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Leeuwestein

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[54] **WIRE MANUFACTURE**

[75] Inventor: **Kurt Leeuwestein,** Duisburg-Neudorf, Germany

[73] Assignee: **Friedrich Kocks,** Dusseldorf, Germany

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[51] **Int. Cl.**.....**B66c 1/66**

[58] **Field of Search**.....214/1 BD, DIG. 4, 214/82; 294/67 C; 198/25

[56] **References Cited**

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Primary Examiner—Robert G. Sheridan
Assistant Examiner—George F. Abraham
Attorney—Buell, Blenko & Ziesenheim

[57] **ABSTRACT**

An apparatus is provided for collecting wire bundles from a rod mill and discharging them in a horizontal direction which apparatus includes a vertically disposed guide receiving rod or wire loops from a path and selectively delivering bundles to one of an even number of mandrels on a common frame rotatable about an inclined axis, the mandrels being rotatable from a first position vertically below the guide and receiving bundles therefrom to a second generally horizontal discharge position, each mandrel having a bundle remover displaceable longitudinally of the mandrel.

9 Claims, 2 Drawing Figures

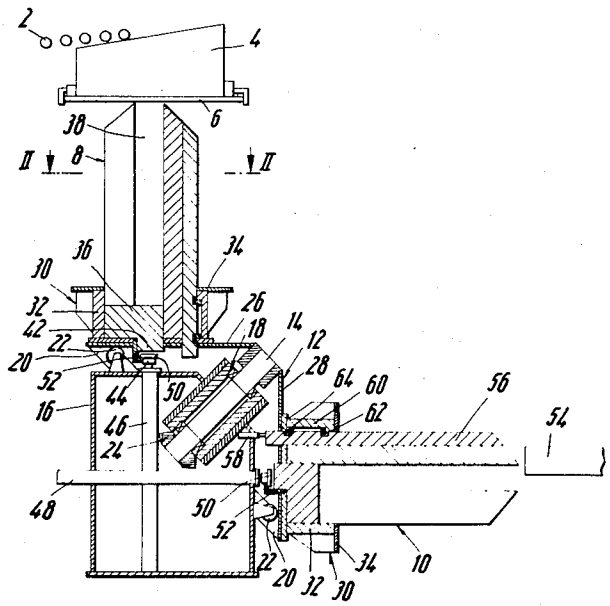
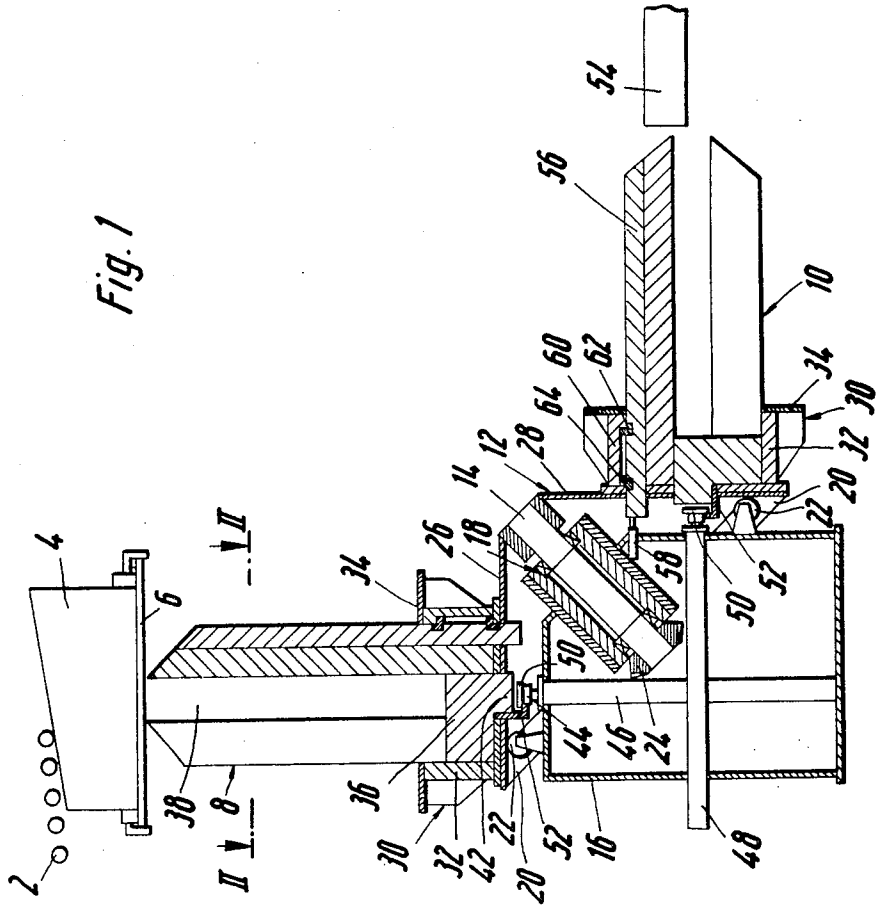


Fig. 1



Inventor:

Kurt Leeuwestein

By Brooks & Kirkenheim

his Attorneys

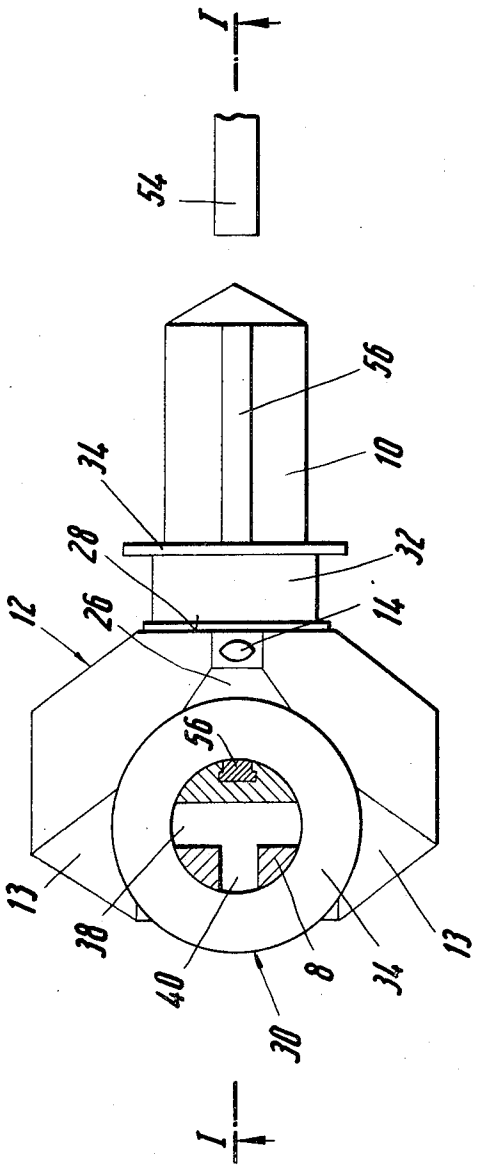


Fig. 2

Inventor:

Kurt Leeuwestein

By Duell, Blenko & Hiesenheimer
his Attorneys

WIRE MANUFACTURE

This invention relates to wire manufacture and particularly to an apparatus for collecting wire or rod bundles in a continuous wire rolling line or rod mill comprising a vertical guide cylinder which is provided at the end of a cooling path and into which the wire, coming from the cooling path enters, in a loop-shaped manner, the guide cylinder having a removable bottom, a plurality of receiving mandrels which are secured to a common rotatable frame and which are movable to a loading station, in which their free ends are directed upwardly directly below the guide cylinder, and to a horizontal discharging station, each mandrel being surrounded by a bundle remover which is displaceable in the axial direction of the respective mandrel.

Such apparatus serves for receiving and collecting wire loops, which emerge at high speed from the cooling path connected at the delivery end of a wire rolling mill, and for transferring to a conveyor apparatus the loops which have been collected into bundles. Since the rolling operation is usually effected with a rapid succession of ingots, the wire loops emerge substantially continuously from the cooling path, so that there is only a relatively short time for changing the mandrels. Whilst the mandrels are being exchanged, the loops are collected in the guide cylinder which has a closable bottom.

Apparatus of the above mentioned kind is described in "Iron and Steel Engineer," Apr. 1969 pages 53 to 61. Four receiving arms or mandrels offset by 90° relative to one another, are secured in a vertical plane to a frame which is rotatable about a horizontal axis. When a bundle has been collected on the receiving mandrel located in a vertical position below the guide cylinder, the bottom of the guide cylinder is closed and the frame provided with the receiving mandrels is rotated through 90°, so that the following mandrel is brought into position below the guide cylinder and receives the wire loops after the bottom of the cylinder has been removed. The mandrel provided with the bundle of wire is at the same time pivoted to move the wire bundle into the horizontal position, and the wire bundle may be removed and further conveyed in a convenient manner. When the next wire bundle has been collected, the frame is further rotated through 90° in the same direction of rotation, so that the fresh bundle is again brought into a horizontal position and a fresh mandrel is pivoted below the guide cylinder. The mandrel from which the preceding bundle of wire has just been removed is pivoted below the level of the rolling line with its free end directed downwardly and rotates idly for two working cycles. Such an apparatus has relatively great spatial requirements, since the diameter of the rotating parts is equal to the diameter of the frame plus double the length of the mandrel. Thus, the pivoting turning radius of the idly rotating stems is partially below the level of the rolling line, since, otherwise, the overall height of the apparatus would be too great. Furthermore, the apparatus is relatively expensive, since at least four mandrels have to be provided, each stem requiring an individual bundle remover and drive devices for the latter.

The publication "Steel and Iron," 1969, Issue No. 12, describes a bundle collecting apparatus in which a plurality of mandrels is arranged in a vertical position on a horizontal plate which is rotatable about a vertical axis. After a mandrel has collected the wire loops into a bundle in the loading station, the plate is rotated to move the mandrel into a discharging station in which the bundle is removed upwardly and deposited in a vertical position onto a conveyor. Such an apparatus is less expensive, with respect to the mechanical devices, than the above-mentioned apparatus, although it has the disadvantage that the bundles are deposited in a vertical position from which they have to be tilted into the horizontal by means of separate devices for the purpose of subsequent removal.

A feature of the present invention is to provide a bundle collecting apparatus which transfers the wire bundles in a horizontal position and which requires only a small amount of space and only low expenditure on mechanical devices.

In accordance with the invention the frame provided with the receiving mandrels is rotatable about an axis of rotation which is inclined by 45° relative to the perpendicular, and an even number of receiving mandrels is arranged with uniform angular spacing around the axis of rotation, each receiving mandrel being inclined at 45° relative to the axis of rotation.

The apparatus constructed in accordance with the invention can operate satisfactorily with two mandrels which are provided on the frame and which are offset by 180° relative to one another and which are pivotable from the vertical loading position into the horizontal discharging position, and vice versa, during rotation of the frame about the axis inclined at 45°.

The actuating devices for the bundle removers displaceable in the direction of the axes of the mandrels may be fixedly arranged in the respective loading and discharging station, so that they can actuate the bundle remover of the mandrel located in the corresponding position. Advantageously, the actuating devices in the loading station and in the discharging station comprise hydraulic cylinders, the free ends of the piston rods of the cylinders being automatically couplable to or releasable from the bundle removers of the respective mandrels by the rotary movement of the frame, coupling and uncoupling being effected for example by means of a flange which is formed on the end of the piston rod and which engages behind a hook-shaped member provided on the remover.

To enable the bundles to be removed from the mandrels and deposited onto an appropriate conveyor in a simple and trouble free manner, that portion of the outside of each mandrel located upwardly when in the horizontal discharging position may have a slide rail which is axially displaceable beyond the free end of the mandrel. A fixedly arranged cylinder may be provided in the discharging station for the purpose of extending the slide rail, while the return movement may be effected by way of a stop which is provided on the respective bundle remover and which comes into abutment against a driver on the slide rail. Advantageously, the slide rail is flush with the surface of the mandrel externally and may be mounted in a groove which is formed in the mandrel and which is undercut at both sides.

The frame may be in the form of a truncated pyramid which has a square base area and right-angled interfacial angles, and which is mounted so as to be rotatable about its central longitudinal axis, the receiving mandrels being secured perpendicularly on the side faces of the truncated pyramid by their base ends.

The invention is further described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a vertical section through one embodiment of the apparatus constructed in accordance with the invention, taken on the line I—I in FIG. 2, and

FIG. 2 is a plan view of the apparatus illustrated in FIG. 1, partially sectioned along the line II—II in FIG. 1.

Referring to the drawings, a vertical guide cylinder 4 is arranged at the end of a cooling path 2 which is associated with a continuous wire rolling line or rod mill and on which the wire or rod is conveyed in the form of overlapping loops. The wire loops enter laterally into the guide cylinder 4 and drop vertically in the interior of the cylinder. The cylinder 4 is provided with a removable bottom 6 which, when the mandrels are being exchanged, may be closed in order to prevent the wire loops, which have entered the cylinder in the meantime, from dropping out.

A rotatable frame 12, provided with two receiving mandrels 8 and 10, is arranged below the guide cylinder 4 and is in the form of a truncated pyramid having a square base area and right-angled interfacial angles.

The four corners of the truncated pyramid located on the side of the base area may be provided with triangular flattened portions 13 which contribute to increasing the rigidity of the frame 12.

The frame 12 has a spindle 14 whose axis is located along the central longitudinal axis of the truncated pyramid, is inclined at 45° to the perpendicular and is journalled in a bearing 18 secured to a base 16. Furthermore, the wider end of the frame is supported by way of a rail 20 which extends around the interior of the truncated pyramid and which abuts against rollers 22 provided on the base 16.

The rotary frame 12 is driven by an electric motor (not illustrated in the drawings) which drives a bevel wheel 24 provided at the lower end of the spindle 14 of the frame.

The two mandrels 8 and 10 are offset by 180° relative to one another on two oppositely located faces 26 and 28 of the pyramid, the axes of the mandrels intersecting one another at right angles. During rotation of the frame 12, each mandrel moves between a vertical loading position, in which it is located directly below the guide cylinder 4, and a horizontal discharging position. The angle of inclination of the spindle 14 of the frame, and the angle between the axes of the mandrels and the axis of the frame, need not be exactly 45°. Thus, for example, the discharging position of the mandrels does not have to be exactly horizontal, but may be inclined downwardly slightly in order to facilitate removal of the bundles.

Each of the two mandrels 8 and 10 is of circular cross section and is surrounded by a bundle remover 30 which is displaceable coaxially of the mandrel. Each of the bundle removers comprises a guide sleeve 32 which surrounds the mandrel, a support table 34 adapted to the diameter of the bundle being secured to the upper end of the guide sleeve 32. The support table 34 may be in the form of a plate surrounding the entire mandrel, as shown in FIG. 2, or it may be in the form of individual arms projecting radially from the mandrel. The guide ring 32 is mounted on the front edges of a retaining spider 36 which comprises three arms and which is guided in complementary longitudinal slots 38 and 40 formed in the respective mandrel. Referring to the drawings, the retaining spider 36 includes a rib which is located diametrically of the mandrel and which is located in the slot 38 extending transversely through the mandrel, and a web which projects at right angles from the center of the rib and which engages into the slot 40 in the mandrel. The slot 40 in the mandrel is thus located on the underside of the mandrel when the latter is in its horizontal position.

The lower end of the retaining spider 36 has a projection 42 which extends through an opening in the respective face 26 or 28 of the pyramid and whose free end face serves as a contact surface for the piston rod 44 of a hydraulic cylinder 46 or 48 which serves for axial displacement of the respective bundle remover 30.

The two cylinders 46 and 48 are fixedly secured in the base 16 and serve to actuate the two bundle removers 30 in the loading station and the discharging station respectively.

The free ends of the piston rods of the two lifting cylinders 46 and 48 automatically couplable to and releasable from the bundle removers 30 of the two mandrels by the rotary movement of the frame 12. For this purpose, the free end of each piston rod 44 has a flange-like widened portion 50, while a hook-like coupling member 52 is arranged in line with the projection 42 provided on the retaining spider 36 of the respective bundle remover. When in its engaged state, the coupling member 52 engages behind the flanged end of the respective piston rod. During extension of the piston rods, the flange 50 is urged against the projection 42 of the respective remover 30 and displaces the latter towards the tip of the mandrel, while the inside of the flange abuts against the hook-shaped coupling member 52 during retraction of the piston rod 44 and withdraws the remover 30 into the position a the bottom of the mandrel.

Normally, the bundle of wire is pushed by means of the remover 30 from the mandrel located in the horizontal discharging station onto a receiving rod 54 (illustrated diagrammatically in the drawing) of a conveyor which further conveys the bundles of wire. In order to facilitate the loading of the bundles of wire onto the respective receiving rod 54, the portion of the outside of each mandrel located upwardly in the horizontal discharging station has a slide rail 56 which is axially displaceable beyond the free end of the mandrel. The slide rail 56 is flush externally with the surface of the mandrel and is mounted in a groove which is formed in the mandrel and which is undercut at both sides. A hydraulic cylinder 58, which is fixedly arranged in the discharging station, serves to extend the slide rail 56. The pistion rod of the cylinder 58 presses against the rear end of the slide rail 56 and pushes the latter beyond the free end of the mandrel together with the forwardly moving remover 30, thus closing the gap between the receiving rod 54 and the mandrel.

When the bundle has been pushed onto the receiving rod 54, and the remover 30 is returning to its initial position, the remover 30 carries along the slide rail by means of a stop 60 which comes into abutment against a driver 62 on the slide rail 56. In order to limit the return movement of the slide rail 56, the latter is provided with a stop 64 which abuts against the respective pyramidal surface of the frame when the rail is in its retracted state.

In the foregoing specification I have set out certain preferred embodiments of my invention, however, it will be understood that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. Apparatus for collecting wire bundles from rod mill comprising a vertically disposed guide means for receiving rod or wire loops from a cooling path, the guide means having a movable bottom, an even number of receiving mandrels and a common frame carrying said mandrels and rotatable about an inclined axis to move each mandrel between a first, generally vertical loading position, in which its free end is directed upwardly directly below the guide means, and a second, horizontal discharging position, each mandrel being surrounded by a bundle remover which is displaceable in the axial direction lengthwise of the respective mandrel, the mandrels being arranged at a uniform angular spacing around the axis of rotation of the frame and being inclined at substantially 45° to the axis of rotation.

2. Apparatus as claimed in claim **1,** in which two mandrels are provided offset relative to one another by 180° on the rotatable frame.

3. Apparatus as claimed in claim **1** in which actuating means for the bundle removers are fixedly arranged at the respective first, loading and second, discharging position.

4. Apparatus as claimed in claim **3,** in which the actuating means comprise respective hydraulic cylinders arranged at the first, loading position and at the second, discharging position.

5. Apparatus as claimed in claim **4,** in which the free ends of the piston rods of the hydraulic cylinders are automatically couplable to and releasable from the bundle removers of the respective mandrels by the rotary movement of the frame.

6. Apparatus as claimed in claim **1,** in which the portion of the external surface of each of the mandrels located upwardly when in the horizontal discharging position has a slide rail for the bundle to be removed, which slide rail is displaceable beyond the free end of the mandrel.

7. Apparatus as claimed in claim **6** in which a hydraulic cylinder is fixedly arranged at the second, discharging position for the purpose of displacing the slide rail.

8. Apparatus as claimed in claim **7,** in which a stop is provided on each bundle remover and cooperates with a driver on the slide rail for effecting return movement of the slide rail.

9. Apparatus as claimed in claim **6,** in which the slide rail is externally flush with the surface of the mandrel and is mounted in a groove in the mandrel both sides of said groove being undercut.

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