Nov. 30, 1937. P. J. HUHN 2,100,780

ABRADING DEVICE

Filed Dec. 24, 1934 2 Sheets-Sheet 1

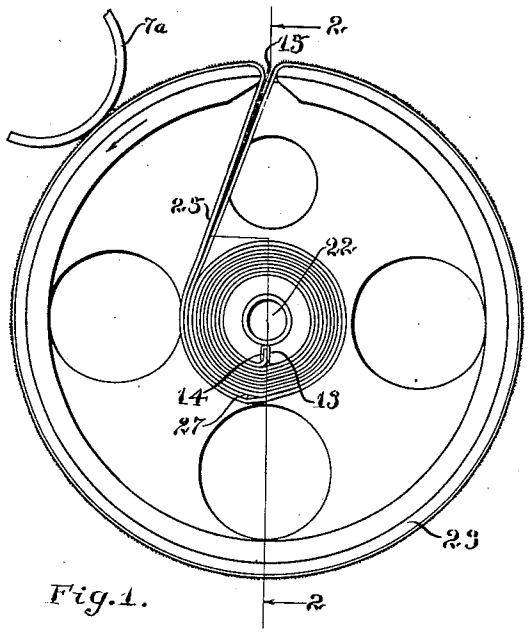


Fig. 1.

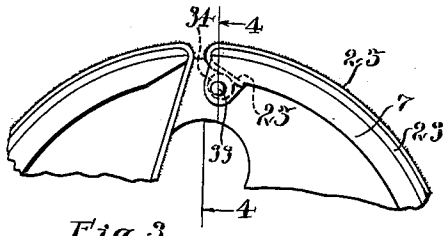


Fig. 3.

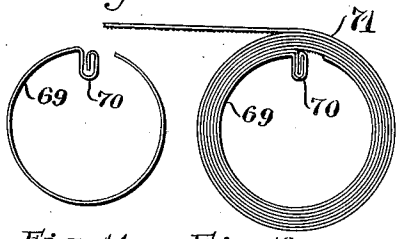


Fig. 14. Fig. 13.

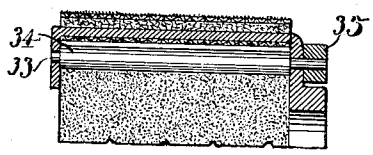


Fig. 4.

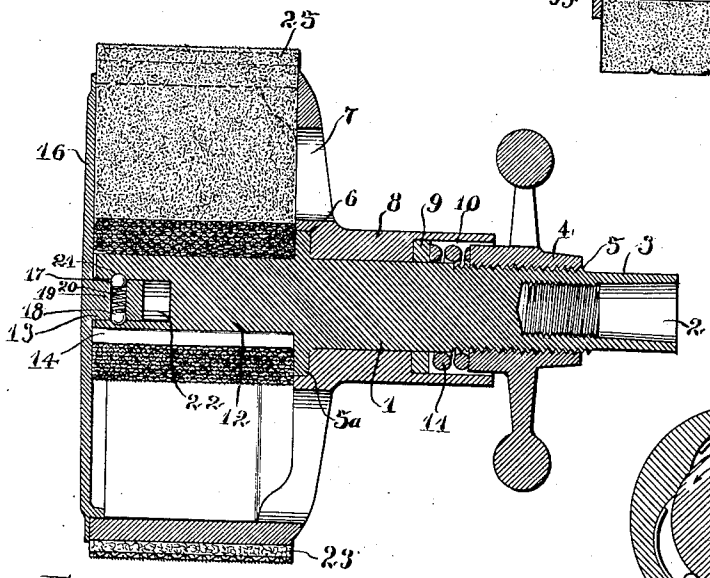


Fig. 2.

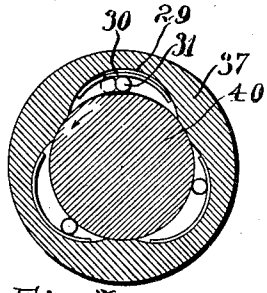


Fig. 5.

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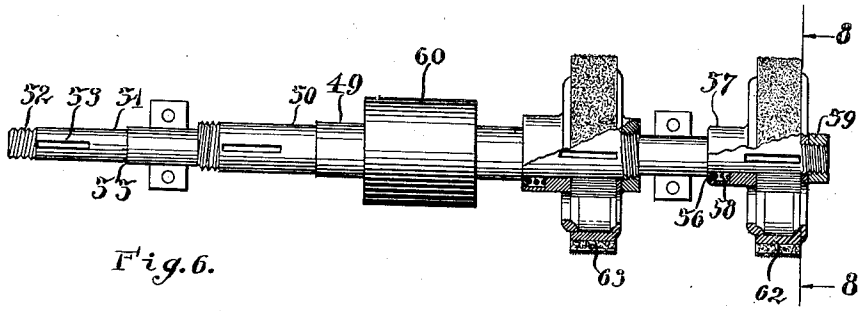


Fig. 6.

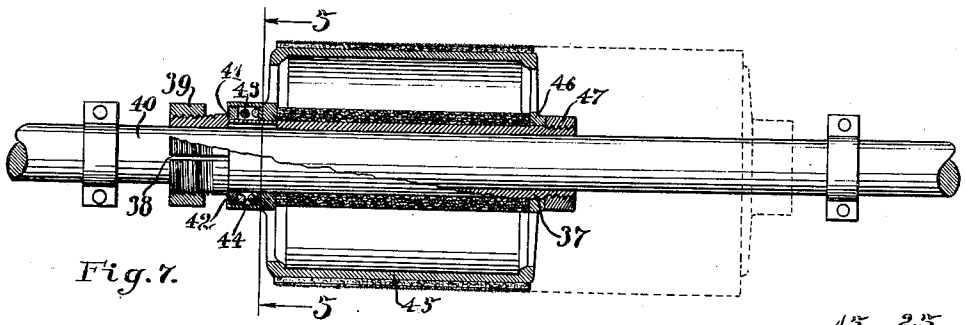


Fig. 7.

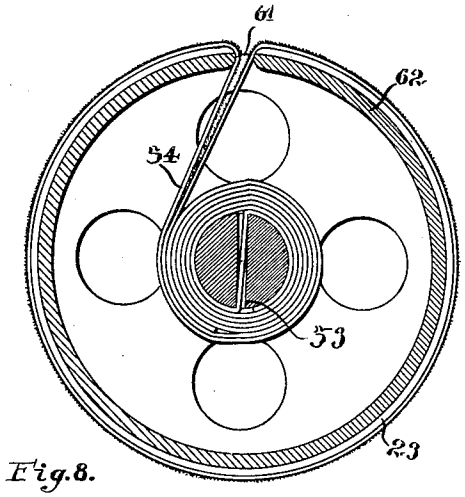


Fig. 8.

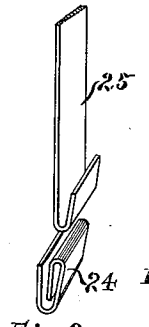


Fig. 9.

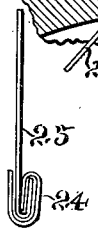


Fig. 10.

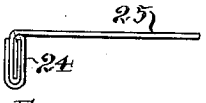


Fig. 11.

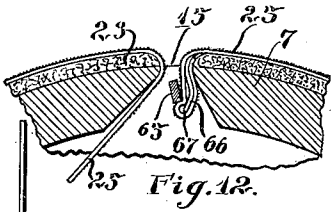


Fig. 12.

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UNITED STATES PATENT OFFICE

2,100,780

ABRADING DEVICE

Paul J. Huhn, St. Paul, Minn.

Application December 24, 1934, Serial No. 758,892

7 Claims. (Cl. 51—194)

The present invention relates to a buffing or abrading wheel wherein a roll of strip abrasive material is carried by a spindle portion and is carried around the periphery of a wheel mounted concentrically with said spindle.

Throughout the specification and claims the term "abrade" shall be intended to include buffing, polishing, and all such like terms.

The broad idea of thus mounting a strip of abrasive material in a wheel is not new, being shown as far back as 1881 in the patent to Dunham, No. 240,395, and in several subsequent patents, including that to Solem, No. 1,889,040, November 29, 1932. The present invention, however, has important features which distinguish it clearly from all such prior constructions with which applicant is familiar.

An object of the present invention is to make an improved and simplified abrasive wheel having a quantity of strip abrasive material mounted therein.

Another object is to make an abrasive wheel having an abrasive strip removably mounted on the periphery thereof and connected to an element relatively movable with respect to said wheel to exert a tautening force on said abrasive strip.

Another object is to provide an abrasive wheel having a supply of strip of abrasive material contained therein adapted to be withdrawn to cover the periphery of said wheel, said strip being drawn taut by a relative movement between said wheel and a spindle upon which said wheel is mounted, and having regulating means to control the tension of said strip on the periphery of said wheel during use.

In order to attain these objects, there is provided, in accordance with one feature of the invention, a spindle adapted to support a roll of strip abrasive material which may be of a type known to the art as "utility roll". An abrasive carrying wheel is here shown as being mounted concentrically with said spindle and is relatively rotatable with respect thereto. The rim of the abrasive carrying wheel is provided with a slotted opening through which the abrasive strip may be passed and carried around the periphery of the wheel, fastening means being provided to retain the strip in position upon the periphery of the wheel. A frictional contact is preferably provided between the spindle and the wheel so that the torque between the spindle and the wheel may be adjustably divided between tension on the strip and frictional engagement between the spindle and the wheel. One form of the wheel is adapted to be mounted in a fixed position upon a driving shaft, while a modified form of the invention is adapted to be moved longitudinally on a driving shaft, and to be locked thereto at any desired point thereon. The device is constructed to be mounted on standard equipment of to-day, and is capable of modification to adapt it for use on any shaft or other rotating member.

These and other features of the invention will be more fully brought out in the following description and the accompanying drawings, wherein:

Figure 1 is an end view of one form of the device showing an article to be abraded in position against the abrasive strip, a face plate being removed to show the interior construction of the device.

Figure 2 is a sectional view on the line 2—2 of Figure 1, the face plate being shown in position thereon.

Figure 3 is an enlarged fragmentary view of a modified form of a portion of a wheel with a strip retaining clamp mounted thereon.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is an enlarged, sectional view on the line 5—5 of Figure 7.

Figure 6 is a plan view of a modified form of the device, a portion of each of two abrading wheels being broken away to show the interior construction thereof.

Figure 7 is an enlarged sectional view of a still further modified form of the device which is capable of being mounted on any shaft of the proper diameter and of being moved to adjusted position longitudinally of a shaft upon which it is mounted.

Figure 8 is an enlarged, sectional view on the line 8—8 of Figure 6.

Figure 9 is an end portion of a strip of abrasive material folded to receive an end clip member, also shown in opened position.

Figure 10 is an edge view of the strip and clip shown in Figure 9 in loosely assembled position.

Figure 11 shows the strip and clip in compacted finished form.

Figure 12 is a fragmentary view of a portion of the rim of an abrading wheel showing a modified form of device for securing an end of the abrasive strip to the wheel.

Figure 13 is an end view of a metal ring with strip securing clip integral therewith and supporting a roll of strip abrasive for easy insertion in a wheel adapted to receive it; and

Figure 14 shows the ring and securing clip of Figure 13 alone and with the clip portion thereof

opened to receive the end of an abrasive strip.

Referring to the drawings in detail, and considering first the structure shown in Figures 1 and 2, a spindle 1 is here shown as provided with an interiorly threaded recess 2 in an end thereof to be threadedly mounted upon the end of a tapered, threaded shaft. The method of mounting this spindle is not material to the invention, however, and any suitable method may be employed for mounting the spindle on a rotatable shaft.

The end portion 3 of the shaft is of slightly reduced diameter to permit an interiorly threaded locking wheel 4 to be threadedly mounted upon a threaded portion 5 of the spindle. The spindle is provided with a flange 5—*a* which is adapted to fit into a recess 6 in a wheel 7. The wheel 7 is provided with a hub 8 which has a relatively close rotating fit on the spindle 1. This fit should be such as to permit free relative rotation between the spindle 1 and the hub 8, but, at the same time, close enough to prevent any wobbling of the hub on the spindle 1.

A ring 9 of hardened steel fits into a recess 10 in the end of the hub 8 and is held in compression against the inner end of this recess by means of a coil spring 11 which is engaged on its outer end by the internally threaded locking wheel 4. Thus, the hub 8 of the wheel 7 is held in compression between the hardened steel ring 9 and the flange 5—*a*. When the locking wheel is drawn down to force the flange 5—*a* into close contact with the recess 6 this action further assists in holding the wheel 7 against wobble movement. The portion 12 of the spindle beyond the flange 5—*a* is cylindrical in shape and is provided with a groove 13 to receive the end 14 of a strip of abrasive material, such as emery paper or crocus cloth, commonly referred to as "utility roll". A slotted opening 15 is provided in the rim of the wheel 7 through which the end of the abrasive strip may be passed. This feature will be brought out presently in the description of the operation of the device.

A cap 16 may be provided to cover the outer open end of the device, and is here shown as being held in position by means of a pair of ball bearings 17 and 18 mounted in a hole drilled transversely of a stud 19 carried by the cover 16, the bells being resiliently pressed outwardly by means of a spring 20 into engagement with an annular groove 21 cut interiorly of a hole 22 drilled longitudinally of the spindle 1.

A cushion strip 23 of a suitable type such as felt or rubber is secured to the outer face of the rim of the wheel 7 in a customary manner.

In using the device, a strip of abrasive material, preferably having a metal clip end, such as is shown in Figures 9, 10, and 11, is inserted in the slot 13 in the hub 1. This clip comprises a strip of metal 24 bent with a double-U bend as shown in Figure 9. The end of a strip 25 of abrasive material is folded back upon itself, as illustrated, to be slidably inserted into the clip 24, as shown in Figure 10. The assembly is then compressed laterally, as in a vise, to the shape shown in Figure 11, which firmly locks the clip on the end of the strip.

After inserting the clip 24 in the slot 13 a quantity of abrasive strip is wound on the cylindrical portion 12 of the hub. This may be done by releasing the wheel 4 on the threads 5 to release the wheel 7 and to permit the spindle 1 to rotate freely therein. The wheel 7 is then held stationary and the spindle 1 is rotated to wind the desired quantity of strip material on the spindle. When a sufficient quantity of abrasive strip is wound upon the spindle, the locking wheel 4 is turned up so as to lightly engage the spring 11, to lightly resist turning movement between the spindle 1 and the hub 7.

The free end of the strip 25 is then pulled outwardly to withdraw a required amount of strip material through the slotted opening 15, is carried around the periphery of the wheel 7, and the end of the strip is passed back into the slot 15, a sufficient length of the strip being carried into the interior of the device to permit its being inserted between the outer and the next adjacent convolutions of the strip. This brings the end of the strip to the point 27 in Figure 1. The wheel 7 is then turned relatively to the spindle in a direction opposite the normal direction of rotation of said wheel, the normal direction being indicated by the arrow in Figure 1. This action tends to wind the strip onto the spindle and thus pulls taut both ends of the strip which extends into the interior of the device. This action, of course, also draws taut the entire portion of the strip around the periphery of the wheel 7 and places it under a desired tension.

At this point the locking wheel 4 is screwed down to compress the spring 11 and exert a resilient, compressive force between the ring 9 and the flange 5—*a* to cause a frictional engagement between the spindle 1 and the hub 8. The degree to which the wheel 4 is turned down will depend to some extent on the strength of the strip used and the character of the work to be performed, since it is desired in using the device to have the friction produced by the engagement of the work with the wheel sufficient to produce a torque slightly in excess of the resistive force of the frictional engagement between the spindle 1 and the hub 8. In this manner, as the wheel rotates and a work piece 7—*a* is brought to bear upon the portion of the strip 25 on the periphery of the wheel, any looseness in the strip will be carried around the periphery and drawn into the slotted opening 15 by a relative rotation between the wheel 7 and the spindle 1, which action tends to wind the strip 25 on the spindle 1. By adjusting the locking wheel 4 the strip can be adjusted to any desired tension within the limit of its tensile strength with the assurance that the strip will be maintained at such tension during use.

In a wheel designed to rotate in the direction indicated in Figures 1 and 2, the wheel 4 and the threaded portion of the shaft upon which it is threadedly mounted must be provided with a right hand thread in order to prevent the wheel 4 from loosening in use, and the thread in the recess 2 must be a left hand thread.

The structure shown in Figures 3 and 4 shows a modified form of strip securing device to secure the free end of the abrasive strip to the wheel. The general structure of the remainder of the wheel 7 can be the same as that shown in Figures 1 and 2. This strip securing device comprises a cylindrical cam 34, rigidly mounted eccentrically upon a shaft 33 which is pivotally mounted interiorly of the opening 15 in the rim of the wheel 7 and is spaced inwardly from the edge of said opening so as to permit the insertion of the end of the abrasive strip 25 between the cam 34 and the inner side of the opening 15, when the cylindrical cam is swung out to a releasing position, and to grip the end of the strip 25 between the cam 34 and the wheel 7 when the shaft 33 is rotated as by means of a knob 35 secured to the

end of the shaft 33 to swing the cam into a gripping position, as shown in Figure 3.

A modified form of wheel construction is shown in Figures 5 and 7. This modified construction is adapted to be mounted on different shafts of a given diameter, and is also adapted for moving to different adjusted positions on the same shaft. In this construction a sleeve 37 has a split end as at 38 on which a locking nut 39 is threadedly mounted. The thread on the nut 39 and the split end 38 of the sleeve 37 is tapered as a pipe thread, so that on threading the nut onto the sleeve the split end of the sleeve will be compressed against a shaft 40 on which the device is mounted to secure the device in adjusted position.

A plurality of cam recesses 29 are provided interiorly of the sleeve 37 and in each of these recesses is mounted a light leaf spring 30 which holds a cam roller 31 in rolling contact with a shaft 40 upon which the device is mounted. Upon a relative turning movement between the sleeve 37 and the shaft 40 the rollers will roll to the ends of the cam recesses 29, thereby securely locking the sleeve 37 against rotation upon the shaft. The sleeve 37 is provided with a shoulder 41 spaced inwardly from the threaded end 38 of the sleeve and against this shoulder is seated a steel washer 42. A compression spring 43 is mounted in a hub portion 44 of a wheel 45 mounted upon the sleeve 37, the opposite end of the wheel having a hub portion 46 which has a rotative fit upon the sleeve 37. A nut 47 is threaded onto the opposite end of the sleeve from that carrying the locking nut 39 and rotation of this nut forces the wheel 45 to the left, as shown in Figure 7, thereby compressing the spring 43 and providing a frictional engagement between the wheel 45 and the sleeve 37. The abrasive strip in this construction may be secured in position in any desired manner providing the inner end of the strip is secured to the sleeve 37 which may be accomplished as shown in Fig. 1 so as to prevent rotation of the sleeve 37 within the roll of abrasive strip 25, and the outer end of the strip may be secured to the rim as shown in Figure 12.

To change the position of the assembly upon a shaft upon which it is mounted, the nut 39 may be loosed to free the split end 38 of the sleeve 37 upon the shaft 40 and the wheel 45 may then be rotated to free the rocking rollers 31 from locking engagement with the shaft 40 whereupon the entire assembly may be moved slidably longitudinally upon the shaft to a desired position.

In Figures 6 and 8 is shown a modified structure adapted to hold a plurality of wheels upon the same shaft. A shaft 49 is provided with stepped down portions 50 and 51. Referring to the left hand portion of Figure 6, which shows the shaft without abrasive wheels mounted thereon; the outer end portion 51 of the shaft is threaded as at 52 and the cylindrical portion 51, which acts as a spindle. A slotted opening 53 is provided for receiving the end of an abrasive strip 54 therein. A shoulder 55 is provided for seating a steel washer 56 shown in position on the right hand portion of the shaft 49. A hub portion 57 is provided with a recess therein in which is mounted a coil spring 58. This coil spring is held in compression by means of a nut 59 threadedly mounted on the outer threaded portion of the shaft. Since the two ends of the shaft on opposite sides of a drive pulley 60 are duplicates in size and structure, except for a reversal of the threads, the same reference numerals will be used to refer to both. The end of an abrasive strip is inserted through a slotted opening 61, see Figure 8, in the rim of a wheel 62 and is threaded through the slotted opening 53 in the shaft 49. The nut 59 may then be loosened to free the wheel 62 for rotation upon the shaft 49 and by holding the wheel stationary and feeding the abrasive strip through the slotted opening in the rim in a manner similar to that described for the structure shown in Figures 1 and 2, a desired quantity of abrasive strip may be wound upon the shaft. By rolling the abrasive strip on the shaft with the abrasive side outwardly, as shown in Figure 8, the abrasive strip may be carried around the periphery of the rim of the wheel, passed into the interior thereof, and between the outer and second convolution of the strip wound upon the hub, so that the end of the strip is held in compression between these two outer convolutions of the strip. A second wheel 63 is mounted on the enlarged portion 59 of the shaft 49, and, since it is similar in construction and operation to the outer wheel 62, except for the larger diameter of the hub portion to adapt it to fit upon the enlarged portion 59 of the shaft, it will be unnecessary to describe this wheel 63 in detail.

A modified and effective form of strip end securing device is shown in Figure 12. It is here shown as being mounted on a wheel such as that illustrated in Figure 1. It comprises a bar 65 mounted interiorly of the slotted opening 15 in the rim of the wheel 7. A hook-shaped sheet metal clip 66 is provided and the end portion of the abrasive strip 25 is folded over this clip, after which the clip 66 is inserted between the bar 65 and the side of the slotted opening 15. Tension on the peripheral portion of the strip tends to force the clip 66 more tightly against the bar 65, thereby securely locking it in position. The lower end portion 67 of the clip 66 is here shown with a folded edge portion to more securely anchor the clip in position. This type of clip has been tested in actual use at speeds in excess of three thousand five hundred revolutions per minute with no tendency to release.

A modified and desirable form of combined end clip and roll support is shown in Figures 13 and 14. This form of device is of course adapted for open end wheels only, as for instance, that shown in Figures 1 and 2. The device comprises a cylindrical sheet metal member 69 having an inwardly bent clip end portion 70 adapted to fit into a slot in the spindle such as the slot 13 in Figure 1. The clip end portion is preferably formed with a double-U bend as is the clip 24 in Figure 9, and the end of a strip 71 is folded and inserted therein in the same manner and the folds of the clip compressed to grip the strip as described for Figures 10 and 11.

The strip 71 is then wound on the cylinder 69 to form a roll of the desired diameter. When thus rolled the entire roll of material may be slipped onto a spindle adapted to receive it, the clip 70 fitting into a slot in the spindle adapted to receive it, and thus hold the end of the strip securely in position on the spindle.

I claim:

1. An abrading device, comprising a spindle, a wheel having a slotted opening in the periphery thereof mounted freely rotatable thereon, a strip of abrasive material rolled on said spindle and rotatable therewith, the free end of said strip passing outwardly through said slot and around the periphery of said wheel and then inwardly through

said wheel to said spindle, said strip constituting a driving connection between said spindle and wheel, and means interposed between said spindle and said wheel for elastically controlling the relative rotation of said wheel and said spindle during an abrading operation.

2. An abrading device, comprising a spindle, a wheel mounted freely rotatable thereon, said wheel having a slotted opening in the periphery thereof, a strip of abrasive material rolled on said wheel and rotatable therewith, one end of said material being secured within the wheel and passing outwardly through said slot and around the periphery of said wheel and then inwardly through said slot to said spindle, said strip constituting the driving connection between said spindle and wheel, friction means interposed between said wheel and spindle, and means for adjustably regulating said friction means to control the relative rotation of said wheel and spindle and tension on said spindle during an abrading operation.

3. An abrading device, comprising a spindle, a wheel mounted freely rotatable thereon, said wheel being formed with a slotted opening in its periphery, a strip of abrasive material mounted upon said spindle and passing outwardly therefrom through said slot and around the periphery of said wheel and then inwardly through said slot and secured within said wheel, and means for controlling the tension upon said strip by controlling the relative rotation of said wheel and spindle during an abrading operation, consisting of a fixed abutment carried by said spindle and engaging with one side of said wheel, friction means engaging with the opposite side of said wheel in opposition to said fixed abutment, and means for adjustably controlling the pressure of said friction means against said spindle and wheel.

4. An abrading device, comprising a spindle, a wheel mounted freely rotatable thereon, said wheel being formed with a slotted opening in its periphery, said spindle being adapted to receive a strip of abrasive material rolled thereon, said strip being carried at one end by the spindle and passing outwardly through said slotted opening and around the periphery of said wheel and thence inwardly through said slotted opening and fastened in connection with said wheel, said strip constituting the normal driving connection between the spindle and wheel, friction means interposed between the wheel and spindle, adjusting means therefor, said friction means normally resisting the relative rotative movement between the spindle and wheel and being controllable by said adjusting means to increase or decrease the frictional engagement with said wheel and controlling the tensile stress upon said abrasive strip.

5. An abrading device, comprising a spindle, a wheel mounted freely rotatable thereon, said wheel being formed with a slotted opening in its periphery, a strip of abrasive material mounted in said spindle and passing outwardly therefrom through said slot and around the periphery of said wheel into a secured position with said wheel, an outwardly projecting flange carried by said spindle alongside the inner side of said wheel, a friction assembly mounted upon said spindle on the outer side of said wheel, and means for adjusting the tension of said friction assembly against said wheel to regulate the engagement of said wheel with said flange, for the purpose set forth.

6. An abrading device, comprising a spindle, a wheel mounted freely rotatable thereon, said wheel having a slotted opening in the periphery thereof, a strip of abrasive material mounted on said spindle and passing outwardly therefrom through said slot around the periphery of said wheel, and then inwardly to a secured position upon said wheel, said strip constituting the normal driving connection between said wheel and spindle, an abutment carried by said spindle adjacent the inner side of said wheel, friction means surrounding said spindle on the outer side of said wheel, and means for controlling the engagement of said wheel with said abutment to regulate the relative rotative movement between the spindle and wheel, consisting of an adjustable member mounted upon said spindle outside of said friction means, and adjustable to regulate the engagement of said spindle with said wheel and the relative rotative movement between the spindle and wheel.

7. An abrading device, comprising a spindle, a wheel mounted freely rotatable thereon, said wheel being formed with a slotted opening in its periphery, a strip of abrasive material mounted upon said spindle and passing outwardly therefrom through said slot and around the periphery of said wheel and then inwardly through said slot and secured within said wheel, and means for controlling the tension upon said strip by controlling the relative rotation of said wheel and spindle during an abrading operation, consisting of an abutment carried by the spindle on one side of said wheel, a spring assembly interposed between said spindle and wheel in opposition to said fixed abutment, and means for adjusting the tension of said assembly.

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