Jan. 18, 1938. C. T. DAVIS 2,105,637

APPARATUS FOR ABRADING STRAND MATERIAL

Filed June 29, 1935 2 Sheets-Sheet 1

Fig. 1.

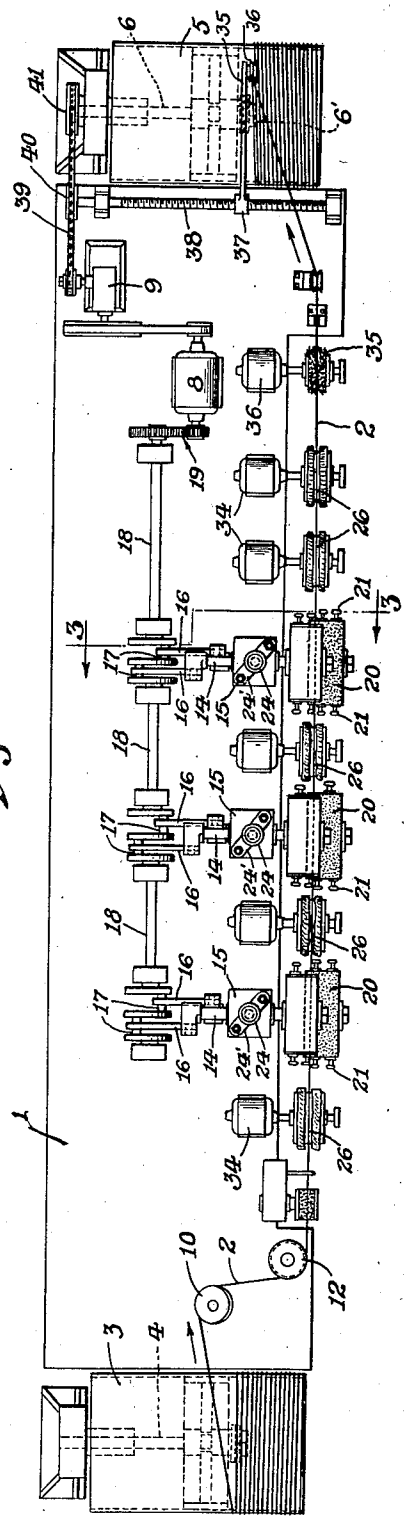
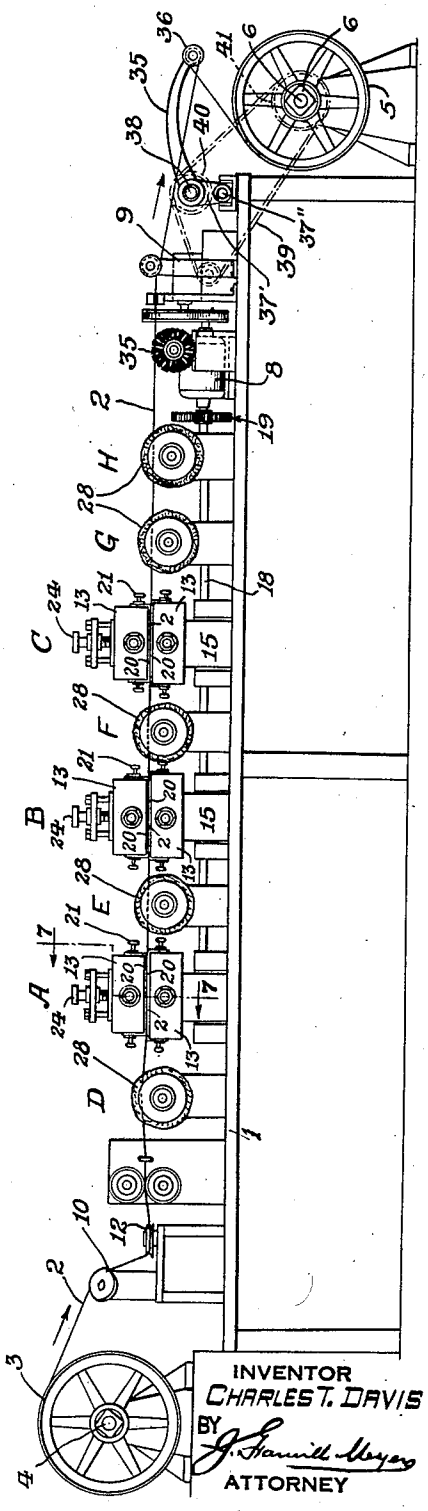


Fig. 2.



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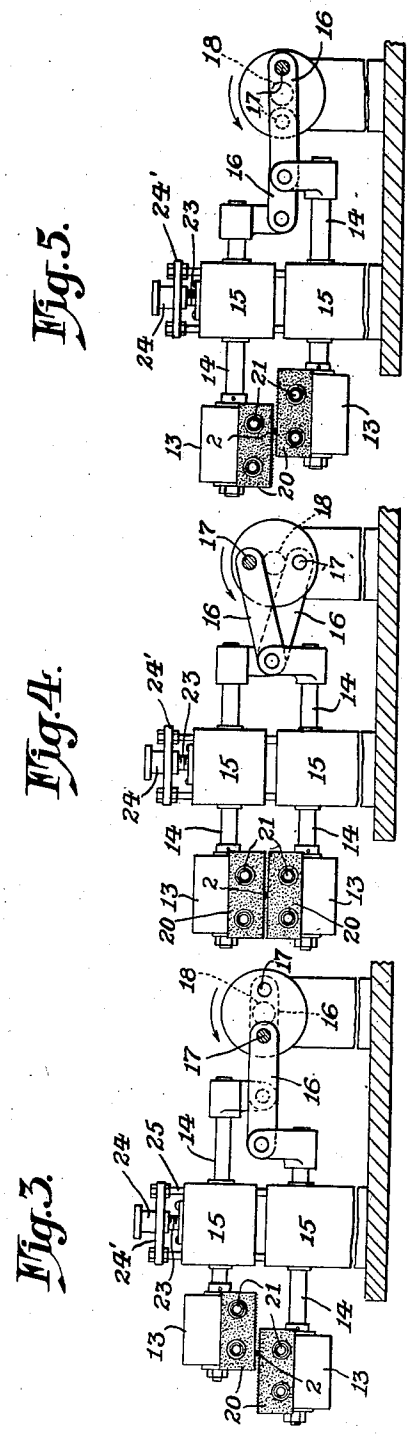


Fig. 3.

Fig. 4.

Fig. 5.

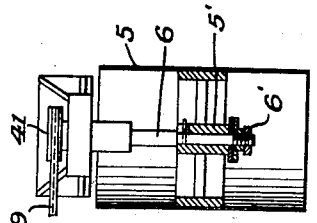


Fig. 8.

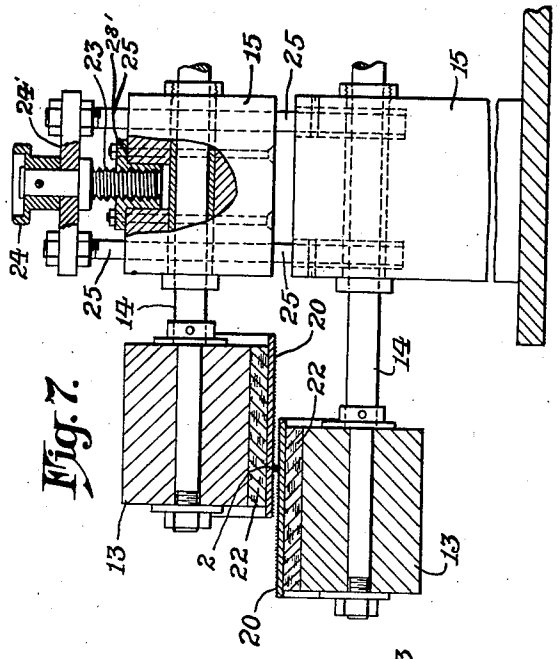


Fig. 7.

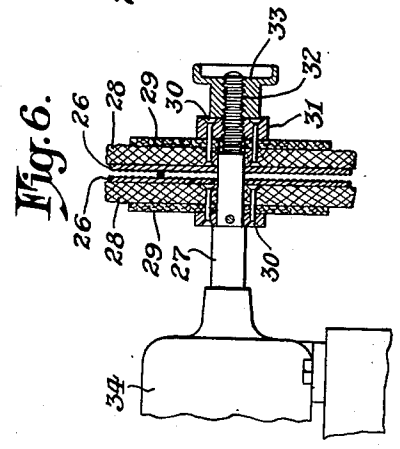


Fig. 6.

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APPARATUS FOR ABRADING STRAND MATERIAL

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Application June 29, 1935, Serial No. 29,151

7 Claims. (Cl. 51—112)

My present invention relates to a method of and machine for abrading, gauging, buffing and polishing strand material such as strings made from homogenized animal tendon fibers and so-called "catgut" strings or the like, although the method and machine are well adapted for use upon metal strands, such as wire made from steel, copper, brass and alloys of different metals.

An object of the invention is to provide a simple and effective method of and machine for operating upon strand material, that will be automatic and continuous in operation and which will insure accurate gauging, abrading and polishing of the material at a relatively low cost.

As to the method, the invention consists in advancing the strand material to be acted upon, imparting an axial twist or twirl to the material while it is so advanced and in simultaneously abrading, grinding, sandpapering, buffing and polishing the strand.

In the preferred embodiment of the invention I employ a plurality of successively and alternately acting abrading and buffing or polishing operations as the strand material is being advanced under appropriate tension, as this has proved to be very successful in commercial operation, although I do not wish to be understood as limiting myself to this specific method, except as I may be limited by the terms of the appended claims.

As for the machine, the invention comprises means for advancing a strand and associated means for axially twisting or twirling the strand during such advance, and means for abrading, grinding, sand-papering or buffing the strand as it is advanced.

In the preferred type of machine I provide a plurality of pairs of combined strand engaging, twisting or twirling and abrading elements arranged in spaced relation and in a common plane to provide a rectilinear strand-path between each pair of said elements, and I also provide a plurality of strand grinding, buffing or polishing members arranged between the said twisting and abrading elements to operate alternately with relation thereto, so that the advancing strand will be successively and alternately abraded and buffed or polished while it is being twisted or twirled, and while it is traveling in a rectilinear path.

In order to enable others skilled in the art to understand, construct and use my said invention, I will now proceed to describe the same in detail, reference being had to the accompanying drawings, wherein—

Fig. 1 is a plan view of the machine;

Fig. 2 is a front elevation;

Figs. 3, 4 and 5 are side elevations taken on the line 3—3 of Fig. 1, of the combined abrading and twisting elements showing one type of mechanism for imparting complemental reciprocating movements thereto, the several views showing the different relative positions the elements assume during the operation of the machine;

Fig. 6 is a transverse sectional view of one of the buffing and polishing members;

Fig. 7 is a transverse sectional view taken on the line 7—7 of Fig. 2, of one of the combined strand abrading and axially twisting elements showing how the elements are mounted and supported for relative adjustment to accommodate strands of different diameter and to vary the gauge thereof, and also showing the bearing blocks for the shafts upon which the abrading elements are mounted;

Fig. 8 is a plan view, partly in section, showing the mounting for the take-up drum or reel.

By referring to Figs. 1 and 2 of the accompanying drawings, which is illustrative of a preferred embodiment of the invention, it will be seen that the various elements of the machine are mounted upon an elevated table or platform 1, the combined strand-abrading and axially twisting or twirling elements being indicated generally by the letters A, B and C, while the grinding, buffing or polishing members are indicated generally by the letters D, E, F, G and H.

In the machine illustrated I have shown three combined strand gripping abrading and twisting or twirling elements which are arranged in spaced relation and in a common plane to provide between them a rectilinear strand path along which the strand 2 travels. Obviously I may employ a greater or lesser number of the said combined strand-abrading and twisting elements. The buffing, grinding or polishing members, of which five are employed in the illustrated embodiment of the invention, are arranged alternately with relation to the abrading and twisting elements, and are positioned to intersect the travel path of the strand so that the latter will be subjected to successive abrading, gauging and buffing or polishing as well as twisting.

While I have shown five such grinding, buffing and polishing members it is obvious that I may employ a greater or lesser number, depending upon the character of the strand material being operated upon.

The strand 2 is usually delivered to the machine wound upon a drum or reel 3, which is removably mounted upon a spindle 4, and after passing through the machine, the strand is wound upon a take-up drum or reel 5, which is removably mounted upon a shaft 6, an automatic laying device being preferably employed to accurately lay the strand upon the drum so that the several convolutions of the strand as it is being wound about the drum or reel will be separated from each other. This arrangement while desirable for

certain types of strand material, may not be at all necessary with other kinds of strand material, as for instance metallic strands, where a simple reel would preferably be employed so that the convolutions of the strand would be built up thereon.

The shaft 6, of the take-up or receiving drum or reel 5, is driven by any suitable form of gearing, such as the sprocket gearing shown, from a motor 8 through a reduction gearing 9. Obviously any suitable mechanism may be employed for driving the drum or reel 5, depending upon the speed of travel of the strand material through the machine.

In its passage to the machine from the drum or reel 3, the strand 2 is preferably passed about suitable tension rollers 10 and 12, which are offset relative to each other, so that the strand will be maintained at a suitable tension as it is drawn through the machine and in association with the abrading, gauging axially twisting and buffing or polishing mechanisms.

As all of the combined abrading and axially twisting mechanisms, as well as the buffing mechanisms are identical in construction and operation, a detailed description of one of each such mechanism will suffice for all.

As more clearly shown in Figs. 3, 4, 5 and 7, each combined strand engaging and twisting or twirling mechanism consists of a pair of opposed blocks 13, one of which is mounted above the other for relative reciprocatory movements. Each block is mounted upon a shaft 14, passing through a companion bearing member 15, and which shaft 14 is connected by means of a link 16, to a crank 17, mounted upon a shaft 18, Fig. 1, which shaft is common of all the cranks of the several abrading and twisting mechanisms. The shaft 18 is driven from the motor 8 through the gearing 19. By the arrangement described as more clearly illustrated in Figs. 3, 4 and 5, it will be seen that there is a separate link 16 and a separate crank 17 for each of the shafts 14 and their companion bearing blocks 13, and the arrangement is such that the blocks have a relative reciprocating motion imparted thereto, all of the lower blocks 13 of the series, as well as all of the upper blocks 13 of the series, moving in unison,—that is to say, while the lower blocks 13 are moving outward, the upper blocks 13 are moving inward, and vice-versa.

The strand 2 to be acted upon, travels in a rectilinear path between the several pairs of blocks and the blocks are provided on their confronting faces with removable and replaceable strips or sheets of strand engaging material 20, preferably of sandpaper, the ends of the strips being folded up against the opposite ends of the blocks and attached thereto by means of removable thumb pins 21.

By preference the confronting faces of the blocks 13 are each provided with a strip of backing material 22, composed of cork, felt or the like, as more clearly shown in Fig. 7, in order to afford a yielding support for the strips or sheets of abrading material 20, which abrading material may consist of relatively fine sandpaper or the like. Each of the upper blocks 13 is preferably adjustably mounted toward and from its companion lower block 13, and one means of accomplishing this adjustment is through the medium of a hand-operated screw 23, having a handle 24, which passes into a threaded plate 23' in the bearing block 15, suitable guide rods 25 being employed to prevent rotation of the upper bearing 15 while it is being adjusted toward and from its lower bearing block 15. The guide rods 24, are fixed to the lower block and extend upward through openings in the upper bearing block 15, the upper ends of the rods being connected by a diagonally arranged connecting plate 24', in which the hand-operated screw 23, is journalled for rotation, all as more clearly shown in Fig. 7.

By reason of the adjusting means described, it will be obvious that the space between the abrading members 13 may be adjusted to accommodate strand material of different diameters and by varying the space between the several abrading members A, B and C, so that the space between the several members decreases from the entrance to the delivery end of the machine, the strand material may be ground away and further gauged as to diameter as it passes through the machine.

In addition to the abrading action of the blocks, they operate to impart an axial twist or twirl to the strand as it is advanced through the machine. This axial twist or twirl is imparted to the strand because the strand is gripped by the abrading material and thus as the blocks 13 are reciprocated the strand is twisted or twirled, the twist or twirl extending throughout the area of the several abrading or gripping members, and obviously since the strand is advancing while it is gripped by the abrading material, it is likewise abraded or ground away. Thus it will be seen that the strand is simultaneously twisted or twirled and abraded during its passage through the machine. In other words it may be said that the reciprocating blocks cause the strand to be twirled, because by their reciprocating action upon the strand, the strand is rapidly and reversibly rotated on its longitudinal axis.

The additional grinding, buffing or polishing members consist of a pair of confronting, grinding, buffing or polishing discs 26, removably mounted upon a shaft 27, and each disc is backed by a cushioning disc 28, composed of cork, felt or other yielding material so that as the strand 2 travels between the grinding, buffing or polishing discs 26, it will be ground, smoothed and polished.

The cushioning discs 28 are further backed by other discs 29, composed of leather or other suitable flexible material, and each of the discs 28 and 29 are secured by means of headed pins 30 to a nut 31, screwed upon the threaded end 32 of the shaft 27.

A hand-operated lock nut 33 is threaded upon the outer end of the screw 32 and operates to lock the outermost discs 28 and 29 to a properly adjusted position relative to its opposite companion disc, so that by the means described the space between the confronting faces of the two discs may be adjusted to suit the diameter of the strand being acted upon.

Because of the fact that the several blocks 13 of the combined abrading and axial strand twisting mechanisms and the several buffing and polishing discs may be independently positioned or adjusted relative to each other, it will be obvious that by varying the distance, through adjustment, of these several elements, the strand being acted upon may be abraded, buffed and polished to a variable extent in order to change the diameter or gauge thereof, and in this way strands of different gauge may be produced.

The grinding, buffing or polishing discs D, E and F, for example, may be faced with suitably graded sandpaper in order that they will have an abrading or grinding action upon the strand, whereas the discs G and H may be faced with a

material having a lesser abrading action or a polishing or smoothing action.

The shafts 27 upon which the buffing and polishing discs are mounted, may be rotated in any suitable manner, as by the independent motors 34, although it is clear that they may be otherwise rotated and the direction of rotation is preferably, but necessarily, anti-clockwise, or in a direction opposite to the direction of movement of the strand 2, and preferably the buffing and polishing discs may be rotated at a greater speed than the linear speed of travel of the strand 2, in which case they may be rotated in a clockwise direction.

In order to thoroughly brush and clean the strand after it has passed through the abrading, buffing and polishing elements, I prefer to pass the same through a rotary brush 35, located at the delivery end of the machine, which brush may be rotated by a motor 36, or by any other suitable mechanism.

It will be obvious from the construction described, that the abrading sheets 20, as well as the abrading and polishing discs 26, may be readily renewed as they wear away, and because the discs 26 are secured to the yieldable backing discs 28, the action upon the strand will be a more or less yielding one.

As will be seen by referring to Fig. 8, the hub 5' of the drum or reel 5, is removably mounted upon the shaft 6, and is securely held to the shaft by means of a nut 6', so that the drum or reel will rotate with the shaft, but may be readily removed therefrom after the strand has been wound thereon, and a new drum or reel substituted.

Any suitable means may be employed for gradually laying the convolutions of the strand upon the drum or reel where such means is desirable, although it will be understood that in all cases it may not be necessary. This means in the instance shown, consists of an arm 42, having a strand-guiding pulley 36 at its outer end, such arm having a threaded nut or block 37 at its other end which is in threaded engagement with a threaded shaft 38, which will operate to cause the nut or block 37 and its arm 35, to travel along the shaft 38, as the latter is rotated by means of the sprocket chain 39, passing over the sprocket 40, said chain also meshing with a sprocket 41, mounted upon the shaft 6, upon which the drum or reel 5 is removably mounted. The arm 42, has a downward extension 37', below the threaded nut 37, which extension is forked at its lower end to partly embrace a guide rod 37'', which extends parallel to the threaded rod 38. Thus the arm 42, is caused to be guided in its back and forth movements. The nut or block 37 is an ordinary split threaded nut. When the arm 42 has reached the end of its travel in each direction this nut is opened up and pushed back manually to the starting point on the threaded shaft 38.

The outer end of the spindle 4, upon which the drum 3 is removably mounted, is threaded at its outer end like the spindle 6 shown in Fig. 8, and a nut similar to the nut 6', Fig. 8, is employed not only to hold the drum or reel 3' on its spindle 4, but to exert a frictional retarding action against free rotation of the drum 3 to regulate the tension of the strand as it passes from the drum or reel 3 through the machine to the take-up drum or reel 5.

The operation of the machine will be clear from the foregoing description, and without further explanation, suffice it to say that it will be apparent that as the strand material passes through the machine, it will be subjected to a succession of alternate abrading and buffing or polishing operations and will be axially twisted as it is advanced. It has been found that a strand so acted upon will be delivered from the machine in a highly polished condition and of a uniform diameter, which diameter may be varied depending upon the adjustment of the abrading and polishing elements in order to regulate the gauge of the strand.

What I claim and desire to secure by Letters Patent is:

1. In a machine for abrading strand material, means for advancing a strand along a travel path, and plural means for transversely rotating the strand and for abrading the same during such rotation and advance, and polishing means for the strand at a plurality of points between the points where it is rotated.

2. In a machine for abrading strand material, a pair of opposed relatively and laterally reciprocating strand rotating members, a pair of opposed rotary abrading elements, and means for advancing a strand along a travel path between said pairs of members and elements.

3. In a machine for abrading strand material, a plurality of pairs of opposed laterally reciprocating strand engaging members, said pairs being located in spaced relation to provide a rectilinear strand path, extending between the said pairs, opposed pairs of rotary buffing and abrading discs located between the pairs of engaging members, and means for advancing a strand between the said pairs of members and discs successively.

4. In a machine for abrading strand material, a plurality of pairs of opposed strand gripping members, means for simultaneously reciprocating said members laterally in opposite directions to rotate the strand while being advanced, rotary buffing and abrading means between the said gripping members, and means for advancing a strand.

5. In a machine for abrading strand material, a plurality of pairs of opposed laterally reciprocating strand gripping and abrading members, said pairs being arranged in spaced relation to provide a rectilinear travel path therebetween for the strand to be treated, opposed pairs of rotary buffing and polishing discs located between each pair of abrading members, a strand take-up drum at the end of the machine, and means for rotating said drum to cause the strand to move in a travel path through the machine.

6. In a machine for abrading and polishing strand material, a plurality of pairs of opposed reciprocating blocks each having abrading material on its confronting face, means for simultaneously reciprocating said blocks transversely in opposite directions, pairs of rotary buffing discs arranged between the several pairs of blocks, and means for guiding and advancing a strand between the said pairs of blocks and discs for the purpose specified.

7. The combination of means for continuously advancing an elongated string of taut material along a travel path, pairs of reciprocating blocks that reversibly twirl the string between them, each block having abrading material on its confronting face and pairs of buffing discs arranged between the pairs of blocks.

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