roll pockets. Adhesion of material such as heated, reduced iron ore to the mold pockets is highly undesirable because it results in deformed briquettes, breakage of segments, and reduces the efficiency of the briquetting process. Production rates of the briquetting machines are typically at the rate of 30 to 43 tons per hour. Also typically, the rolls move at from 15 to 28 revolutions per minute; a roll may contain as many as 36 to 250 pockets around the circumference of the roll, which is about 3 feet in diameter. Accordingly, it will be seen that it is typical for a given pocket to appear in the nip of the rolls every two or four seconds.

Prior to the present invention, the heating problem was for a time considered to be extremely difficult, if not insoluble. Thereafter, a spray system was developed on the outer circumference of the roll at 180° from the nip. The use of water sprays at one point only, however, has limitations which arise mainly from the rapid increase and decrease of segment temperature with each revolution. My invention involves the use of a particular system of internal water circulation which provides cooling continuously throughout the rotation of the roll, thus maintaining a relatively constant temperature throughout.

Prior to the present invention, it has been known to use water for the internal cooling of such devices as rolls. See, for example, U.S. Pat. No. 2,650,034. Water cooling has also been used for various types of presses, molds, and dies, such as disclosed in U.S. Pat. Nos. 3,556,201, 3,525,098, 3,735,805, 3,213,491, 3,259,175 and in German Pat. No. 1,071,733. The control of temperature during an iron briquetting process is discussed in U.S. Pat. No. 3,556,722.

SUMMARY OF THE INVENTION

I have invented a system for internal water cooling of briquette mold segments during operation on a tandem roll briquetting machine. The system permits the use of relatively high temperatures and compaction pressures while at the same time decreasing the incidence of sticking, and increasing the ready release of briquettes from the roll pockets.

My invention provides the circulation of water in a closed system within the roll and briquetting mold segments. It is capable of removing at least 500,000 btu/hour from a typical machine as described herein. A preferred embodiment of my invention is shown in the drawings, of which FIG. 1 is a perspective view of an assembled roll unit including briquette mold segments,

FIG. 2 is a cutaway view of the roll and its shaft, showing the mold segment seats and part of the internal water circulation system of my invention,

FIG. 3 is an exploded view of a roll segment showing the seating within the segmented clamps,

FIG. 4 is a detailed portion of a clamp ring, and FIGS. 5 and 6 are sectional views of the subject of FIG. 4.

Referring to FIG. 1, the assembled briquette roll unit comprises roll core 6, a pipe 24 axially within it, and peripheral roll segments 2 secured by clamps 4 having bolt and nut assemblies 18 to secure them. The roll segments 2 include briquette pockets 54.

Referring to FIG. 2, the cutaway briquette roll assembly shows the roll core 6 placed around the pipe 24. Centered on roll core 6 is the segment-supporting roll body section 3. The purpose of the roll body section 3 is to provide seats 8 in the shape of V's. The seats 8 are designed to hold segments 2, not shown in FIG. 2.

Pipe 24 is inserted into larger terepinned hole 26 to provide equal passages through the pipe 24 and around its circumference. Collar 28 is welded to pipe 24 and ring 30 is attached to provide a watertight barrier when pipe 24 is threaded or otherwise affixed to roll core 6.

Water is introduced into pipe 24 and channeled to radial passages 34 and thence to annular grooves 36 which functions as a supply manifold. The holes 38 are drilled into cover plate 40.

In FIG. 3, an exploded view of two opposed clamps and the manner of fitting on a segment is shown. The clamps 4 may be seen to be connected by bolt 18. Between them is a roll segment 2 which contains pockets 54. This assembly, as the previously described roll assembly, is conventional except for the water circulation elements described below. Operation of my invention is illustrated as follows.

Water flows through holes 38 from groove 36 to holes 42 in clamp ring 4. The holes 44 channel water into holes 46 then through holes 48 in segment 2.

Water flow is through segment 2 and into clamp 4, further into outlet annular groove 50 which operates as a discharge manifold, thence to radial passage 52.

It can be seen that the water exiting through the terepinned hole 26 does not intermix with the inlet water inside the pipe 24. A divided flow of cooling water is directed in a once through passage 48 inside the segments 2 to cool the segment surfaces 54. Pipe 24 rotates with the roll; water is introduced to it from a conventional rotary joint not shown. If it is desired for the pipe to be stationary, a conventional rotary joint may be used in the interior of the roll.

A unique design feature of my invention is the manner in which the clamp rings 4, segments 2 and roll body 6 are gasketed at 56 and 58 as shown in FIGS. 4 and 6. FIG. 5 shows the obround gasket 58 inserted in retaining groove 56. FIG. 6 shows the obround gasket 56 and 58 in operating attachment with clamp 4, tight-
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1. Apparatus for making reduced iron ore briquettes comprising a plurality of mold segments adapted to be placed on the periphery of a mold support, said mold segments having transverse passages for conducting water through them, and a mold support in the form of a roll adapted to accommodate a plurality of mold segments around its periphery, said mold support also having transverse passages for cooling water, and manifold means for circulating cooling water from the mold support to the mold segments.

2. Apparatus of claim 1 including an axial passage in the core of the roll and a plurality of radial passages in said roll connected to the transverse passages therein.

3. Apparatus of claim 1 in which the manifolds include annular inlet and discharge passages on the mold support.

4. Apparatus of claim 1 in which the manifolds include distribution headers and discharge recesses for each mold segment.

5. Apparatus of claim 4 in which the headers and recesses are located in clamp rings.

6. Apparatus of claim 4 in which the headers and recesses are sealed by resilient gaskets.

7. A briquette mold roll comprising a roll support, a plurality of mold segments on the periphery thereof, said segments each containing at least three transverse passages therethrough, and means for circulating cooling water through the passages in the segments while the roll support turns.

8. A mold roll comprising a mold roll body, an axial pipe for introducing water thereto, radial water passages leading to the periphery thereof, an annular manifold thereof, means for directing water from said annular manifold to peripheral mold segments, means for receiving water from peripheral mold segments, an annular discharge manifold connected thereto, radial discharge passages leading from the discharge manifold toward the axial pipe, and a passageway concentric to said pipe for removing spent cooling water.

9. Apparatus of claim 7 in which the means for circulating cooling water through the passages in the segments includes segment clamps having manifold recesses and means for conveying water to and from annular recesses in the mold roll.

10. Apparatus of claim 9 including radial passages for conveying water to and from the annular recesses and axial passages for conveying water to and from the radial passages.

1 claim: