Dec. 30, 1941. E. A. BOVEE 2,268,330

RIM ROLLING MACHINE

Filed June 24, 1938 2 Sheets-Sheet 1

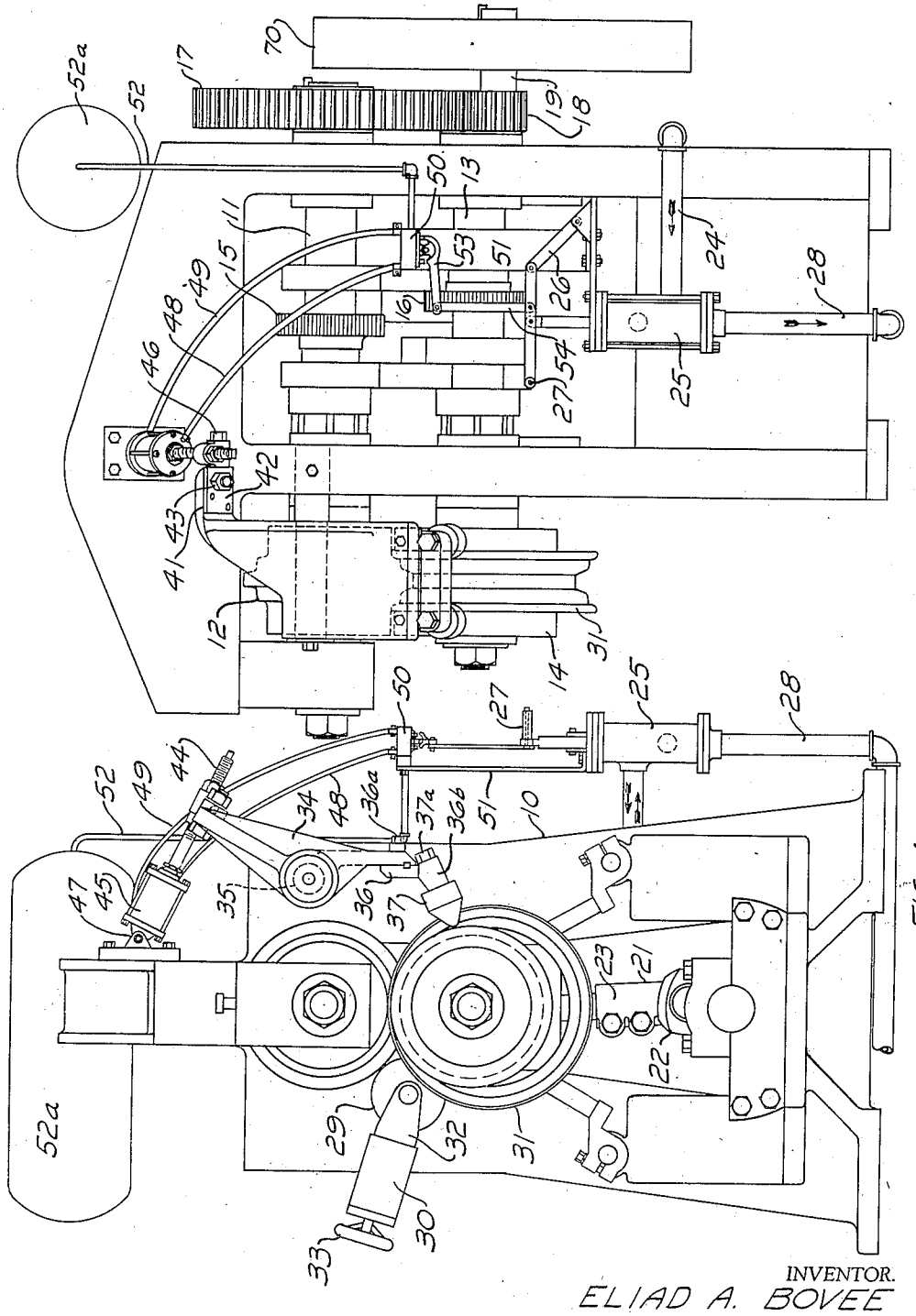

FIG. 2

FIG. 1.

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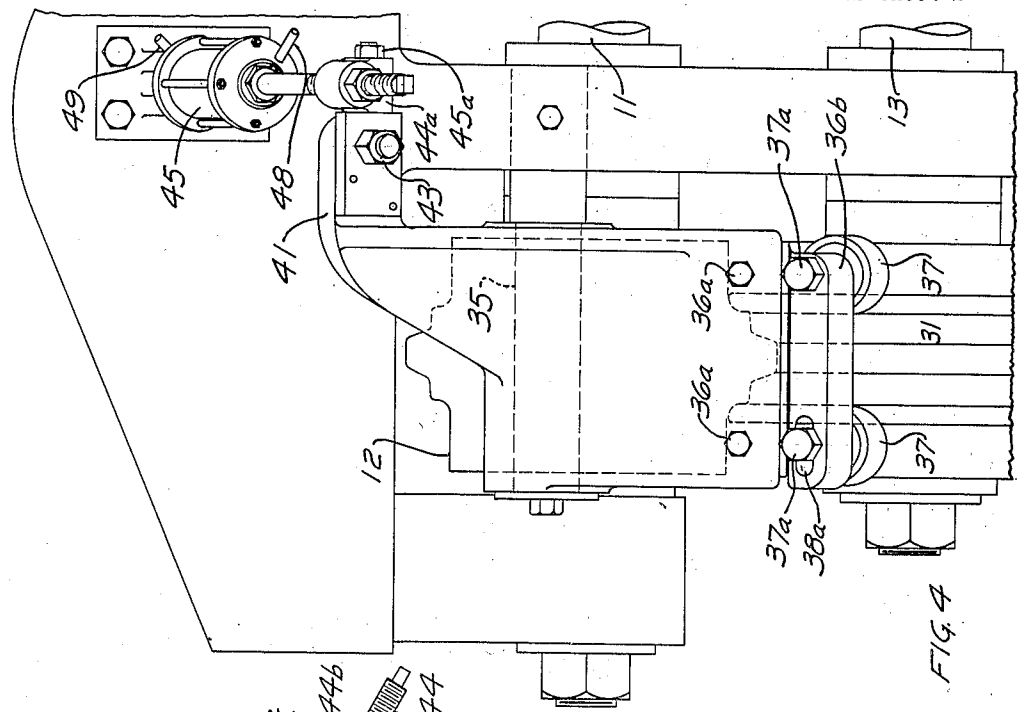

FIG. 4

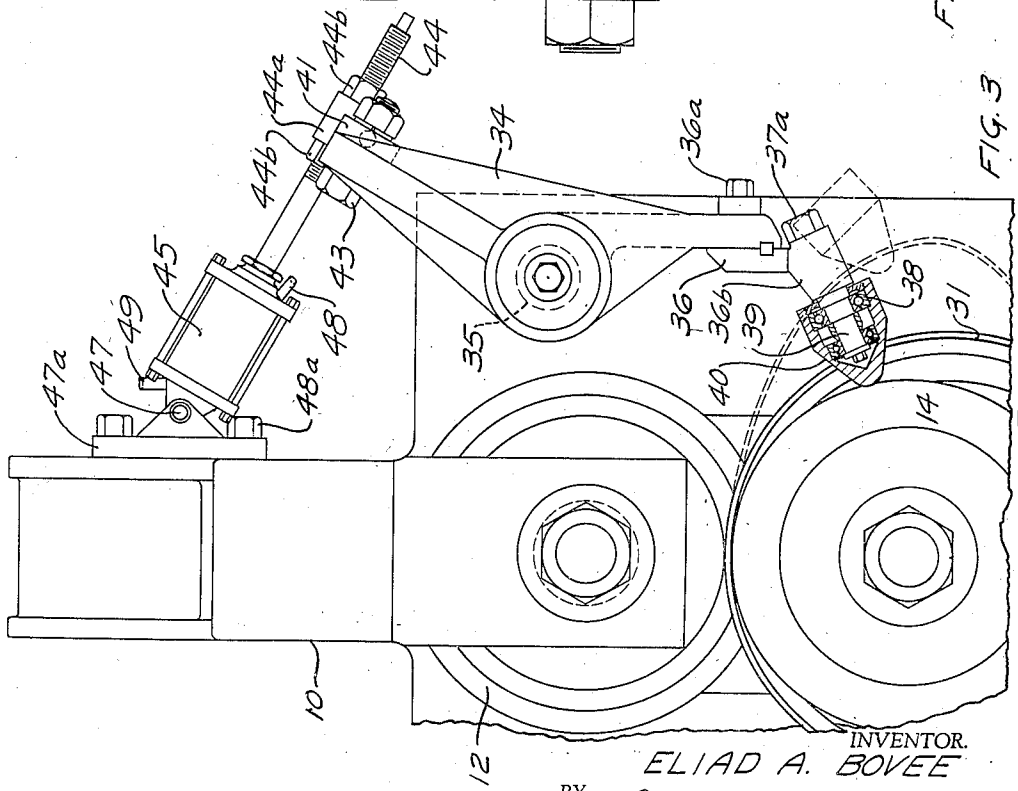

FIG. 3

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RIM ROLLING MACHINE

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6 Claims. (Cl. 153—29)

This invention relates to rolling machines for shaping metal hoops, and more particularly to mechanism for guiding the material to be formed and holding it in place between the rolls of the rolling machine.

In present day practice the commonly accepted method of forming wheel rims, particularly those of the drop center type, is to bend a flat metal strip into a hoop, join the ends of the hoop by welding, and then roll the hoop to the desired cross-section between a pair of rolls of a rolling machine. During the rolling process the hoops become considerably distorted and do not reassume a true circular shape until the rim is completely formed. It is essential, therefore, to provide some mechanism for guiding the hoops and holding them in proper position between the rolls which will maintain contact with the hoops but which is capable of movement radially of the hoops. Heretofore the usual means for guiding the hoops consisted of a pair of cylindrical guide rollers mounted on slides which were slidable in guide ways and were held in contact by means of springs. The rollers were moved into operating position by means of manually operated mechanism. These guide rollers had a tendency to jam against the work, and therefore, would not follow the contour of the hoops as the latter were distorted under the action of the forming rolls. As a result, the rollers were prematurely worn out, and the hoops were not held in proper relationship to the forming rolls.

This invention overcomes the aforementioned disadvantages by means of a novel guiding mechanism which exerts the proper pressure on the hoops when in active position, and which is capable of free movement to allow for deformation of the hoops during the rolling process.

Briefly, the invention comprises a rocking arm or bell crank pivotally mounted intermediate its ends on the frame of the rolling machine adjacent the forming rolls. Mounted on one end of the bell crank is a pair of laterally spaced conical rollers which are adapted to engage the edges of the hoops and exert pressure thereon in radial and axial directions. The other end of the bell crank is connected to the frame of the machine by a resilient means which allows the bell crank to rock but which normally tends to swing the bell crank about its pivot in a direction toward the hoops, thereby exerting pressure thereon. Preferably this last mentioned resilient means comprises a piston operating in a cylinder and actuated by compressed fluid, preferably air. By employing a fluid actuated piston and cylinder it is possible to swing the bell crank to inactive position without the necessity of providing additional means to perform this function. However, this resilient means may be a spring or other similar device.

It is an object of this invention, therefore, to provide a guiding mechanism which will exert a constant pressure on the work during the process of rolling the same. A further object is to provide a guiding mechanism which is capable of readily following the contour of the work as the shape is changed by the rolls. A still further object is to provide a mechanism which may be readily moved from a work holding position to a work releasing position, and which is under the control of the operator.

These objects and others ancillary thereto will become apparent in the following specification when read in connection with the accompanying drawings, wherein like reference numerals designate corresponding parts in the several views.

In the drawings:

Figure 1 is a side elevational view of a rolling machine embodying the invention;

Figure 2 is a front elevational view of the rolling machine shown in Figure 1;

Figure 3 is a fragmentary elevational view on an enlarged scale similar to Figure 1 and showing the invention as applied to a rim rolling machine; and

Figure 4 is a front elevational view of the structure shown in Figure 3.

The rim rolling machine shown herein comprises a main frame 10 which supports the various moving elements. Adjacent the upper portion of the frame is a shaft 11 on which an upper forming roll 12 is secured by any suitable means. This shaft 11 is rotatable on a fixed axis. A second movable shaft 13 is also mounted on the frame below the shaft 11 and carries a second forming roll 14. The shaft 13 is mounted for movement vertically relative to the frame 10 and the shaft 11 whereby the rolls 12 and 14 may be moved apart to allow the work to be inserted between them. The two shafts 11 and 13 are connected by a gear train including gears 15 and 16 in order to transmit rotary motion from the shaft 11 to the shaft 13. The shaft 11 carries a gear 17 which is securely fixed thereto. Gear 17 is driven by gear 18 fixed to a shaft 19 that is driven by any suitable prime mover. A fly wheel 20 is also mounted on the shaft 19.

The lower roll 14 and the shaft 13 on which it is mounted are moved up and down by a conventional mechanism indicated at 21. Only part of

this mechanism is shown, as its construction is well known to those skilled in the art. The motive power is furnished by a hydraulic piston and cylinder (not shown) operating a crank 22 which drives a pitman 23 connected to the shaft 13.

The hydraulic piston for moving the lower roll 14 is supplied with fluid from any suitable source of supply through a pipe 24. The supply of fluid is controlled by means of a valve 25 operated by a linkage 26 and a handle 27 which is under the control of the operator of the machine. A discharge pipe 28 is connected to the valve 25 for carrying the fluid back to the supply reservoir. Vertical movement of the handle 27 in one direction moves the valve 25 to a position where it admits liquid under pressure from the pipe 24 to the hydraulic cylinder of the operating mechanism of the lower roll 14, and movement of the valve 25 in the opposite direction allows the liquid to be discharged from the hydraulic cylinder through the pipe 28, as indicated by the arrows.

The particular rolling machine shown herein is adapted for forming wheel rims of the drop center type. A rim of that type is shown in position at 31. It will be apparent that the rolls 12 and 14 must be moved apart by the above described mechanism to allow the hoop from which the rim is formed to be inserted between the rolls. Then when the lower roll 14 is moved upward the rolls and the hoop 31 are rotated, and the hoop is shaped to the form of the complementary rolls.

As the hoop is shaped to the required cross-section, it may lose its circular contour until it is completely finished and it is necessary to provide a mechanism to guide the hoop during this rotation and hold it in proper position relative to the rolls. This mechanism consists generally of two parts. The first part is the fixed guide roller 29 which is mounted on a support 30 at one side of the rolls 12 and 14. The guide roller 29 seats in the bottom of the groove in the rim 31. The roller 29 is supported on a yoke 32 that may be adjusted longitudinally of the support 30 by means of a hand wheel 33. Once properly adjusted for the particular type of rim being rolled, it is unnecessary to move this roll.

The other part of the guiding mechanism is located on the side of the rolls 12 and 14 opposite the roller 29. This is the structure that embodies my invention. It comprises a bell crank 34 oscillatably mounted on a shaft 35 on the frame 10. Secured to the lower end of the bell crank 34 is a bracket 36 rigidly bolted thereto by bolts 36*a*. A depending bar 36*b*, preferably formed integral with the bracket 36 depends therefrom. A pair of guiding rollers 37 are rotatably mounted on shafts 39 which are attached securely to the bar 36*b* by means of nuts 37*a*. It will be noted that the bar 36*b* is provided with an elongated slot 38*a* whereby the position of one guiding roller may be adjusted laterally in order that different widths of rims may be formed on the same machine. The guide rollers 37 are shown in cross-section in Figure 3. It will be seen that they are mounted on ball bearings 33 on the shaft 39 for easy rotation with respect thereto. The rollers have conical tips 40 for a purpose which will presently appear.

The upper end of the bell crank 34 is provided with a laterally extending arm 41 to which a bracket 42 is secured by a bolt 43. A piston rod 44 extends through a hole in a block 44*a* which is pivoted on a shaft 45*a* on the bracket 42. It will be noted that the piston rod 44 is threaded and is secured by two nuts 44*b* to the block 44*a* whereby to allow for adjustment of the piston rod relative to the block 44*a*. A piston (not shown) is connected to the piston rod 44 and is housed within a cylinder 45. The cylinder 45 is pivoted at 47 to a bracket 47*a* securely bolted to the main frame by means of bolts or cap screws 48*a*.

From the foregoing it will be apparent that the bell crank 34 may rock about the shaft 35 as the piston moves within the cylinder 45, and the guide rollers 37 may move from the full line position in Figure 3 to the dotted line position.

The piston and cylinder 45 previously mentioned is of the double-acting type. A pair of conduits 48 and 49 extend from the opposite ends of the cylinder 45 to a valve housing 50 carried by the support 51 mounted on the valve 25. Air under pressure is supplied to the valve 50 through a supply pipe 52 from a compressed air storage tank 52*a* of relatively large capacity. (See Figures 1 and 2.) The pressure in the tank 52*a* may be maintained by any suitable air pump. The valve 50 may be of any suitable type in which the conduits 48 and 49 may be alternately connected with the storage tank 52*a* or with the atmosphere. When conduit 49 is connected to the supply pipe 52 then the conduit 48 is open to the atmosphere, and when conduit 48 is connected to the supply pipe 52, conduit 49 discharges to the atmosphere. The valve 50 is operated by an arm 53 pivoted on the valve housing 50 and is connected by a link 54 to the linkage 26 that controls the valve 25. It will thus be seen that when the handle 27 is moved to operate the valve 25, the bell crank 34 will also be moved to throw the guiding rolls from active to inactive position, or vice versa. It will be obvious, however, that these two mechanisms may be controlled separately, if desired.

The guiding rollers 37 are spaced, as shown in Figures 2 and 4, in a manner to engage the opposite edges of the rim 31 that it is desired to hold in place between the rolls. When air pressure is exerted on the piston in cylinder 45, it is transmitted through the bell crank 34 and guide rollers 37 to the work 31. Due to the conical shape of the guide rollers 37, the pressure exerted on the work by the guide rollers may be resolved into two components, one directed axially of the rolls 12 and 14, and the other radially thereof. The first mentioned component centers the work axially of the rolls and the other component holds the work against the rolls.

It will be apparent that because of the relatively large volume of the storage tank 52*a*, as compared to the volume of the cylinder 45, the piston in the cylinder may move from one end of the cylinder to the other without changing the combined volumes of the cylinder and storage tank to any appreciable extent. Therefore, from a practical standpoint, the air pressure on the piston will remain constant for all positions of the latter. The air pressure may be adjusted to an amount sufficient to force the guide rollers 37 against the work at all times, so that as the work is distorted during the rolling process, the guide rollers may rock about the pivot 35. If the shape of the work approaches that shown in dotted lines in Figure 3, the rollers will swing in a counter-clockwise direction about pivot 35, thus causing the piston to move to the left in the cylinder 45 against the pressure of the air therein and in the tank 52*a*. As the work nears

completion it approaches the final form shown in full lines in Figure 3, allowing the air pressure acting on the piston to swing the arm **34** and rollers **37** about the pivot **35** in a clockwise direction. Thus the rollers **37** are at all times held in contact with and in the proper guiding relation to the work **31**, yet the pressure will never increase to a point where the guide rollers will be scored by the work.

The scope of the invention is indicated in the appended claims.

I claim:

1. In a rolling machine, a support, a pair of complementary forming rolls rotatably mounted on the support, a bell crank pivotally mounted on the support for rotation in the plane of rotation of the forming rolls, a pair of spaced apart tapered guide rollers mounted upon one end of the bell crank for rotation about axes parallel to the plane of the forming rolls and adapted to engage the edges of work to be rolled and hold the same in place between said forming rolls, one of said guide rollers being mounted for adjustment in a direction axially of the forming rolls, and resilient means connecting the other end of the bell crank to the support for biasing the guide rollers against the work.

2. In a rolling machine, a support, a pair of complementary forming rolls rotatably mounted on the support, a pair of spaced apart guide rollers movably mounted on the support adjacent the rolls and adapted when in operative position to engage opposite edges of work to be shaped by said rolls and when in inoperative position to release said work, the adjacent sides of said guide rollers diverging toward the rolls, and mechanism for moving said guide rollers between inoperative and operative positions and for holding the guide rollers against the work with a substantially uniform pressure when in the latter position.

3. In a rolling machine, a support, a pair of complementary forming rolls rotatably mounted on the support, a pair of spaced apart guide rollers movably mounted on the support adjacent the rolls and adapted when in operative position to engage opposite edges of work to be shaped by said rolls and hold it in place between said rolls and when in inoperative position to release said work, the adjacent sides of said guide rollers diverging toward the rolls, and fluid operated mechanism for moving said guide rollers between inoperative and operative positions and for holding the guide rollers against the work with a substantially uniform pressure when in the latter position.

4. In a rolling machine, a support, a pair of complementary forming rolls rotatably mounted on the support, a pair of spaced apart guide rollers movably mounted on the support adjacent the rolls and adapted when in operative position to engage opposite edges of work to be shaped by said rolls and hold it in place between said rolls and when in inoperative position to release said work, the adjacent sides of said guide rollers diverging toward the rolls, and fluid operated mechanism for moving said guide rollers between inoperative and operative positions and for holding the guide rollers against the work with a substantially uniform pressure when in the latter position, said mechanism including a double acting piston and cylinder, a valve connected with said cylinder, and means for supplying fluid to said cylinder through said valve whereby said cylinder may be placed in communication alternately with a source of fluid supply and the atmosphere.

5. In a rolling machine, a support, a pair of complementary forming rolls rotatably mounted on the support, a bell crank pivotally mounted intermediate its ends on the support, a pair of spaced guide rollers adjacent one end of the bell crank and adapted when in operative position to retain work to be formed in place between said rolls and when in inoperative position to release the work, the adjacent sides of said guide rollers diverging toward said rolls, and fluid operated mechanism connected to the other end of the bell crank for moving said guide rollers between inoperative and operative positions for holding the guide rollers against the work with a substantially uniform pressure when in the latter position.

6. In a rolling machine, a support, a pair of complementary forming rolls rotatably mounted on the support, a pair of guide rollers movably mounted on the support adjacent the rolls and adapted to retain the work to be formed in position between the rolls, the adjacent sides of said guide rollers diverging in a direction toward said rolls, and fluid operated mechanism for maintaining the guide rollers against the work with a substantially uniform pressure at all times during the rolling of the latter.

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