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(54) IMPROVEMENTS IN OR RELATING TO SKEW ROLL STAND FOR ROLLING MILLS

(71) We, HOESCH WERKE AKTIENGESELLSCHAFT, of Eberhardstrasse 12, 4600 Dortmund 1, Germany, a German Company do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a working roller for use in a skew roll stand and to a skew roll stand for a rolling mill including such working rollers.

Such a skew roll stand is employed for reducing a starting material such as a tube or rod, and comprises a drivable roll carrier allowing central passage of the workpiece and supporting three similar, drivable and axially adjustable working rolls or bevel wheel shape, all inclined at the same angle to the rolling axis and mutually spaced at 120° about this axis. The rollers are so directed with respect to the axis that their extended axes pass by the rolling axis at short equal minimum distances. Each of the bevelled working rollers may have at its smaller end a smoothing zone defined by a surface of revolution about the working roller axis.

DT-AS 1602 153 discloses such a skew roll stand for reducing solid sections. This skew roll stand has the disadvantage that it does not permit a surface on the workpiece to be obtained which can be regarded as satisfactory, even with the smoothing zones on the bevel working rollers, when working at an economic rolling speed of about 0.5 to 1.5 m/sec. On the contrary, the surface of the workpiece suffers distortions produced by the smoothing zones which exhibit deviations from the contour of a right cylindrical surface of revolution; the distortions resemble a three-start thread and are of a magnitude which cannot be ignored, so that reworking has to be performed to produce a finished product.

The present invention provides a working roller for use in a skew roll stand of a rolling mill, the roller being of bevel wheel shape and having at the smaller end thereof a smoothing zone defined by a surface of revolution about the roller axis, the line of generating of the surface of revolution defining the smoothing zone being of such concavity that the concave line of generation making contact with the workpiece in use describes the surface of revolution of an imaginary cylindrical body upon rotation about the workpiece.

The invention also provides a skew roll stand for a rolling mill for reducing a starting material to a tube or rod, the stand comprising a drivable roll carrier allowing central passage of the workpiece and drivably supporting three such working rollers for axial adjustment, the rollers being inclined at equal angles to the rolling axis andmutually spaced at 120° thereabout, the extended axes of the rollers having short and equal minimum spacings from the rolling axis.

The invention can be embodied in a skew roll stand capable of producing a finished product, in particular a tube, at an economic rolling speed of at least 0.5 m/sec, the product exhibiting a surface quality of which the shape errors always lie within a tolerance limit of 0 to 4×10^{-3} times the diameter of the rolled workpiece.

The maximum length of the projection upon the rolling axis of the concave generatrix of the smoothing zone in contact with the workpiece is limited by technical features of the machine design.

The acceptable feed length through which the workpiece is advanced in relation to each 120° of rotation of the roll carrier, in order that the total surface of the workpiece can be included in the working operation, is theoretically equal to this projection length.

For economic reasons the feed length should approach as closely as possible to the above mentioned limits.

Because a certain degree of overlap is essential it is therefore advisable that the practical feed length related to each 120° of a roll carrier revolution be equal, at most, to 0.9 times the theoretically possible feed length. This means that the length of the projection upon the rolling axis of the concave generatrix of the smoothing zone in contact with the workpiece is at least 1.1 times the feed length produced by each working roller over 120° of a roll carrier revolution.

Finally, it is advantageous to arrange that the smoothing zone parts of the working rolls can be readily replaced. This ensures an improved facility for machining the smoothing zones of the working rolls independently of the reduction zones of these rolls. Moreover, it is then possible to employ for each different diameter of workpiece the same set of work rolls, exchanging only the smoothing zone parts of these rolls to suit the workpiece.

The advantages of the skew roll stand of the invention are to be seen particularly in the possibility of its use as a working stand at economic rolling speeds giving high quality rolled product surfaces to a tolerance of 0 to 4×10^{-3} times the diameter of the rolled workpiece; by using a single stand and a mandrel, seamless tubes for examples can be produced economically with a required high surface quality and only slight deviations in shape in respect of diameter and wall thickness tolerances.

The invention will now be more particularly described with reference to an embodiment thereof which is diagrammatically shown in the accompany drawing, in which:-

Figure 1 is a side elevation of a working roll and the rolled material;

Figure 2 is a front elevation of the working roller arrangement according to Figure 1.

Figures 1 and 2 show the relative positioning of rolled material and a working roll of the bevel type in a skew rolling stand. Unworked rolling stock 1, is being reduced in the stand over a reduction region 4 to the form of cylindrical rod 2, by means of the reducing section 3 of the working roll. The working roll is arranged to be rotatable about its axis 5 and is arranged together with the other working rolls, not shown in the drawing, in a roll support means, also not shown in the drawing, which is rotatable about the rolling axis 6. In order to make it possible to effect advancement of the rolled material in the rolling direction "A", the axis of the working roll, as also that of the other working rolls, is so directed with respect to the rolling axis 6 that the extensions of the respective axes 5 of the working rolls are spaced from the rolling axis 6 by short equal minimum distances "a", and the bevel shaped working rolls are in each case provided at their smaller diameter ends with a smoothing zone 7, of which the line of generation, where it is in continuous contact at 8' with the rolled material, forms the generation surface of an imaginary cylindrical body as the working roller rotates about the rolled material.

This concave smoothing zone 7 thus produces a smooth surface on the rod 2.

Where it is required to produce seamless tubes, a mandrel is employed within the workpiece, the mandrel being arranged between the working rolls and to be supported in a known manner in opposition to the rolling direction.

WHAT WE CLAIM IS:-

1. A working roller for use in a skew roll stand of a rolling mill, the roller being of bevel wheel shape and having at the smaller end thereof a smoothing zone defined by a surface of revolution about the roller axis the line of generation of the surface of revolution defining the smoothing zone being of such concavity that the concave line of generation making contact with the workpiece in use describes the surface of revolution of an imaginary cylindrical body upon rotation about the workpiece.

2. A working roller as claimed in claim 1 wherein the part thereof providing the smoothing zone is replaceable.

3. A skew roll stand for a rolling mill for reducing a starting material to a tube or rod, the stand comprising a drivable roll carrier allowing central passage of the workpiece and drivably supporting three working rollers each as claimed in claim 1 or 2 for axial adjustment, the rollers being inclined at equal angles to the rolling axis andmutually spaced at 120° thereabout, the extended axes of the rollers having short and equal minimum spacings from the rolling axis.

4. A skew roll stand as claimed in claim 3 wherein the concave generating line of the smoothing zone for engaging the workpiece has a projected length upon the rolling axis amounting to at least 1.1 times the length of feed produced by each working roller over 120° of a revolution.

5. A skew roll stand for a rolling mill substantially as herein described with reference to the accompanying drawing.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

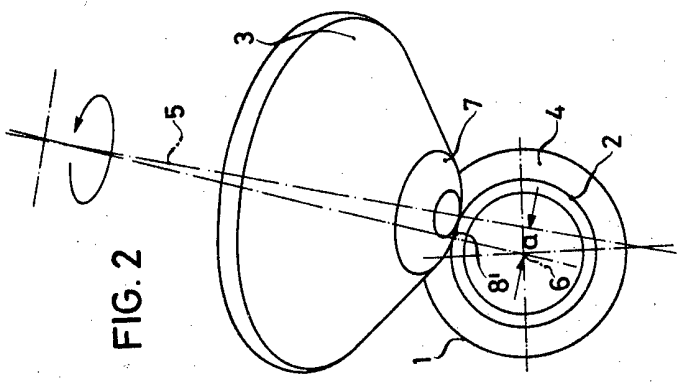

FIG. 2

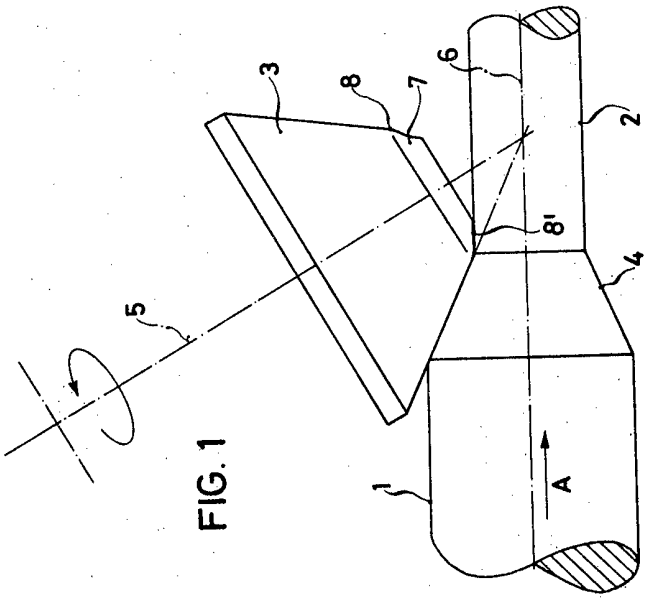

FIG. 1