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MULTIROLL STANDS

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Fig. 1

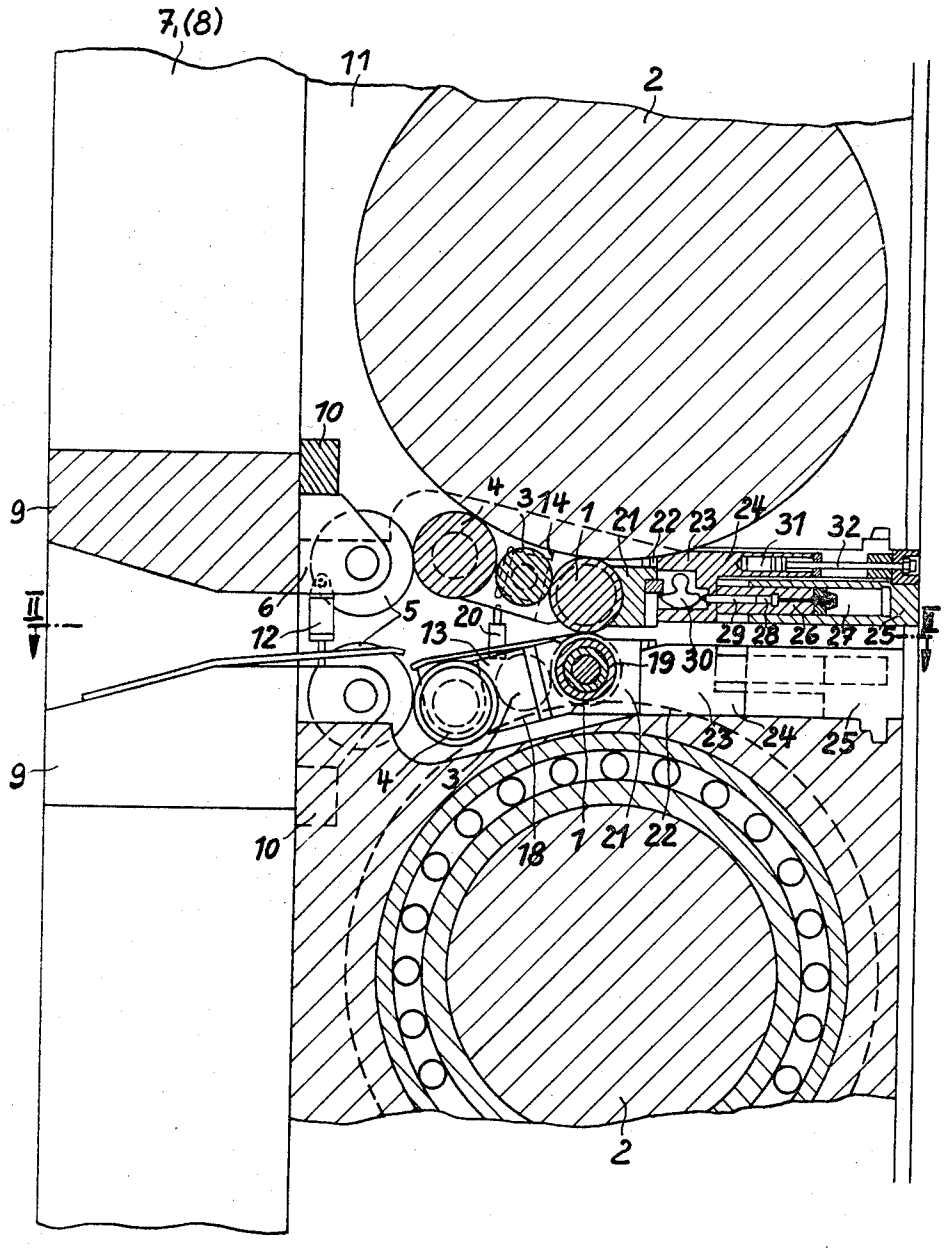

Fig. 2

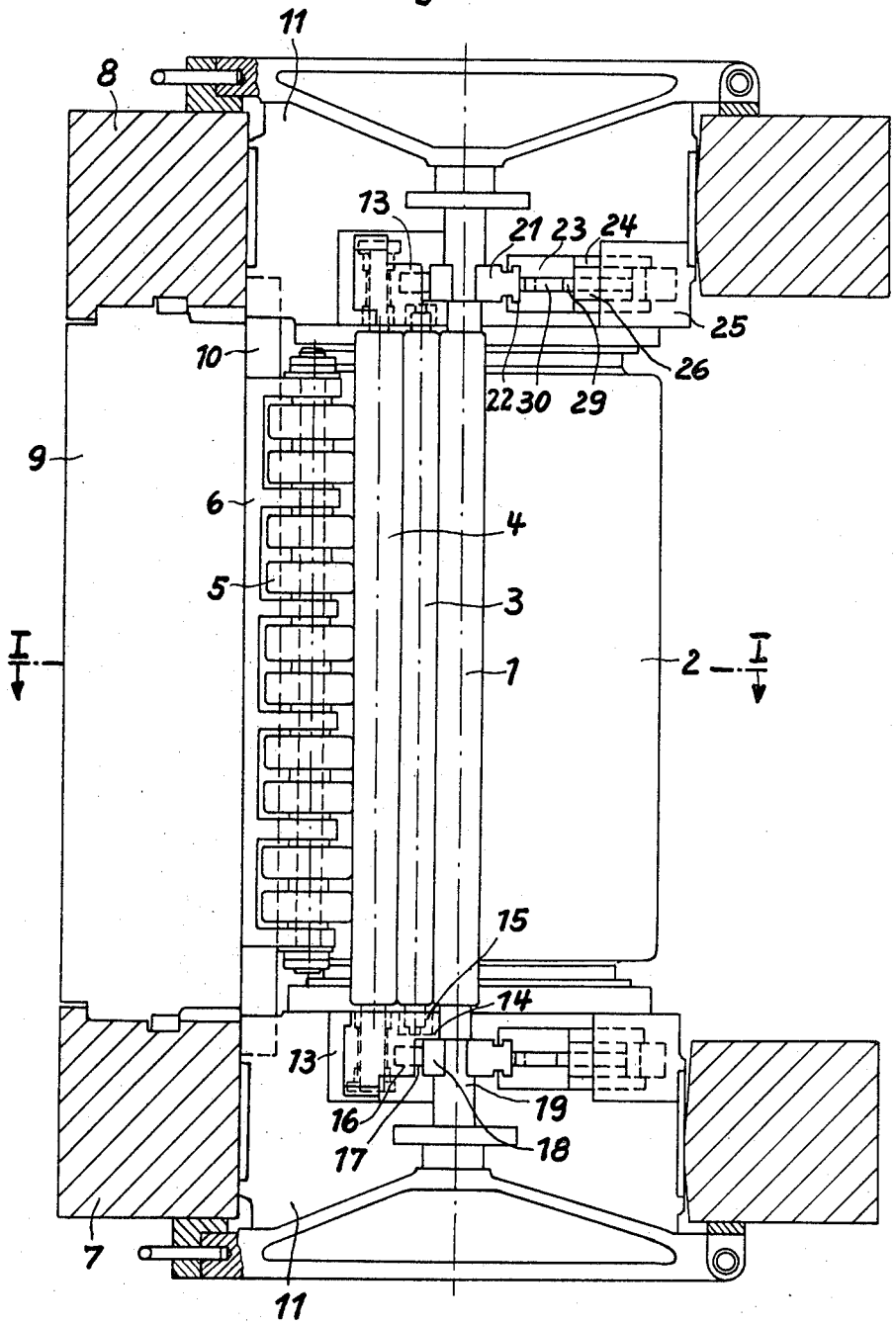
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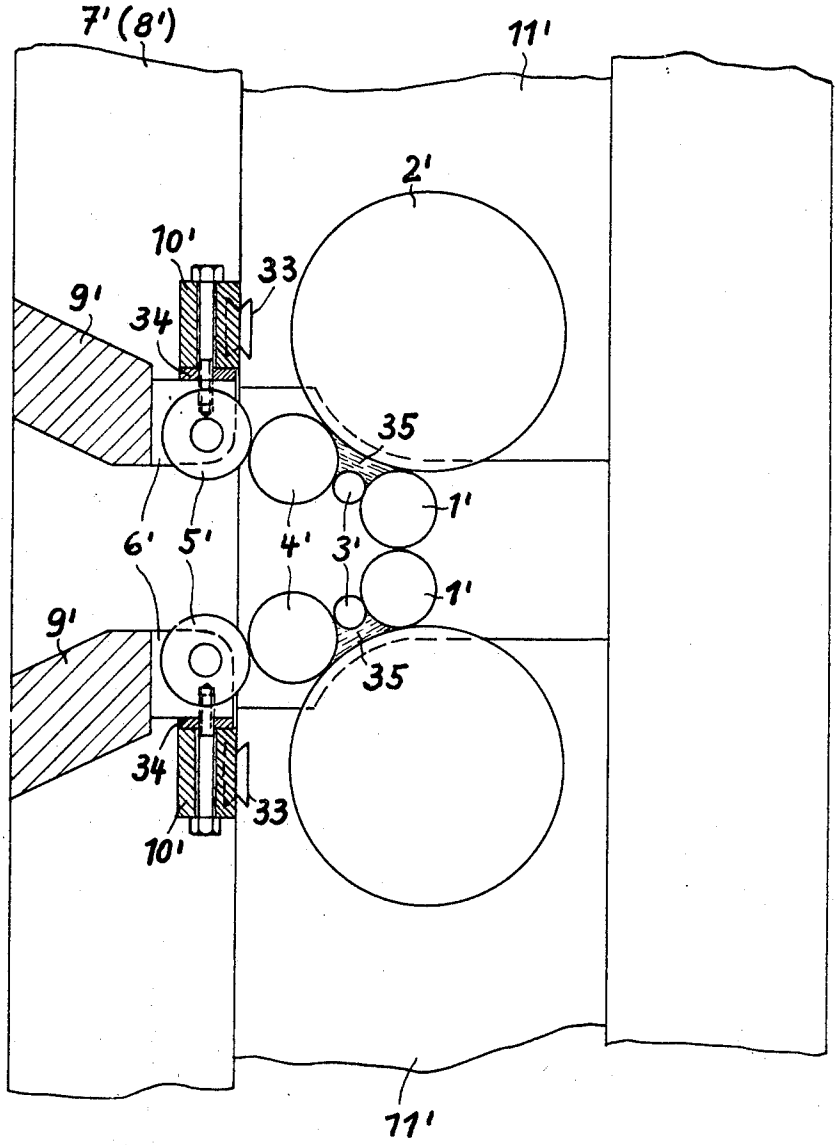
Fig. 3



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MULTIROLL STANDS

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Int. Cl. B21b 13/14
U.S. Cl. 72—241 4 Claims

ABSTRACT OF THE DISCLOSURE

In multiroll stands for rolling metal strips comprising a pair of upper and lower working rolls, reversing rolls, and supporting rollers, the supporting rollers being a plurality of individual rollers of short axial length in axially spaced relationship on the two axes and journalled to supporting bridges. In the past, the supporting rollers were in direct contact with the backing rolls, and because of their construction the supporting rollers formed circumferential streaks on the backing rolls which in turn imparted the streaks to the working rolls which defaced the strip being formed. To overcome this, and make the rolls more easily serviceable, the instant invention provides a pair of intermediate rolls between the supporting rolls and the backing rolls.

This invention relates to a multiroll stand for the cold-rolling or hot-rolling of strips of steel or of nonferrous metals, with two positively driven backing rolls, and with working rolls driven by peripheral friction. In a known roll stand for the lateral supporting of the working rolls, the working rolls are displaced out of the vertical axis plane of the driven backing rolls, and are supported, in the direction of the displacement, by intermediate rolls and by supporting rollers journalled on supporting bridges, on their bodies, the supporting rollers bearing frictionally on the backing rolls.

The geometry of this system of one-sided lateral supporting of the working rolls restricts the possibilities of adoption of the structure, because, with a diameter of the working rolls proportioned to the forces occurring, the minimum diameter of the working rolls can only amount to about 14 percent of the diameter of the large driven backing rolls. With even smaller diameter working rolls, the supporting rollers approach so close to the upper and lower working rolls in a vertical plane that no sufficient intermediate space remains for the unhindered passage of the stock that is being rolled or for stock guides.

A further imperfection of the known roll stand may be seen in the fact that since the supporting rollers each consist of a pluarity of individual rollers of short axial length, spaced apart, and since these rollers come into direct contact with the backing roll, which comes into direct contact with the strip that is being rolled, any imperfections in the surface of these supporting rollers are liable, by a burnishing action, to produce tracks on the backing rolls, especially if these are not very hard. Then, when cold rolling stock with a sensitive surface, these tracks may for instance yield streaks of differing light reflection on the strip that is being rolled. Where this phenomenon is disadvantageous, the supporting rollers, in order to obviate it, must be racked away from the large backing rolls, though in this case the advantage of the simple automatic alignment of the supporting rollers with their axes parallel is lost, and greater constructional expenditure becomes necessary.

For the hot-rolling of thin strips, the known construction has the disadvantage that the stock does not admit

of being satisfactorily shielded against undesirable wetting by the cooling water, which is required in large quantities for the cooling of the working rolls and the intermediate rolls. Even if it should be necessary to cool the stock, the quantities of cooling medium for cooling the rolls and for cooling the stock must be capable of being regulated independently of one another, in order to enable constant roll-gap conditions to be maintained, so as to obtain stock of a constant form.

The aim of the invention is to provide a roll stand without the disadvantages set forth, in which, for the cold-rolling of thin hard strips, very small diameter working rolls can be employed. Economically it is further desired that the working rolls, worn down in the known roll stand to the minimum diameter there possible, should be capable, after rehardening and regrinding, of being reinserted in the instant roll stand by simple measures for further use.

For hot-rolling it should be ensured that the cooling medium for the surface cooling of all the rolls is reliably separated from the stock, and is indepedently adjustable, as regards pressure and quantity, of any required cooling of the rolled stock. Moreover a reliable screening of the supporting rollers, with their roller bearings, from the radiation of heat from the stock, must be ensured.

According to this invention, all these requirements are fulfilled by the fact that intermediate rolls bearing upon the supporting rollers are held in frictional driving connection on the one hand with the positively driven backing rolls, and on the other hand, by way of a reversing roll in each case, with the working rolls, whilst the axes of the working roll, reversing roll and intermediate roll in each case are held in a common plane.

The result is thereby obtained that with the same supporting-roller diameter, the diameter of the working rolls can be diminished to about 10 percent of the backing-roll diameter. In this way the diameter of the working rolls in the known construction, already ground down to about 14 percent of the diameter of the backing rolls, with the backing-roll system according to the invention, admit of being brought into use again, there always being two rolls located between the supporting rolls and the working rolls, which obviates the transferring of streaks from the supporting rollers to the surface of the strip.

The supporting rollers are located so far from the rolling plane that it is easy to shield them from the heat radiated by the stock. Their packings are withdrawn from the immediate action of the cooling water.

In a further development of the invention, the journals of the upper and lower intermediate rolls on each side are accommodated in a bearing body which is provided, on the side of the working roll, with a cylinder, the piston of which is connected with a claw, which, jointly with an oppositely located claw, supports the bearing of the working roll, there being arranged, between the working rolls and the intermediate-roll bearings, in the bearing body, in the same plane, a longitudinal guide, in which the bearing of the reversing roll, constructed as a slide-block, is displaceably accommodated. In this way the working roll can be very easily exchanged. Owing to the movable reversing roll, the grinding down of the roll can of itself be compensated for, within definite limits.

The upper bearing bodies are provided with holding means. This obviates any sinking of the upper working roll, when the stock has run out, and any sinking of the bearing bodies, with the reversing rolls and the intermediate rolls, when the working rolls are being changed.

According to a further feature of the invention, the spaces bounded by the backing rolls, the working rolls, the reversing rolls and the intermediate rolls, are provided

with admission and discharge ducts for cooling fluid. These are preferably so arranged that the admission is effected in the middle of the spaces and the exhaust at their ends. When the roll stand is being used for hot-rolling, the cooling medium serving for cooling the surfaces of the rolls flows through these spaces, which are sealed from the peripheral surfaces of the rolls concerned.

Two embodiments of the invention are illustrated by way of example in the accompanying drawings, in which:

FIG. 1 shows a vertical section on the line I—I (FIG. 2) through a cold-rolling roll stand;

FIG. 2 shows a horizontal section on the line II—II (FIG. 1) at the level of the rolled stock; and

FIG. 3 shows diagrammatically the arrangement of the rolls in a hot-rolling roll stand.

The bodies of two working rolls 1 of a multiroll stand are each vertically supported against a backing roll 2, and are horizontally supported, through the medium of reversing rolls 3 and through intermediate rolls 4 bearing on the backing rolls 2, by supporting rollers 5. They are displaced, in the direction of the supporting rollers 5, out of the common axial plane of the backing rolls 2. The supporting rollers 5 are journalled in upper and lower supporting-roller combs 6, which bear, with their rear sides, against supporting bridges 9 arranged between the housings 7 and 8. Vertically, the supporting-roller combs 6 find an abutment on supporting beams 10, which in themselves extend parallel to the rolls, and are anchored to the chocks 11. The upper and lower supporting-roller combs 6 are held in contact with the beam 10 by pressure-fluid cylinders 12 arranged between them.

The bearings of the intermediate rolls 4 are located in bearing bodies 13, in longitudinal guides 14 of which the bearings 15, constructed as slide-blocks, of the reversing rolls 3 are also accommodated. In the bearing bodies 13 are also arranged compressed-air cylinders 16, the pistons 17 of which are connected with claws 18, which serve for centering the working-roll bearings 19 in the common axial plane of the intermediate rolls 4 and the reversing rolls 3. Between the upper and lower bearing bodies 13 are arranged pressure-fluid cylinders 20, which support the upper bearing bodies, and prevent the intermediate rolls 4 and reversing rolls 3 sinking when the working roll 1 is being dismantled.

For securing the bearings 19 of the working rolls, opposite to the intermediate rolls 4, claws 21 are provided, each of which is slidable in a vertical guide 22 of a slide-piece consisting of a head 23 and a guiding member 24. The slide-piece, thus horizontally displaceable transversely to the rolls, is guided on the chock 11, its guiding member 24 being accommodated in a yoke-like guiding body 25 secured to the chock 11. The piston 26 of a cylinder 27 provided in the guiding body 25 is directed towards the back of the head 23.

In the piston 26 is provided a cylinder 28, the piston 29 of which exerts, upon a transmission lever 30 fulcrumed in the head 23, a horizontal force, which is transmitted to the claw 21 as a vertical force directed against the backing roll 2, and thus holds the working roll 1 against the backing roll 2. In the guiding member 24 of the slide-piece is arranged a cylinder 31, the piston rod 32 of which is secured to the chock 11. Upon working fluid being supplied, the slide-piece, with the claw 21, is drawn back, as a result of which the dismantling of the working rolls 1 is rendered possible.

In the roll stand illustrated in FIG. 3, working rolls 1' and intermediate rolls 4' of larger diameter are inserted, as is advantageous for hot-rolling. The additional space required for this is obtained by virtue of the fact that the bearing surfaces of the supporting bridges 9' for the supporting-roller combs 6' are set back so far in relation to the neighbourhood of the housing windows that the supporting-roller combs 6', with the supporting rollers 5', are shifted far out of reach of the housing windows, and between the cheeks of the housing 7' and 8'.

The supporting-roller combs 6' are bolted to supporting beams 10', which, at their ends, are secured laterally to the chocks 11' by wedges 33. By means of spacing plates or shims 34, the most advantageous position of the supporting rollers 5', according to the working roll diameter (wear) in each case, can be brought about.

The spaces 35 enclosed by the peripheral surfaces of the backing rolls 2', the intermediate rolls 4', the reversing rolls 3' and the working rolls 1', are provided with inlets and outlets, not shown, for cooling fluid. In this way the surface cooling of the rolls is reliably separated from the rolled stock, and can be regulated independently of the cooling of the rolled stock.

We claim:

1. A multiroll stand, comprising: two positively driven backing rolls; two working rolls driven by frictional contact with the backing rolls, the axes of the working rolls being displaced out of the plane containing the axes of the backing rolls; supporting bridges extending between the housings of the roll stands; a plurality of individual supporting rollers of short axial length, in axially spaced relationship on each of two axes and journalled in the supporting bridges; two intermediate rolls respectively bearing against each of the supporting rollers and also bearing against each of the backing rolls; two reversing rolls respectively bearing against each of the working rolls and also against each of the intermediate rolls; means for keeping the intermediate rolls in frictional driving contact with the backing rolls, and also, through the medium of the reversing rolls, with the working rolls; and means for maintaining the axes of each respective contacting working roll, reversing roll and intermediate roll in a common plane.

2. A multiroll stand as claimed in claim 1 wherein the maintaining means comprises two sets of bearing bodies in which the ends of the upper and lower intermediate roll are respectively journalled; a piston-and-cylinder unit in each bearing body; bearings in which the ends of the working rolls are journalled; a claw connected with the piston of each of the piston-and-cylinder units; further claws each supporting the bearings of one of the working rolls; and longitudinal guides provided in the sides of each of the bearing bodies, and bearings for the reversing rolls, constructed as slide-blocks, slidable in the longitudinal guides.

3. A multiroll stand as claimed in claim 2, further comprising holding means for the upper bearing bodies.

4. A multiroll stand as claimed in claim 1, wherein spaces for accommodating fluid for cooling the rolls are bounded by parts of the peripheries of the backing rolls, the working rolls, the reversing rolls and the intermediate rolls.

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