

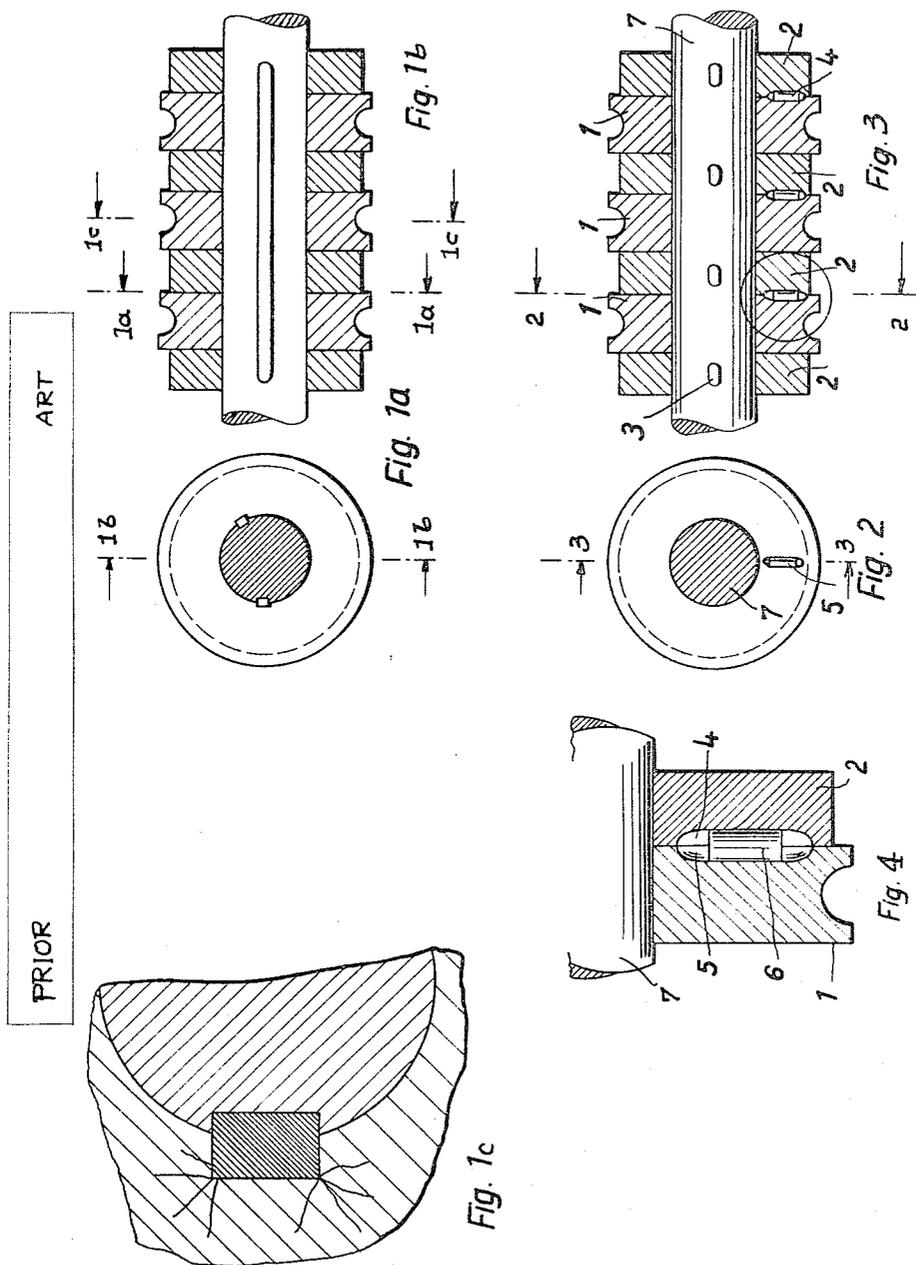
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MULTIPLE COLD ROLLING MILL

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MULTIPLE COLD ROLLING MILL

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The invention relates to rolling mills, and relates more particularly to multiple cold rolling mills of the step-back type, the latter also sometimes being referred to as "pilgrim" type rolling mills.

The rolls of these mutiple cold rolling step-back mills in constructions of the prior art are formed by annular roll elements which have external ring grooves and which are mounted precisely spaced apart from each other on a drive shaft. Spacer elements are provided which hold the roll elements apart; the roll elements are shrunk onto the shaft. The uniform development course of the rolling grooves is insured by a key-and-slot arrangement that passes through the entire group of roll elements and spacer elements.

The aforesaid constructions of the prior art have the disadvantage, however, that it is difficult to remove the roll elements; yet such a removal is necessary from time to time to re-finish the worn rolling groove surfaces thereor or to exchange them. To remove the rolling elements, it is necessary to loosen them first by induction heating, and then to move them off the shaft, for instance by means of an hydraulic retraction equipment.

In actual practice it has been found that the roll elements could be pried off only upon the application of a major effort, and that the slots for the keys had developed cracks which rendered the roll elements unsuitable for re-use.

The cause for the development of the cracks may perhaps be found in the heat treatment to which the roll elements have been subjected. Whatever the cause, however, the disadvantages of these damages to the roll elements are serious. They require to keep on hand a large supply of roll elements, and cause a great deal of time loss in the exchange of the roll elements.

It is accordingly among the principal objects of the invention to provide a rolling arrangement which avoids the aforesaid drawbacks of the prior art.

It is another object of the invention to provide a rolling arrangement in which the roll elements are easily mounted on, and dismounted from, the driving shaft.

It is a further object of the invention to cut the time losses during the interchange of roll elements, and to promote the re-use of refinished roll elements.

It is yet another object of the invention to provide a direct positive driving connection between the shaft and the spacer elements, and an indirect positive driving connection between the shaft and the roll elements, without any need to key the roll elements to the shaft.

It is still a further object of the invention to provide for a driving connection between spacer and roll elements which will not cause any deformation of the roll elements.

With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, one embodiment of the same being illustrated in the accompanying drawings and described in the specification.

In the accompanying drawing,

FIG. 1a is a sectional view taken on the line 1a—1a of FIG. 1b, showing a construction in accordance with the prior art;

FIG. 1b is a fragmentary sectional view taken on the line 1b—1b of FIG. 1a;

FIG. 1c is a fragmentary large scale sectional view, taken on the line 1c—1c of FIG. 1b;

FIG. 2 is a sectional view, taken on the line 2—2 of FIG. 3, similar to FIG. 1a but showing an embodiment in accordance with the instant invention;

FIG. 3 is a fragmentary sectional view, taken on the line 3—3 of FIG. 2; and

FIG. 4 is a fragmentary large scale sectional view, similar to FIG. 3 but showing only a detail thereof.

In FIGS. 1a—1c, there is shown a system in accordance with a construction of the prior art. The key-and-slot arrangement extends throughout the entire group of roll and spacer elements. The previously mentioned cracks, that develop in the roll elements, are shown in FIG. 1c.

In accordance with the instant invention, which is illustrated in FIGS. 2—4, however, there are provided a series of, for instance three, roll elements 1 which are spaced apart from each other for precise predetermined distances, and which are heat shrunk onto a driving carrier shaft 7.

A plurality of spacer elements or spacer disks 2 are mounted on the shaft 7; the spacer disks 2 are mounted loosely on the shaft 7, though they are keyed to the shaft 7 each by means of a key 3 for positive driven connection therewith. Each pair of adjacent roll elements 1 is separated by a spacer disk 2, so that along the axis of the shaft 7 roll elements 1 alternate with spacer disks 2.

Drive means are provided that establish a positive, though indirect, driving connection from the shaft 7, by way of the keys 3 and the spacer disks 2, to the roll elements 1. These drive means comprise a radial recess 5 that is depressed in at least one of the flanks of each roll element 1 and that forms a chamber with a similar recess that is depressed in the flank of the adjoining spacer disk 2; and a drive member 6 is positioned in each of these chambers.

The spacer disks 2 are so keyed on the shaft 7 that all the radial recesses 4 are disposed in axial alignment. Each chamber has a cylindrical section, and the drive members 6 are cylindrical, and each fits into, and is disposed in, the cylindrical section of a chamber.

The radial recesses 5 are so positioned in the roll elements 1 in relation to the rolling groove that, upon the interleaving of corresponding roll elements 1 and spacer disks 2 and the insertion of the drive members 6, the roll elements 1 will be disposed along the shaft 7 in predetermined position relative to each other.

In mounting the elements on the shaft 7, alternately a spacer disk 2 and a roll element 1 are put onto the shaft 7, and a drive member 6 is inserted in each chamber as it is formed by the juxtaposition of the respective recesses 4 and 5.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what we claim as new and desire to be secured by Letters Patent, is as follows:

1. In a multiple cold rolling mill of the step-back type, a driving carrier shaft, a series of annular roll elements having external ring grooves and being heat shrunk onto said carrier shaft, a plurality of spacer disks loosely mounted and keyed on said shaft, each roll element being adjacent at least one spacer disk, and drive means establishing a driving connection between said carrier shaft and said roll elements, by way of said spacer disks comprising each roll element defining with at least one adjoining spacer disk a radial chamber, and a drive member fitting into and disposed in each chamber.

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2. In a rolling mill, as claimed in claim 1, said chamber being formed of two opposite radial recesses of which one is defined in said spacer disk and the other in said roll element, said chamber including a cylindrical section, said drive member being cylindrical and fitting into and disposed in said section.

3. In a multiple cold rolling mill of the step-back type, a driving carrier shaft, a series of annular roll elements having external ring grooves and being spaced apart from each other and mounted on said carrier shaft, a plurality of spacer elements loosely mounted on said shaft, at least some of the spacer elements being disposed each in a space between two roll elements so that on the carrier shaft roll and spacer elements alternate, said spacer elements being keyed to said carrier shaft, said roll elements being heat shrunk onto said carrier shaft, and drive means establishing a driving connection between said carrier shaft and said roll elements by way of said spacer elements comprising opposite radial recesses defined in each pair of adjoining elements forming a chamber therebetween, and a drive member fitting into and disposed in each chamber.

4. In a rolling mill, as claimed in claim 3, the radial recess being so positioned in each roll element in relation to the rolling groove thereof that, upon the interleaved

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mounting of the roll elements and spacer elements and insertion of the drive members, the roll elements of the series will be disposed on said shaft in predetermined position relative to each other.

5. In a rolling arrangement for use in a multiple cold rolling mill, a driving shaft, a series of annular roll elements having external ring grooves and being mounted on said shaft, a plurality of spacer disks mounted in positive driven connection on said shaft, each roll element being adjacent at least one spacer disk, and drive means establishing a driving connection from said shaft by way of at least some of said spacer disks to said roll elements comprising a radial chamber defined by each roll element with an adjoining spacer disk, and a drive member fitting into and disposed in each chamber, whereby torque will be transmitted from said shaft to said spacer disks, and from at least some of said spacer disks to said drive members and thence to said roll elements.

No references cited.

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