Sept. 17, 1929. F. O. HOAGLAND 1,728,286

APPARATUS FOR MANUFACTURING DRAFTING ROLLS

Filed Dec. 26, 1924 2 Sheets-Sheet 1

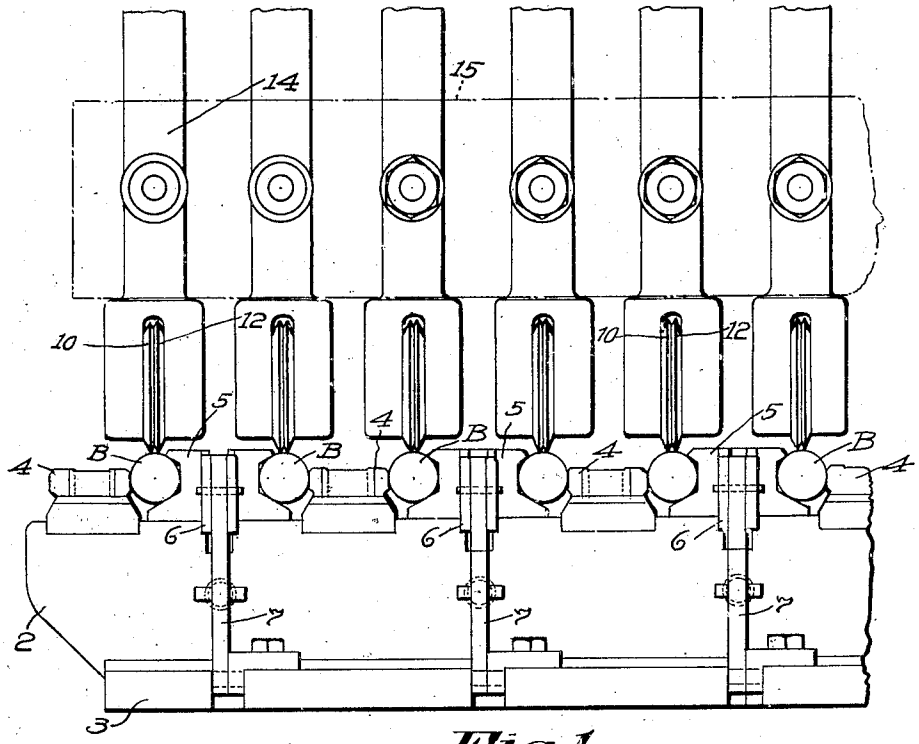


Fig. 1

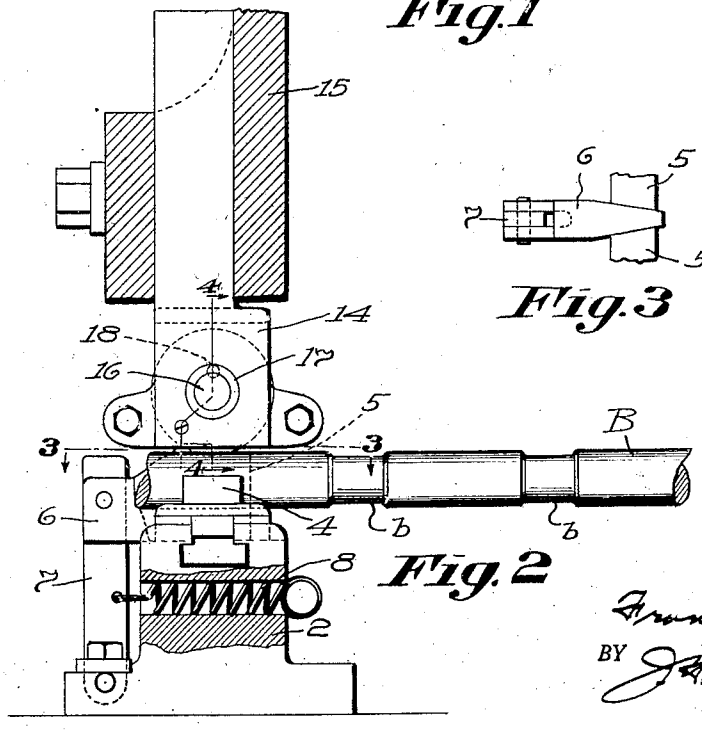


Fig. 2

Fig. 3

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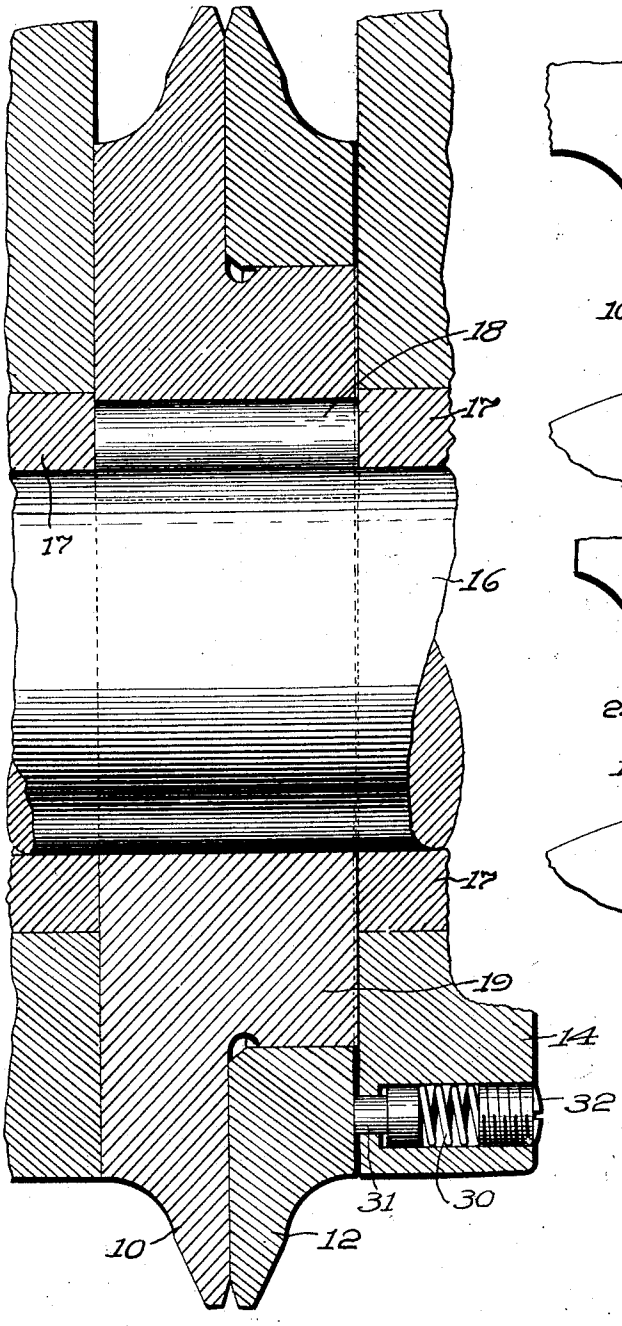
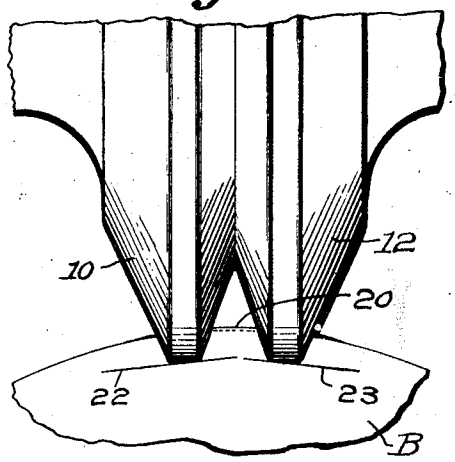


Fig. 4

Fig. 5



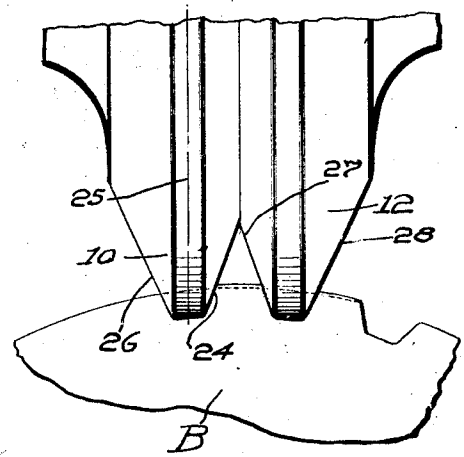


Fig. 6

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UNITED STATES PATENT OFFICE

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APPARATUS FOR MANUFACTURING DRAFTING ROLLS

Application filed December 26, 1924. Serial No. 758,107.

This invention relates to the manufacture of grooved metal parts such as the drafting rolls used extensively in textile machinery. For example, in a spinning frame the roving passes between two or more pairs of drawing rolls on its way to the spindle, and these rolls usually are grooved longitudinally to enable them better to grip the roving. Heretofore the grooves in rolls of this character have usually been made by planing. The present invention aims to improve the apparatus used for this purpose with a view especially to reducing the expense of manufacture of such rolls.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings and the novel features will be particularly pointed out in the appended claims.

Referring now to the drawings,

Figure 1 is an end view showing somewhat diagrammatically an apparatus constructed in accordance with this invention;

Fig. 2 is a side view, partly in cross section, of the apparatus shown in Fig. 1;

Fig. 3 is a fragmentary plan view on the line 3—3, Fig. 2;

Fig. 4 is a vertical cross sectional view of the grooving tools shown in Figs. 1 and 2 and the parts immediately associated therewith: and

Figs. 5 and 6 are fragmentary cross sectional views illustrating the manner in which the grooving operation is performed.

In Fig. 1, 2 indicates a fixture secured on the reciprocating table of a planing machine. This fixture carries a series of chucks each adapted to support a drafting roll blank B. The chucks are preferably arranged in pairs, as shown, each chuck comprising a stationary member 4 having a face adapted to bear against one side of the roll, and a member 5 which is movable toward and from the stationary member 4. The part 5 is made in the form of a jaw and these two jaw members of adjacent chucks are arranged back to back. A wedge 6 located between the jaws 5—5 is operable to force them apart and thus clamp the work against their respective stationary member 4—4 as will be evident from an inspection of Fig. 1. In the construction shown the wedge 6 is pivoted to the upper end of a lever 7, and a strong coiled spring 8 connected with this lever tends to pull it forward, that is, in the direction necessary to force the wedge inwardly between the two jaws 5—5.

The machine is also equipped with the usual indexing mechanism for rotating the blanks B step by step, as required during the grooving operation, but since this mechanism is a well known part of the machine it is not illustrated.

The grooving operation is performed by two grooving disks 10 and 12, respectively, these disks being supported in a slotted holder 14 which is clamped in a horizontal bar 15 that extends across the table 2 and above it, the bar being supported in a stationary position. The disks shown in Figs. 4, 5 and 6 are designed especially for grooving the drawing rolls used in a spinning frame. In the construction illustrated the disk 10 is mounted on a shaft 16 which is rotatably supported in bushings 17—17 fastened in the opposite arms of the holder 14. A key 18 consisting of a round pin secures the disk 10 and shaft 16 together for rotation in unison. This disk 10 is provided with a hub portion 19 that is of substantially the same width as the slot in the holder, having just enough clearance to run freely. While this arrangement therefore permits the disk 10 to rotate freely, it holds the disk in a fixed position, any axial movement of the disk with reference to the holder being prevented.

The other disk 12 is mounted to rotate freely on the hub 19 but is given a slight lateral clearance of, say, two or three-thousandths of an inch so that it can have a very limited axial movement relatively to the disk 10. Normally the disk 12 is held against the disk 10 by a spring 30 acting through a plunger 31 and backed up by a screw 32, these parts all being mounted in an aperture formed in one arm of the holder 14.

In performing this grooving operation a drawing roll blank B is first turned in the usual manner, the reduced necks *b* being formed at the desired intervals. The blank

is then set in one of the chucks on the table 2 and the holder 14 is adjusted in the bar 15 so that the lower edges of the grooving disks 10 and 12 will project below the peripheral surface of the blank B. The table 2 is next moved forward into contact with the disks and under them, thus rolling the disks along the periphery of the blank B for its entire length. Since both the tools and the work are supported rigidly, this operation results in rolling two grooves in the blank, as indicated in Fig. 5. It will be observed that each disk has a relatively thin flat edge with bevelled margins which diverge as they extend backwardly from said edge, this "flat" portion of the edge being really approximately cylindrical in form. As each disk rolls along the surface of the work it forms a groove partly by depressing the metal under the edge of the disk and partly by raising the metal at opposite sides of said edge. This is illustrated in Fig. 5, the metal being lifted quite appreciably at 20. The blank B is next indexed by a distance equal to that between centers of the grooves, this indexing operation taking place while the disks are out of contact with the blank, and the disks are again traversed over the blank. This causes the disk 10 to make a new groove, while the disk 12 travels in the groove previously made by the disk 10. In certain kinds of these drawing rolls the grooves are not spaced with absolute uniformity but are purposely spaced by intervals which are slightly irregular or non-uniform. This spacing is controlled by the indexing mechanism and the formation of the grooves at the proper intervals is ensured by the fact that the disk 10 is compelled to rotate in a fixed position, no axial movement of this disk relatively to its holder being permitted. The slight axial movement permitted to the disk 12, however, enables this disk to adjust itself to the irregularities in spacing between adjacent grooves. The disk 10, therefore, may be termed a "master", while the disk 12 is a "follower".

Inasmuch as the plane of the meeting faces of the disks is approximately radial to the blank B, I prefer to make the flat edges of the two disks somewhat inclined, as indicated in Fig. 5. Preferably this inclination is such that the lower edges of the disks when in their working position lie in planes approximately tangent to a circle drawn through the beds of the grooves. These tangent planes being indicated by the lines 22 and 23, Fig. 5.

It should also be noted that the inclination of one marginal face of each disk is greater than that of the other with reference to a plane perpendicular to the axis of the disk.

The margins of the disks shown are inclined at an angle of 45° with reference to each other, and the inner marginal face 24 of the master disk 10 lies at an angle of 19° with reference to the median plane 25 of the disk, while the outer margin 26 lies at an angle of 26° with reference to said plane 25. The marginal faces 27 and 28 of the follower disk 12 make angles of 19° and 26° approximately with reference to the median plane of this disk. The inclination of these marginal faces is made such that when the blank B has been indexed one tooth the follower disk 12 will occupy substantially the same relative relationship to the groove that the master disk 10 previously occupied.

The operations above described are continued until the grooving operation is completed. That is, the blank is reciprocated backward and forward under the grooving disks 10 and 12, running out of contact with the disks at each end of its stroke and being indexed into a new position between successive reciprocating movements. After grooves have been formed around the entire blank B, the disks are traversed through the entire series of grooves again and sometimes this re-traversing is performed several more times so that the blank is caused to make a sufficient number of complete revolutions while the disks operate on it in order to properly shape each tooth between the two disks. In the initial formation of the teeth by the grooving operation, there is a tendency for the teeth to lean somewhat. The follower cooperates with the master to correct this tendency and to effect a re-shaping of the walls of the grooves to bring each tooth into a radial position. The two disks also cooperate to force the metal upwardly between them and therefore act to increase the height of the teeth. By indexing the blank through two, three, or more revolutions, as may be desired, the disks correct any malformation of the grooves or teeth which has been produced in the initial grooving operation.

The distance between centers of the edges of the two disks preferably is made equivalent to the minimum distance between grooves, and since both the master and the follower form grooves on their first stroke across the work, this grooving operation is started at the point on the roll where grooves of minimum spacing are to be made. This applies, of course, only to those rolls in which the grooves are not spaced uniformly.

When the grooving operation has been completed the blank is removed and it is then ground in order to reduce it to the desired diameter. The roll next is subjected to a lengthwise lapping operation which removes burrs caused by grinding and gives the desired finish. These grinding and lapping operations may be performed in the usual manner.

It will be evident to those skilled in this art that this invention effects substantial economies in the manufacture of grooved rolls. Not only can the grooves be made more economically in the manner above described

than by the usual planing operation, but the grain structure of the walls of the grooves is much more satisfactory, the grain of the steel running radially of the flutes instead of crosswise, as when the grooves are cut by planing or the like. It also materially facilitates the finishing operations since it eliminates the filing which has been necessary heretofore and reduces the length of time required to perform the lapping operation.

While I have herein shown and described the best embodiment of my invention that I have so far devised, it will be understood that the invention is not limited to embodiment in the precise form shown. For example, the grooving disks used necessarily will be designed in accordance with the work which they are intended to perform. The apparatus may be modified in other particulars without departing from the spirit or scope of the invention.

It is also contemplated that more than two grooving disks may be used, if desired. For example, three disks could be employed, one to effect a rough grooving and the other two disks being arranged and cooperating as above described. Such an arrangement could be used to advantage in making rolls having grooves spaced by regular intervals, since the first disk would take much of the wear which in the arrangement illustrated must be taken by the master disk 10.

Having thus described my invention, what I desire to claim as new is:

1. In a machine for grooving drafting rolls and the like, the combination of two grooving disks, a holder in which said disks are mounted side by side for rotation, a support for said holder, said holder supporting one of said disks for rotation in a fixed position, and the other disk having a limited freedom of movement toward and from its companion disk, and means for supporting a drafting roll blank in position for the operation thereon of said disks simultaneously and for movement relatively to said disks to transfer their point of operation longitudinally of the blank.

2. In a machine for grooving drafting rolls and the like, the combination of two grooving disks, a holder in which said disks are mounted side by side for rotation and for simultaneous operation on the work, a support for said holder, said holder supporting one of said disks for rotation in a fixed position, and the other disk having a limited freedom of movement toward and from its companion disk, a table mounted for reciprocating movement relatively to said holder, and a chuck on said table for holding a drafting roll blank in position for the operation thereon of said disks and for rotary indexing movement relatively to said disks.

3. A grooving tool comprising two grooving disks, and a holder in which said disks are mounted side by side for rotation, each of said disks having a relatively thin edge with the opposite marginal faces of the disk diverging as they extend backwardly away from said edge, said holder supporting one of said disks for rotation in a fixed relationship to said holder while permitting the other disk to have a limited freedom of movement axially with reference to the first disk.

4. A grooving tool comprising two grooving disks, a holder having a slot in which said disks are mounted side by side for rotation, one of said disks having a hub fitting snugly in the slot in said holder, and a shaft supporting the latter disk for rotation, the second disk running on the hub of the first disk.

5. A grooving tool comprising two grooving disks, a holder in which said disks are mounted side by side for rotation and for simultaneous operation on the work, said disks having thin approximately cylindrical edges with tapered margins extending backwardly from said edges, and said edges being inclined slightly with reference to each other.

6. A grooving tool comprising two grooving disks, a holder in which said disks are mounted side by side for rotation and for simultaneous operation on the work, each of said disks having a thin approximately cylindrical edge with the opposite marginal faces of the disk diverging as they extend backwardly away from said edge, one of said faces being inclined at a greater angle than the other with reference to a plane normal to the axis of said disk.

7. A grooving tool comprising a holder, a grooving disk supported in said holder for rotation but held otherwise in a fixed relationship to the holder, a second disk rotatably mounted in said holder beside the first disk and having a limited freedom of movement axially with reference to the first disk, and means for yieldingly holding the second disk in a fixed axial relationship to the first disk.

8. A grooving tool comprising two grooving disks, a holder having a slot in which said disks are mounted side by side for rotation and for simultaneous operation on the work, one of said disks having a hub fitting snugly in the slot in said holder, a shaft supporting the latter disk for rotation, the second disk running on the hub of the first disk, and a spring pressed plunger bearing on said second disk and yieldingly holding it in a fixed axial relationship to the first disk.

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