July 4, 1939. J. SEVERIN 2,164,724

ROLLING MILL FOR ENLARGING HOLLOW BODIES

Filed June 15, 1937

Fig. 1.

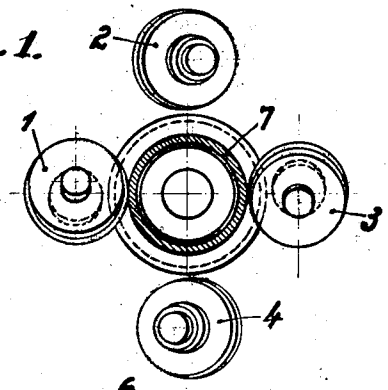


Fig. 2

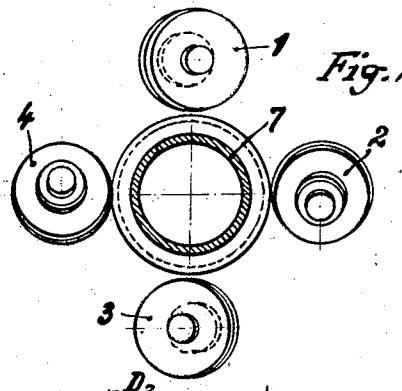


Fig. 1a

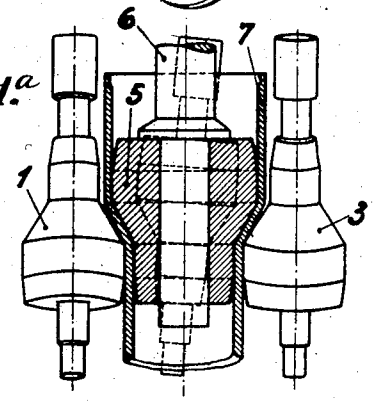
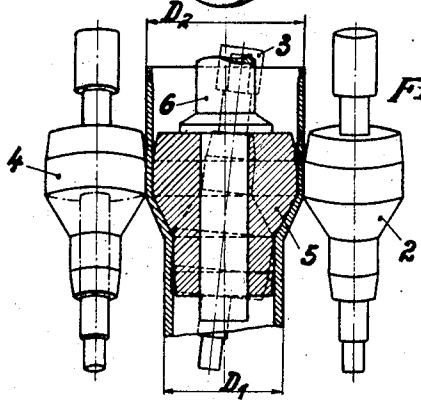


Fig. 2a



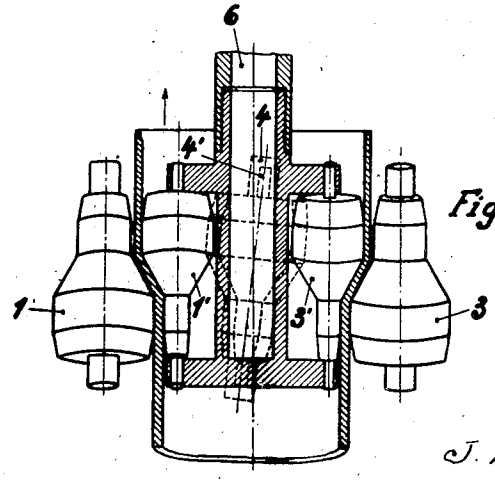


Fig. 3

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ROLLING MILL FOR ENLARGING HOLLOW BODIES

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5 Claims. (Cl. 80—13)

The present invention relates to means for enlarging hollow bodies and more particularly pertains to a rolling mill for enlarging the diameter of previously formed cylindrical members such as pipes.

It is generally known to widen hollow bodies for instance pipes by pulling or pressing a conical plug through the pipe. It has further become known, to widen hollow bodies in special machines and particularly by means of rolls, the corresponding hollow body being rolled by the outer rolls either over a turning conical mandrel, or the rolling being effected over rolls of suitable shape arranged in the interior of the hollow body. The outer rolls bear against the hollow body to be widened on their entire length and grip and treat the same by contact on their whole length. These known devices and methods for widening pipes possess practically the inconvenience, that always special arrangements are necessary which can be used only for widening, but not for the pipe production proper. In order to widen pipes in the hitherto known manner either a plug-drawing bench, a thrust bench or a special tool is required.

The present invention relates to a rolling mill for widening hollow bodies for instance pipes, in which the above stated inconvenience is avoided. According to the invention the widening of the hollow bodies can be carried out with such machines, rolling mills and plants as chiefly required for the production of the pipes themselves, the widening being effected chiefly by means of rolling mills, in which the axial direction of existing internal and external rolls forms a small angle with the rolling direction of the pipes in the tangential plane through its point of contact, this angle being necessary to attain a forward movement of the material to be rolled, whereas the axial directions of the rolls in all other planes are practically parallel to the rolling direction.

Rolling mills with four or more rolls may be used and amongst others also oblique rolling mills (Mannesmann rolling mill), radial rolling mills or the like.

The rolling mill is built so that the pipe to be widened is gripped at the moment of entering into the rolling mill by half the existing rolls, or if there are four rolls, by two of the same, and driven over a mandrel or over rolls in being widened according to the shape of the mandrel or of the rolls, the external rolls being of such shape that they engage on the pipe only on its cylindrical, not yet widened portion, whereas they do not yet bear on the conical pipe portions in course of being widened. The other half of the existing rolls, in the case of a rolling mill comprising four rolls, is built into the rolling mill so that they are out of engagement at the moment when the hollow body or pipe to be widened is pushed in and engages only after the pipe has been gripped by the rolls which first become active, and driven over the mandrel and has been fed to the rolls which up to then have been out of engagement. These rolls serve then to move forward the pipe to be widened or the widened portion of the same, which has been pushed over the mandrel or the internal rolls, and to pull the pipe over the mandrel or the internal roll. If this second part of the set of rolls has begun to work, the half of the set of rolls which has first become effective is withdrawn from the pipe surface and the pipe to be widened is now pulled over the mandrel or over the inner rolls by the second half of the roll set. If the rolling mill were constructed so that only the first half of the set of rolls works, or drives the pipe only over the mandrel or the internal roll, the last end of the pipe could not be widened any more and after the engaging of the outer rolls has ceased the pipe would stick and shrink as these rolls can only drive forward the pipe to be widened, as long as it still has its original diameter. To avoid this and to therefore ensure a smooth passing of the pipe through the rolling mill, the latter is built so that the second half of the set of rolls grips the pipe after the conical portion of the mandrel or of the internal rolls has passed through and pulls the pipe over this mandrel or internal rolls, whereby a smooth running off also of the extreme end of the pipe is attained and further shortening of the pipe is avoided, which occurs if the pipe to be widened is driven over the mandrel or the internal rolls.

In the accompanying drawing

Figs. 1 and 2 and Figs. 1*a* and 2*a* show diagrammatically in end and side elevation a rolling mill with four outer rolls.

Fig. 3 shows in side elevation a rolling mill with rolls instead of a mandrel.

A rolling mill constructed according to the invention and shown in Figs. 1 and 1*a* comprises a set of four outer rolls, instead of which, however, a set of six, eight or even more outer rolls may be used.

According to Figs. 1 and 1*a* one half of the set of rolls, or the rolls 1 and 3 engage the pipe 7 to be widened at its not yet widened portion and press the same over the mandrel 5 in the pipe and rotatably mounted on the mandrel rod 6. The

other half of the set of rolls, or the rolls 2 and 4, are at this moment out of engagement with the pipe surface. Whereas of the rolls 1 and 3 the largest diameter is at the entrance-side of the pipe, the rolls 2 and 4 are arranged inversely so that their largest diameter is at the outlet end of the pipe and their smallest diameter at the entrance-end of the pipe.

After the foremost end of pipe 7 has been rolled over the mandrel, the rolls 2 and 4 are brought into engagement on the portion of the pipe which has already been widened by the action of the rolls 1 and 3 and the mandrel 5, and the rolls 1 and 3 are then lifted off the surface of the pipe.

Figs. 2 and 2a show clearly how the rolls continue to work. From this moment the pipe 7 is pulled by the rolls 2 and 4 over the mandrel 5 fixed on the mandrel rod 6, and the pipe is widened in this manner from its initial diameter D^1 to its final diameter D^2.

Fig. 3 illustrates diagrammatically apparatus for performing a similar operation with the difference that instead of the inner mandrel 5, inner rolls 1' to 4' are provided opposite the outer rolls. In this form of carrying out the method it is no longer necessary that the outer rolls of the first and second half of the roll-set are of similar dimensions, as it would be sufficient to construct the second half of the set of outer rolls as short cylindrical rolls, as indicated in Fig. 2a in dash dot lines relative to the roll 4. It is further not necessary to make the rolls all of similar diameter, in some instances it may even be advantageous, if the rolls of the second half of the set are of larger diameter than those of the first half of the set. In this instance the rolls of the first half of the set need no longer be lifted off the pipe after the rolls of the second half of the set have come to engage it, as by the larger diameter of the rolls of the second half of the set upsetting of the material is prevented, as then the larger diameters of the rolls of the second half of the set produce a higher speed of the material to be rolled relative to the speed imparted to the same by the rolls of the first half, which would be expressed in a tensile stressing of the rolling material between the points of engagement of the rolls of the two halves of the set.

The arrangement of the rolls, as it has been selected and shown in the drawing, has been made for the reason that, on the one hand, by the shape of the rolls guiding of the material to the utmost has to be attempted, but then also, because with these rolls, if the construction of the rolling mill permits of adjusting the rolls radially to the material to be rolled, it is possible to widen the pipe several times in one heat and with the same outer rolls. It would then only be necessary to interchange the mandrel head and to replace it by a corresponding mandrel considering the widening in which then the rotatable part of the mandrel or the internal rolls ought to be arranged in inverse direction as at the preceding passage of the pipe.

I claim:

1. A rolling mill for enlarging cylindrical shaped hollow bodies comprising in combination, a mandrel adapted to be arranged inside the hollow body having conical shaped means for enlarging the body and cylindrical portions at each end thereof, at least two sets of rolls adapted to alternately engage the outer surface of the hollow body, each roll having the axis thereof arranged at an angle with respect to the axis of the mandrel, the rolls of one set having enlarged diameter portions for initially engaging the unenlarged portion of the hollow body so as to push and roll the hollow body over the mandrel, the rolls of the other set having enlarged diameter portions adapted to engage the enlarged portion of the hollow body for pulling and rolling the hollow body over the mandrel, and the cylindrical portions of the mandrel supporting portions of the hollow body engaged by the rolls.

2. A rolling mill for enlarging previously formed pipe comprising in combination, a mandrel adapted to be arranged inside the pipe having conical shaped means for enlarging the pipe and cylindrical portions at each end thereof, two sets of rolls adapted to alternately engage the outer surface of the pipe, each roll being arranged with the axis thereof at an angle with respect to the axis of the pipe, the rolls of one set having large diameters at the ends diametrically opposite the smaller end of the mandrel for initially engaging the unenlarged portion of the pipe so as to push and roll the pipe over the mandrel, the opposite ends of said rolls having smaller diameters and extending beyond the conical means of the mandrel, the other set of rolls having large and small diameter portions arranged oppositely with respect to the first set of rolls, the large diameter portions of the second set of rolls being adapted to engage the enlarged portion of the pipe for pulling and rolling the pipe over the mandrel after the first set of rolls are removed from engagement with the pipe, and the cylindrical portions of the mandrel supporting portions of the pipe engaged by the rolls.

3. A rolling mill for enlarging pipe comprising in combination, a mandrel adapted to be arranged inside the pipe having conical shaped rolls with cylindrical portions at each end of the conical parts for engaging the interior of and enlarging the pipe, at least two sets of rolls adapted to alternately engage the outer surface of the pipe, each roll having the axis thereof arranged at an angle with respect to the axis of the pipe, the rolls of one set being adapted to initially engage the unenlarged portion of the pipe so as to push and roll the pipe over the mandrel, the rolls of the other set being adapted to engage the enlarged portion of the pipe for pulling and rolling the pipe over the mandrel after the first set of rolls are removed from engagement with the pipe, and the cylindrical portions of the conical shaped rolls supporting portions of the pipe engaged by the rolls.

4. A rolling mill as claimed in claim 3 wherein the rolls adapted to engage the outer surface of the pipe have similar diameters.

5. A rolling mill as claimed in claim 3 wherein the rolls of one set which are adapted to engage the outer surface of the pipe are of one diameter and the rolls of another set are of a larger diameter than the rolls of the first set.

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