Sept. 24, 1963 H. L. F. BOND 3,104,849

EXPANSIBLE MANDREL

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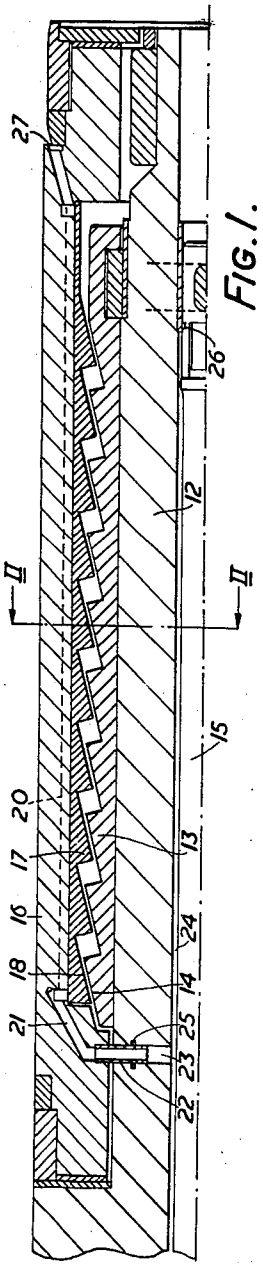


FIG. 1.

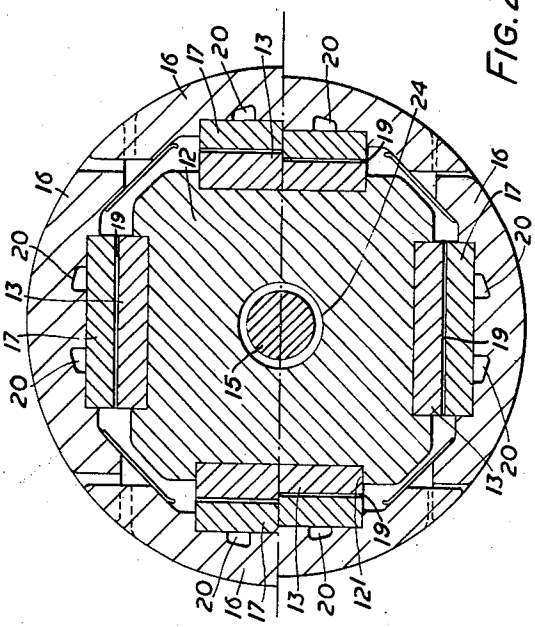


FIG. 2.

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EXPANSIBLE MANDREL

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This invention relates to the coiling of strip and is particularly concerned with the coiling of hot strip, such as steel strip coming off a reducing mill. Strip coilers for this purpose are usually expansible, the strip being coiled while the coiler is in the expanded state and the coiler being then collapsed to enable the coil of strip to be removed. Usually, the surface of the coiler is segmental, the segmental elements being located on a central core and radially expanded by wedge action or by a suitable linkage. With hot strip, the coiler must be cooled in some way, and it has been the practice to pass cooling liquid through the passages between the segmental elements and the central core; however, in such a construction, difficulty is experienced in maintaining the expanding parts of the coiler suitably lubricated, with the result that heavy wear and jamming of the expanding mechanism has occurred.

In accordance with one aspect of the present invention there is provided an expansible mandrel for coiling hot strip comprising a plurality of segmental elements expansively mounted on a central core, passages between said elements and core for the reception of lubricant and cooling passageways for the circulation of cooling fluid, arranged to withdraw heat from the segmental elements, there being no communication between the lubricant passages and the cooling passageways.

In accordance with another aspect of the invention there is provided an expansible mandrel for coiling hot strip comprising a plurality of segmental elements expansively mounted on a central core, and at least one groove in an inner face of each of said elements, each groove defining in part a passageway for the circulation of cooling fluid and being sealed from spaces within the mandrel between the elements and core.

In accordance with a further aspect of the invention there is provided an expansible mandrel for coiling hot strip comprising a central core, a plurality of segmental elements around the core, expansion means between the core and each segmental element and secured to the inner surface of each segmental element in surface to surface disposition, and grooves in the inner surface of each segmental element or in the contacting surfaces of the expansion means, which grooves are closed by the contacting surfaces of the expansion means or by the inner surfaces of the segmental elements to form passageways for the circulation of cooling fluid.

The invention will be more readily understood from the following description of an expansible mandrel for hot strip, given by way of example, reference being made to the accompanying drawings in which:

FIGURE 1 is a half central longitudinal section through the mandrel, and

FIGURE 2 is a section on the line II—II of FIGURE 1, the top and bottom halves showing the mandrel in expanded and collapsed condition, respectively.

The mandrel comprises a tubular core 12 which is carried in bearings (not shown), and which has formed in its surface four grooves 12' for the reception of four sliding wedge members 13. Each of the members 13 has on its outer surface a series of inclined wedging surfaces 14 and the four members 13 are connected by means not shown to a central shaft 15, which can be moved axially

to cause movement of the members 13 in either direction.

Four highly stressed, forged segmental elements 16 are located about the core 12 and each has secured to it a wedging member 17, which is bedded into a recess in segmental element 16 and which is generally similar to the wedging member 13 having inclined surfaces 18 co-operating with surfaces 14. The wedging members 17 are fixed to their respective elements 16 by radially extending screws (not shown), the heads of which are recessed into the surfaces 18. Movement of the shaft 15 causes relative movement between the members 13, 17 and expansion or collapse of the segmental elements 16, according to the direction of movement. The passages 19 between the members 13, 17 are filled with lubricant to prevent jamming.

Each of the segmental elements 16 is provided with a number of grooves 20 on its inner surface which are closed by abutting faces of the wedge members 17 to form passageways 20 for the circulation of cooling fluid. Two such passageways are shown in the drawing, but more may be supplied if necessary. The two passageways 20 in each element 16 communicate with a common supply passage 21 leading to a telescopic connection 22 between the element 16 and the core 12. The connection 22 communicates with a duct 23 in the core 12, leading from the passageway 24 between the core 12 and the shaft 15. A sealing gland 25 is provided around the telescopic connection 22 to prevent leakage of cooling liquid to the lubricant-filled passage 19 between the wedging members 13, 17 and a similar sealing gland 26 is supplied around the shaft 15 to prevent cooling liquid in the passage 24 escaping past the shaft 15. Suitable sealing members may also be provided between the wedge members 17 and the segmental elements 16 for the same purpose.

Cooling liquid, preferably water, is supplied to the passage 24 and through the telescopic joint 22 to the cooling passageways 20. The cooling liquid discharges through outlets 27 located in the segmental elements 16 remote from the inlet duct 21.

The hot strip is coiled round the mandrel in contact with the outer surfaces of the segmental elements 16. However, as the cooling liquid passes through those elements 16, themselves, the heat conducted from the hot strip to the elements is substantially prevented from passing to the expanding mechanism illustrated by the wedging members 13, 17. In addition, the lubricant in the wedging mechanism is not brought into contact with the cooling liquid and therefore remains in position and effective.

It will be understood that the expanding mechanism may be other than the wedging members 13, 17 illustrated in the drawing. For example, the segmental elements 16 may be connected to the core 12 by links, such that relative axial movement of the elements 16 and the core 12 results in the elements 16 being expanded or contracted as required. It will also be understood that the passages for the cooling fluid may be formed otherwise than as shown in the drawings; for example, grooves similar to grooves 20 may be formed in the surfaces of the wedging members 17 engaging the segmental elements 16, rather than in the elements 16 themselves the grooves being closed by the surface of the segmental elements 16 to form passageways, as before.

In accordance with the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I consider to represent the best embodiment thereof. However, I desire to have it understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An expansible mandrel for coiling hot strip comprising a central core having a liquid conveying duct therein, a first set of wedge members mounted on said core, a plurality of segmental elements around said core, each having grooves in the inner surface thereof, a second set of wedge members cooperating with said first set and secured to said segmental elements in surface-to-surface disposition so as to close said grooves and to form passageways separated from the cooperating surfaces of said sets of wedge members, and a telescopic connection piece between said duct and said grooves of each said segmental element, relative movement between said sets of wedge members causing expansion and contraction of said segmental elements relative to said core.

2. An expansible mandrel for coiling hot strip comprising a central core having a liquid conveying duct therein, a plurality of segmental elements around said core, each having at least one lengthwise passageway therein, means connected between said core and said segmental elements for expanding said segmental elements relative to said core, passages between said segmental elements and said core for the reception of lubricant and connection means between said duct and each of said passageways, said passageways being independent of and unconnected with said lubricant passages.

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