July 20, 1954 R. F. HOLTZ 2,684,000

MULTIPLE ROLL PASS MILL

Filed April 6, 1949 3 Sheets-Sheet 1

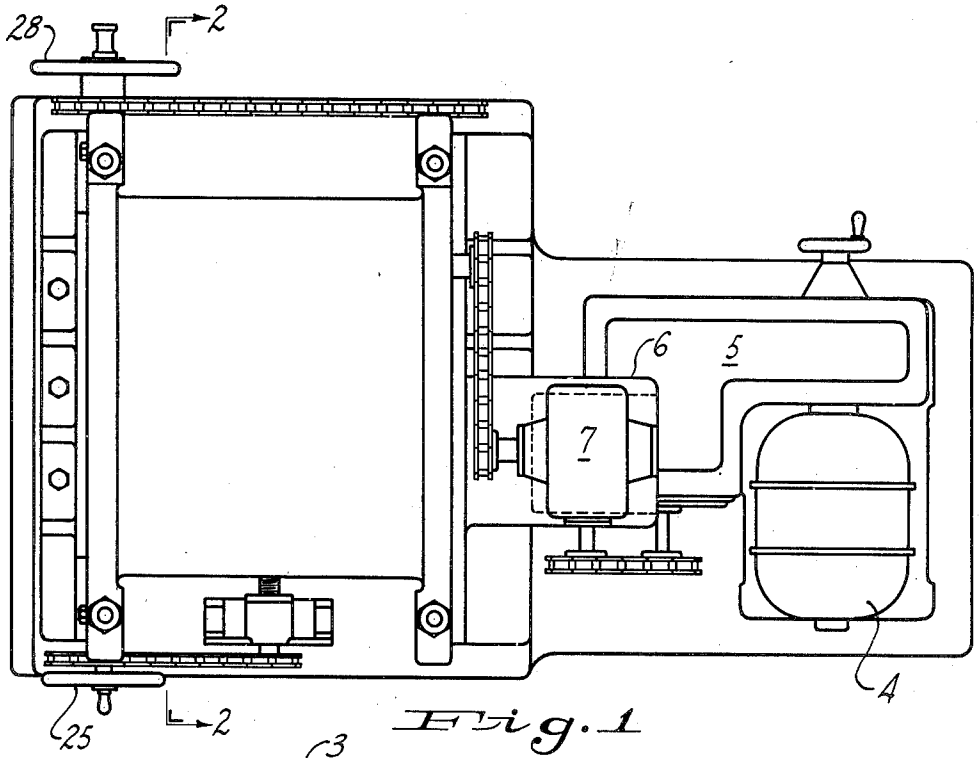


Fig. 1

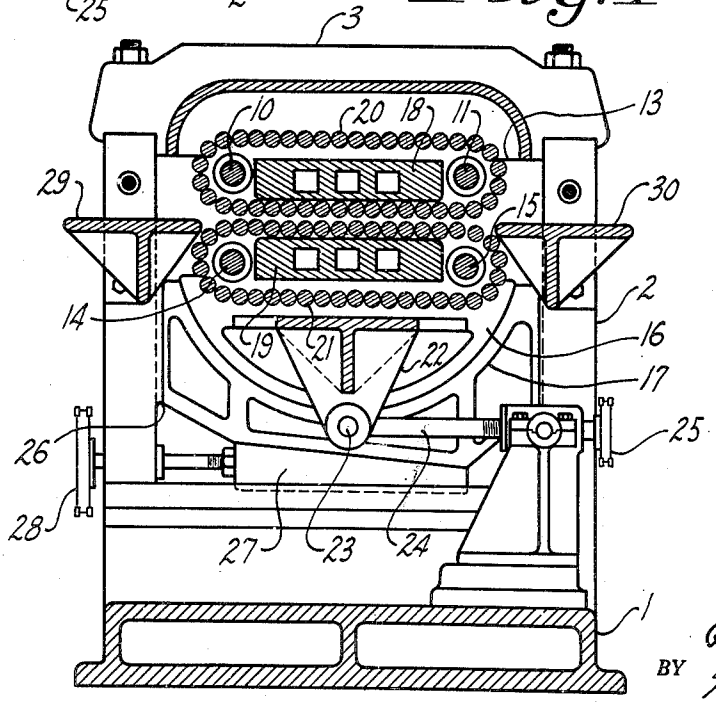


Fig. 2

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MULTIPLE ROLL PASS MILL

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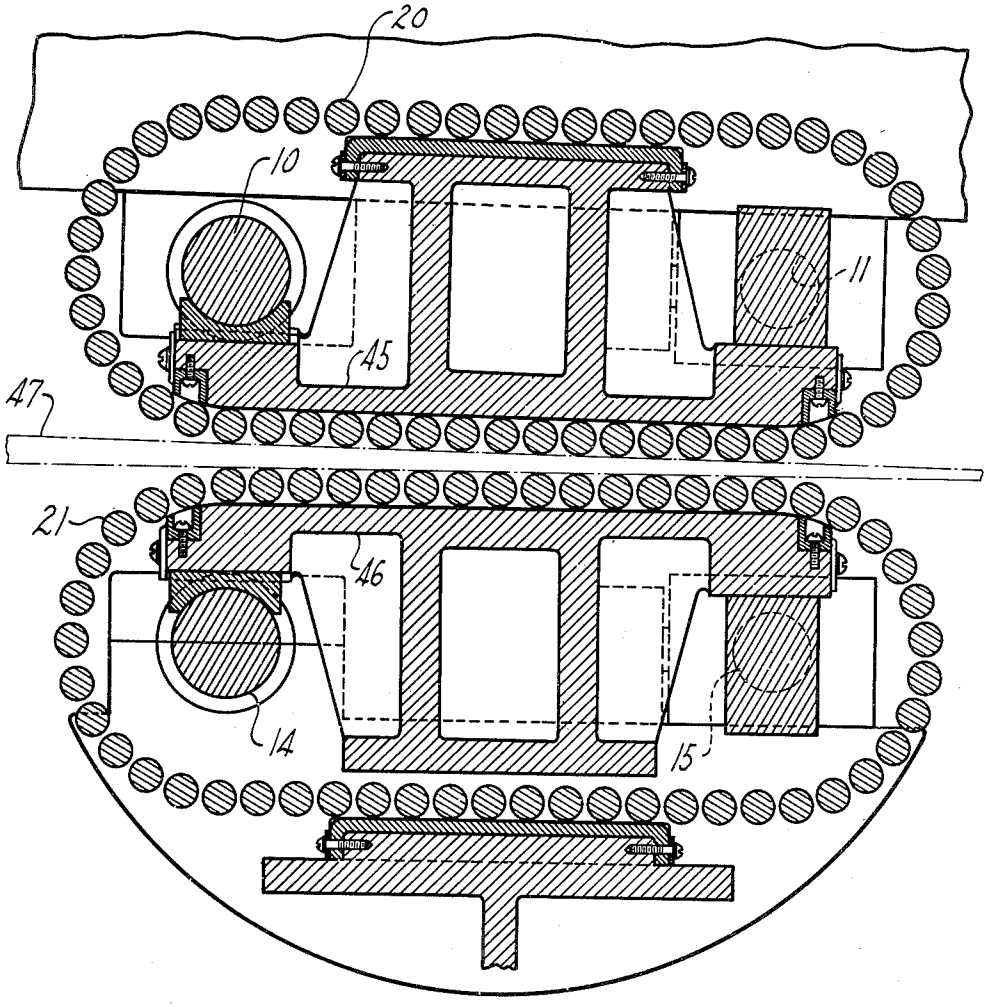


Fig. 3

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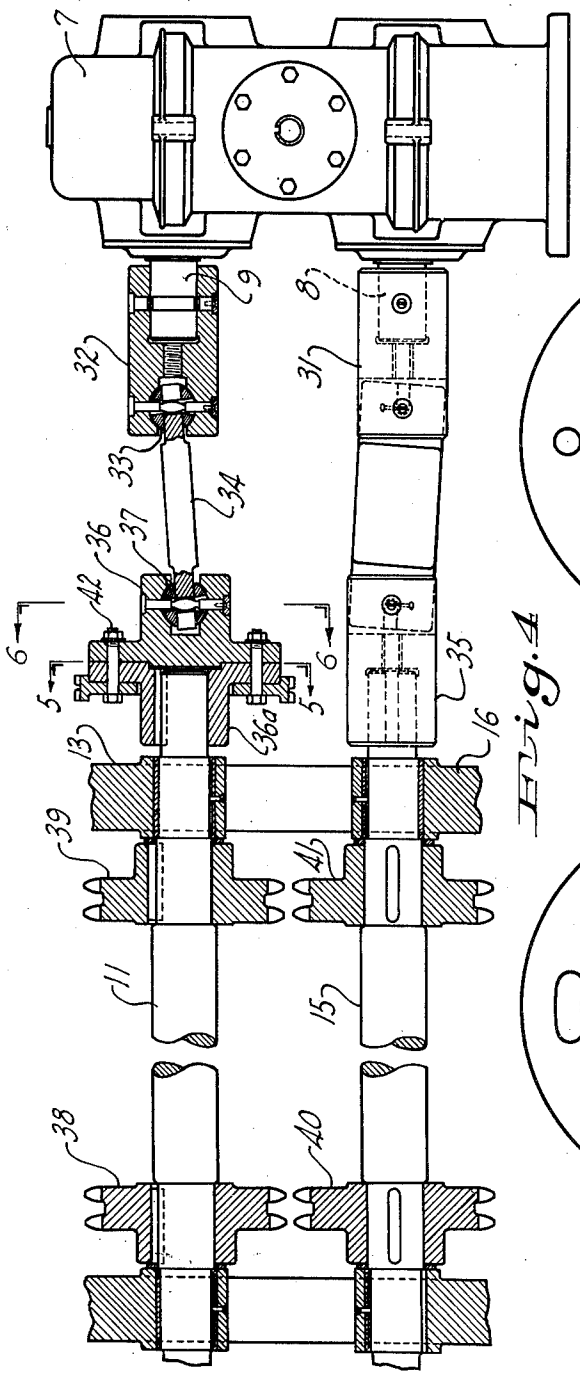


Fig. 4

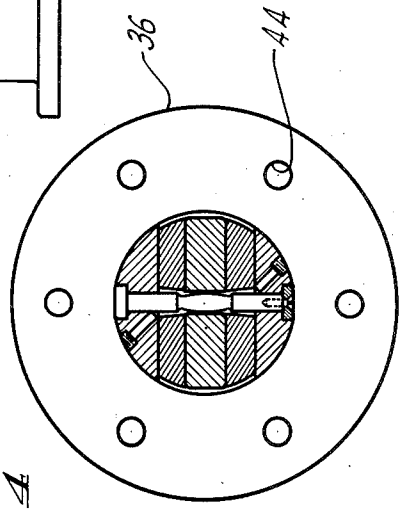


Fig. 6

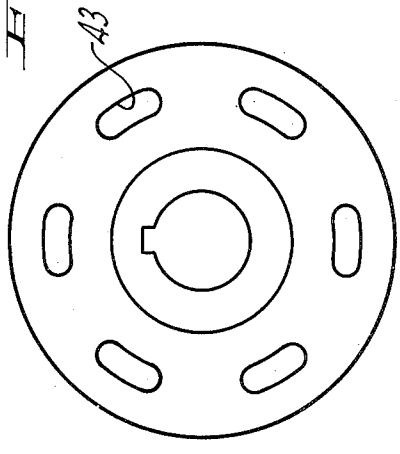


Fig. 5

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UNITED STATES PATENT OFFICE

2,684,000

MULTIPLE ROLL PASS MILL

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Application April 6, 1949, Serial No. 85,900

4 Claims. (Cl. 80—31.1)

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This invention relates to a combined roller leveler and multiple roll reduction mill for use in straightening sheets and plates and for reducing same where that is required. In Patent No. 2,391,419, granted to me December 25, 1945, is disclosed a roller leveler device utilizing multiple straightening rolls mounted on chains to be movable in the direction of the sheet material between a plurality of pressure blocks which support the rolls of relatively small diameter along their entire length. The patent further deals with a cradle mount and other features for adjusting the rolls as required.

In accordance with the present invention I utilize the same or similar apparatus as a multiple roll reduction pass for sheet material by adjustment of shaft centers of one drive relative to the other in lateral position to bring the upper and lower rollers with their axes in vertical alignment whereby, together with the tiltable means for adjusting the upper and lower rollers, the rollers of uniform diameter would constitute severally adjustable roll passes and jointly a series of gradually reducing roll passes in the direction of movement of the strip. The apparatus could also be adjusted to constitute a roller leveler by staggering the rollers in the manner disclosed in my former patent.

The invention will become more apparent from a consideration of the accompanying drawings, constituting a part hereof, in which like reference characters designate like parts, and in which

Fig. 1 is a top plan view of a roller leveler embodying the principles of this invention;

Fig. 2 a cross-sectional view of the roller leveler taken along the line 2—2, Fig. 1;

Fig. 3 a vertical cross-sectional view through the rollers and pressure platens showing a modified form of journal and roller mounts;

Fig. 4 a vertical section partially in elevation of the sprocket drive gears and shafts for the roller supporting chains;

Fig. 5 an end elevational view of a shaft coupling taken along the line 5—5, Fig. 4; and

Fig. 6 an end elevational view partially in section of a coacting coupling member and universal joint therefor, taken along the line 6—6, Fig. 4.

With reference to Figs. 1 and 2 of the drawings, the numeral 1 designates a base having side frames 2 and a connecting yoke 3 at the top thereof, the base 1 forming an extension beyond the side frames as shown in Fig. 1 for mounting a drive motor 4 and transmission mechanism 5. A side bracket 6 extending from the frame members 2 constitutes a support for a drive transmission 7 from which a pair of drive shafts 8 and 9 extend, as shown in Fig. 4. A plurality of sprocket shafts 10 and 11 are mounted in a cross

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member 13 and a similar pair of shafts 14 and 15 are mounted in a cradle 16 that is supported on a complementary shaped support 17 to be tiltable thereon. A pressure block 18 is provided in the top of cross member 13 and a pressure block 19 in the cradle 16, the pressure blocks extending the full length of chain rollers 20 and 21 to provide a maximum area of contact of the pressure blocks with the rollers. Cradle 16 is provided with a fulcrum 22 connected by a pin 23 to a rod 24 and may be movable by the wheel 25. The cradle support 17 is adjustable vertically in ways 26 on the side frames 2 by a wedge 27 through the adjusting wheel 28. Tables 29 and 30 are provided to support the material passing between the rollers 20 and 21, as will be apparent.

As shown in Fig. 4, shafts 8 and 9 are provided with coupling members 31 and 32 having universal joints 33 with connecting links 34 driving couplings 35 and 36. Coupling 35 may be a plain sleeve with a universal joint 37 as shown in coupling 36. Couplings 35 and 36 are respectively connected to drive shafts 11 and 15 shown in Fig. 2, which are each provided with a pair of sprocket wheels 38, 39 and 40, 41, respectively, the sprockets being keyed on their respective shafts as shown. Shafts 11 and 15 are journaled in the cross member 13 and the cradle 16 as previously explained.

In accordance with the present invention the coupling 36 is a split member and consists of the part designated by the reference numeral 36 and the coupling 36*a*, the parts being connected by bolts 42. To make the drive shaft 11 angularly adjustable relative to the drive shaft 15 for the purpose of converting the apparatus from a roller leveler as disclosed in my earlier Patent No. 2,391,419, to a reduction mill as shown in Figs. 2 and 3, the coupling member 36*a* has its bolt holes 43 elongated as shown in Fig. 5, the elongation being approximately 18° and the shifting of the coupling on the bolt a distance from one end of the slot 43 to the other is sufficient to index the sprocket wheels 38 and 39 one tooth, the pitch of the sprocket chain being such that a half-tooth adjustment of the sprocket wheels 38 and 39 will bring the rolls 20 and 21 in vertical alignment when one end of the slot 43 abuts the bolts 42, and in staggered relation as shown in my former patent when the other end of the slot 43 abuts bolts 42.

From the above it is evident that by employing an adjustable coupling 36, 36*a*, as shown in Fig. 4, a roller leveler may be converted to a multiple pass mill or vice versa. As shown in Fig. 6, the bolt holes 44 in the coupling member 36 are not slotted, so that angular displacement of the parts 36, 36*a*, effects movement only of the part 36*a* and its connected shaft 11.

In Fig. 3 of the drawing the shafts **10**, **11**, **14** and **15** are shown journaled in bearing blocks mounted on the pressure platens **45** and **46** to withstand the greater pressure on the rollers **20** and **21** when the apparatus is used as a multiple pass reduction mill.

Also in Fig. 3 the work or sheet **47** is diagrammatically illustrated between the passes of the respective rolls as a gradually reducing member which demonstrates that each pair of oppositely disposed rolls constitutes a reduction pass through which the material travels while the rolls severally in series constitute a gradually reducing pass whereby the degree of reduction effected by the multiple rolls is equivalent to that of much larger rolls when a single pair of rolls is used as in conventional practice.

It has been established in the art that the working roll of a reduction mill which is usually supported by a backing roll is of a relatively small diameter to more efficiently effect reduction engagement with the work piece. By utilizing the pressure platens **18** and **19** of Fig. 4, or **45** and **46** of Fig. 3, a much smaller roll may be employed with great reduction efficiency. Also the platens permit of the travel of the rollers on chains in the direction of movement of the work piece or sheet **47** which distributes wear evenly over the rolls and their supports, as well as the bearings of the drive and driven shafts.

It is evident from the foregoing description of the invention that chain type roller levelers may be converted to multiple roll reduction mills or vice versa by adjustment of the shaft center of one chain drive relative to the other in lateral position, and that by tilting the supporting pressure plates any desired reduction roll pass constituted by a series of rollers is obtainable without materially increasing the pressure on each individual roll.

Although one embodiment of the invention has been herein illustrated and described, it will be evident to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

I claim:

1. A rolling mill for metal sheet material comprising in combination a pair of laterally spaced endless roller chains having rolls journaled therein and extending across said chains, a second pair of said laterally spaced roller chains in superposed relation to said first named pair, the rollers of said chains converging in a horizontal plane to constitute a series of roll passes for acting on the sheet metal therebetween, said roller chains being mounted on a plurality of sprocket wheels mounted on a drive and a driven shaft, a sprocket wheel for each of said chains being mounted on the drive shaft whereby they are simultaneously driven so that the rollers of each chain maintain a fixed relation to the rollers of the cooperating chain, and means for angularly adjusting the sprocket wheel of one of the roller chains relative to the position of the sprocket wheel of the other of said roller chains to thereby adjust the rolling axes of the rollers of one chain relative to the rollers of the other of said chains, pressure platens supporting the rolls on the working strands of said chains, and means for adjusting said platens to change their bearing surfaces from the horizontal to thereby vary the sizes of the several succeeding roll passes.

2. A rolling mill for metal sheet material comprising in combination a pair of laterally spaced endless roller chains having rolls journaled therein and extending across said chains, a second pair of said laterally spaced roller chains in superposed relation to said first named pair, the rollers of said chains converging in a horizontal plane to constitute a series of roll passes for acting on the sheet metal therebetween, drive mechanisms for said roller chains to subject the rollers to bodily movement in a horizontal plane in a direction transversely to the axis of the rollers, and means for adjusting the drive means of one of said roller chains relative to the other to thereby adjust the rolls of one chain relative to the rolls of another, pressure platens supporting the rolls on the working strands of said chains, one of said platens having means for tilting the bearing surface thereof to thereby simultaneously vary the successive roll passes between the pressure platens.

3. A rolling mill for metal sheet material comprising in combination a pair of laterally spaced endless roller chains having rolls journaled therein and extending across said chains, a second pair of said laterally spaced roller chains in superposed relation to said first named pair, the rollers of said chains converging in a horizontal plane to constitute a series of roll passes for acting on the sheet metal therebetween, drive mechanisms for said roller chains to subject the rollers to bodily movement in a horizontal plane in a direction transversely to the axis of the rollers, and means for adjusting the drive means of one of said roller chains relative to the other to thereby adjust the rolls of one chain relative to the rolls of another, pressure platens supporting the rolls on the working strands of said chains, one of said platens being mounted on a saddle support and means for adjusting the saddle angularly to thereby simultaneously vary the successive roll passes between the pressure platens.

4. A rolling mill for metal sheet material comprising in combination a pair of laterally spaced endless roller chains having rolls journaled therein and extending across said chains, a second pair of said laterally spaced roller chains in superposed relation to said first named pair, the rollers of said chains converging in a horizontal plane to constitute a series of roll passes for acting on the sheet metal therebetween, drive mechanisms for said roller chains to subject the rollers to bodily movement in a horizontal plane in a direction transversely to the axis of the rollers, and means for adjusting the drive means of one of said roller chains relative to the other to thereby adjust the rolls of one chain relative to the rolls of another, pressure platens supporting the rolls on the working strands of said chains, said platens being relatively adjustable to simultaneously vary the working passes of the successive rolls between said platens.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,013,429	Nowak	Jan. 2, 1912
1,412,317	Schneider	Apr. 11, 1922
1,556,737	Wilson	Oct. 13, 1925
2,250,448	Edwards	July 29, 1941
2,314,605	Arnold	Mar. 23, 1943
2,391,419	Holtz	Dec. 25, 1945

FOREIGN PATENTS

Number	Country	Date
609,706	Great Britain	Oct. 6, 1948