

Sept. 7, 1965

M. MORGAN

3,204,940

APPARATUS FOR COOLING HOT METAL ROD IN A LAYING REEL

Filed Nov. 28, 1961

2 Sheets-Sheet 1

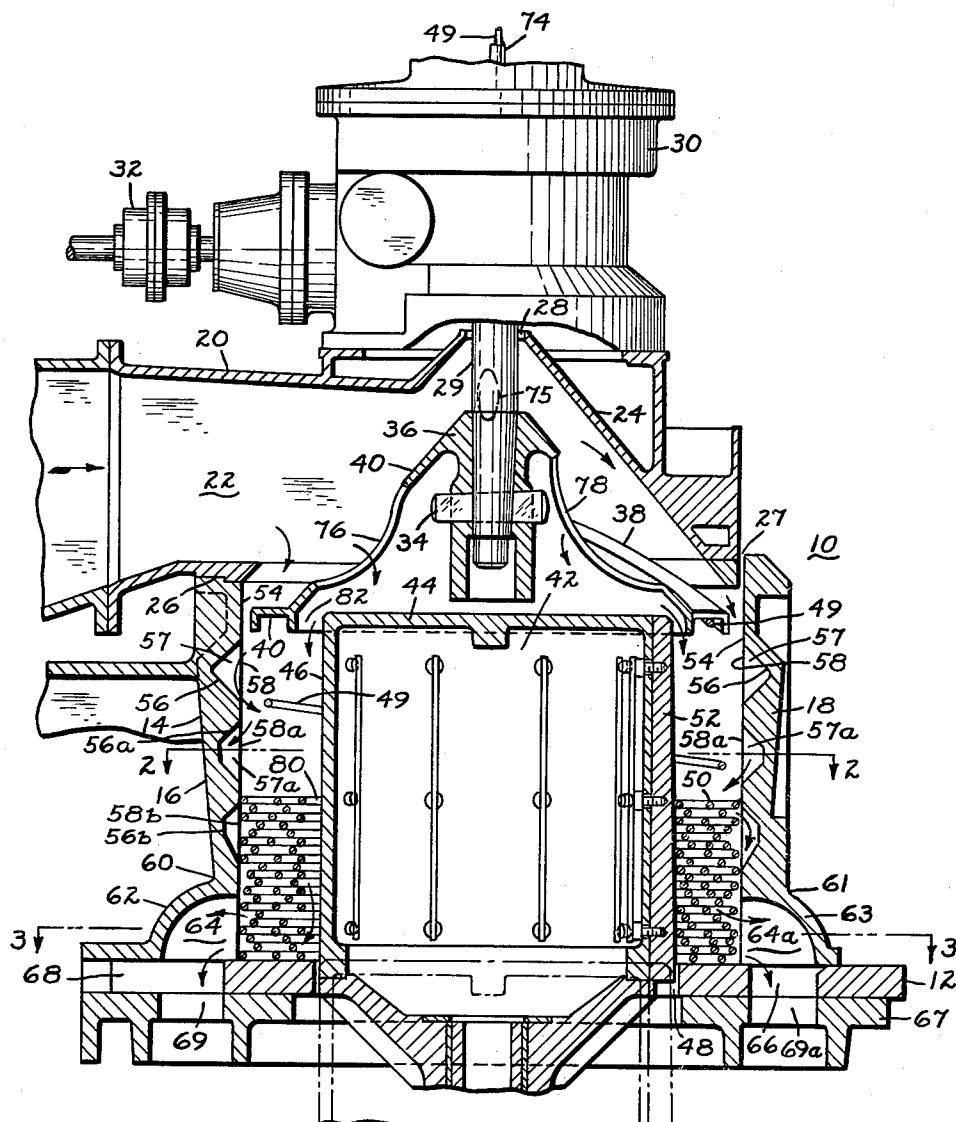


Fig. 1

INVENTOR  
Myles Morgan  
BY  
Russell, Chittick & Pfund  
Attorneys

**Sept. 7, 1965**

M. MORGAN

**3,204,940**

# APPARATUS FOR COOLING HOT METAL ROD IN A LAYING REEL

Filed Nov. 28, 1961

2 Sheets-Sheet 2

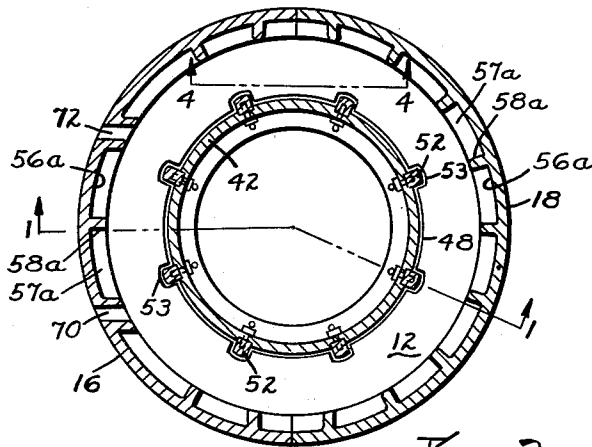


Fig. 2

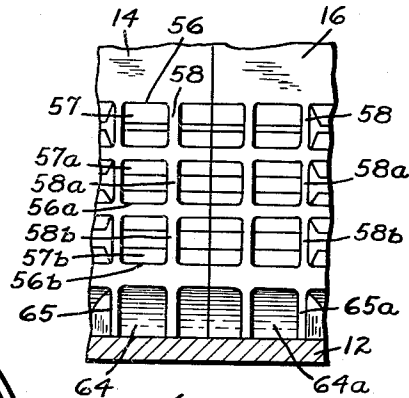


Fig. 4

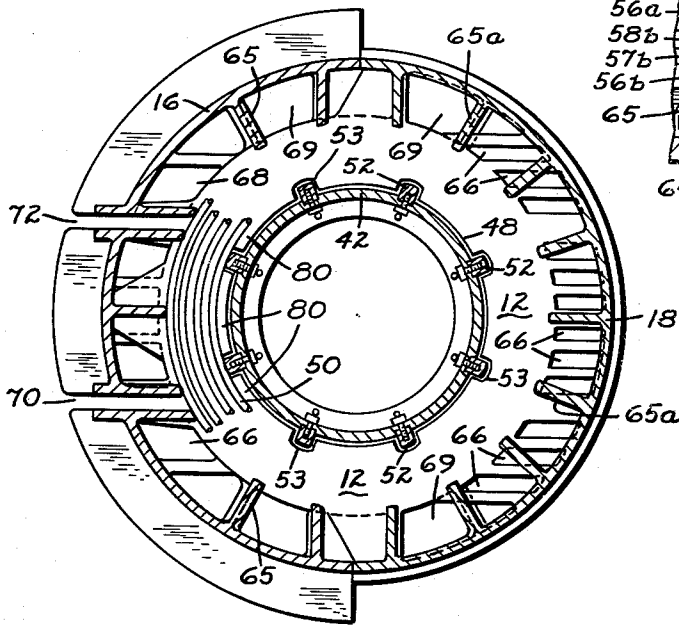


Fig. 3

INVENTOR.

INVENTOR.  
Myles Morgan

BY

Russell, Chittick & Pfund

Attorneys

1

2

## 3,204,940 APPARATUS FOR COOLING HOT METAL ROD IN A LAYING REEL

Myles Morgan, Worcester, Mass., assignor to Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts

Filed Nov. 28, 1961, Ser. No. 155,291

4 Claims. (Cl. 266—5)

This invention relates generally to the handling and storage of hot metal rods being delivered from a rolling mill or the like and specifically to a method and apparatus for coiling a continuous rod into a coil and simultaneously cooling the rod as it is being coiled.

It is well known in the industry that to allow a coiled red-hot rod to cool by normal radiation to the atmosphere will result in an undesirable excessive accumulation of scale on the rod surface. Consequently, it is customary in the industry today to provide a coolant (air or water) supplied from an exterior source, which coolant is directed continuously at the growing coil in the laying reel and at the rod as it is laid on the top of the coil to increase the rate of cooling without damage to the metal structure and to decrease the scale accumulation.

The majority of the systems in use today use air which is forced through the superimposed layers of the coiled rod which are deposited and retained in their circular bundle form between the cylindrical core or drum and the interior wall of the surrounding cylindrical casing of the laying reel. The cool air which is directed downwardly over the coil as it is being formed in the laying reel acts as a medium for heat exchange. While the air becomes progressively warmer as it passes to the lower portion of the coil, the net effect is to produce a substantially uniform temperature throughout the coil within the time available. The rod, which may enter the laying reel at perhaps 1400° F., may be cooled to 1100° F. or thereabouts by the time the coil is completed. In the present laying reels, the closely lying convolutions of the coil particularly block the passage of the cooling air so that the coil temperature is not reduced as much as desired. Furthermore, some of the surfaces of the coiled rod may be more or less by-passed by the downward flow of air since heretofore there has been no way known for directing the air in diverse directions between the rod layers.

Therefore, one object of this invention is to provide a laying reel structure which will result in more uniform and rapid cooling of the rod as it is being coiled and thereafter while remaining in the laying reel in coiled form.

Another object of this invention is to provide a cylindrical core or drum having slightly tapered vertical ribs on its outer periphery to provide air channels between the coil and the central drum and to facilitate lowering of the drum when the completed coil is to be removed from the laying reel.

Still another object of this invention is to provide turbulence chambers on the interior wall of the casing and vertical passages along the drum wall which together disturb or break up the air flow in such a manner that all parts of the coil will at each level be cooled uniformly.

This invention is an improvement on my Patent No. 2,621,914, issued on December 16, 1952, for Apparatus for Coiling Hot Metal Rods.

The invention will be more fully understood as the description proceeds aided by the accompanying drawings in which:

FIG. 1 is a view in sectional elevation of the coil forming and cooling apparatus;

FIG. 2 is a horizontal section taken on line 2—2 of FIG. 1;

FIG. 3 is a horizontal section taken on line 3—3 of FIG. 1; and

FIG. 4 is an elevational view of part of the interior wall of the casing taken on line 4—4 of FIG. 2.

Referring to the drawings, there is illustrated a laying reel 10 comprising a base plate member 12 supporting a hollow cylindrical casing 14 extending upwardly and substantially normal thereto. The hollow cylindrical casing 14 is made in two semi-cylindrical sections 16 and 18. The section 16 is fixed on the base plate member 12 and the section 18 is vertically movable relative thereto in a manner well understood in the art. A cover portion 20, including an air duct 22 and a conical hood 24, effectively closes the upper end of casing 14. The upper end of section 16 is directly engaged by the cover as at 26 while the right end of the cover as at 27 fits closely within the upper interior wall of section 18.

Extending downwardly through a cylindrical aperture 28 in the upper portion of the casing 20 is a drive spindle 29 which is actuated through suitable gearing in housing 30 by means of a motor (not shown) driving through a coupling 32. The axis of spindle 29 is aligned with that of casing 14. Keyed to drive spindle 29 by key 34 and rotatable therewith is a revoluble laying cone 36 having oppositely disposed spiraling guides 38 and 40, only one of which is used during the rod laying operation.

Concentrically positioned within the casing 14 is a cylindrical drum 42 closed at the top by an imperforate cover 44 and having a peripheral wall 46 which extends downwardly for a short distance through a circular aperture 48 formed in the supporting plate member 12. The annular space between casing 14 and drum 42 is adapted to receive and retain the rod 49 in the form of a coil 50 as shown in FIG. 1. The vertical extent of the coil is determined by the length of the billet from which the rod is rolled. As herein shown, the coil is about half completed. The drum 42 has a plurality of vertically extending slightly tapered ribs 52 disposed on the outer periphery thereof at spaced intervals. These ribs act as spacers between the interior of the coil 50 and the peripheral wall 46 of the cylindrical drum 42. Notches 53 in plate member 12 receive the lower ends of ribs 52. The ribbed cylindrical drum 42 is adapted for vertical downward movement through the notched aperture 48 by means of a conventional mechanism (not shown) thereby to permit horizontal removal of the coil from the casing after the section 18 has been raised. When the drum is in down position with the top flush with plate member 12, the space between the drum and the surrounding aperture 48 will be small enough to preclude the end of the coil catching therein.

The interior surface 54 of casing 14 is provided with a plurality of circumferential grooves 56, 56a and 56b, each of substantial depth and height. Each groove is broken into a series of pockets 57, 57a and 57b by a plurality of vertical members or partitions 58, 58a and 58b. The partitions prevent entry of the outer convolutions of the coil into the pockets. The lower ends 60 and 61 of the upstanding sections 16 and 18 of casing 14 have portions 62 and 63 belled outwardly defining an annular area 64, 64a. Other vertical rib members 65 and 65a partition the annular area 64, 64a and prevent the entrance therein of the outer lower convolutions of coiled rod.

It will be seen by referring to FIGS. 1 and 3 that the supporting plate member 12 has a series of ports 66 formed therein on the righthand segment below the annular area 64a of section 18. These ports are smaller than other ports 68 formed in the lefthand segment below annular area 64 of section 16. Ports 66 are relatively

3

small to eliminate the possibility of the bottom end or other part of the coiled rod 50 catching on the edge of one of the ports 66 as the coil is removed from the housing by sliding it to the right along plate member 12 after section 18 has been raised and drum 42 lowered. A support member 67 has ports 69 and 69a of substantially the same area as the ports above in plate member 12 which provide a continuation of the exhaust passages for the downwardly moving air.

Parallel vertically extending slots 70 and 72 laterally spaced from each other (see FIGS. 2 and 3) extend through the wall of the casing section 16 and are adapted to allow conventional pusher arms (not shown) to move therethrough. The pusher arms operate in conjunction with mechanism which moves the opposite section 18 upwardly and simultaneously lowers the drum 42. With section 18 raised to a level to clear the top of the coil and with the top 44 of the drum 42 flush with the upper surface of plate member 12, the pusher arms push the coil to the right out of the laying reel to a conveyor.

The laying cone 36 receives the oncoming rod 49 via a tube 74 and hollow spindle 29 whence it passes diagonally outward through an opening 75. The rod is then spiralled downwardly around the outer conical surface of the laying cone, being guided in such movement by the guide 38 or 40, as the case may be. Rotation of the laying cone 36 causes the advancing rod to be laid continuously in coiled fashion between the casing 14 and the drum 42 in a known conventional manner. To improve air circulation, the laying cone has a pair of oppositely disposed symmetrical openings 76 and 78.

The operation of the invention will now be understood with reference to the description and the accompanying figures. With the central drum 42 in the raised position as shown in FIG. 1, the hot rod is delivered through the pipe 74 which extends downwardly through the gear box 30 to the laying cone 36. In conventional manner, the rod is delivered by the laying cone to the area between the drum 42 and the interior wall of the cylindrical casing 14. Since the tapered vertical ribs 52 extend outwardly from the peripheral surface 46 of the drum 42, the rod will be held in spaced relationship thereto. Since the interior of coil 50 engages only the tapered ribs 52, there is less friction to be overcome when the drum is lowered. Furthermore, a number of arcuate vertical air spaces 80 between the coiled rod and the surface of the drum are created as coiling proceeds. Simultaneously with the delivery of the hot rod, air is supplied from an external blower (not shown) through the duct 22. The air travels downward exteriorly and interiorly of laying cone 36. The passage outside of the lower periphery of cone 36 is the major channel with the minor channel being through openings 76 and 78 and the inner annular area 82. During the passage of the air downwardly over the rod, some of the air enters the several grooves 56, 56a and 56b formed in the interior wall 54 of the casing 14. This imparts a turbulence to the air and directs and re-directs it over the coiled rod in a multitude of directions. The several arrows shown in FIG. 1 illustrate some of the numerous directions of flow the air will take. Some of the air will move into the spaces 80 and then back through the coil. Other portions of the air will travel inwardly from the grooves. As the air reaches the bottom of the coil, it flows radially outward in area 64, 64a and thence is discharged downwardly through the openings in plate member 12 and base 67. Through the use of this novel construction, all parts of the coiled rod are subjected to heat transfer conditions of a more efficient nature than heretofore available. This results in the coil being at a lower temperature when it is discharged from the laying reel.

It will be understood that the dimensions and number of the grooves may be varied somewhat to effect modifications of the diversified air currents as may seem expedient

4

under different conditions of rod size, temperature and rate of delivery.

Since other obvious modifications may be made in the device without departing from the scope of the invention, it is intended that all matters contained herein be interpreted in an illustrative and not in a limiting sense.

I claim:

1. A laying reel for coiling hot rod comprising an outer casing, a drum concentrically positioned within said casing, said drum having an imperforate cover member, a laying cone above said drum, a plurality of vertical outwardly extending circumferentially spaced rib members on the exterior surface of said drum, the inner wall of said casing provided with a plurality of turbulence chambers spaced circumferentially and vertically from each other, an annular exhaust port at the bottom of said casing broken by a plurality of vertical members to prevent entry of coiled rod into said exhaust port, means for introducing air into the upper portion of said casing, whereby said air will pass downwardly in diverse directions through a coil disposed between said casing and rib members to rapidly reduce the temperature thereof before being exhausted by said exhaust port.

2. In a laying reel comprising a casing, drum and base plate member, means for continuously air cooling the entering hot rod and the coiled rod up to the time of discharge from the said laying reel, said means comprising at least one circumferential groove about the interior of said casing, means for preventing entry of the coiled rod into said groove, vertical ribs on the exterior of said drum to hold the coiled rod away from the drum surface and thereby to form passages between the drum and coil, an annular air discharge port at the bottom of said casing radially outward of the lower end of the coil, means for preventing entry of the coiled rod into said annular discharge port, discharge openings in said base plate member below said annular discharge port, means for supplying air continuously downwardly into the space between said casing and drum, said groove, passages and annular discharge port collectively causing said air to flow in diverse directions over the rod as it enters the reel and thereafter as the rod is in coiled form, said diverse air flow increasing and rendering more uniform the heat transfer from the said rod to the said air.

3. In a laying reel for coiling hot rod, means for causing the cooling air that passes therethrough to travel in diverse directions for improved cooling of the said rod, said means comprising a two-part casing, a plurality of grooves of substantial height and depth in relation to the rod diameter extending about the interior of said casing, means extending across said grooves to prevent entry of the rod therein, an annular exhaust port at the bottom of said casing, means for preventing entry of the rod in said exhaust port, a drum within and concentric with said casing, vertically extending ribs on said drum in such number and dimension to prevent the coiled rod from touching said drum and thereby to provide vertical air passages between the coiled rod and drum, said grooves and vertical air passage cooperating to cause the cooling air as it passes downwardly between the casing drum to flow over said coiled rod in different directions before reaching said exhaust port.

4. In a laying reel for coiling hot rod, means for imparting turbulence to cooling air being forced downwardly over hot rod being coiled therein, said means comprising a two-part casing, each part of said casing having circumferentially extending grooves of substantial height and depth with respect to the rod diameter, said grooves having therein vertically extending members whose inner surfaces lie substantially flush with the inner wall of said casing, said members acting to prevent entry of the coiled rod into said grooves.

(References on following page)

## References Cited by the Examiner

## UNITED STATES PATENTS

|           |       |          |           |
|-----------|-------|----------|-----------|
| 373,463   | 11/87 | Lenox    | 242—83 XR |
| 1,085,540 | 1/14  | Case     | 263—11    |
| 1,338,003 | 4/20  | Egler    | 263—6     |
| 2,621,914 | 12/52 | Morgan   | 266—6     |
| 2,924,445 | 2/60  | Morgan   | 266—6     |
| 2,946,535 | 7/60  | Marion   | 242—84    |
| 3,092,350 | 6/63  | Thompson | 242—78    |

5

10

|           |       |                 |          |
|-----------|-------|-----------------|----------|
| 3,100,634 | 8/63  | Rubrecht et al. | 263—40   |
| 3,114,539 | 12/63 | Wilson et al.   | 266—5 XR |

## FOREIGN PATENTS

|           |       |          |
|-----------|-------|----------|
| 743,011   | 12/43 | Germany. |
| 1,094,778 | 12/60 | Germany. |

MORRIS O. WOLK, *Primary Examiner.*RAY WINDHAM, *Examiner.*