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R. B. FOULKS

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CYLINDER REGISTERING MECHANISM

Filed May 31, 1956

4 Sheets-Sheet 1

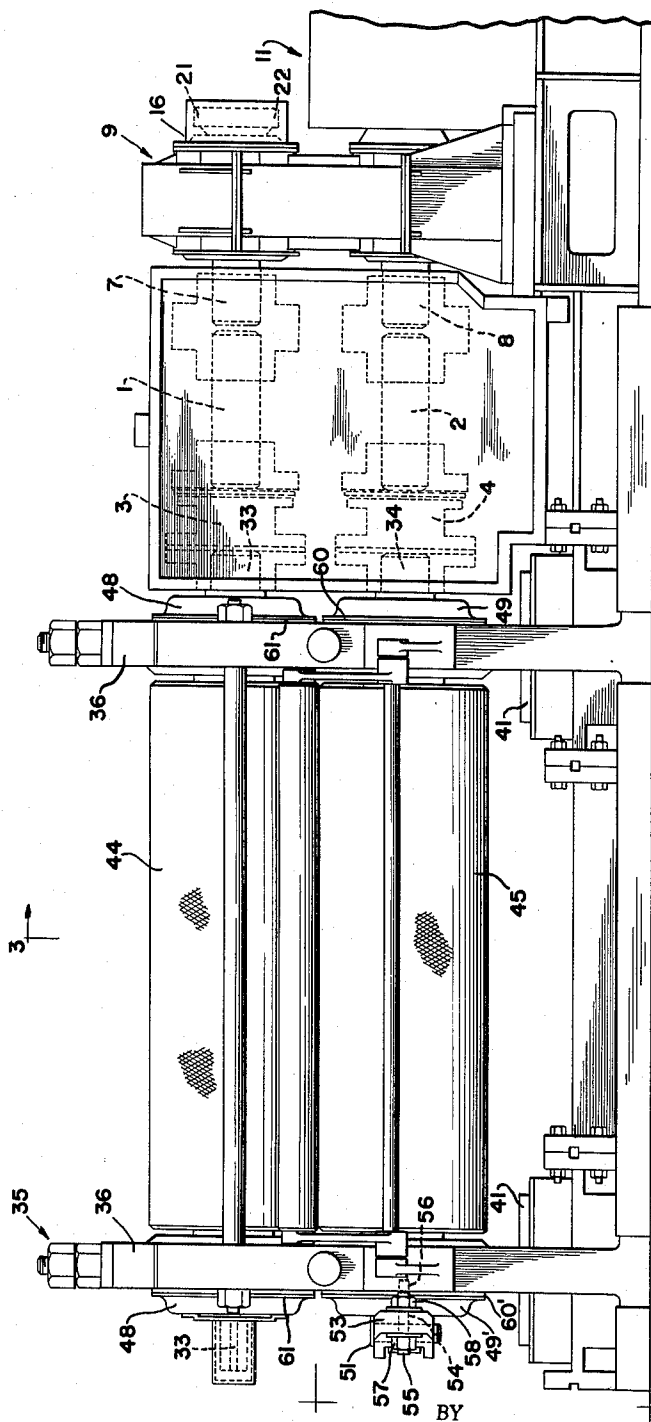


FIG. 1.

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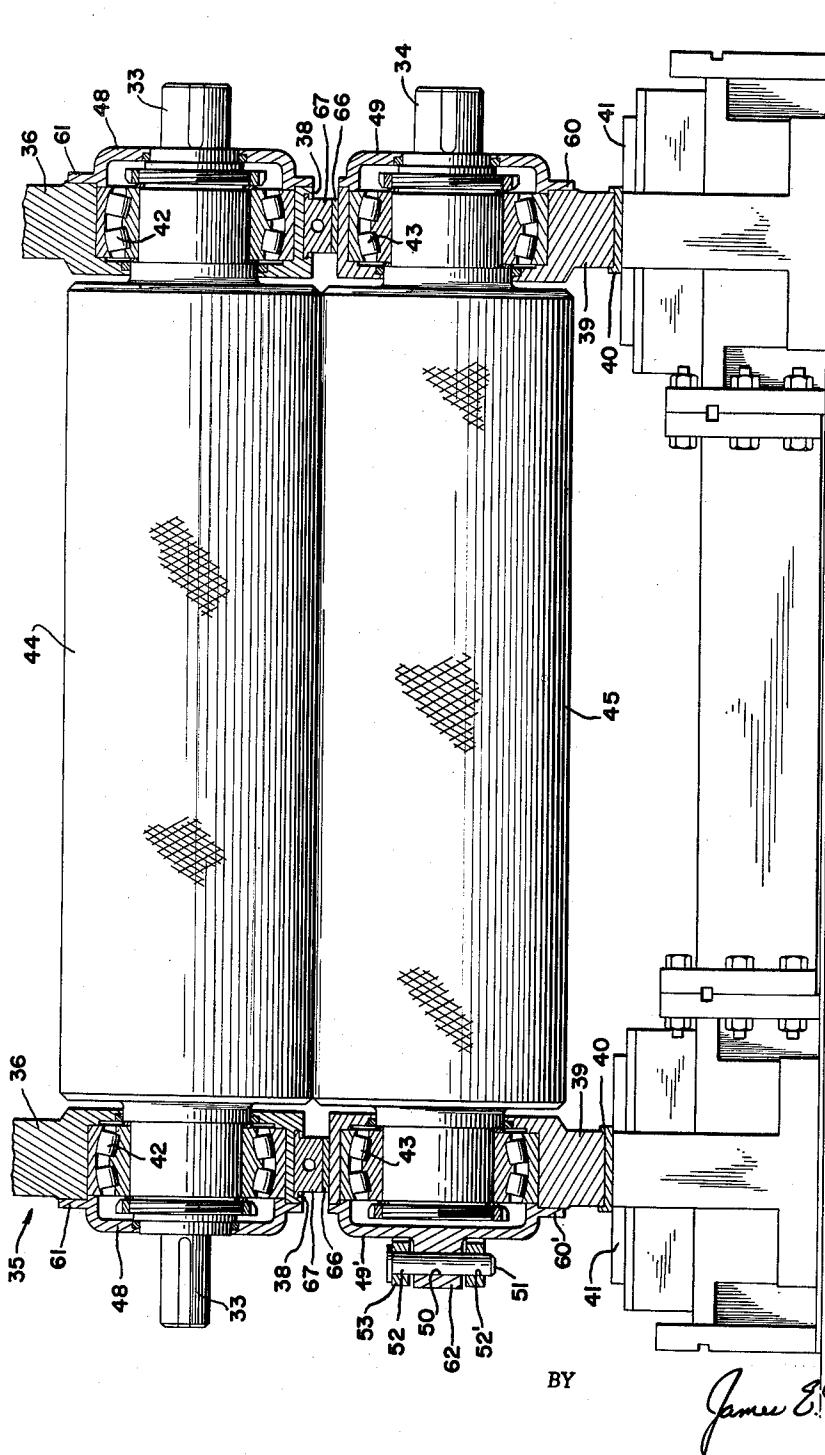
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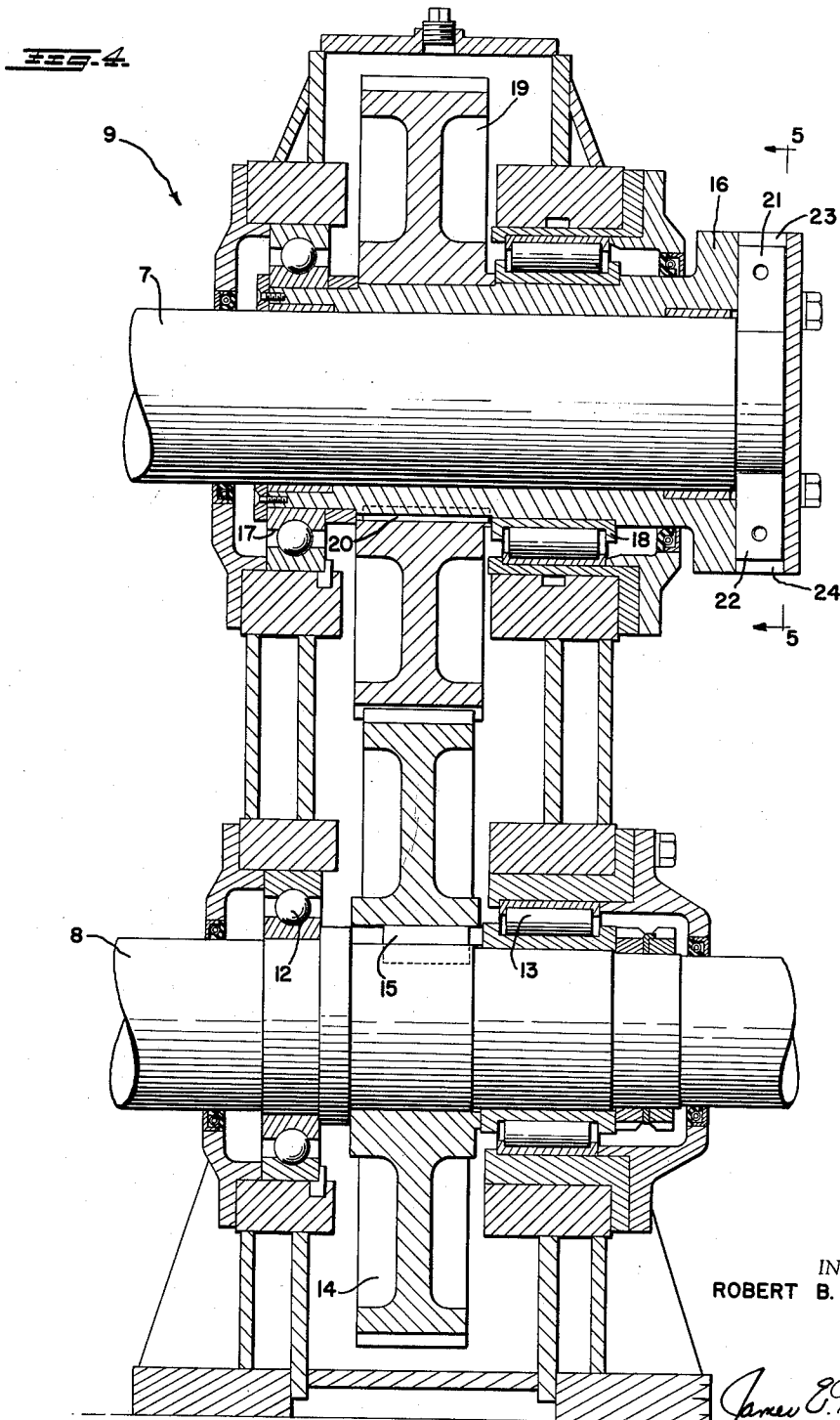
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CYLINDER REGISTERING MECHANISM

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12 Claims. (Cl. 101—23)

This invention relates to the art of roll embossing and to an embossing apparatus having a pair of embossing rolls through which a sheet of material is passed so as to form a raised or embossed design or pattern on the material. More particularly, this invention relates to the adjustment of the rolls of such embossing apparatus relative to each other.

The conventional rolling mills for the production of embossed sheet metal generally comprise a pair of mated embossing rolls between which the sheet to be embossed is passed. The surface of one roll has embossing projections thereon of the desired pattern, while the mated second roll has recesses adapted to completely receive the embossing projections of the first roll.

In order to emboss the sheet properly the position of one roll must be adjusted relative to the position of the other roll to obtain registry. That is to say, it is necessary to assure that embossing projections of one roll are in correct alignment with respect to the embossing recesses of the other roll. In accordance with prior art practices, such adjustment is accomplished prior to assembling the mounting and drive means for one roll.

The prior art practices for producing embossed sheet metal possess certain inherent disadvantages with regard to adjustment of one roll relative to the other. Generally, it is very difficult to obtain perfect registry by careful assembly of the mounting and drive means when employing the prior art devices. It is often necessary to completely disassemble and reassemble the rolls and mountings if registry between the two rolls is not obtained on initial assembly. As a result of these difficulties, perfect registry is seldom achieved with the prior art devices and accordingly a slightly imperfectly embossed sheet is generally produced. For some patterns these imperfections are not noticeable and a marketable, though imperfect product is produced. In the case of certain very difficult patterns, such as diamond shape patterns, the inability to obtain perfect registry of one roll relative to the other has made it impossible to produce such patterns when employing the practices of the prior art.

Accordingly, the primary purpose and object of this invention is to provide improved means for adjusting the position of the rolls of an embossing mill relative to each other which eliminates or substantially reduces many of the disadvantages of the prior art techniques.

Another object of this invention is to provide improved means for adjusting the positions of the rolls of an embossing mill whereby perfect alignment or registry of the embossing projections of one roll with the embossing recesses of the other roll may be achieved.

Another object of this invention is to provide means for longitudinal adjustment of a roll of an embossing mill.

Another object of this invention is to provide means for longitudinal and radial adjustment of the rolls of an embossing mill to assure perfect alignment or registry of the embossing projections of one roll with the recesses of the other roll.

These and other objects of the instant invention will be

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apparent from the following description thereof when taken in conjunction with the accompanying drawings.

In accordance with this invention, there is provided an embossing mill comprising a roll stand and a pinion stand, having a novel means of transverse adjustment of at least one roll relative to the other and a novel sleeve type mounting for the pinion of at least one roll to accomplish radial adjustment between rolls.

A detailed discussion of a specific means for carrying out this invention will be described in conjunction with the following drawings wherein:

Figure 1 is an elevational view with parts removed for purposes of clarity of an embossing mill stand and pinion stand employing the longitudinal and angular adjustment means of this invention.

Figure 2 is an enlarged elevational view partly in section with certain parts removed for purpose of clarity of the embossing mill stand shown in Figure 1.

Figure 3 is a side elevational view with parts removed for purposes of clarity of the embossing mill stand taken along the line 3—3 of Figure 1.

Figure 4 is a side elevational sectional view of the pinion stand of this invention, and

Figure 5 is a fragmentary end elevational view with parts removed for purposes of clarity of the embossing rolls, mounting sleeve and shaft for driving the upper roll of the embossing mill stand when viewed along the line 5—5 of Figure 4.

Figure 6 is a fragmentary sectional view taken along the line 6—6 of Figure 3 and showing the manner in which the guideways 63 and recesses 64 are arranged to permit lateral movement of the roll carrying chucks with respect to the roll frame.

With reference to the accompanying drawings in which the same reference numerals have been applied to various corresponding parts and with particular reference to Figures 1, 2 and 3, an embossing mill is shown comprising a roll stand 35 and a pinion stand 9. Roll stand 35 comprises a pair of cooperating mated embossing rolls 44 and 45 extending generally horizontally and supported by shaft members 33 and 34 and a pair of vertical frames 36. Frames 36 have windows 37 which accommodate the lower and upper chucks 38 and 39 respectively. Chucks 38 and 39 are mounted within windows 37 by means of projecting guideways 63 on the vertical edges of windows 37 which fit within matching recesses 64 in chucks 38 and 39. Lower chucks 39 are slideably supported by flanged plates 40 which rest on a raised portion 41 at the base of each vertical frame 36 at the bottom of windows 37. Chucks 38 and 39 provide journal support for shaft members 33 and 34 by means of bearings 42 and 43. Upper chucks 38 are adjustably supported by lower chucks 39 by means of wedge members 66 and 67.

Axial adjustment of lower embossing roll 45 relative to upper roll 44 is accomplished by means employing the leverage principle including a yoke member 53, and threaded adjusting means extending through the extremities of yoke member 53 and into the respective vertical frame 36.

The ends of each shaft member 33 and 34 are covered by cap members 48, 49 and 49' having flanges 61, 60 and 60' respectively. Cap members 48 and 49 have an opening therein to permit passage of an extension of the respective shaft 33 or 34. Shaft 34 does not have an extension on the left hand end, whereby cap member 49' may be completely closed. Cap 49' is affixed to lower chuck 39 by bolts 59 passing through a series of holes spaced around the periphery of flange 60'. Yoke member 53 is pivotally attached at its central portion to cap member 49' by means of a suitable pin 51 which passes through an eye 50 located in a projection 62 on cap

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member 49' and eyes 52 and 52' in the center of yoke member 53. At either end of yoke member 53 is provided a suitable round opening 54 to permit the previously mentioned threaded adjusting means which may comprise studs 55 and nuts 57 and 58 to pass there-through. Suitably aligned with openings 54 when yoke member 53 is fastened to cap 49' are threaded openings 56 which are engaged by studs 55. Nuts 57 and 58 are threaded onto studs 55 on either side of yoke member 53.

Axial adjustment of lower roll 45 is obtained by loosening the nuts 57 and 58 and adjusting one or the other to move the yoke member 53 in the desired direction axially. Since yoke member 53 is affixed to cap 49' by pin 51 and cap 49' is in turn affixed to the left hand chuck 39, left hand chuck 39 is moved in the desired direction. Since lower roll 45 is mounted in both chucks 39 and right hand chuck 39 is also slideably mounted on a raised portion 41, the lower roll 45 is moved in the desired direction. While chucks 39 are mounted on projecting guideways 63, there is sufficient clearance provided between guideways 63 and recess 64 to permit longitudinal movement for alignment of the embossing projections of one roll with the embossing recesses of the other roll. As may be seen in Figure 6 the projecting guideway 63 rests in a recess or elongated slot 64. The width of the slot 64 is somewhat greater than that of the guideway 63 such that limited lateral movement of the chuck members 39 with respect to the mill frame is permitted in order that the roll 45 may be moved axially of itself by a suitable leverage mechanism which will be described in detail hereinafter.

With the above described apparatus advantage may be taken of the leverage principle to effect adjustment more easily and more accurately. By adjusting nuts 57 and 58 on first one side and then the other, the nuts which are not being adjusted serve as a fulcrum with the force being applied at the opposite end of yoke member 53. Where eyes 52 and 52' are located halfway between the ends of yoke member 53 a mechanical advantage of two is obtained. That is to say, twice as much force is applied at pin 51, as is applied at the end of yoke member 53 at which the adjustment is being made. In addition the end of yoke member 53 where the adjustment is being made is moved approximately twice as far longitudinally as pin 51, chucks 39 and embossing roll 45. This permits a finer and more accurate adjustment of embossing roll 45 relative to roll 44 than could be obtained without the use of the leverage principle.

Embossing rolls 44 and 45 are suitably driven through a pinion stand 9 and a pair of connecting shafts 1 and 2. Shaft 1 is connected to shaft member 33 of the upper embossing roll 44 while shaft 2 is connected to shaft member 34 of the lower embossing roll 45 by suitable flexible couplings 3 and 4 respectively. Shafts 1 and 2 are also coupled to shaft members 7 and 8 mounted within pinion stand 9. Lower shaft member 8 is driven by a suitable prime mover such as a motor (not shown) through suitable means such as a flexible coupling 11.

With reference to Figures 4 and 5, the mountings for shaft members 7 and 8 will be described in detail. Shaft member 8 is mounted within pinion stand 9 in a pair of bearings 12 and 13 mounted on either side of stand 9. A suitable pinion 14 is keyed by key 15 to lower shaft member 8 in a position between bearings 12 and 13. Shaft member 7 has a suitable sleeve 16 closely fitting said shaft at the right hand portion of said shaft. Sleeve 16 is suitably mounted in bearings 17 and 18 on either side of pinion stand 9. A suitable pinion 19 is keyed to sleeve 16 by key 20 in a position between bearings 17 and 18 and intermeshes with pinion 14. The right hand end portion of shaft member 7 is provided with diametrically opposed flat projections 21 and 22 extending radially from the shaft member 7. These projections 21 and 22 fit matching slots 23 and 24 in sleeve 16. Slots 23 and 24 are of a width sufficiently greater than the

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width of projections 21 and 22 to permit shaft member 7 to be rotated within sleeve 16 a sufficient amount for alignment of the projections of one roll with the recesses of the other. In order to maintain shaft member 7 in a desired fixed position relative to sleeve 16, two pairs of set screws 25, 25', 26 and 26' are provided which engage threaded openings 27, 27', 28 and 28'. By threading each pair of set screws 25, 25', 26 and 26' toward each other into contact with either side of each of said projections 21 and 22, shaft member 7 may be held in fixed position relative to sleeve 16. If the embossing rolls are not in registry, the set screws 25, 25', 26 and 26' may be loosened and the upper embossing roll 44 turned thereby turning shaft member 7 within sleeve 16 until the upper embossing roll 44 is in perfect registry with the lower embossing roll 45. The set screws 25, 25', 26 and 26' are then tightened maintaining the upper roll in registry with the lower roll. As can be seen from Figure 5, the shaft member 7 may be rotated clockwise, for example by loosening set screws 25' and 26 while tightening set screws 25 and 26'. Shaft member 7 may be rotated counterclockwise by reversing this procedure. For operation of this device, timing marks 31 and 32 are provided near the periphery on the end of each embossing roll 44 and 45. These marks are placed in such a position that when the two marks are in line with a line passing through the axis of both the upper roll 44 and the lower roll 45, the embossing projections of one roll are in perfect alignment with the recesses of the other roll. Thus to obtain perfect registry, the upper shaft 7 is rotated within sleeve 16 through proper adjustment of set screws 25, 25', 26 and 26' as above described until timing marks 31 and 32 are in line.

While there has been shown and described hereinabove the present preferred embodiments of this invention, it is to be understood that the invention is not limited thereto and that various changes, alterations and modifications can be made thereto without departing from the spirit and scope thereof as defined in the appended claims, wherein—

What is claimed is:

1. In a rolling mill for the production of embossed sheet metal the combination of a pair of vertical frames having windows therein with projecting vertical guideways, a pair of cooperating mated embossing rolls including shaft members extending generally horizontally between and supported by said frames, chucks defining journal supports for said shaft members mounted in said frames by means of recesses therein matching said projecting vertical guideways, sufficient clearance being provided between said guideways and said recesses to permit longitudinal movement of one of said mated embossing rolls relative to the other, and leverage means acting between said chucks and at least one of said mill frames to move said chucks and said one roll laterally of the mill frames to effect axial adjustment of one of said rolls relative to the other, said leverage means including a yoke member pivotally secured at an intermediate portion thereof to a chuck for said last-mentioned roll.

2. A rolling mill for the production of embossed sheet as defined in claim 1 including further, common means acting between said rolls to drive said rolls in opposite directions, said drive means including means permitting rotational adjustment of one of said rolls relative to the other whereby said rolls may be brought into axial and peripheral registry.

3. In a rolling mill for the production of embossed sheet metal the combination of a pair of spaced vertical frames having windows therein provided with projecting vertical guideways, a pair of cooperating mated embossing rolls including shaft members extending generally horizontally between said spaced vertical frames, chucks providing journal support for said shaft members mounted on said frames, said chucks being provided with vertical recesses matching engagement with said project-

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ing vertical guideways, sufficient clearance being provided between said guideways and said recesses to permit longitudinal movement of at least one of said mated embossing rolls, the chucks supporting the lower of said mated embossing rolls being slideably supported at the base of said pair of vertical frames, and means acting through said chucks and at least one of said frames to affect axial adjustment of one of said rolls, said means comprising a yoke member pivotally affixed at an intermediate portion thereof to one of said chucks, threaded adjusting means extending through the extremities of said yoke member and into the vertical frame within which the chuck to which said yoke member is affixed is mounted.

4. In a rolling mill for the production of embossed sheet metal wherein adjustably disposed rolls are employed, the combination of a roll stand and a pinion stand, said roll stand comprising a pair of spaced vertical frames having windows therein with projecting vertical guideways, a pair of cooperating mated embossing rolls including shaft members extending generally horizontally between and supported by said pair of frames defining said roll stand, chucks providing journal support for said shaft members mounted on said frames at least a pair of said chucks including recesses therein matching said projecting vertical guideways, sufficient clearance being provided between said guideways and said recesses to permit axial movement of one of said mated embossing rolls with respect to the other, and means affecting axial adjustment of said one of said rolls relative to the other, said means comprising a cap member affixed to one of said pair of chucks, a yoke member pivotally attached at its central portion to said cap member, threaded adjusting means extending through the extremities of said yoke member and into the vertical frame within which the chuck to which said yoke member is affixed is mounted, said pinion stand comprising a frame, intermeshing pinions disposed one above the other in said frame, shaft members connected to said pinions, each of said pinion shaft members being flexibly connected to a shaft member of one of the respective embossing rolls, one of said pinion shaft members being connected to a drive means.

5. In a rolling mill for the production of embossed sheet metal wherein adjustably disposed rolls are employed, the combination of a roll stand and a pinion stand, said roll stand comprising a pair of spaced vertical frames having windows therein with projecting vertical guideways, a pair of cooperating mating embossing rolls extending generally horizontally between said spaced frames, chucks providing journal support for said shaft members mounted in said frames, said chucks being provided with recesses matching said projecting vertical guideways, sufficient clearance being provided between said guideways and said recesses to permit axial movement at least one of said mating embossing rolls, the chucks supporting the lower of said mating embossing rolls being slideably supported at the base of said vertical frame, and means affecting longitudinal adjustment of said one of said rolls relative to the other, said means comprising a yoke member pivotally affixed to one of said chucks, threaded adjusting means extending through the extremities of said yoke member and into the vertical frame within which the chuck to which said yoke member is affixed is mounted, said pinion stand comprising a frame, intermeshing pinions disposed one above the other, shaft members for rotatably supporting each of said pinions in said frame, each of said pinion shaft members being flexibly connected to the shaft member of one of said embossing rolls, one of said pinions being directly keyed to its respective shaft member, the other of said pinions being keyed to a sleeve member closely fitting the respective shaft member and means acting between said sleeve and said shaft member permitting radial adjustment of said sleeve member and pinion relative to said

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shaft member, whereby said mating rolls may be brought into both axial and circumferential registry.

6. The rolling mill of claim 5 wherein said means acting between said shaft and sleeve members comprises a pair of diametrically opposed flat projections extending outwardly from the end portion of the shaft member about which said sleeve member is closely fit, said sleeve member being provided with diametrically opposed slots matching said projections provided on said shaft member, sufficient clearance being provided between said slots and said projections to permit said shaft member to be rotated within said sleeve member, and acting between said slots and said projections permitting movement of said shaft member relative to said sleeve member in a desired fixed but adjustable position.

7. The rolling mill of claim 6 wherein said means for maintaining said shaft member in fixed but adjustable position relative to said sleeve member comprises two pairs of set screws threadedly engaged in said sleeve member on either side of each of said slots whereby said set screws may be moved into contact with either side of each of said projections to maintain said projections in a fixed position within said slots, which fixed position may be varied by dependent upon the position of said set screws.

8. In a rolling mill for the production of embossed sheet metal wherein adjustably disposed rolls are employed, the combination of a roll stand and a pinion stand said roll stand comprising a pair of spaced vertical frames, a pair of cooperating, mated embossing rolls extending generally horizontally between said spaced frames and supported therein, support means for said rolls and means acting between at least one of said spaced frames and said roll support means to effect axial movement of at least one of said mated embossing rolls with respect to the other, said pinion stand including a pair of intermeshing pinions disposed one above the other, shaft members rotatably supporting each of said pinions in said pinion stand, each of said pinion shaft members being flexibly connected to each of said mated embossing rolls, one of said pinions being directly keyed to its respective shaft member, the other of said pinions being keyed to a sleeve closely surrounding its respective shaft member, and means acting between said sleeve and said shaft member permitting radial movement of said sleeve and said pinion carried thereby relative to said shaft member, whereby said roll driven by said last mentioned pinion may be brought into circumferential registry with the other of said pair of cooperating rolls.

9. A rolling mill as defined in claim 8 wherein said means acting between said shaft member and said sleeve comprises a pair of diametrically opposed flat projections extending outwardly from the end portion of the shaft member about which said sleeve is closely fitted, said sleeve being provided with diametrically opposed slots receiving said projections provided on said shaft member, sufficient clearance being provided between the sides of said slots and said projections to permit limited rotational movement of said shaft member within and relative to said sleeve and means carried by said sleeve and acting against said projections to lock said sleeve and said shaft member in fixed but adjustable relation.

10. A rolling mill as defined in claim 9 wherein said means for locking said shaft member relative to said sleeve comprises two pairs of set screws in threaded engagement with said sleeve and disposed on either side of each of said slots whereby said set screws may be moved into contact with either side of each of said projections to maintain said projections into fixed position within said slots which position may be varied dependent upon the position of said set screws.

11. The rolling mill of claim 9 wherein timing marks are provided near the periphery on the end of each of said embossing rolls in a position where said timing marks are in line with a line passing through the axes of both

of said embossing rolls when said rolls are in perfect radial alignment.

12. In a rolling mill for the production of embossed sheet metal wherein adjustably disposed rolls are employed, the combination of a roll stand and a pinion stand, said roll stand comprising a pair of vertical frames having windows therein provided with projecting vertical guideways, a pair of cooperating mated embossing rolls extending generally horizontally between and supported within said frames, shaft members provided on either end of each of said embossing rolls, chuck means journaling said shaft members in said frames, said chuck means including recesses therein matching said projecting vertical guideways provided on said frames, sufficient clearance being provided between said guideways and said recesses to permit axial movement of one of said mated embossing rolls with respect to the other, means acting between said frame and said chuck means to accomplish said axial adjustment of one of said rolls relative to the other, said means comprising a cap member affixed to one of said chuck means, a yoke member pivotally attached at its central portion to said cap member, threaded adjustment means extending through the extremities of said yoke member and into the vertical frame within which the chuck means to which said yoke member is affixed is mounted, said pinion stand comprising a frame, intermeshing pinions disposed one above the other and journaled in the pinion frame, said pinions including shaft members, each of said pinion shaft members being flexibly connected to the shaft member of its respective embossing roll, one of said pinions being directly keyed to its respective shaft member, the other pinion of said intermeshing pinions being keyed to a sleeve in closely fitted and surrounding relation with respect to the other pinion shaft member, adjusting means disposed between said last-mentioned pinion shaft member and said sleeve acting to permit radial adjustment of said sleeve and the said pinion carried thereby relative to said last-mentioned shaft member, said last mentioned means comprising a pair of diametrically opposed flat projections provided

on the end portion of the shaft member about which said sleeve is closely fitted, said sleeve being provided with diametrically opposed slots within which said projections are disposed, sufficient clearance being provided between the sides of said slots and said projections to permit limited rotational movement of the pinion shaft member with respect to said sleeve and adjustable means for locking the pinion shaft member in adjustable relation to said sleeve such that the pinion shaft member and the embossing roll to which said pinion shaft member is fixed may be rotated when said pinion is stationary to effect registry of said one embossing roll with respect to the other of said embossing rolls, and common drive means affixed to one of said intermeshed pinions acting to drive said pinions and said embossing rolls.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,957,409

October 25, 1960

Robert B. Foulks

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 21, for "recess" read -- recesses --; column 5, line 59, for "said", first occurrence, read -- at least --; column 6, line 12, after "and" insert -- means --.

Signed and sealed this 19th day of September 1961.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents

USCOMM-DC