Dec. 15, 1931. W. R. HARRISON 1,836,921

APPARATUS FOR ROLLER SPUN METAL MANUFACTURE

Filed March 12, 1929 3 Sheets-Sheet 1

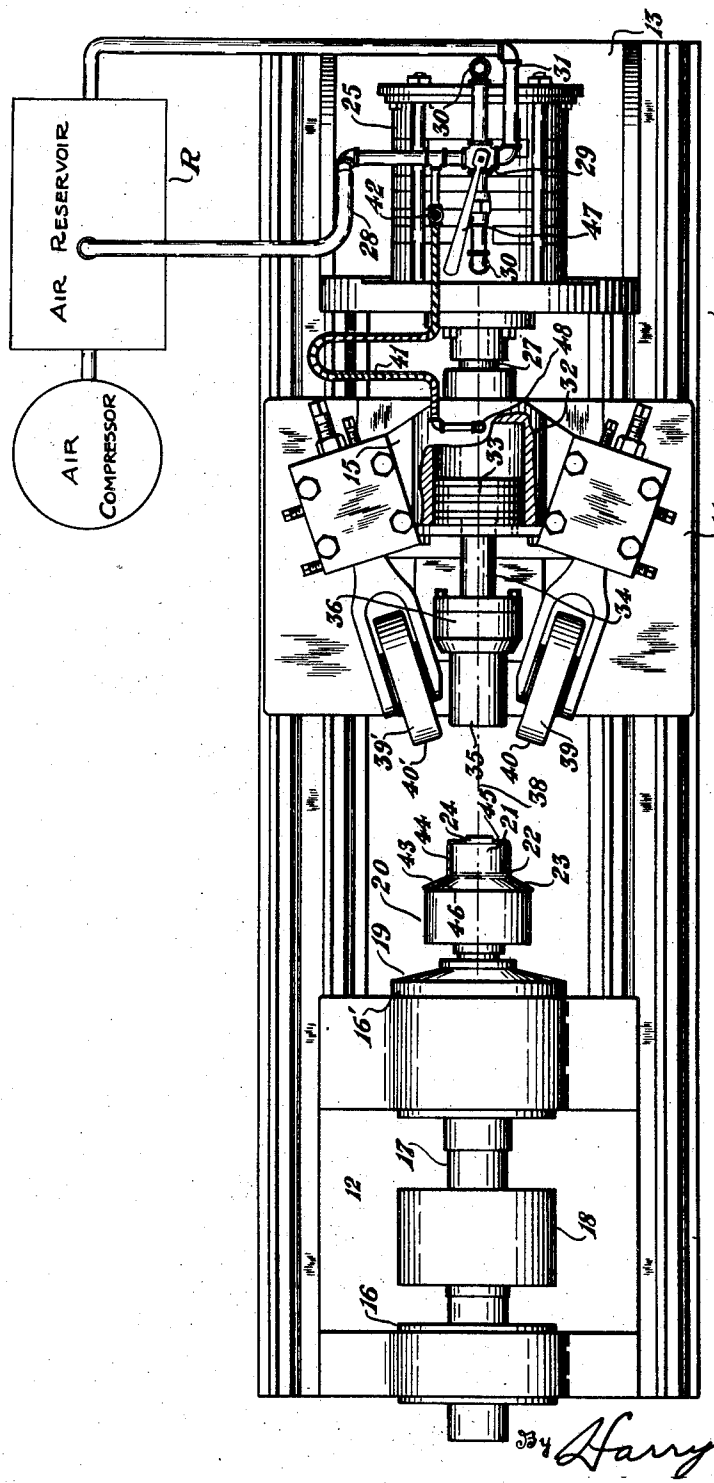

Fig. 1

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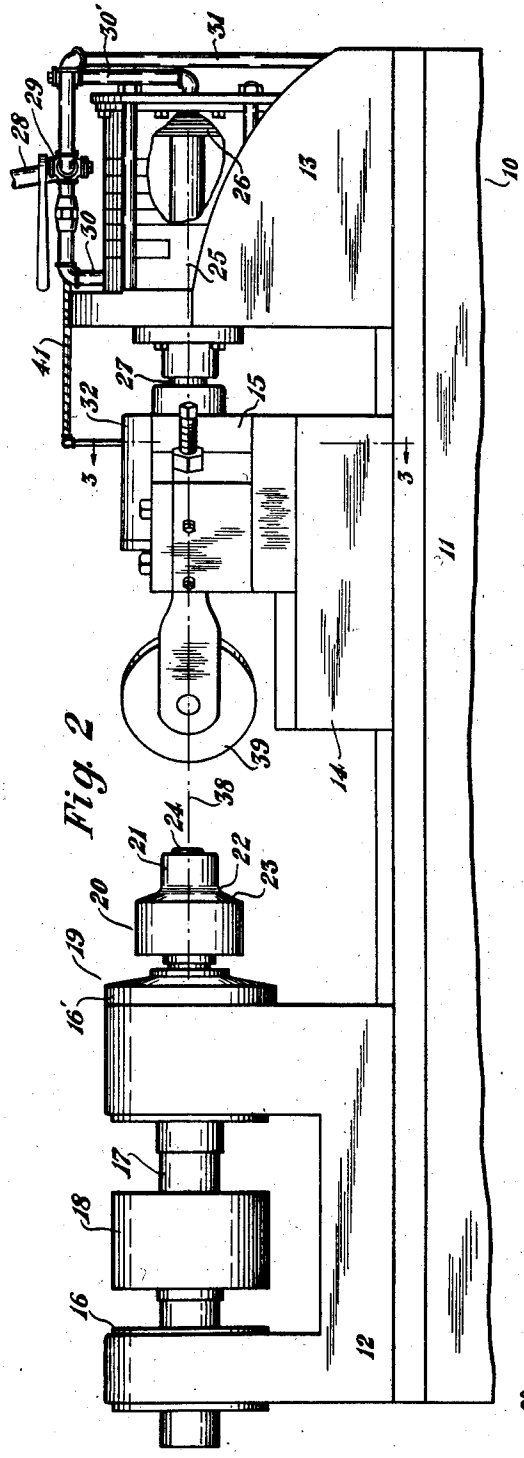


Fig. 2

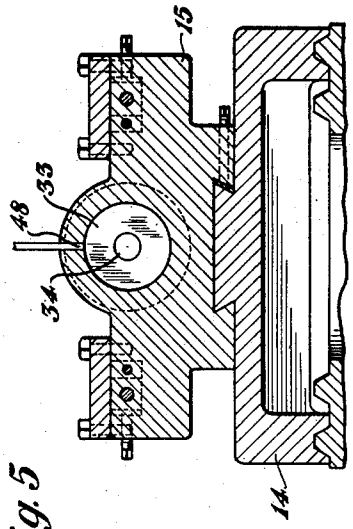
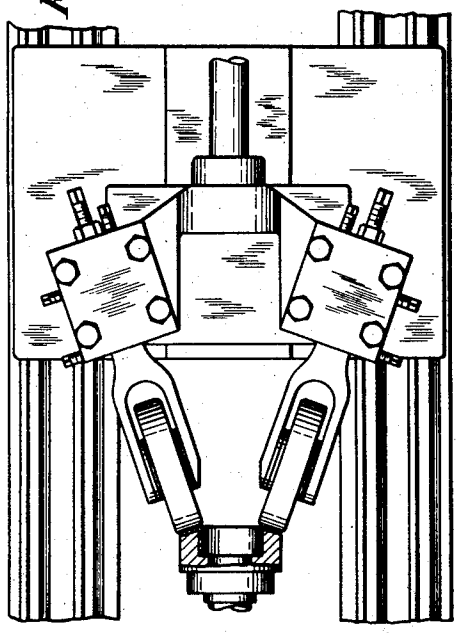


Fig. 3

Fig. 5



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APPARATUS FOR ROLLER SPUN METAL MANUFACTURE

Filed March 12, 1929 3 Sheets-Sheet 3

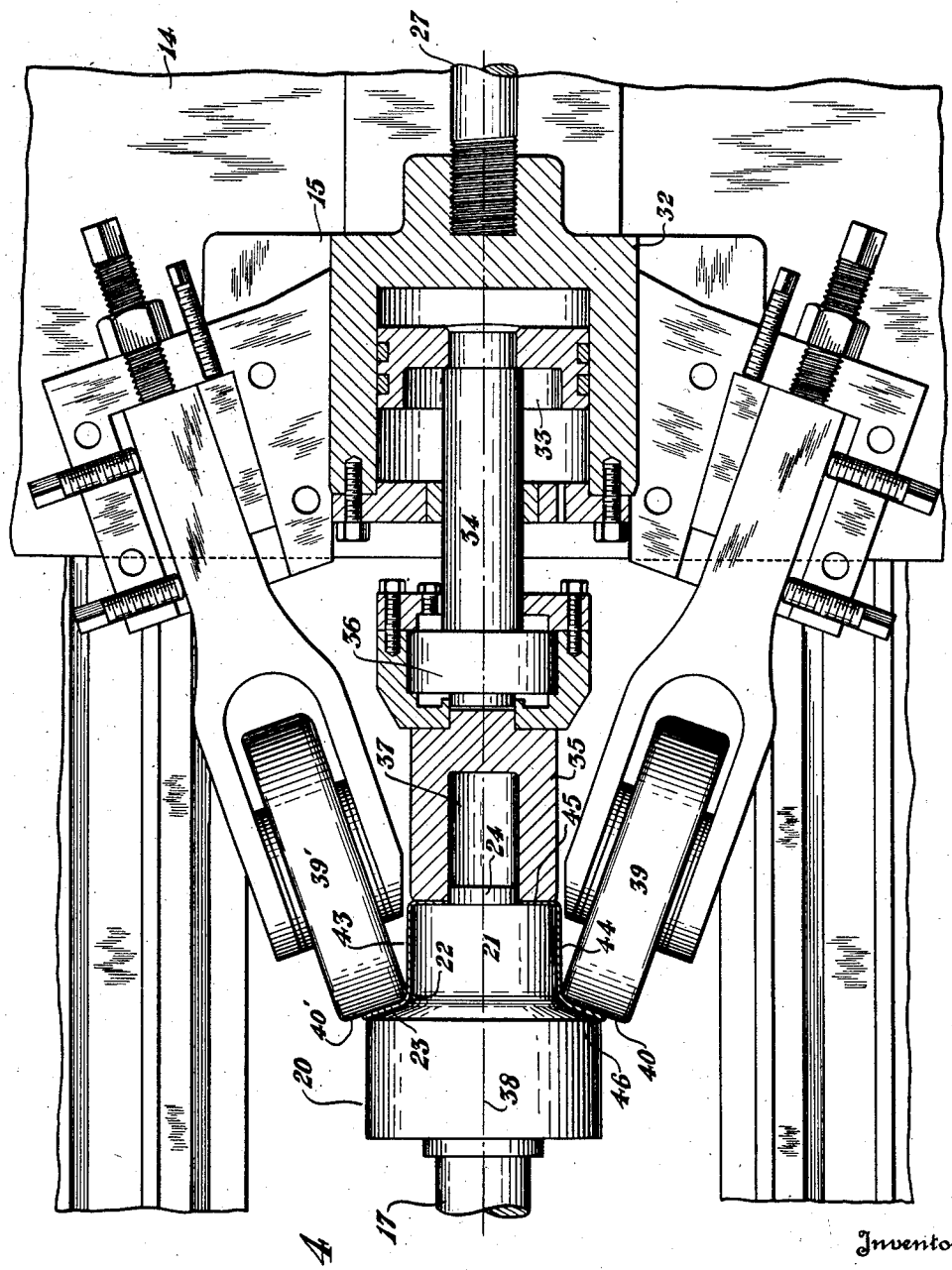

Fig. 4

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UNITED STATES PATENT OFFICE

WILLIAM R. HARRISON, OF MASSILLON, OHIO, ASSIGNOR TO THE SPUN STEEL CORPORATION, OF CANTON, OHIO, A CORPORATION OF OHIO

APPARATUS FOR ROLLER SPUN METAL MANUFACTURE

Application filed March 12, 1929. Serial No. 346,357.

My invention relates to methods and apparatus for roller spinning, in the manufacture from sheet or strip metal of articles including a cylindric body and a peripheral flange extending at a definite angle therefrom, such as the adjustable V pulleys set forth in the prior applications of Reynold G. Nelson, Serial No. 212,496, filed August 12, 1927, and Serial No. 286,979, filed June 20, 1928; and the methods and apparatus of the present invention include improvements of the methods and apparatus set forth in U. S. Patent, No. 1,680,061, issued to Reynold G. Nelson, August 7, 1928, for spun metal manufacture and products.

The method of roller spinning set forth in the said prior patent includes rotating material to be spun, and applying an axially directed thrust to the rotating material.

The apparatus for carrying out this method set forth in the said prior patent includes yielding means for applying the axially directed thrust, and preferably includes an air cylinder or the like, and a cooperating piston.

The method and apparatus of the aforesaid patent are not directly adaptable for roller spinning a flange extending outwardly from a cylindric body, for such roller spinning it is necessary to clamp the cylindric body on a rotating arbor having a shoulder between which and a roller spinning tool, the flange is roller spun to a fixed angular relation with the cylindric body; and this roller spinning of the flange between the arbor shoulder and the roller spinning tool serves to smooth and densify the wearing face of the flange.

The clamping of the partially formed cylindric body on the arbor, and the roller spinning, thus comprise two separate operations, the performance of which has heretofore required the operation of two separate controls by the machine operator, if proper clamping is to be attained during the roller spinning operation; it being understood that if the clamping means is rigidly mounted on the same advancing tool holder carrying the roller spinning tool, the partially formed cylindric body will not be properly clamped at the beginning of the spinning operation, in order to permit the necessary advance of the roller spinning tools.

Accordingly the objects of the present improvements include the provision of an improved and more rapid method and apparatus for carrying out the two operations of clamping the cylindric body, and roller spinning the flange, and improvements in the general and detail arrangements of the several parts of the apparatus, together with improvements in their mode of operation, all as will hereinafter be set forth in detail and claimed.

In general terms the improved method hereof may be stated as including applying a yielding clamping thrust upon a cylindric body having a partially formed flange thereon, and then during the application of the clamping thrust applying upon the flange yielding roller spinning thrusts moving in the same direction as the clamping thrust, and the clamping thrust being automatically increased before application of the roller thrusts.

Preferred and improved apparatus for carrying out the improved process is illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a top plan view, with portions broken away and portions in section, of a preferred embodiment of the improved apparatus;

Fig. 2, a fragmentary front elevation thereof;

Fig. 3, a transverse sectional view thereof as on line 3—3, Fig. 2;

Fig. 4, an enlarged fragmentary view similar to Fig. 1, with portions in section, illustrating the apparatus at the completion of a cycle of clamping and roller spinning operations; and

Fig. 5, a reduced view similar to Fig. 4, illustrating a modified embodiment of the apparatus, for use only in carrying out a roller spinning operation.

Similar nuberals refer to similar parts throughout the several views.

A preferred embodiment of the improved roller spinning apparatus of the present in-

vention is indicated generally at 10, and includes a bed 11, which may be supported upon suitable legs, not shown.

A spinning head stock 12 is mounted at a desired longitudinal location upon the bed 11, and an improved tail stock 13 is preferably adjustably mounted upon the bed at any desired longitudinal location with reference to the head stock.

Between the head stock 12 and the tail stock 13, a longitudinally adjustable reciprocating tool holder mounting auxiliary bed 14 is mounted upon one set of ways of the bed 11.

An improved tool holder 15 is mounted for longitudinal reciprocation on the auxiliary bed 14.

For resisting both thrust and radial loads, the head stock 12 mounts at its ends, ball or roller bearings 16 and 16′, and a spindle drive shaft 17 is journalled in the spaced bearings 16 and 16′, and a drive pulley 18 is secured upon the drive shaft 17 between the bearings, the pulley being thus adapted for operative connection, as by a belt not shown, with a power shaft.

At the spinning end 19 of the head stock, the spindle shaft 17 has secured thereon a roller spinning die head 20, the die head being located between the bearing 16′ and the tail stock 13.

The die head 20 preferably includes a sleeve forming cylindric portion 21, which extends from the outer end of the die head to a curved junction at 22 with an outwardly extending flange forming shoulder 23, and a pilot pin 24 of a diameter less than the diameter of the cylindric portion 21 projects from the outer end of the die head towards the tail stock.

The tail stock 13 includes a cylinder 25 in which is operatively mounted a double acting piston 26 from which a piston rod 27 extends out of the cylinder towards the head stock, the piston being adapted for yielding movement towards and from the head stock, by means of a compressible medium, such as air or the like, admitted to the cylinder from a supply line 28.

A three way control valve 29 preferably connects the supply line 28 with opposite ends of the cylinder by suitable pipes 30 and 30′, and a third pipe 31 connects the valve 29 with a reservoir, indicated diagrammatically at R, for compressed air, and the supply line 28 is likewise connected with the reservoir, so that when the compressed air is not being delivered to either end of the cylinder, the air supply line 28 is directly returned to the reservoir. Accordingly a constant pressure is maintained in the supply line 28.

By operation of the valve 29, air may be selectively admitted at either side of the piston to move the piston rod towards or away from the spinning die head.

The outer end of the piston rod 27 is secured to the tool holder 15 for longitudinally moving the same towards and away from the spinning die head.

The reciprocating tool holder 15 includes a clamping cylinder 32, in which a clamping piston 33 is operatively mounted; and a clamping piston rod 34 extends from the piston 33 and out of the cylinder 32 towards the head stock 12.

Upon the outer end of the piston rod 34, a clamping head 35 is mounted, preferably by means of a radial and thrust bearing 36; and the clamping head 35, preferably has formed in its outer end a pilot socket 37, the open end of which may slide over the pilot pin 24.

The tool holder piston rod 27, the clamping piston rod 34, and the clamping head 35 are all preferably coaxial with each other, and with the die head 20.

At opposite sides of their common longitudinal axis 38, the tool holder 15 has adjustably mounted thereon, angled spinning rollers 39 and 39′. Elements of the cylindric rolling surfaces 40 and 40′ of the rollers 39 and 39′, respectively, are parallel, respectively, with elements of the flange forming shoulder 23 at opposite sides of the axis 38.

The tail stock end of the clamping cylinder 32 communicates through a flexible pipe line 41 with the air supply line 28. The pipe line 41 has a valve 42 therein for controlling the rate of flow of air therethrough in either direction.

In use, a partially formed cylindric body or piece 43, including a sleeve 44 and an inwardly extending flange 45 at one end of the sleeve and an outwardly and angularly extending flange 46 at the other end of the sleeve, is seated on the die head as illustrated in Fig. 1; and the partially formed angular flange 46 rests against the flange forming shoulder 23 of the die head, it being understood that the imperfections of the original forming of the flange, are not usually perceptible to the eye.

The control lever 47 of the valve 29 is then operated to admit air under pressure from the reservoir R through the pipe 31 to the outside end of the tail stock cylinder 25.

The several parts of the apparatus at this instant are in the positions illustrated in Fig. 1, the clamping head 35 being maintained in the outwardly extending position illustrated, due to the communicating connection of its cylinder 32 with the air supply line 28.

The tool holder 15 then advances towards the head stock, until the clamping head 35 strikes against the inwardly extending flange 45 of the cylindric body or piece being worked upon, thereby clamping the piece on the arbor die head 20, and the clamping pressure is then automatically increased due to the fact that the tool holder 15 continues to advance but the clamping head piston 33 is stopped, thereby causing air to flow back

into the reservoir from the cylinder 32 through the pipe line 41 and the restricted opening in the valve 42.

The tool holder continues to advance, and the clamping head 45 securely clamps the piece 43 on the arbor die head, and finally the angled spinning rollers 39 and 39′ strike against opposite sides of the outer surface of the flange 46 of the piece 43, the other surface of which lies against the flange forming shoulder 23 as aforesaid, whereby the flange 46 is finished formed by the rolling of the cylindric rollers 39 and 39′ thereover against the reaction of the flange forming shoulder 23.

The valve lever 47 is then operated to change the flow of the air into the head stock end of the cylinder 25, whereby the piston 27 is caused to move away from the head stock withdrawing the tool holder 15 to the position illustrated in Fig. 1.

During the withdrawing movement of the tool holder 15, the clamping head piston 33 resumes its extended position, an outlet orifice 48 being provided at the head stock end of the cylinder 32, so that the head stock end of the piston 33 works only against atmospheric pressure.

The finished formed piece 43 is then removed from the arbor die head, and another partially formed piece is replaced thereon, and the valve 29 is actuated so that the apparatus will repeat the aforesaid cycle of operations comprising the improved method hereof.

This cycle of operations, as carried out by the improved apparatus, consumes less time than it takes to describe it, and enables very rapid and at the same time accurate production of the desired finished formed roller spun pieces.

I claim:

1. Apparatus for cold roller spinning and the like, including a spinning head, a tool holder for moving towards and away from the head, a cylinder on the tool holder, a clamping piston in the cylinder, a clamping head operated by the piston, a tool holder operating cylinder, a double acting piston in the tool holder operating cylinder, and single supply means for supplying a compressible medium to both cylinders.

2. Apparatus for cold roller spinning and the like, including a spinning head, a tool holder for moving towards and away from the head, a cylinder on the tool holder, a clamping piston in the cylinder, a clamping head operated by the piston, a tool holder operating cylinder, a double acting piston in the tool holder operating cylinder, single supply means for supplying a compressible medium to both cylinders, and means for restricting the supply to the clamping cylinder.

3. Apparatus for cold roller spinning and the like, including a spinning head, a tool holder for moving towards and away from the head, a cylinder on the tool holder, a clamping piston in the cylinder, a clamping head operated by the piston, a tool holder operating cylinder, a double acting piston in the tool holder operating cylinder, a supply line for supplying a compressible medium to each end of the tool holder operating cylinder, means connecting the supply line with the clamping cylinder for supplying a compressible medium to the clamping cylinder, and means for maintaining a constant pressure in the supply line.

In testimony that I claim the above, I have hereunto subscribed my name.

WILLIAM R. HARRISON.