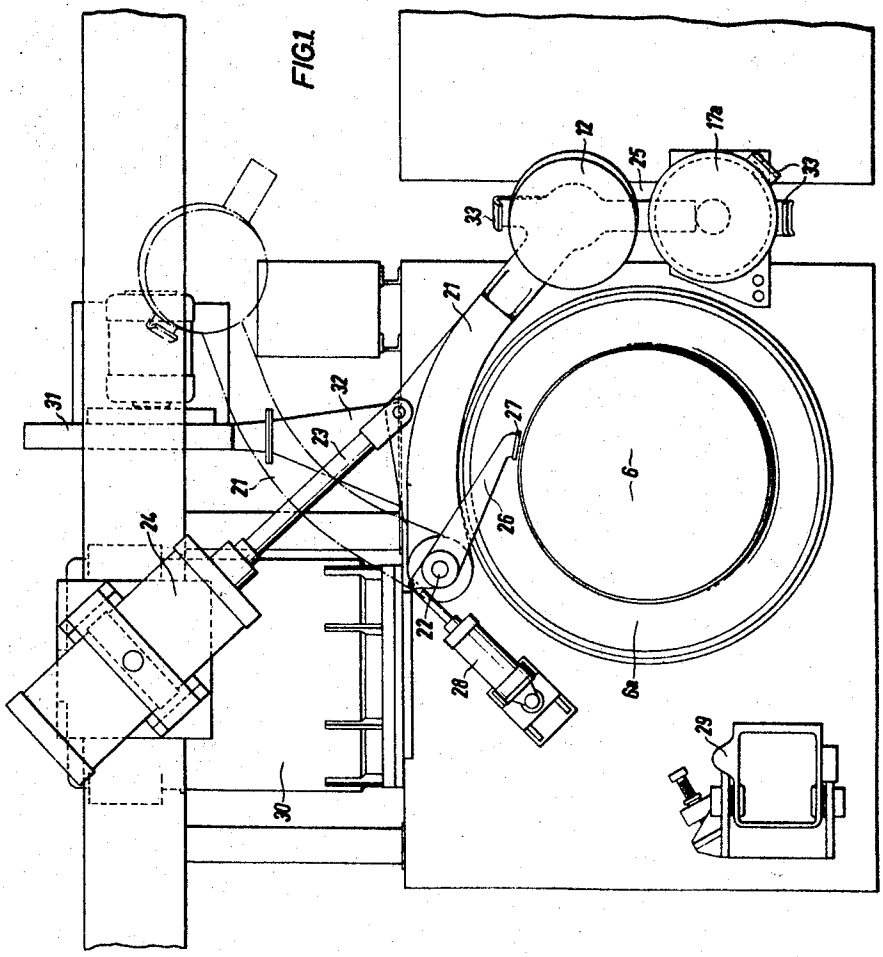
Aug. 5, 1969 S. H. RICHARDS 3,459,024

MULTIHOLE WIRE-DRAWING MACHINE AND A METHOD OF THREADING UP THE SAME

Filed July 13, 1966 2 Sheets-Sheet 1

FIG. 1



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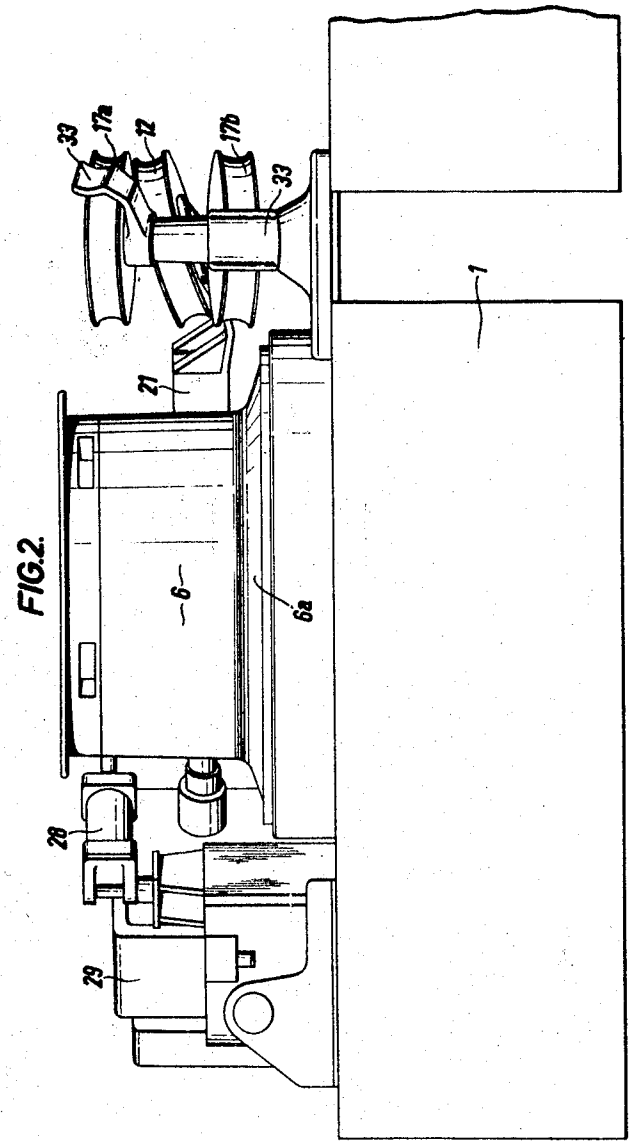

FIG.2.

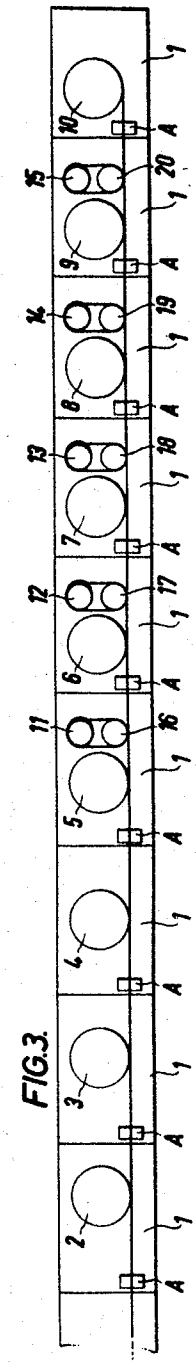

FIG.3.

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MULTIHOLE WIRE-DRAWING MACHINE AND A METHOD OF THREADING UP THE SAME

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Int. Cl. B21c 1/10
U.S. Cl. 72—289 6 Claims

ABSTRACT OF THE DISCLOSURE

A multihole wire-drawing machine having in alignment a plurality of wire drawing dies, a plurality of rotatable drawing blocks interposed between the drawing dies and a plurality of guide and dancer pulleys associated with certain drawing blocks for controlling the rate of rotation thereof. A clamping arm is provided for each drawing block having a dancer and guide pulley associated therewith to facilitate threading-up the machine and so that the wire can be threaded onto the guide and dancer pulleys by winding three or more turns of wire on the corresponding drawing block and retaining all but the first two turns onto the block with the clamping arm while removing and reversing the first two turns and placing loops thereof onto the guide and dancer pulleys.

This invention relates to a wire-drawing machine of the multihole type in which wire is led around a series of rotatable drawing blocks and through a series of drawing dies, one die interposed between each adjacent pair of blocks and one die interposed in the wire path leading to the first block of the series. The operation of threading the wire along its eventual wire path through the machine being referred to herein as "threading-up."

Since the wire is reduced in cross-sectional area as a result of its passage through a die, it follows that succeeding blocks in a wire-drawing machine of the kind specified must rotate at increasing peripheral speeds and that careful control of the speeds must be undertaken.

In practice, there are two main systems of block-speed control, coupling the armatures of the block motors in series across a supply voltage and coupling the armatures of the block motors in parallel across the supply voltage whilst employing a variable resistance or reactance in series with the field windings to control the speed of each motor.

In the first-mentioned method of control, the speed of each block is controlled by the tension in the wire leaving the block. In the second-mentioned method of control, the wire is formed into a loop between adjacent blocks and a dancer pulley is enclosed in the loop of wire, motion of the dancer pulley in response to enlargement or reduction in loop size being employed to control the speed of the preceding block.

This invention is concerned with an improvement in this latter method of control and in particular relates to a wire-drawing machine adapted for employment with heavier gauge feedstock, and arranged so that threading-up of the machine is greatly facilitated. The invention also relates to an improved method of threading-up a multihole wire drawing machine.

According to the present invention, an improved multihole wire drawing machine comprises at least two rotatable drawing blocks spaced apart in the direction of wire passage through the machine, a drawing die interposed along the wire path between the blocks, a dancer pulley and at least one guide pulley mounted between the die and the preceding block to define a loop path for wire passing therebetween, the dancer pulley being mounted so that its axis of rotation is movable to elongate or reduce the length of said loop path and means for urging the dancer pulley towards said guide pulley to minimise the loop path size on the occasion of threading-up.

Clearly where there are more than two blocks and a plurality of dancer pulleys in a machine, each dancer pulley should be associated with its own means for minimising loop path size.

Preferably, there are two guide pulleys and one dancer pulley to define each loop path, the two guide pulleys being mounted coaxially one above the other. By providing two guide pulleys, one disposed at the level of wire leaving the preceding block and one disposed at the level of wire passing through the die to the next block, it is possible to operate the machine with a larger number of turns on each block and thus, by cooling the blocks, to achieve more efficient cooling of wire in its passage through the machine. When employing a multihole wire drawing machine to effect a large areal reduction in cross-section of wire, the speed of drafting through the later dies can be so great that generation of heat impairs the quality of the drawn wire. Efficient cooling of the wire is, therefore, essential if high quality wire is to be obtained from the machine without sacrifice of linear throughput of the machine.

It is known to bias the dancer pulley during drawing with a pneumatic cylinder and by suitably adapting the pneumatic cylinder it can also be employed for urging the dancer pulley towards the guide pulley, or pulleys on the occasion of threading-up the machine.

To further facilitate the operation of threading-up it is convenient to provide the blocks with holding means adapted to retain turns of wire on the block while wire is being formed as a loop around the dancer and guide pulleys and fed through a die to the next block.

One form of multihole wire drawing machine in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a schematic plan view of one block of the machine and the associated equipment,

FIGURE 2 is a side elevation of that part of the machine shown in FIGURE 1, and

FIGURE 3 is a schematic plan of a complete machine in accordance with the invention.

Referring to the drawing, the machine comprises a plurality of frames 1 each rotatably supporting a vertical drawing block and a drawing die A. The blocks have been numbered 2 to 10 in FIGURE 3, and FIGURES 1 and 2 show in some detail the arrangement in respect of block

6. Blocks 5, 6, 7, 8 and 9 are provided with loop-forming pulleys comprising a dancer puller 11–15 and two spaced apart guide pulleys 16 to 20. Block 10, which represents the final block of the machine, is not provided with any automatic speed control means, this block being employed to set the overall speed of the machine. The dancer pulleys 12, 13, 14 and 15 are used to control the speeds of blocks 6, 7, 8 and 9 respectively and dancer pulley 11 is used to control the speeds of blocks 2, 3, 4 and 5. The speed ratio between blocks 2, 3, 4 and 5 is preset on the basis of the sizes of dies being employed for the first four stages of the machine. In practice, the small variations in block speed caused by variations in tension in the wire leaving a block, are adequate to control the speeds of the initial blocks where comparatively heavy gauge wire is still being handled at comparatively low speeds.

Referring now to FIGURES 1 and 2, it will be seen that guide pulleys 17 are formed by an upper pulley 17*a* and a lower pulley 17*b*. The upper pulley 17*a* is aligned with the top of the block 6 and the lower pulley 17*b* is aligned with the axis of the next die, the two guide pulleys being mounted with their axes collinear and vertical. The use of two guide pulleys arranged in this manner, enables wire to be drawn off one block and fed to the next block along horizontal paths, irrespective of the number of turns of wire which are allowed to accumulate on the one block. In practice, this is a great advantage, since it enables sufficient turns to be accumulated on the block so that if the block is cooled internally (as it invariably will be), the wire may be adequately cooled between drawing operations through contact with the block.

Associated with the guide pulleys 17 is the dancer pulley 12 which is rotatably mounted on a pivoted arm 21. The arm 21 can pivot about a vertical axis, defined by a spindle 22, from the position shown in full lines in FIGURE 1 to the position shown in chain-lines. The axis of rotation of the pulley 12 is inclined to the vertical so that the groove in the pulley 12 is inclined to receive wire from the guide pulley 17*a* and to feed it to the guide pulley 17*b* (see FIGURE 2).

The arm 21 is connected with a piston rod 23 of a pneumatic cylinder 24. By supplying compressed air to one end of the cylinder 24, the arm may be turned into the position of closest approach of the pulleys 12 and 17 (determined by a stop 25 engaging the support stand of the guide pulleys 17). By supplying compressed air to the other end of the cylinder 24, the pulley 12 may be urged away from the pulleys 17 to tension wire in the loop formed therearound.

Mounted on the spindle 22 is a pivoted holding arm 26 terminating in a turn-retaining pad 27. The pad 27 can be withdrawn from, or urged against, the wire-engaging surface of the block 6 by a motive cylinder 28 (for a purpose hereinafter more fully to be explained).

Also mounted on the frame 1 is a die-box 29, for accommodating a suitably sized die (not shown), an electric motor 30 for driving the block 6 and a motorised fan 31 for feeding air through a duct 32 over the wire-engaging surface of the block 6.

Threading-up of the block 6 is accomplished after block 5 has been threaded-up, and is effected in the following way.

The free end of wire is drawn through the die in die-box 29 and, employing a conventional pulling-in dog temporarily secured to block 6, is layered on the wire-engaging surface of the block 6. As the block 6 is rotated, wire engages the outwardly flanged lower end 6*a* of the block causing the turns already laid on the block, to rise. To facilitate this rising of the turns the block tapers slightly in an upwardly direction as can be seen in FIGURE 2.

The block 6 is longer in the axial direction than blocks on similar machines of a conventional design, and this enables far better cooling of the wire to be obtained. When the block 6 is furnished with a sufficient number of turns of wire, the block 6 is stopped and the pad 27 pressed against the turns to retain them in position while the pulling-in dog is removed. The pad 27 does not engage the top two turns of wire on the block, so that these can readily be removed from the block.

The arm 21 is now swung into the position shown in FIGURE 1, so that the pulleys 12 and 17 are as close together as possible. The top two turns of wire are lifted from the block 6 and dropped over the pulleys 12 and 17. It has been discovered that with a little practice, this operation which results in the formation of a loop of wire around the pulleys 12 and 17, can be accomplished very easily even with the heaviest gauge feedstocks. Clearly the details of the operation will depend to some extent on the particular operator, but basically it is found to be convenient to remove the top two turns from the block, reverse the order of the turns removed by slipping the upper turn below the lower turn moving the turns laterally and then dropping them over the pulleys 12 and 17. To facilitate the location of the wire in the grooves of the pulleys, it is convenient to provide the pulleys with wire guides 33 (see FIGURES 1 and 2). With a loop of wire loosely formed around the pulleys 12 and 17, the end of the wire is led through the die between blocks 6 and 7 and is secured to the pulling-in dog now connected to block 7. Threading-up of block 7 can now proceed in the manner adopted for block 6, the arm 21 meanwhile being urged in an anticlockwise direction to take up slack wire in the loop.

When the machine is operating, any alteration in the length of wire between blocks 6 and 7, will cause the arm 21 to move clockwise or anticlockwise and this movement of the arm is employed for the speed control of the motor 30, in such a way that as the arm 21 moves clockwise, the motor 30 is accelerated and as the arm 21 moves anticlockwise, the motor 30 is decelerated.

One advantage of the novel arrangement of loop-forming pulleys 12 and 17, is the aforementioned ease of threading-up. A concomitant advantage is the ability to operate satisfactorily with double the number of turns of wire on the blocks and thus with enhanced cooling of wire between drawing operations. The increased number of turns cannot be employed on blocks 2, 3 and 4 where tension in the wire leaving the block is employed for speed control but on these initial blocks wire heating is not a problem. On the later blocks, where high speed drafting occurs, efficient cooling is of great importance and it has been found that a machine in accordance with the invention can be employed at higher speeds and with heavier gauge feedstock than similar machines of more conventional design.

What is claimed is:

1. An improved multihole wire-drawing machine comprising at least two rotatable drawing blocks spaced apart in the direction of wire passage through the machine, a drawing die interposed along the wire path between the blocks, a dancer pulley and guide pulley mounted between the die and the preceding block to define a loop path for wire passing therebetween, the dancer pulley being mounted so that its axis of rotation is movable to elongate or reduce the length of said loop path, means for urging the dancer pulley towards said guide pulley to minimize the loop path size on the occasion of threading-up, and holding means mounted adjacent to said preceding block and movable against said preceding block on the occasion of threading-up to urge the turn preceding the penultimate turn against the block whilst leaving the ultimate and penultimate turns free for forming wire loops for threading-up the dancer and guide pulleys.

2. A machine as claimed in claim 1, in which there are two guide pulleys and one dancer pulley to define each loop path.

3. A machine as claimed in claim 2, in which the two two guide pulleys are mounted coaxially one above the other.

4. A machine as claimed in claim 1 in which the means to minimise loop path size is a pneumatic cylinder.

5. A machine as claimed in claim 1, in which the arm supporting the dancer pulley is provided with a stop which bears against a rigid support when the dancer pulley is in its position of closest approach to the guide pulley or guide pulleys.

6. A method for threading-up a multihole wire-drawing machine having at least two rotatable drawing blocks spaced apart in the direction of wire passage through the machine, a drawing die interposed along the wire path between the blocks, and a dancer pulley and guide pulley mounted between the die and the preceding block to define a loop path for wire passing therebetween, the dancer pulley being mounted so that its axis of rotation is movable to elongate or reduce the length of said loop path; comprising the steps of feeding a free end of wire onto said preceding block and rotating said block to form a

plurality of at least three turns thereon, removing the first two turns of wire from the block while retaining the remaining turns thereon, placing loops of the first two turns over the dancer and guide pulleys for threading-up the wire thereon, and feeding the free end of wire through the die to the succeeding block.

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