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BRAKE SHOE AND LINING GRINDER

John Y. Blazek, Maple Heights, Ohio, assignor
to Lempco Products, Inc., Bedford, Ohio, a cor-
poration of Ohio

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This invention relates to grinding machines for the brake shoes and the brake shoe linings of automotive vehicles.

The common form of brake shoe is a circularly accurate body of T-form in cross section.

The T-head or flange is generally cylindrical externally and a lining of wear resisting material is fastened on it.

It has been common practice to grind the lining, either when the shoe is new, or when the lining is renewed after wear, to true it up to cylindrical contour so as to fit the cylindrical brake drum with which it engages.

This operation has been necessary because the shoe flange, particularly when fabricated from steel, tends to be warped out of true cylindrical form and the lining, if merely attached thereto, would accordingly have a warped braking surface.

The lining has heretofore been fastened to the shoe flange with rivets. To renew a lining, the rivets are driven out, a new lining is riveted on, and then maybe ground, as aforesaid, to true it up.

Thus in the case of such riveted linings, a service garage needs only a device or machine to grind the new lining after it has been riveted on the shoe.

According to more recent practice, however, linings are secured to the brake shoe flange, by an adhesive or bonding material. To renew a lining, the worn lining and bonding material must first be removed by grinding or cutting operation. Then the metal surface of the shoe must be given a clean, bright abraded finish of a quality to which the bonding material will adhere. Then the new lining is bonded to the shoe and ground to true it up to cylindrical form.

It would seem to be obvious that the bonded lining could be ground off and the grinding then continued deep enough to grind the underlying metal of the shoe to recondition it, as aforesaid, for bonding a new lining thereon, and that existing grinders as referred to above for truing up the surface of the renewed lining could do this; and that no further apparatus is needed and no problem needs to be solved. But such is not the case because a problem is raised by the bonded linings.

As aforesaid, the shoes are almost always warped, that is, the T-head or flange of the shoe is not truly cylindrical. The flange is only about 3/8" thick on the average, and it deviates that much from a true cylindrical form in many cases.

If therefore, a grinding machine that was made to grind a cylindrical surface on a renewed lining were used to grind off the worn bonded lining; and then the grinding were continued deep enough, to abrasively clean up the shoe metal over the whole surface to recondition it for bonding a new lining; such continued, cylindrical grinding would, in some places grind away all of the flange, or leave it so thin that it would not be serviceable as a shoe.

Underlying the present invention is the conception of a process by which the grinding operation is performed in two steps.

First, the worn lining and residue of bonding material are ground off and the metal surface of the shoe reconditioned for bonding, not by grinding on a cylindrical contour, but by grinding in conformity with the warped contour of the shoe, whereby the surface on the flange of the shoe, retains its warped form and full original thickness.

Second, when the new lining has been bonded on, it is ground to cylindrical contour.

The invention comprises a single power operated machine by which both of these successive grinding steps can be performed.

It is therefore among the objects of the invention to provide an improved grinding process and the grinding machine for performing grinding operations involved in initially applying, or in renewing, bonded brake shoe linings.

To provide a machine and process by which a brakeshoe lining that has been mounted on a brake shoe by either rivets or bonding, may be trued up to cylindrical form; and also by which in the case of bonded linings, a worn lining can be removed and the shoe reconditioned for the bond of a new lining without unduly cutting away material of the shoe flange if it is one that is warped out of cylindrical form.

Another object is to provide an abrasive grinding machine of the class referred to comprising an abrasive belt, and a mounting for supporting a brake shoe in grinding pressure with the belt, and means to allow the shoe to shift to maintain grinding pressure contact with a warped lining-supporting surface of the shoe.

Another object is to provide, in an abrasive-belt type of grinding machine, an improved yieldable backing structure behind the grinding flight of the belt, to hold it in grinding engagement with the work as the work is fed into the belt.

Another object is to provide in a grinding machine for grinding brake shoes and linings thereof, means for mounting an arcuate brake shoe for oscillating movement to engage it with a grinding surface of the machine, and improved
means for adapting the machine to shoes of different arcuate radius.

Another object is to provide an improved mounting for an abrasive belt of a belt type grinding machine.

Other objects will be apparent to those skilled in the art to which the invention pertains.

The invention comprises a machine by which the aforesaid process may be practiced and the aforesaid objects attained; the actual invention being set forth in the appended claims; a preferred embodiment of the invention being fully disclosed in the following description taken in connection with the accompanying drawing in which:

Figs. 1 and 2 are perspective views of the said embodiment from opposite sides thereof;

Fig. 3 is a side elevational view corresponding to Fig. 1 but to a larger scale, with parts broken away and parts in section;

Fig. 4 is a view looking at the parts of Fig. 3 from the right side thereof with parts broken away and parts in section;

Fig. 5 is a view looking at the parts of Fig. 3 from the top thereof with parts broken away and parts in section;

Fig. 6 is a fragmentary view from the plane 6—6 of Fig. 3 with parts behind the section plane omitted;

Fig. 7 is a sectional view from the plane 7—7 of Fig. 6;

Fig. 8 is a sectional view from the plane 8—8 of Fig. 5;

Fig. 9 is a fragmentary sectional view from the plane 9 of Fig. 5;

Fig. 10 is a perspective view of a brake shoe and lining of the type to which the invention is related;

Fig. 11 is a fragmentary sectional view from the plane 11 of Fig. 3.

Referring to the drawing, there is shown at 1, a base, formed to stand stably on a bench 2 or like support, and having bolt holes 3, by which it may be bolted thereto, preferably near the end or side of the bench so that a dust spout 4 to be referred to, may overhang and extend below the bench.

A motor 5, on the base has a lower belt pulley 6, on its shaft.

The base has an upright column 7, of plate form, braced by web like braces 8—8 and an upright post 9, is secured in a socket 11 on the column 7. A pulley bracket construction, indicated generally at 12, has an upper belt pulley 13 mounted thereon, directly above the lower pulley 14. An abrasive belt 15 runs on the pulleys 6 and 13, driven by the lower pulley 6. The belt has a working belt flight 15, the abrasive side being toward the said column 7.

The said upper pulley bracket 12 is constructed to be adjustable to positionally adjust the pulley 13 to provide suitable tension in the abrasive belt 14, and to keep the upper and lower pulleys in parallelism to counteract any tendency of the belt to run off of the pulleys; as follows, see Figs. 3, 4, and 5.

A bracket head 16 is vertically slidable on the upper portion of the post 10, and is splined thereto as at 17 to prevent rotation thereof.

A pulley support 18, carries a bearing bolt 19, on which the pulley 13 has rotary bearing. The head 16, engages the pulley support 18, on mutually slotted surfaces thereof in a vertical plane at 20, parallel to the axes of the pulleys 6 and 13. The lower portions of the head and support are in the form of depending flanges 21 and 22, and the head and support are clamped together at said plane by a cap screw 23, going through an oversize smooth hole 24 in the flange 21 and threaded into the flange 22.

The pulley support 18, is pivoted on the head 16 by a pin 25, threaded into the support 18, and passing through said plane of engagement 26, and into a bore in the head 16, in which it is rotatable; the axis of the pin being at right angles to the said plane and above the cap screw 23, as shown in Fig. 3.

As shown in Fig. 5, the pulley 13, extends laterally from the pulley support 18 and laterally with respect to the axis of the pin 25.

The pulley support can be adjustably rocked on the pin 25, after loosening the screw 23, which, as will be apparent, will move the rotary axis of the pulley 13, in a vertical plane, to compensate for any upward or downward inclination thereof with respect to the axis of the lower pulley 6, and therefore correct for any tendency of the belt to run off of the pulleys; and this adjustment is provided for as follows.

A lug 26, on the head 16, has a handle screw 27, threaded therethrough extending toward the flange 22 at a point below the pin 25. Upon turning the screw 27, by its handle 28, in alternate directions (after the screw 23 is loosened), the inner end of the screw will rock the support 18, around the pin 25 in one direction, or allow the tension of the belt to rock it in the other direction. This adjustment is then fixed by tightening the screw 23.

Below the head 16, the part 10 is threaded as at 29 and a knurled hand nut 30 on the thread engages the under side of the head 16 and supports it.

The nut 30 is turned by hand to raise or lower the head 16 and pulley support 18 attached to it by the pin 25 and the screw 23, to tighten or loosen the abrasive belt 14.

The column 7, Figs. 3, 4, and 5 has formed thereon, at its top, a rectangular slideway 31 extending horizontally and approximately at right angles to the belt flight 15; and a slide 32 is reciprocable in or on the slideway. The slideway has a slot 33 therein; and a clamp head 34 overlapping the slot has a threaded shank 35 extending through the slot 23 and screwed into the slide 32. A handle 36 on the head 34 is provided to turn the threaded shank 35, whereby the head 32 may be freed to be manually slid in the slideway to adjustably position it, and then clamped against sliding when positioned.

A scale pointer 37 on the slide 32, indicates, on a scale 38, the position of the slide, the scale being in inches in the range of commercial brake shoe diameters.

A chuck support 39 is oscillately pivoted on the slide 32 on a horizontal axis approximately parallel to the belt flight 15, by the following construction, Figs. 2, 5 and 8. The chuck support comprises a flat arm portion 40. A headed pin 41 goes through the arm portion 40 as a bearing therefor, and into a pedestal 42, in which the pin is secured by a set screw 43, the pedestal 42 being mounted on the slide 32 by screws 44—44 and the head of the pin 40 holding the arm portion 41 against the pedestal.

The chuck support 39 has a lateral extension 45, and a handle 46 is adjustably slidable in a bore in the extension at right angles to the belt flight 15, and may be fixed in any slidable position by a pair of wing screws 47—47.
A chuck jaw 48 is secured to the handle 46 forwardly of the extension 45 by welding at 48, Fig. 5, and is adjustably positionable with the handle. A movable chuck jaw 50 is mounted on the chuck jaw 48 to move toward and from it, by a pair of pins 61—61. Figs. 3 and 4, projected through guide holes in the chuck jaw 48 and threaded into the chuck jaw 48.

The chuck jaws have confronting flat gripping faces normally held apart to provide a space 52 therebetween, Figs. 5 and 11, by a spring 53 therebetween, and the chuck jaw 50 is movable toward and from the chuck jaw 48 against the spring tension by turning a hand wheel nut 54 on the threaded end of a stud 55 projecting from the jaw 48 and through a clearance hole 56 in the jaw 50.

Each of the chuck jaws 48 and 50 has rounded corners 57—57, spaced apart vertically, and spaced from the belt flight 15 in the position of the parts in Fig. 3, and equally distant from the axis of the pivot bolt 41.

In the operation of the machine as thus far described, the web 56 of the shoe (Figs. 3, 10 and 11) is inserted in the space 52 between the chuck jaws 48 and 50 with the flange 59 of the shoe in firm engagement with the rounded corners 57—58 of the chuck jaws (Fig. 3).

The web 56 is then tightly clamped between the jaws by turning the hand wheel nut 54 as described.

The size of the shoe is known, being designated by its diameter (or the diameter of the brake drum with which it is to be used).

The slide 31 is unclamped by turning the handle 46 as described and is then slid along the side of the shoe 35 until the scale points 34 indicates that size on the scale 38, and is then again clamped to the side of the shoe. This adjustment position the pivot pin 41 so that its pivot axis is distant from the belt flight 15 by one half of the adjustment diameter, or the radius of the shoe.

The handle 46 is then freed by loosening the thumb screws 47—47 and is slid forwardly until the brake shoe lining 60, (or the brake shoe flange 59, as the case may be) contacts the belt flight 15.

The handle is then again secured by the thumb screws 47—47.

The chuck jaws 48—50 and the handle 46 itself are prevented from rotating about the axis of the handle, by mutually engaging flat surfaces on the arm 48 and the chuck jaw 48, as indicated at 61 and 62 respectively, Figs. 4, 5 and 2.

If now the handles be oscillated up and down about the pivot pin 41 as described, the belt flight will abrade the lining 60 (or the shoe flange 59) on a cylindrical surface whose radius is that for which the scale setting was made.

The brake shoe can be fed forward from time to time as grinding proceeds, by increments as desired, by manually sliding the handle 46 as aforesaid.

To hold the belt flight 15 against the work thus being pressed against it, an adjustable idler pulley 63, is provided contacting the back side of the belt flight 15, at the place opposite to the place where the work contacts its abrasive front side, the construction being as follows.

A bracket 54 Figs. 3 and 6 extends forwardly from the forward part of the slide way 31, being bolted thereto as shown in Fig. 6 by bolts 65—65 and has two spaced rigid posts 66—67 rising therefrom; and has an upstanding arm 68 pivoted thereto, the arm 68 being forked and straddling the bracket 54 as shown in Fig. 7, and a bearing pin 69 going through the bracket and the fork.

A bearing bolt 70 for the idler pulley 63 is mounted on the pivoted arm 68. The pulley 63 can be adjustably rocked around the pin 69, toward and from the belt flight 15, by rocking the arm 68, and positioning it.

This is done by a screw 71 threaded through the post 66 and at its inner end abutting upon one side of the arm 68, and having a wheel handle 72 on its other end to turn it, to adjustably rock the arm 68 in one direction; and by a yieldable spring 74 on the opposite side of the arm 68, axially aligned with the screw 71 and abutting at its opposite ends upon the arm 68 and post 67, to retract the arm 68 when the screw 71 is turned in the other direction; and a lock nut 75 to fix the screw 71 when adjustably turned.

The idler pulley has a layer of thick soft rubber 75 on its rim of uniform thickness, the outer surface 76 of the layer being cylindrical, and the bearing axis of the pulley 63 is parallel to the back of the belt flight 15, so that when the pulley 63 is adjusted as aforesaid, the rubber layer 75 acts as a cushioned backing for the belt flight 15 on the full width of the belt.

In operation, when the machine is used to true up the surface of a brake lining, such as indicated at 60, Figs. 10 and 3, to cylindrical contour, the handle 46 and chuck jaws 48—50 are fed forwardly until the lining contacts the abrasive belt flight 15; and the handle is then fixed by the thumb screws 47—47; and is then oscillated up and down, and from time to time fed forwardly another increment, as necessary, until the whole face of the lining is ground by the belt flight 15. The geometry embodied in the device, as described, makes this ground face a true cylinder to the radius or the diameter for which the scale 37—38 is set; even if the flange 59 of the shoe is warped out of cylindrical form.

The rubber layer 75 on the idler pulley 63 behind the belt maintains grinding pressure, but yields enough to prevent excessive pressure and gouging or scoring so that the grind surface is left smooth.

When the machine is used to remove a worn lining and its bonding material, and to condition the surface of the shoe flange 59 for bonding on a renewal lining, the same operation could be performed by continuing to grind by increment adjustment of the handle 46, until the metal surface of the flange was exposed and cleaned and abraded; but only if the flange 59 were not warped, as has been explained.

For this operation therefore, another important feature of the construction is put into use as follows.

As shown in Figs. 8 and 4, the bolts 44—44 which mount the pedestal 42 on the slide 32, go through oversize holes 71 in the pedestal.

A vertical pivot pin 78 is provided in aligned bores in the pedestal 42 and slide 37, on which the pedestal has limited oscillatory movement on the slide 32 on a vertical axis, due to the oversize holes.

A manually removable vertical lock pin 79 is projected through aligned bores 80—81 in the pedestal 42 and slide 32, Figs. 4 and 9, radially displaced from the pivot pin 78, and locks the pedestal against oscillatory movement; this being the condition of the parts when a cylindrical surface is to be grounded, as referred to above.

When, as here being considered, the shoe flange 59 is to be ground, the lock pin 79 is with-
drawn manually, and may be provided with a handle on its upper end for that purpose, and a chain 82 may be attached to it to keep it from becoming lost, if accidentally dropped.

The operator now, upon oscillating the main handle 45 up and down for grinding in a circular arc as described, may also concurrently move the handle and the chuck and shoe from side to side; and by inspecting the work as the grinding goes on, may cause the full width of the flange 58 to be presented to the flat grinding surface of the belt flight 45, in spite of warpage in the shoe flange. Thus, the grind is in conformity to the warped surface of the shoe, instead of triuing it up to a cylindrical surface with the disadvantages hereinafter described.

A sheet metal hood 83 is shown in Figs. 1 and 2, and the belt 14, and having an opening 84 to expose the working part of the belt flight 15; and communicates at its lower end with the aforesaid spout 4 by which dust from the grinding operation may be confined and discharged from the spout into any suitable dust receptacle, indicated as a bag in Fig. 3 at 85.

The hood may be supported in any suitable manner by the base 1 and the post 10, and may be in sections to facilitate removal.

I claim:

1. A grinding machine comprising a main frame rotatably supporting upper and lower spaced belt pulleys; an externally abrasive belt running on the pulleys and adapted to be driven by a motor driving one of the pulleys, and having a generally vertical planar abrasive belt flight; an elongated rectilinear guideway on the frame extending toward the plane of the belt flight; a bearing construction adjustable positionable along the guideway, and lock means for locking in an adjusted position; the bearing construction having a bearing axis generally horizontal and parallel to the plane of the belt flight; a chuck support mounted to oscillate on the bearing construction; said chuck support being formed with a bore; a unitary chuck and chuck handle assembly mounted on the chuck support, and oscillatable in unison therewith by the handle, the chuck handle having a shank portion received in the bore of the chuck support and adjustable longitudinally thereto to shift the chuck and chuck handle unit bodily toward and from the belt flight to position the chuck in spaced relation to the belt flight, lock means to lock the shank in adjusted positions, and surfaces on the chuck support and chuck mutually engaged on a vertical plane at right angles to the belt flight in all shank adjusted positions.

2. In a grinding machine of the type comprising an elongated planar abrasive belt flight vertical in a position of use, a chuck confronting the belt flight and mounted on a chuck support, the chuck support mounted on a bearing construction the chuck comprising a chuck axis, in a bore in the chuck support, the shank extending out of one end of the bore to provide a handle for oscillating the support and chuck in unison on the bearing construction the axis of the bearing construction being disposed to maintain oscillatory movement of the chuck in longitudinal planes of the belt flight at right angles thereto; the chuck being between the belt flight and the other end of the bore and being adjustably positionable on the chuck support to feed the chuck toward the belt flight by adjustably positioning the shank with the bore; and the bearing construction being movable toward and from the plane of the belt flight and adapted to be locked in adjusted positions to adjustably vary the distance of the bearing axis from the belt flight; the chuck having jaws to grip the web of a brake shoe and having abutments engageable by the flange of the brake shoe when its web is gripped by the chuck, the abutments being spaced apart and equidistant radially from the bearing axis in all adjusted positions of the axis and all fed position of the axis; the chuck and chuck support having surfaces mutually engaged in a vertical plane at right angles to the belt flight in all adjusted positions of the shank in the bore.

3. In an abrasive belt grinding machine a main frame; a pair of belt pulleys one substantially vertically above the other in a position of use rotatably supported by the frame on spaced bearings, and a tensioned abrasive belt running on the pulleys and adapted to be driven by the motor; adjusting means for one of the pulleys to adjust its position to prevent the belt from running off due to pulley misalignment, comprising: a support for said pulley bearing, pivoted relative to the main frame on a substantially horizontal pivot axis at substantially a right angle to the said pulley bearing axis; the support and a portion of the main frame having surfaces mutually engaged with each other on plane at right angles to the pivot axis; lock means normally clamping the said surfaces together to rigidly lock the support against pivotal movement, and operable to unlock it; a screw carried by the main frame at an angle to the pivot axis and spaced radially therefrom and abutting at its end upon the pulley support to rock it on said plane in one direction, when unlocked, upon turning the screw in one direction, and permitting the pulley support to be rocked in the other direction by belt tension when the screw is turned in the other direction; and adjusting means operable to adjust the distance apart of the pulley bearings to adjust the tension in the belt.

4. In an abrasive belt grinding machine a main frame; a pair of belt pulleys one substantially vertically above the other in a position of use rotatably supported by the frame on spaced bearings, and a tensioned abrasive belt running on the pulleys and adapted to be driven by a motor; adjusting means for adjusting the tension of the belt and the alignment of the pulleys to prevent the belt from running off of the pulleys, comprising: a post on the main frame, generally parallel to the belt; a head reciprocable on the post; a bearing bracket on the head supporting the bearing of one of the pulleys; a nut threaded on the post engaging the head and rotatable to effect movement of the head on the post and the bearing bracket therewith to adjust the tension in the belt; the bearing bracket being mounted on the head by a substantially horizontal pivot bearing axis substantially at right angles to the said pulley bearing axis, and the bearing bracket and head being rigidly clamped together by releasable clamp means upon mutually engaged surfaces thereof in a common plane at right angles to the pivot axis; a screw reacting on the post, and an a portion of the bearing bracket radially spaced from the pivot axis, whereby rotation of the screw will pivotally move the bearing bracket when unlocked.

5. In a grinding machine of the type having an abrasive belt running on spaced pulleys and providing a planar abrasive belt flight, against a
front portion of which work to be ground is to be engaged with pressure; an idler pulley behind the belt flight engaging the back of said portion of the belt flight; a bearing for the idler pulley mounted on an arm pivoted to a bracket extending from the frame along one side of the belt, and the pivot being at a point substantially directly under the idler pulley bearing axis by which the pulley can pivotally rock substantially at right angles toward and from the back of the belt flight substantially without components of movement longitudinally thereof; a spring reacting on the arm and on a portion of the bracket urging the arm and pulley to pivot in one direction, and a screw reacting on the arm and on another portion of the bracket opposing action of the spring and adjustable to stop said spring effected movement of the arm, to adjustably position the pulley.

6. In a grinding machine of the type having an abrasive belt running on spaced pulleys and providing a planar abrasive belt flight, against a front portion of which work to be ground is to be engaged with pressure; an idler pulley engaging the back of said belt flight portion, and rotatable on a bearing; a mounting for the idler pulley bearing comprising a bracket on the frame extending along one side of the belt flight, and an arm pivoted on the bracket on an axis generally parallel to and substantially directly under the idler pulley bearing axis and supporting the pulley bearing; and operable adjusting means to rock the arm on its pivot to move the pulley adjustably substantially at right angles toward and from the back of the belt flight portion and substantially without components of movement longitudinally thereof.

7. In a grinding machine, a frame, an abrasive belt running on spaced pulleys on the frame, providing a planar abrasive belt flight therebetween substantially vertical in a position of use; a chuck holder; a work holding chuck provided with a handle, mounted on the chuck holder in front of the belt flight by a shank of the handle in a bore of the chuck holder extending toward the belt flight; a bearing, on the frame for the chuck holder, having a bearing axis on which the chuck holder and chuck may be manually oscillated in unison by the handle, in longitudinal planes of the belt flight at right angles to the plane of the belt flight, whereby a cylindrical surface may be ground on a work piece held by the chuck; the said bearing being adjustably positionable on the frame toward and from the plane of the belt flight to vary the radius of the cylindrical surface to be ground; the chuck being movably on the chuck holder by the longitudinal movement of the shank in the bore by the handle to feed the work to the belt flight; the chuck holder bearing being pivotally mounted on the frame on a pivot axis generally at right angles to the said bearing axis, and lock means locking it against pivoting when a cylindrical surface is to be ground; and the lock being releasable to permit alternate selective pivoting movements of the chuck holder and chuck by the handle concurrently with said oscillatory movement whereby a warped circular surface may be ground on the work; the chuck holder and chuck having surfaces mutually engaged on a common vertical plane at right angles to the belt flight and preventing rotation of the shank in the bore.

8. In a grinding machine, a frame, an abrasive belt running on spaced pulleys on the frame, providing a planar abrasive belt flight therebetween; a chuck holder; a work holding chuck provided with a handle, mounted on the chuck holder in front of the belt flight by a shank of the handle in a bore of the chuck holder extending toward the belt flight; a bearing on the frame for the chuck holder, having a bearing axis on which the chuck and chuck holder may be manually oscillated in unison by the handle in longitudinal planes of the belt flight at right angles to the plane of the belt flight, whereby a cylindrical surface may be ground on a work piece held by the chuck; the said bearing being adjustably positionable on the frame toward and from the plane of the belt flight to vary the radius of the cylindrical surface to be ground; the chuck being movably on the chuck holder by the longitudinal movement of the shank in the bore by the handle to feed the work to the belt flight; the chuck holder bearing being pivotally mounted on the frame on a pivot axis generally at right angles to the said bearing axis, and lock means locking it against pivoting when a cylindrical surface is to be ground; and the lock being releasable to permit alternate selective pivoting movements of the chuck holder and chuck by the handle concurrently with said oscillatory movement whereby a warped circular surface may be ground on the work; the chuck holder and chuck having surfaces mutually engaged on a common vertical plane at right angles to the belt flight and preventing rotation of the shank in the bore.

9. A grinding machine for grinding cylindrical surfaces, or, optionally, circular warped surfaces, on a work piece, comprising; a main frame; a power driven element having a planar abrasive grinding surface; a support oscillatably mounted on a bearing carried by the frame; a work holding chuck confronting the grinding surface and provided with a handle and mounted on the chuck support, by a handle shank in a bore of the chuck support; and oscillatable in unison with the chuck support, by the handle; the chuck being adjustably positionable on the chuck support to feed the work on the grinding surface by longitudinal movement of the shank in the bore; the bearing axis of the chuck holder disposed so that oscillations of the chuck holder and chuck will cause a cylindrical surface to be ground on a work piece mounted in the chuck; the chuck support bearing being pivotally mounted on the frame on a pivot having an axis generally at right angles to the axis of the chuck holder bearing; releasable lock means locking the bearing against pivoting when a cylindrical surface is to be ground; the chuck holder and chuck being oscillatable on the pivot when the lock is released whereby the chuck holder and chuck may be oscillated on the pivot and on the bearing concurrently with selected movements to grind a circular warped surface on a work piece in the chuck; the chuck holder and chuck having surfaces mutually engaged on a common vertical plane at right angles to the belt flight and preventing rotation of the shank in the bore.

10. A grinding machine comprising a main frame rotatably supporting upper and lower spaced belt pulleys; an externally abrasive belt running on the pulleys and adapted to be driven by a motor driving one of the pulleys, and having a generally vertical planar abrasive belt flight; an elongated rectilinear guideway on the frame extending toward the plane of the belt flight; a bearing support adjustably positionable along the guideway, and lock means for locking it in an adjusted position; a bearing construction on the bearing support having an axis generally horizontal and parallel to the plane of the belt flight; a chuck support mounted to oscillate on the bearing construction; a unitary chuck and handle assembly mounted on the chuck support by a shank of the handle in a bore of the chuck holder extending toward the belt flight, and oscillatable in unison with the chuck holder by the
handle, the chuck and handle assembly being adjustably movable by longitudinal movement of the shank in the bore to position the chuck in spaced relation to the belt flight, and lock means to lock the chuck and handle assembly in adjusted positions; the bearing construction having a pivot connection with the bearing support on a generally vertical axis, and a releasable lock locking the bearing construction against pivoting; and the chuck holder, bearing construction, and chuck, being oscillatable by the handle about the pin axis concurrently with said oscillation on the bearing construction, when the lock is released; the chuck holder and chuck having surfaces mutually engaged on a common vertical plane at right angles to the belt flight and preventing rotation of the shank in the bore.

11. The method of reconditioning for use a brake shoe having a worn lining bonded to a brake shoe flange of generally cylindrical form but which flange is warped out of true cylindrical form, which includes; feeding the shoe toward a planar grinding surface to grind the lining and oscillating the shoe on an axis parallel to the abrading surface while concurrently oscillating the shoe around a second axis at an angle to the first axis, to cause grinding to occur on a warped circular contour conforming to the warped contour of the flange; continuing as aforesaid until the worn lining and bonding material are ground off and a clean warped metal surface on the warped flange is exposed; then bonding a new lining on the warped flange; then feeding the shoe toward a planar grinding surface to grind the lining and oscillating the shoe on an axis parallel to the planar grinding surface to grind a true cylindrical surface on the lining.

12. A grinding machine for grinding a cylindrical surface on the lining of a brake shoe of the type comprising a generally cylindrical flange and a web at right angles thereto; the machine comprising a main frame rotatably supporting upper and lower belt pulleys; an abrasive belt running on the pulleys and adapted to be driven by a motor and having a planar abrasive belt flight generally vertical in a position of use; a free end bearing pin mounted on a support; said support mounted for positioning movement on the frame, and guide means constraining it to move horizontally and vertically from the belt flight rectilinearly and at right angles to the plane of the belt flight, and in all moved positions maintaining the bearing axis generally horizontal and parallel to the plane of the belt flight, and clamp means to fix it in moved positions; a chuck support mounted to oscillate on the bearing; a chuck comprising an elongated round shank in a bore extending toward the belt flight and provided on the oscillatable chuck support and comprising chuck jaws connected to the shank and between an end of the bore and the belt flight and operable to grip the shoe web therein; the shank being manually adjustable longitudinally in the bore to move the chuck jaws toward or from the belt flight; means to lock the shank in adjusted positions; the chuck and the oscillatable support having planar surfaces in mutual contact on a vertical plane at right angles to the belt flight, preventing rotation of the shank in the bore, in all adjusted positions thereof and the shank continuing in a handle beyond the other end of the bore for oscillating the chuck support and chuck on the bearing.

13. A grinding machine comprising a main frame rotatably supporting upper and lower belt pulleys; an externally abrasive belt running on the pulleys and adapted to be driven by a motor and having a generally planar abrasive belt flight vertical in a position of use; a bearing construction supporting a bearing and mounted for positioning movement on the frame, and guide means constraining it to move horizontally and vertically from the belt flight rectilinearly and at right angles to the plane of the belt flight, and clamp means to fix it in moved positions; a chuck support mounted to oscillate on the bearing; a chuck comprising an elongated round shank in a bore extending toward the belt flight and provided on the oscillatable chuck support and comprising chuck jaws connected to the shank and between an end of the bore and the belt flight and operable to grip the shoe web therein; the shank being manually adjustable longitudinally in the bore to move the chuck jaws toward or from the belt flight; means to lock the shank in adjusted positions; the chuck and the oscillatable support having planar surfaces in mutual contact on a vertical plane at right angles to the belt flight, preventing rotation of the shank in the bore, in all adjusted positions thereof and the shank continuing in a handle beyond the other end of the bore for oscillating the chuck support and chuck on the bearing.

14. An abrading machine comprising a base having a generally horizontal platform portion, an upright column extending upwardly from one end of the platform portion, a motor on the other end of the platform portion of the base, said motor having a shaft rotatable about a horizontal axis, a pulley on the motor shaft, an upright post on the column, a pulley mounted on the post for rotation about a horizontal axis spaced vertically above the motor shaft axis, an annular belt trained about the pulleys, said belt having spaced flights and an outwardly directed abrasive surface, bracket means supported by the column and extending from the latter over the top of the motor, an idler pulley disposed between the flights of the belt, means mounting the idler pulley on the bracket in substantially line contact supporting relation to one of the belt flights, a member mounted on the column for relative sliding movement toward and away from said one belt flight, a work support mounted on the slideable member for turning movement about a horizontal axis, the work support turning axis being carried laterally to and from the belt during said sliding movement, and work clamping means supported on the work support to turn with the latter, the rotational axis of the idler pulley and the turning axis of the work support defining a plane which intersects the said one flight of the belt substantially along said line of supporting contact.

15. An abrading machine comprising a base having a generally horizontal platform portion, an upright column extending upwardly from one end of the platform portion of the base, said motor having a shaft rotatable about a horizontal axis, a pulley on the motor shaft, an upright post on the column, a pulley mounted on the post for rotation about a horizontal axis spaced vertically above the motor shaft axis, an annular belt trained about the pulleys, said belt having spaced flights and an outwardly directed abrasive surface, bracket means supported by the column and extending from the latter over the
top of the motor, an idler pulley disposed between the flights of the belt, means mounting the idler pulley on the bracket in substantially line contact supporting relation to one of the belt flights, a member mounted on the column for relative sliding movement toward and away from said one belt flight, a work support mounted on the said member for turning movement about a substantially horizontal axis.

18. An abrading machine comprising a base having a generally horizontal platform portion, an upright column extending upwardly from one end of the platform portion, a motor mounted on the other end of the platform portion of the base, said motor having a shaft rotatable about a horizontal axis, a pulley on the motor shaft, a pulley mounted on the post for rotation about a horizontal axis spaced vertically above the motor shaft axis, the vertical position of said pulleys both being wholly outside the platform portion of the base, an annular belt trained about the pulleys, said belt having spaced flights and an outwardly directed abrasive surface, backing means mounted on the column and extending laterally therefrom in cantilever fashion between the flights of the belt and in supporting relation to one such flight, a member mounted on one side of the column and projecting laterally from the column in the same direction as the belt backing means, said member being slidable on the column and guided therefor for rectilinear movement along a line substantially normal to the plane of said one flight of the abrasive belt, a work support, and means mounting the work support on the slidable member for turning movement about a substantially horizontal axis.

19. A method of reconditioning a brake shoe of the type comprising a metal member having a surface that is substantially a segment of a cylinder and a composition lining bonded to such surface, which method comprises feeding the shoe and a substantially flat moving abrasive surface relatively together to abrade the lining while concurrently oscillating the shoe about angularly disposed axes one of which is parallel to the abrading surface to provide a clean metal surface on the metal member, bonding a new lining of wear resistant composition material to the clean metal surface so provided, and feeding the shoe toward a substantially planar grinding surface to grind the new lining while oscillating the shoe about an axis parallel to said planar grinding surface to grind a true cylindrical surface on the new lining.

20. In the method of finishing a brake shoe of the type comprising a segmental metal member having a substantially cylindrical surface and a cylindrically surfaced composition lining secured against such metal member surface and conformed thereto, which method comprises drawing a flexible abrasive sheet element relatively across the lining, the improvement which comprises in combination tensioning the sheet abrasive element to provide on one side a substantially planar abrasive surface, moving the shoe relatively toward and away from said one side of the tensioned sheet abrasive element to establish substantially line contact between the substantially cylindrical surface of the lining and the planar abrasive surface of the tensioned abrasive element, supporting the tensioned abrasive element by pressure applied yielding thereinto to the other side thereof substantially along a line parallel to the contact line and spaced from the latter by the thickness of the abrasive element, and continuously drawing the abrasive element across the cylindrical surface of the lining of the shoe in a movement which advances all portions of the abrasive surface along said line contact at substantially the same linear rate of speed while turning the brake shoe about an axis.
paralleling both the support and contact lines whereby the cylindrical surface of the lining is drawn progressively across the planar surface of the abrasive element at said line of contact and at such contact line the said abrasive surface is maintained substantially tangent to the cylindrical liner surface with all portions of the abrasive element moving relatively circumferentially of the liner in all turned positions of the brake shoe.

References Cited in the file of this patent

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<th>Number</th>
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